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Message from Associate Editor In Chief

Let me first of all take this opportunity to wish all our readers a very happy, peaceful and prosperous year ahead.

This is the First Issue of the Third Volume of International Journal of Engineering Research and General Science. A total of 189 research articles are published and I sincerely hope that each one of these provides some significant stimulation to a reasonable segment of our community of readers.

In this issue, we have focused mainly on the Upcoming Research and Innovation. We also welcome more research oriented ideas in our upcoming Issues.

Author's response for this issue was really inspiring for us. We received many papers from many countries in this issue than previous one but our technical team and editor members accepted very less number of research papers for the publication. We have provided editors feedback for every rejected as well as accepted paper so that authors can work out in the weakness more and we shall accept the paper in near future. We apologize for the inconvenient caused for rejected Authors but I hope our editor's feedback helps you discover more horizons for your research work.

I would like to take this opportunity to thank each and every writer for their contribution and would like to thank entire International Journal of Engineering Research and General Science (IJERGS) technical team and editor member for their hard work for the development of research in the world through IJERGS.

Last, but not the least my special thanks and gratitude needs to go to all our fellow friends and supporters. Your help is greatly appreciated. I hope our reader will find our papers educational and entertaining as well. Our team have done good job however, this issue may possibly have some drawbacks, and therefore, constructive suggestions for further improvement shall be warmly welcomed.

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Preparation of Activated Carbon from Date Stones:Optimization on Removal of Indigo Carmine from Aqueous Solution Using a two-Level Full Factorial Design

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Abstract—In this work date stones (SD), agriculture wastes, available in large quantity in Tunisia, were used to prepare a low cost activated carbon (DSAC) for removing Indigo Carmine (IC) from aqueous solution. Chemical activation method using $ZnCl_2$ was employed for the preparation of the DSAC. A 2-level full factorial design (FFD) was applied to correlate the preparation variables (activation temperature, activation time and impregnation ratio) to the removal of IC from aqueous solution. The influence of the studied parameters on the IC adsorption was also investigated by using the analysis of variance (ANOVA) to identify the significant variables. The results obtained showed that the optimum conditions for preparing activated carbon from DS for IC adsorption were activation temperature of 700°C, activation time of 120 min and impregnation ratio of 2:1 (Acid / DS, wt basis) which resulted in 298.1 mg/g adsorption capacity of IC from aqueous solution at pH 6.0. It was observed that experimental values obtained were in good agreement with the values predicted by the model. The DSAC seems to be a good adsorbent for the removal of anionic dyes in particular indigo carmine from wastewaters.

Keywords—Activated carbon, Full factorial design, Analysis of variance, Optimization, Date stones, Indigo carmine removal, Adsorption.

INTRODUCTION

Many industries such as textile, paper, printing, leather, food, cosmetics, etc. use dyes to colour their final product and consume substantial volume of water [1, 2]. As a result, they generate a considerable amount of coloured wastewater. Discharge of this dye-containing-wastewater into environment can cause damage to the environment as dyes even in very low concentration are toxic to aquatic life [2- 4]. In addition, presences of colour substances in the water body may decrease the light transmission which decreasing the photosynthesis activity, leading to decrease growth of bacteria and hence decreasing the bio- degradation of impurities in water [4,5]. It has also been reported that many dyes and pigments have toxic as well as carcinogenic and mutagenic effects on aquatic life as well as humans [6,7].Therefore several physical, chemical and biological methods are available to remove dyes from wastewater before it safely discharged into environment [1,8-10]. Adsorption has been found to be superior to other techniques for wastewater treatment in terms of initial cost, flexibility, simplicity of design, ease of operation, and insensitivity to toxic pollutants and does not result in the formation of harmful substances [8, 11]. The most widely used adsorbent is an activated carbon because of its high surface area due to the presence of micro and meso pores [12]. However, commercial activated carbons are expensive so they may not be economical for wastewater treatment purpose. So, a number of studies have been performed using activated carbon prepared from agricultural wastes for the removal of dyes from aqueous solution [10]. Date stones, used in this study, are found to be a good source of activated carbons for removal of various pollutants [13 -21]. Basically, there are two different processes for production of activated carbon: physical and chemical activation [22-24]. The physical activation technique consists of carbonization of the precursor material followed by gasification of the resulting char in steam or carbon dioxide. The chemical activation technique involves carbonization of the raw material that has been impregnated with chemical reagent ($ZnCl_2$, H_3PO_4, KOH...). The chemical activation technique has

more advantages over the physical activation technique since the chemical reagents enhance the yield and increase the surface area of the resulted product. $ZnCl_2$ is one of the most widely used chemical activating agents for the preparation of activated carbon. Among the most useful dyes, there is indigo carmine which is an anionic dye. It is one of the oldest dyes and still one of the most used in textile industry [25] for dyeing of denim and polyester fibres [26, 27]. It is usually used in food and cosmetics industries. Indigo carmine (IC) is considered as a highly toxic indigoid dye [28]. Contact with skin and eyes can cause permanent injury to cornea and conjunctiva [25] and if consumed by oral via may cause death [27].Several processes have been suggested for removal of Indigo Carmine and other dyes from wastewater including photochemical [30- 33] electrochemical [34, 36] biological [36,37] methods , electrocoagulation [38,39] and adsorption[26,40,41].

This research is aimed at optimizing preparation parameters for production of activated carbon from date stones which is abundantly available as waste material in Tunisia, for adsorption of indigo carmine. $ZnCl_2$ was chosen as activating reagent, since it resulted in high surface areas and high yield [10, 15] .Some of the most important preparation conditions: activation temperature, chemical impregnation ratio IR and activation time were optimized using response surface methodology RSM, an experimental design technique which is a useful tool in studying interactions between two or more variables [42-48].

EXPERIMENTAL

Adsorbate

Indigo Carmine (Fig.1), which is also commonly known as Acid Blue 74 or Food Blue 1 is a dark blue, water-soluble powder. Its molecular formula is $C_{16}H_8O_8N_2S_2Na_2$ and molecular weight is 466.36 g/mol. For the present study Indigo Carmine was obtained from Labosi (colour index: 73015) and used as received without further purification. Solutions were prepared by dissolving requisite quantity of the dye in distilled water.

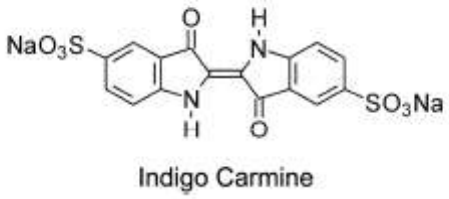


Fig. 1. The molecular structure of indigo carmine (IC).

Preparation of the activated carbon

The date stones were first washed with water to remove impurities, dried at 105°C for 24h, crushed and sieved. Fraction with average particle size of about 300µm was selected for this study. The dried stones were soaked in $ZnCl_2$ solution with a different impregnation ratios (0.25- 2.00) for 24 h at 110 °C. The dried mixture were put into a furnace and heated for different activation times (30-120 min) at different temperatures (400-700°C) under a constant N_2 (99.99%) flow of 120 cm^3/min. Then, the produced activated carbon was repeatedly washed with 0.1 mol/L HCl followed by hot distilled water until the pH of washed solution reached 6.7-7. Finally, the product was dried at 110 °C for 24 h, ground and sieved to a particle size of 125 µm for further studies.

Adsorption studies and analytical method

The adsorption tests were performed at fixed parameters (contact time of 24h, initial IC concentration of 100 mg/l, and adsorbent dose of 0.2g/l at pH 6.0) .The mixture was agitated at 200 rpm at 25°C. The residual concentration of IC solution was determined spectrophotometrically on a visible spectrophotometer (HACH DR/2000) at a wavelength of 610 nm. The adsorption capacity q_{max} (mg/g) was calculated according to the equations (1):

$$q_{\max}(mg/g) = \frac{(C_0 - C_e)V}{m} \qquad (1)$$

Where C_0 and C_e were the concentrations of IC (mg/L) initially and after 24h, V is the volume of solution (L) and m is the amount of dry adsorbent used (g).

Design of experiments by a two-Level Full Factorial Design

In order to optimize an activated carbon preparation, three factors influencing the process: impregnation ratio, activation temperature and activation time must to be studied. But the studying of the each and every factor is quite tedious and time consuming. Thus, a factorial design can minimize the above difficulties by optimizing all the affecting parameters collectively at a time. Factorial design is applied to reduce the total number of experiments in order to achieve the best overall optimization of the process. The basic experimental design is to input all factors at two-levels, called 'high' and 'low' in experimental terms or represented by the coded levels of '+1' and '−1'. For any experiment with k number of factors each at two-levels, a full factorial design will have 2^k runs. This study used a three factors full factorial design. The levels and ranges of the studied process parameters (X_1 - activation temperature, X_2 – activation time and X_3 –impregnation ratio) affecting IC removal employed in the experiment are given in Table 1 with 11 runs to model the date stones activated carbon production process. The data ranges were selected based on the preliminary results and the literature.

Table. 1. Independent variables and their coded levels for the two-Level FFD

Variables (factors)	*Code Values*	*Coded variable levels*		
		+1	0	-1
Activation Temperature(°C)	X_1	700	550	400
Activation Time(min)	X_2	120	75	30
Impregnation Ratio IR	X_3	2	1.125	0.25

Response for IC adsorption capacity was used to develop an empirical model which correlated the response to the three preparation variables employing.

The general mathematical model developed by using factorial design is as follow (44):

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_1X_2 + b_5X_1X_3 + b_6X_2X_3 + b_7X_1X_2X_3 \qquad (2)$$

Where Y is the response and the b terms are parameters to be determined with b_0 is the global mean and bi represents the other regression coefficients.

RESULTS AND DISCUSSION

Development of regression model equation

The design matrix as well as predicted and experimental responses is given in Table 2. Run 9-11 at center points were conducted to determine the experimental error and the reproducibility of the data. It was found that The IC removal was varied from 25.4 to 298.1mg/g and the most active carbon was produced when the activation temperature was 700°C for 120 min and $ZnCl_2$ to carbon mass ratio was 2.0: 1($ZnCl_2$: DS).

TABLE 2. Experimental Design matrix for preparation of DSAC

Run Number	*Activated carbon preparation variables*			*Response IC removal Y(mg/g)*	
	Activation temperature X1(°C)	Activation time X2 (min)	Impregnation ratio X3 (W/W)	Actual	predicted
1	400	30	0.25	25.4	33.88
2	700	30	0.25	58.25	49.78
3	400	120	0.25	31.2	22.72
4	700	120	0.25	157.9	166.38
5	400	30	2.00	33.4	24.92
6	700	30	2.00	48.6	57.1
7	400	120	2.00	121.2	129.68
8	700	120	2.00	298.1	289.62
9	550	75	1.125	93.9	96.76
10	550	75	1.125	98.3	96.76
11	550	75	1.125	100.1	96.76

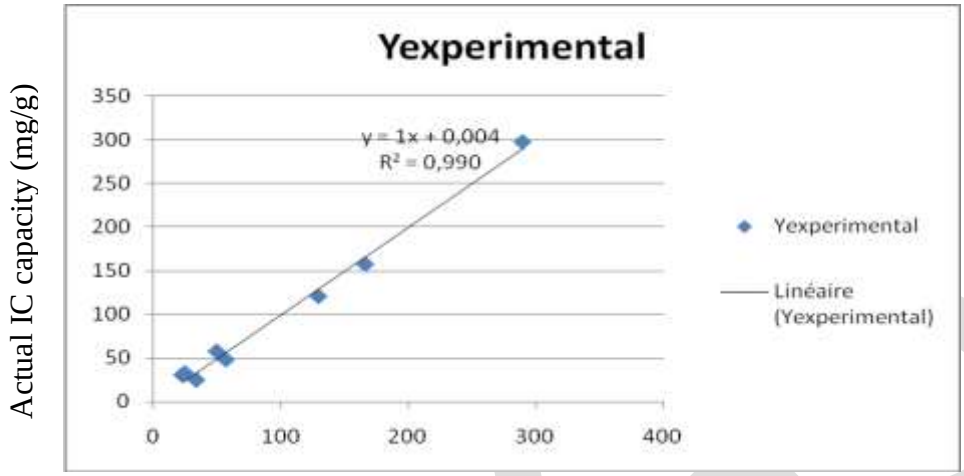
From table 2, it can be seen that the adsorption capacity value depended highly of preparation conditions and ranged from 25.4to

298.1. The higher adsorption capacity was obtained in the case of 700°C of activation temperature, 120mmin of activation time and 2 of impregnation ratio. The results were analyzed using Design Expert® 7.1.6 software and along with the main effects the interactions of different factors were determined. The mathematical regression model for the 8 runs factorial design is given by:

$$\mathbf{Y= 96.76+ 43.96\ X_1+55.34\ X_2+28.57X_3\ +31.94\ X_1\ X_2\ +4.07\ X_1\ X_3\ +28.98\ X_2\ X_3} \quad \mathbf{(3)}$$

The positive sign in front of the terms indicates a synergetic effect. So it can be concluded that all factors studied are synergistic.

As shown by figure 1 the R^2 value is 0.99 which is considered high, indicating that the predicted values of the response from the model are in agreement with the actual experimental data for IC removal.



Predicted IC capacity (mg/g)

Fig. 2. Correlation between the experimental and predicted values for IC removal

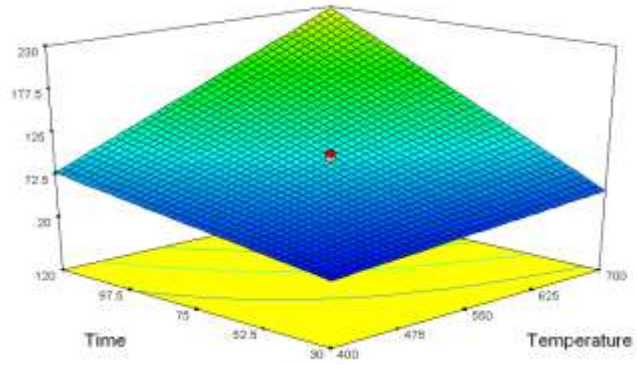
Analysis of variance

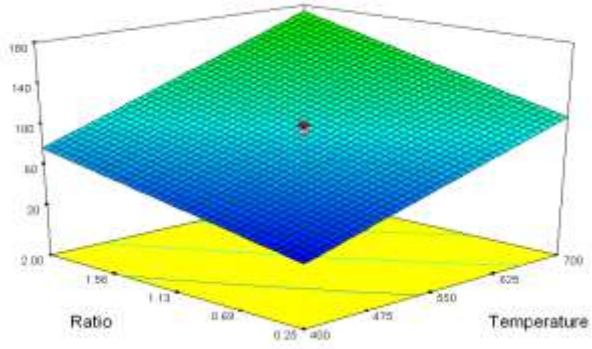
The validity of the model was further justified through analysis of variance (ANOVA).Results obtained are reported in Table3. The higher of F-test value and the lower of P-value, the higher the significance of corresponding coefficient. Values of P less than 0.05 indicate that the model termsare significant. From table 3, it can be seen that the prediction of the model is significant with F-value of 51.62 and Prob › F less than 0.0001. X_1, X_2, X_3, X_1X_2, X_1X_3 and X_2X_3 were significant model terms to the response. However, the effects of activation temperature: X_1 and time: X_2 were greater than impregnation ratio: X_3 on IC removal.

Fig.3 shows the three – dimensional response surface which was constructed to demonstrate the effect of the significant variables on IC removal. It was observed from this figure that the activation time and the temperature imposed greater effect on IC removal than impregnation ratio. At higher values of these factors, the removal of IC becomes more extensive. The activation temperature is an important parameter in shaping the pore structure of DSAC. At higher activation temperature and at longer activation time, the removal of volatile matters from DS becomes more extensive, resulting in a higher IC adsorption.

Table. 3. ANOVA for response model for IC removal by DSAC.

Source	Sum of squares	Degree of freedom	Meansquare	F value	Prob > F
Model	61505.01	6	10250.84	51.62	0.0041
X_1	15457.22	1	15457.22	77.83	0.0031
X_2	24503.45	1	24503.45	123.38	0.0016
X_3	6529.39	1	6529.39	32.88	0.0105
X_1X_2	8163.23	1	8163.23	41.10	0.0077
X_1X_3	132.44	1	132.44	0.67	0.4740
X_2X_3	6719.30	1	6719.30	33.83	0.0101
Residual	595.80	3	198.60	-	-





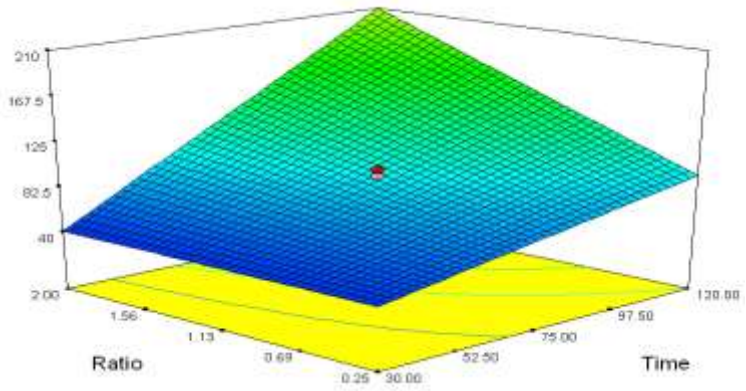


Fig. 3. Three dimensional response surface plot for IC adsorption

Process optimization

One of the main aims of this study was to find the optimum process parameters at which activated carbon produced will have a high IC removal. The optimized conditions were an impregnation ratio of 2.0 g/g, an activation temperature of 700 ºC and an activation time of 120 min. In such optimal combination of parameters, the adsorption of IC reached approximately 300 mg/g. The insignificant error for the IC removal as presented in table 4 showed that the experimental data was in good agreement with the predicted data which can indicated the success of the process of optimisation exercise.

Table 4. Model validation

Temperature (°C)	*Activation time (h)*	*Impregnation ratio (IR)*	q_{IC} *(mg/g)*		
			Experimental	Predicted	Error (%)
700	2	2	298.1	289.61	2.85

Comparison with others adsorbents

Table 5 compares the adsorption capacities of different adsorbent used for removal of IC. The value of q in this study is larger than those in most previous works. This suggests that the IC can be easily adsorbed by the DSAC.

Table 5. Comparison of activated carbons prepared from various raw materials and the optimum conditions of IC removal.

Precursor	*Preparation conditions*	*q (mg/g)*	**Source**
Delanie regia	-	115	40
mytilus edulis shells	-	40.41	49
chitin	-	5.78	50
chitosan	-	71.82	50
Commercial A C	-	57.32	41
silk yarn	0.5 M HCl (room temperature, 0.5 h)	15.06	51
Rice husk ash		29.28	27
Hen Feathers	hydrogen peroxide (30% w/v) ,24 h	1494.68	52
Citrus reticulata peels	20 % formaldehyde ,10 % urea, 3 h.	71.07	53
modified TiO_2 nanoparticles	CetyltriMeammonium bromide 0.08M,1 h	106.24	54
De-oiled soya	H_2O_2, 24h	174.88	28
Bottom ash	H_2O_2, 24h	78.81	28
Date Stones	$ZnCl_2$ (700°C, 2 h, 2g/g)	298.10	This study

CONCLUSION

Date stones were used as precursor to produce an activated carbon with high indigo carmine removal from aqueous solution. A 2-level full factorial design was conduct to investigate the effects of three activated carbon preparation factors: activation temperature, activation time and impregnation ratio. The optimum condition was activation temperature of 700 °C, activation time of 120 min and impregnation ratio of 2.The maximum adsorption capacity obtained is 298.1 mg/g, which is higher than the most others adsorbents. The present study shows that activated carbon prepared from date stones can be used as a good adsorbent for the removal of indigo carmine from aqueous solutions.

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IT Auditing to Assure a Secure Cloud Computing for Enterprise Applications

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Abstract— Recently, all over the world mechanism of cloud computing is widely acceptable and used by most of the enterprise businesses in order increase their productivity. However there are still some concerns about the security provided by the cloud environment are raises. Thus in this our research project, we are discussing over the cloud computing paradigm evolvement for the large business applications like CRM as well as introducing the new framework for the secure cloud computing using the method of IT auditing. In this case our approach is basically directed towards the establishment of the cloud computing framework for the CRM applications with the use of checklists by following the data flow of the CRM application and its lifecycle. Those checklists are prepared on the basis of models of cloud computing such as deployment models and services models. With this project our main concern is to present the cloud computing implications through the large database enterprise CRM application and achieving the desired level of security with design and implementation of IT auditing technique. We claim that with this our proposed methods for the CRM applications, we will providing the security, regulations, compliance of such cloud computing environments.

Keywords— Cloud Computing Security and CRM

PROBLEM STATEMENT:

Moving traditional applications and their infrastructure to cloud has shifted the in-house control to a third party. It posts many challenges including security and privacy, performance and availability out of the security is the number one concern. Clearly using cloud computing does not make the security issue go away. It becomes an even challenging topic. In that sense, it is not quite a usual utility concept we are talking about it. Still there is problem with the security as the data leakage due to the poor authentications and information assurance.

AIMS AND OBJECTIVES:

Thus in this project our main aim and objective is to address the security issue from information assurance and security point of view. That is, we take holistic view of securing cloud computing by using the IT auditing vehicle. IT auditing or in general accounting auditing under cloud computing has added extra role of building strategic plan for the enterprise in addition to the traditional auditing role. We make master checklists as a framework specifically toward cloud computing based on its deployment models and service models. The goal is to create a framework with master check list so that both internal and external auditors can reference to it when they come to audit this new and dynamic cloud computing territory. Following are summarized objectives of our project:

- To present and study the detailed framework of the cloud computing for enterprise applications.
- To design and implement the large database based enterprise application for the cloud computing environment.
- To implement the IT auditing mechanism for the security purpose.

Research Methodologies:

1)Research Methods Used: For our research we used the qualitative research and quantitative research methods for the collection and analysis of data for our research.

A)Qualitative Research:

In this chapter the main research area of the proposed research work and their findings during our study.

Qualitative research is referred as the scientific research which is consisting of the various investigations during procedures for the same:

- Seeking for the answers for the questions.
- In order to answer the questions, systematically needs to use the predefined procedures set.

- Evidence collection.
- Generating the findings which weren't determined in advance.
- Produces the findings which are applicable beyond the immediate boundaries of study.

[Ref: Qualitative Research Methods: A Data Collector's Field Guide]

This all characteristics are shared by the qualitative research. In addition to this, using these research methods we can understand given research problem from the point of view of local population it involves. This type research is especially important in obtaining the culturally related information regarding to the opinions, values, social contexts and opinions.

There frequently used qualitative methods which are in-depth interviews, participant's observation, and focus groups, each method is responsible for getting the particular information for the same. [Ref: Qualitative Research Methods: A Data Collector's Field Guide]

- Participant observation: this is suitable method for collecting the data on the naturally occurring behaviors during their usual contexts.
- In-depth interviews: This kind of methods is optional for the collection of data and mostly depends on the personal perspectives.
- Focus groups are effective in eliciting data on the cultural norms of a group and in generating broad overviews of issues of concern to the cultural groups or subgroups represented.

[Ref: Qualitative Research Methods: A Data Collector's Field Guide]

B)Quantitative Research :On the other hand, in quantitative research, sampling techniques are used and their findings are presented in the form of numerical as well as statistical calculations are done in order to do the estimations of future quantities or events. Thus both research methods are differing in several ways.

[Ref: http://www.businessdictionary.com/definition/quantitative-research.html]

Thus in our case, we did the information collection related to the various surveillance methods, there ways to use, advantages, correctness ratios etc. As we know the main aim of such system is to develop the remote surveillance systems which are very cost effective, fast, robust, and secure as compare to the existing remote surveillance systems. Thus our main area of research for such system was CRM functionality, IT auditing concept etc.

[Ref: http://www.businessdictionary.com/definition/quantitative-research.html]

TIME PLAN:PROJECT BREAKDOWN:

1) Effort estimate table:

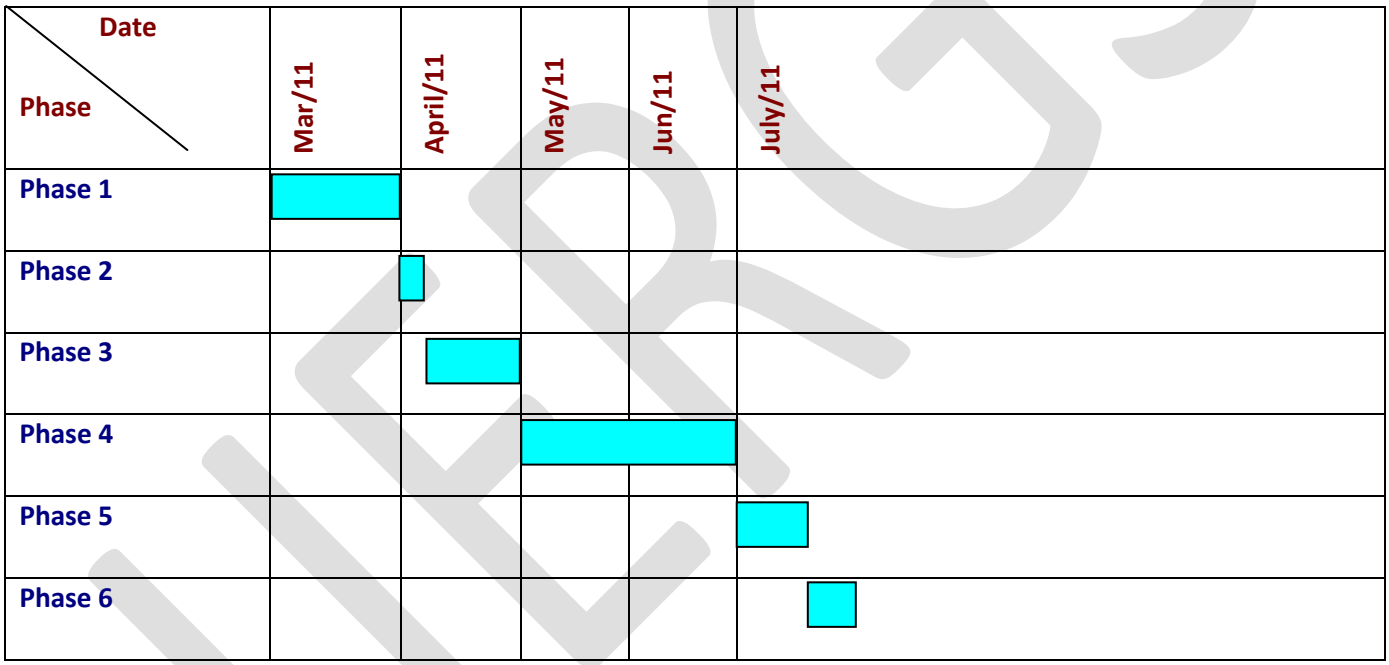
Task	Effort weeks	Deliverables	Milestones
Analysis of existing systems & compare with proposed one	**4 weeks**		
Literature survey	**1 week**		
Designing & planning	**1+2 weeks**		
○ **System flow**	**1 weeks**		
○ **Designing modules & it's deliverables**	**2 week**	Modules design document	
Implementation	**8 weeks**	Primary system	
Testing	**3 weeks**	Test Reports	formal
Thesis	**1 weeks**	Complete project report	formal

2) Phase Description:

Phase	Task	Description

Phase 1	Analysis	Analyze the information related to the Cloud Computing.
Phase 2	Literature survey	Collect raw data and elaborate on literature surveys.
Phase 3	Design	Assign the module and design the process flow control.
Phase 4	Implementation	Implement the code for all the modules and integrate all the modules.
Phase 5	Testing	Test the code and overall process whether the process works properly.
Phase 6	Thesis	Prepare the thesis for this project with conclusion and future enhancement.

3) Project plan:



HARDWARE AND SOFTWARE REQUIREMENTS:

There are following software and hardware.

1) Hardware Requirements are:

- Intel Pentium III or above processor
- Minimum of 256 MB RAM
- Secondary Memory of minimum 5 GB
- NIC Card (Network Interface Card)

2) Software Requirements

- JDK1.4 onwards
- JCreator 4.1 onwards
- Myeclipse6.0 onwards
- Tomcat Apache 5.25 onwards

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Novel PVC Membrane Sensors for Pinaverium Bromide Determination in Pharmaceutical Formulation and Human Urine

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Abstract: The characteristics, performance and applications of three new, simple, rapid, selective and sensitive poly vinyl chloride (PVC) membrane electrodes are described for determination of pinaverium bromide (Pina) in raw material, pharmaceutical formulations and human urine using dibutylphthalate (DBP) as plasticizer. Sensor no. 5 (Pina-TPB) was fabricated using cation exchanger sodium tetraphenylborate (NaTPB), sensor no. 7 (Pina- RT) used ammonium reineckate (RT) and sensor no. 13 (Pina-TPB/RT) used a mixture of both. The sensors showed a near-Nernstian slope of 58.7±0.26, 54.4±0.34 and 55.4±0.27 mV decade^{-1} at 25±0.1°C within the concentration range 5x10^{-6}- 5x10^{-3}, 9.8x10^{-6}- 5x10^{-3} and 9.8x10^{-6}- 5x10^{-3}mol L^{-1} Pina, with detection limits of 2x10^{-6}, 5x10^{-6} and 5x10^{-6} mol L^{-1} Pina for sensors, respectively. The electrode response is independent of pH in the range of 3-11 for the three sensors investigated. All sensors show fast response time which is very short (10 s). Surface analysis using scanning electron microscopy was used to determine the cause of the limited life span of plastic membrane electrode. Validation of the method showed suitability of the sensors for the quality control analysis of pinaverium bromide in pharmaceutical formulation and human urine. The proposed method was simple, accurate and precise.

Keywords: Pinaverium bromide; Potentiometry; Sensors; Electron microscopy Pharmaceutical formulations; Human urine.

1 Introduction

Pinaverium bromide (Fig. 1) [Morpholinium, 4-[(2-bromo-4,5-dimethoxyphenyl)methyl]-4-[2-[2-(6,6-dimethylbicyclo[3.1.1]hept-2-yl)ethoxy]ethyl]-, bromide (Mol. Wt. 591.42)] is a quaternary ammonium compound, is an L-type calcium channel blocker with selectivity for the gastrointestinal tract, which can effectively relieve pain, diarrhea and intestinal discomfort, and provide safe and effective treatment of irritable bowel syndrome (IBS)[1-4].

Several methods have been reported for the determination of pinaverium bromide in dosage forms and in biological fluids: liquid chromatography–electrospray tandem mass spectrometry [5], high-performance liquid chromatography [6-7], gas chromatographic mass spectrometry [8], but these methods suffer from a variety of drawbacks, i.e. they are costly, and are not appropriate for large-scale monitoring.

Potentiometric sensors can overcome these limitations and have advantages such as selectivity, sensitivity, high precision, simplicity, wide linear range, low cost, and rapid determination of a variety of ions in different types of sample. Pinaverium has a low

absorption (8–10%), and maximum blood levels are reached 1 h after oral administration. Some 97% of the drug is bounded to protein in the plasma. With 1.5 h mean half-life, it undergoes a first-pass metabolism that reduces the bioavailability at therapeutic doses. Pinaverium bromide is almost eliminated after transformation in the liver [9]. One of the major problems in the measurement of pinaverium bromide is the small amount present. Thus, there is a growing need for robust sensor systems that allow rapid and reliable determinations, particularly in quality control analysis.

No studies in the literature have reported potentiometric methods for determination of pinaverium bromide yet.

The present work describes construction and investigation of performance characteristics of new ISEs based on PVC for the determination of pinaverium bromide in bulk powder, pharmaceutical formulations, and spiked urine.

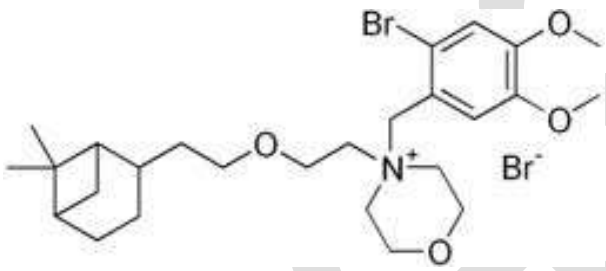

Fig. 1. Chemical structure of pinaverium bromide

2 Experimental

2.1 Reagents and materials

All chemicals were of analytical grade. Double distilled water was used throughout all experiments. Pure grade pinaverium bromide and the pharmaceutical preparation spascolon tablets (100 mg/Tablet) were provided by Chemipharm pharmaceutical industries, 6th October City- Egypt. Sodium tetraphenylborate (NaTPB), ammonium reineckate (NH_4RT), poly (vinyl chloride) of high molecular weight (PVC), dioctyl sebacate (DOS), and tricresyl phosphate (TCP) were obtained from Fluka (U.S.A.). Tetrahydrofuran (THF), dibutyl phthalate (DBP) and dioctyl phthalate (DOP) were purchased from Merck (Germany). The metal salts were provided by BDH as nitrates or chlorides. Stock solutions of the metal salts were prepared in bidistilled water and standardized when-ever necessary.

2.2 Apparatus

Potentiometric and pH-measurements were carried out using 702 titroprocessor equipped with a 665 dosimat (Switzerland) made by Metrohm. A mLw W20 circulator thermostat was used to control the temperature of the test solutions. A saturated calomel electrode (SCE) was used as the external reference, while a Ag/AgCl electrode was used as an internal reference. The electrochemical system may be represented as follows: Ag/AgCl/filling solution/membrane/test solution//KCl salt bridge//saturated calomel electrode.

JEOL scanning electron microscope (JSM - 5610 LA) is used to investigate the morphology of the surfaces of freshly prepared and expired electrode membranes.

2.3 Preparation of the ion-pair

The ion-pairs, Pina-TPB and Pina-RT were prepared by mixing 100 mL 10^{-2} mol L^{-1} pinaverium bromide solutions with 100 mL of 10^{-2} mol L^{-1} of sodium tetraphenylborate or ammonium reineckate. The formed precipitates were filtered, washed thoroughly with bidistilled water and dried at room temperature. The composition of the ion-pair was found to be 1: 1 both in case of Pina-TPB and Pina-RT as confirmed by elemental analysis data. The percentage values found are 71.89, 7.38 and 1.86 and the calculated values are 72.22, 7.34 and 1.68 for C, H and N, respectively, in case of Pina-TPB, while in case of Pina-RT the percentage values found are 42.32, 5.49 and 11.46 and the calculated values are 42.35, 5.52 and 11.53 for C, H and N, respectively.

2.4 Conductometric measurements

Conductomertic titrations were followed with a Jenway conductivity meter. 5 mL of $5.0x10^{-3}$ mol L^{-1} pinaverium bromide solution diluted to 50 mL with distilled water was titrated against a $1.0x10^{-2}$ mol L^{-1} NaTPB or NH_4RT solution. The conductance of the solution was measured after each addition of the titrant. The titration plot (conductance versus molar ratio) showed a break which corresponds to stoichiometry of ion-pairs.

2.5 Electrode preparation

The electrode was constructed as described previously [10]. The membranes were prepared by dissolving varying amounts of the ion-pair and PVC in 10 mL THF. To these, solvent mediators, viz. DBP, DOS, TCP and DOP were added to get membranes of different compositions. The mixture was stirred with a glass rod. When the solution became viscous it was poured into a 6.0 cm Petri dish. The solution was then allowed to evaporate for 24 h at room temperature. Transparent membranes of about 0.2 mm thickness were obtained. A 12 mm diameter disk was cut out from the prepared membrane and glued using PVC–THF paste to the polished end of a plastic cap attached to a glass tube. The electrode body was filled with a solution of 1×10^{-1} mol L^{-1} NaCl and 5×10^{-3} mol L^{-1} pinaverium bromide solution. The electrode was preconditioned before use by soaking in a 1×10^{-3} mol L^{-1} pinaverium bromide solution for 0.5 h. The ratio of membrane ingredients, time of contact and concentration of conditioning solution were optimized so that the potentials recorded were reproducible and stable.

2.6 Electrodes calibration

The conditioned electrodes were calibrated by separately 50 mL aliquots of solutions (10^{-6} to $5x10^{-3}$ mol L^{-1}) of pinaverium bromide into a series of 100 mL beakers. The membrane electrodes, in conjunction with saturated calomel electrode, were immersed in above test solutions and allowed to equilibrate while stirring. The potential was recorded after stabilising to ± 1 mV, and the potential was plotted as a function of the negative logarithm of pinaverium bromide concentration.

2.7 Selectivity coefficient determination

The modified separate solution method and the matched potential method (MPM) [11-13] are employed to determine the selectivity coefficients, $\log K^{pot}_{Pina,J^{Z+}}$, of the potentiometric sensors towards different species. In the modified separate solution method, the potential of a cell comprising a working electrode and a reference electrode is measured in two separate solutions, where, E_1 is the potential measured in 1×10^{-3} mol L^{-1} Pina, E_2 the potential measured in 1×10^{-3} mol L^{-1} of the interfering compound, z_1 and z_2 are the charges of pinaverium and interfering species, respectively and S is slope of the electrode calibration plot. The selectivity coefficients were determined by the modified separate solution method using the rearranged Nicolsky equation:

$$\log K^{pot}_{Pina,J^{z+}} = ((E_1-E_2)/S) + (1 + (z_1/z_2)) \log a$$

Potentiometric selectivity factors of the electrode were evaluated by applying the matched potential method (MPM). According to this method, the activity of Pina solution was increased from $a_A=1.0\times10^{-6}$ mol L^{-1} (reference solution) to $à_A=1\times10^{-3}$ mol L^{-1}, and the changes in potential (ΔE) corresponding to this increase were measured. Next, a solution of an interfering ion of concentration a_B in the range 1.0×10^{-1}–1.0×10^{-2} mol L^{-1} was added to new 1×10^{-6} mol L^{-1} reference Pina solution until the same potential change (ΔE) was recorded. The selectivity factor $K_{A,B}^{MPM}$ for each studied species was calculated using the following equation:

$$K_{A,B}^{MPM} = \frac{(à_A - a_B)}{a_B}$$

2.8 Determination of pinaverium bromide in spascolon tablets

The required amount from the tablets was dissolved in 30 mL bidistilled water and filtered in 50 mL measuring flask. The residue was washed three times with bidistilled water, and the volume was completed to the mark by the same solvent. The contents of the measuring flask were transferred into a 100 mL titration cell and subjected to potentiometric determination of pinaverium bromide.

2.9 Determination of pinaverium bromide in spiked urine samples

Different amounts ($5x10^{-5}$-$2x10^{-4}$ mol L^{-1}) of pinaverium bromide and 5 mL urine of a healthy person were transferred to 50-mL measuring flask and completed to the mark by bidistilled water. The contents of the measuring flask were transferred to a 100-mL beaker, and subjected to potentiometric determination of pinaverium bromide by the standard addition method.

3 Results and discussion

3.1 Influence of membrane composition

Pinaverium cation was found to form 1:1 water insoluble ion-pair with each of sodium tetraphenylborate and ammonium reineckate as indicated by elemental analysis data and ascertained using conductometric titration (Fig. 2). The prepared ion-pairs were identified and examined as ion exchange sites in PVC membrane sensors responsive for pinaverium cation.

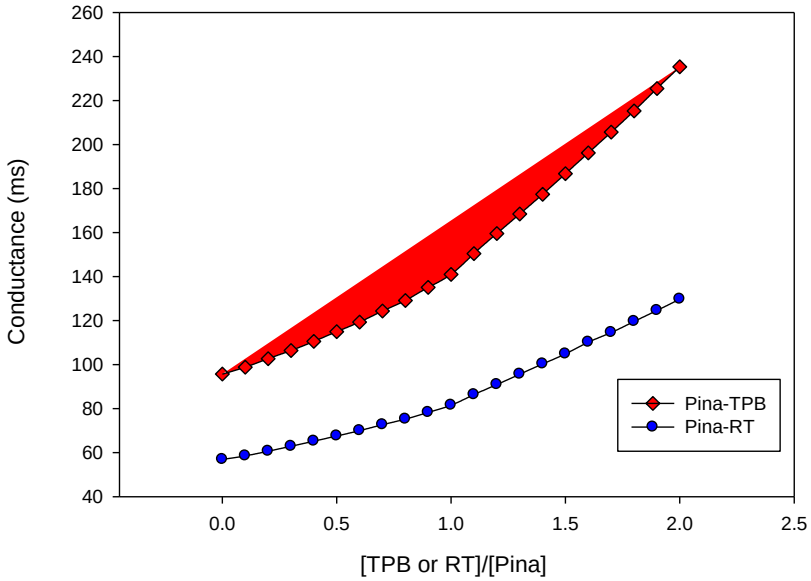

Fig. 2. Conductometric titration curves of 5 x 10^{-3} mol L^{-1} Pina against 1.0 x 10^{-2} mol L^{-1} NaTPB and RT

Several sensors of different compositions prepared as described in the experimental section, were tested. The slope, the linear concentration range, limit of detection and limit of quantitation for the different sensors are given in Table 1. The best performance was exhibited by sensor no. 5 with Pina-TPB, DBP and PVC in ratio 12:44:44, respectively. This sensor showed a nearly Nernstian response with slope of 57.6 mV/decade and a linear concentration range $5x10^{-6}$ -$5x10^{-3}$ mol L^{-1}. Sensor no. 7 with Pina-RT, DBP and PVC in ratio 1:49.50:49.50, respectively showed a nearly Nernstian response with slope of 53.6 mV/decade and a linear concentration range $9.8x10^{-6}$ -$5x10^{-3}$ mol L^{-1} while sensor no. 13 with Pina-TPB/RT, DBP and PVC in ratio 2:1:48.50:48.50, respectively, showed a nearly Nernstian response with slope of 53.6 mV/decade and a linear concentration range $9.8x10^{-6}$ -$5x10^{-3}$ mol L^{-1}. The calibration graphs of the different sensors are shown in Fig .3

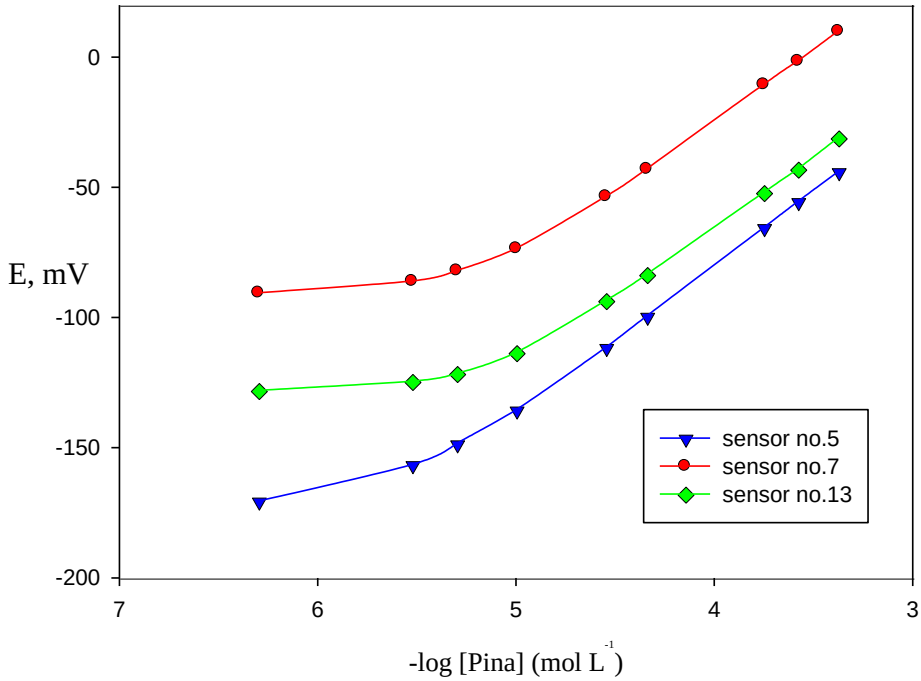

Fig. 3. Profile of the potential in mV versus -log concentrations of Pina in (mol L^{-1}) obtained with sensors nos. 5, 7 and 13

The PVC acts as a regular support matrix for the plastic membrane ion-selective electrode, but its use requires a plasticizer which acts as a fluidizer allowing homogeneous dissolution and diffusional mobility of the electroactive complex inside the membrane [14]. Four plasticizers, DBP, DOP, DOS and TCP were tested and recorded in Table 1. The results indicated that DBP is the best tested plasticizer. Poor sensitivities for sensors plasticized by the other plasticizers are due to low distributions of the electroactive ion-pairs Pina-TPB and Pina-RT in these solvents. The electrochemical performance characteristics of the proposed sensors were systematically evaluated according to IUPAC standards [15]. Table 2 shows that sensor no. 5 can detect Pina in very dilute solutions down to $2x10^{-6}$ mol L^{-1}

Table 1. Optimization of membrane compositions and their potentiometric response for Pina ion selective membrane

Sensors no.	Composition of membrane% (w/w; mg)							**Slope** mV/decade	*Linear concentration range* (mol L^{-1})	LOD[a] (mol L^{-1})	LOQ[b] (mol L^{-1})	RSD %
	Pina-TPB	Pina-RT	PVC	DBP	DOP	DOS	TCP					
1	3	-	**48.50**	**48.50**	-	-	-	**55.9± 0.23**	**$5x10^{-6}$-$5x10^{-3}$**	**$3x10^{-6}$**	**$1x10^{-5}$**	**0.42**
2	5	-	**47.50**	**47.50**	-	-	-	**55.5±0.25**	**$5x10^{-6}$-$5x10^{-3}$**	**$3x10^{-6}$**	**$1x10^{-5}$**	**0.46**
3	7	-	**46.50**	**46.50**	-	-	-	**56.1± 0.07**	**$5x10^{-6}$-$5x10^{-3}$**	**$3x10^{-6}$**	**$1x10^{-5}$**	**0.12**
4	9	-	**45.50**	**45.50**	-	-	-	**56.7±0.28**	$5x10^{-6}$-$5x10^{-3}$	$3x10^{-6}$	$1x10^{-5}$	0.50
5	**12**	**-**	44	44	**-**	**-**	**-**	57.6±0.21	**$5x10^{-6}$-$5x10^{-3}$**	**$2x10^{-6}$**	**$6.7x10^{-6}$**	**0.37**
6	-	0.5	**49.75**	**49.75**	-	-	-	**53.4±0.11**	**$9.8x10^{-6}$-$5x10^{-3}$**	**$5x10^{-6}$**	**$1.6x10^{-5}$**	**0.22**
7	**-**	**1**	49.50	49.50	**-**	**-**	**-**	53.6± 0.37	**$9.8x10^{-6}$-$5x10^{-3}$**	**$5x10^{-6}$**	$1.6x10^{-5}$	0.69
8	-	1.5	**49.25**	**49.25**	-	-	-	**52.6±0.29**	**$9.8x10^{-6}$-$5x10^{-3}$**	**$9.8x10^{-6}$**	**$3.2x10^{-5}$**	**0.56**
9	-	2	**49.00**	**49.00**	-	-	-	**52.5±0.34**	**$1.9x10^{-5}$-$5x10^{-3}$**	**$9.8x10^{-6}$**	**$3.2x10^{-5}$**	**0.66**
10	-	3	**48.50**	**48.50**	-	-	-	**51.0±0.45**	**$1.9x10^{-5}$-$5x10^{-3}$**	**$9.8x10^{-6}$**	**$3.2x10^{-5}$**	**0.89**
11	-	5	**47.50**	**47.50**	-	-	-	**48.9±0.39**	**$2.8x10^{-5}$-$5x10^{-3}$**	$1.9x10^{-5}$	$6.3x10^{-5}$	**0.81**
12	1	1	49.00	49.00	-	-	-	**53.2±0.18**	$9.8x10^{-6}$-$5x10^{-3}$	$4x10^{-6}$	$1.3x10^{-5}$	**0.34**
13	**2**	**1**	**48.50**	**48.50**	**-**	**-**	**-**	53.6±0.39	**$9.8x10^{-6}$-$5x10^{-3}$**	$5x10^{-6}$	$1.6x10^{-5}$	0.73
14	12	-	44	-	44	-	-	48.7±0.36	**$5x10^{-6}$-$5x10^{-3}$**	$1.4x10^{-6}$	$4.7x10^{-6}$	0.86
15	12	-	44	-	-	44	-	49.9±0.34	$5x10^{-6}$-$5x10^{-3}$	$3x10^{-6}$	$1x10^{-5}$	0.75
16	12	-	44	-	-	-	44	51.2±0.27	$5x10^{-6}$-$5x10^{-3}$	$2x10^{-6}$	$6.7x10^{-6}$	0.55
17	-	1	49.50	-	49.50	-	-	36.8±0.41	**$9.8x10^{-6}$-$5x10^{-3}$**	$5x10^{-6}$	$1.6x10^{-5}$	0.88
18	-	1	49.50	-	-	49.50	-	47.5±0.28	$9.8x10^{-6}$-$5x10^{-3}$	$5x10^{-6}$	$1.6x10^{-5}$	0.64
19	-	1	49.50	-	-	-	49.50	48.1±0.21	**$9.8x10^{-6}$-$5x10^{-3}$**	$4x10^{-6}$	$1.3x10^{-5}$	0.45

a Limit of detection

b Limit of Quantitation

RSD: relative standard deviation (four determinations)

Table 2. Electrochemical response characteristics of the three investigated Pina sensors

Parameter	Sensor no.5	Sensor no.7	Sensor no.13
[a] Slope (mV/decade)	57.6±0.21	53.6±0.37	53.6±0.39
) LOD (mol L^{-1}	$2x10^{-6}$	$5x10^{-6}$	$5x10^{-6}$
LOQ (mol L^{-1})	$6.6x10^{-6}$	$16.7x10^{-6}$	$16.7x10^{-6}$
Response time (s)	10	10	10
Working pH range	3-11	3-11	3-11
linear concentration range (mol L^{-1})	$5x10^{-6}$ -$5x10^{-3}$	$9.8x10^{-6}$ -$5x10^{-3}$	$9.8x10^{-6}$ -$5x10^{-3}$
Stability (days)	16	6	16
Average recovery(%)±S.D.[a]	99.76±0.213	98.89±0.372	99.92±0.396
Correlation coefficient (r^2)	0.9999	0.9994	0.9996

a Average of four determinations.

3.2 Influence of internal filling solution

The sensors have been examined at various concentrations of internal reference pinaverium bromide solution in the range of ($5x10^{-3}$ to $1x10^{-4}$ mol L^{-1}) and the potential response of the electrodes has been observed. It was found that the best results in terms of slope and linear concentration range have been obtained with internal solution of concentration $5x10^{-4}$ mol L^{-1}. Thus, $5x10^{-4}$ mol L^{-1} concentration of the reference solution was quite appropriate for the smooth functioning of the proposed sensors. The results are shown in Table 3.

Table 3. Effect of internal filling solution on pina responsive sensors

Internal filling solution (mol L^{-1})	Slope mV/decade	*Linear concentration range* (mol L^{-1})
	Sensor no.5	
5 $x10^{-3}$	57.6±0.24	$5x10^{-6}$ -$5x10^{-3}$
1 $x10^{-3}$	57.7±0.28	$5x10^{-6}$ -$5x10^{-3}$
5 $x10^{-4}$	**58.7±0.26**	**$5x10^{-6}$ -$5x10^{-3}$**
1 $x10^{-4}$	57.3±0.29	$5x10^{-6}$ -$5x10^{-3}$
	Sensor no.7	
5 $x10^{-3}$	53.6±0.36	$9.8x10^{-6}$ -$5x10^{-3}$
1 $x10^{-3}$	52.0±0.19	$9.8x10^{-6}$ -$5x10^{-3}$
5 $x10^{-4}$	**54.4±0.34**	**$9.8x10^{-6}$ -$5x10^{-3}$**
1 $x10^{-4}$	53.4±0.29	$9.8x10^{-6}$ -$5x10^{-3}$
	Sensor no.13	
5 $x10^{-3}$	53.6±0.34	$9.8x10^{-6}$ -$5x10^{-3}$
1 $x10^{-3}$	53.0±0.26	$9.8x10^{-6}$ -$5x10^{-3}$
5 $x10^{-4}$	**55.4±0.27**	**$9.8x10^{-6}$ -$5x10^{-3}$**
1 $x10^{-4}$	54.2±0.22	$9.8x10^{-6}$ -$5x10^{-3}$

3.3 Dynamic response time

Dynamic response time is an important factor for analytical applications of ion-selective electrodes. To measure the dynamic response time of the sensor the concentration of the test solution was changed in steps from ($1x10^{-6}$ – $1x10^{-3}$ mol L^{-1}). The required time for the sensors to reach values within ±1 mV of the final equilibrium potential was (5-10 s) for sensors.

3.4 Influence of soaking time and life time

The life times of the sensors were determined by soaking in $1x10^{-3}$ mol L^{-1} pinaverium bromide solution for interval ranging from 0.5 hr. to 16 days till the electrode lost its Nernstian behavior. This behavior may be attributed to the decomposition of the ion-pair and loss of other components in the membrane phase that was in contact with aqueous test solution containing drug ion. The response of the sensors has been measured by recording the calibration graph at 25 °C at different intervals. The results listed in Table 4 show the effect of soaking time on slope and concentration range. It is worthy to mention that the short life time of the investigated electrodes (less than one month for the best cases) may be attributed to the low lipophilicity of pina –ion-pairs[16].

Table 4. Effect of soaking time on the potential response of the pina sensors

Soaking time	Slope(mV/decade)	Linear concentration range (mol L^{-1})
	Sensor no.5	
0.5 hr	58.7±0.21	$5x10^{-6}$ -$5x10^{-3}$
6 hr	58.5±0.24	$5x10^{-6}$ -$5x10^{-3}$
1 day	56.9±0.31	$5x10^{-6}$ -$5x10^{-3}$
3 days	55.8±0.22	$6.5x10^{-6}$ -$5x10^{-3}$
6 days	55.3±0.27	$6.8x10^{-6}$ -$5x10^{-3}$
7 days	54.0±0.19	$8x10^{-6}$ -$5x10^{-3}$
11 days	52.2±0.25	$9.5x10^{-6}$ -$5x10^{-3}$
16 days	45.3±0.26	$2x10^{-5}$ -$5x10^{-3}$
	Sensor no.7	
0.5 hr	54.4±0.27	$9.8x10^{-6}$ -$5x10^{-3}$
6 hr	54.2±0.34	$9.8x10^{-6}$ -$5x10^{-3}$
1 day	53.3±0.37	$9.8x10^{-6}$ -$5x10^{-3}$
2 days	52.6±0.28	$1x10^{-5}$ -$5x10^{-3}$
3 days	50.7±0.25	$1.5x10^{-5}$ -$5x10^{-3}$
5 days	50.3±0.39	$1.8x10^{-5}$ -$5x10^{-3}$
6 days	48.9±0.37	$2.2x10^{-5}$ -$5x10^{-3}$
	Sensor no.13	
0.5 hr	55.4±0.28	$9.8x10^{-6}$ -$5x10^{-3}$
2 hr	56.9±0.26	$9.8x10^{-6}$ -$5x10^{-3}$
6 hr	55.9±0.24	$9.8x10^{-6}$ -$5x10^{-3}$
1 day	55.2±0.28	$9.8x10^{-6}$ -$5x10^{-3}$
2 days	55.8±0.27	$9.8x10^{-6}$ -$5x10^{-3}$
3 days	55.5±0.25	$9.8x10^{-6}$ -$5x10^{-3}$
5 days	54.9±0.29	$1x10^{-5}$ -$5x10^{-3}$
6 days	53.5±0.21	$1x10^{-5}$ -$5x10^{-3}$
8 days	53.3±0.23	$1.2x10^{-5}$ -$5x10^{-3}$
12 days	51.5±0.21	$1.5x10^{-5}$ -$5x10^{-3}$
14 days	50.5±0.31	$1.7x10^{-5}$ -$5x10^{-3}$
16 days	49.0±0.32	$1.9x10^{-5}$ -$5x10^{-3}$

3.5 Influence of soaking on the morphology of the membrane's surface

The electron microscopy images of surfaces of fresh and expired electrodes were obtained by tracing the secondary electrons emitted from the membrane surface. Drastic changes in the morphology of the surfaces which can be attributed to prolonged soaking of the electrodes have been observed. Images for a membrane including Pina-RT ion pair is taken as a representative (Fig. 4). These morphological changes are ascribed to some sort of solvent/gel layer interaction leading ultimately to shrinking of the polymeric network [Fig. 4b]. The harm of these surface changes is that they generate unequal strains at the deformed areas and consequently produce asymmetry potentials [17]. These potentials interfere with the phase boundary equilibrium of pinaverium at the membrane surface, and negatively affect the performance of the electrode.

Fig.4. High-resolution electron micrographs of a membrane surfaces containing Pina-Rt ion pair. (a) Fresh membrane (3500-fold magnification), and (b) expired membrane (3500-fold magnification)

3.6 Influence of temperature

Thermal stability of the sensors was tested by constructing calibration graphs for the electrode potential, E_{elect}, versus pPina at different temperatures covering the range 20-60°C. The electrode potentials from these graphs at pPina = 0 were obtained and plotted versus (t-25), where t is the temperature of the solution. A straight line was obtained for each electrode and the slope (dE/dt) represents the thermal coefficient of the electrode [18]. The slopes were found to be 0.00012, 0.00084 and 0.00083 V/°C for sensors no.5, 7 and 13, respectively. This indicates fairly high thermal stability of the sensors within the investigated temperature range and shows no deviation from the theoretical Nernstian behavior.

3.7 Influence of pH and effect of electrolytes

The effect of pH on the electrode potential at pinaverium bromide concentrations 1×10^{-4} and 1×10^{-3} mol L^{-1} was studied. The pH was varied by adding HCl or NaOH solutions in different concentrations (each 0.1-1.0 mol L^{-1}). The results are shown in Fig. 5. As can be seen, the pH had little influence on the potential response, especially at high concentrations. The electrode response was checked with bidistilled water, 0.04 mol L^{-1} Britton Robinson buffer pH 7.0 or 0.1 mol L^{-1} phosphate buffer pH 7.0. The best results were achieved in 0.04 mol L^{-1} Britton Robinson buffer pH 7.0 in the case of Pina-TPB sensor (sensor no.5), but in the case of the other sensors, using bidistilled water, it provided not only a higher Nernstian slope but also a stable potential reading. Therefore, 0.04 mol L^{-1} Britton Robinson buffer pH 7.0 was used in the case of Pina-TPB sensor and bidistilled water was used in the case of the other sensors. The effect of ionic strength on the response of the sensors was also studied, by measuring the potential values of the sensors at different electrolyte concentrations, 0.01-1.0 mol L^{-1} NaCl in 0.04 mol L^{-1} Britton Robinson buffer pH 7.0 in the case of Pina-TPB sensor, and in bidistilled water in the case of the other sensors. The results indicate that there is no effect of ionic strength on the response of these sensors.

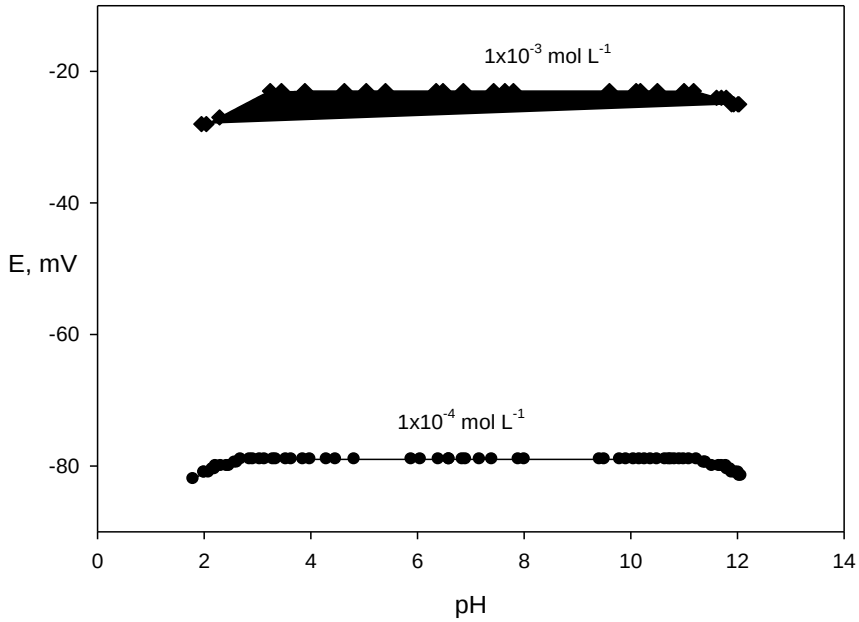

Fig. 5. Effect of pH on the potential responses of sensor no. 5

3.8 Determination of solubility products of Pina ion-pairs

Pungor and Toth [19] have shown that the solubility products of the precipitates constituting the ion-selective sensors determine the detection limits of precipitate-based sensors. Hence the proposed electrodes were used for determination of the solubility products (Ksp) of pina-TPB and pina-RT ion-pairs by standard addition method. The solubility product of the pina-TPB and pain-RT ion-pairs were found to be 7.80×10^{-13} and 7.02×10^{-12} at 30°C, respectively indicating a relatively low solubility of ion pair containing NaTPB compared with that containing ammonium reineckate. This behaviour is in accordance with the difference in life span of the studied sensors.

4 Validation of the method

The linearity, limit of detection, selectivity, precision, accuracy, and ruggedness/robustness were the parameters used for the method validation.

4.1 Selectivity

Selectivity is an important characteristic of an electrode that delineates the extent to which the device may be used in the estimation of analyte ion in the presence of other ions and extent of utility of any electrode in real sample measurement. The selectivity of an ion-pair based membrane electrode depends on the physico-chemical characteristics of the ion-exchange process at the membrane. For example, sample solution interface, mobility of the respective ions in the matrix of the membrane and on the hydrophobic interactions between the primary ions and the PVC membrane [20]. The selectivity of the Pinaverium membrane electrode is related to the free energy of transfer of the pinaverium cation between aqueous and membrane phases. None of the investigated species interferes, as shown by the very small values of the selectivity coefficient (Table 5). This reflects a very high selectivity of the investigated electrodes towards Pinaverium. The inorganic cations do not interfere because of the difference in their mobility and permeability as compared to pinaverium cation. In case of sugars and amino acids, the high selectivity is related to the difference in polarity and lipophilic nature of their molecules relative to pinaverium cation. The mechanism of selectivity is mainly based on the stereo

specificity and electrostatic environment and is dependent on how much fitting is present between the location of the lipophilicity sites in two competing species in the bathing solution side and those present in the receptor of the ion-exchanger [21].

Table 5. Selectivity coefficient values $K^{pot}_{Pina,J^{z+}}$ for Pina sensors

Interferent	Sensor no.5		Sensor no.7		Sensor no.13	
	SSM	MPM	SSM	MPM	SSM	MPM
Na^+	$2.79x10^{-4}$	-	$2.61 x10^{-3}$	-	$3.47 x10^{-3}$	-
K^+	$4.06x10^{-4}$	-	$4.95 x10^{-3}$	-	$7.00 x10^{-3}$	-
NH_4^+	$5.42x10^{-4}$	-	$3.83 x10^{-3}$	-	$5.24 x10^{-3}$	-
Li^+	$2.46 x10^{-4}$	-	$1.71 x10^{-3}$	-	$2.59 x10^{-3}$	-
Ca^{2+}	$5.94 x10^{-5}$	-	$1.70 x10^{-4}$	-	$2.04 x10^{-4}$	-
Mg^{2+}	$5.25 x10^{-5}$	-	$1.77 x10^{-4}$	-	$2.50 x10^{-4}$	-
Co^{2+}	$8.99 x10^{-5}$	-	$2.96 x10^{-4}$	-	$3.08 x10^{-4}$	-
Cu^{2+}	$1.06 x10^{-4}$	-	$3.36 x10^{-4}$	-	$3.49 x10^{-4}$	-
Mn^{2+}	$1.54 x10^{-4}$	-	$2.96 x10^{-4}$	-	$4.29 x10^{-4}$	-
Fe^{3+}	$1.74 x10^{-4}$	-	$3.08 x10^{-4}$	-	$3.79 x10^{-4}$	-
Vitamine B1	$1.87 x10^{-2}$	-	$1.84 x10^{-2}$	-	$1.89 x10^{-2}$	-
Vitamine B6	$8.35 x10^{-3}$	-	$1.55 x10^{-2}$	-	$1.60 x10^{-2}$	-
Glucose	-	$8.47 x10^{-4}$	-	$5.47 x10^{-4}$	-	$9.22 x10^{-4}$
Fructose	-	$9.22 x10^{-4}$	-	$5.28 x10^{-4}$	-	$4.51 x10^{-4}$
Maltose	-	$6.47 x10^{-4}$	-	$5.69 x10^{-4}$	-	$4.94 x10^{-4}$
Lactose	-	$7.16 x10^{-4}$	-	$6.79 x10^{-4}$	-	$5.47 x10^{-4}$
Urea	-	$7.77 x10^{-4}$	-	$6.47 x10^{-4}$	-	$5.10 x10^{-4}$
β-alanine	-	$7.57 x10^{-4}$	-	$5.92 x10^{-4}$	-	$5.69 x10^{-4}$
Glycine	-	$9.22 x10^{-4}$	-	$6.18 x10^{-4}$	-	$5.28 x10^{-4}$

4.2 Ruggedness/ Robustness

For ruggedness [20] of the method a comparison was performed between the intra- and inter-day assay results for pinaverium obtained by two Ph.D. candidates. The RSD values for the intra- and inter-day assays of pinaverium in the cited formulations performed in the same laboratory by the two analysts did not exceed 2%. On the other hand, the robustness [22] was examined while the parameter values (pH of the eluent and the laboratory temperature) were deliberatly slightly changed. Pinaverium recovery percentages were good under most conditions, not showing any significant change when the critical parameters were modified.

4.3 Accuracy

Accuracy is an important requirement of electroanalytical methods. It can be defined as the closeness between the true or accepted reference value and the obtained value [24]. The accuracy of the proposed method using the proposed sensors was investigated by the determination of pinaverium in spiked samples prepared from serial concentrations of pinaverium reference standards. The results summarized in Tables 6 and 7 show high accuracy of the proposed method, as indicated by the percentage recovery values.

4.4 Linearity

Under the optimal experimental conditions, linear relationships exist between the electrode potential/mV and the log [Pina]. The regression data, correlation coefficients (r^2) and other statistical parameter are listed in Table 2.

4.5 Limit of detection

LOD is the lowest quantity of the investigated compound in a sample that can be detected, but not necessarily quantified with an acceptable uncertainly. LOD of an electroanalytical method is an important factor if quantitative measurements are to be made at concentrations close to it. Especially, LOD is necessary for the trace analysis of drug active components in pharmaceuticals and/or human urine samples [23]. The values of LOD that are presented in Table 2 indicate that the sensors under investigation are highly sensitive, selective and can be applied in determination of small amounts of pinaverium bromide.

4.6 Precision

Precision is a measure of how close results are to one another. Precision is also expressed as the closeness of agreement between independent test results obtained under stipulated conditions. Precision is usually expressed as standard or relative standard deviations of the replicate analysis [23]. Hence the precision of the proposed potentiometric method using the sensors under investigation was measured as percentage relative standard deviation (RSD %) as shown in Tables 6 and 7.

Table 6**.** Determination of Pinaverium bromide in pure solution and pharmaceutical preparations applying the standard additions and potentiometric titrations method

Sample	Standard additions				Potentiomtric titration			
	Taken mg	Found mg	Mean Recovery %	RSD %	Taken mg	Found mg	Mean Recovery %	RSD %
			Sensor no.5					
Pure solution	5.91	5.89	99.00	0.98	44.35	44.06	99.93	0.95
	2.95	2.96	100.33	0.04	29.57	29.27	99.00	0.21
	2.36	2.33	98.72	0.03	14.78	15.08	102.03	0.83
	1.47	1.45	98.63	0.32				
Spascolon	5.91	5.83	98.64	0.87	44.35	44.06	99.93	0.53
	2.95	2.94	99.66	0.63	29.57	29.27	99.00	0.47
	2.36	4.50	98.00	0.32	14.78	15.08	102.03	0.37
	1.47	1.48	100.68	1.00				
			Sensor no.7					
Pure solution	5.91	5.84	98.81	0.38	44.35	44.65	99.93	0.12
	2.95	2.94	99.66	0.99	29.57	29.86	99.00	0.80
	2.36	2.32	98.30	1.08	14.78	15.08	102.03	0.81
	1.47	1.46	99.31	1.30				
Spascolon	5.91	5.80	98.13	0.50	44.35	44.06	99.93	0.90
	2.95	2.93	99.32	0.99	29.57	29.27	99.00	0.75
	2.36	2.30	97.45	1.00	14.78	15.08	102.03	0.55
	1.47	1.44	97.95	0.92				
			Sensor no.13					

Pure solution	5.91	5.90	99.83	0.12	44.35	44.65	99.93	0.64
	2.95	2.93	99.32	1.23	29.57	29.86	99.00	0.42
	2.36	2.37	100.42	0.66	14.78	15.08	102.03	0.37
	1.47	1.45	98.63	0.97				
Spascolon	5.91	5.85	98.98	1.17	44.35	44.06	99.93	0.46
	2.95	2.93	99.32	0.89	29.57	29.27	99.00	0.69
	2.36	2.36	100.01	0.56	14.78	15.08	102.03	0.34
	1.47	1.48	100.68	0.73				

RSD: relative standard deviation (four determinations)

Table 7. Determination of pinaverium bromide in spiked urine samples applying the standard addition method

Sensor	Taken (mg)	Found (mg)	Recovery %	RSD %
Sensor no.5				
	5.91	5.88	99.49	1.01
	2.95	2.94	99.66	0.45
	2.36	2.37	100.42	0.75
	1.47	1.47	100.00	0.22
Sensor no.7				
	5.91	5.92	100.16	0.89
	2.95	2.93	99.32	0.34
	2.36	2.33	98.72	0.45
	1.47	1.48	100.68	1.09
Sensor no.13				
	5.91	5.85	98.98	1.95
	2.95	2.91	98.64	1.04
	2.36	2.31	97.88	0.55
	1.47	1.46	99.31	0.44

RSD: relative standard deviation (four determinations)

5 Analytical application

The accuracy and applicability of the proposed sensors were evaluated by its application for the determination of pinaverium bromide in pure solutions and in pharmaceutical preparations (Spascolon tablets) by both the standard addition and the potentiometric titration methods. Representive potentiometric titration curves and its first order derivatives are shown in Fig. 6.

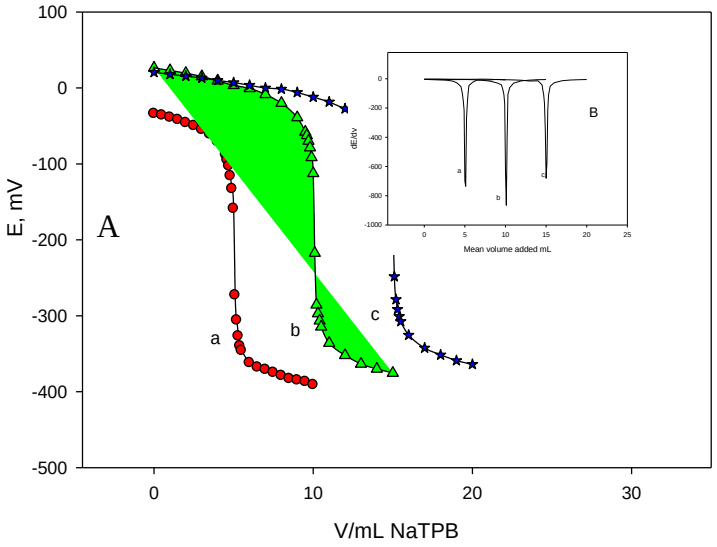

Fig. 6. Potentiometric titration curves (A) and its first order derivatives (B) of (a) 5, (b) 10 and (c) 15 mL of $5x10^{-3}$ mol L^{-1} Pina using sensor no. 13 and $5x10^{-3}$ mol L^{-1} NaTPB as titrant

The obtained average recovery and relative standard deviation values are summarized in Table 6, which reflect the high accuracy and precision of the sensors. Determination of pinaverium bromide in spiked urine samples was also carried at four different levels of concentration using the standard addition technique (Table 7). The proposed sensors can therefore be applied to the determination of pinaverium bromide in pure solutions, in pharmaceutical preparations, and in spiked urine samples without fear of interference caused by the excipients expected to be present in tablets or in the constituents of the body fluids. The results obtained from the standard addition method of the drug were compared with those obtained from the potentiometric titration method by applying F-and t-tests [24]. The results (Table 8) show that the calculated F- and t-values did not exceed the theoretical values, reflecting the accuracy and precision of the applied method.

Table 8. Statistical comparison between the results of an analysis of a pharmaceutical preparation Spascolon tablets applying the standard addition and potentiometric titration methods

Parameters	Standard addition method	Potentiometric titration method
		Sensor no.5
Mean recovery (%)	99.17 [a]	100.32 [b]
SD	0.789	1.267
RSD (%)	0.795	1.263
F-ratio	2.57 (9.55)[c]	
t-test	1.49 (2.57)[d]	
Sensor no.7		
Mean recovery (%)	99.02 a	100.32 [b]
SD	0.593	1.267
RSD (%)	0.599	1.263
F-ratio	4.56 (9.55)[c]	
t-test	1.84 (2.57)[d]	
Sensor no.13		

Mean recovery (%)	99.63	100.32 [b]
SD	0.627	1.267
RSD (%)	0.630	1.263
F-ratio	4.08 (9.55) [c]	
t-test	1.77 (2.57) [d]	

a: Average of four determinations

b: Average of three determinations

SD: standard deviation

RSD: relative standard deviation

c: Tabulated F-value at 95% confidence level

d:Tabulated t-value at 95% confidence level and six degrees of freedom

6 Conclusions

The present work involves the preparation of new PVC membrane sensors. The described sensors are sufficiently selective for the quantitative determination of pinaverium bromide in pure form, pharmaceutical dosage form, human urine. The present sensors show high sensitivity, reasonable selectivity, fast static response, long-term stability and applicability over a wide pH range with no sample pretreatment. The presented methods for the determination of pinaverium bromide with the prescribed sensors are advantageous over the previously described procedures being faster than many other techniques (response time of 10s). The suggested methods are characterized by low LOD values amounting to 10^{-6} mol L^{-1} using sensors; thus they are more sensitive than many spectrophotometric and chromatographic methods. These sensors were used satisfactory for analyses of human urine without any interference from the matrix.

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Optimization of Weight of Cable Duct

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Abstract- Optimization of weight of cable duct is a value engineering project. This paper gives idea about cost reduction of component without affecting its function and quality. There are different ways to reduce the cost of component like weight reduction, optimizing design, alternative material, change manufacturing process etc. In this paper we consider weight reduction of material to reduce the cost of component. We made 3-D model of component by using UG NX6 CAD software. We calculate the deflection of part (Theoretical calculation) under loading condition of UDL for reduced thickness part. Again we verify with ANSYS 14 software. Vibration was major dominant factor so we measure the vibrations of the part by vibration pen. We found vibrations are within tolerance as per ISO 10816-3.

Keywords-Value Engineering, Vibration Measurement, Manufacturing Cost, 3-D software UG NX, Von Miss stresses, ISO 10816-3, Accerlation Integrated sensor.

INTRODUCTION

Value engineering is a scientific approach to reduce the cost of component without affecting its function and quality. This research investigates by reduction of weight of material we can reduce the cost of component as in manufacturing industries 70% cost reflects raw material cost and 30% is processing cost. Cable duct is a basically "C" section channel which is used for carrying the cables (see Fig-1) & it is structural part of a machine. It is basically assembly of 2 part top and bottom part (see fig-2). In existing design bottom part is having thickness of 3mm while top part has thickness of 1.5 mm.

Fig 1: Cables carrying Cable Duct

The maximum weight of cables in duct is 10kg by considering factor of safety 1.3. Reducing the thickness by 50% we found very little deflection in part. Vibration is major dominant factor in machine. Machine spindles running @ speed of 20000 rpm. We compare vibration of existing part with reduced part thickness and found vibrations are well within tolerance as per ISO 10816-3. We measure vibration in mm/sec as it indicates fatigue strength of the part. Vibrations are measured by piezoelectric accerlated integrated sensor. We did its transportation trial also as machine goes to different zones of the world.

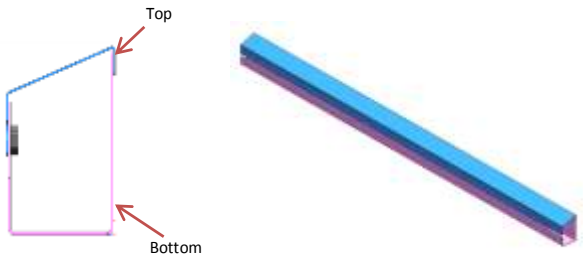

Fig 2: Assembly view of Cable Duct

ANALYSIS TECHNIQUE

First step of project was making 3-D model of part using UG NX software (see Fig-3). Same we imported in ANSYS in IGES format. Cable Duct part then meshed using tetrahedron elements. All required data filled in ANSYS software.

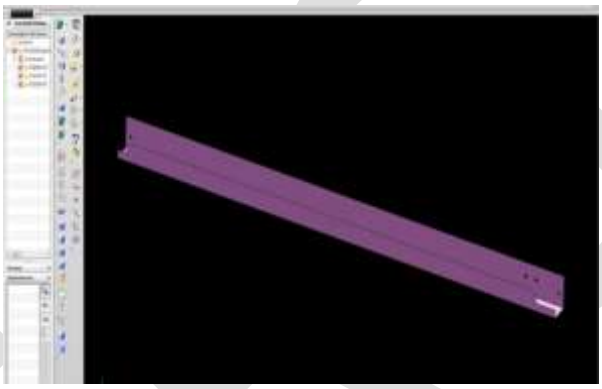

Fig 3: IGES Model for Cable Duct bottom

On existing design we found maximum deflection is 0.3 mm and von miss stress is 52 MPa (see fig-4).

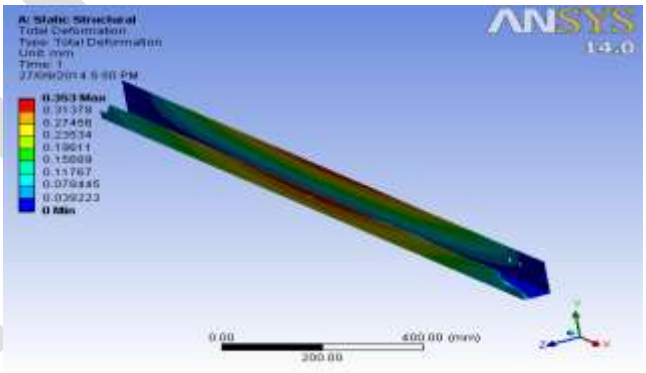

Fig 4: Max. Deflection of part for 3mm thick sheet

while in newly design part, we found 0.56 mm deflection and 64 MPa von missed stresses (see fig-5) are develop when part is under loading condition which is lesser than yield strength of the steel part

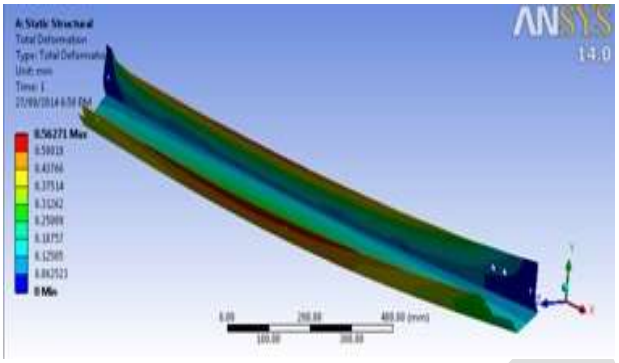

Fig 5:Max. Deflection of part for 1.5 mm thick sheet.

DESIGN OF EXPERIMENT

Vibration Trial

In order to take vibration reading we use piezoelectric accerlated integrated sensor (vibration pen). Vibrations readings are taken in mm/sec which indicates fatigue strength of the part. We ran our machine @ different speed and take readings at 6000, 10000, 15000 and 20000 rpm. As part length is long nearly 1.7 m so we take readings at 3 positions like @ starting point, middle point & End point of cable duct & we name it as position 1, position 2 and position 3 respectively.

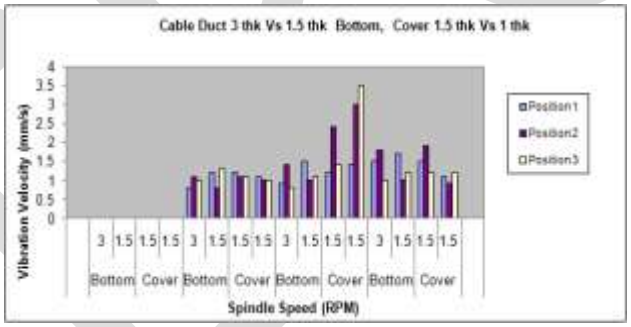

Fig 6: Vibration reading for Left side of machine

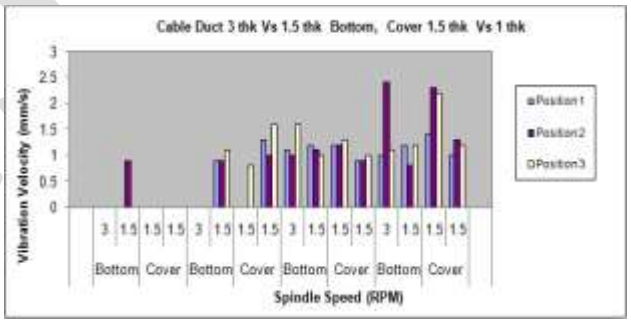

Fig 7: Vibration reading for Right side of machine

Above graph clearly shows that maximum vibration on newly design part is 2.5mm/sec which is well within the tolerance as per ISO 10816-3

Transportation Trial

We also taken transportation trial of the part as machines goes to different regions of the world. We find appropriate solution (see fig – 7) in order to avoid bent of the part during transportation

Fig 8:Packing with four wooden supports

MANUFACTURING COST COMPARISON

Costing of Bottom Cable Duct Part

Table No-1 shows manufacturing cost of existing part. Cost of any part calculated on hourly basis of consumption. Any process cost is divided into 3 steps.

1. Machining Setup Time
   It is time required to setting all the parameters of the machine in order to start the manufacturing of the part which includes tooling change, RM put up, programming etc.

2. Machining Time
   It is time require to do machining on the part. It can be also called as a processing time for manufacturing the part

3. Labour Time
   It is time consumed by operation in order to manufactured one part.

Existing Bottom part is manufactured by Laser Cutting-Straightening-Tapping-Bending-Powder coating. (Table No-1)

Sr. No	Operation	Resource	Time requitred in hr	Value INR	Break up
1	sheet 3x1250x2500	10592148	9.27Kg	478.44	
2	Laser Cutting	45212	0.001	2.47	Machining Setup Time
			0.03	51.5	Machining Time
			0.06	5.89	Labour Time
	Operation 0010		0.091	59.86	
3	Straightning	45214	0.001	1.12	Machining Setup Time
			0.005	2.96	Machining Time
			0.014	1.12	Labour Time
	Operation 0020		0.02	5.2	
4	Tapping	45217	0.001	0.09	Machining Setup Time
			0.008	2.66	Machining Time
			0.008	1	Labour Time
	Operation 0030		0.017	3.75	
6	Bending	45215	0.001	0.27	Machining Setup Time
			0.009	6.35	Machining Time
			0.014	1.42	Labour Time
	Operation 0040		0.024	8.04	
7	Powder coating	45219	0	0	Powder coating setup time
			0.006	45.96	Powder coating time
			0.046	4.47	Labour time
	Operation 0050		0.052	50.43	
8	Material over heads	45121		9.57	Administration
			Total Manufacturing Cost	615.29	

Table 1: Manufacturing cost of 3mm thick old bottom part

Sr. No	Operation	Resource	Time requitred in hr	Value INR	Break up
1	sheet 1.5x1250x1750	10709966	4.75Kg	207.8	
2	Laser Cutting	45212	0.001	2.47	Machining Setup Time
			0.022	38.84	Machining Time
			0.045	4.44	Labour Time
	Operation 0010		0.068	45.75	
3	Straightning	45214	0.001	1.12	Machining Setup Time
			0.005	2.96	Machining Time
			0.014	1.12	Labour Time
	Operation 0020		0.02	5.2	
4	Nut welding	45216	0.001	0.56	Machining Setup Time
			0.017	4.93	Machining Time
			0.023	2.4	Labour Time
	Operation 0030		0.041	7.89	
5	Hexagonal weld nut	10259616	-	1.44	3pcs
6	Bending	45215	0.001	1.23	Machining Setup Time
			0.009	6.35	Machining Time
			0.014	1.42	Labour Time
	Operation 0040		0.024	9	
7	Powder coating	45219	0	0	Powder coating setup time
			0.006	60.75	Powder coating time
			0.046	4.47	Labour time
	Operation 0050		0.052	65.22	
8	Material over heads	45121		4.21	Administration
			Total Manufacturing Cost	346.51	

Table 2: Manufacturing cost of 1.5mm thick new Bottom part

Costing ofTop Cable Duct Part

Manufacturing cost of newly design part is shown in Table No-2. As we reduced the thickness engagement of threading of part become less so we induced weld nut for bottom part. Due to use of weld net threading engagement becomes more.

Manufacturing process for newly design part is Laser Cutting-Straightening-Nut Welding-Bending-Powder coating.

Sr. No	Operation	Resource	Time requitred in hr	Value INR	Break up
1	sheet 1.5x1250x1750	10709966	2.84Kg	133.9	
2	Laser Cutting	45212	0.001	0.1	Machining Setup Time
			0.02	37.51	Machining Time
			0.04	4.29	Labour Time
	Operation 0010		0.061	41.9	
3	Straightning	45214	0.001	0.97	Machining Setup Time
			0.005	2.97	Machining Time
			0.014	1.12	Labour Time
	Operation 0020		0.02	5.06	
6	Bending	45215	0.001	0.1	Machining Setup Time
			0.01	6.35	Machining Time
			0.014	1.42	Labour Time
	Operation 0040		0.025	7.87	
7	Powder coating	45219	0	0	Powder coating setup time
			0.006	35.4	Powder coating time
			0.046	4.47	Labour time
	Operation 0050		0.052	39.87	
8	Material over heads	45121		4.21	Administration
			Total Manufacturing Cost	232.81	

Table 3: Manufacturing cost of 1.5mm thick old top part

Sr. No	Operation	Resource	Time requitred in hr	Value INR	Break up
1	sheet 1x1250x1750	10756705	1.90Kg	82.76	
2	Laser Cutting	45212	0.001	0.19	Machining Setup Time
			0.02	35	Machining Time
			0.04	4	Labour Time
	Operation 0010		0.061	39.19	
3	Straightning	45214	0.001	0.97	Machining Setup Time
			0.005	2.97	Machining Time
			0.014	1.12	Labour Time
	Operation 0020		0.02	5.06	
6	Bending	45215	0.001	0.1	Machining Setup Time
			0.01	6.35	Machining Time
			0.014	1.42	Labour Time
	Operation 0040		0.025	7.87	
7	Powder coating	45219	0	0	Powder coating setup time
			0.006	60.75	Powder coating time
			0.046	4.47	Labour time
	Operation 0050		0.052	65.22	
8	Material over heads	45121		4.21	Administration
			Total Manufacturing Cost	204.31	

Table 4: Manufacturing cost of 1mm thick newtop part

RESULT AND DISCUSSION

The study of ANSYS shows that if we change the thickness of the part then it will not affect function of the part. Deflection and stresses developed on the part are well below than yield strength of the part. Also all transportation trials are ok.The basic agenda of this project is to having cost reduction in part by reducing its thickness. Using ANSYS software we calculate deformation of part under loading condition. Vibration analysis also done with the help of Vibration pen by SKF. Result of ANSYS software & vibration analysis is within safe zone.

Following points are observed

1. Present cost of Cable duct part (top + bottom):- INR 848.1 /-
2. Cost of the part after weight reduction of cable duct (top + bottom):- INR 550/-
3. Approximate cost saving per part :- **INR 298/-**
4. No. of parts used in machine (top + bottom):- 60
5. Approximate cost saving per machine:- **INR 17880/-**

Vibration analysis is also found within the limit as per standard ISO 10816 – 3.

Deformation of part under loading condition also found negligible & which will not affect the functionality of the part. Inside area of cable duct channel we kept same so volume of cable duct with new design & old design will remain same.

ACKNOWLEDGMENT

I would like to express a deep sense of gratitude and thanks profusely to **Prof. K.A.Rade** Department of Mechanical Engineering, Bharati Vidyapeeth University, who was the thesis Supervisor. Without the wise counsel and able guidance, it would have been impossible to complete the thesis in this manner.

CONCLUSION

This project was carried out with the aim of reduction of cost for machine. By doing analysis of part after reducing the thickness we reduce the cost. We also save 6kg of raw material steel per assembly which saves natural resources also. With the help of all above data we conclude that we can reduce the cost of component by value engineering method.

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Design and simulation of various Fixed-fixed RF MEMS Switch

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Abstract— The paper represents the various design Fixed-fixed RF MEMS switch .The comparative analysis of RF MEMS switch of z-component displacement, pull in voltage and capacitance. The switch used high dielectric constant material hafnium oxide .The COMSOL® MULTIPHYSICS 4.3b software is used to design and simulated the switch. The switch is design to decreases the power consumption and linearity .In this paper the proposed switch is reduced the actuation voltage. The low voltage switches are essential due to their compatibility of benchmark IC technology in RF application and microelectronics systems. In realizing MEMS switches with low actuation voltage, spring constant of beam must be reduced.

Keywords— MEMS switch, Fixed- Fixed Beam, Low actuation voltage, pull in voltage, Meanders, Electrostatic actuation, Squeeze damping

INTRODUCTION

Micro-Electro-Mechanical Systems (MEMS) are integrated micro devices or systems that combine electrical and mechanical components and make use of the advantages of both solid-state and electromechanical systems [1, 2]. Fixed-fixed beams under voltage driving are widely used in many MEMS sensors and actuators, including MEMS switches [1]. MEMS is an enabling technology and current applications include accelerometers, pressure, chemical and flow sensors, micro-optics, optical scanners, fluid pumps , biomedical , telecommunication and RF applications [1,3]. Micro Electro Mechanical Systems (MEMS) capacitive type transducers are used to sense external mechanical excitation such as force, acceleration, as a change in capacitance. It requires electrical energy and this energy is applied as a constant voltage (or) constant charge [4]. RF MEMS is one of the MEMS technology areas that have very high demanding applications particularly in wireless and satellite communication systems. MEMS switches can be categorized in different ways such as their actuations electrostatic, electromagnetic, electro thermal and piezoelectric actuation .The electrical configurations are series or shunt, mechanical structures cantilever or fixed-fixed beam and even by their materials metallic and carbon allotropes [5]. Electrical components such as inductors and tunable capacitors can be improved significantly compared to their integrated counterparts if they are made using MEMS and Nanotechnology [6]. MEMS technology enables the realization of RF passive components with the benefits of low loss, small size, low power consumption, high quality factors, high tunable characteristics and high linearity compared with conventional semiconductor based passive [7,8]. MEMS switches offer the high RF performance and low DC power consumption of electro-mechanical switches but with the size and cost features of semiconductor switches [9]. These MEMS devices are relatively simple to design and fabricate as well as to integrate on a chip with CMOS circuits. However, voltage driving may exhibit an inherent instability situation, known as the pull-in phenomenon [10]. The high k dielectrics, HfO2 has both a high k value as well as chemical stability with water and Si [11]. The improve the reliability of capacitive switches led to the application of different characterization methods and structures such as the MIM (Metal-Insulator-Metal) capacitors that allowed to determine the charging and discharging times constants [12].The paper represent the design of MEMS switch with low actuation voltage and this to reducing the actuation voltage we introducing the meanders in the switch. The various types designs of switches gives graphs between applied voltage and displacement .The aim of this research that is low actuation voltages ,low power consumption and increasing the switching speed.

Design of Switch

The design of switch we are vary the parameters and design of different types of Fixed- Fixed switch .The Fixed –fixed switch is fixed at both ends .In Fig.1 we represent the switch C which uses the meanders in the beam .As the applied voltage is apply on the beam, the movable beam moves to downward in z-direction .As the pull in voltage received the movable beam contact with electrode. The dimension of switches is such types:

Table 1 Dimension of Switch D

Parameters	Dimension/Block1	Dimension/Block2	Dimension/Block3
Length	70µm	200 µm	70µm
Width	40µm	10 µm	40µm
Height	2µm	2 µm	2µm

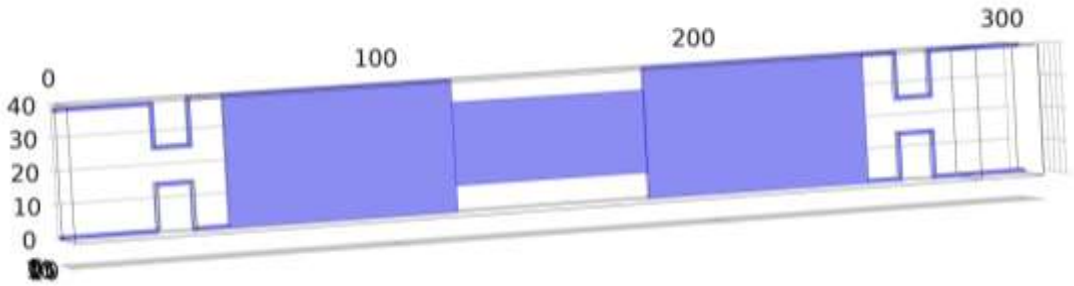
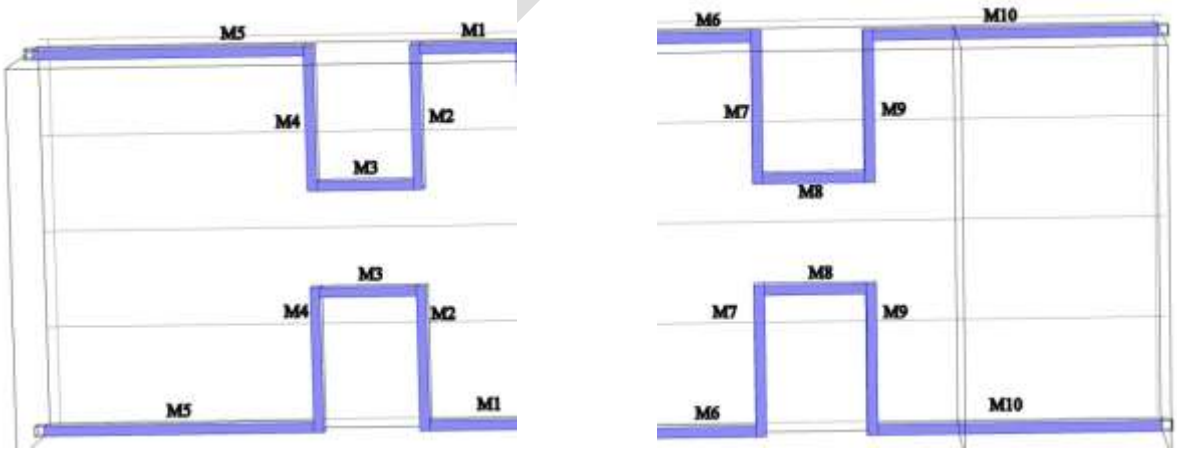


Fig.1 Schematic 3D structure of Switch C

In Fig.2 show the structures of meanders .The dimension of the meanders is such types:

Table 2 Dimension of meanders For Switch D

Terminal	Input Terminal(µm)					Output Terminal(µm)				
Parameters	M 1	M 2	M3	M4	M5	M6	M7	M8	M9	M10
Length	10	15	10	15	29	10	15	10	15	29
Width	1	1	1	1	1	1	1	1	1	1
Height	2	2	2	2	2	2	2	2	2	2



(a) Meanders structure for input terminal (b) Meanders structure for output terminal

Simulation of switches:

The simulation of switches gives various displacements at various applied voltages. In the beginning when the electrostatic actuation force is applied the voltage induces between movable beam and electrode. The beam deflects or moves from its original position. The voltages values increases gradually but there is no significant changes in displacement. So now we increases the voltage with large difference and achieved the maximum displacement of the switch .The Fig.3 show the simulated 3d structure of switch A at 70.1 volt. The Fig.4 shows the simulated 3d structures of switch B at 70.1 volt. The switch B is without meanders structure. The Fig. 5 shows switch C simulated 3d structure at 70.1 volt. The graphical presentation is shows in Fig.6 that is graph of displacement and applied voltage of switch D. The Fig.7 shows the graphs between capacitance and applied voltages of switch D. As voltages increases the distance between electrode and beam will be reduced.

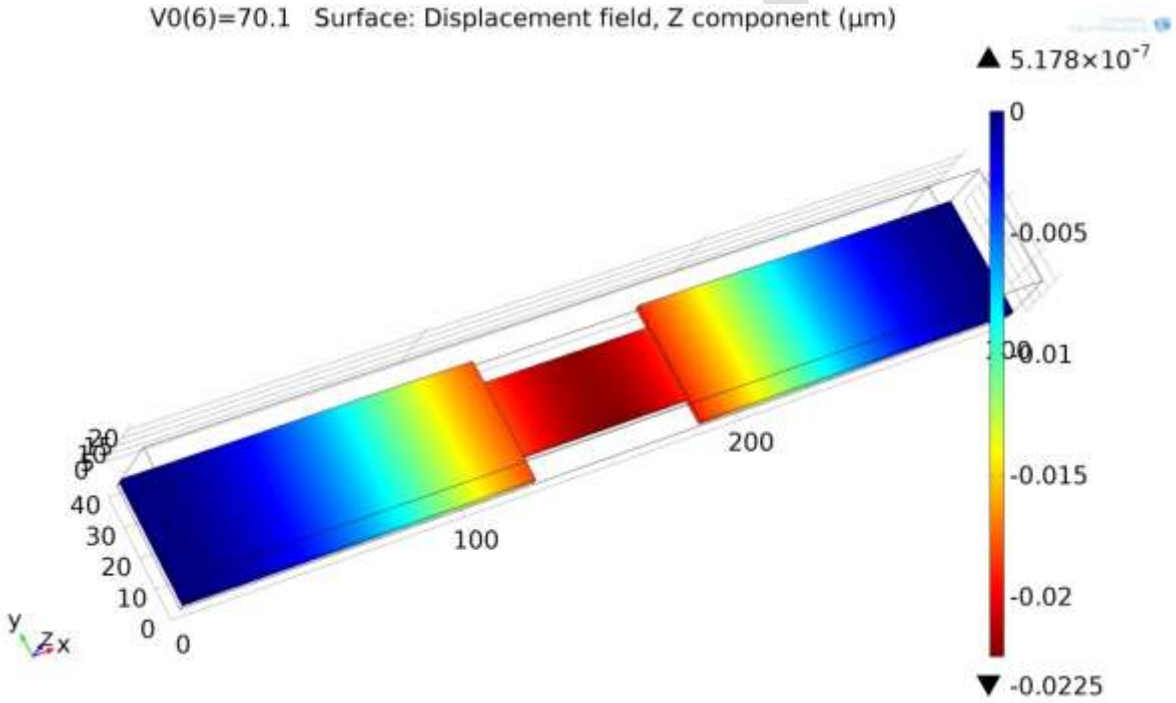


Fig.3 Simulated 3D Struture of switch A at voltage 70.1

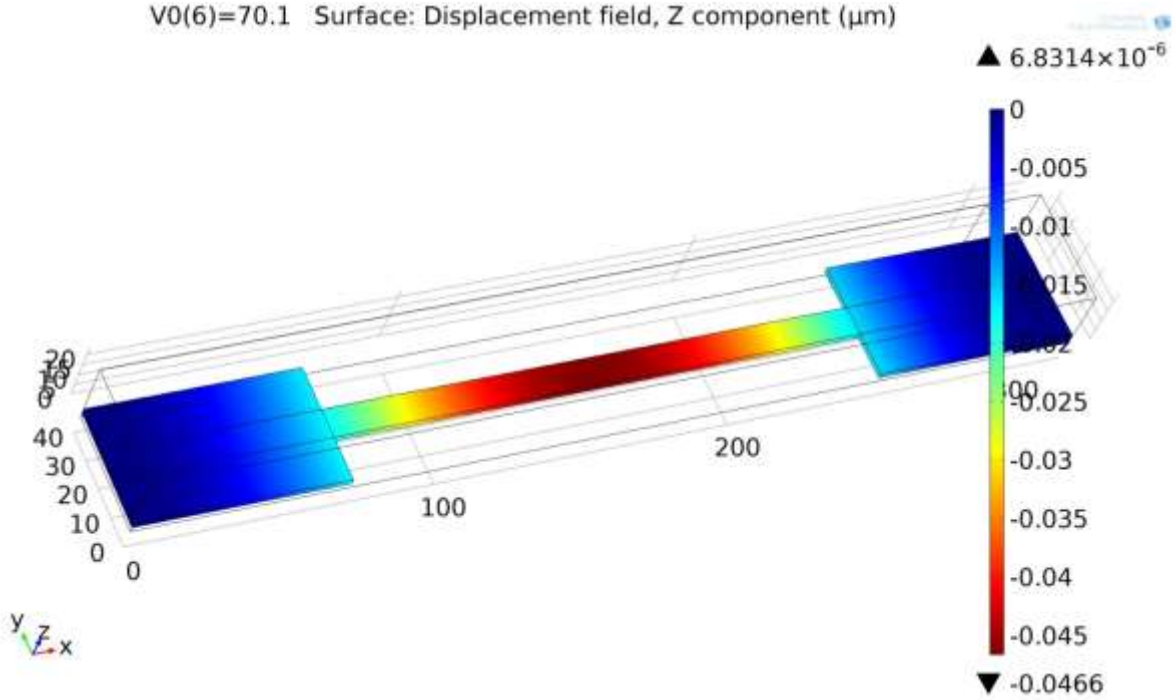


Fig.4 Simulated 3D Struture of switch B at voltage 70.1

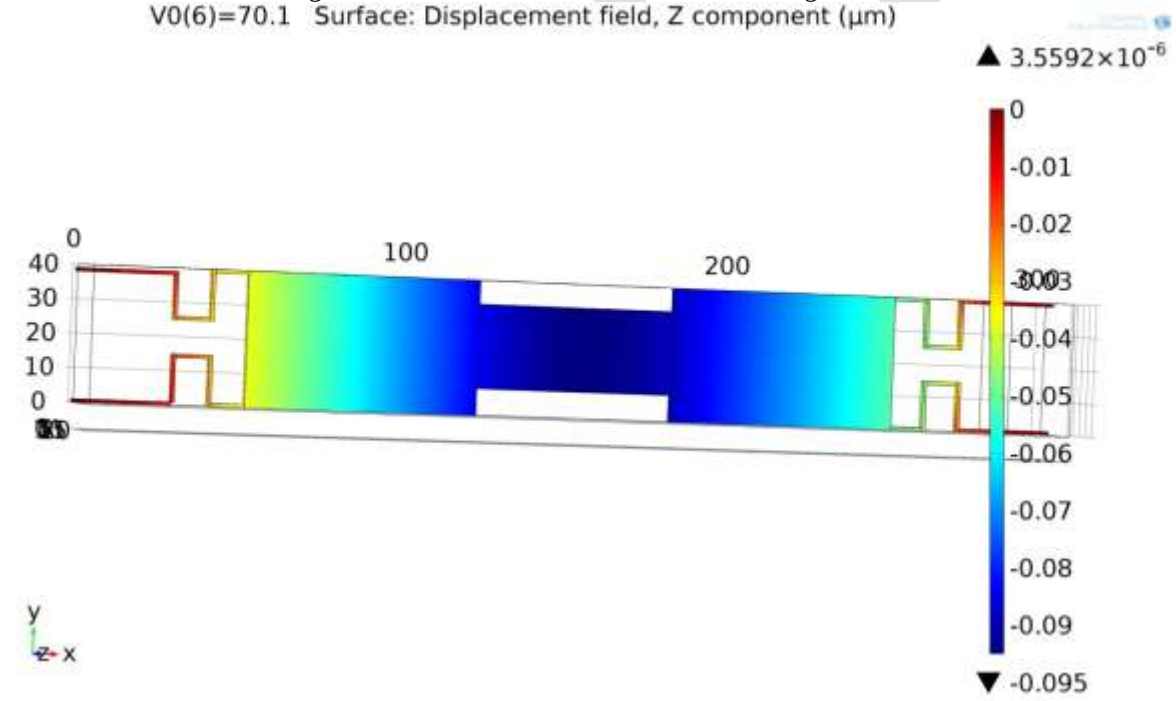


Fig.5 Simulated 3D Struture of switch C at voltage 70.1

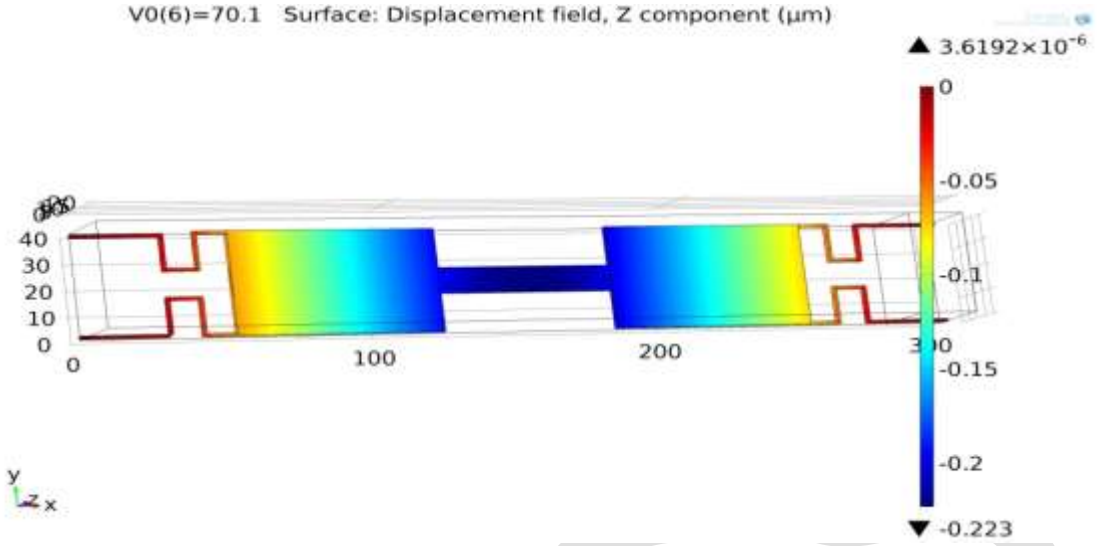


Fig.6 Simulated 3D Struture of switch D at voltage 70.1

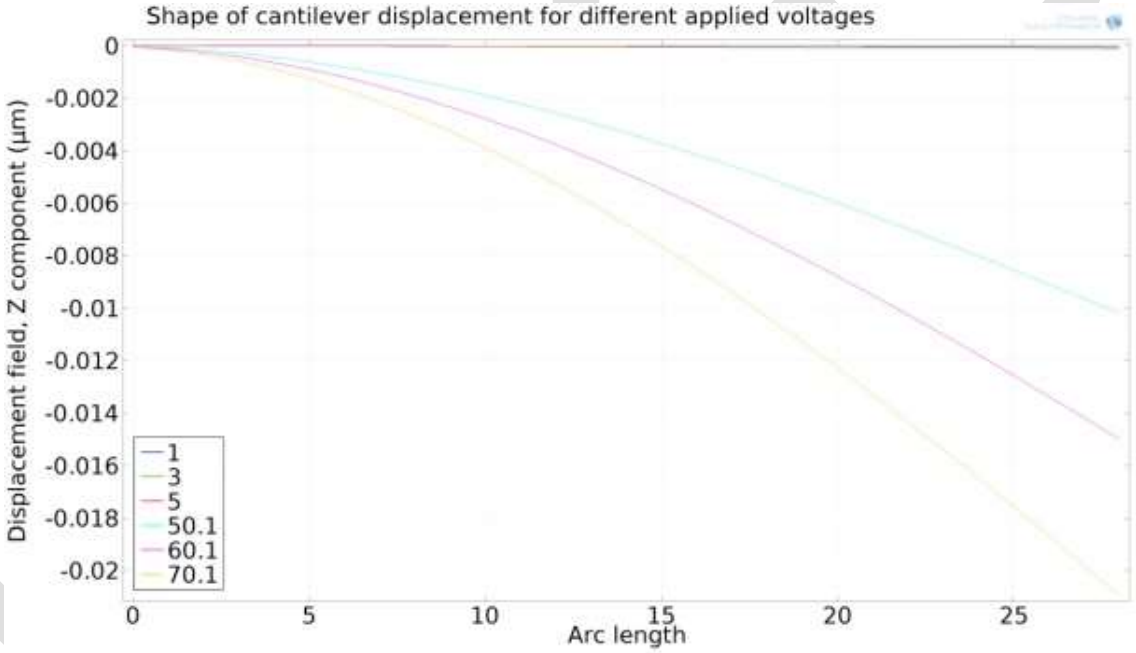


Fig.7 z-component displacement and arc length at various simulation voltages of Switch D

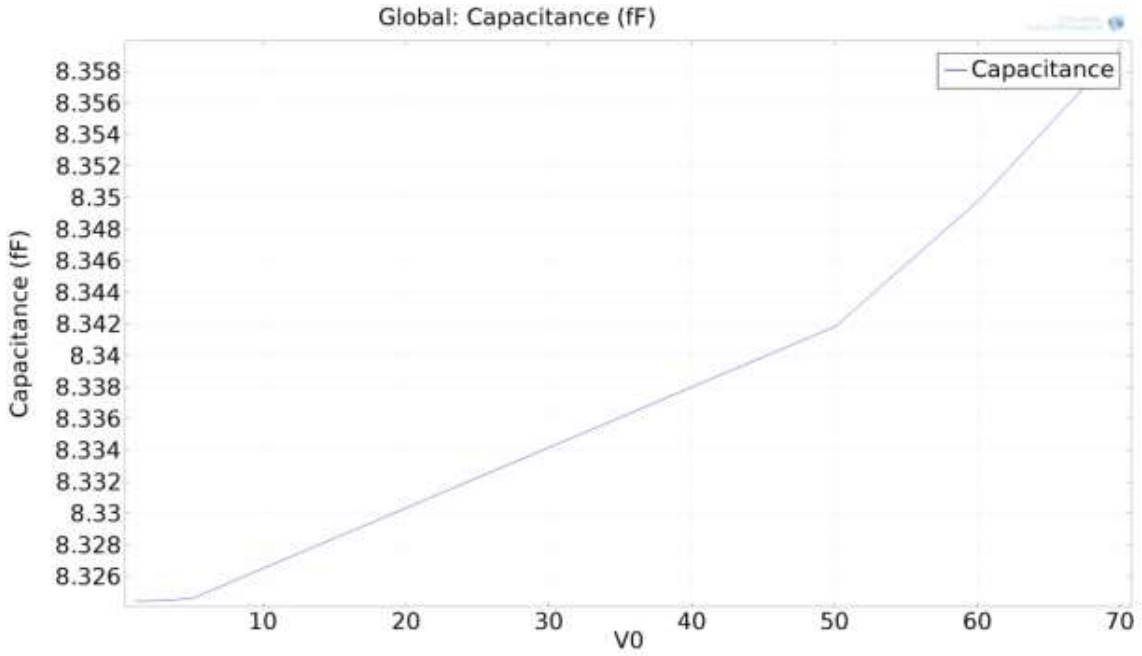


Fig.8 Capacitance and applied voltage variation of switch D

Result & Discussion

The various types design of Fixed- Fixed switch we represent design and simulation .The various shapes provides different z-component displacement .As Table 3 show the comparison study of displacement at various voltages. The Switch A gives very low displacement at 70.1 volt. At same voltage the switch D will gives 0.223µm z-component displacement. The switch D is more flexible than to other switches .The switch D is reducing the actuation voltages.

Table 3 Comparison of z-component displacement of various switches

Displacement	z- component displacement(µm)			
Voltage	A	B	C	D
1	-4.4884e-6	-9.1814e-6	-1.8276e-5	-3.9443e-5
3	-4.0397e-5	-8.2637e-5	-1.645 e-4	-3.5506e-4
5	-1.1222e-4	-2.2957e-4	-4.5702e-4	-9.8668e-4
50.1	-0.0114	-0.0234	-0.0472	-.1059
60.1	-0.0164	-0.034	-0.0688	-0.1575
70.1	-0.0225	-0.0466	-0.095	-0.223

CONCLUSION

As the MEMS technology is used to reduce the size of electronic devices, sensors, relay switches etc. The low actuation voltage reduced the power consumption and provides linearity of switches. The switch D is using the meanders which increasing the flexibility and switching speed. The meander is used to reduced the actuation voltage and increases switching speed.

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Receiver Localization for Cognitive Radio Networks using Interference Constraints

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Abstract—Opportunistic spectrum access technique provides utilization of unused portions of the licensed spectrum for reuse.Such that primary users do not affect harmful interference from the transmissions of secondary radios .Therefore, it is important to analyse the effect of cognitive network interference due to secondary spectrum reuse. We consider a scenario in which cognitive radios i.e secondary users opportunistically share a fixed spectrum resource with different probability of interference constraints. Secondary network variables are optimized by exploiting channel statistics and maps that pin point the area where primary receivers are likely to reside. The receiver location is tracked using Bayesian approach, based on 1-bit message referred as "interference tweet"

Keywords — Average interference, Bayesian estimation, channel state information, cognitive radio network, interference tweet, receiver localization, resource management

1. INTRODUCTION

With the emergence of new wireless applications and devices, there is excessive demand for radio spectrum. Due to the scarcity of radio spectrum and the under-utilization of assigned spectrum, Federal Communications Commission has started to review their spectrum allocation policies for selection of bestavailable spectrum band. Therefore, opportunistic spectrum access along with a cognitive radio (CR) technology provides promising solution to resolve this problem [10]. This technique has capability to share wireless channel with licensed user in an oppourtunistic manner. This can be realized with the help of efficient spectrum management techniques. User in the CR network must determine: which portions of the spectrum are unused, select the best available channel, co-ordinate access to this channel with other users and vacate the channel when a licensed user is detected

2. METHODOLOGY

The projected localization system involves following steps as shown in Fig.1.There is receiver map as a tool to locate a primary user receiver. The location is tracked using recursive Bayesian estimator, which is based on 1 bit message, also called as interference tweet. Receiver map as a tool for unveiling areas where PU receivers are located, with the objective of limiting the interference inflicted to those locations. These maps are tracked using a recursive Bayesian estimator [8], which is based on a 1-bit message broadcasted by the PU system whenever the instantaneous interference across a PU receiver exceeds a given tolerable level.

Here two interference announcement strategies are considered:

1. The primary user (PU) broadcasts the message to notify the interference has occurred.
2. The generic message is transmitted if at least one of the PU receivers is interfered.

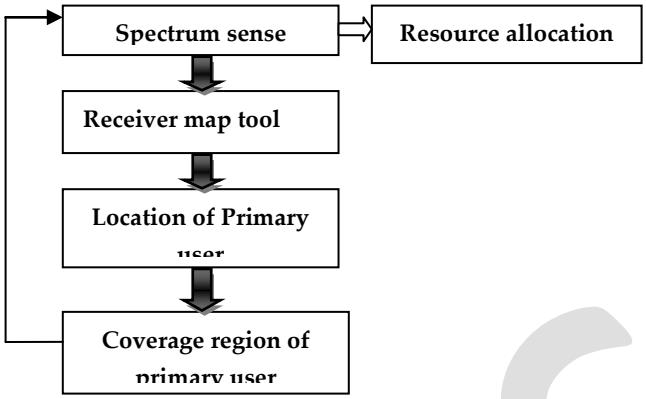

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Fig.1.System flow chart

3. SYSTEM MODEL

3.1 State information of primary and secondary channel

Consider a multi-hop secondary user (SU) network with M no. of nodes. $\{U\}_m^M = 1$ deployed in area $A \in R2$. Here, assume that SUs share a flat-fading frequency band with main PU system in an underlay setup. Based on the output of the spectrum sensing stage such as max. Tolerable power, probability of interference across primary users, average link gain, coverage region etc. SUs implement adaptive RA, [1] while protecting the PU system from excessive interference.

When resources are shared in a hierarchical setup, the available channel state information (CSI) over different SU network is different. The accuracy of the CSI is typically depends on whether PUs or SUs are involved [2]. Here, we assume the state of the SU-to-SU channels is already known. The instantaneous gain of link $U_m \rightarrow U_n$ is denoted as $g_{m,n}$ and it is given by the squared magnitude of the small-scale fadi ng realization scaled by the average signal-to-interference- plus-noise ratio (SINR) [3].

Suppose now that PU transmitters communicate with Q PU receivers located at $\{x^{(q)} \in A\}_{q=1}^{Q}$. With $h_{m,x^{(q)}}$ is the intantaneous channel gain between U_m and position $x^{(q)}$.Here we can obtained average link gain based on locations $\{x^{(q)} \in A\}_{q=1}^{Q}$,but the instantaneous value of the primary link cannot perfectly determined due to random fast fading effects. Therefore, SU m may cause interference to PU q. Next, it is assumed that only $\{h_{m,x(q)}\}$ i.e. the joint distribution of processes is known to the SU network, which is denoted as $\phi_h(\{h_{m,x^{(q)}}\})$ [3]. Let I be the maximum instantaneous interference power tolerable by the PUs, the secondary network can determine the interference probabilities at each location $x^{(q)}$. For instance, if U_m is scheduled to access the channel with a transmit-power p , the probability of causing interference to PU receiver q is $\Pr\{ph_{m,x^{(q)}} > I\}$.

Sometime locations $\{x^{(q)} \in A\}_{q=1}^{Q}$ are generally uncertain. For this, let $z_{X^{(q)}}$ is a binary variable having value 1 if PU receiver q is located at $x \in A$. Let $G = \{x_g\}$ are grid points representing potential locations for the PU receivers. Instead of $\{z_{X^{(q)}}\}$, the idea is to use the probabilities $\beta_{x^{(q)}} = \Pr\{z_{X^{(q)}} = 1\}$, $\forall x \in G$, to identify areas where a PU receiver q is more likely to reside, and limit the interference accordingly.

Here we assume that PU receiver has its mobility pattern. Next, the PU system is protected by setting I = −70 dB and $i^{\max} =$ 0.05. Here, Rayleigh-distributed small-scale fading is also simulated [3]. Let, sets $s = \{\phi_h\} \cup \{\beta_{x^{(q)}}\}$ and $g = \{g_{m,n}\}$ are Statistical primary state information (PSI) and available secondary CSI, recpectively.

3.2 Resource allocation based on interference constraints

Application-level data packets are generated at the SUs, and routed throughout the network to the intended destination(s). Packet streams are referred to k .The each flow for the destination is denoted by $d(\mathrm{k})$. Packet arrivals at U_m, for each flow k, are modeled by a stationary stochastic process with mean $a_m^k \geq 0$.

There are some notations are used for further calculation:

Let $r_{m,n}^k(\mathrm{g},\mathrm{s}) \geq 0$ is the instantaneous rate used for routing packets of flow k on link $U_m \rightarrow U_n$ during the state realizations g and s. Let $b_m^k[\mathrm{t}]$ are amount of packets of flow k that at time t are stored in the queue of node m. If queues are deemed stable [5], then satisfies the following condition,

$$\lim_{t\to+\infty}(1/t)\sum_{\tau=1}^{t}\mathrm{E}[\mathrm{b}_m^k[\tau]] \leq \infty$$

Next,

$$\{\mathrm{E}_{g,s}[\mathrm{r}_{m,n}^k]\}_{n\in N_m}$$

Specifies avg. amount of packets routed through each SU's outgoing link. Where, $N_m \subset \{1,....,\mathrm{M}\}$ is a set of one hop neighboring nodes of U_m.

At the medium access layer, let $w_{m,n}$ be the binary scheduling variable such that, $w_{m,n}$ =1 for U_m transmits to its neighboring node U_n, otherwise zero. Assume that one secondary link is scheduled per time slot, it as follows

$$\sum_{(\mathrm{m},\mathrm{n})\in\varepsilon} w_{m,n}(\mathrm{g},\mathrm{s}) \leq 1 \qquad (1)$$

Where, $\varepsilon = \{(\mathrm{m},\mathrm{n}) : \mathrm{n} \in \mathrm{N}_m, \mathrm{m} = 1,....\mathrm{M}\}$ represents the set of SU-to-SU link [9].

At physical layer, instantaneous rate and transmit power variables are coupled, and this rate power coupling is modeled here using Shannon's capacity formula [3]

$$C_{m,n}(\mathrm{g}_{m,n},\mathrm{p}_{m,n}) = \mathrm{W}\ \log\ (1+ p_{m,n}g_{m,n}/\mathrm{k}_{m,n})$$

Where, $k_{m,n}$ represents the coding scheme-dependent SINR gap, and W is the bandwidth of the primary channel that is to be reused [3]. Let average transmit-power of U_m, is,

$$\bar{p}_m = E_{g,s}[\sum_{n\in N_m} w_{m,n}(\mathrm{g},\mathrm{s})\,\mathrm{p}_{m,n}(\mathrm{g},\mathrm{s})] \qquad (2)$$

Where $E_{g,s}[.]$ denotes expectation with respect to random variable g,s .Powers transmitted by the SUs have to obey two different constraints. First, the instantaneous power $p_{m,n}$ can not exceed a pre-defined limit $p_m^{\max}$. Second, the average power satisfies $\bar{p}_m \leq p_m^{-\max}$. The binary variable $i^{(\mathrm{q})}(\{\mathrm{p}_{m,n}\},s)$ represents interference inflicted to the PU system as,

$$i^{(\mathrm{q})}(\{\mathrm{p}_{m,n}\},\mathrm{s}) = \sum_{x\in G} \{\sum_{(\mathrm{m},\mathrm{n})\in\varepsilon} w_{m,n}(\mathrm{g},\mathrm{s})\mathrm{p}_{m,n}(\mathrm{g},\mathrm{s})\mathrm{h}_{m,x^{(\mathrm{q})}} > I\}\, z_x^{(\mathrm{q})} \qquad (3)$$

Where $\mathbb{1}_{\{x\}}$ the indicator function ($\mathbb{1}_{\{x\}}$) =1 if x is true, otherwise zero). If $i^{(q)}(\{p_{m,n}\}, s) = 1$ then one or more PU receivers are interfered. Let $i^{max} \in (0, 1)$ denote the maximum long-term probability (rate) of interference [12].

Then, the following condition must satisfy

$$E_{g,s} = \sum_{(m,n)\in\varepsilon} w_{m,n}(g,s)\, i_{m,n}(p_{m,n}(g,s),s)] \le i^{max} \qquad (4)$$

Finding the condition for stochastic resource allocation, let us consider $\bar{i}[t]$ be the interference across PU, as [10]

$$\bar{i}[t] = 1/t \sum_{\tau=1}^{t} i(\{p_{m,n}[\tau]\}, s[\tau])$$

And running average of interference is, $\bar{i}[t] = 1/t \sum_{\tau=1}^{t} i[\tau]$

Reported in graph of Fig.3.So as $t \to \infty$

Resource allocation will be takes place if:

1) $\bar{i}[t] \le i^{max}$

2) $\bar{P}[t] \ge P^* - \delta(\mu)$, where $\delta(\mu) \to 0$ as $\mu \to 0$ ..... [6], [7]

4. NUMERICAL RESULTS

Fig.2 shows the scenario, in which M=12 SU transceivers (marked with red circles) are placed over 450 * 450 m and cooperate in routing packets to the sink node U_{12}. One data flow is considered, and traffic is generated at SUs $N_s = \{1,2,3,4,7,8\}$. A PU transmitter (marked with a cyan triangle) communicates with 2 PU receivers (cyan rhombus) using a power of 3 dB. The first PU receiver is located at $x^{(1)}$ = (x = 250, y = 280), static, and it is served by the PU source during the entire simulation interval $t \in [1, 10^4]$. The second PU is located at $x^{(2)}$ = (130, 240), mobile and it is served by the PU source only during the interval $[1, 6*10^3]$. The PU system is protected by setting I = −70 dB and $i^{max} = 0.05$ [11]. Here Rayleigh-distributed small-scale fading is also simulated [4]. The SU system can estimate the PU source location, and of its coverage region by sensing phase ([1]–[4]). Now, the PU coverage region is then plotted by using equidistant grid points (marked with black squares in Fig.2).

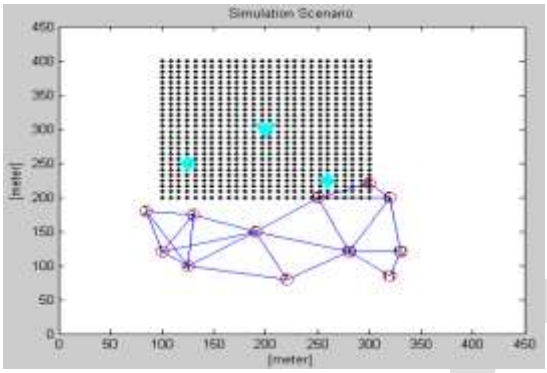
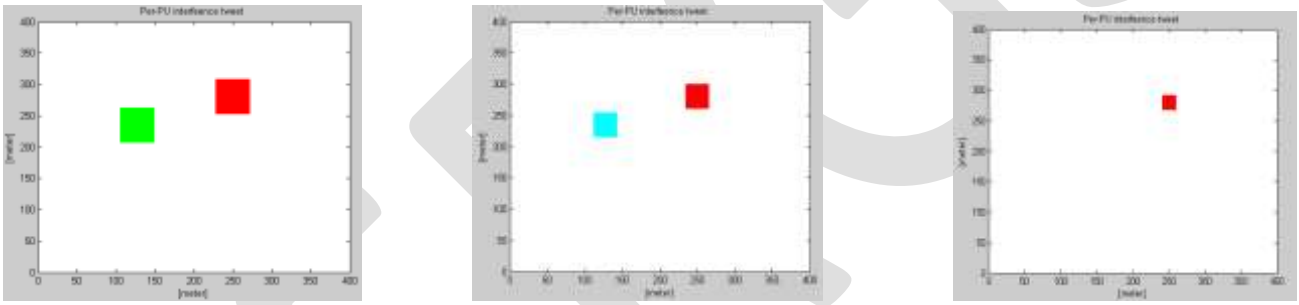


Fig.2.Simulated Scenario

Performance of the receiver localization scheme can be accessed through the maps shown in Fig.3. Maps (a), (b), (c), (d) are acquired at different time instant such that t=100, t=1000, t=6000, t=10000.So it is possible to estimate the area where PU receivers are likely to reside. Clearly, as time goes by localization accuracy improves.



(a) interference tweet at instant= 100 (b) interference tweet at instant= 1000 (d) interference tweet at instant= 10000

Fig.3. Per-PU interference tweet across each primary receivers (PU Rx1=(x = 250, y = 280) and PU Rx2=(x=130, y= 240)) at different instant of time, such as (a) t = 100, (b) t =1000 (c) t =6000, (d) t =10000 .Simulation interval t € [1, 10^4]. The second PU is mobile and it is served by the PU source only during the interval [1, $6*10^3$].

at instant (t)		100	500	1000	3000	5000	10000
Instantenous interference	at PU Rx.1	1.9237	3.7691	4.1572	1.6896	2.3190	2.9115
	at PU Rx.2	1.4161	3.5836	1.0497	1.2300	0.6769	0.9645

Table.1.Instantaneous interference across both primary user receivers at different instant of time

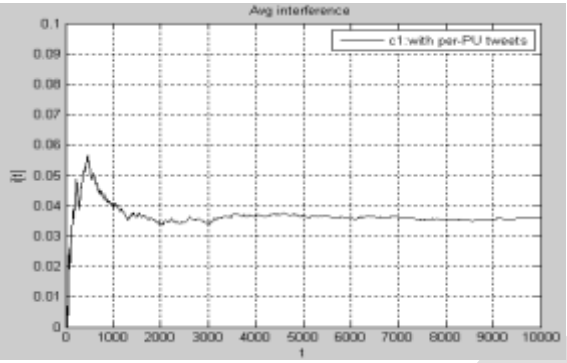


Fig.4.Average interference rate with primary user tweets

The joint resource allocation algorithm is based on location of primary receiver. Bayesian estimator givers information about location of primary sources.Whenever PU receiver is inflicted by interference, tweet message is broadcasted by them. Fig.4 shows rate of average interference across primary receiver.

5. CONCLUSION

For milti-hop cognitive radio network dynamic cross layer resource allocation techniques were designed.A Bayesian estimator is used to track unknown location of primary receivers.The inputs to the estimator were interference notification broadcasted by primary system and transmitting power across secondary system. The optimal solution gives how to manage the resources at different layers which is a function of the perfect CSI and uncertain CSI of the SU-to-SU links and the SU-to-PU links respectively.We can also calculate average interference rate for whole system i.e. nothing but system wide interference constraints.

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Multiple Cracks Effects on Vibration Characteristics of Shaft Beam

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Abstract—Whenever a mechanical component is subjected to fluctuating stresses the crack is oriented in the component due to fatigue failure. The cracked component is failed due to most dangerous and frequent catastrophic failure without any prior indication. In this paper vibration analysis of cantilever shaft beam is done using Experimental Modal Analysis and Finite Element Analysis. First three Natural Frequencies of transverse vibration are determined and also the mode shapes of these modes of vibrations are extracted and plotted using ANSYS 14.5. The results obtained using Finite Element Analysis are compared with the Experimental Modal Analysis. The study shows good agreement between the results obtained using Finite Element Analysis and Experimental Analysis.

Keyword — Vibration Characteristics, Modal Analysis, Damage, Shaft Beam, Multiple Crack, Crack Detection, Condition Monitoring.

1. INTRODUCTION

Crack in the component if undetected results in to sudden failure without any prior indication. Different researchers has proposed different methods for mathematical modeling and crack detection .Ashish K. Darpe [1] present a novel way to detect transverse crack in a rotating shaft. He studied the behavior of simply supported shaft with transverse surface crack subjected to both bending and torsional vibration. K.M. Saridakis et al. [2] present the application of neural networks, fuzzy logic and genetic algorithm for the identification of cracks in shafts. In another research of Ashish K. Darpe [3] studied coupled vibrations of a rotor with slant crack. He model stiffness matrix for Timoshenko beam on concepts of fracture mechanics the behavior of the shaft slant crack was compared with transverse surface crack. Sachin S. Naik and Surjya K. Maiti [4] studied triply coupled bending and torsion vibration of Timoshenko and Euler–Bernoulli shaft beams with arbitrarily oriented open crack. The changes of compliance coefficients with angular position of the crack was presented. The study shows that the frequency of vibration decreases with increase in distance of the crack from free end. D. P. Patil and S. K. Maiti [5] studied detection of multiple cracks in the beam using frequency measurement. The results gives linear relationship between damage parameters and natural frequency of vibration of beam. A. K. Darpe et al. [6] studied dynamics of a bowed rotor with a transverse crack. They concluded that amplitude and directional nature of higher harmonic components of bowed rotor remains unchanged, however rotating frequency component changes in magnitude. Athanasios C. Chasalevris and Chris A. Papadopoulos [7] studied identification of multiple cracks in beams under bending load. They formulate compliance matrix of two DOF as a function of both crack depth and angle of rotation of the shaft. Their proposed method gives not only depth and size of the crack but also angular position of the crack. Ashish K. Darpe [8] studied dynamics of a Jeffcott rotor with slant crack. The Stiffness coefficients based on flexibility coefficients was used to model equation of motion. The study shows that the lateral and longitudinal stiffness is more for slant crack as compared to transverse crack. The trends of 3 x frequency component can be used to detect and to identify the type of crack. Tejas H. Patel, Ashish K. Darpe [9] present influence of crack breathing model on nonlinear dynamics of a cracked rotor. The study shows that for the rotor with deeper crack, the crack model displays chaotic, sub harmonic and quasi-periodic motion. A.S. Sekhar [10] presented a review on multiple cracks effects and their identification in which

he summaries different methods of single as well as multiple crack detection. S.K. Georgantzinos, N.K. Anifantis [11] present the study of breathing mechanism of a crack in a rotating shaft beam. He studied the behavior of the transverse crack in cantilever shaft with two different cases of straight and curved front of the shaft beam. Flexibility coefficients were calculated on the basis of energy principle. He concludes that the breathing behavior depends on depth and shape of the crack. In the present work the Experimental Modal Analysis of the shaft beam with multiple cracks is done and the results are compared with results of Finite Element Analysis performed in ANSYS 14.5.

2. EXPERIMENTAL MODEL ANALYSIS

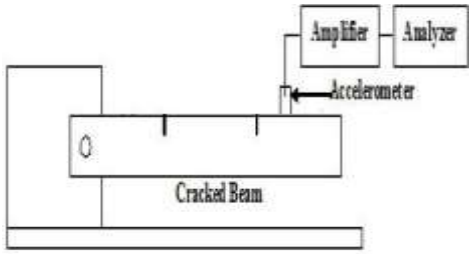

Fig. 1Test rig for Experimental Modal Analysis

The Natural frequencies and mode shapes for cantilever beam without crack and with two cracks of different crack depths and positions is determined. The results obtained experimentally are validated with the results obtained by FEA analysis. The method described has been applied to a cracked Euler Bernoulli's beam. The FFT analyzer used is 4 channelBruel and Kjaer make. The piezoelectric, miniature type unidirectional accelerometer is used to sense the frequency response function. The accelerometer is mounted on the beam by using special wax. The accelerometer is mounted just near the crack to capture the correct input signals. The impact hammer is used to excite the beam whose frequency response function is to be captured. The beam is tapped gently using an impact hammer. The range of excitation of impact hammer is 1-4000 Hz.

Specifications and properties of test specimen:

Diameter of the beam = 0.03 m

Length of the beam = 0.360 m

Width of the crack = 0.27mm

Elastic modulus of the beam = 2 x 1011 N/m2

Poisson's Ratio = 0.3

Density = 7850 Kg/m3

End conditions of the beam = One end fixed and other end free (Cantilever beam)

3. FINITE ELEMENT ANALYSIS OF BEAM

The Finite Element Analysis of the beam was done using ANSYS 14.5 software. A 3D model of the shaft beam was prepared and to model crack of width 0.27mm blocks of 0.27mm width was created and subtracted from the shaft model. The 3D model of the shaft is meshed with 20node186 element. The material used for the beam has following properties,

1) Modulus of Elasticity= $2x10^{11}$ N/m^2,

2) Poisons ratio= 0.3,

3) Mass Density= 7850 kg/m^2.

The degrees of freedom of all the elements at one end are made zero so as to get boundary conditions as cantilever beam. A Block Lanczos method is used for extraction of natural frequencies vibration. The first three modes of transverse vibration are extracted. The mode shapes of the first three modes of transverse vibration are plotted.

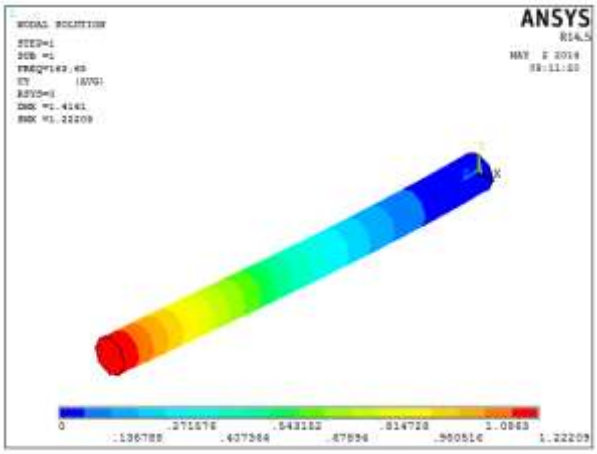

Fig.2 1st Mode of Vibration (Healthy beam)

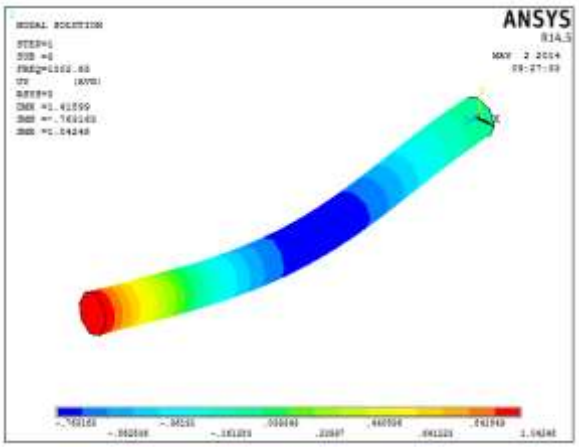

Fig.3 2nd Mode of Vibration (Healthy beam)

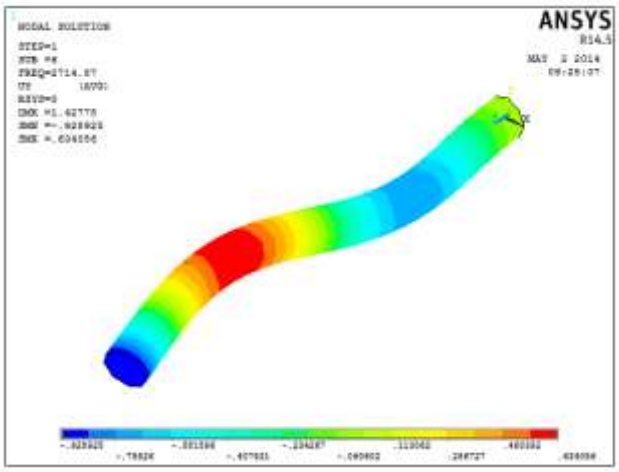

Fig.4 3rd Mode of Vibration (Healthy beam)

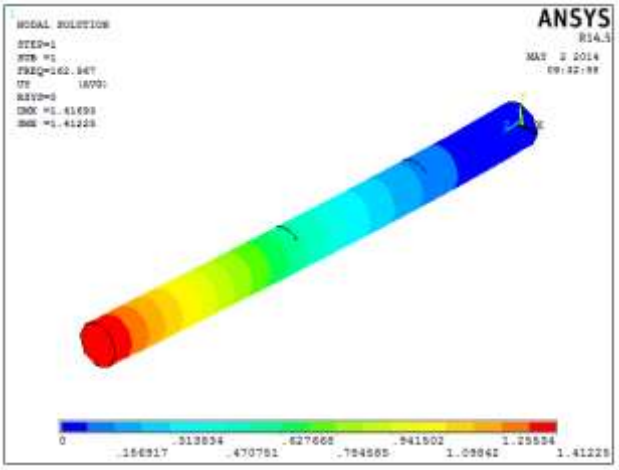

Fig.5 1st Mode (e_1=0.25, a_1/d=0.1, e_2=0.55, a_2/d=0.1)

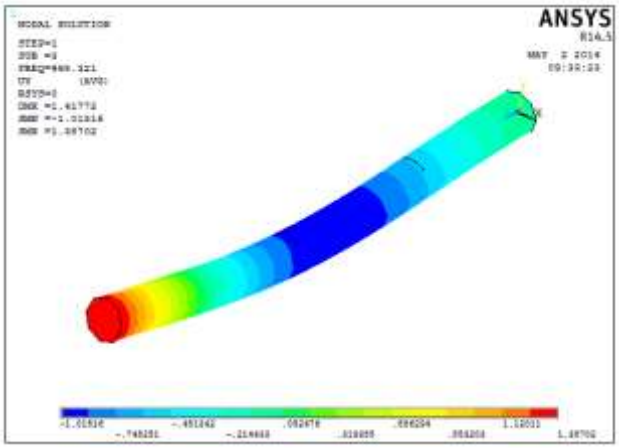

Fig.6 2nd Mode (e_1=0.25, a_1/d=0.1, e_2=0.55, a_2/d=0.1)

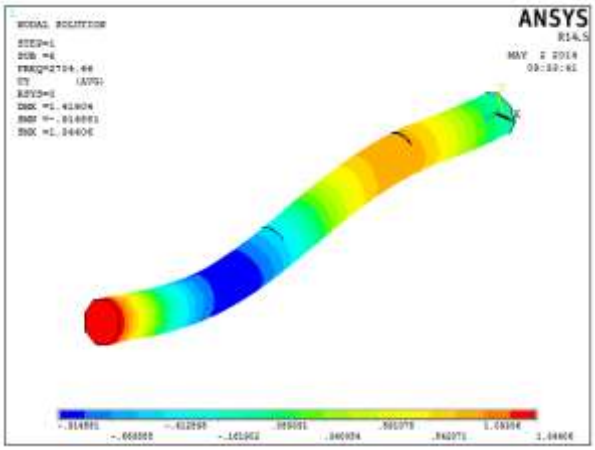

Fig.7 3rd Mode (e_1=0.25, a_1/d=0.1, e_2=0.55, a_2/d=0.1)

4. RESULTS

4.1 EXPERIMENTAL AND FEA RESULTS

The nomenclatures used are as follows,

L Length of the beam.
L_1 Distance of first crack from fixed end.
L_2 Distance of second crack from fixed end.
e_1 Ratio of L_1 and L.
e_2 Ratio of L_2 and L.
a_1 Depth of the first crack
a_2 Depth of the second cracks.
a_1/d Crack depth ratio of first crack.
a_2/d Crack depth ratio of second crack.

Table 1. Experimental and FEA results

Sr. no.	e1	a1/d	e2	a2/d	1st mode FEA, HZ	1st mode Experimental, HZ	2nd Mode FEA, HZ	2nd Experimental, HZ
1	Uncracked beam				1	1	1	1
2	0.25	0.1	0.55	0.1	0.995845	0.954458864	0.9957311	0.974742063
3	0.25	0.2	0.55	0.2	0.98069	0.966424574	0.98090963	0.95703373
4	0.25	0.3	0.55	0.3	0.949771	0.951660912	0.95078795	0.916974206
5	0.25	0.4	0.55	0.4	0.901192	0.864210025	0.90463794	0.891646825
6	0.25	0.5	0.55	0.5	0.827437	0.81343017	0.83648514	0.823263889

4.2 COMPARISON OF EXPERIMENTAL AND FEA RESULTS

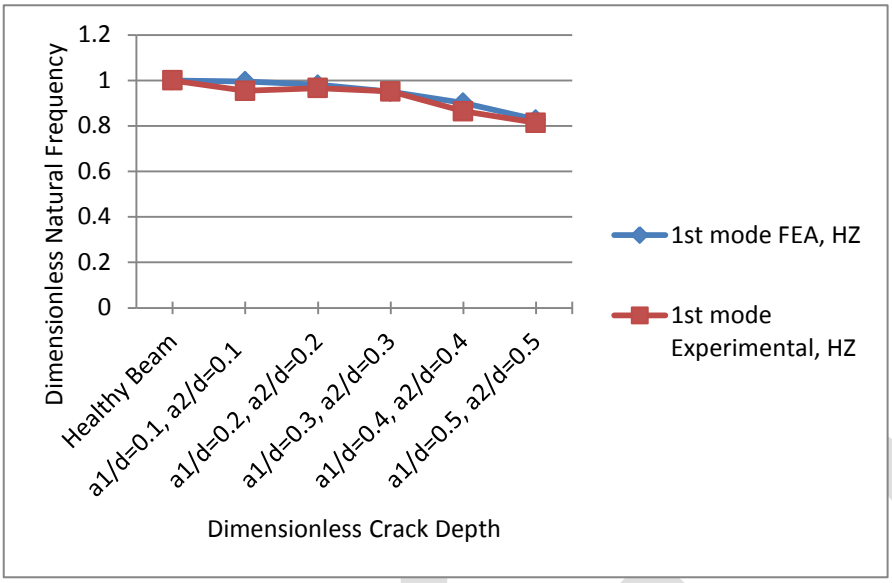

Fig.8 Comparison of FEA and Experimental Modal Analysis Results for 1st mode of vibration

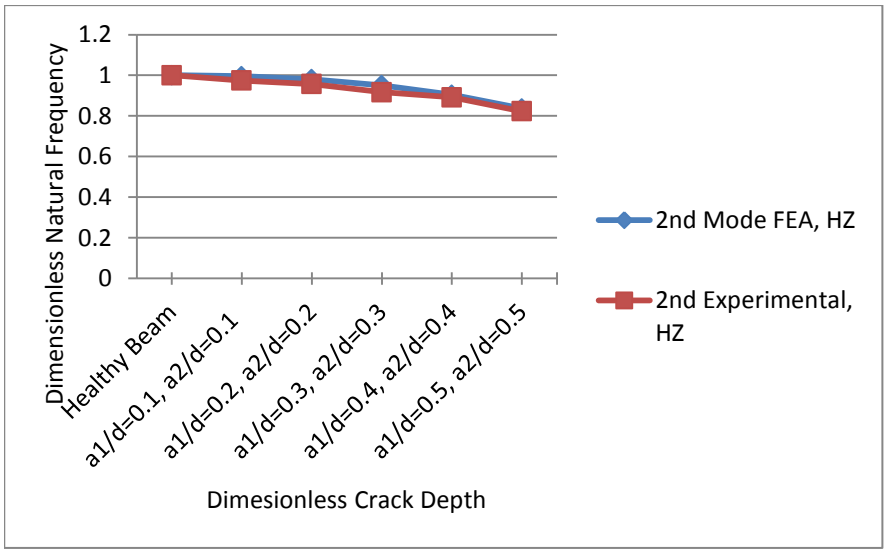

Fig.9 Comparison of FEA and Experimental Modal Analysis Results for 2nd mode of vibration

4.3 VARIATION OF NATURAL FREQUENCY OF VIBRATION WITH INCREASE IN DEPTH OF CRACK

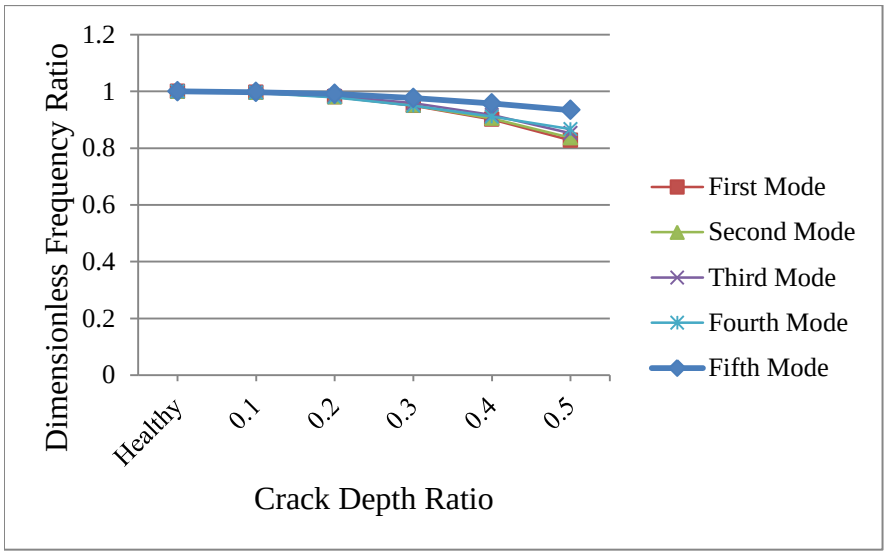

Fig.10 Natural Frequency ratio at different crack depths for e_1=0.25 and e_2=0.55

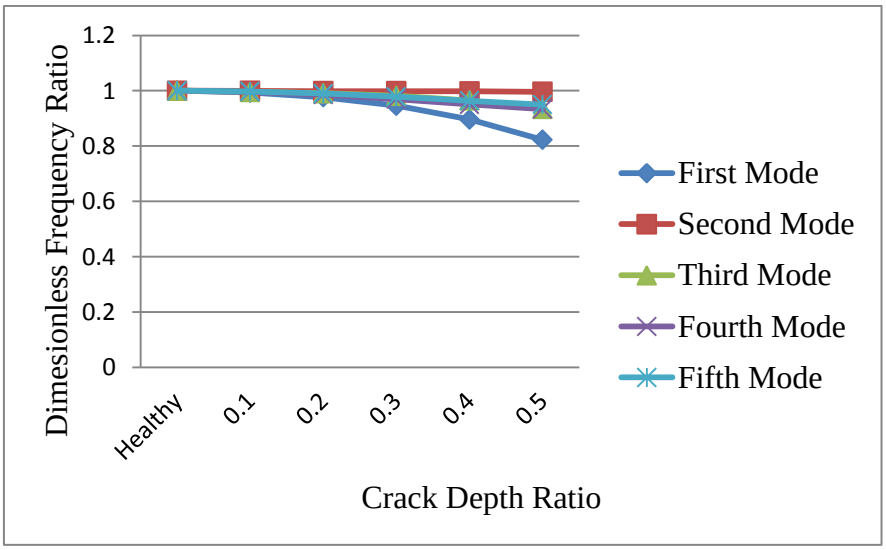

Fig.11 Natural Frequency ratio at different crack depths for e_1 =0.3 and e_2 =0.2

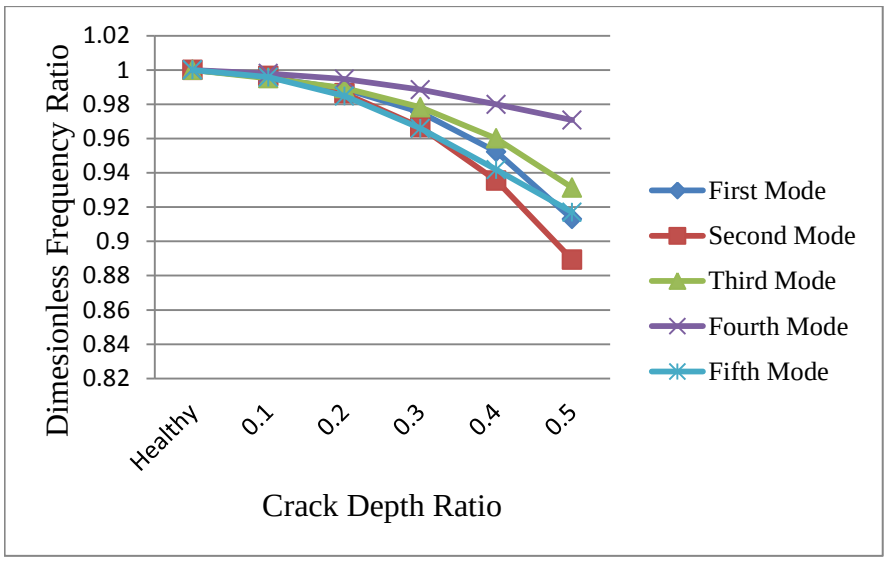

Fig.12 Natural Frequency ratio at different crack depths for e_1 =0.3 and e_2 =0.4

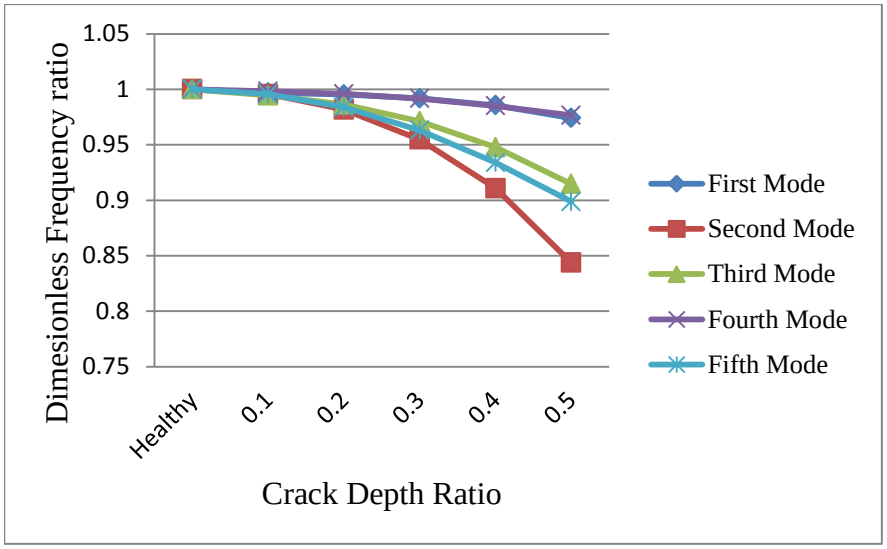

Fig.13 Natural Frequency ratio at different crack depths for e_1 =0.3 and e_2 =0.6

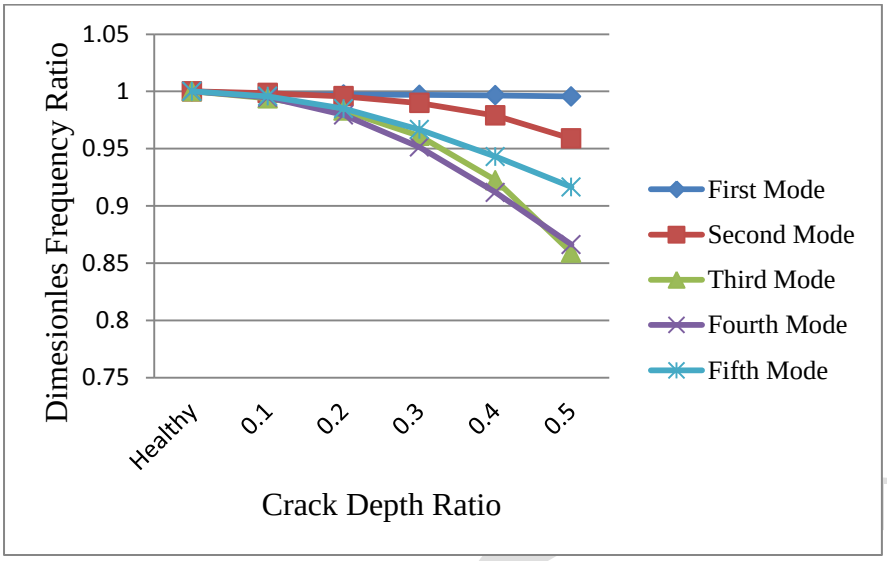

Fig.14 Natural Frequency ratio at different crack depths for e_1 =0.3 and e_2 =0.8

4.4 VARIATION OF DIFFERENT MODES OF VIBRATION WITH INCREASE IN CRACK DEPTH

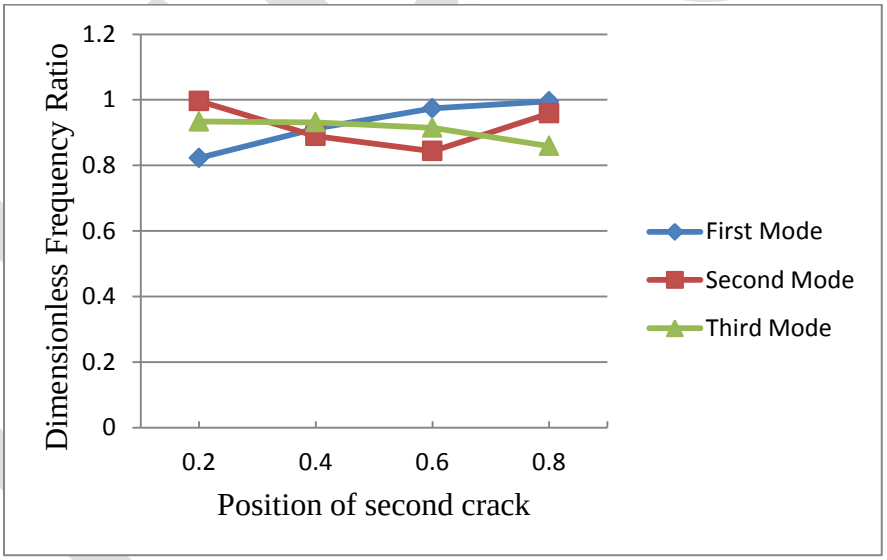

Fig.15 Natural frequency ratio at different crack positions for L_1=0.25, a_1=0.1 and a_2=0.1

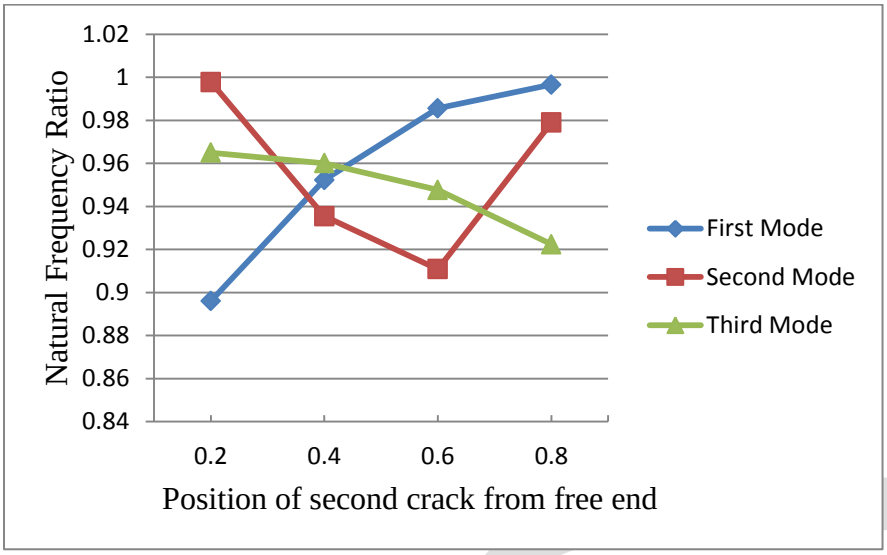

Fig.16 Natural frequency ratio at different crack positions for L_1=0.25, a_1=0.2 and a_2=0.2

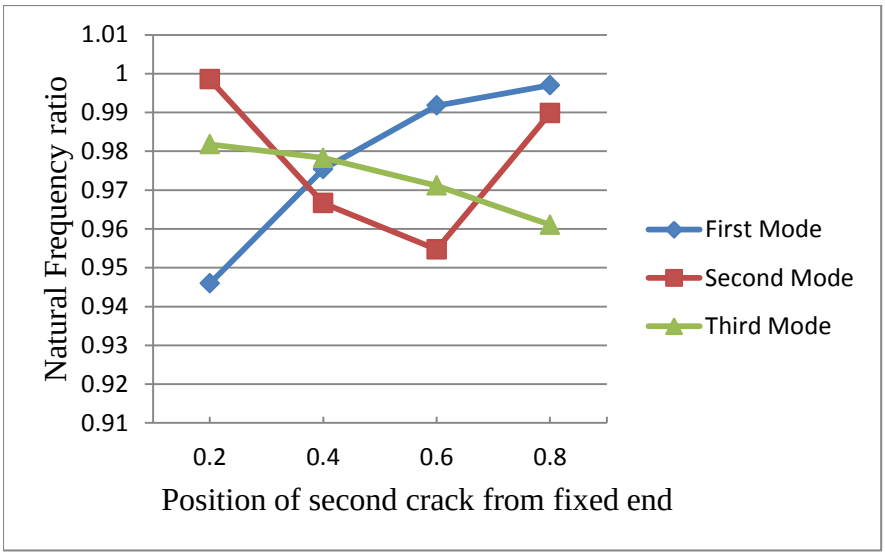

Fig.17 Natural frequency ratio at different crack positions for L_1=0.25, a_1=0.3 and a_2=0.3

4.5 VARIATION OF DIFFERENT MODES OF VIBRATION WITH INCREASE IN CRACK DEPTH

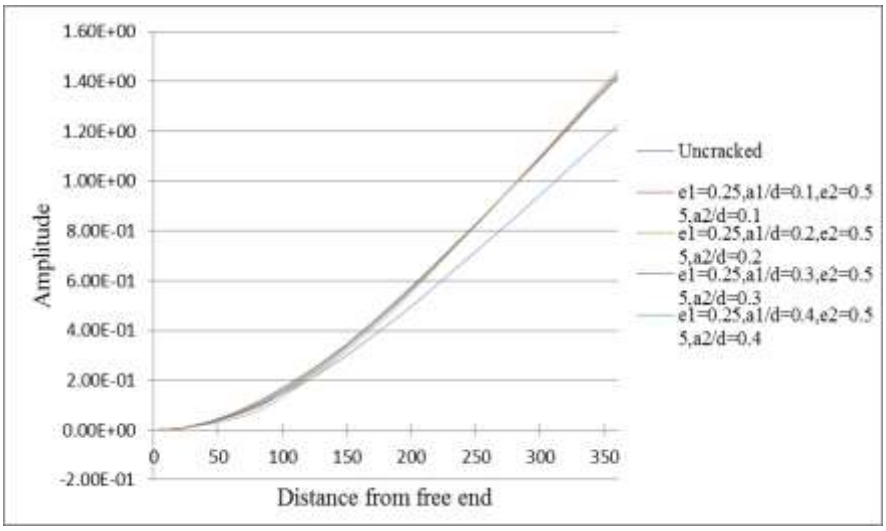

Fig.18 Mode shapes of 1st mode of vibration

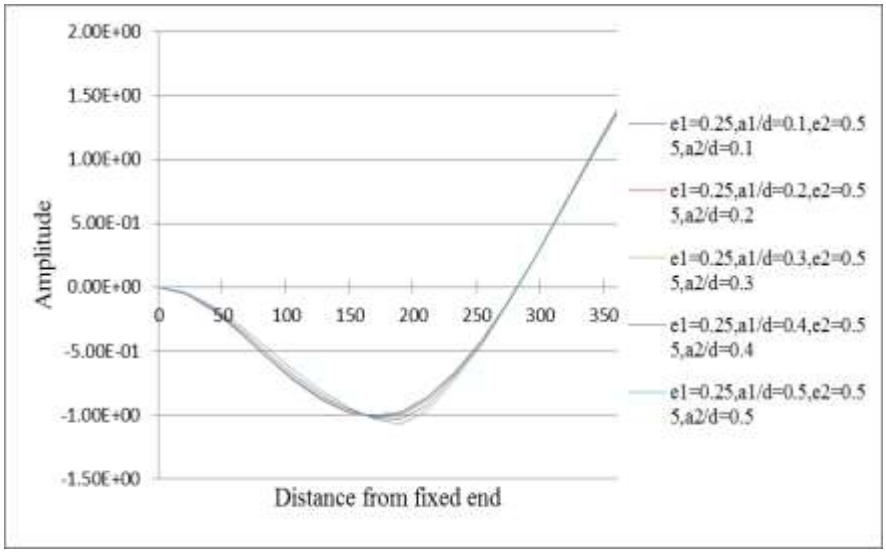

Fig.19 Mode shapes of 2nd mode of vibration

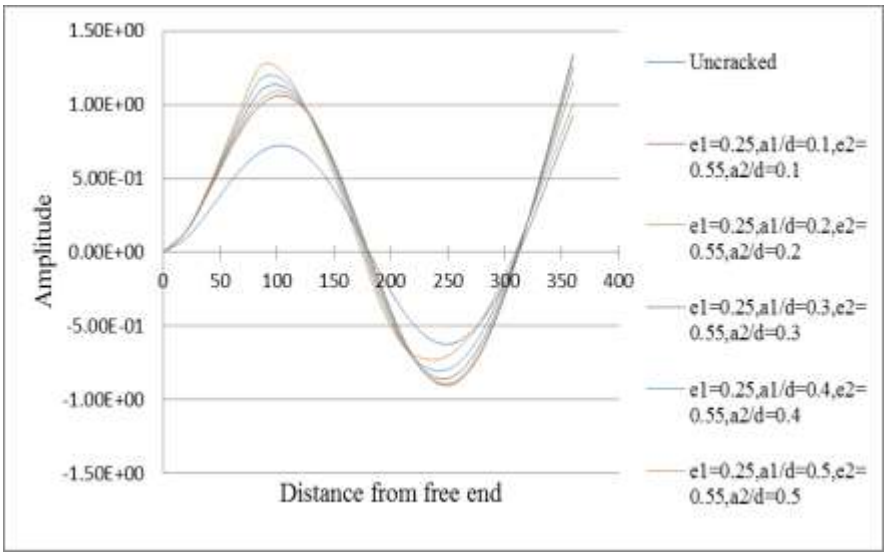

Fig.20 Mode shapes of 3rd mode of vibration

5. DISCUSSION

The Natural Frequencies of transverse vibration of the beam for first three modes are extracted from ANSYS 14.5. The results obtained using Finite Element Analysis for the first three transverse modes are compared with the results obtained using Experimental Modal Analysis of the shaft beam. The results obtained by FEA and Experimental Modal Analysis are in good agreement as shown in the figure 8 and figure 9. Also the variation of the Natural Frequencies of first three modes with increase in crack depth is studied. The oriented crack introduces local flexibility in the structure. The increase in flexibility results in increase in amplitude of vibration and decrease in natural frequency of vibration. As shown in the figure 10 to 14 the Natural Frequency of vibration decreases with increase in depth of the crack. This behavior is same for all positions of the cracks considered. Figure 15 to 17 shows the variation of the natural frequency ratio for various positions and depths of second crack. It can be seen that the frequency ratio of first mode increases with increase in distance of the crack from fixed end. Also, the frequency ratio of second and third mode decreases with increase in distance of the crack from fixed end. The mode shapes of the first, second and third modes of vibration are extracted using ANSYS and plotted as shown in figures 18 to 20. It has been observed that the mode shapes of the healthy beam and the cracked beam has different shapes as indicated in figures. This is because of increase in flexibility causes increase in amplitude of vibration.

CONCLUSION

In this work the Finite Element Analysis of a shaft beam with two transverse cracks was done in ANSYS 14.5 and its validation is done using Experimental Modal Analysis. The Mode shapes of first three modes of transverse vibration are plotted and comparison of mode shapes of healthy and cracked shaft beam was done. Also the comparison of the values of natural frequencies obtained by Finite Element Analysis is compared with the results of Experimental Modal Analysis.

1) The study shows good agreement between Experimental modal analysis and Finite Element Analysis results.
2) It is observed that the natural frequency of vibration of all three transverse modes of vibrations decreases with increase in depth of the crack as the presence of crack in structural member introduces local flexibilities.
3) As the position of the second crack changes from fixed end to free end the Natural Frequency of vibration increases for first mode but it decreases for second and third modes of vibration.
4) The mode shapes of the first three modes of vibration are plotted on the graph and it can be seen that the introduction of the crack changes the shape of mode shapes.
5) As the position of the second crack changes from fixed end to free end the mode shapes also shifts slightly with the crack.
6) The mathematical Modeling of the shaft is done using strain energy release rate approach.

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Optical Character Recognition Using Artificial Neural Network

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Abstract -This paper examines the use of neural networks to accomplish optical character recognition.Recognition of Handwritten text has been one of the active and challenging areas of research in the field of image processing and pattern recognition [4].The whole process of recognition includes two phases segmentation of characters intoline, word and characters and then recognition through feedforward neural network. Basically an offline handwritten alphabetical character recognition system using multilayer feed forward neural network has been described in our work. a method of feature extraction is introduced for extracting the features of the handwritten alphabets and then we use the data to train the artificial neural network.It contributes immensely to the advancement of an automation process and can improve the interface between man and machine in numerous applications [7].

Keywords - Character Recognition, Training, Feature Extraction, Image Processing, ANN,OCR, classification.

INTRODUCTION

Character recognition, usually abbreviated to optical character recognition or shortened OCR, is the mechanical or electronic translation of images of handwritten, typewritten or printed text (usually captured by a scanner) into machine editable text [1]. It is a field of research in pattern recognition, artificial intelligence and machine vision. Though academic research in the field continues, the focus on character recognition has shifted to implementation of proven techniques. For many document-input tasks, character recognition is the most cost-effective and speedy method available. And each year, the technology frees acres of storage space once given over to file cabinets and boxes full of paper documents [10].

The goal of Optical Character Recognition (OCR) is to classify optical patterns (often contained in a digital image) corresponding to alphanumeric or other characters. The process of OCR involves several steps including segmentation, feature extraction, and classification [12].Theneural network technology can be usedto analyze the stroke edge, the line of discontinuity between the text characters, and the background [3]. Allowing for irregularities of printed ink on paper, each algorithm averages the light and dark along the side of a stroke, matches it to known characters and makes a best guess as to which character it is. The OCR software then averages or polls the results from all the algorithms to obtain a single reading [2]. Neural networks can be used, if we have a suitable dataset for training and learning purposes. Datasets are one of the most important things when constructing new neural network.

METHODOLOGY

To solve the defined handwritten character recognition problem of classification we used MATLAB computation software with Neural Network Toolbox and Image Processing Toolbox add-on.In Classification Processthere are two steps in building a classifiertraining and testing. These steps can be broken down further into substeps.

TRAINING

a. Pre-processing – Processes the data so it is in a suitable form .
b. Feature extraction – Reduce the amount of data by extracting relevant information—Usually results in a vector of scalar values. (We also need to normalize the features for distance measurements)
c. Model Estimation – from the finite set of feature vectors, need to estimate a model (usually statistical) for each class of the training data.

TESTING

a. Pre-processing
b. Feature extraction – (both same as above)
c. Classification – Compare feature vectors to the various models and find the

closest match. One can use a distance measure.

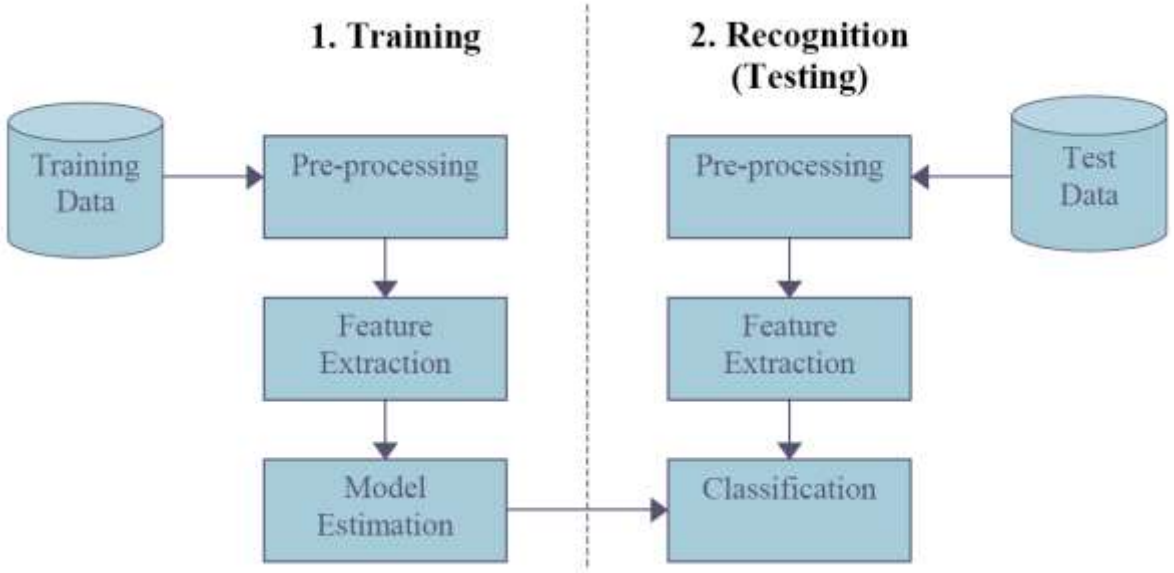

Fig 1. Training And Testing Of Data

AUTOMATIC IMAGE PREPROCESSING

The image is first being converted to grayscale image follow by the threshing technique, which make the image become binary image. The binary image is then sent through connectivity test in order to check for the maximum connected component, which is, the box of the form [6]. After locating the box, the individual characters are then cropped into different sub images that are the raw data for the following feature extraction routine. Binarization is Usually presented with a grayscale image, binarization is then simply amatter of choosing a threshold value.Morphological OperatorsRemove isolated specks and holes in characters, can use theMajorityoperator.Segmentation is by far the most important aspect of the pre-processing stage. It allows the recognizer to extract features from each individual character [12]. In the more complicated case of handwritten text, the segmentation problem becomes much more difficult as letters tend to be connected to each other.It Checks the connectivity of shapes, label, and isolate.

FEATURE EXTRACTION

The sub-images have to be cropped sharp to the border of the character in order to standardize the sub-images. The image standardization is done by finding the maximum row and column with 1s and with the peak point, increase and decrease the counter until meeting the white space, or the line with all 0s. This technique is shown in figure below where a character "S" is being cropped and resized.

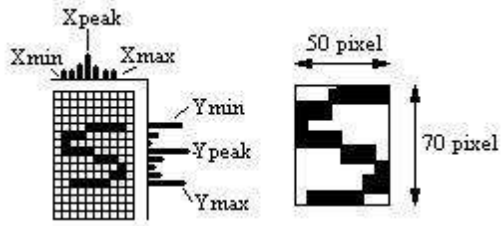

Fig 2. Cropped and resized picture

The image pre-processing is then followed by the image resize again to meet the network input requirement, 5 by 7 matrices, where the value of 1 will be assign to all pixel where all 10 by 10 box are filled with 1s, as shown below:

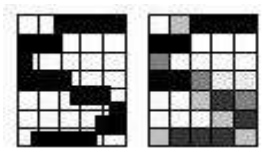

Fig 3. Image resize again to meet the network input requirement

Finally, the 5 by 7 matrices is concatenated into a stream so that it can be feed into network 35 input neurons. The input of the network is actually the negative image of the figure, where the input range is 0 to 1, with 0 equal to black and 1 indicate white, while the value in between show the intensity of the relevant pixel [15]. By this, we are able to extract the character and pass to another stage for future "classification" or "training" purpose of the neural network character.

DESIGN AND IMPLEMENTATION

Initially we are making the Algorithm of Character Extraction. We are using MATLAB as tool for implementing the algorithm. Then we design neural network, we need to have a Neural Network that would give the optimum results . There is no specific way of finding the correct model of Neural Network. It could only be found by trial and error method [11]. Take different models of Neural Network, train it and note the output accuracy. There are basically two main phases in our Paper: Pre-processing and Character Recognition. In first phase we have are preprocessing the given scanned document for separating the Characters from it and normalizing each characters. Initially we specify an input image file, which is opened for reading and preprocessing. The image would be in RGB format (usually) so we convert it into binary format [8]. To do this, it converts the input image to grayscale format (if it is not already an intensity image), and then uses threshold to convert this grayscale image to binary i.e.all the pixels above certain threshold as 1 and below it as 0. we needed a method to extract a given character from the document.

The character recognition application can be used in two different ways. First way is to type every command inside the MATLAB console and workspace on hand. The second way is to use already pre-prepared Graphical User Interface [10]. The GUI consists of two files. First file include all necessary programming code, and the second file include visible interface shapes and forms. The interface works like the workflow of recognition process. First we load the image, than we select the character and after that we click crop, pre-process, feature extraction and finally recognize [7]. On every stage, GUI shows us a new image, which is unique for the each step. The images can be viewed in the Main window, RGB, Binary, Crop to Edges and Features window.

CONCLUSION

This paper carries out a study handwritten character recognition using Artificial Neural Network.Artificial neural networks are commonly used to perform character recognition due to their high noise tolerance. The systems have the ability to yield excellent results. The feature extraction step of optical character recognition is the most important. A poorly chosen set of features will yield poor classification rates by any neural network. At the current stage of development, the software does perform well either in terms of speed or accuracy but not better. It is unlikely to replace existing OCR methods, especially for English text. A simplistic approach for recognition of Optical characters using artificial neural networks has been described.

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Examining the performance of AODV routing protocol under black hole attack with varied node densities and mobilities

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Abstract – In Mobile ad hoc network (MANET), nodes do not rely on any fixed infrastructure which enables users to communicate with each other without any pre-established physical link between them. Due to this high mobility nature and open distributed network characteristics, mobile ad hoc networks are threatened by lot of security attacks. Black hole attack is one such dangerous active attack in MANETs. In black hole attack, a malicious node falsely claims that it has the shortest part towards the destination inorder to transfer data packets even though it does not have one. Once the data packets broadcasted by the source node reaches this malicious node, it drops all those packets preventing from progressing further. This type of attacks seriously damages the performance of the network and should be strictly prevented. In this paper, the effect of black hole attack on the Ad-hoc On-demand Distance Vector (AODV) routing protocol is studied using Network Simulator (NS-2). The performance of the routing protocol AODV is evaluated with and without black hole attack in the network with varied node deployments

Keywords – Mobile ad hoc network, AODV, Black hole attack, Security attacks, Network Simulator, Packet delivery ratio, average end-to-end delay

1. INTRODUCTION

The remarkable technology of wireless networks started in late 1970s and the interest has been growing ever since. Earlier, information sharing between various communication devices is somewhat difficult, as the users need to set up static, bi-directional links between the devices to perform various administrative tasks. Inorder to prevent the difficulty in maintaining these infrastructure based networks, various techniques has been determined leading to ad hoc networks. In these type of networks, communication is entirely based on the construction of temporary networks with no basic infrastructure provided, no connecting wires and no administrative intervention required. Such interconnection between mobile nodes is called a Mobile Ad hoc Network (MANET).

Mobile ad hoc network is an autonomous and decentralized network in which any mobile node can freely move in and out of the network. These mobile nodes must act as both host and router in which both route discovery mechanism and data transmission between nodes is handled by the mobile nodes itself. These nodes have the ability to configure themselves and because of their self-configuring capability, they can form an arbitrary network when needed without the basis of any fixed infrastructure. Due to these characteristics, the network topology gets varied more frequently and hence a routing protocol must be efficient enough in delivering an ameliorated network performance. Traditional routing protocols used for wired networks cannot be employed for mobile ad hoc networks because the basic idea of such ad hoc networks is mobility with dynamic topology [14]. Routing protocols plays a major role in such type of networks whose function is to transfer data packets between the mobile nodes efficiently tackling all the varying situations.

Due to their inherent characteristics and lack of any centralized administration, mobile ad hoc networks are vulnerable to different types of security attacks. These attacks include active interfering, passive eavesdropping, impersonation and denial of service [1]. Since the communication among the nodes is purely based on mutual trust between nodes, malicious nodes in the network must be identified carefully and must be restricted in their behaviour. Hence securing a mobile ad hoc network is necessary for basic functionality of the network. Black hole attack is one among these various attacks. In the black hole attack, a malicious node drops all the packets coming in its way without transferring them to its neighborhood node, thus degrading the network performance. Black hole attack may occur due to a malicious node which is deliberately misbehaving, as well as a damaged node interface. Such type of attacks must be prevented inorder to obtain better performance of the network. In this paper, the performance of the AODV routing protocol is examined under black hole attack.

2. ROUTING PROTOCOLS IN MANETS

In MANETs, nodes are not familiar with the network topology in priori. Routing protocols are responsible in establishing the paths between the mobile nodes inorder to transmit data between source and destination in that path. Hence a routing protocol must be efficient enough in handling various network phenomenon's and must tolerate against different security attacks. These routing protocols are broadly classified into three types based on the phenomenon in which they broadcast information.

1. Proactive or Table-Driven routing protocols

2. Reactive or On-Demand routing protocols

3. Hybrid routing protocols

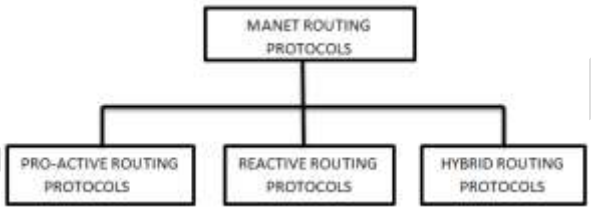

Figure 1: Routing Protocols in MANETs

2.1 Proactive routing protocols

Proactive routing protocols designed for MANETs are adopted from various traditional routing protocols available for wired networks. Proactive routing protocols attempt to maintain up-to-date routing information from each node to every other node in the network prior to the need of data transmission. The routing information is kept in a number of different routing tables and the routing information is updated regularly responding to the changes in the network topology. Primary advantage of proactive routing protocols is the availability of routes to concern nodes at any moment. Control overhead generated by these protocols is significantly more in large networks. Examples of such networks include DSDV, OLSR, WRP etc.

2.2 Reactive routing protocols

In this type of routing protocols, routes between the mobile nodes are not continuously maintained without any need such as in proactive routing protocols. Routes are established between the mobile nodes only when needed i.e., On-Demand. Here in reactive routing protocols, if a source node needs to send data packets to some destination, it checks whether it already has a route towards the destination to transmit data packets. If it does not find any route, then it initiates the route discovery phase to establish a new path towards the destination, through which the data packets are sent. The drawback of the reactive routing protocol is the introduction of route acquisition latency. The time taken by the data packets to reach the destination is more compared to proactive routing protocols. Reactive routing protocols include AODV, DSR, AOMDV etc.

2.3 Hybrid routing protocols

Hybrid routing protocols exploits the strengths of both proactive and reactive routing protocols inorder to deliver better performance. In hybrid routing, entire network is divided into zones so that, one protocol is used within a zone and another protocol is

used between the zones. ZRP is an example of such routing protocol. Performance of the On-demand routing protocol, AODV is determined in this paper.

AD-HOC ON-DEMAND DISTANCE VECTOR (AODV) ROUTING PROTOCOL

AODV is an on-demand routing protocol. It does not maintain any routing information and participate in any periodic routing table exchanges prior to the necessity of communication. It finds the route between the mobile nodes only when needed (on-demand). AODV routing protocol adopts the concept of destination sequence numbers from DSDV to maintain the most recent information about the mobile nodes and the concept of on-demand route discovery and maintenance from DSR. Each entry in the routing table consists of the destination node, destination sequence number, number of hops, next hop, expiration table for the entry in the tables containing the routing information etc. AODV routing protocol makes use of various control messages such as Route Request (RREQ), and Route Reply (RREP) for establishing a path from source to destination. Header information of various control messages used in AODV is listed out in [10].

Whenever a source node needs to communicate with another node for which it has no route, the process of route discovery is initiated by the source which broadcasts a RREQ packet to its neighborhood nodes. Each neighboring node either responds to the RREQ by sending Route Reply (RREP) packet back to the source node or it further transfers the RREQ packets to its neighborhood nodes after incrementing the hop count. This route discovery process is carried on until the RREQ packet reaches the destination node or an intermediate node that has a fresh enough route entry for the destination in the routing table. Once the intermediate node has a valid route towards destination, it sends a RREP packet back to the source node in the reverse path. Making use of the reply from an intermediate node rather than the destination node reduces the route establishment time and also the control traffic in the network.

Sequence numbers are used in these control packets and they serve as time stamps which are used by the nodes to compare the freshness in the routing information [4]. When a node sends any type of routing control message, it increases its own sequence number in the message. Routing information with highest sequence number is considered to have more fresh or up-to-date information. If a node receives more than one RREP, it updates its routing information, and propagates the RREP with the highest sequence number discarding others.

The source starts the data transmission as soon as it receives the first RREP, and then it updates its routing information of better route to the destination node. If at all any of the nodes in the data path moves away causing the breakage of the link, the route discovery process is reinitiated to establish a new route to the destination node, Route Error (RERR) control packet is sent to all the nodes in the network which are using this broken link for communication. Routing protocol assumes that all the nodes are cooperative in nature in broadcasting information.

3. SECURITY ATTACKS IN MANETS

As in [12], security is a very important issue for the basic functioning of the network. MANETs are more susceptible to various attacks than wired networks due to its flexible environment. Due to its dynamic nature, the network can be accessed by both the legitimate users and malicious attackers. Since the routing protocol assumes that all the nodes in the network are cooperative in nature, malicious attackers can easily disrupt network operations by violating protocol specification. An attacker first analyses the network functioning and then launch attacks into the network which degrades the network performance. Hence these attacks must be strictly prohibited.

These attacks are basically classified into two categories – Passive attacks and Active attacks. These are further sub-classified into various kinds depending upon the type of the attack such as Denial of Service attack, Fabrication attack, Modification attack, Replay attack and Impersonation attack. Passive attacks just listen to the traffic of the network to obtain vital information. These types of attacks do not affect the functioning of the network. It is difficult to identify such type of attacks as the performance of the network does not vary. It is even not possible to detect the presence or the location of the attacker node in this case. The only way to prevent such type of attacks is through encryption. Whereas, active attacks aim to modify the transmitted data by adding random packets or attempt to interrupt the data flow from source to destination. The main purpose is to pull all packets towards the attacker for analysis or to obstruct the network communication. Black hole attack is one such attack which comes into this category. Among these two types of attacks, only active attacks can be accepted out at routing level. They can either be inner or outer. In order to combat these attacks, a secure environment should provide confidentiality, availability, authenticity, integrity and non-repudiation [2].

BLACK HOLE ATTACK

A Black hole attack is a denial of service type of attack, where a malicious node attracts all the data packets by falsely claiming that it has the shortest and fresh enough route towards the destination [7]. Once the source node chooses that path to transfer data, the malicious node absorbs all the data without forwarding them to the destination. To be more elaborate, when a source nodes needs to communicate with some destination node, it initiates the route discovery process by sending route request (RREQ) packets. In black hole attack, a malicious node initially waits till the nodes broadcast RREQ packets. Once the RREQ packet is received by the malicious node, it immediately responds with a false route reply (RREP) packet with highest sequence number, indicating that it has the fresh route towards the destination. The source node believes that the destination node is behind the malicious node and ignores all the RREP packets received from other nodes, even if it is from actual destination. Then the source node transmits the data packets through the path containing the malicious node trusting that these packets will reach the destination.

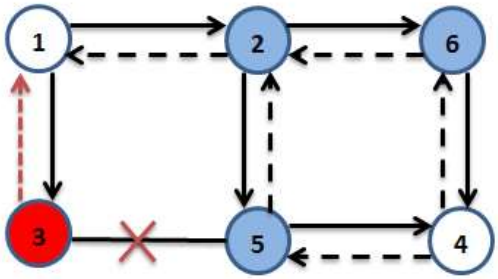

Figure 2: Black hole attack in MANET

Once the data packets reach the black hole node, it does not forward the data packets further and simply drops them. Thus, a black hole node pretends to have fresh routes to all the destinations in the network requested by all the nodes and absorbs the networks data traffic. This type of attack never forwards any data packets.

In figure 2, source node 1 wants to send data packets to the destination node 4 in the network. Here node 3 is a malicious node which acts as a black hole. When the source node initiates the route discovery process, the malicious node responds to the RREQ packet immediately with a false or malicious RREP having higher modified sequence number, though it do not have any route to the destination. Since the reply from the malicious node first reaches the source node, it updates its routing table accordingly. Then it starts broadcasting the data packets through node 3, which do not forward the data packets to its neighboring node.

4. SIMULATION SETUP

Inorder to analyze the performance of AODV under blackhole attack, network simulator NS-2 is used. NS-2 uses the collaborative environment for simulation making use of discrete event simulation [6]. Here various quantitative metrics like packet delivery ratio, average end-to-end delay, normalized routing load and jitter are estimated under blackhole attack. The performance of the network is determined with the following network parameters summarized in Table 1.

Table 1: Simulation Parameters

Parameters	Values
Simulator	NS – 2.35

Network Dimensions	1000m x 1000m
Simulation Time	200 sec
Node mobility model	Random waypoint
Routing protocols	AODV
Application type	UDP
Traffic type	Constant Bit Rate (CBR)
No. of nodes	20, 40, 60, 80, 100
Speed of node	5 – 30 m/s in steps of 5
Pause Time	0 sec
Physical Layer	IEEE 802.11b
MAC Protocol	IEEE 802.11
Transmission rate	100 kbps
Packet size	512 kb

5. PERFORMANCE EVALUATION

In this paper, the effect of black hole attack is determined by considering the quantitative metrics such as packet delivery ratio, average end-to-end delay, normalized routing load and jitter. However, the network performance is evaluated with and without attack. In both the cases, the following metrics are considered to evaluate the performance under varied node mobility and node density.

1) Packet Delivery Ratio: Packet Delivery Ratio (PDR) is the ratio between the number of packets transmitted by a traffic source and the number of packets received by a traffic sink. It measures the loss rate as seen by transport protocols and as such, it characterizes both the correctness and efficiency of ad hoc routing protocols. It represents the maximum throughput that the network can achieve. A high packet delivery ratio is desired in any network.

$$PDR = \frac{Total\ no.\ of\ received\ packets}{Total\ no.of\ packets\ sent}$$

2) Average End-to-End Delay: The packet end-to-end delay is considered as the average time a packet takes to traverse the network. This is the time from the generation of a packet by the source, till its reception at the destination's application layer and is expressed in seconds. It therefore includes all the delays in the network such as buffer queues, transmission time and delays induced by routing activities and MAC control exchanges. The end-to-end delay is therefore a measure of the how well reliability of a routing protocol adapts to the various constraints in the network and hence represents the reliability the routing protocol.

$$EED = \sum \frac{(Received\ time - sent\ time)}{Total\ data\ packets\ received}$$

3) Normalized Routing Load: Normalized Routing Load is the ratio between the total number of routing packets sent to the number of data packets delivered. This metric is used to evaluate the scalability of the network.

$$NRL = \frac{no.\ of\ routing\ packets\ sent}{no.of\ data\ packets\ received}$$

4) Jitter: Jitter is the variation in the time between packets arrival, caused by network congestion, timing drift, or route changes. A network with constant delay has no variation (or jitter). Hence jitter should be minimum for a routing protocol to perform better.

5.1 Impact of black hole attack with varied node densities

Inorder to determine the impact of the black hole attack on the AODV routing protocol, its performance is determined including an attacker node and by varying the total number of nodes. Various metric values are determined which are discussed in this section

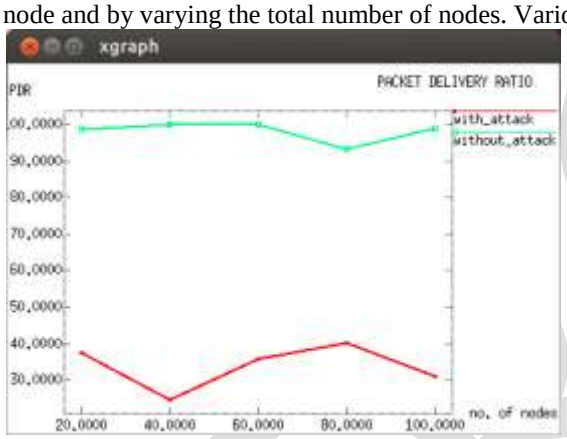

Figure 3: No. of nodes vs PDR

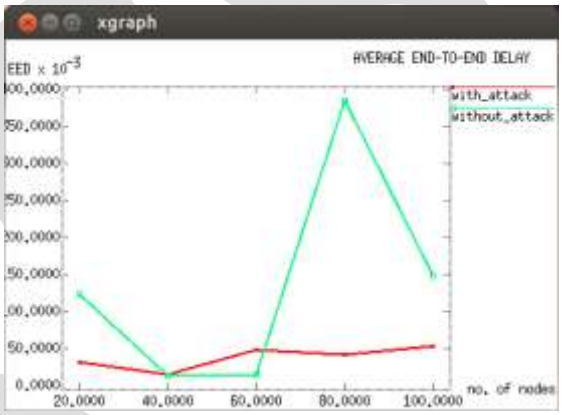

Figure 4: No. of nodes vs EED

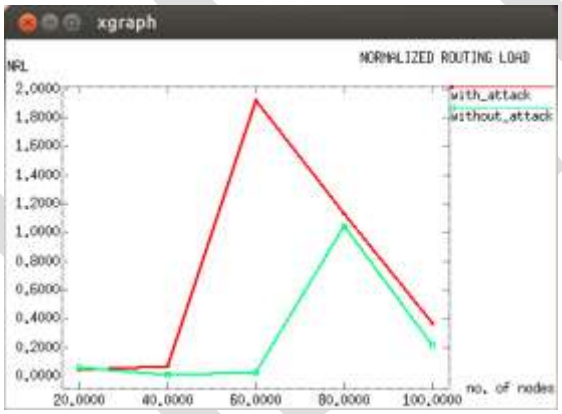

Figure 5: No. of nodes vs NRL

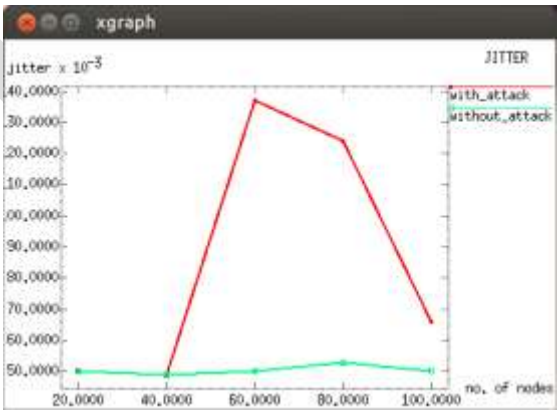

Figure 6: No. of nodes vs Jitter

From figure 3, a drastic change in the packet delivery ratio is observed, when the network is analyzed in the presence of blackhole attack. This happens because the number of packets delivered greatly reduces as all packets traversed in attacker's way, will be dropped. From figure 4, it is clear that the average end-to-end delay is somewhat consistent in the presence of the attacker than that of the normal case. Figure 5 depicts that normalized routing load is more in the presence of attack, as the routing packets generated in the network greatly increases because of the malicious nodes as it frequently broadcasts the packets to misinterpret the source node. From figure 6, it is evident that as the number of nodes increases over 40 nodes, jitter in the network increases indefinitely as the attacker nodes presence creates routing changes and congestion in the network when compared to no attack scenario.

5.2 Impact of black hole attack with varied node mobilities

In addition to analyzing the network performance with varying node densities, estimation of performance with changing node mobilities is also implemented. The node speeds are varied in the range of 5-30 m/sec. The following simulation results depict the impact of black hole attack on the AODV routing protocol

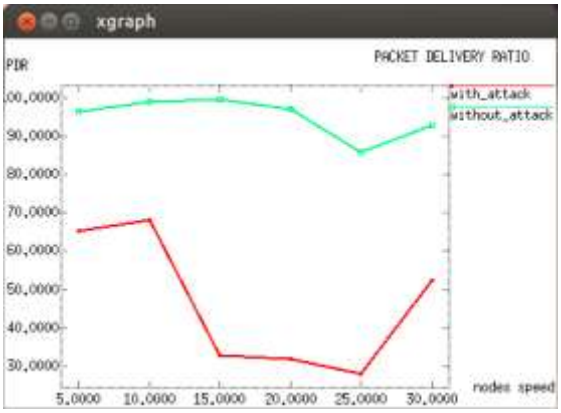

Figure 7: Node speed vs PDR

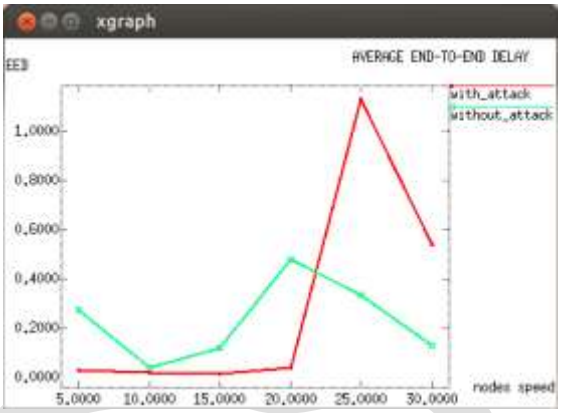

Figure 8: Node speed vs EED

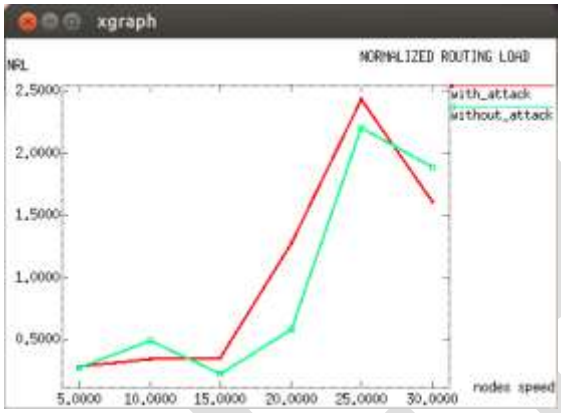

Figure 9: Node speed vs NRL

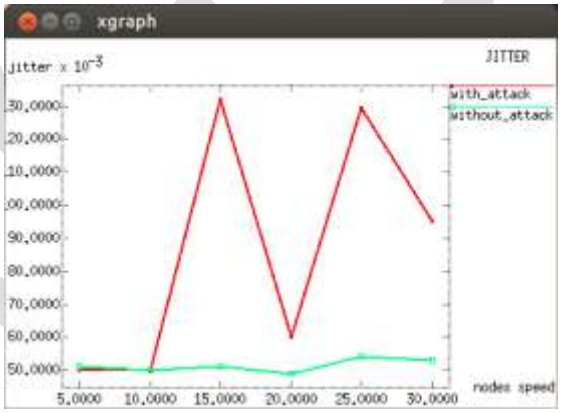

Figure 10: Node speed vs Jitter

Figure 7 shows that with increased node mobility, Packet delivery ratio declines drastically signifying the impact of blackhole attack. Figure 8 illustrates that when the speeds of the nodes is limited to 20m/s, in scenarios of with and without attack, end to end delay is low in the presence of the attacker because of its mischievous activity; however after 20 m/s, as mobility increases, delay increases predominantly. Figure 9 illustrates that the Normalized routing load remains almost same in instances of with and without blackhole attack with varying node mobilities. This shows that the impact of the attacker is slightly decreased in this case because of the frequent path changes with increased mobility. However, figure 10 shows the way in which the jitter gets fluctuated in the presence of blackhole attack. This is because of the network congestion which greatly increases with varying node mobility. However, jitter is consistent in the network without any attacker.

6. CONCLUSION

In this paper, different mobile ad hoc network scenarios are analyzed with and without blackhole attack under AODV routing protocol, considering various simulation parameters listed above. The network is examined for different performance differentials like packet delivery ratio, average end-to-end delay, normalized routing load and jitter with varying node densities and mobilities in the deployed network. The simulation results signify that the performance of network in the presence of blackhole attack is predominantly decreasing in packet delivery ratio as the attacker nodes discards all the data packets traversing its path. Jitter increases as the attacker nodes increase congestion in the routes discovered. Average end-to-end delay decreases in the presence of attack, as the attacker nodes send RREP message immediately with minimum hop count and maximum sequence number. These changes in employed metrics conclude that network performance is degrading predominantly in the presence of blackhole attack.

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Hydraulic Hybrid Vehicle

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Abstract—This paper presents a hydraulic hybrid vehicle drive train to improve the fuel efficiency of a passenger car. The hydro-mechanical system demonstrates excellent fuel economy potential, yet requires development work in the area of pump/motors with high efficiency at low displacement fractions. The fuel consumption of off-road machines is strongly reduced if part load operation of the engine and throttled control of the hydraulic implements are avoided. This is the aim of the 'Hydrid': a full hybrid hydrostatic drive train and control system. The Hydrid has hydraulic accumulators for energy storage and power management, hydraulic transformers for efficient power control, and highly efficient and compact in-wheel motors. System behavior demonstrates that the new control strategy takes advantage of high power density and efficiency characteristics of hydraulic components, and minimizes disadvantages of low energy density, to achieve enhanced overall efficiency.EPA is leading the development of hydraulic hybrid vehicles. This breakthrough technology can cost-effectively reduce emissions and drastically reduce fuel consumption while maintaining or improving performance. A delivery vehicle is an excellent application for hybrid technology since its service cycles involve numerous braking events. Hydraulic hybrid technology has significant commercial potential for a wide range of medium-sized vehicles such as urban delivery trucks, shuttle/transit buses, and waste disposal vehicles.

Keywords— Hydrid,Accumulator, Hydraulics,HHV

1.INTRODUCTION

Global market competition, oil production forecasts, and environmental protection forces are stimulating work on significantly improved fuel economy of all classes of vehicles. In recent years, fuel consumed by trucks grows at a much faster rate than that of passenger cars. This is a consequence of increased proportion of light trucks and sport-utility vehicles, as well as a higher demand for ground transportation of goods. In case of trucks, the availability of new technologies for improved fuel economy is somewhat limited compared to passenger cars, due to the fact that heavier trucks already use very efficient diesel engines, as well as constraints on the potential for weight and air drag reduction imposed by payload carrying requirements. Hence, advanced hybrid propulsion systems are critical to achieving future fuel economy goals for trucks.A major component of global energy consumption is transportation, which consumes 4.8 billion barrels of crude oil per year. Of the transportation industry, passenger cars consume 2 billion barrels of oil per year with a value of $100 billion. [1]

A hybrid vehicle contains two sources of power consisting of an internal combustion engine and a second power source that allows for energy storage. The energy storage is used during braking events and other drive train control strategies to minimize fuel consumption. Two auxiliary power sources have been found most practical: electric motor/generators combined with batteries and hydraulic pump/motors combined with hydraulic accumulators.Electric hybrid vehicles have been the first hybrid technology to be mass produced for the commercial passenger car market. A strength of electric hybrids is the high energy density of electric batteries, allowing for large energy storage in relatively compact and lightweight batteries. A substantial shortcoming of electric hybrids is the relatively low power density of both electric motor/generators and batteries at approximately 30-100 W/kg.

Switching the second hybrid power source to hydraulics realizes benefits in a multiple areas:

1) The power density of hydraulic pumps/motors and accumulators is very high at approximately 500-1000 W/kg.
2) Hydraulic components are inexpensive when compared with electrical components, especially advanced battery packs.
3) Certain hybrid architectures allow for independent control of the torque at each wheel, which opens numerous possibilities for vehicle dynamics control.
4) Recent and developing technologies such as digital hydraulic valves and high energy density accumulators are improving the future outlook of hydraulic hybrid vehicles. [1]

A prime advantage of certain hydraulic hybrid drive train architectures is leveraging the intrinsically high power density of the

hydraulic energy storage system through optimal engine management. Internal combustion engines create power most efficiently at relatively high power levels near the RPM of the peak torque output. Operating at other conditions decreases the energy conversion efficiency. An optimal engine management scheme runs the engine near the peak efficiency, with a portion of the power being transferred to the wheels while the additional power is stored. Once the accumulator is charged to a desired state, the engine is shut off and power for vehicle propulsion is supplied by the accumulator.

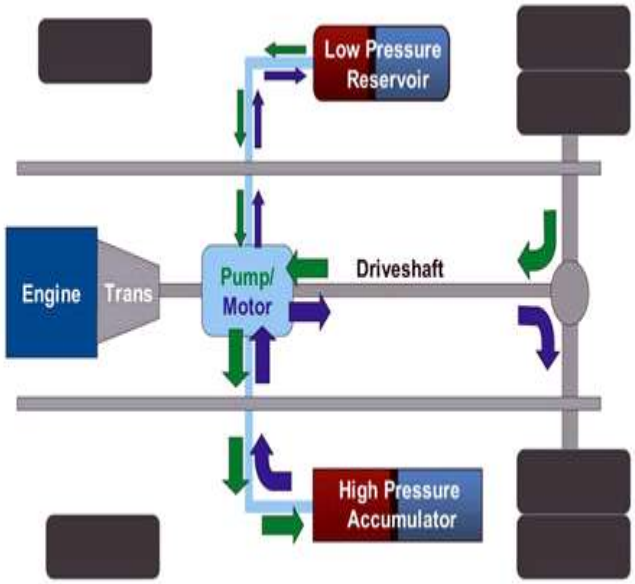

Fig 1.1 Basic structure for Hydraulic Hybrid Technology)[2]

2.LITERATURE SURVEY

1. WHY HYDRAULIC AND NOT ELECTRIC?

There are currently many electric hybrid vehicles on the market. Toyota and Honda provide many compact vehicles that utilize the above technology using electricity instead of hydraulics. Even though the concept is very similar, the properties of hydraulics differ slightly. The main difference is that hydraulic systems are able to store more energy at a faster rate than an electrical system. This increase in energy storage is crucial to be able to effectively move and accelerate a heavy diesel engine. There is no practical way to store the same amount of energy in an electrical system that would be stored in a hydraulic system. The cost would be far too great, and designing batteries and capacitors to make the system work would be very difficult and inefficient. However a hydraulic system is much larger than an electrical system which makes is much more reasonable for smaller compact cars which have less space to house a hybrid system, and which require far less energy to operate effectively. [2]

2. PREVIOUS WORK

This project began in the spring semester of 2008. This was originally a Colorado State University Mechanical Engineering Senior Design project that began in the fall semester of 2007. The first semester of this project, a large group of mechanical engineers began to think through the design of the hydraulic hybrid. Most of this semester was spent researching previous experiments and possible designs that could be applied to this project. Many Simulink models were created in MATLAB to determine experimental predictions of what the efficiency of the vehicle, what size of vehicle was needed, and how much pressure needed to be stored in order to supply sufficient power to the vehicle. Also in the fall semester of 2007, the group also purchased a "test skid" from the University of Michigan. The details of the test skid will be explained in detail in the following section.

There was relatively no electrical engineering work that was done on this project prior to the spring semester of 2008, however Michael Neuberg and Evan Vleck researched the best methods of controlling this system and came upon a local company in Ft. Collins called MotoTron. They design controllers (ECU's) for high performance vehicles. What made MotoTron the controller of choice was its seamless interface between the hardware and MATLAB. The only programming language that is needed is a working knowledge of Simulink, and the Simulink models can be directly downloaded to the controller. MotoTron agreed to donate the necessary supplies, software, and technical support to the project.

3. CURRENT WORK

There was a tremendous amount of work that went into the controls design in the spring semester of 2008. The majority of the time and effort went into understanding, to a very detailed level, what was being controlled and why it needed to be controlled. In the figure below, there is a schematic of the hydraulic system which illustrates where there are valves, release valves, accumulators, and displacement controllers.

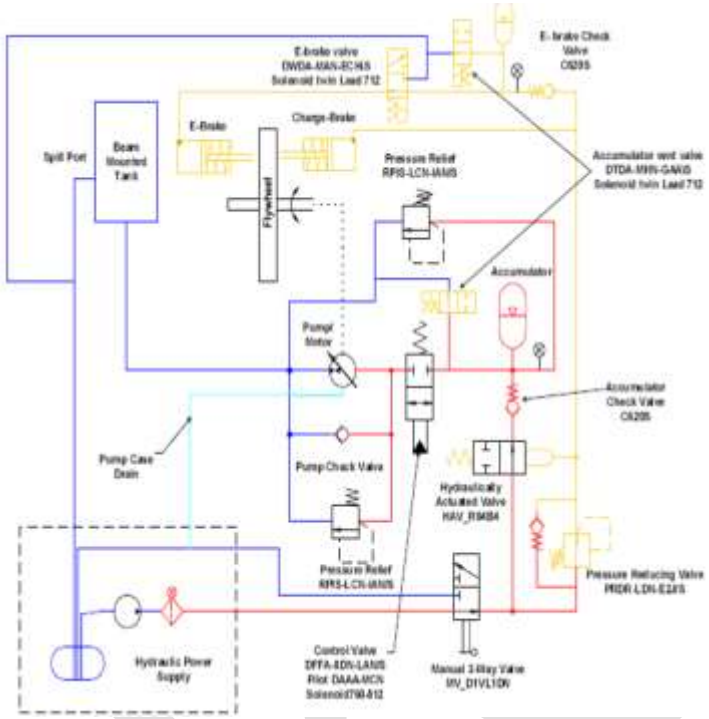

Fig.2.1 this schematic shows the layout of the hydraulic system

The Hydraulic Hybrid system is broken down into two main parts: the Safety Controller and the Displacement Controller. The safety controller is very similar to the displacement controller because they both monitor the system for dangerously high speeds and pressures. When there is a speed or pressure that is read in that exceeds set levels within the controller, the displacement controller is the fires to react and attempt to adjust the displacement until the system reaches stability. Similar if the pressure is increasing too rapidly or is reaching critical levels, the displacement controller will set the displacement pump to no longer pump hydraulic fluid into the accumulator. Should the displacement pump not gain control of the system, or fail completely, the safety controller, which is a completely separate unit will assume control of the system and turn off the hydraulic system. It will also release any pressure from the accumulator, and in our test case, it does apply the brakes to reduce any dangerous speeds. [3]

TYPES OF HHV

1. PARALLEL SYTEM
2. SERIES SYSTEM
3. HYDROMECHANICAL DRIVE TRAIN.

3.HYDRO-MECHANICAL DRIVE TRAIN

1. DEVELOPMENT

The hydro-mechanical system discussed in this paper, and shown in Figure, consists of a hydraulic pump/motor mount between the engine and a mechanical transmission. The output of the transmission and a second hydraulic pump/motor are combined in a planetary differential. The output of the differential powers the wheels. The two variable displacement pump/motors are connected to a high pressure accumulator for energy storage. The goal during operation is to transmit as much power as possible through the highly-efficient mechanical transmission, while using the hydraulics to allow the engine speed and vehicle velocity to be independent.

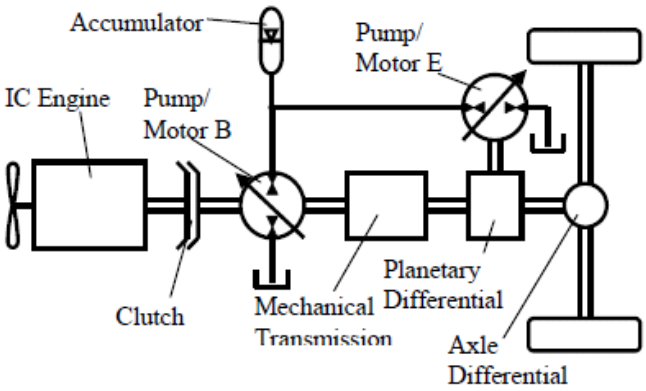

Fig 3.1 (Hybrid hydro-mechanical drive train with a single planetary differential)

An innovation of the hydro-mechanical drive train developed by the authors is a method to control the torque at each wheel independently. Independent control of the torque at each of the wheels opens avenues to an array of vehicle dynamic controls. In conventional drive trains, active vehicle dynamic controls, such as traction control, are accomplished by applying brakes to individual wheels. This method is inefficient and imprecise. As a solution to this issue, the authors developed a drive train that allows direct control of the torque at each wheel through varying the displacement of hydraulic pump/motors.

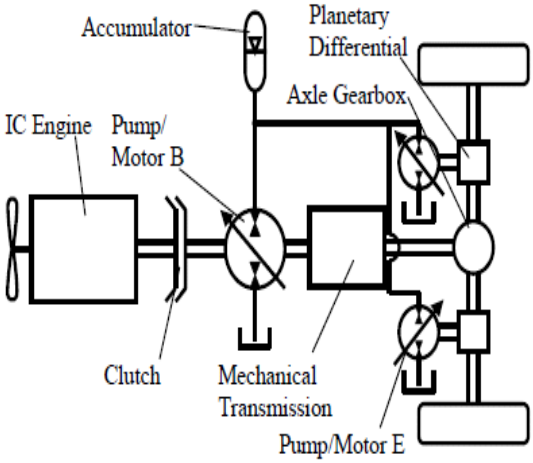

Fig 3.2(The novel hydro-mechanical drive train with independent wheel torque control. This figure demonstrates the concept for two-wheel drive wheel.)

The hydro-mechanical drive train with independent wheel torque control is functionally similar to the standard hydro-mechanical drive train presented in Figure 1, yet the power split is recombined in planetary differentials for each wheel. Figure 2 shows the concept for independently controlling the torque at both rear wheels. The output of the mechanical transmission enters a right-angle gear set which contains two directly coupled outputs. These outputs enter planetary differentials which combine the mechanical branch with one of two hydraulic branches. While Figure 2 is a representation of a two-wheel-drive implementation for clarity, this drive train can also be implemented for all wheel- drive by adding the front drive shaft, right-angle gear set, and differentials with pump/motors for each front wheel.

4.ADWANTAGES OF HHT

- Idle losses of the engine are avoided
- Losses of the hydrodynamic torque converter are avoided
- The engine is always operated around the sweet point
- Throttle losses in the control of hydraulic cylinders are minimized
- Energy recuperation can be maximized

- Auxiliaries like steering systems and cooling fans can be decoupled from the engine and optimized from an efficiency point of view.

- 40% or more reduction in carbon dioxide, the primary greenhouse gas

It will depend on the kind of application how much all of these factors will contribute to an improvement of the fuel economy. Eriksson has calculated that a load sensing control of a double acting hydraulic cylinder has an efficiency of around 37%. By means of a hydraulic transformer, most of these losses could be avoided. As for the drive train, the total efficiency of a pump, a transformer and the hydraulic in-wheel motors will not be higher than the current mechanical drive train, but it will certainly improve the average cycle efficiency of the engine. The effects on the fuel consumption will be similar to the full hydrostatic drive train, which is developed for a truck application.

5.ENERGY MANAGEMENT

A hybrid vehicle requires careful management of the kinetic and stored energy to minimize fuel consumption. The role of the energy storage device is to capture and release the kinetic energy of the vehicle, while the role of the engine is to provide the power to overcome the parasitic losses such as aerodynamic drag and rolling resistance. Furthering this concept reveals that the total energy of the vehicle, defined as the sum of the energy stored in the accumulator, the kinetic energy, and the gravitational potential energy, should remain approximately constant in an ideal hybrid operation.[5]

Due to the energy storage and high power density of hydraulics, the engine operation is drastically different than a conventional drive train. The engine is not required to produce large amounts of power for rapid vehicle acceleration. Instead, the engine is sized to overcome the average parasitic losses and system inefficiencies at the maximum cruising velocity as well as the ability to climb a grade at a desired velocity. This means that the engine can be dramatically downsized from a conventional drive train without a negative impact on performance.

As previously discussed, to maximize the efficiency, the engine is only operated at or near the minimum brake specific fuel consumption. Operating at a fixed angular velocity and torque not only creates the most efficient conversion of fuel to shaft work, but also allows for other engine optimization options. Current automobile engines are required to operate across a wide range of speed and torque conditions and are not optimized for a specific operating condition. By designing an engine for a specific operating condition, the emissions, economy, vibrations, and acoustics can be optimized.

Because the engine is only operated at one torque and angular velocity condition, it must be cycled on and off according to the charge state of the accumulator. When the accumulator charge drops below a specified level, the engine is turned on. The engine continues to run, propelling the vehicle and/or storing energy in the accumulator, until the accumulator charge exceeds a specified high level, at which point the engine is turned off. The vehicle is then propelled solely by the accumulator until the charge drops below the low charge level, causing the engine to restart.

Using this control strategy, the engine is started and stopped quite often. A sensible method of restarting the engine is using the hydraulic system. By always keeping an adequate level of charge in the accumulator when the engine is off, the engine can always be started with the hydraulic unit coupled to the engine, eliminating the need for a conventional electric starter. An exception to this engine on-off operation is avoiding modes of power recirculation in the hydro-mechanical drive train. This will be further discussed in the hydro mechanical sub-section. [5]

6.FUTURE SCOPE

This project will never truly be finished. There are always opportunities to make it better, make it more efficient, and make it cheaper. This semester most of the research and brute force work was done in order to get actual test results and data that can be used to further develop the design. The bulk of this semester was spent learning the concept of the hydraulic hybrid and how to control it. It was a huge undertaking to get a test skid and a vehicle up and running on one semester however those goals will be complete by the end of the semester.

There is a bright future for this project. As stated before, the goal of this semester was just to get everything running. Now begins the challenge of collecting data and designing a system that will perform most efficiently. One area that will see the largest improvement over the next year is the automation of the control system. Currently the controls are all set by a user at a computer. In the next semester, the main goal is to have all settings automatically set by the controller, and the only input from the driver will be pressing the gas pedal. Having this system completely automated will allow for a more accurate picture of how the vehicle is operating. After we collect a lot of data, we will be able to determine what displacements will allow for improved operation, better fuel efficiency, and reduced emissions.

As fuel prices increase as well as pollution, this project has the ability to provide solutions to both of those issues. Working on this

project was as educational about project management as it was engineering. There was so much to be learned about managing so many people on such a large scale project. When mistakes were made, deadlines were missed and everyone suffered. It was very neat to see how operating as a team can accomplish so much and if not organized correctly, can be more inefficient than a smaller team.[4]

As discussed above, the efficiency of the hydraulic pump/motors has much room for improvement, especially when operating at low displacements. These improvements could come from optimizing existing designs, including the friction surfaces, or with new designs specifically aimed at high efficiency across a wide operating range. Another approach to improving efficiency is to implement digital valves to create virtually variable pump/motors from fixed displacement units. One area where digital valves would be especially beneficial is in operating a hydraulic unit in both directions and as a pump and a motor. With a typical hydraulic unit, this requires compromises in the valve plate design, which could be eliminated with digitalvalves.

The novel innovation presented in this paper that enables independent wheel torque control needs to be exploited for advances in the control of vehicle dynamics. While a good deal of research has previously explored these types of vehicle dynamic controls, they have primarily relied on applying braking systems to certain wheels, which is inherently inefficient. Furthermore, the high torque capability of hydraulics allows a much greater torque differential between wheels, even allowing anti-lock braking without friction brakes. This drive train architecture has the potential to spawn completely new vehicle dynamic control options. [4]

7.CONCLUSION

The novel innovation presented in this paper that enables independent wheel torque control needs to be exploited for advances in the control of vehicle dynamics. While a good deal of research has previously explored these types of vehicle dynamic controls, they have primarily relied on applying braking systems to certain wheels, which is inherently inefficient.

Furthermore, the high torque capability of hydraulics allows a much greater torque differential between wheels, even allowing anti-lock braking without friction brakes. This drive train architecture has the potential to spawn completely new vehicle dynamic control options.

In summary, the hydro-mechanical drive train with independent wheel torque control has the potential for excellent fuel economy in a passenger vehicle operated in an urban environment. The drive train combines a highly efficient power transmission through the mechanical branch and infinite speed variation through the hydraulic branch. Through modeling it was demonstrated that the pump/motor units typically operate at low displacements, creating poor efficiency in the current generation of pump/motors. This reveals a significant research and development project to develop units that operate efficiently in this regime. Through continued development and optimization, this drive train offers an attractive alternative to curb increasing energy consumption.

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Efficient reversible multiplier using column bypass technique for dsp applications

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Abstract—Power dissipation is one of the important criteria in VLSI system. Reversible logic computation is one of the efficient ways to minimize power which has the property of logical and physical reversibility. This paper presents an efficient 4x4 reversible multiplier using column bypass technique through which the switching activity is reduced. Since the design focus is to implement a reversible multiplier, proper selection of gate is also necessary. It must have not only reversible property, but also be fault tolerant. However, the major constraints in reversible logic are to minimize the number of garbage outputs & reduce the delay. Hence by this technique, power dissipation is controlled with reduced number of garbage values.

Keywords: Reversible logic, Constant input, Garbage output, Reversible multiplier, partial product, multipliers, XILINX.

I. INTRODUCTION

In the nano-scale design of today's circuits, the power consumption which leads to heat dissipation in computer machinery has become one of the major challenges and attracts the attention of many researchers. Power dissipation is an important factor in VLSI design as modern logic circuits offer a great deal of computing power in a small footprint. The logic elements are normally irreversible in nature and according to Landauer's principle [1] irreversible logic computation results in energy dissipation due to power loss. This is because; erasure of each bit of information dissipates at least KTln2 Joules of energy where K is Boltzmann's constant and T is the absolute temperature at which the operation is performed. Also, as Moore predicted that the number of transistors approximately doubles in every eighteen months and if this trend continues to hold, in the near future more and more energy will be lost due to the loss of information.

This particular problem of VLSI designing was realized by Feynman and Bennet in 1970s. Charles Bennett [2] showed that energy loss could be avoided or even eliminated if the computations are carried out in reversible logic and also proved that circuit built from reversible gates have zero power dissipation.

Reversible computation has emerged as a promising technology having applications in low power CMOS, nanotechnology, optical computing, optical information processing, DNA computing, bioinformatics, digital signal processing and quantum computing. It is very clear that reversible circuits will play dominant role in future technologies.

A reversible logic gate is an n-input n-output logic device with one-to-one mapping. This helps to determine the outputs from the inputs and also the inputs can be uniquely recovered from the outputs. Also in the synthesis of reversible circuits direct fan-out is not allowed as one–to-many concept is not reversible. However fan out in reversible circuits is achieved using additional gates. A reversible circuit should be designed using minimum number of reversible logic gates. From the point of view of reversible circuit design, there are many parameters for determining the complexity and performance of circuits.

- The number of Reversible gates (N): The number of reversible gates used in circuit.
- The number of constant inputs (CI): This refers to the number of inputs that are to be maintained constant at either 0 or 1 in order to synthesize the given logical function.
- The number of garbage outputs (GO): This refers to the number of unused outputs present in a reversible logic circuit. One cannot avoid the garbage outputs as these are very essential to achieve reversibility.
- Quantum cost (QC): Refers to the cost of the circuit in terms of primitive gates. It is calculated knowing the number of primitive reversible logic gates (1 x 1 or 2 x 2) required to realize it.

Multipliers are an integral part of many computational units. It is important for every processor to have a high speed multiplier. Multiplication is an essential arithmetic operation for common DSP applications such as Filtering, computation of FFTs etc. High end DSP processors also need to cater to the execution speed, accuracy of the results and also keep an eye on the power consumption. To achieve this, parallel array multipliers are used, where there is a need to check power efficiency.

A. Contribution

In this paper, we have proposed a reversible 4x4 column bypass multiplier circuit using Taffoli gate (TG) and Peres gate (PG) for partial product generation. We have also used two new gates, Mux Full Adder gate (MFA) and Mux Half Adder gate (MHA) along with Haghparast-Navi gate (HNG) and Peres gate (PG) for the summation circuit. The proposed multiplier circuit is efficient compared to the existing designs in terms of gate counts, garbage outputs, constant inputs and quantum cost, and this design can be generalized to construct reversible n x n multiplier.

B. Organization

The paper is organized into the following sections. Section 2 is an overview of basic reversible gates. The background work is described in section 3. Section 4 is about the new reversible gates. The proposed multiplier design is described in section 5. Results and discussion of the proposed design is presented in section 6. Conclusions are contained in section 7, and a comprehensive list of references has also been provided.

II. REVERSIBLE GATES

A. Basic reversible gates

1) Feynman Gate*:* Fig.1 shows a 2x2 Feynman gate [3]. The input vector is I (A, B) and the output vector is O (P, Q). The outputs are defined by P=A, Q=A⊕B. Quantum cost of a Feynman gate is 1.

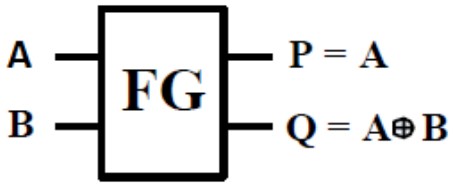

Fig. 1 Feynman gate

2)Toffoli Gate: Fig 2 shows a 3x3 Toffoli gate [4] the input vector is I (A, B, C) and the output vector is O (P,Q,R). The outputs are defined by P=A, Q=B, R=AB⊕C. Quantum cost of a Toffoli gate is 5.

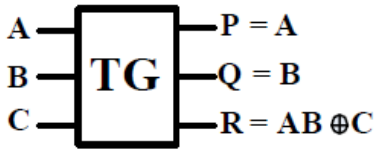

Fig. 2 Toffoli gate

3)Fredkin Gate: Fig 3 shows a 3x3 Fredkin gate [5]. The input vector is I (A, B, C) and the output vector is O (P, Q, R). The output is defined by P=A, Q=A′B⊕AC and R=A′C⊕AB. Quantum cost of a Fredkin gate is 5.

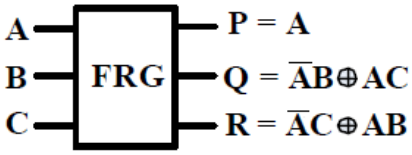

Fig. 3 Fredkin gate

4) Peres Gate*:* Fig 4 shows a 3x3 Peres gate [6]. The input vector is I (A, B, C) and the output vector is O (P, Q, R). The output is defined by P=A, Q=A⊕B and R=AB⊕C. Quantum cost of a Peres gate is 4. In the proposed design Peres gate is used because of its lowest quantum cost.

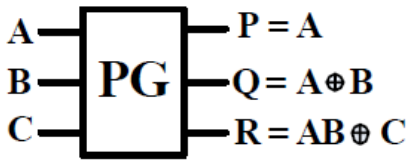

Fig. 4 Peres gate

5) Haghparast Navi Gate(HNG)*:*Fig.5 shows HNG gate [7].The input vector is I(A,B,C,D) and the output vector is O(P,Q,R,S). The outputs are defined by the following equations: P=A, Q=B, R=A⊕B⊕C and S= (A⊕B)C⊕AB⊕D. When D=0 HNG gate can be used as FA.

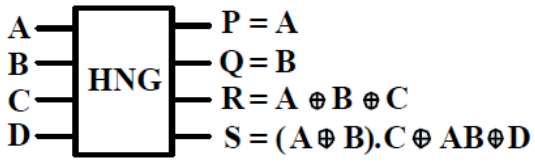

Fig. 5 HNG gate

B. Reversible multiplexer

1) PV Gate*:* Fig 6.shows a 3X3 PV gates which is a reversible multiplexer. The input vector is I(S, A, B) and output vector is O (P, Q, R). The outputs are defined by P=S, Q=S'A+SB, R=SA+S'B. S can be used as select line.

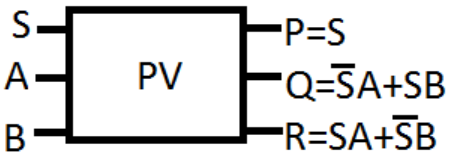

Fig. 6 PV gate

III. RELATED WORKS

In the recent years many reversible circuits as a replacement for conventional irreversible circuits have been proposed. On the other hand, because of the extensive use of multipliers in computer systems, several reversible circuits for implementing multipliers have been proposed [8-11]. For example, in [8], Haghparast et al. have introduced a two-part reversible multiplier circuit. The first part is for partial product generation and the second part takes the result from the first part and performs addition for producing the final result. The design uses an array of 16 PG gates for partial product generation and then addition is accomplished using a circuit which consists of PG [7] and HNG [5] gates. Another study in reversible multiplier design has been proposed by Rakshith Saligram and Rakshith T.R [12]. Their paper presents the design of 4x4 reversible multiplier employing column bypass and 2-dimensional row and column bypass techniques. The reversible column bypass multiplier has three computational units namely the product unit, the full adder unit and the column bypass unit. Peres gate (PG) is used to compute the partial products and full adder unit comprises of Double Peres gate (DPG) which is used in the last row of the multiplier as a ripple carry adder. Column bypass unit is a combination of Double Peres gate (DPG) and Fredkin gate (FRG) and is used in the carry save adder stages. Here Fredkin gate (FRG) functions as a multiplexer which chooses the sum term when column bypass control input (CBCI) is 1 and the partial product term if CBCI is 0.
Another study in multiplexer design has been proposed by Praveen.B and Vinay Kumar S.B [13]. A 3x3 reversible PV gate is proposed in order to function as a 2:1 multiplexer. Based on the select input S, the corresponding message bits are passed on to the output Y. Our proposed design is compared with the existing works based on four main parameters: number of garbage outputs, number of constant inputs, number of gates and quantum cost.

IV. PROPOSED REVERSIBLE GATES

A. MHA gate

Fig .7 shows the proposed 4 x 4 reversible MHA gate. The inputs are I(A,B,C,D) and their corresponding outputs are O(P,Q,R,S). If C=0 it works as a half adder. Input D acts as the select line. Carry is generated at P and Sum at S.

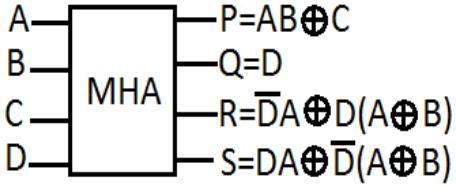

Fig. 7 MHA gate

B. MFA gate

Similarly MFA gate is a 5 x 5 reversible gate which is represented in Fig .8. The inputs are I(A,B,C,D,E) and their corresponding outputs are O(P,Q,R,S,T). If D=0 it works as a full adder. Input E functions as the select line. Carry is generated at P and Sum at R.

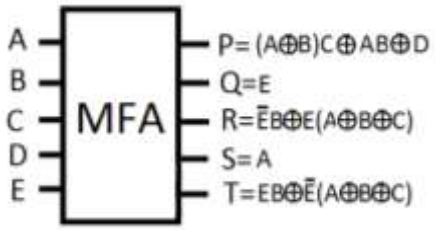

Fig.8 MFA gate

MHA and MFA gates are used in carry save adder stages of the column bypass multiplier. The internal architecture of the proposed gates is as depicted in Fig. 9 and Fig. 10 respectively.

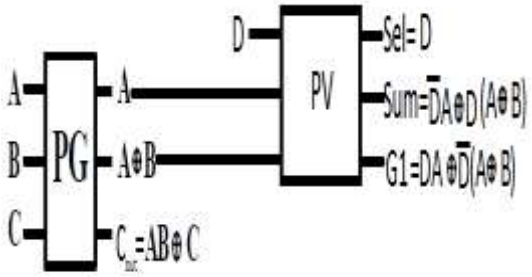

Fig. 9 Internal architecture of MHA gate

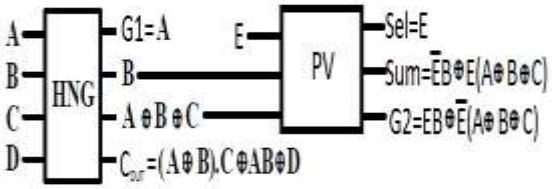

Fig. 10 Internal architecture of MFA gate

The multiplexer is realized using a PV gate which chooses the sum term when the select input is 1 and the partial product if the select input is 0. The carry out is passed unaltered.

V. PROPOSED 4 X 4 MULTIPLIER

Consider two unsigned n-bit numbers where $X=X_{n-1},X_{n-2}\ldots X_0$ is the multiplicand and $Y=Y_{n-1},Y_{n-2},\ldots,Y_0$ is the multiplier.
The product of these two bits can be written as

$$P = \sum_{i=0}^{n-1} X_i \sum_{j=0}^{n-1} Y_j \, 2^{i+j}$$

x_3 x_2 x_1 x_0 y_3 y_2 y_1 y_0

x_3y_0 x_2y_0 x_1y_0 x_0y_0

x_3y_1 x_2y_1 x_1y_1 x_0y_1

x_3y_2 x_2y_2 x_1y_2 x_0y_2

x_3y_3 x_2y_3 x_1y_3 x_0y_3

P_7 P_6 P_5 P_4 P_3 P_2 P_1 P_0

Fig. 11 Partial products in 4 x 4 multiplications

Proposed reversible multiplier circuit is divided into two parts.

A. First part: Partial Product Generation Circuit

The partial product generation circuit is depicted in fig 12.The partial products are generated using a combination of Taffoli gate (TG) and Peres gate (PG). First three rows consist of 12 TG and the last row comprises of 4 PG. Here the propagated multiplicand bits x0 – x2 which are considered to be garbage at the last stage are fed to the select lines of the multiplexers in the first row of the summation circuit. Thus at this stage, 3 garbage outputs are reduced. Therefore this stage produces only 5 garbage outputs.

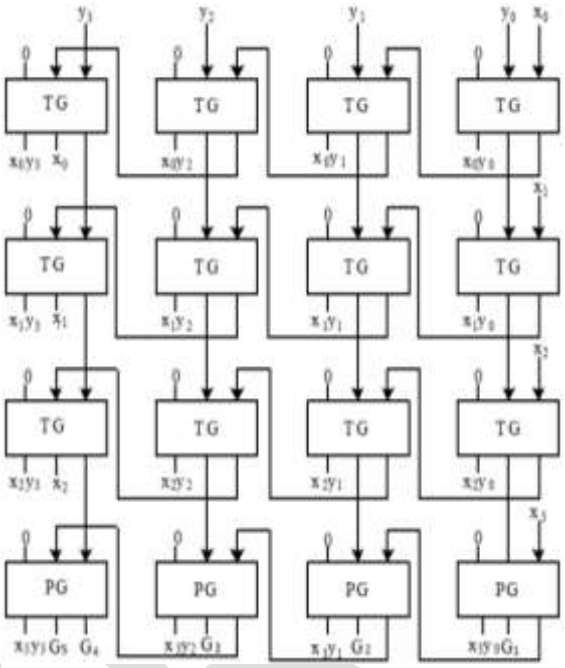

Fig.12 Partial products generation circuit

B. Second part: Summation Circuit

In the proposed summation circuit shown in Fig. 13, the first stage is implemented using MHA gate because the value of the carry inputs are considered to be '0' in the first stage. The carry outputs of each adder circuit are diagonally forwarded to the next stage of adder circuits. Thus MFA gate is used for further stages. This results in carry save technique where the carry bits are not immediately added but saved for the next stage. Also if the bit x_i in the multiplicand is '0', then the corresponding diagonal cells are all '0'. Consequently the appropriate diagonal cells are disabled by the multiplexer and the sum output of the above cell is let to bypass this unimportant diagonal. In the final stage, carries and sums are merged using a ripple carry adder circuit which is formed by a combination of PG and HNG gate.

VI. RESULTS

The reversible column bypass multiplier is synthesized and simulated to test its functionality using XILINX in conjunction with MODELSIM. The simulation results for the 4x4 reversible column bypass multiplier is shown in Fig. 13. Table 1 shows the comparison of column bypass multiplier with the multiplier in [12].It is evident from the table that the proposed reversible column bypass multiplier is better in terms of garbage outputs, constant inputs and total number of gates.

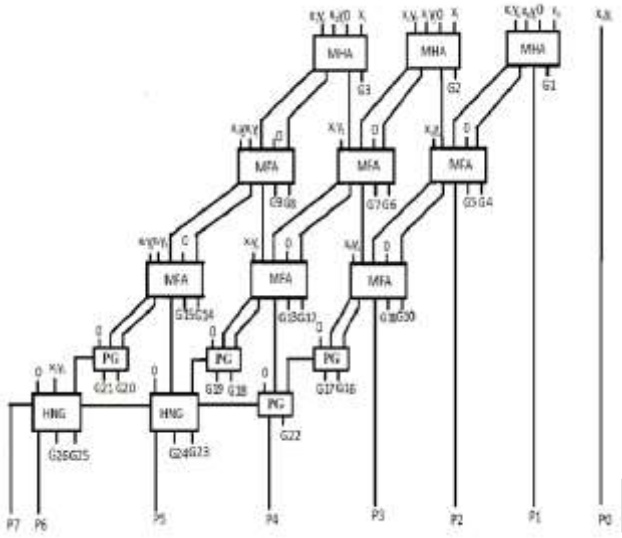

Fig.13 Proposed reversible summation network

TABLE I
COMPARISON OF PERFORMANCE PARAMETERS

Multiplier	No. of gates	Garbage outputs	Constant inputs
Reversible Multiplier[13]	40	80	31
Proposed design	31	31	31

VII. CONCLUSION

This study presents an optimized reversible multiplier circuit using column bypass technique. It eliminates the extra correction circuits needed and has a simpler modified full adder as compared to the row bypass multiplier. This design helps in reducing the switching activity when the binary input has zeros in it. Thus the delay in this multiplier gets reduced. Power reduction is accomplished using reversible logic gates. This paper presents two new gates namely MHA and MFA using which the garbage outputs and constant inputs are greatly reduced.

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Performance of Concrete with Partial Replacement of Cement by Flyash and Natural Sand by Artificial Sand

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ABSTRACT - Cement Concrete occupies the most important role in the field of Civil Engineering. It mainly consists of Cement, Fine Aggregate and Coarse Aggregate. In the Concrete, the Cement acts as a binding material for Fine Aggregate and Coarse Aggregate. Many investigations have been done on Fly Ash and Artificial Sand individually. The utility of Fly Ash as partial replacement in concrete mixes is rise on these days. An attempt have been made to examine the suitability of replacing the 30% of Fly Ash and 50% of Artificial Sand for a concrete of grade M35. Examine strength characteristics such as Compressive Strength of Concrete Mix for 7 days, 28 days, 56 days of Curing Period and Durability Characteristics such as Acid Attack Test, Acid Durability Factor, Acid Attack Factor of Concrete Mix for 30 days, 60 days, 90 days results are analyzed and compared with the Conventional Mix.

KEY WORDS - Concrete, Fly Ash, Artificial Sand, Natural Sand, Coarse Aggregate, H_2SO_4 Solution, Compressive Strength, Acid Attack Test, Acid Durability Factor and Acid Attack Factor.

1. INTRODUCTION - Fly ash is one of the residues generated in coal combustion facilities, and comprises the fine particles that rise with the flue gases. Fly ash is produced by coal-fired electric and steam generating plants. Typically, coal is pulverized and blown with air into the boiler's combustion chamber where it immediately gets ignites, generates heat and produces a molten mineral residue. Boiler tubes extract heat from the boiler, cool the flue gases and cause the molten mineral residue to harden and form ash. Coarse ash particles, called as Bottom Ash or Slag, fall to the bottom of the combustion chamber, and the lighter fine ash particles, termed as Fly Ash, remain suspended in the flue gas. Before exhausting the flue gas, fly ash is removed by particulate emission control devices, such as filter fabric bag houses or electrostatic precipitators.

There are basically two classes of Fly Ash as defined by ASTM C618 as:

1. Class F Fly ash
2. Class C Fly ash

Natural or River sand are weathered and worn out particles of rocks and are of various grades or sizes depending upon the amount of wearing. Now-a-days good sand is not readily available, it is transported from a long distance. Those resources are also exhausting very rapidly. So it is a need of the time to find some substitute to natural river sand. The Artificial Sand produced by proper machines can be a better substitute to River Sand. The sand should be sharp, clean and course. The grains should be of durable material. The sand must be of proper gradation (it should have particles from 150 microns to4.75mm in proper proportion).

2.LITERATURE RIEVIEW –

A.H. L. Swaroop , K. Venkateswara Rao, Prof. P Kodandaramarao (2013) conducted durability studies on concrete with Fly Ash and GGBS with replacing 20% of cement by Fly Ash (FAC1), concrete made by replacing 40% of cement by Fly Ash (FAC2), concrete made by replacing 20% replacement of cement by GGBS (GAC1) and Concrete made by replacing 40% replacement of cement by GGBS (GAC2). The effect of 1% of H2SO4 and Sea Water on these concrete mixes are determined by immersing these cubes for 7days, 28days, 60days in above solutions and the respective changes in both compressive strength and weight reduction had observed and up to a major extent we can conclude concretes made by that Fly Ash and GGBS had good strength and durable properties comparison to conventional aggregate in severe Environment and they recommend that the use of fly ash between 20-40% replacement with cement for better results.

K. Uma Shankar & K. Suganya (2014) conduct Durability Study of structural elements using Fly Ash Aggregates by taking five different cement Fly Ash proportions of R1 (cement 10% and fly ash 90%), R2 (cement 15% and fly ash 85%), R3 (cement 20% and fly ash 80%), R4 (cement 30% and fly ash 70%), R4 (cement 40% and fly ash 60%) and shows that the higher quantity of fly ash in making fly ash aggregate specimens recorded lower weight losses during the Acid Resistance Test.

Nimitha. Vijayaraghavan, Dr. A.S. Wayal (2013) conducted studies on Effect of Manufactured Sand on Durability Properties of Concrete. Three types of replacements were taken i.e., 0%, 50%, 100% of Manufactured Sand by Natural Sand and concluded that The use of manufactured sand in the construction industry helps to prevent unnecessary damages to the environment and provide optimum exploitation of the resources.

Experimental results of M.G. Shaikh et al. suggest that the sharp edges of the particles in artificial sand provide better bond with the cement than the rounded part of the natural sand. Both concrete made using Artificial Sand and Natural Sand are moderate to Chloride Permeability.

3.MATERIALS –

3.1 CEMENT - Ordinary Portland Zurari Cement of 53 grade available in local market of standard brand having Fineness of 6%, Standard consistency of 32%, Specific Gravity of cement 3.1, Initial and Final setting time of 100 min and 170 min respectively was used in the investigation.

3.2 FLYASH – Fly ash having Specific gravity of 2.29 was used.

3.3 FINE AGGREGATE – Fine Aggregate normally consists of Natural, Crushed, or Manufactured Sand. Natural Sand is the usual component for Normal Weight Concrete. The Fine Aggregate having the following physical properties are used.

Property	Natural Sand	Artificial Sand
Specific Gravity	2.55	3.09
Bulk Density (loose) in kg/ m^3	1547	1592.15
BulkDensity (Compacted) in kg/ m^3	1681	1740.29
Fineness	2.46	2.86

3.4 COARSE AGGREGATE - Coarse Aggregate in concrete occupy 35 to 70% of the volume of the concrete. It may be proper to categories the properties into two groups: exterior features (maximum size, particle shape, textures) and interior quality (strength,

density, porosity, hardness, elastic modulus, chemical mineral composition etc.). Coarse Aggregate having properties of Specific Gravity of 2.85, Bulk Density (loose) 1621.77 kg/ m^3,Bulk Density (Compacted) 1774.37 kg/ m^3, Fineness 8.62 were used.

3.5 WATER - Water used for Mixing and Curing shall be clean and free from injurious amounts of Oils, Acids, Alkalis, Salts, Sugar, Organic materials or other substances that may be deleterious to concrete. Generally drinking and potable water is considered satisfactory for mixing concrete.

3.6 CONPLAST SP 430 - Conplast SP430 is based on Sulphonated Napthalene Polymers and supplied as a brown liquid instantly dispersible in water of Specific Gravity of 1.20 was used.

3.7 SULPHURIC ACID - Sulphuric acid is a highly corrosive strong mineral acid with the molecular formula H_2SO_4. It is a pungent-ethereal, colorless to slightly yellow viscous liquid which is soluble in water at all concentrations. Sometimes, it is dyed dark brown during production to alert people to its hazards. The historical name of this acid is Oil Of Vitriol. For preparing dilute sulphuric acid always put concentrated acid slowly into water, never vice versa, in order to avoid overheating of the liquid, as this often causes acid droplets to spew out of the vessel in all directions. Sulphuric acid is a very strong Diprotic Acid that forms two series of salts – Sulphates (e.g. Na_2SO_4, $CaSO_4$) and Hydrogen Sulphates (e.g. $NaHSO_4$).

$$H_2SO_4 \longleftrightarrow H^+ + HSO_4^-$$

$$HSO_4 \longleftrightarrow H^+ + SO_4^-$$

4.EXPERIMENTAL INVESTIGATION-Total number of 36 cubes were casted for this experimental work. 18 cubes are for Normal Mix (or) Conventional Mix and the 18 cubes are for Combined mix i.e., for 30 % replacement of flyash for cement and 50% replacement of artificial sand for natural sand. The specimens are tested by compression testing machine having capacity of 300T after 7, 28, 56 days of curing. Load should be applied gradually at the rate of 140 kg/cm^2 per minute till the Specimens fails. Load at the failure divided by area of specimen gives the compressive strength of concrete.

For acid attack test concrete cube of size 150 mm X 150 mm X 150 mm are prepared for the conventional mix and combined mix. The specimens are cast and cured in mould for 24 hours. After 24 hours, all the specimens are demoulded and kept in curing tank for 28 days. After 28 days all specimens are kept in atmosphere for 1day for constant weight. subsequently, the specimens are weighed and immersed in 5% sulphuric acid (H_2SO_4) solution for 30, 60, 90 days. After completion of age of immersing in acid solution, the specimens are taken out and were washed in running water and kept in atmosphere for 1day for constant weight. Subsequently the specimens are weighed and loss in weight and hence the percentage loss of weight was calculated.

Acid Durability Factor - Are determined directly in terms of relative strengths. The relative strengths are always with respect to the 28 days value (i.e at the start of the test).

Acid Durability Factors (ADF) = Sr (N/M)

where, Sr = relative strength at N days, (%)

N = number of days at which the durability factor is needed.

M = number of days at which the exposure is to be terminated.

Acid Attack Factor - The extent of deterioration at each corner of the struck face and the opposite face is measured in terms of the solid diagonals (in mm) for each of the two cubes. Acid Attack Factors (AAF) per face is calculated as follows.

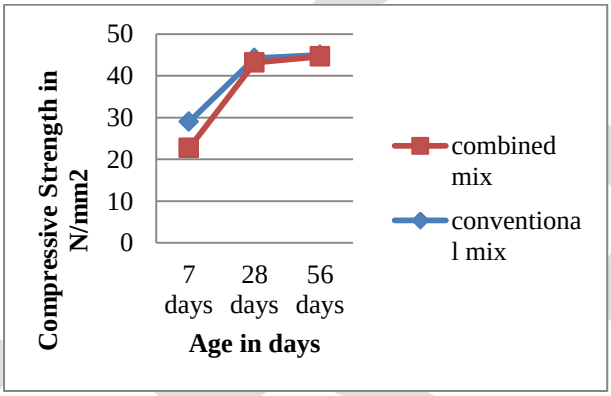
AAF = (Loss in mm on eight corners of each of 2 cubes) / 4

5. RESULTS

5.1 Compressive Strength results

Concrete mixes	7 Days	28 Days	56 Days
Conventional mix	29 N/ mm^2	44.25 N/ mm^2	45.02 N/ mm^2
Combined mix	22.74 N/ mm^2	43.16 N/ mm^2	44.65 N/ mm^2

Compressive Strength results for Conventional and Combined mixes

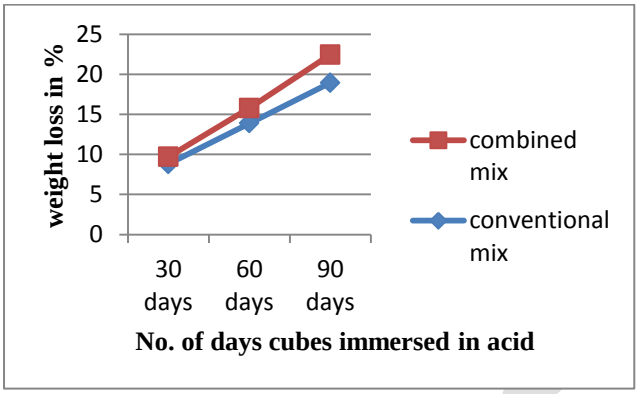


Graph 1 : Variation of Compressive Strength results for Conventional And Combined Mix

5.2 Percentage Weight loss results for conventional and combined mixes

No. of Days	Conventional mix			Combined mix		
	Average weight of cube before immersion in gm	Average weight of cube before immersion in gm	weight loss in %	Average weight of cube after immersion in gm	Average weight of cube after immersion in gm	weight loss in %
30 days	8500	7750	8.8	8550	7720	9.7
60 days	8500	7320	13.89	8550	7200	15.78
90 days	8500	6890	18.94	8550	6630	22.45

% Weight Loss results for both Conventional and Combined mixes

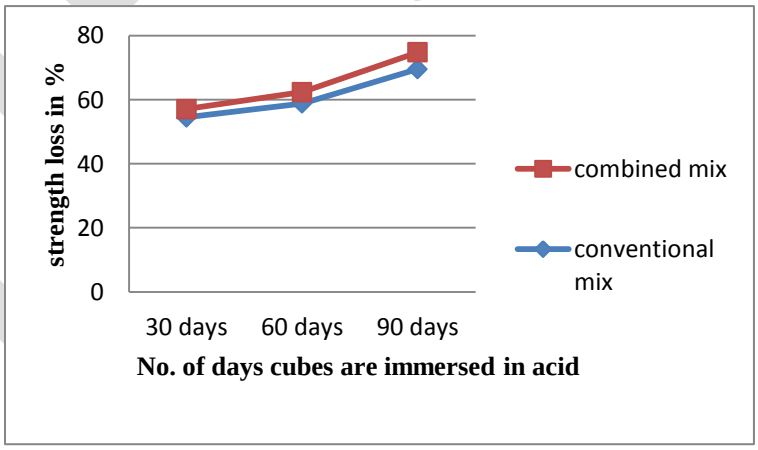


Graph 2 : Variation of Percentage Weight Loss results

5.3 Percentage Strength loss results for conventional and combined mixes

No. of days	Conventional mix			combined mix		
	Average strength of cube before immersion in N/mm^2 w.r.t28 days strength	Average strength of cube after immersion in N/mm^2	strength loss in %	Average strength of cube before immersion in N/mm^2 w.r.t 28 days strength	Average strength of cube after immersion in N/mm^2	strength loss in %
30 days	44.25	20.15	54.46	43.16	18.52	57.08
60 days	44.25	18.22	58.82	43.16	16.26	62.33
90 days	44.25	13.48	69.53	43.16	10.89	74.77

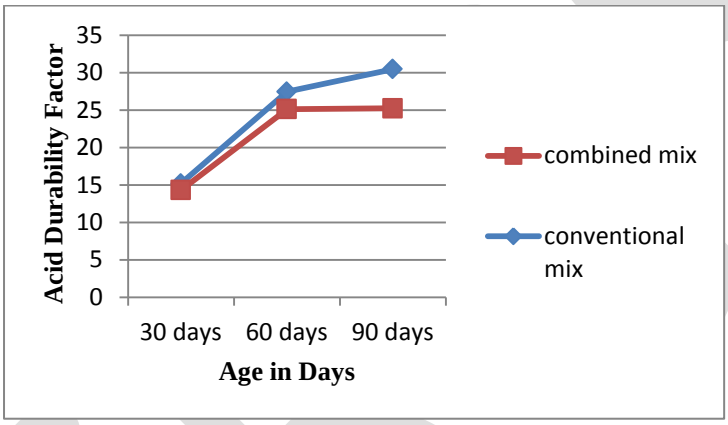
% Strength Loss results for both Conventional and Combined mixes



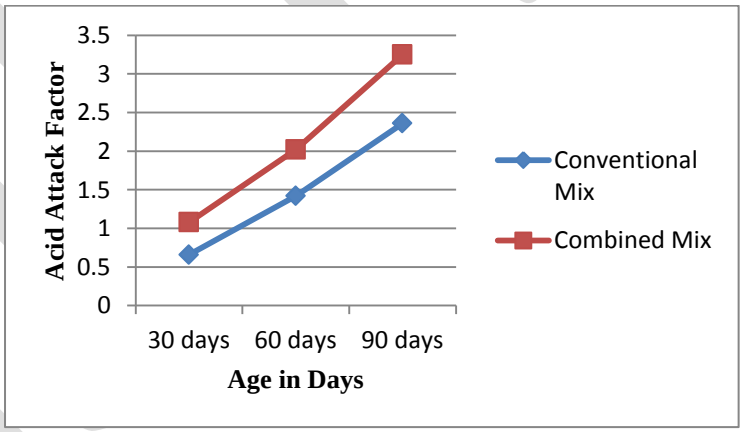
Graph 3 : Variation of percentage Strength Loss results

5.4 Acid Durability Factor and Acid Attack Factor results for conventional and combined mixes

No. of days	Conventional mix					Combined mix				
	Sr	N	M	ADF	AAF	Sr	N	M	ADF	AAF
30 days	45.54	30	90	15.18	0.66	42.92	30	90	14.31	1.08
60 days	41.18	60	90	27.45	1.42	37.67	60	90	25.11	2.02
90 days	30.47	90	90	30.47	2.36	25.23	90	90	25.23	3.25



Graph 4 : Variation of Acid Durability Factor results



Graph 5 : Variation of Acid Attack Factor results

CONCLUSIONS

1. It was observed that the strengths for the combined mix increases gradually as the time of curing period increases.
2. The percentage weight loss gradually increases as the number of days immersion of cubes in acid increases. The percentage weight loss for combined mix is more as compared to the conventional mix. The percentage weight loss for combined mix increases by 0.9% ,1.89%, 3.51% at the ages of 30, 60, 90 days respectively.

3. The percentage strength loss gradually increases as the number of days immersion of cubes in acid increases. The percentage strength loss for combined mix is more as compared to the conventional mix. The percentage strength loss for combined mix is 2.62%, 3.51%, 5.24% more as compared to the conventional mix at the ages of 30, 60, 90 days.
4. The Acid Durability Factor for combined mix is less as compared to the conventional mix. The acid durability factor for combined mix reduces at the percentages of 0.87, 2.34, and 5.24 for 30, 60, 90 days.
5. The Acid Attack Factor for Combined Mix is more as compared to the Conventional Mix. The Acid Attack Factor for Combined Mix raises at the percentages of 0.42, 0.6 and 0.89 for 30, 60, 90 days respectively.
6. The results obtained for combined mix are almost equal to that of the conventional mix, therefore it is recommended that both Fly Ash and Artificial Sand are replaced combined.

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A Real Time Driver Fatigue System Based On Eye Gaze Detection

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Abstract— Now a days, Many accident occur due to Driver Fatigue and Distraction. The main problem due to which accident occur is drivers drowsiness. The main approach for driver fatigue or accident prevention is driver face monitoring. It first capture images from driver face and also it extract parameter of fatigue and distract from eye. This parameter are percentage of PERCLOS, eyelid distance, eye blink rate, blink speed, gaze direction. Base on this parameter the system estimate drivers alertness and rings the alarm if needed. It mainly focus on the Eye Gaze technique. This method is not only responsive to road enviornment and driver's action but also it is designed to correlate the drivers Blink behaviour base upon the driver's drowsiness. The driver fatigue system monitors the driver and accordingly detect and act on drivers inattentiveness. The system also detects if the eye is not found and will work accordingly. Hence all techniques tries to minimize the number of accident cause by drivers fatigues.

Keywords— Driver Fatigue, Distraction, Drowsiness Detection, Driver Face Monitoring ,PERCLOS, gaze direction, Eye Gaze Technique.

INTRODUCTION

The daily occurrence of traffic accidents has become a horrific price of modern life. Complacency about the dangers of driving contribute to the death of more than one million people worldwide in traffic accidents each year[1]. Fifty million more are seriously injured. In the organization for economic co-operation and development (OECD) member countries, road accidents are the primary cause of death for males under the age of 25 [2]. Driving and being drowsy is sometimes compared with driving under the influence of alcohol or drugs, because sleepiness slows down reaction time, decreases awareness and impairs judgment [3].

Driver fatigue is a significant factor in a large number of vehicle accidents. Recent statistics estimate that annually 1,200 deaths and 76,000 injuries can be attributed to fatigue related crashes. There is no doubt that driver error is at the heart of road fatalities[4]. In their landmark study used 100 vehicles equipped with video and sensor logging equipment to study how people drive and why they crash. They found that 81% of accidents and 76% of near accidents they witnessed involved momentary inattention (within 3 seconds) before the incident.

Fatigue occurs in three different types: sensory fatigue, muscle fatigue and cognitive fatigue. Sensory fatigue and muscular fatigue are only measurable and there is not any way to measure cognitive fatigue [5,6]. The development of technologies for detecting or preventing drowsiness at the wheel is a major challenge in the field of accident avoidance systems. Because of the hazard that drowsiness presents on the road, methods need to be developed for counteracting its affects. The focus will be placed on designing a system that will accurately monitor the open or closed state of the driver's eyes in real-time. By monitoring the eyes, it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. Detection of fatigue involves a sequence of images of a face, and the observation of eye movements and blink patterns.

Monotony of a certain task can reduce the concentration of person and may cause distraction. Monotony is caused by three main reasons: (1) lack of personal interest, (2) doing a repetitive task for long time and (3) external factors (like talking with mobile phone). Monotony in driving usually is caused by the second and third reasons. Prolonged driving on highways with flowing traffic has a negative effect on driver concentration. In this case, driver is not fatigued, but due to the monotony of driving, his/her concentration will gradually be decreased and the driver will not have a careful control on the vehicle. Driver distraction can also is caused by talking to people or mobile phone and listening to music [5,6]. Driver distraction can be estimated by head and gaze direction determination. The main problem for distraction detection is that if head is forward and eyes look toward the road, the driver does not necessarily pay attention to the road. In other words, looking toward the road is not paying attention to it [6].

Table 1. Comparison between the Main Approaches for Driver Drowsiness Detection

	Physiological approach	Driving Behaviour approach	Visual Feature approach
Fatigue Detection	Yes	Yes	Yes
Distraction Detection	No	Yes	Yes
Accuracy	Very Good	Good	Moderate
Simplicity	Difficult	Relatively Easy	Easy
Detection Speed	Very Fast	Slow	Fast

METHODS BASED ON DRIVER DROWSINESS

Many efforts have been made recently to develop on-board detection of driver drowsiness. A number of approaches have been investigated and applied to characterize driver drowsiness using physiological measures, ocular measures, and performance measures.The detection of driver inattention the methods used for drowsiness detection can be divided into three categories: based on driving behaviour , based on physiological features, and based on visual features.

I.DRIVING BEHAVIOUR APPROACH

Driver operation and vehicle behavior can be implemented by monitoring the steering wheel movement, accelerator or brake patterns, vehicle speed, lateral acceleration, and lateral displacement. These too are non-intrusive ways of detecting drowsiness, but are limited to vehicle type and driver conditions. The problem with this technique is that it will eventually become tiresome and annoying to the driver ,and measuring equipment that must be attached to driver's body. Body movements are measured directly, by a device called Actigraph or recorded by a camera. The Actigraph detects activity by sensing motions via an internal accelerometer (Actigraph). The subject can for example wear a wristwatch device that detects wrist movements. Several studies have found significant relationship between EEG levels and the presence of sleep that has been indicated by actigraph measures [7]. According to a study at the technical university in Prague regarding the typical course of events, driving is characterized by alertness and frequent looks in the mirrors at the beginning of the drive. This alertness is soon replaced with repetitiveness and decreased activity appears after 30-60 minutes. At this stage the driver moves his eyes rather than turning his head when looking in the mirrors. When starting to feel tired the driver stretches his body and increasing feelings of drowsiness makes him yawn and he starts bending his head to the left or to the right. Deep breaths now and then are regarded as a sign of increasing drowsiness[8].Different behavioural indicators are put into four categories representing different levels of drowsiness[9]. For example yawning is placed in the least severe group while having the eye lids closed for longer than 2.5 seconds is in the most severe group.

II.PHYSIOLOGICAL APPROACH

The other method is physiological features that measures drowsiness by measuring heart rate and brain activity.EEG has been shown a good measure of drowsiness [10]. By fixing electrodes to the scalp, alpha, beta and theta brain waves can be examined and the brain status from fully alert to falling asleep can be recognized. But EEG is unpractical to measure in the car and therefore most useful as a reference, when calibrating other measures[7]. Among these methods, the techniques that are best, based on accuracy are the ones based on human physiological phenomena. This technique is implemented in two ways: measuring changes in physiological signals, such as brain waves, heart rate, and eye blinking; and measuring physical changes such as sagging posture, leaning of the driver's head and the open/closed states of the eyes. EEG could be used to detect deficiencies in information processing, which can occur even though the eyes are wide open, and the slow eye closures would detect insufficient perceptual capabilities. The problems with both EOG and EEG are the requirement of obtrusive electrodes which make them unsuitable to use in cars, as cabling of the drivers would not achieve any acceptance. Hence, they are not feasible to be used in a real-time drowsiness detection system.

III.VISUAL FEATURE APPROACH

And the last method is visual features that uses information obtain from a camera for detecting drowsiness. The visual features methods are used by eye state information, head movement, facial expression .The methods used for eye state to measure driver drowsiness have done by calculating values like eye closure duration(ECD),frequency of eye closure(FEC) . Parameters used to describe the blink behaviour, extractable from the EOG signal, are for example blink frequency [blinks/minute], amplitude or eyelid

opening level [mV] and duration [ms]. According to [11], a relaxed person blinks about 15-20 times per minute, although only 2-4 are needed from a physiological viewpoint. When performing cognitive tasks the blink frequency drops to as little as 3 blinks per minute, whereas an increase in blink frequency indicates reduced vigilance [12]. Visual information is of vital importance when driving [13]. This indicates that measurements of eye closure (i.e. eye lid is closed longer than one second), eye movements and ocular physiology are appropriate methods of detecting driver drowsiness[14]. This can be measured with EOG.

DRIVER FATIGUE SYSTEM

There is still no precise definition for fatigue. Certainly, due to the lack of precise definition of fatigue, there is not any measurable criterion to measure it [6].so processing of eye region and investigation of closed eyelids is the most important criterion used to estimate fatigue. The driver face monitoring system is a real-time system that investigates driver physical and mental condition based on processing of driver face images. Driver status can be detected from eyelids closure, blinking, gaze direction, yawning and head movement. This system will alarm in hypo-vigilance states such as drowsiness, fatigue and distraction.

Driver fatigue and distraction is detected by processing of face, head, eye region. There are many researches based on this approach. The main reason of this large amount of researches is that main symptoms of fatigue and distraction appear in driver eyes. Moreover, processing of eye region instead of total face region has less computational complexity.

Major parts of driver fatigue system are:
I. Imaging
II. Intelligent Software

I. IMAGING

The part for imaging includes lighting and camera and may include imaging controller if necessary. Since driver face monitoring system should work in all light conditions, lighting and camera selection is one of the most important stage of system design. Lighting devices not only should provide enough light in environment, but also should not hurt driver eyes. Thus, near infrared (IR) spectrum is usually used in lighting. Camera should be chosen based on the lighting spectrum as well. Visible spectrum is also used in the driver face monitoring systems, but face lighting in night is troubling for driver vision system. Thus, it seems that visible spectrum is not very useful in real conditions. Another approach for imaging is pulsed lighting/imaging. In pulsed imaging, a controller is used to synchronize lighting and imaging. In this case, the controller adjusts light source(s) turning on/off and camera aperture opening. The pulsed imaging approach usually used in near IR lighting spectrum.

II. INTELLIGENT SOFTWARE

Intelligent software is the most important part of driver face monitoring system and is divided into two main parts: image processing algorithms and decision-making algorithms. The main goals of image processing algorithms include Preprocessing, detection and tracking of face, eyes and other facial components, and extraction of appropriate symptom from facial images. Indeed, image processing algorithm is the main part of driver face monitoring system. These algorithms usually require large amounts of memory and impose a high computational load on the processor and hardware. To design an accurate and real-time system, we should focus on these algorithms. After extraction of appropriate symptom from images, decision-making algorithms determine the level of driver alertness based on extracted symptoms. Finally, an appropriate output is generated for the system. Decision-making algorithms should be able to detect driver fatigue and distraction and make an appropriate decision; hence, they are important. The shorter duration that decision-making algorithm can detect driver drowsiness or distraction result in higher performance of the system.
In Driver fatigue System, reducing error of the system in detection of face and its components, reducing error of face tracking and increasing system accuracy in detection of fatigue and distraction are considered as other problems of such systems.

EYE DETECTION

Driver fatigue systems, eye region is always processed for symptom extraction, because the most important symptoms are related to the eyes activity. Therefore, eye detection is required before processing of eye region. Eye detection methods can be divided into three general categories: (1) methods based on imaging in IR spectrum, (2) feature-based methods and (3) other methods.

I. METHODS BASED ON IMAGING IN IR SPECTRUM

One of the quick and relatively accurate methods for eye detection is the methods based on imaging in IR spectrum. In these methods, physiological and optical properties of eye in IR spectrum are used. In [15] a similar method for eye detection, except that after initial

eye detection, used Support Vector Machine (SVM) for increasing accuracy of eye detection. SVM is used to increase the accuracy of eye detection.

Methods based on lighting in IR spectrum are able to detect eyes without face detection, and therefore these methods have less computational complexity than other methods. These methods are more suitable for the systems which can detect the driver fatigue and distraction only based on the processing of eye region. The main disadvantage of this method is that if eyes are closed, system is not able to detect eyes.

II.FEATURE-BASED METHODS

i. Methods based on Binarization

Image Binarization is one of the simplest methods in image segmentation which can be used in eye detection. Usually more complicated processing is needed to detect the proper location of eye, because results of binarization usually have high error rate.In [16], with assumption that eye is the darkest points in face, eye location was determined. For this purpose, after binarization of face image, large contours are detected. The first central moment of two largest contours of face image is determined as eye center.In [17] an eye detection algorithm that detects eye in the HSV color space. This method has a very good accuracy for eye detection in color images, but it fails when illumination of environment is low.

ii. Methods based on Projection

Projection is one of the simplest methods for face detection that can also be used for eye detection. In this method we assume eye is darker than skin surface. Therefore, horizontal projection of face image in eye location has smaller values.projection was used to determine initial location of eye[18]. To increase the accuracy of projection based methods for eye detection, detection is usually performed with one or more prior assumptions. For example, because eye is always in the upper half of face, projection for the bottom half of face is not calculated and beard or mustache will not reduce the accuracy of eye detection.

projection is not efficient for black people or those who have eyeglasses. This method is less sensitive to face color, but it fails for detection of eyes with sunglasses.

iii. Other Methods

There are a few methods for eye detection based on other approaches that have been used in driver face monitoring systems. These methods are usually time-consuming; therefore they are not used in real-time systems. In [18] detected eye region based on a face model. For this purpose, the estimated eyebrow area was separated from face image and was processed with Sobel edge detection operator.

Table 2 - Comparison Parameter of the systems for Eye Detection and Tracking of eye and other components

Eye Detection	Tracking Method	Parameters	Robustness
Imaging in the IR Spectrum	Adaptive filters (Kalman filter)	PERCLOS Eye blink speed Gaze direction Head rotation	Very Good
Imaging in the IR Spectrum	Adaptive filters (Kalman filter)	PERCLOS Eye blink rate Eye saccadic movement Head nodding Head orientation	Very Good
Imaging in the IR Spectrum and verification by SVM	Imaging in the IR Spectrum and verification by SVM	PERCLOS Eye blink speed Gaze direction Eye saccadic movement Yawning Head nodding Head orientation	Very Good
Explicitly by Feature-based (projection)	Search window (based on face template matching)	PERCLOS Distance between eyelids	Good
Feature-based (binarization)	Other methods (combination of hierarchical tracking method)	PERCLOS Eye blink rate Gaze direction Yawning Head orientation	Average

CONCLUSION

The novel dual-eye-tracker image retrieval system presented in this provides an excellent platform for conducting research on gaze-based image retrieval and as well as content-based image retrieval in general.The use of driver eye gaze combined with road events to estimate the to driver's observations was developed and the feasibility of the approach was verified However, it was shown that road events almost certainly missed by the driver could be identified. The systems correlate the driver eye gaze with road scene events to estimate the driver's observations. The benefit of driver observation monitoring was also demonstrated to suppress redundant warnings and cancel warning "with a glance". These systems have the potential to provide the detection or earlier warning of missed road events. The timely knowledge of these missed events would hopefully provide the precious extra seconds for human reaction time.

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Prevention of Attacks In Manet Using Usor Protocol

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Abstract—Privacy protection of mobile ad hoc networks is more demanding than that of wired networks due to the open nature and mobility of wireless media. In wireless networks, providing privacy protection with low power devices and low bandwidth network connection is very challenging task. In this project, solid privacy requirements has been defined regarding privacy-maintain routing in MANET. Then an unobservable secure routing scheme USOR has been proposed to offer complete unlink ability and content un-observability for all types of packets. Privacy-preserving routing is crucial for some Adhoc networks that require stronger privacy protection. A number of schemes have been proposed to protect privacy in Adhoc networks. However, none of these schemes offer complete unlinkability or unobservability property.USOR is efficient as it uses a novel combination of group signature and ID-based encryption for route discovery.USOR has been implemented on ns2, and evaluated its performance by comparing with AODV and MASK. The simulation results show that USOR not only has satisfactory performance compared to AODV, but also achieves stronger privacy protection than existing schemes like MASK.

Keywords-Unobservable Secure On Demand Routing Protocol (USOR), Mining Association with Secrecy Constrains (MASK), Adhoc on Demand Distance Vector Routing Protocol (AODV)

I. INTRODUCTION

Communication is the process by which two or more people exchange ideas, facts, feelings, or impressions in ways that each gains a common understanding of the meaning, intent, and use of messages. Thus, good communication consists of creating understanding of the message. In computerized technology, we need to transfer the data from one another without any problem like security and quality. In wired networks, one has to gain access to wired cables so as to eavesdrop communications. The attacker only needs an appropriate transceiver to receive wireless signal without being detected. In wired networks, devices like desktops are always static and do not move from one place to another. Hence in wired networks there is no need to protect users' mobility behavior or movement pattern, while this sensitive information should be kept private from adversaries in wireless environments.

A. Need of security

Network security consists of the provisions and policies adopted by a network administrator to prevent and monitor unauthorized access, misuse, denial of a computer network and network-accessible resources. Users choose an ID and password or other authenticating information that allows them access to information and programs within their authority [1]. The networks are comprised of "nodes", which are "client" terminals (individual user PCs), and one or more "servers" and/or "host" computers.

They are linked by communication systems, some of which might be private, such as within a company and others which might be open to public access Network security involves all activities that organizations, enterprises, and institutions undertake to protect the value and ongoing usability of assets and the integrity and continuity of operations[2][3]. An effective network security strategy requires identifying threats and then choosing the most effective set of tools to combat them.

II. THREATS TO NETWORK SECURITY

A Network attack or security incident is defined as a threat, intrusion, and denial of service or other attack on a network infrastructure that will analyze your network and gain information to eventually cause your network to crash or to become corrupted. In many cases, the attacker might not only be interested in exploiting software applications, but also try to obtain unauthorized access to network devices. Unmonitored network devices are the main source of information leakage in organizations. In most organizations, every email message, every web page request, every user logon, and every transmittable file is handled by a network device. Under some setups, telephone service and voice messaging are also handled by network devices. If the attacker is able to "own" your network devices, then they "own" your entire network.[2][3] Network attacks cut across all categories of software and platform type. There are at least seven types of network attacks.

- Sniffing
- Hijacking

- Trojans
- DoS

A. Sniffing

Packet sniffing is the interception of data packets traversing a network. A sniffer program works at the Ethernet layer in combination with network interface cards (NIC) to capture all traffic travelling to and from internet host site[1][4]. Further, if any of the Ethernet NIC cards are in promiscuous mode, the sniffer program will pick up all communication packets floating by anywhere near the internet host site. A sniffer placed on any backbone device, inter-network link or network aggregation point will therefore be able to monitor a whole lot of traffic. Most of packet sniffers are passive and they listen all data link layer frames passing by the device's network interface [4][5]. There are dozens of freely available packet sniffer programs on the internet. The more sophisticated ones allow more active intrusion network host interface to detect sniffing.

The key to detecting packet sniffing is to detect network interfaces that are running in promiscuous mode. Sniffing can be detected two ways:

1. Host-based: Software commands exist that can be run on individual host machines to tell if the NIC is running in promiscuous mode.
2. Network-based: Solutions tend to check for the presence of running processes and log files, which sniffer programs consume a lot of. However, sophisticated intruders almost always hide their tracks by disguising the process and cleaning up the log files. The best countermeasure against sniffing is end-to-end or user-to-user encryption.

B.Hijacking

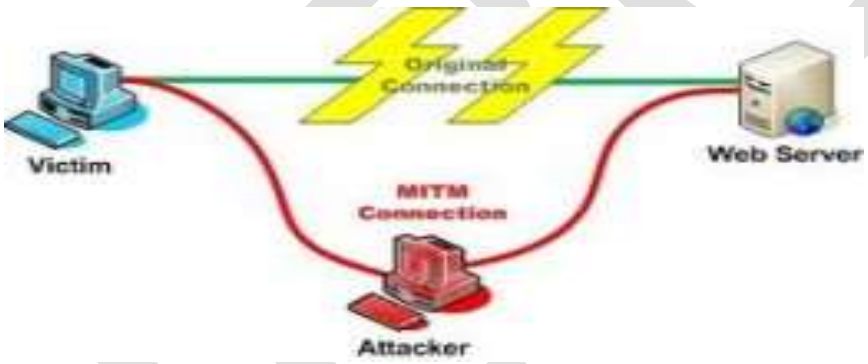

Figure 1. Man-in-the-middle attacks

This is a technique that takes advantage of a weakness in the TCP/IP protocol stack, and the way headers are constructed. Hijacking occurs when someone between you and the person with whom you are communicating is actively monitoring, capturing, and controlling your communication transparently. For example, the attacker can re-route a data exchange.[2][7] When computers are communicating at low levels of the network layer, the computers might not be able to determine with whom they are exchanging data. Man-in-middle attacks as shown in the Figure1 say that someone assuming your identity in order to read your message. The person on the other end might believe it is you, because the attacker might be actively replying as you, to keep the exchange going and gain more information.

C.Trojans

These are programs that look like ordinary software, but actually perform unintended or malicious actions behind the scenes.[3][5] Most remote control spyware programs are of this type. The number of Trojan techniques is only limited by the attacker's imagination. A torjanizes file will look, operate, and appear to be the same size as the compromised system file. The only protection is early use of a cryptographic checksum or binary digital signature procedure.

D.Denial-of-Service attack (DoS)

A denial of service attack is a special kind of Internet attack aimed at large websites. It is a type of attack on a network that is designed to bring the network to its knees by flooding it with useless traffic and as shown in Figure 2. Denial of Service can result when a system, such as a Web server, has been flooded with illegitimate requests, thus making it impossible to respond to real requests or tasks. Yahoo! and e-bay were both victims of such attacks in February 2000. A Dos attack can be perpetrated in a number of ways[5].

Figure 2. DOS attack over

III. ATTACKS IN AD-HOC NETWORKS

Classes of attack might include passive monitoring of communication, active network attack, close –in attack, exploitation by insiders and attacks through the service providers. Information system and networks offer attractive targets and should be resistant to attack from full range of threat agents, from hackers to nation states.A system must be able to limit damage and recover rapidly when attacks occur.There are different types of attacks in AD-HOC networks but the following attacks were only considering

1. Black hole attack
2. Wormhole attack

A. Black hole attack

An attacker can drop received routing messages, instead of relaying them as the protocol requires, in order to reduce the quantity of routing information available to the other nodes. This is called black hole attack and it is a "passive" and a simple way to perform a Denial of Service. [1][7]The attack can be done selectively (drop routing packets for a specified destination, a packet every n packets, a packet every t seconds, or a randomly selected portion of the packets) or in bulk (drop all packets), and may have the effect of making the destination node unreachable or downgrade communications in the network.

A Wireless ad-hoc network is a temporary network set up by wireless mobile computers (or nodes) moving arbitrary in the places that have no network infrastructure. Since the nodes communicate with each other, they cooperate by forwarding data packets to other nodes in the network. One of these attacks is the Black Hole Attack against network integrity absorbing all data packets in the network. Since the data packets do not reach the destination node on account of this attack, data loss will occur. There are lots of detection and defense mechanisms to eliminate the intruder that carry out the black hole attack. Mainly, there are two solutions for this attack. The first is to find more than one route to the destination. The second is to exploit the packet sequence number included in any packet header. Computer simulation shows that compared to the original ad hoc on-demand distance vector (AODV) routing scheme; the second solution can verify 75% to 98% of the route to the destination depending on the pause times at a minimum cost of the delay in the networks.

B.Wormhole attack

The wormhole attack is quite severe, and consists in recording traffic from one region of the network and replaying it in a different region. For launching a wormhole attack, an adversary connects two distant points in the network using a direct low-latency communication link called as the wormhole link. The wormhole link can be established by a variety of means, e.g., by using an Ethernet cable, a long-range wireless transmission, or an optical link. [2][7]The severity of the wormhole attack comes from the fact

that it is difficult to detect, and is effective even in a network where confidentiality, integrity, authentication, and non-repudiation (via encryption, digesting, and digital signature) are preserved.In wormhole attacks, the attackers tunnel the packets between distant locations in the network through an in-band or out-of-band channel. [4][5]The wormhole tunnel gives two distant nodes the illusion that they are close to each other.

IV. SYSTEM ANALYSIS

A. Existing System

A number of secure routing schemes have been brought forward**.** MASK is based on a special type of public key crypto system, the pairing-based cryptosystem, to achieve anonymous communication in MANET.

B.AODV

It is a routing protocol for MANETs and other wireless Adhoc networks. It establishes a route to a destination only on demand. [2][3]The main advantage of this protocol is having routes established on demand and that destination sequence numbers are applied to find the latest route to the destination. The connection setup delay is lower.

One disadvantage of this protocol is that intermediate nodes can lead to inconsistent routes if the source sequence number is very old and the intermediate nodes have a higher but not the latest destination sequence number, thereby having stale entries.

C. MASK

It offers the anonymity of senders, receivers and sender-receiver relationships in addition to node unlocalability and untrackability and end to end flow untraceability. MASK is based on a special type of public key crypto system, the pairing-based cryptosystem, to achieve anonymous communication in MANET. MASK requires a trusted authority to generate sufficient pairs of secret points and corresponding pseudonyms as well as cryptographic parameters. MASK is quite expensive and may be vulnerable to key pair depletion attacks.

D.Proposed System

An efficient privacy maintain routing protocol USOR has been proposed that achieves content unobservability by employing anonymous key establishment based on group signature. The setup of USOR is simple: each node only has to obtain a group signature signing key and an ID-based private key from an offline key server. The unobservable routing scheme USOR aims to offer the following privacy properties.

E.Anonymity

The senders, receivers, and intermediate nodes are not identifiable within the whole network, the largest anonymity set.

F.Unlinkability

The linkage between any two or more IOIs from the senders, the receivers, the intermediate nodes, and the messages is protected from outsiders. Note linkages between any two messages, e.g., whether they are from the same source node, are also protected.

G.Unobservability

Any meaningful packet in the routing scheme is indistinguishable from other packets to an outside attacker. Not only are the content of the packet but also the packet header like packet type protected from eavesdroppers. [6]And any node involved in route discovery or packet forwarding, including the source node, destination node, and any intermediate node, is not aware of the identity of other involved nodes (also including the source node, the destination node, or any other intermediate nodes)[7].

V. SIMULATION RESULT

A. Malicious Mode of Transmission

When the packets were transferring from source node to destination node through the intermediate nodes where malicious node was introduced in the network. This leads to black hole attack and the packets get lost as shown in the Figure 3. The black holes refer to places in the network where the incoming or outgoing packet is silently discarded without informing the source that the data did not reach its intended recipient.

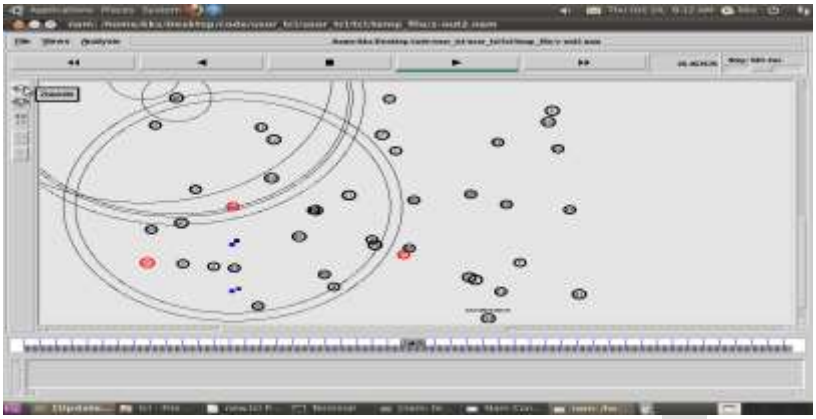

Figure 3.Packet loss in the network

B.USOR Mode of Transmission

Different keys were generated by RSA algorithm for encryption and decryption that are private key, public key and group ID.

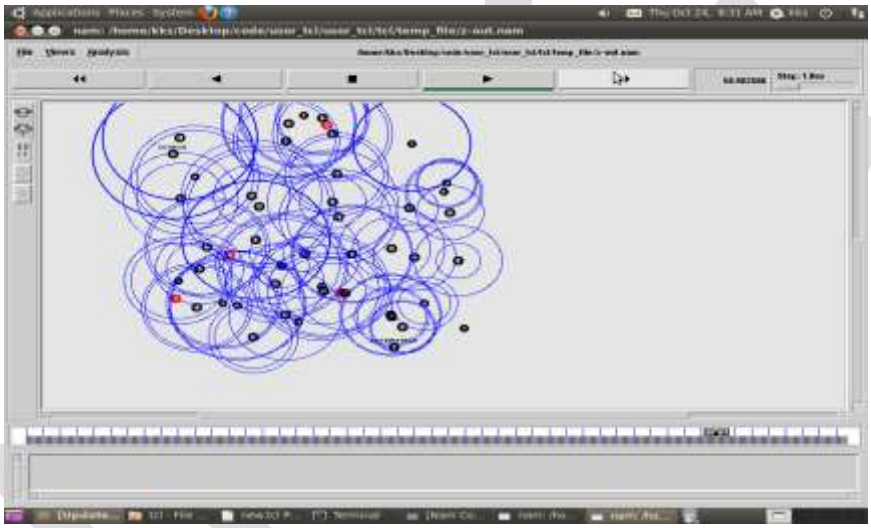

Figure 4. Prevention of attack using USOR.

Initialising the nodes as two types, leader node and normal node. Nodes generate hash code by using sha-1 algorithm and encrypting that code with public key then transmitting it to destination. Destination node can verify that encrypted message by using the private key and as well as group ID.

VI. CONCLUSION

An unobservable routing protocol USOR based on group signature and ID-based cryptosystem for ad hoc networks is proposed. The design of USOR offers strong privacy protection completes unlink ability and content unobservability for ad hoc networks. The security analysis demonstrates that USOR not only provides strong privacy protection, it is also more resistant against attacks due to node compromise. The protocol on ns2 has been implemented and examined performance of USOR, which shows that USOR has satisfactory performance in terms of packet delivery ratio, latency and normalized control bytes.

ACKNOWLEDGMENT

Future work along this direction is to study how to defend against wormhole attacks, which can be prevented with USOR and also how to make the unobservable routing scheme resistant against DoS attacks is a challenging task that demands in-depth

investigation. In black hole attack prevention, RREQ was only encrypted but in future when avoiding wormhole attack both RREQ and RREP were encrypting.

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Modelling of Flow Dynamics of an Incompressible Viscous Fluid in a Channel with Solid Obstruction of Variable Length

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Abstract— Inthis study, the time -independent laminar flow of a viscous, incompressible fluid in two - dimensions was analyzed using Navier –Stokes equations with continuity equation as an incompressibility constraint and vorticity – stream function approach. The fluid was allowed to flow in a rectangular channel obstructed by a solidrectangularplate of variable length with uniform incident velocity. The CFD computer code Flex PDE was used to analyze the flow dynamics. It was observed that by increasing the blockage ratio, the maximum values of the stream function as well as the maximum value of the velocity decreased at the obstruction and the size of vortex increased. It was also observed that with the increase in blockage ratio the region of low pressure increased behind the obstruction.

Keywords— Channel flow, Rectangular obstruction, Two- dimensional flow dynamics,Navier- Stokes equations, Vorticity-Stream function, Flex PDE, Reynolds number.

INTRODUCTION

In the pipes and channels, many a times it has been observed that the fluid flow is constricted by obstructions of different shapes and sizes affecting the fluid flow dynamics. The understanding of the complexities ofthe fluid flows arising out of these constrictions is of importance in computational fluid dynamics. Researchers in this field have introduced different types of mathematical methods and techniques to understand the complexities of the fluid flows under different kinds of obstructions.

Roshko [1] investigated the effects of vortex formations and bluff body similarity using dimensional analysis of a wake model. He gave an empirical relation between the universal Strouhal number and the wake Reynolds number (R_e). Using this relation, drag was calculated from the shedding frequency measurements. In his work, different bluff bodies were correlated in a single relation. Greenspan [2] analyzed the numerical study of steady, viscous, incompressible flow in a channel with a step in two dimensions. He showed the variation of streamlines and equi-vorticity at different Reynolds numbers and concluded that as the Reynolds number is increased,the size ofthe right vortex also increases.Zdravkovich[3]presented a review of flow interference between the two circular cylinders in various arrangements for different separation distances and Reynolds numbers. In side- by- side arrangement to the approaching flow of two circular cylinders interference in drag coefficient was observed for a separation distance smaller than five cylinder diameters. The flow pattern in side- by- side arrangements showed a bi-stable nature. He further observed that for a separation distance greater than two, the process of the vortex formation of both cylinders was exactly the same as that of the single cylinder and when the separation distance becomes smaller, the bulk flow between the two cylinders deflected to one side or the other can equally take place.Valencia[4]performed the experimental investigations on the wake interference of a row of normal flat platesconsisting of two, three and four plates arranged side- by- side in a uniform flow with Reynolds numbers of about 10^4.Braza et al.[5]used a second-order finite volume method and analyzed the dynamic characteristics of the pressure and velocity fields of the unsteady, incompressible and laminar wake behind a circular cylinder. Different vortex and physical aspects of the initiation of vortex shedding as well as the interactions of the velocity and the pressure in the wake, outside the wake and near wake were analyzed in their work.

Gera et al. [6] carried out a numerical simulation for a two-dimensional unsteady laminar flow past a square cylinder for the Reynolds numbers in the range of 50-250 and captured the features of flows past a square cylinder in a domain with the

use of CFD code. The variation of Strouhal number with Reynolds number was found from this analysis and it was found that upto Reynolds number 50, the flow was observed to be steady and between theReynolds numbers 50 to 55, instability occurred and vortex shedding appeared and flow became unsteady. Kumaret al.[7]studied the flow past a rotating circular cylinder experimentally in a water tunnel at Reynolds numbers of 200, 300, and 400 and non-dimensional rotation rates $\propto$ (ratio of surface speed of the cylinder to the free stream velocity) varying from 0 to 5. They presented global view of the wake structure at the three Reynolds numbers and various rotation rates. It was found that for $0 < \alpha < 1{:}95$, regular periodic vortex shedding was observed with vortex shedding suppression occurring at $\alpha = 1{:}95$ for all the Reynolds numbers. The Reynolds number was observed to influence the wake morphology more strongly near the vortex shedding suppression rotation rate.Lam and Leung [8] investigated the vortices behind a long flat plate inclined at a small angle of attack to a main flow stream. In this study, velocity fields were obtained at three angles of attack 20^0, 25^0 and 30^0 and at a Reynolds number Re $\approx$ 5,300.Vikramet al. [9] analyzed the numerical investigation of two-dimensional unsteady flow past two square cylinders with in-line arrangements in a free stream to investigate the influences on the size of the eddy, velocity, frequency of vortex shedding, pressure coefficient and lift coefficient by varying pitch to perimeter ratio of two square cylinders. It was found that the size of the eddy and the monitored velocity in between the square cylinders increased with the increase in the pitch to perimeter ratio.In this investigation, frequency of vortex shedding was found to be same in between the cylinders and in the downstream of the cylinder and the pressure distribution near to the surface of the cylinder wasobserved to be quite low due to the viscous effects. In this analysis, the upstream cylinder was found to experience higher lift compared to the downstream cylinder.

Domaet al. [10] described the motion of thesteady flow of a viscous incompressible fluid passing a rectangular plateand simulated numerically. In this study, the Reynolds number was varied as 0.5, 1, 10, 20, 100, 200 and 300 and the variation of streamlines was studied alongwith the pressure force, velocity magnitude, vorticity magnitude.Gowdaand Tulapurkaraz[11**]** studied the flow through and around a parallel-walled channel with an obstruction (flat plate) placed at the channel inlet. Depending on the position of the obstruction, the flow inside the channel was observed to be in a direction opposite to that of outside, stagnant or in the same direction as outside but with reduced magnitude. The parameters that varied were the gap between the obstruction and the entry to the channel, the length of the channel and the Reynolds number. In this study, the maximum value of the reverse flow velocity was found to be about 20 % of that of the flow outside andthe maximum forward velocity inside the channel (when it occurred) was observed to be only about 65% of the outside velocity even for very large gaps between the obstruction and the channel entrance. Bhattacharyya and Maiti [12] gave information about the uniform flow past a long cylinder of square cross-section placed parallel to a plane wall. In this study, the maximum gap between the plane walls to the cylinder was taken to be 0.25 times the cylinder height and found that the critical value of the gap height for which vortex shedding was suppressed depended on the Reynolds number which was based on the height of the cylinder and the incident stream at the surface of the cylinder.Kabir et al. [13] studied the numerical simulation of the reverse flow phenomena in a channel with obstruction geometry of triangular, circular, semi-circular and flat plate at the entry. In this study, the simulations were performed for different gap to width ratios and for different Reynolds numbers. The simulation results predicted the occurrence of reverse flow and existence of other flow features such as vortex shedding.

In this study, the influence of the different ratios of the length of the rectangular solid obstruction to the channel width termed as the blockage ratio on the velocity and pressure fields and the stream patterns was investigated numerically using the Navier-Stokes equations along with the continuity equation as a compressibility constraint and the stream and vorticity mathematical formulations for the two-dimensional, steady, laminar flow of incompressible and viscous fluid in a rectangular channel.

GOVERNING MATHEMATICAL FORMULATION

The flow dynamicsfor incompressible (divergence-free) Newtonian fluid within the flow domain is described by the Navier-Stokes equations (momentum equations- a set of second-order partial differential equations relating first and second derivatives of fluid velocity) under isothermal and steady state conditions neglecting gravity forcein the Laplace formulation alongwith the continuity equation for the conservation of mass as:

$$(U \cdot \nabla) U + (\nabla p)/\varrho - \nu \nabla^2 U = 0 \qquad (1)$$

$$\nabla \cdot U = 0 \qquad (2)$$

Where the first term in Eq.(1) is the inertia force due to the time-independent convective acceleration associated with the change in velocity vector U (x, y) over position causing non-linearity.∇p is the gradient of pressure force p (x, y), ϱ is the density of the fluid i.e.

water in this analysis, ν is the kinematic viscosity (ratio of the dynamic viscosity μ and the density ϱ) of the fluid under consideration. The divergence of velocity vector $\nabla . U$ representing the continuity equation acts as the incompressibility constraint for the Navier-Stokes equations ensuring the conservation of mass of the fluid under consideration.

In this studyfor the two-dimensional flow under above stated assumptions,the Navier-Stokes equations (Eq.1) and the continuity equation (Eq. 2)in the primitive variable formulation in Cartesian coordinate systemare written as:

$$\left(u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}\right)=\frac{1}{\varrho}\left[-\frac{\partial p}{\partial x}\right]+\nu\left(\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}\right) \quad (3)$$

$$\left(u\frac{\partial v}{\partial x}+v\frac{\partial v}{\partial y}\right)=\frac{1}{\varrho}\left[-\frac{\partial p}{\partial y}\right]+\nu\left(\frac{\partial^2 v}{\partial x^2}+\frac{\partial^2 v}{\partial y^2}\right) \quad (4)$$

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}=0 \quad (5)$$

Where u and v are the components of the velocity vector U in the directions*x*(along the channel)andy (across the channel),respectively. Eq.(1) was converted to non-dimensional form by scaling the terms using characteristic (reference) length (L) and characteristic (reference) velocity (U^*). In this analysis, the characteristic length and the characteristic velocity were taken as the channel width and the mean velocity of the flow, respectively.The dimensionless form of Navier-Stokes equations for the two-dimensional flow in the vector form iswritten as:

$$(\bar{U}.\bar{\nabla})\bar{U}+\bar{\nabla}\bar{p}-\frac{1}{Re}(\bar{\nabla}^2\bar{U}) \quad =0 \quad (6)$$

Where *Re* is the Reynolds Number (ratio of inertial to viscous forces) and the dimensionless variables are as under:

$$\bar{x}=\frac{x}{L} \quad ; \quad \bar{y}=\frac{y}{L} \quad ; \quad \bar{U}=\frac{U}{U^*} \quad ; \quad \bar{p}=\frac{p}{P}$$

$$\frac{\partial}{\partial\bar{X}}=\bar{\nabla}=L\frac{\partial}{\partial X} \quad ;\frac{\partial}{\partial\bar{y}}=\bar{\nabla}=L\frac{\partial}{\partial y}$$

$$\frac{\partial^2}{\partial\bar{x}^2}=\bar{\nabla}^2=L^2\frac{\partial^2}{\partial x^2} \quad ; \quad \frac{\partial^2}{\partial\bar{y}^2}=\bar{\nabla}^2=L^2\frac{\partial^2}{\partial y^2}$$

Here, the two dimensionless groups in the non-dimensional Navier-Stokes equations are as:

$$\frac{P}{\varrho U^{*2}} \text{and} \frac{\mu}{\varrho U^* L}$$

The inverse of the dimensionless group ($\frac{\mu}{\varrho U^* L}$) is the Reynolds number.For two-dimensional fluid flow, Eqs. (3 and 4) in the non-dimensional form are written as:

$$\bar{u}\frac{\partial\bar{u}}{\partial\bar{x}}+\bar{v}\frac{\partial\bar{u}}{\partial\bar{y}}=-\frac{\partial\bar{p}}{\partial\bar{x}}+\frac{1}{Re}\left(\frac{\partial^2\bar{u}}{\partial\bar{x}^2}+\frac{\partial^2\bar{u}}{\partial\bar{y}^2}\right) \quad (7)$$

$$\bar{u}\frac{\partial\bar{v}}{\partial\bar{x}}+\bar{v}\frac{\partial\bar{v}}{\partial\bar{y}}=-\frac{\partial\bar{p}}{\partial\bar{y}}+\frac{1}{Re}\left(\frac{\partial^2\bar{v}}{\partial\bar{x}^2}+\frac{\partial^2\bar{v}}{\partial\bar{y}^2}\right) \quad (8)$$

Where $\bar{u}=\frac{u}{U^*}$; $\bar{v}=\frac{v}{U^*}$

The continuity equation (Eq.5) in the non-dimensional form is written as:

$$\frac{U^*}{L}\left[\frac{\partial\bar{u}}{\partial\bar{x}}+\frac{\partial\bar{v}}{\partial\bar{y}}=0\right] \text{or} \frac{\partial\bar{u}}{\partial\bar{x}}+\frac{\partial\bar{v}}{\partial\bar{y}}=0 \quad (9)$$

The vorticity-stream function formulation was employed in which the derived variables in terms of the vorticity vector ω(curl of theflow velocity vector) is written as:

$$\omega = \nabla \times U \qquad (10)$$

The stream vorticity vector for two-dimensional case is written as:

$$\omega = \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \qquad (11)$$

For developing the streamlines (lines with constant value of stream function) pattern, the stream function was used. The usefulness of the stream function ψ (x, y) lies in the fact that the velocity components in the x and y direction at a given point are given by the partial derivatives of the stream function at that point and also the two-dimensional continuity equation (Eq.5) implies the existence of a function called the stream function ψ(x, y) such that

$$\frac{\partial \psi}{\partial x} = -v \text{and} \frac{\partial \psi}{\partial y} = u \quad (12)$$

By combining the above definitions with Eqs.(7 and 8), the non-pressure vorticity transport equation for steady state condition is obtained as:

$$u\frac{\partial \omega}{\partial x} + v\,\frac{\partial \omega}{\partial y} = \frac{1}{Re}\left(\frac{\partial^2 \omega}{\partial x^2} + \frac{\partial^2 \omega}{\partial y^2}\right) \qquad (13)$$

The incompressibility constraint is satisfied by expressing the velocity vector in terms of stream function as given in Eq. (12). By coupling the Eq. (12) and the scalar vorticity ($\omega = \nabla \times U$. k ; k being the unit vector in z direction) of Eq. (11), the two-dimensional mathematical formulation for the stream function ψ(x, y) in the elliptic form (Poisson equation) is obtained as:

$$\frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} = -\omega \text{or} \nabla^2 \psi = -\omega \qquad (14)$$

The stream function ψ (x, y) was found from the vorticity function (Eq. 14).

PROBLEM DESCRIPTION

In this study, the two-dimensional steadyand laminar flow of an incompressible and viscous fluid under isothermal condition normal to a solid flat rectangular obstruction (plate)of afinite length in a fluid flowing in a pipe of rectangular cross-section (referred as channel) as shown in Fig. A was considered for analyzing the influence of the ratio of the length of the solid rectangular obstruction to the channel width termed as blockage ratio h on the nature of flow dynamics. The numerical simulations were carried out for h = 0.3, 0.5, 0.7 and 0.9 for the Reynolds number (R_e) equal to 100. In the present investigation the problem has been computed by applying boundary conditions as follows.

(a) At inlet – Uniform flow (U = 1.0, V = 0)

(b) At outlet boundary – Atmospheric pressure (P = 0)

(c) On the surface – No slip condition (U=V= 0.0)

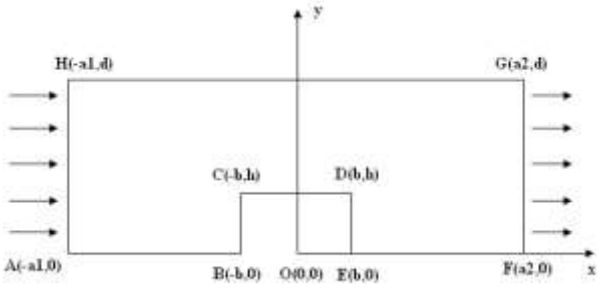

Fig. A

NUMERICAL SIMULATION

For simulating the stream line patterns, velocity and pressure distributions in the flow regime under study were simulated using CFD computer code Flex PDE (A flexible solution system for partial differential equations by PDE solutions Inc., www.pdesolutions.com).This code utilizes the finite element numerical solverperforming the operations necessary to turn a description of a partial differential equations system into a finite element model, solve the system, and present graphical and tabular output of the results.It performs the entire range of functions necessary to solve partial differential equation systems: an editor for preparing scripts, a mesh generator for building finite element meshes, a finite element solver to find solutions, and a graphics system to plot the results.

Flex PDE solves systems of first or second order partial differential equations in one, two or three-dimensional Cartesian geometry, in one-dimensional spherical or cylindrical geometry, or in axi-symmetric two-dimensional geometry. The system may be steady-state or time-dependent.The equations can be linear or nonlinear. (Flex PDE automatically applies a modified Newton-Raphson iteration process in nonlinear systems.)Flex PDE is a fully integrated PDE solver, combining several internal facilities to provide a complete problem solving system with the following facilities.

- A symbolic equation analyzer expands defined parameters and equations, performs spatial differentiation, and symbolically applies integration by parts to reduce second order terms to create symbolic Galerkin equations. It then symbolically differentiates these equations to form the Jacobian coupling matrix.
- A mesh generation facility constructs a triangular or tetrahedral finite element mesh over a two or three-dimensional problem domain. In two- dimensions, an arbitrary domain is filled with an unstructured triangular mesh. In three-dimensional problems, an arbitrary two-dimensional domain is extruded into third dimension and cut by arbitrary dividing surfaces. The resulting three-dimensional Fig. is filled with an unstructured tetrahedral mesh.
- A Finite Element numerical method facility selects an appropriate solution scheme for steady-state, time-dependent or eigen value problems with separate procedures for linear and nonlinear systems. The finite element basis may be linear, quadratic or cubic.
- An adaptive mesh refinement procedure measures the adequacy of the mesh and refines the mesh wherever the error is large. The system iterates the mesh refinement and solution until a user-defined error tolerance is achieved.
- A dynamic time step control procedure measures the curvature of the solution in time and adapts the time integration step to maintain accuracy.

RESULTS AND DISCUSSION

The streamline patterns are shown in Figs. 1, 5, 9 and 13 at blockage ratios of 0.3, 0.5, 0.7 and 0.9, respectively.It was observed that as we go away from the obstruction in the y-direction the values of stream function increased at different blockage ratios. Also the maximum values of stream function were observed to be 0.70, 0.45, 0.17 and 0.16 at blockage ratios of 0.3, 0.5, 0.7 and 0.9, respectively. It is seen from these simulated values of stream function that as the blockage ratio was increased the maximum value of the stream function decreases. Further from these Figs. it was also observed that the size of vortex formed in the right of the obstruction got enlarged as the blockage ratio increased from 0.3 through 0.9.

The velocity distribution for different blockage ratios were shown in Figs. 2, 6,10, and 14 and from these Figs. the maximum values of the velocity in x-direction were observed to be 1.47,1.31,0.79 and 0.78 at the obstruction for these blockage ratios, respectively. Further it was observed that the velocity decreased past the obstruction. These simulated values of maximum velocities revealed that

as the blockage ratio increases from 0.3 to 0.7 the variation in the magnitude of the maximum velocities were higher in comparison to those when the blockage ratio increased from 0.7 to 0.9.

The flow patterns were shown in Figs. 3,7,11 and 15. It was seen from these Figs. that the flow reversed its direction in the right corner of the obstruction. It is seen from these Figs. that the area of the reversed flow region increased with the increase in blockage ratio. This is because the pressure behind the obstruction is low in comparison to the pressure in other region of the flow. It was also observed that as the blockage ratio was increased the magnitude of the flow decreased. The pressure profiles were shown in Fig. 4,8,12 and 16 for different blockage ratios. It is seen from these Figs. that as the blockage ratio increases the pressure at the obstruction decreases while the region of low pressure increased behind the obstruction.

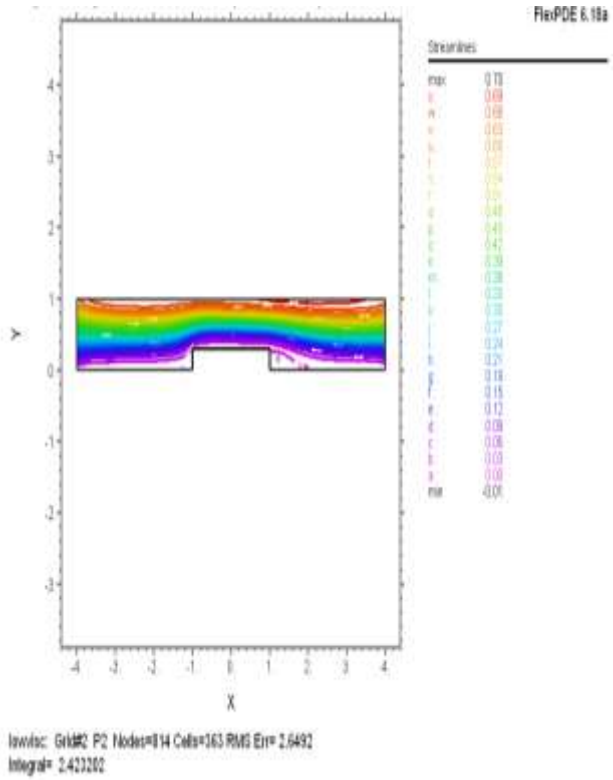

Fig. 1: Streamlines at h = 0.3

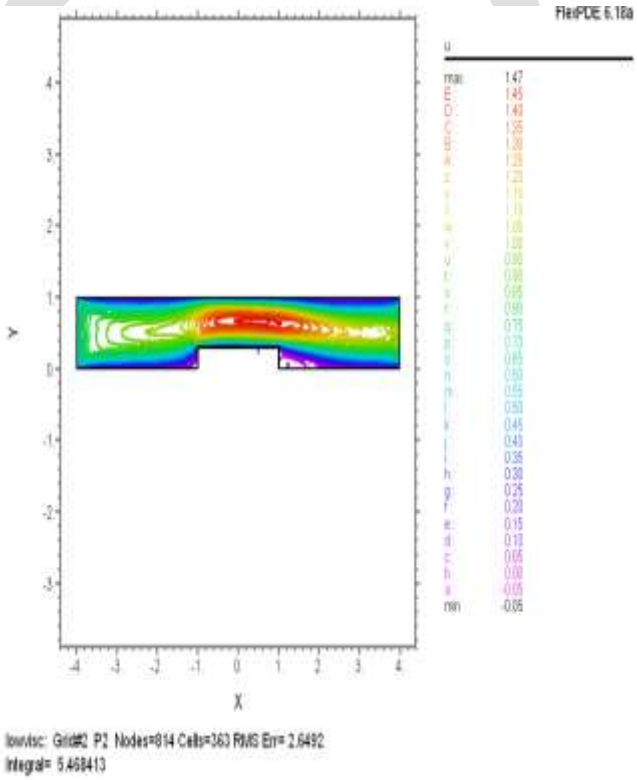

Fig.2: Velocity in x – direction at h =0.3

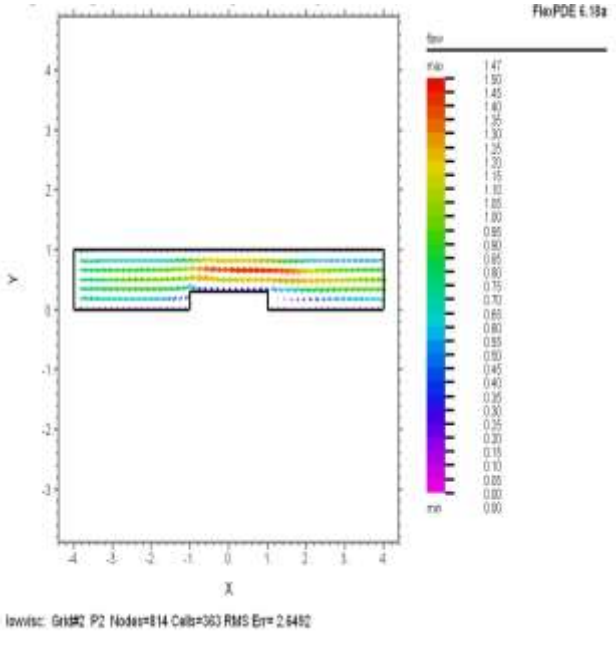

Fig. 3: Flow at h = 0.3

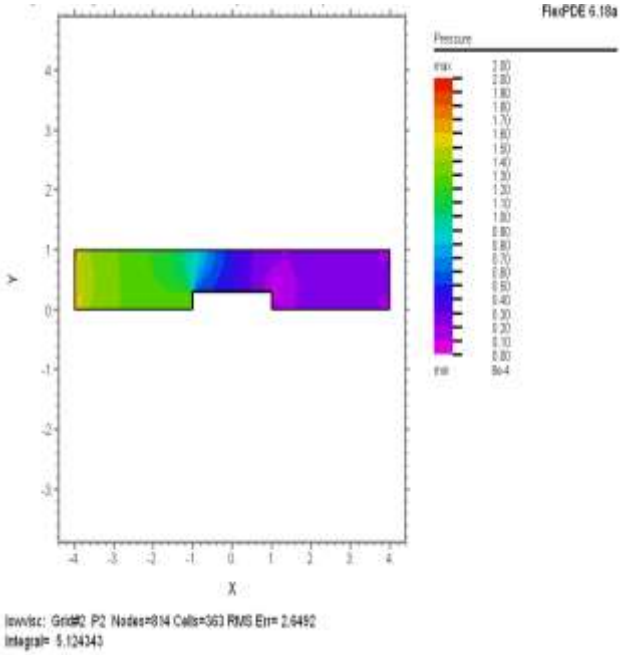

Fig.4:Pressure at h = 0.3

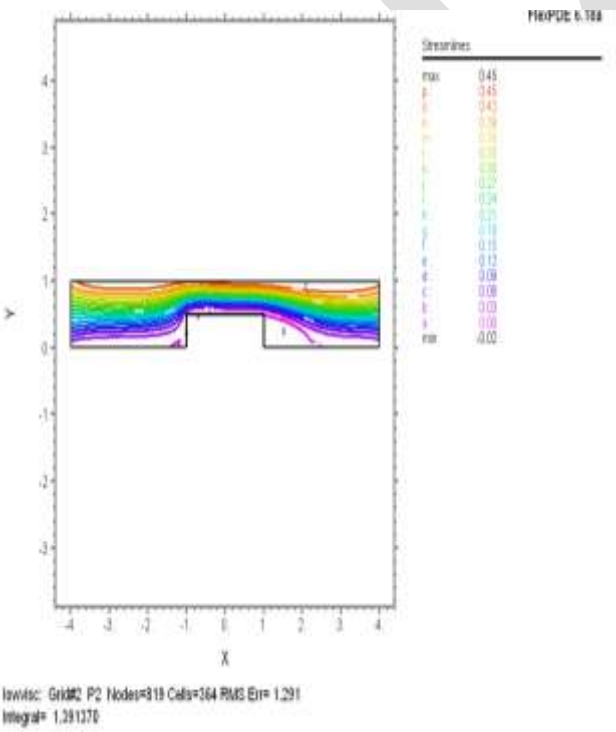

Fig.5: Streamlines at h = 0.5

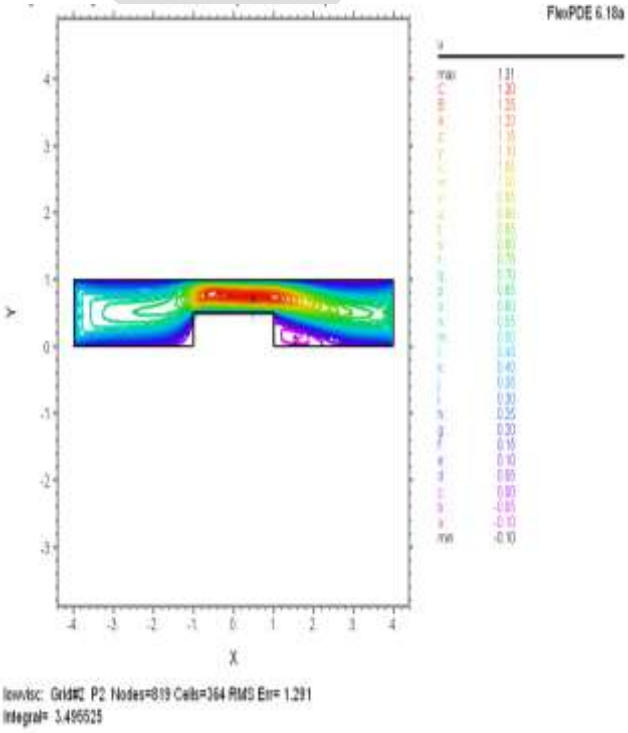

Fig.6: Velocity in x – direction at h =0.5

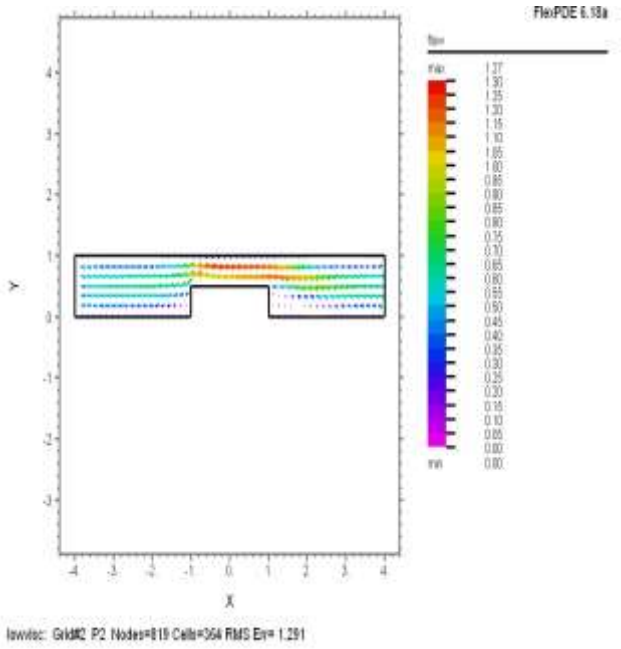

Fig.7: Flow at h = 0.5

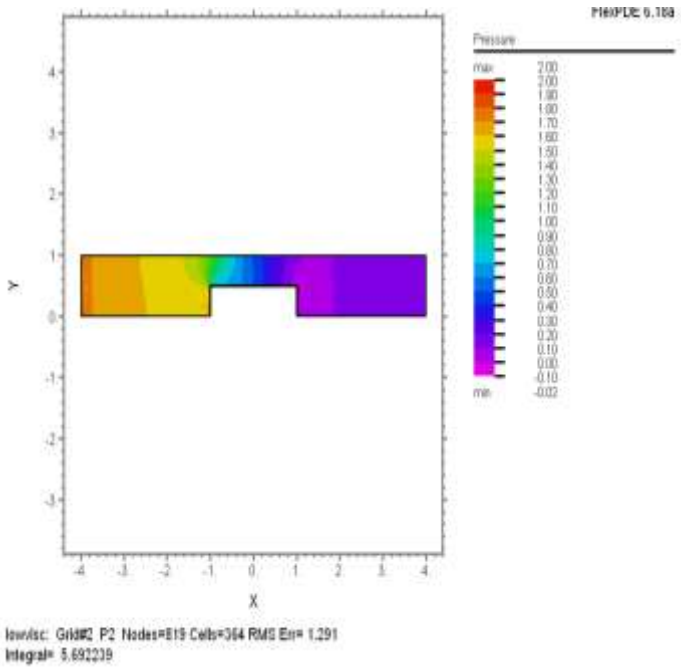

Fig.8:Pressure at h = 0.5

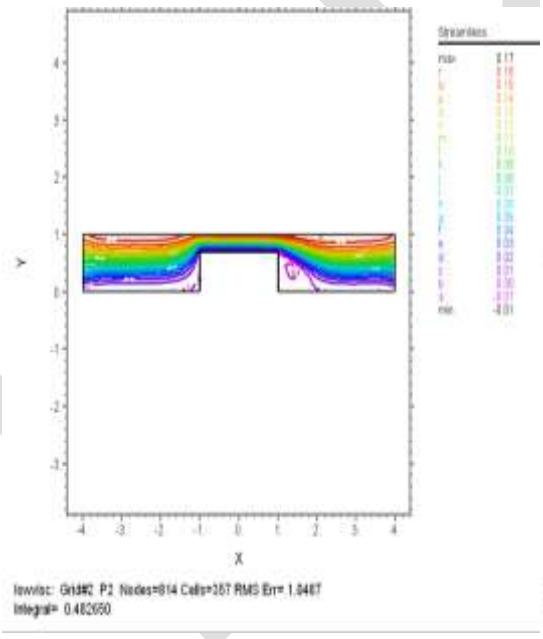

Fig.9: Streamlines at h = 0.7

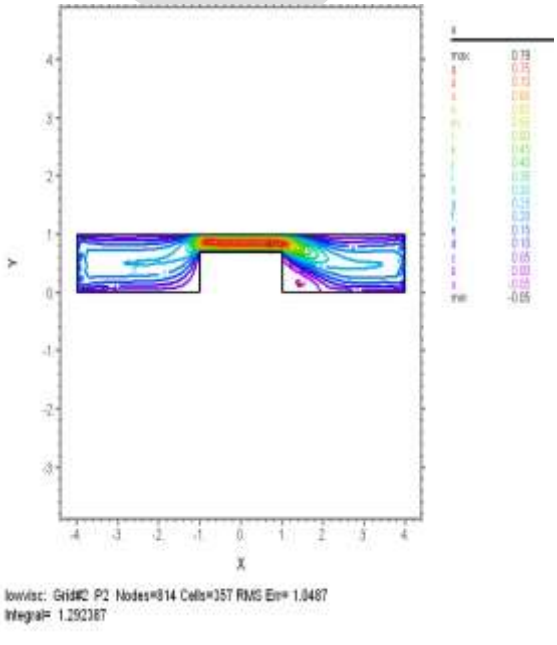

Fig.10:Velocity in x – direction at h = 0.7

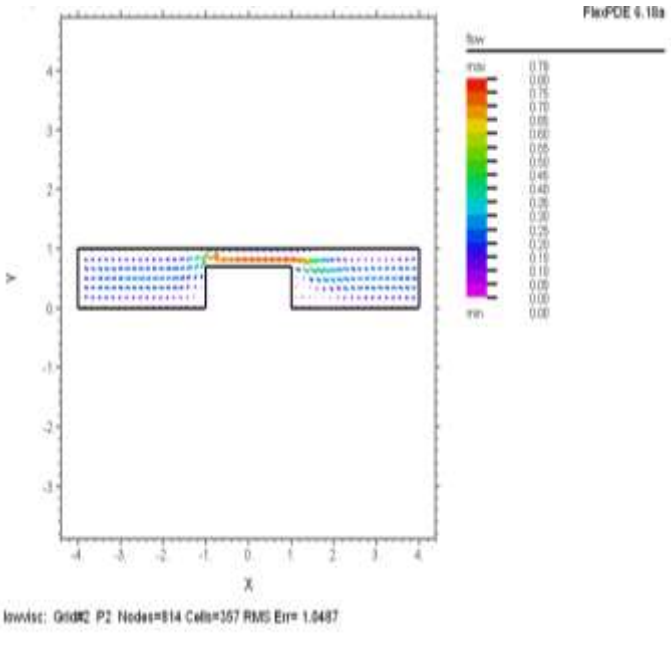

Fig.11:Flow at h = 0.7

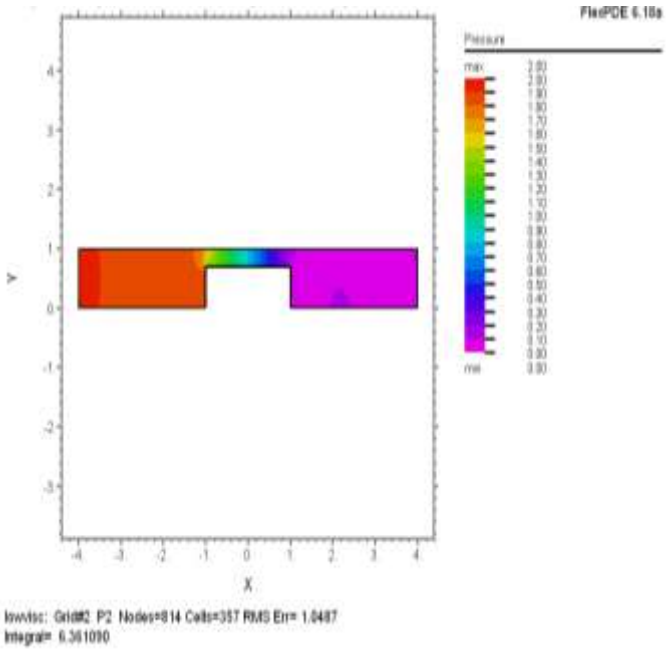

Fig.12:Pressure at h = 0.7

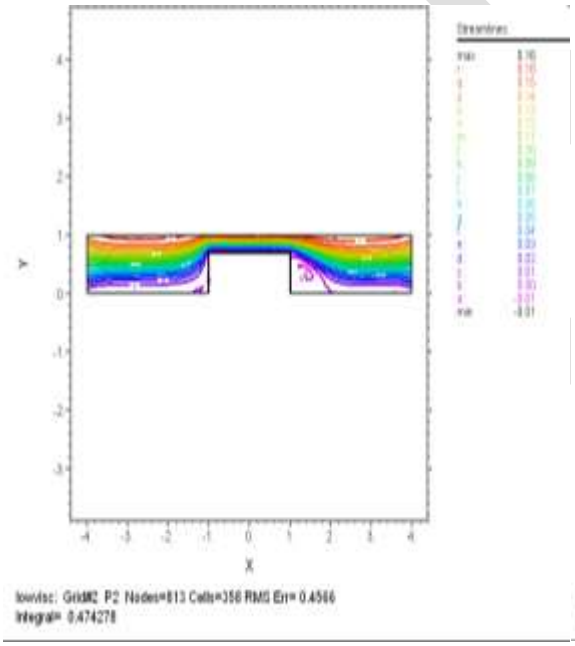

Fig.13:Streamlines at h = 0.9

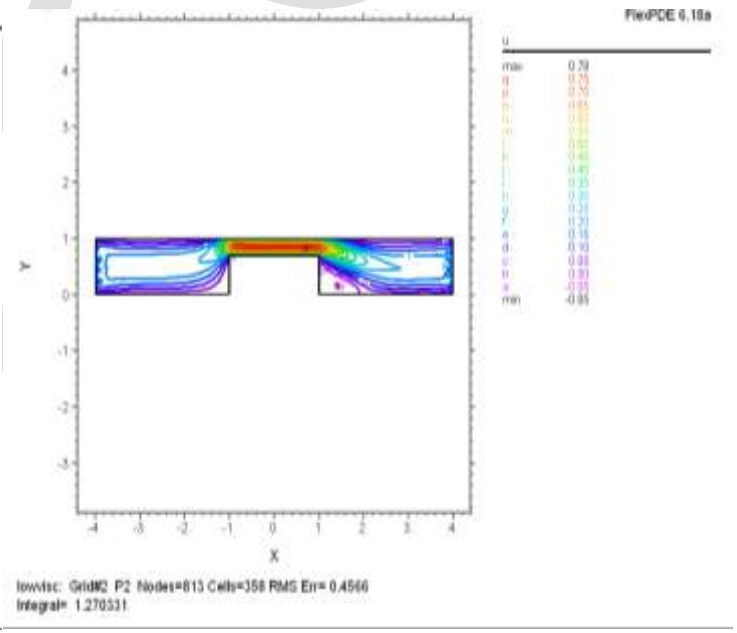

Fig.14:Velocity in x – direction at h = 0.9

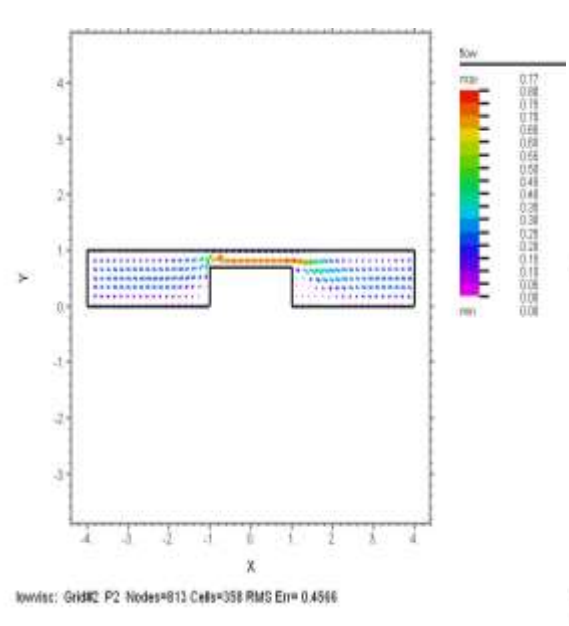

Fig.15:Flow at h = 0.9

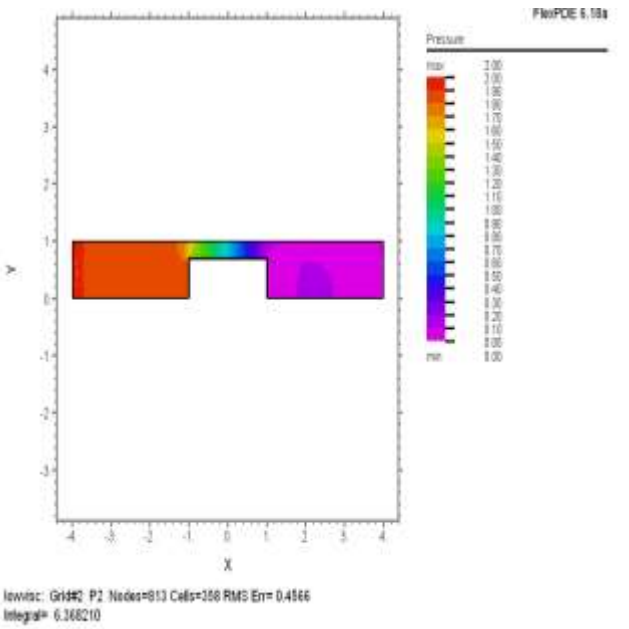

Fig.16:Pressure at h = 0.9

CONCLUSION

The Flex PDE software was used for numerical simulation of fluid dynamics to evaluate the flow characteristics of incompressible viscous fluid i.e. water flowing in rectangular channel as laminar flow and obstructed by a solid rectangular obstruction (flat plate) of variable length using the Navier-Stokes equations alongwith continuity equation as an incompressibility constraint and the vorticity-stream function approach. In this study, it was found that there is a variation in the magnitude of the stream function due to different blockage ratios i.e. the maximum values of the stream function decreased with the increased in the blockage ratio and vice-versa. It was also observed that as we go away from the obstruction in the direction normal to the direction of flow, the value of function increased and by increasing the blockage ratio, the area in which the flow reverses its direction was found to be increased. It was also observed that with the increase in blockage ratio the region of low pressure increased behind the obstruction.

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MR IMAGES ENHANCEMENT USING RETINEX

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ABSTRACT- Magnetic resonance imaging, or MRI, is a way of obtaining very detailed images of organs and tissues throughout the body without the need for x-rays or "ionizing" radiation. Instead, MRI uses a powerful magnetic field, radio waves, rapidly changing magnetic fields, and a computer to create images that show whether or not there is an injury, disease process, or abnormal condition present. A new method for enhancing the contrast of magnetic resonance images (MRI) by retinex algorithm is proposed. The concept of the retinex, formed from "retina" and "cortex", suggesting that both the eye and the brain are involved, to explain the colour constancy processing of human visual systems. Retinex algorithm can correct the blurring in deep anatomical structures and inhomogeneity of MRI. Multiscale retinex (MSR) employed SSR with different weightings to correct inhomogeneities and enhance the contrast of MR images. The method was assessed by applying it to images acquired on MRI scanner systems. Its performance was also compared with other methods based on two indices: (1) the peak signal-to-noise ratio (PSNR) and (2) the contrast-to-noise ratio (CNR). The retinex algorithm successfully corrected a nonuniform grayscale, enhanced contrast, corrected inhomogeneity, and clarified the deep brain structures of MR images captured by surface coils and outperformed histogram equalization, local histogram equalization, and a wavelet based algorithm, and hence may be a valuable method in MR image processing.

KEY WORDS – Magnetic resonance imaging, multiscale retinex, single scale retinex peak signal to noise ratio, contrast to noise ratio.

1. INTRODUCTION - Magnetic resonance imaging is a medical imaging technique used in radiology to visualize internal structures of the body in detail. Over the past twenty years, magnetic resonance imaging (MRI) has become one of the most important imaging modalities available to clinical medicine. It offers great technical flexibility, and is free of the hazards associated with ionizing radiation.MRI makes use of the property of nuclear magnetic resonance (NMR) to image nuclei of atoms inside the body[1]. Several techniques have been recently developed to improve the detection and diagnosis capabilities including eliminating artifacts and enhancing the contrast of MR images presence [2]. Zoroofi et al. [4] proposed a post processing technique to reduce MRI body motion artifacts due to the presence of an object on the imaging plane. They proposed a reconstruction algorithm, based on a superposition bilinear interpolation algorithm, reducing such artifacts with a minimum-energy method to estimate the unknown parameters of body motion Results showed feasibility in clinical application. Sled et al. [5] demonstrated the efficacy of an automatic nonparametric method in correcting intensity nonuniformities using both real and simulated MR data. Ahn et al. [6] used Method of local adaptive template filtering for enhancing the signal-to-noise ratio (SNR) in MRI without reducing the resolution. Moreover, Styner et al. [7] showed parametric bias-field correction method could correct bias distortions that are much larger than the image contrast. Likar et al. [8] used a model-based correction method to adjust inhomogeneity in the intensity of an MR image. They applied an inverse image-degradation model where parameters were optimized by minimizing the information content of simulated and real MR data.

Lin et al. [9] used a wavelet based algorithm to approximate surface-coil sensitivity profiles. They corrected image intensity in homogeneities acquired by surface coils, and used a parallel MRI method to verify the spatial sensitivity profile of surface coils from the images captured without using a body coil. It has also been shown that contrast enhancement can be used to improve the quality of MR images [10, 11].

Several MRI-related techniques have been suggested to facilitate more accurate clinical diagnoses. Among them, surface coils were used to enhance the SNR and improve the resolution [12]. A surface coil consisted of conductive loops that transmit radiofrequency (RF) energy can also be used as receivers. They exhibited maximal sensitivity in localizing surface structures and facilitate faster MRI scanning [12-15]. The use of stronger gradients increased the spatial resolution but reduced the sensitivity. Nevertheless, the location of surface coils must be controlled to increase sensitivity. Image quality can be improved by reducing the thermal noise generated outside the region of sensitivity, eliminating artifacts due to body movements and respiration, and using steep imaging gradients. Another obvious disadvantage of planar surface coils was that the low signal level made it difficult to image deep brain structures, resulting in a large dynamic range of signal intensities in MR images. Dynamic-range compression has been used to solve this problem [11, 12] with views of larger regions being captured by a phased array of surface coils [13]. Phased-array surface coils can be implemented by switching among multiple surface-coil receivers. This improved the SNR and increased the clinical applications, but the problem of signal loss in deep brain structures remained. Therefore, an optimum contrast enhancement algorithm would be helpful to improve the quality of MR images acquired by surface coils. Stretching the pixel dynamic range of certain objects in an image is a widely adopted approach for enhancing the contrast [15, 16].

The image contrast-enhancement techniques can be divided into two types: global and local histogram enhancement. The (global) histogram equalization technique improved the uniformity of the intensity distribution of an image by equalizing the number of pixels at each gray level. The disadvantage of this method is that it is not effective in improving poor localized contrasts [17-19]. Local histogram enhancement used an equalization method to improve the detailed histogram distribution within small regions of an image, and also preserved the gray-level values of the image. The obtained histogram is updated in neighbouring regions at each iteration, and then local histogram equalization is applied. However, the visual perception quality of a processed image is subjective, and it is known that both global and local histogram equalization do not result in the best contrast enhancement. For image processing, the presence of the nonuniformity of an MR image caused by the inhomogeneity of the magnetic intensity is very similar to that of a normal image resulted from bad illumination sources and environmental conditions [20-23].

To address the nonuniformity problem of an image, Land et al [24], inspired by the psychological knowledge about the brains processing of image information from retinas, developed a concept named retinex as a model for describing the colour constancy in human visual perception. His idea is that the perception of human is not completely defined by the spectral character of the light reaching the eye from scenes. It includes the processing of spatial-dependant colour and intensity information of the retina of an eye, which can be realized by the computation of dynamic-range compression and colour rendition. Although hardware techniques can be utilized to correct the image inhomogeneity and to enhance image contrast, they are costly and inflexible. Hence, it is promising to develop easy and low-cost software-based techniques to address the inhomogeneity problem in MR images [25]. In this paper, we introduced a software-based retinex algorithm for contrast enhancement and dynamic-range compression that improve image quality by decreasing image inhomogeneity.

2. METHODE

2.1 RETINEX ALGORITHM

Digital cameras become extraordinarily convenient in daily life, although images obtained with such cameras suffer from a loss in clarity of details and colour as the light levels drop within shadows, or as distance from a lighting source increases. This is due to the fact that cameras only capture the light reflected by the scene, while human beings could adjust automatically to the variation of light. This problem is known as colour constancy. Colour constancy refers to the steady psychological perception for the colour of a scene when light varies. People maintain approximate colour constancy despite variation in the colour of nearby objects and despite variation in the spectral power distribution of the ambient light. Land's Retinex (retinal-cortical) theory is the first computational model to explain and achieve colour constancy. It is based on a series of psychophysical experiments. The purpose of the Retinex is to compute lightness values that will be invariant under changes of viewing context, as human performance is roughly invariant under similar changes have become extraordinarily convenient in daily life, although images obtained with such cameras suffer from a loss in clarity of details and colour as the light levels drop within shadows, or as distance from a lighting source increases. This is due to

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Land's Retinex (retinal-cortical) theory is the first computational model to explain and achieve colour constancy. The last version of Edwin Land's retinex model for human vision's lightness and colour constancy has been implemented in 1986. Land named the model that tries to reproduce this elaboration 'Retinex', as an amalgamation of 'retina' and 'cortex', since he did not know if the perception process takes place only in the retina or also in the brain cortex.

2.1.1 SINGLE SCALE RETINEX

The Retinex is a human perception based image processing algorithm which provides "COLOUR CONSTANCY or COLOUR/LIGHTNESS RENDITION" and "DYNAMIC RANGE COMPRESSION".

Single Scale Retinex can either achieve "COLOUR / LIGHTNESS RENDITION" or "DYNAMIC RANGE COMPRESSION", but not both simultaneously.

A common problem with colour imagery digital or analog is that of successful capture of the dynamic range and colour seen through the viewfinder onto the acquired image. This image is poor rendition of the actual observed scene.

A distinct trade of f controlled by the scale of surrounded function exist between the dynamic range compression and tonal rendition and one can improve only at the cost of reducing the other. The magnitude of the scale determines the type of information that the retinex provides:

1. Smaller scale providing more dynamic range compression.
2. Larger scale providing more colour constancy.

Jobson and his co-worker defined a single-scale Retinex (SSR), which is an implementation of centre/surround Retinex.The Single-scale retinex is given by

$$R_i(x,y) = \log I_i(x,y) - \log[F(x,y) * I_i(x,y)] \quad (1)$$

Where Ii(x, y) is image distribution in the ith colour band, F(x, y) is the normalized guass function, C is the Gaussian surround space constant and $R_{i(}x, y)$ is the retinex output

$$\iint F(x,y)dxdy = 1 \quad (2)$$

Gaussian function: $F(x, y) = Ke^{-(x2+y2)/c2}$

The image distribution is the product of scenes reflectance and illumination.

$$I_i(x,y) = S_i(x,y)r_i(x,y) \quad (3)$$

Where Si(x, y) is the spatial distribution of illumination and ri(x, y), the distribution of scene reflectance. The convolution with surround function works as averaging in the neighbourhood.

Generally the illumination has slow spatial variation, which mean

$$R_i(x,y) = \log \frac{S_i(x,y)r_i(x,y)}{\overline{S_i(x,y)}\,\overline{r_i(x,y)}} \quad (4)$$

.

$$S_i(x,y) \approx \overline{S_i(x,y)}$$

(5)

$$R_i(x,y) \approx \log \frac{r_i(x,y)}{\overline{r_i(x,y)}} \quad (6)$$

Hence the illuminance term can be eliminated from the retinex obtained making colour constancy possible.

Jobson et al [25] stated that Gaussian had the property of being more "regional" and offered good dynamic range compression over a large range of space constant. The selection of space constant is related with visual angel in the direct observation. But the value cannot be theoretically modelled and determined. Depending on the special scale, it can either provide dynamic range compression (small scale) or tonal rendition (large scale).

Steps involved in implementation of SSR-

- Read image and convert size front unit 8 to double.
- Define RGB components and convert size to double. Obtain log transform to compress dynamic range. Obtain FFT
- Assume scale values as 15, 80 and 250.
- Create 2D mesh grid for the image.
- Define gauss pdf function, normalize its value and obtain FFT.
- Multiply the FFTs and obtain the SSR for each colour component.
- Concatenate the new components obtained and obtain the final SSR image.

2.1.2 MULTI SCALE RETINEX-

The MSR combines the dynamic range compression of the small scale retinex with the tonal rendition of the large scale retinex to produce an output which a compasses both.

The advantages that the MSR has over the SSR are in the combination of scales which provide both dynamic range compression and tonal rendition at the same time. The overall result of the application of MSR is still more saturated than human observation giving the final image a washed out appearance but, it preserves most of the detail in the scene. This greying of areas of constant intensity occurs because the retinex processing enhances each colour band as a function of its surround. The smaller value in the weaker channel gets pushed up strongly, making them approximately equal to in magnitude to the dominant channel, leading to a greying out of the overall region.MSR produces a much better final images in terms of colour constancy and dynamic range compression than SSR.

Because of the trade-off between dynamic range compression and colour rendition, we have to choose a good scale c in the formula of F(x, y) in SSR. If we do not want to sacrifice either dynamic range compression or colour rendition, multiscale retinex, which is a combination of weighted different scale of SSR, is a good solution,

$$R_{MSRi} = \sum_{n=1}^{N} \omega_n R_{ni} \quad (6)$$

$$R_{MSRi} = \sum_{n=1}^{N} \omega_n \{\log I_i(x,y) - \log[F_n(x,y) * I_i(x,y)]\} \quad (7)$$

Where N is the number of the scales, Rni is the ith component of the nth scale. The obvious question about MSR is the number of scales needed, scale values, and weight values. Experiments showed that three scales are enough for most of the images, and the weights can be equal. Generally fixed scales of 15, 80 and 250 can be used, or scales of fixed portion of image size can be used. But

these are more experimental than theoretical, because we do not know the scale of image to the real scenes. The weights can be adjusted to weight more on dynamic range compression or colour rendition.

Steps involved in implementation of MSR-

- Read image and convert size from unit 8 to double.
- Define RGB components and convert size to double. Obtain log transform to compress dynamic range. Obtain FFT
- Assume scale values as 15, 80 and 250.
- Create 2D mesh grid for the image.
- Define gauss' pdf function, normalize its value and obtain FFT for each sigma value.
- Multiply the FFTs for one colour component with the gauss pdfs for each sigma value
- Introduce weights for each sigma component in the obtained result and obtain the SSR for each colour component.

Concatenate the new components obtained and obtain the final MSR image.

2.1.3 PSNR (PEAK SIGNAL TO NOISE RATIO)-

The peak signal-to-noise ratio (PSNR) is defined as

$$\text{PSNR} = 20\log\frac{ipeak}{\sqrt{\sum_{k,l}\frac{\{y(k,l)-m(k,l)\}}{}}} \quad (8)$$

Where $y(k, l)$ and $m(k, l)$ were the enhanced and original images of size K and L respectively,
And ipeak was the maximum magnitude of images.

3. COMPARISION TO OTHER TECHNIQUES

3.1 Non-linear gamma correction

Good visual representations seem to be based upon some combination of high regional visual lightness and contrast. To compute the regional parameters, we divide the image into nonoverlapping blocks that are 50×50 pixels. For each block, a mean, I, and a standard deviation, σ_f, are computed. A first approach was to postulate that for visually good rendition the contrast × lightness product should be above a minimum value, with the additional constraint that each component cannot fall below an absolute minimum value.

This regional scale is sufficiently granular to capture the visual sense of regional contrast. Both the contrast and the lightness can be measured in terms of the regional parameters. The overall lightness is measured by the image mean, which is also the ensemble measure for regional lightness. The overall contrast, σ_f, is measured by taking the mean of σ_f, and it provides a gross measure of the regional contrast variations. The global standard deviation of the image did not relate, except very weakly, to the overall visual sense of contrast. Image frame sizes ranged from 512×512 to 1024×1024 pixels.

The coupling of the constraints of minimum contrast-lightness product with minimum contrast and lightness as separate entities defines the zone in figure labelled "visual good". Further, this figure suggests that there may exist a contour of much higher contrast-lightness, which can be considered a "visual ideal".

When images are displayed on monitors, their intensity profile is typically modified using the gamma-Transformation given by:

$I_o(x, y) = [I_i(x, y)] \wedge 1/\gamma$ (9)

,

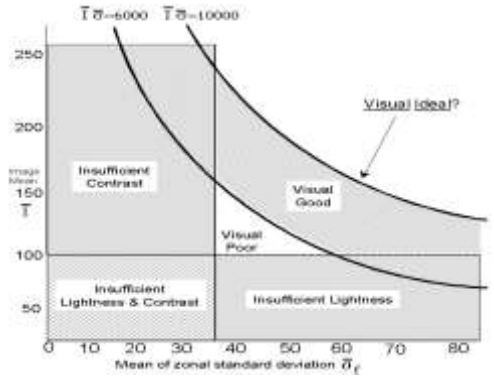


Figure 1 shows Variation of image intensity and contrast

Where, *Ii(x, y)* is the input value, and $I_o(x, y)$ is the modified value.
A value of is γ-1 the linear transform. In order to gauge our results against a linear baseline for the original image data, we determined that most digital images are super-linear and should be corrected to approximate linearity by gamma transforming the processed image using γ =0.63

While this has negligible effect on standard deviation values, it just adjusts the mean downward from about 165 to about 128.

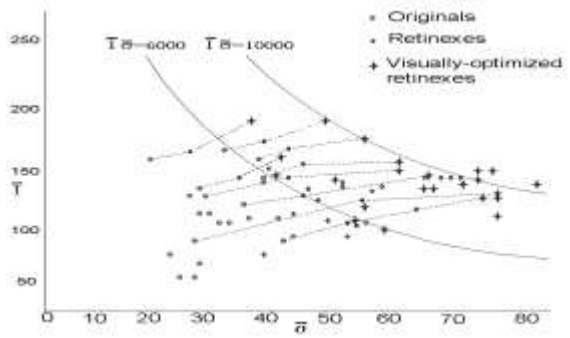


Figure 2 Showing visually optimal area

3.2 Histogram Equalization

A global technique that works well for a wide variety of images is histogram equalization. This technique is based on the idea of remapping the histogram of the scene to a histogram that has a near-uniform probability density function. This results in reassigning dark regions to brighter values and bright regions to darker values. Histogram equalization works well for scenes that have unmolded or weakly bi-modal histograms (i.e. very dark, or very bright), but not so well for those images with strongly bi-modal histograms (i.e. scenes that contain very dark and very bright regions).

3.3Homomorphic Filtering

The technique is that most resembles conceptually and functionally is homomorphic filtering. The image is first passed through a logarithmic non-linearity that provides dynamic range compression. It is then Fourier transformed, and its representation in the spatial

frequency domain is modified by applying a filter that provides contrast enhancement. The modified image is then inverse Fourier transformed and is passes through an exponential non-linearity that 'reverses' the effects of the logarithmic nonlinearity.

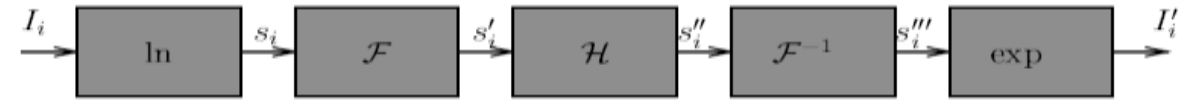
Homomorphic filter is used for image enhancement. It simultaneously normalizes the brightness across an image and increases contrast. Here homomorphic filtering is used to remove multiplicative noise. Illumination and reflectance are not separable, but their approximate locations in the frequency domain may be located. Since illumination and reflectance combine multiplicatively, the components are made additive by taking the logarithm of the image intensity, so that these multiplicative components of the image can be separated linearly in the frequency domain. Illumination variations can be thought of as a multiplicative noise, and can be reduced by filtering in the log domain.

To make the illumination of an image more even, the high-frequency components are increased and low-frequency components are decreased, because the high-frequency components are assumed to represent mostly the reflectance in the scene (the amount of light reflected off the object in the scene), whereas the low-frequency components are assumed to represent mostly the illumination in the scene. That is, high-pass filtering is used to suppress low frequencies and amplify high frequencies, in the log-intensity domain.

Mathematically,

$s_i(x, y) = \ln[I_i(x, y)]$ (10)
$s_i^1(v, w) = F[s_i(x, y)]$ (11)
$s_i^{11}(v, w) = s_i^1(v, w)H(v,w)$ (12)
$s_i^{111}(x, y) = F^{-1}[s^{11}(v, w)]$ (13)
$I_i^1(x, y) = \exp[s_i^{111}(x, y)]$ (14)

H represents the homomorphic filter. It is in its final exponential transform that the homomorphic filter differs the most from the MSR. MSR does not apply a final inverse transform to go back to the original domain.



Homomorphic filtering[9]

Figure 3 shows Block diagram for Homomorphic filtering

The homomorphic filter consistently provided excellent dynamic range compression but is lacking in final colour rendition. The output of the homomorphic filter in effect appears extremely hazy compared with the output of the MSR though the dynamic range compression of the two methods appears to be comparable.

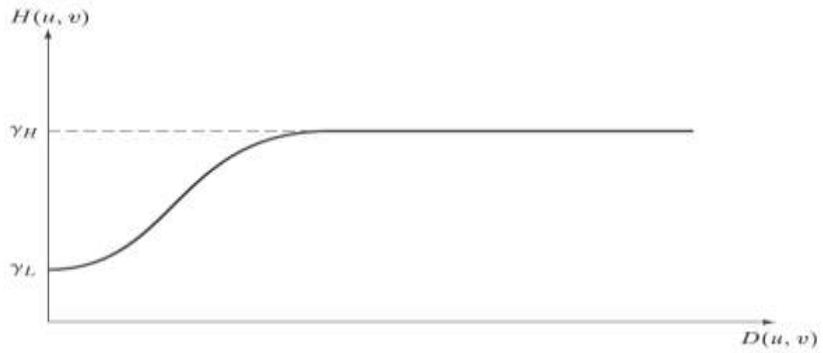


Figure 4 shows Characteristics of homomorphic filter used

3.4 Manual Image Enhancement

As both professional and amateur photographers face the limitations of the narrow dynamic range in current printing technology, and the inadequate performance of image enhancement algorithms, more and more attention is being focused on manual enhancement methods. One such technique is 'burning-and-dodging' where different regions of an image are interactively modified by a user'. The burn and dodge tool provides the capability of modifying the colour content of a region by using tools of varying sizes and shapes that work as electronic "scrims."

We have provided a brief description of the commonly encountered "problems" introduced inevitably in a digital image due to the nature of the acquisition process and the pre-processing algorithms. Since in many image enhancement applications—e.g. images obtained from the Internet— we neither know the source of the image (digital camera or scanner), nor do we know how the images have been "enhanced," it is critical that we understand the effects of these common processes on the output of the MSR.

We recognize that in such cases, slight modifications to the canonical set of constants may need to be made in order to obtain the best possible visual quality. However, though the presence of these operations in the input image can adversely affect the overall visual quality of the output image produced by the MSR, even the 'not-the-best' MSR output is still typically better than the original image in terms of contrast, visual quality.

The MSR has thus proven to be quite resilient to many of the arbitrary operations that are used in digital image formation and can thus be truly considered a fully automatic process.

4. Result and Discussion

Selected results for diverse test cases

- The test images presented here begin with some test scenes. We feel it is fundamental to refer the processed images back to the direct observation of scenes. This is necessary to establish that how well the computation represents a result that is; "what you would have seen if you would have been there".

- Clearly we cannot duplicate human vision visions, peripheral vision which spans almost 180^{o} but within the narrower angle of most image frames we would like to demonstrate that the computation achieves the clarity of colour and detail in shadows, reasonable colour constancy and lightness and colour rendition that is present in direct observation of scenes. While we cannot yet test performance for scenes that go beyond 8 bit dynamic ranges, these results support the utility for the processing scheme for the enhancement of conventional 8-bit colour images.

The test scenes are given first so that we can describe the degree to which the computation approaches human visual performance. All the test scene images after retinex processing are quite "true to life" compared with direct observation. We did not carefully match camera spatial resolution to observation so some difference in perceived detail is expected and observed. However overall colour lightness and detailed rendering for the multi scale retinex is a good approximation to human visual perception.

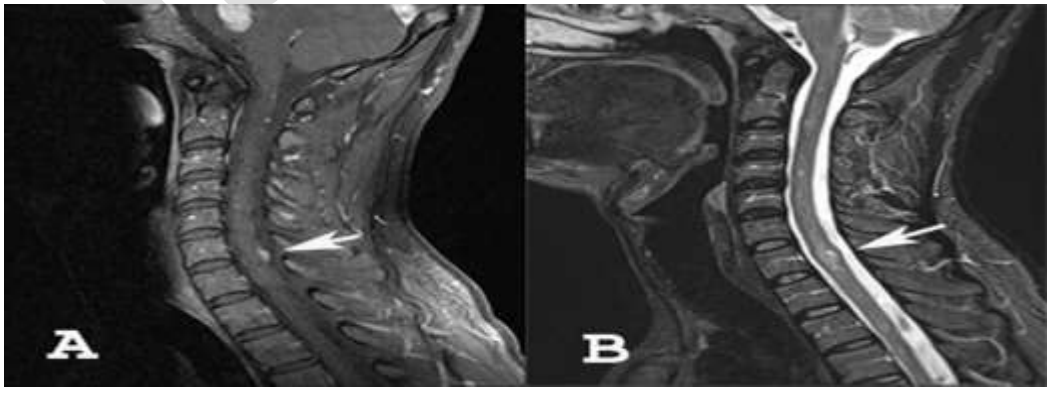


Figure 5 shows the MR image of cervical spine fig A original image fig B retinex output.

3. CONCLUSION

The inhomogeneity and anatomic-structure blurring found in images captured by surface receiving coils was due to variations in image brightness. The inhomogeneities of MR images were very low frequency components in frequency domain of images. The retinex algorithm especially performed to remove the very low frequency components of images by an estimator constructed with a similar low pass filter from a Gaussian surround function as described in for the purpose of correction of the inhomogeneous MR images. The variations of inhomogeneity in MR images received. Hence, MR post processing techniques were crucial in improving the structural details and homogeneity of such brain images. In the present study, we proposed an easy, low-cost software-based method to solve these problems, also avoiding expensive charges to the imaging hardware. Our novel retinex algorithm successfully corrected a nonuniform greyscales, enhanced contrast, and corrected inhomogeneity.

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STRENGTH AND DURABILITY STUDIES ON CONCRETE WITH FLYASH AND ARTIFICIAL SAND

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ABSTRACT- Currently India has taken a major initiative on developing the infrastructures such as Express Highways, Power Projects and Industrial Structures etc., to meet the requirements of globalization, in the construction of buildings and other structures. Concrete plays the key role and a large quantum of concrete is being utilized in every construction practices. River Sand, which is one of the constituents used in the production of Conventional Concrete, has become very expensive and also becoming scarce due to depletion of river bed. Quarry dust is a waste obtained during quarrying process. It has very recently gained good attention to be used as an effective filler material instead of Fine Aggregate. An attempt have been made to examine the suitability of replacing the 30% of Fly Ash and 50% of Artificial Sand for a Concrete of grade M35.Examine strength characteristics such as Compressive Strength for 7days, 28days, 56days of Curing Period and Durability Characteristics such as Acid Attack Test, Acid Durability Factor, Acid Attack Factor for 30days, 60days, 90days results are analyzed and compared with the Conventional Mix.

KEY WORDS: Cement, Fly Ash, Natural Sand, Artificial Sand, Coarse Aggregate, HCl Solution, Compressive Strength, Acid Attack Factor, Acid Durability Factor.

1. INTRODUCTION-Artificial sand is a crushed stone dust used as a Fine Aggregate. However, recycled concrete aggregate, Fly Ash, Blast Furnace Slag, Quarry Dust, a by-product from the crushing process during quarrying activities is one of those materials that have recently gained attentions to be used as concreting aggregates, especially as Fine Aggregates. Quarry Dust have been used for different activities in the construction industry, such as Road Construction, and manufacture of building materials, such as light weight Aggregates, Bricks, Tiles and Autoclave Blocks. The Artificial Sand produced by proper machines can be a better substitute to River Sand. The sand must be of proper gradation (it should have particles from 150 microns to 4.75 mm in proper proportion).

Fly Ash is one of the residues generated in the combustion of coal. Fly Ash is generally captured from the chimneys of power generation facilities. Fly Ash consists of fine, powdery particles that are predominantly spherical in shape, either solid or hollow, and mostly glassy (amorphous) in nature. The carbonaceous material in Fly Ash is composed of angular particles. The particle size distribution of most bituminous coal Fly Ashes is generally similar to that of silt (less than a 0.075mm).These ash particles consist of Silica, Alumina, Oxides of Iron, Calcium, and Magnesium and toxic heavy metals like Lead, Arsenic, Cobalt, and Copper. This poses problems in the form of land use, health hazards, and environmental impact.

2.LETERATURE RIEVIEW

Prof R. S. Deotale, Harshavardhan L. Rangari, Prof Swapnil P. Wanjari conducted studies on concrete mix with partial replacement of Cement by suitable Pozzolonic Cementitious Material and Sand by Manufactured Quarry Sand. The present study is aimed at utilizing Quarry sand as fine aggregate replacing natural sand and also the compressive strength of the water cured specimens is measured on the 7, 28, 56 days for M25, M30, M35 grades of concrete and concluded that 50% Replacement of Natural Sand by

Quarry sand would produce higher compressive strength for all grade of concrete M35, M30, M25 Grade of concrete and as per the study of acid attack and concrete show that con. H_2SO_4 affect more on concrete as compare to HCl.

Rajamani. N.P et.al in (2006) studied on this work, a prediction equation was proposed which estimates the 28 days compressive strength of fly ash concrete and can also be used to modify any basic cement concrete mix so that the concretes with and without replacement of fly ash have similar strength. The prediction equation also considers the different levels of replacement of sand and fly ash with fine aggregate at sand replacements of 20, 40, 60 % were prepared. Actual fine aggregate quantity added was varied from 1.0 to 1.6 times the quantity of sand replaced to study the effect of higher quantity of fly ash in concrete. Compressive strength of these mixes was determined at 7, 28 days. They reached their target mean strength and compared with proposed prediction equation.

By Prof. Chandrakant B Shah et.al, their study was aimed in finding the trends due to replacement of Portland cement by processed fly ash of compressive strength of standard 70.7 mm mortar cubes at the ages of 3, 7, 28, 56 and 90 days. The percentage replacements were 40, 45, 50 and 55 respectively. Test showed that although the initial strengths were lower than that for only OPC, for mix at later age, the results were close to that of OPC. The study showed that replacement of OPC 53 grade cement by processed fly ash up to 55 to 60 % would be possible.

P. M. Shanmugavadiv etal. have shown from water permeability test that permeability reduced with increase in proportion of manufactured sand. This may be due to less voids present in concrete with manufactured sand showing better bonding between the aggregate and cement paste. Results of rapid chloride penetration test shows that chloride ion penetrability is high for concrete with natural sand while it is reduced using manufactured sand. They attribute this due to coarser grain size of manufactured sand resulting in better packing of particles. They suggest that 70% of manufactured sand in concrete is the optimum replacement for natural sand for better results.

3.EXPERMENTAL INVESTIGATION-

This experimental program consists of the following steps:

- Materials used
- Casting
- Curing
- Testing

3.1 Materials used

Cement- Ordinary Portland Cement of 53 grade available in local market of standard brand was used in the investigation. The Cement used has been tested for various proportions as per IS 4031-1988 and found to be conforming to various specifications of IS 12269-1987. The physical properties of Portland cement are given in below table.

Serial no	Property	Test results
1	Specific gravity	3.12
2	Fineness of cement	6%
3	Normal consistency	32%
4	Initial setting time	100min
5	Final setting time	170min

Table: 1 Physical properties of Ordinary Portland Cement

Fine aggregate-In the present investigation locally available natural Sand and artificial sand was used as Fine Aggregate. The physical properties of Natural Sand and artificial sand are tabulated in below Table.

Property	**Natural Sand**	**Artificial Sand**
Specific Gravity	2.55	3.09
Bulk Density (loose) in kg/ m^3	1547	1592.15
Bulk Density (Compacted) in kg/ m^3	1681	1740.29
Fineness	2.46	2.86

Table 2: Physical Properties Of natural sand and artificial sand

Coarse aggregate-Machine Crushed angular granite metal of 20mm and 10mm size from the local source was used as Coarse Aggregate. The physical properties of Coarse Aggregate are given in below table.

S.NO	Parameter	Test value
1	Specific gravity	
	20 mm	2.85
	10 mm	2.65
2	Fineness modulus	8.62
3	Bulk density(Kg/cu. M.)	
	Loose	1548.14
	compacted	1696.3

Table 3: Physical Properties Of Coarse Aggregate

Fly ash- In the present investigation Class F Fly Ash from Vijayawada Thermal Power Station, Krishna Dist, and Andhra Pradesh was used as cement replacement material. The properties of fly ash are conforming to IS 3812-1981 of Indian Standard Specification for Fly Ash for use as Pozzolana and Admixture. Specific gravity of 2.29 was used.

Water-This is the least expensive but most important ingredient of concrete. The water which is used for making concrete should be clean and free from harmful impurities such as Oil, Alkalities, Acids, etc. In general the water which is fit for drinking should be used for making concrete.

Chemical admixtures-Usually the chemical admixtures used are high range water reducers (Super Plasticizers) and viscosity-modifying agents, which change the rheological properties of concrete. In this project work, super plasticizer CONPLAST SP 430 is used.

Hydrochloric acid- It is formed by the dissolution of gaseous hydrogen chloride in water. It is a strong volatile monoprotic acid that easily liberates acrid gaseous HCl. The maximum concentration of hydrochloric acid is approx. 38% HCl. Its salts are called chlorides.Hydrogen chloride (HCl) is a monoprotic acid, which means it can dissociate (*i.e.*, ionize) only once to give up one H^+ ion (a single proton). In aqueous hydrochloric acid, the H^+ joins a water molecule to form a hydronium ion, H_3O^+.

$$HCl + H_2O \rightarrow H_3O^+ + Cl^-$$

3.2 Casting-The cast iron moulds are cleaned of dust particles and applied with mineral oil on all sides before concrete is poured in the moulds. The moulds are placed on a level platform. The well mixed green concrete is filled, allowed to flow and settle itself in the moulds. Excess concrete was removed with trowel and top surface is finished level and smooth. 150mm x 150 mm cubes were used. In this paper Total number of 36 cubes were casted.18 cubes are for Normal Mix and the 18 cubes are for Combined mix i.e., for 30 % replacement of flyash for cement and 50% replacement of artificial sand for natural sand.

3.3 Curing-The specimens are cured in mould for 24 hours. After 24 hours, all the specimens are demoulded and kept in curing tank for 28 days. After 28 days all specimens are kept in atmosphere for 1day for constant weight. subsequently, the specimens are weighed and immersed in 5% hydrochloric acid (HCl) solution for 30, 60, 90 days.

3.4 Testing- The specimens are tested by compression testing machine having capacity of 300T after 7, 28, 56 days of curing. Load should be applied gradually at the rate of 140 kg/cm^2 per minute till the Specimens fails. Load at the failure divided by area of specimen gives the compressive strength of concrete. For acid attack test after 28 days all specimens are kept in atmosphere for 1day for constant weight. subsequently, the specimens are weighed and immersed in 5% hydrochloric acid (HCl) solution for 30, 60, 90 days. After completion of age of immersing in acid solution, the specimens are taken out and were washed in running water and kept in atmosphere for 1day for constant weight. Subsequently the specimens are weighed and loss in weight and hence the percentage loss of weight was calculated.

Acid Durability Factor - Are determined directly in terms of relative strengths. The relative strengths are always with respect to the 28 days value (i.e at the start of the test).

Acid Durability Factors (ADF) = Sr (N/M)

where, Sr = relative strength at N days, (%)

N = number of days at which the durability factor is needed.

M = number of days at which the exposure is to be terminated.

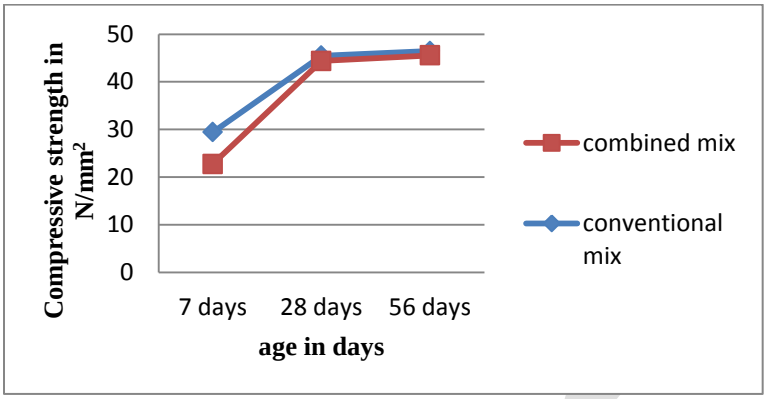
Acid Attack Factor - The extent of deterioration at each corner of the struck face and the opposite face is measured in terms of the solid diagonals (in mm) for each of the two cubes. Acid Attack Factors (AAF) per face is calculated as follows.

AAF = (Loss in mm on eight corners of each of 2 cubes) / 4

4. RESULTS

Compressive Strength results

Concrete mixes	7 days	28 days	56 days
Conventional mix	29.42 N/mm^2	45.48 N/mm^2	46.47 N/mm^2
Combined mix	22.74 N/mm^2	44.39 N/mm^2	45.56 N/mm^2

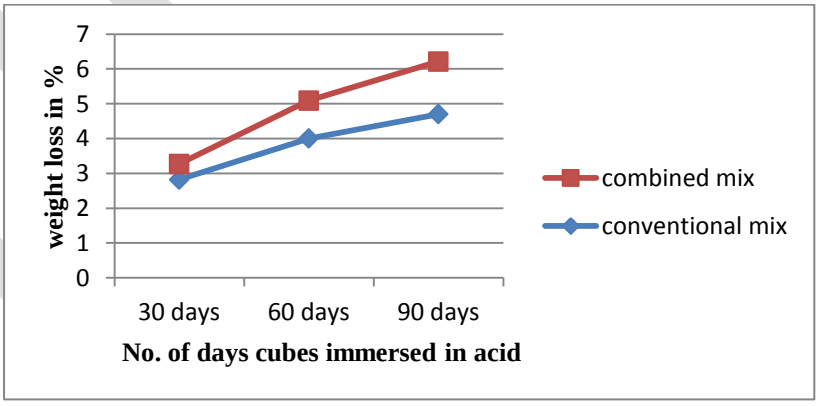


Graph 1: Variation of Compressive Strength with Curing time for two Mixes

Percentage Weight loss results

No. of days	Conventional mix			Combined mix		
	Average weight of cube before immersion in gm	Average weight of cube after immersion in gm	weight loss in %	Average weight of cube before immersion in gm	Average weight of cube after immersion in gm	weight loss in %
30 days	8500	8260	2.82	8550	8270	3.27
60 days	8500	8160	4.0	8550	8115	5.09
90 days	8500	8100	4.7	8550	8020	6.21

Table 4.2 Percentage Weight Loss For Conventional And Combined Mix



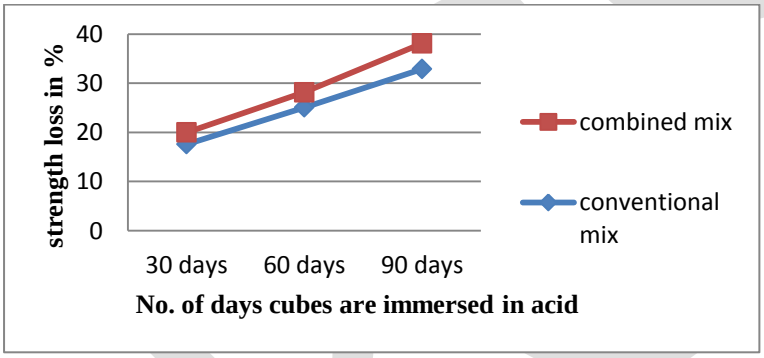
Graph 2: Shows the Percentage Weight Loss for Conventional and Combined mix at the ages of 30, 60, 90 days of Immersion of cubes in Acid (HCl)

Percentage Strength loss results

No. of days	Conventional mix	Combined mix

	Average strength of cube before immersion in N/mm^2	Average strength of cube after immersion in N/mm^2	strength loss in %	Average strength of cube before immersion in N/mm^2	Average strength of cube after immersion in N/mm^2	strength loss in %
30 days	45.48	37.48	17.59	44.39	35.49	20.00
60 days	45.48	34.07	25.08	44.39	31.89	28.16
90 days	45.48	30.52	32.89	44.39	27.48	38.09

Table 4.3 Percentage Strength loss for conventional and combined mix

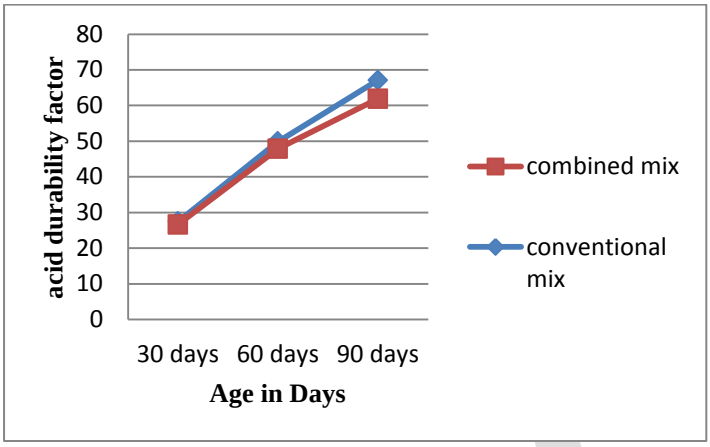


Graph3: shows the Percentage Strength loss for Conventional and Combined mix at the ages of 30, 60, 90 days of immersion of cubes in Acid(HCl)

Acid durability factor

No. of days	Conventional mix				Combined mix			
	Sr	N	M	ADF	Sr	N	M	ADF
30 days	82.41	30	90	27.47	80	30	90	26.66
60 days	74.92	60	90	49.94	71.84	60	90	47.89
90 days	67.11	90	90	67.11	61.91	90	90	61.91

Table 4.4 Acid Durability Factor

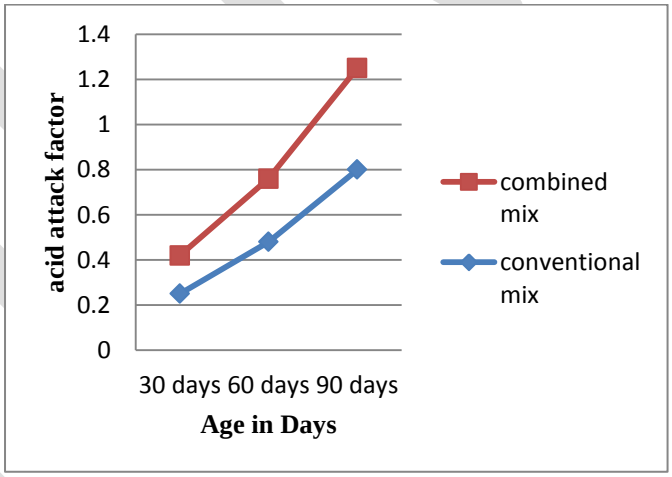


Graph 4: shows the acid durability factor for conventional and combined mix at the ages of 30, 60, 90 days of immersion of cubes in acid(HCl).

Acid attack factor

Age in days	AAF	
	Conventional mix	Combined mix
30 days	0.25	0.42
60 days	0.48	0.73
90 days	0.80	1.25

Table 4.5 Acid Attack Factor



Graph 5: shows the acid attack factor for conventional and combined mix at the ages of 30, 60, 90 days of immersion of cubes in acid(HCl)

CONCLUSIONS-From the results obtained in this investigation, the following conclusions can be drawn:

- The Combined Mix reduces its Compressive Strength by 6.68 N/mm^2 at the age of 7 days, 1.09 N/mm^2 at the age of 28 days and 0.91 N/mm^2 at the age of 56 days.

- The Strengths for the combined mix at the earlier age i.e., at the age of 7 days is very low where as the Strengths at the later ages i.e., at the age of 28, 56 days is high.
- It is observed that the strengths for the combined mix increases gradually as the time of curing period increases.
- The Percentage Weight loss gradually increases as the number of days immersion of cubes in Acid increases. The Percentage weight loss for combined mix is more as compared to the Conventional mix. The Percentage Wt. loss for Combined mix increases by 0.45% , 1.09%, 1.51% at the ages of 30, 60, 90 days respectively.
- The Percentage Strength loss gradually increases as the number of days immersion of cubes in Acid increases. The Percentage Strength loss for combined mix is more as compared to the Conventional mix. The Percentage Strength loss for combined mix is 2.41%, 3.08%, 5.2% more as compared to the Conventional mix at the ages of 30, 60, 90 days.
- The Acid Durability Factor for Combined mix is less as compared to the Conventional mix. The Acid Durability Factor for combined mix reduces at the percentages of 0.81, 2.05, 5.2 for 30, 60, 90 days.
- The Acid Attack Factor for Combined Mix is more as compared to the Conventional Mix. The Acid Attack Factor for Combined Mix is raises at the percentages of 0.17, 0.28 and 0.45 for 30, 60, 90 days respectively.
- The results obtained for combined mix are almost equal to that of the conventional mix, therefore it is recommended that both Fly Ash and Artificial Sand are replaced combined.

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Real Time Moving Object Tracking In Video Processing

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Abstract— Real time moving object detection and tracking is one of the important research fields that have gained a lot of attention in the last few years. Cameras installed around us but there are no means to monitor all of them continuously. It is necessary to develop technologies that automatically process those images in order to detect problematic situations or unusual behavior of human. Design computer vision base automated video surveillance system addresses real-time observation of people within a busy environment leading to the description of their actions and interactions. Tracking is required for security, safety and site management. Object detection by background subtraction technique. Using single camera detect track human behavior. Background subtraction is the process of separating out the foreground objects from the background in a sequence of video frames. If human entity is cross the line design security in mall or public area the object is tracked. It is laborious to track and trace people over multiple cameras. In this paper, we present a system for real-time tracking and fast interactive retrieval of persons in video streams from multiple static surveillance cameras. The system when realizes the human entry, it is processed in a second and the alert is produced for the security purpose.

Keywords—: Human detection and tracing, background subtraction, video streams.

INTRODUCTION

Identifying moving objects from a video sequence is a fundamental and critical task in many computer vision applications.Here are various algorithms are used to detect moving object for video surveillance system. In order to detect moving objects in high speed, the complexity of algorithm mustbe simplified. Moving object detection algorithms based onframe difference has considerable processing speed than thealgorithms of optical flow, statistical learning algorithm.

In [5], author proposed a moving object detection algorithm based on frames difference and edge detection. In [6], the background subtraction and three frame differencing method is proposed for target extraction. In [7], author proposed a very similar method to [6], and it uses HSV color model to remove shadow and illuminated pixels from the subtracted image. The algorithm in [9] proposed a multimodal adaptive background subtraction method for object detection, which takes care of the usual affection such as changing illumination, occlusion, clutter and irrelevant extraneous movements, but it has such a heavy load of parameters since the background model change adaptively over time.

CCTV cameras are important for surveillance applications at bus, train station airports and shopping centers. For the camera operators, however, it is laborious to track and trace People over multiple cameras. In this paper, we present a semi-autonomous system for real-time tracking and fast interactive retrieval of persons in video streams from multiple surveillance cameras. The primary focus of this paper is to discuss an innovative technique for detection of human behavior in different public places like bus, railway station, super mall for security and safety.

Tracking require the location and/or shape of the object in every frame. There are three key steps in video analysis, first detection of moving objects, second is tracking of objects from frame to frame and third analyzing the object tracks to recognize their behavior. For detection and tracing the object use canny edge detector. For more accurate tracking we subtract the background from the frame using the Nearest Neighbor (NN) algorithm. The Nearest Neighbor algorithm uses the distance between the object and the background to subtract it. For identify skin color use blob detector. For the identified object a bounding box is built. By DML algorithm we can track the object. This paper deals with enumerating the steps involved in the process of to detect problematic situations or unusual behavior of human.

METHODS BASED ON OBJECT TRACKING

The human object is captured; a data base about the pixel values are trained to the system.Video Camera is fixed at a required place where security is needed. Whenever human movement is captured by the camera it is immediately detected and the object is tracked by background subtraction method.In the area of moving object detection and tracking, a technique robust to background dynamics using background subtraction with adaptive pixel-wise background model update is described.Two type of technique are used for moving object detection. Background subtraction,Decolor Technique. DECOLOR performs object detection and background estimation simultaneously with a training sequences.

A. Background Subtraction Technique

Background subtraction is a widely-used concept utilized to detect moving objects in videos taken from a static camera. In the last two decades, several algorithms have been developed for background subtraction and were used in various important applications such as visual surveillance, sports video analysis, motion capture, etc. Various statistical approaches have been proposed to model scene backgrounds. We consider a background the pixels of image without motion and a foreground of pixels with motion. Then the simplest background model assumes each background pixel his brightness varies independently with normal distribution. Then we can determine our statistical model of background by accumulating several dozens of frames and there squares.[4]
Background subtraction is a widely used for detecting moving objects. The ultimate goal is to "subtract" the background pixels in a scene leaving only the foreground objects of interest. If one has a model of how the background pixels behave the "subtraction" process is very simple Background subtraction usually consists of three attributes besides the basic structure of the background model, background initialization background maintenance (updating the background model to account) and foreground/background pixel classification.[4]

I. *Background Subtraction Algorithm*
The four major steps in a background subtraction algorithm are,
1. Pre-processing, 2. Background modelling, 3. Foreground detection and 4. Data validation.

II. *Frame Differencing*
Frame differencing involves the following steps:
1. Estimate the background for time t. 2. Subtract the estimated background from the input frame. 3. Apply the threshold (Th), to the absolute difference to get the foreground mask.

B.Edge detector technique:

I.Canny edge detector:
The canny edge detector is used to identify the edges of the object and their traces to detect the object. It is the most common and frequent method used for the object detection for its curve let transforms property. It determines the edges of the object more accurately than other operators.Because of the canny edge detector is susceptible to noise in raw unprocessed image data, it uses a filter based on a Gaussian, where the image is convolved with a Gaussian filter. The result will be a blurred version of the original which is not affected by a single noisy pixel to any significant degree. An edge in an image may point in various directions, so the canny edge algorithm uses four filters to detect vertical, horizontal,and diagonal edges in the image.[4]

The Canny operator works in a multi-stage process. First of all the image is smoothed by Gaussian convolution. Then a simple 2-D first derivative operator (somewhat like theRoberts Cross) is applied to the smoothed image to highlight regions of the image with high first spatial derivatives. Edges give rise to ridges in the gradient magnitude image. The algorithm then tracks along the top of these ridges and sets to zero all pixels that are not actually on the ridge top so as to give a thin line in the output, a process known as *nonmaximalsuppression*. The tracking process exhibits hysteresis controlled by two thresholds: *T1* and *T2* with *T1* > *T2*. Tracking can only begin at a point on a ridge higher than *T1*. Tracking then continues in both directions out from that point until the height of the ridge falls below *T2*. This hysteresis helps to ensure that noisy edges are not broken up into multiple edge fragments.

Advantages of canny edge detection algorithm.

Less Sensitive to noise: Its uses Gaussian filter which removes noise ata great extent as compared to above filters.

Remove streaking problem: The classical operators' like Robert uses single thresholding technique but it results into streaking. Streaking means, if the edge gradient just above and just below the set threshold limit it removes the useful part of connected edge, and leave the disconnected final edge. To overcome from this

drawback canny detector uses 'hysteresis' technique which uses two threshold values t_lowand t-high as discussed above in cannyalgorithm.

Good localization: LoG operators cannot find edge orientation while canny operator provides edge gradient orientation which results into good localization.

II.Roberts Edge Detector

The Roberts operator performs a simple, quick to compute, 2-D spatial gradient measurement on an image. It thus highlights regions of high spatial gradient which often correspond to edges. In its most common usage, the input to the operator is a greyscale image, as is the output. Pixel values at each point in the output represent the estimated absolute magnitude of the spatial gradient of the input image at that point.

According to Roberts, an edge detector should have the following properties: the produced edges should be well-defined, the background should contribute as little noise as possible, and the intensity of edges should correspond as close as possible to what a human would perceive. With these criteria in mind and based on then prevailing psychophysical theory Roberts proposed the following equations:

$$\text{Yi,j} = \sqrt{xi,j}$$

$$\text{Zi,j} = \sqrt{(yi,j - yi+j,j+1)2 + (yi+1,j - yi,j+1)2}$$

where x is the initial intensity value in the image, z is the computed derivative and i,j represent the location in the image.The results of this operation will highlight changes in intensity in a diagonal direction. One of the most appealing aspects of this operation is its simplicity; the kernel is small and contains only integers. However with the speed of computers today this advantage is negligible and the Roberts cross suffers greatly from sensitivity to noise.

III.Sobel Edge Detector

The Sobel operator performs a 2-D spatial gradient measurement on an image and so emphasizes regions of high spatial gradient that correspond to edges. Typically it is used to find the approximate absolute gradient magnitude at each point in an input greyscale image.Sobel operator is a discrete differentiation operator used to compute an approximation of the gradient of image intensity function for edge detection.

At each pixel of an image, sobel operator gives either the corresponding gradient vector or normal to the vector. It convolves the input image with kernel and computes the gradient magnitude and direction.

As compared to Robert operator have slow computation ability but as it has large kernel so it is less sensitive to noise as compared to Robert operator. As having larger mask, errors due to effects of noise are reduced by local averaging within the neighborhood of the mask.

C.FILTERS

I. Particle Filter

Particle Filter is used to realize the particularly selected object tracking.particle filters methods are asset of on-line posterior density estimation algorithms that estimate the posterior density of the state space by directly implementing the Bayesian recursion equations.Particle filtering is a Monte Carlo approximation to the optimal Bayesian filter, which monitors the posterior probability of a first-order Markov process through the following formula:

$$\int f(x_k)p(x_k|y_{0,\ldots}y_k\ )dx_k \approx \sum_{l=1}^{N} F(X_K^{(L)})\frac{1}{N}$$

ii.Kalman Filter

The Kalman filter possesses many applications in technology. It is an essential part of both military technology and the development of space technology.[**10**] The main function of Kalman Filter is to utilize measurements recorded over time which contain random variations and inaccuracies to generate values that tend closer to the measurement's true values and connected values that resulted from calculations. For

estimating the position of object is performed using the Kalman filter as an estimator. It has been used successfully in different prediction applications or state determination of a system. Kalman filter as a probabilistic prediction method for object tracking. Main problems that can be solved by usingkalman filter in tracking is

- The object can be track if it move beyond the searched region
- Variation factors such as lighting and occlusion which effect the appearance of target.

III.Temporal filtering

Temporal filtering further filters out the erroneous blocks and tracks the object in consecutive frames. Which includes two steps, first is to project the motion vector on the previous frame and filter out the true motion vector and by projecting true motion vector on previous frame the object can be tracked. Second step includes correlating the DCT of two matched object and further reducing the false alarm.[15].Followed by last step of frequency analysis which distinguish real object from false alarm.

1) Motion vector projection and estimating motion vector reliability
Since motion estimation is performed from a coding point of view, MVs do not always capture actual motion, but can contain a lot of noise. To reduce the effect of noisy MVs, we propose to estimate the reliability of MVs based onthe temporally co-located MVs in surrounding frames.

2) Correlation between DCT values of object detected in previous and current frame

Table 1 - Comparison Table:

Author	Date	Method /Algo	Conclusion
Won-Ho Kim, NuwanSanjeewaRajasooriya	International Journal of Computer, Information, Systems and Control Engineering Vol:7 No:9, 2013	Human object detection algo (difference image generation,binary image generation,moving human object segmentation)	Only can detect the human
B.S.M.MADHAVI, M.V.GANESWARA RAO	May-June 2012, IOSRJECE	1)Background subtraction method (background image initialization ,background update,occlusion detection) 2)Moving object detection(moving object extraction,reprocessing, extraction of moving human body	Only can detect the human
Shashank Prasad, Shubhra Sinha	2011 IEEE	Object detection,objectrecognization,object tracking	Only can detect the object
RishabhRai	April, 2013,ijird	Face Detection, YCbCr Model, Skin Segmentation	Only can detect the face
Ridhi Jindal, Anuj Gupta	November 2013,ijarcsse	Skin Filter , Face Detection from Skin Regions	Only can detect the face

S. Mahendran, D. Vaithiyanathan and R. Seshasayanan,	International conference on Communication and Signal Processing, April 3-5, 2013	Distance Metric Learning (DML), Nearest Neighbor (NN) classifier, Blob Detector, Bounding Box, Region Props feature extraction.	Only can detect the human
Amedome Min-DianeyKodjo, Yang Jinhua	2012 International Conference on Optoelectronics and Microelectronics	motion detection, motion tracking, image acquisition	Only can detect the moving object

V CONCLUSION

In this paper, human motion detection and tracking for real time security system was formulated.. The object is detected from the live video and tracked using background subtraction, this system is proposed for real-time security purpose. It is mainly applicable in banks, jewellery shops, military etc. Object detection is made efficiently using the background subtraction technique and DML Bysian Algorithm try to reduce frame rate and this system works on skin color the black and white video can be used but when the background is similar then we try to detect the object. This system increases the efficiency and reduces the cost and total time consumed. Thus the real-time security system is built efficiently in many applications

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Review on: Privacy Preserving and Verification of Integrity Threat by TPA of Shared Data in Cloud

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Abstract: The Cloud computing is a recent technology which provides various services through internet. The Cloud server allows user to store their data remotely on a cloud storage and enjoy on-demand services and application from the configurable resources.without worrying about correctness & integrity of data From anywhere at any time. In cloud computing, data owners host their data on cloud servers and users access that data from cloud server. Due to outsourcing of data on cloud many security challenges occurs. The auditing protocol must be required to check the data integrity in the cloud. Cloud also provides efficient solution for sharing resources among the group. In a group, every member is able to host their data and access data stored by another group member. Owner of data is able to add new users in the group. Identity of user preserved from third party auditor. There are many internal and external threats, which affect on cloud data storage. Every time it is not possible for a user to download all data and verify integrity, so in this paper we proposed system named Privacy Preserving And Verification Of Integrity Threat By Tpa Of Shared Data In Cloud.

Keywords— Cloud Computing, Cloud Data Storage, Public Auditability, Data Auditing, Dynamic Data, Batch Auditing.

I-Introduction

The construction of cloud and storing data on it has a remarkable benefits. It facilitates the authenticated and authorized cloud users to access huge resources that are outsourced and shared on the cloud. Whenever required, the user can request and gain the access (only, if the users' credentials are validated [4]) to the resources in an easy way and at low cost, irrespective of the user locality. Also, cloud computing takes away the expenses that are spent on installing all hardware and software.Cloud computing paradigm allows users to rent the resources based on their needs and pay them as per the use. Despite of all these benefits, cloud computing still a faces broad range of challenges which forbid the successful implementation of the cloud. These include both the traditional as well as cloud security challenges . Specific to cloud computing, the issues are many, of which some are: identity management of cloud users, multi-tenancy support, securing the security of applications, preserving privacy of the users, attaining control over the life cycle of outsourced data, etc. Among which, the issues related to privacy preserving are alone looked at in this survey.

Privacy preserving is used to provide an trusted service sends does not reveal the key and the data that an trusted customer sends in response to an auditor that follows the protocol (honest, but curious) does not reveal the key. Security in cloud computing can be achieved in several ways as authentication, integrity, confidentiality. Data integrity or data correctness is another security drawback that needs to be considered. Preserving the privacy of user, his identity and data in the cloud is very mandatory. With the rise in growth of cloud computing, the concerns about privacy preserving are also getting increased [3]. Several methods have been put forward to tackle this issue of privacy preserving. This work

studies few of those approaches and provides a brief overview. It is important that the privacy of the user data has to be preserved anytime and anywhere. So, the work takes us in both tracks: preserving the privacy of the data as well as preserving the integrity of data. While we prefer some third party auditing to assure the data correctness.But reaching the peak in providing and assuring privacy-preserved data access in cloud is yet in progress and still needs much attention to attain the goal.

A. **Challenges in the cloud data storage security are:**

• Snooping: Snooping is to steal a look into others private data. The efficient way to send and retrieve the data over a secure communication line.

• Cloud Authentication: The clients can acquire's others authorization and may try to delete the data. So it is necessary to guard one's unique authorization. The unauthorized clients must not be log in to others account and delete the data.

• Key Management: The cryptographic keys has to be managed in the cloud environment but this key management must be user friendly.

• Data Leakage: Data leakage takes place when data is transmitted between the user and the cloud server. The best way to protect is to encrypt the data from owner's side.

• Performance: An resilient security approach is necessary for encrypting as well as decrypting the data to and from the cloud but it should keep the user's performance integral.

B. major goals of proposed schemes are.

- 1 The User needs to use best encryption method.
- 2 Secure key management.
- 3 Supple access right managements.
- 4 Light weight integrity verification process for verifying the unauthorized change in the original data without need of local copy data [2].

The proposed scheme uses symmetric encryption which provides confidentiality, integrity, verification with low cost. It also provides enquiry for data owner and access control through which only authorized user can access the data. CSP may hide data loss or damage from users to maintain a reputation. To achieve security, we can handover our data to a third outsource party who will be assigned a task of identify the correctness and integrity of the cloud data. Hence Third party auditor (TPA) will check the data stored on the cloud based on the user's request.

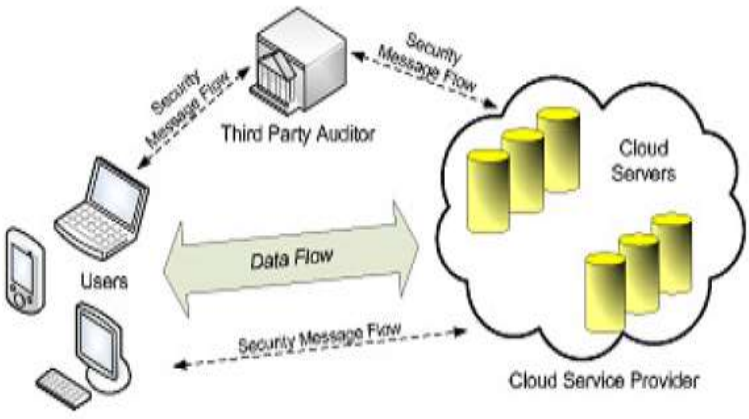

Fig.1: The framework of cloud data storage [1].

Fig.1.show the architecture of cloud storage where the cloud user (U), who has huge amount of data files to be stored on the cloud; the cloud server (CS), which is handled by cloud service provider (CSP) to provide data storage service and has considerable storage space and computation resources the third party auditor (TPA), who has expertise and capabilities that cloud users do not have and is authorized to assess the cloud storage service security on behalf of the user upon request [1] [10].

We cannot achieve privacy; TPA can see the actual content stored on a cloud during the verifying phase. TPA itself may distribute the information stored in the cloud which violate security concept. To avoid the violation of security, Encryption technique is used where data is encrypted before storing it on the cloud. Hence using auditing with zero knowledge privacy technique where TPA will audit users data without seeing the contents. It uses existing public key based homomorphic linear authentication (HLA) [5] that allows TPA to perform auditing without requesting for user data. It reduces communication and computation overhead.

II. LITERATURE SURVEY

A. MAC Based Solution

It is used to verify the data. In this, user uploads the data blocks along with their MAC to CS and provides its secret key SK to TPA. Afterward the TPA will randomly retrieve data blocks & Mac uses secret key to check correctness of stored data on the cloud. Various issues with this system are listed below as [11]

- It introduce an additional online burden to users due to limited use (i.e. Bounded usage) and stateful verification.
- Communication & computation complexity
- TPA requires familiarity of data blocks for verification
- restriction on data files to be audited as secret keys sk are limited
- After usages of all possible secret keys, the user has to download all the data again and recomputed MACfor each data block & republish it on CS.
- TPA should preserve & update states for TPA which is very difficult
- It does not work with dynamic data ie it works only for static data.

B. HLA Based Solution

It supports efficient public auditing without retrieve data block. It is aggregated and required stable bandwidth. It is possible to calculate an aggregate HLA which authenticates a linear combination of the individual data blocks [11].

C. Provable Data Possession

G. Ateniese et al., used a provable data possession with homomorphic verifiable tags [6]. It allows the verification of data without retrieving it from the original source. The model generates probabilistic proofs of possession by sampling random set of blocks of data from the server, which reduce the cost.

The homomorphic verifiable tags computes multiple file blocks which can be combined to form a single file. The client pre-computes the tags and the tags are stored in the Third Party Auditor for verification. The modified file is stored in the server storage. The verification process is done in the requested style generated by the client.

It performs well and supports blockless verification. Its client/server computation is in O (1). Verification and communication takes time. It does not consider the privacy protection of the user's data against the external auditors

D. Dynamic Provable Data Possession

C. Erway, A. Kupcu, C. Papamanthou, and R. Tamassia,Dynamic Provable Data Possession (DPDP) [7]. PDP is mostly applicable for static files. The DPDP is an updated version of the PDP where it supports the updates while storing the data. It can append, modify, or delete the existing blocks of files. This scheme uses rank information to organize the dictionary entities. It supports the verification of files for different users and does not need to download the whole file for verification. It also explains the security and blockless verification of DPDP. Its hashing schemes use ranks based RSA trees. The experimental results show that the block size minimizes the communication and computational overhead.

E. Proof-of-Retrievability System

In this paper A.Juels et al., defined the PORs [8] as using an archive or a backup to help the verifier retrieve the file in the target easily. The user can easily retrieve the file from the backup. The POR is viewed as a kind of cryptographic proof of knowledge (POK), which can support large files. POR protocol reduces the communication cost because it doesn't need to access the file from the server, it can easily be accessed from the archive. This PORs is an unusual security formulation.

The main goal of PORs is that they are used to check the file without downloading the files. It also provides quality of service. Here the pre-processing takes time i.e., encoding the file F is required before storing to the prover. At the time of encoding sentinels are randomly added in specific positions, to constitute the contents of a POR. These sentinels can also retrieved by using the PIR, and it can be reused. It does not consider the privacy of the data against the external auditors. It has computational overhead.

F. Compact Proofs of Retrievability System

H. Shacham and B. Waters [9], in a proof-of-retrievability system, a data storage center must prove to a verifier that he is actually storing all of a client's data. The central challenge is to build systems that are both efficient and provably secure — that is, it should be possible to extract the client's data from any prover that passes a verification check. In this paper, we give the first proof-of-retrievability schemes with full proofs of security against arbitrary adversaries in the strongest model, that of Jules and Kaliski. Our first scheme, built from BLS signatures and secure in the random oracle model, features a proof-of-retrievability protocol in which the client's query and server's response are both extremely short. This scheme allows public verifiability: anyone can act as a verifier, not just the file owner. Our second scheme, which builds on pseudorandom functions (PRFs) and is secure in the standard model, allows only private verification. It features a proof-of-retrievability protocol with an even shorter server's.

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We express our sincere thanks to all the authors, whose papers in the area of cloud computing security and auditability aspect which are published in various conference proceedings and journals.

CONCLUSION

We have proposed a privacy-preserving and Verification Of Integrity Threat by Tpa of Shared Data In Cloud. for securing data storage in cloud computing. Our system is suitable for providing integrity as well as preserving privacy of customers important data from unauthorized access. We supports insertion, modification and deletion of data at the block level, and also supports public verifiability. This scheme is proved to be safe against untrusted server. Privacy of user data is also preserved against third party auditor. This paper focuses on more effective and distributed two level security scheme to address the data storage security issue in cloud computing. As it is based on the symmetric cryptography for protecting user data including encryption prior to storage, user validation procedures prior to storage or retrieval, and building secure channel for data transmission, this method achieves the Reliability, Authenticity and Integrity of the cloud data. This approach of security model is expected to provide more security to user's data in cloud computing during storage and against unauthorized data modification attacks.

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Vibration Analysis of Circular Plate Having Radial Crack by Experimental and FEM analysis

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Abstract— This paper deals with vibration analysis of circular plate having radial crack in it. The plate is of Alluminium (A-2024) and Steel (AISI 304) material. For testing of plate two-boundary condition are chosen namely: 1. Simply Supported and 2.cantilever boundary condition. The plates are crack with different crack ratios (*c/a*) such as 0.2, 0.4, 0.6, 0.8 and 1.0 (no crack in plate). Then the plates fabricated according to dimensions and crack ratios. The plates are analyzed by using FEM software, find out the natural frequencies for different boundary conditions, and crack ratios. Then same plates analyzed experimentally by using FFT analyzer.
Keywords— Circular Plate, vibration, Radial Crack

INTRODUCTION

The problem of the plate is important since such components are frequently used in engineering applications where dynamic excitation may occur. For this reason, some literature on the subject is discussed in the useful review works by Arthur W. Leissa [1]. However, there is relatively little work reported on the plates with crack. Flat Circular Plates are widely used in practice and they have conspicuous role in the theory of acoustics and vibration. They are common in many structures such as architectural structures, pavements, containers, airplanes, ships, instruments, machine parts such as turbine disks/blades, bulk heads in submarines and airplanes, etc. Because of their distinct advantages, thin plates are extensively use in all fields of engineering [2].

In this paper the circular plate is of aluminium (a-2024) with Young's Modulus of 70 GPa , Poisson's ratio 0.3 , density 2770 kg/m^3 and Steel (AISI 304) with Young's Modulus of 204 GPa , Poisson's ratio 0.33, density 7860 kg/m^3. The plate is of 250mm in diameter and 3mm thick. Two boundary conditions are taken for analysis of plates simply supported and cantilever. The plates were manufacture according to the crack ratios (*c/a*), 'c' is the crack length and 'a' is the radius of the plate. The crack in the plate having length of 25mm, 50mm, 75mm ,100mm and one plate without crack for comparing result. For each crack length and boundary condition find out the natural frequencies are found out by using FEM software such as ANSYS by creating model of the plate in ANSYS and results are compared with the experimental results.

STATEMENT OF PROBLEM

The main objective is to find out the change in the natural frequencies of the plate when the crack size in the circular plate increases. Two boundary conditions used to find out the natural frequencies of the plate with change in crack ratios.

For this study a simply supported and cantilever circular plate of AISI 304 Steel and a-2024 Alluminium with a radial crack originating at the circumference of radius '*a*', thickness '*h*' and edge crack radius '*c*' are considered. The geometry of the plate is shown in Fig 1. The crack is said to be increasing towards the center from the edge of the plate. Therefore different crack ratios (*c/a*) are considered such as 0.2 (c-25), 0.4 (c-50), 0.6 (c-75), 0.8 (c-100), 1.0 (without crack).

FINITE ELEMENT METHOD

Due to geometry of the figure, it is very complicated process to find out the natural frequencies by analytical method. So, numerical methods are used to solve these partial differential equations. One of the most used techniques in engineering is Finite Element Method. ANSYS is the popular software uses Finite Element Technique.

First we have prepared the model in CATIA V5R15 software. So, the total plates are 10 in nos. The plates can be prepared for 5 crack ratios, namely; plate without crack (i.e. Crack ratio c/a 1.0), plate having distance of crack from the center of plate 100mm (Crack ratio c/a 0.8), plate having distance of crack from the center of plate 75mm (Crack ratio c/a 0.6), plate having distance of crack from the center of plate 50mm (Crack ratio c/a 0.4), plate having distance of crack from the center of plate 25mm (Crack ratio c/a 0.2) i.e. it is highest crack size in plate.

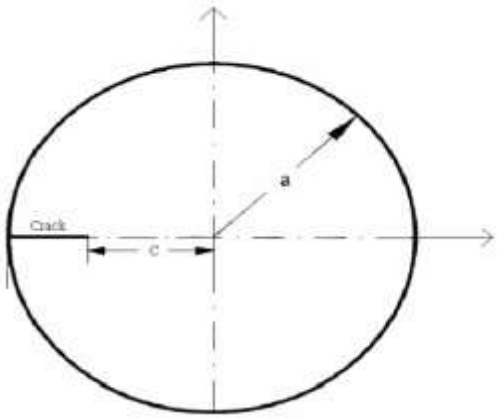

Fig. 1 Geometry of Plate

The prepared model plates are imported into the ANSYS software for obtaining the simulation results. The element type chosen is SOLID95 because SOLID95 is a higher order version of the 3-D 8-node solid element SOLID45. It can tolerate irregular shapes without as much loss of accuracy. SOLID95 elements have compatible displacement shapes and are well suited to model curved boundaries. The element is defined by 20 nodes having three degrees of freedom per node: translations in the nodal x, y, and z directions. The element may have any spatial orientation. SOLID95 has plasticity, creep, stress stiffening, large deflection, and large strain capabilities. Figure 2 shows the plate model mesh in ANSYS. Fine mesh is given in crack area to get accurate result. The results of the ANSYS analysis are shown in Table no. 1

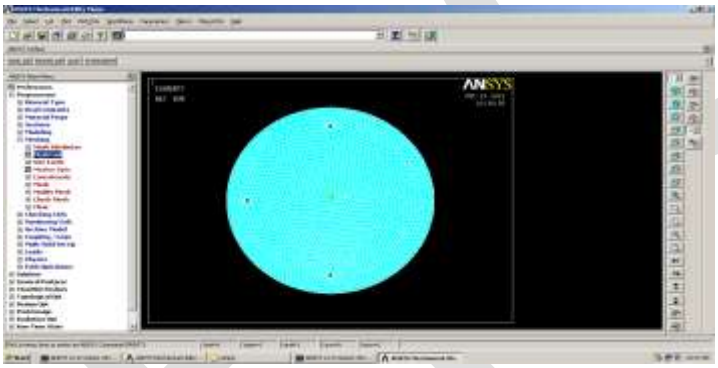

Fig.2 Circular Plate model mesh in ANSYS

EXPERIMENTAL METHOD

The experimental work conducted on FFT (Fast Fourier Transform) Analyzer. Here we use multichannel FFT (4-channel). One channel connected to exciter i.e. to the hammer and other connected to the sensor. During testing, the hammer struck on the plate to get the natural frequency peaks of the plate. The same procedure repeated for other plate. The results of experimentation are shown in Table no.1.

EXPERIMENTAL SETUP

The typical experimental setup is shown in Fig 3 and fixture for clamping of plate and FFT analyzer. The setup consists of hammer, sensor, and FFT analyzer and for display of result laptop. The FFT is multichannel (4 channel) one channel for hammer and one for sensor. The plates excited by hammer and the peak of natural frequency measured by sensor and display the result on laptop screen. The results of measurements are auto generated by FFT software in MS-Word format.

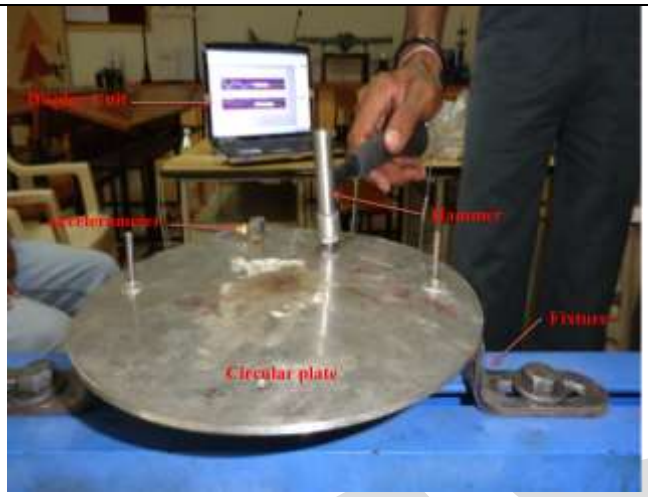

Fig. 3 Experimental Setup for Steel Plate

RESULTS

For AISI 304 steel plate the Young's modulus E=204 GPa, density ρ=7860 kg/m3, Poisson's ratio υ = 0.33, radius a = 0.125m, and thickness h = 0.003 m, without crack (c/a 1.0) simply supported the natural frequency ω for first mode by FEM is 120.74 Hz and by FFT 116.69Hz, Similarly for a-2024 alluminium plate, Young's modulus E = 70 GPa, density ρ=2770 kg/m3,Poisson's ratio υ = 0.3 , radius a = 0.125m, and thickness h = 0.003 m, without crack simply supported the natural frequency ω for first mode is 118.76 Hz and by FFT 112.07 Hz. If the crack initiates in steel plate simply supported case (c/a 0.8) the plate vibrate with higher natural frequency and it goes up to 630.34 Hz for third mode and similar condition seen in alluminium plate but it less vibrate as compare to steel plate.

The steel plate without crack (c/a 1.0) in cantilever case the natural frequency ω for first mode by FEM is 41.682 Hz and by FFT 37.69 Hz, Similarly for alluminium plate without crack (c/a 1.0) cantilever case the natural frequency ω for first mode by FEM is 40.939 Hz and by FFT 39.57 Hz. As crack increases in alluminium plates i.e. for different crack ratios of plate c/a 0.8, c/a 0.6, c/a 0.4, c/a 0.2 the natural frequencies are somewhat decreases and for highest crack size in plates they are increases. For without crack and for highest crack size in plates the difference between natural frequency ω is 0.99 % for alluminium plate and for steel plate it is for different crack ratios of plate c/a 0.8, c/a 0.6, c/a 0.4, c/a 0.2 the natural frequencies are decreases as crack increases in plate.
Finally, it is seen that the natural frequencies are decreases as crack increases in plate. This is due the stiffness of plate decreases. The plate will vibrate for lower natural frequencies ω. The results are tabulated below

	Steel Plate Simply Supported Condition															
	Frequency (Hz)															**% Ave.**
MODE NO. ↓	*c/a*-0.2			*c/a*-0.4			*c/a*-0.6			*c/a*-0.8			*c/a*-1.0			
	FEM-0.2	FFT-0.2	**% change**	FEM-0.4	FFT-0.4	**% change**	FEM-0.6	FFT-0.6	**% change**	FEM-0.8	FFT-0.8	**% change**	FEM-1.0	FFT-1.0	**% change**	
1	120.74	116.69	**3.35**	121.85	119.94	**1.56**	123.07	118.56	**3.66**	208.82	201.31	**3.59**	124.45	129.74	**-4.25**	**1.58**
2	167.64	164.15	**2.08**	170.07	166.90	**1.86**	172.37	169.71	**1.54**	292.94	291.48	**0.49**	174.65	170.65	**2.25**	**1.64**
3	210.76	205.99	**2.26**	274.00	271.06	**1.07**	344.15	338.75	**1.56**	630.34	627.15	**0.50**	378.98	380.79	**-0.47**	**0.98**
Steel Plate Cantilever Condition																
	Frequency (Hz)															**% Ave.**
MODE NO. ↓	*c/a*-0.2			*c/a*-0.4			*c/a*-0.6			*c/a*-0.8			*c/a*-1.0			
	FEM-0.2	FFT-0.2	**% change**	FEM-0.4	FFT-0.4	**% change**	FEM-0.6	FFT-0.6	**% change**	FEM-0.8	FFT-0.8	**% change**	FEM-1.0	FFT-1.0	**% change**	
1	41.682	37.69	**9.58**	41.680	40.25	**3.43**	41.654	39.57	**5.00**	41.664	38.56	**7.45**	41.770	39.57	**5.27**	**6.14**
2	70.431	67.41	**4.29**	72.911	68.35	**6.26**	73.983	70.23	**5.07**	74.476	69.29	**6.96**	74.479	73.91	**0.76**	**4.66**
3	150.29	146.48	**2.54**	151.33	146.56	**3.15**	151.05	146.48	**3.03**	151.58	154.85	**-2.16**	150.94	145.54	**3.58**	**2.02**
Aluminum Plate Simply Supported Condition																
	Frequency (Hz)															**% Ave.**
MODE NO. ↓	*c/a*-0.2			*c/a*-0.4			*c/a*-0.6			*c/a*-0.8			*c/a*-1.0			
	FEM-0.2	FFT-0.2	**% change**	FEM-0.4	FFT-0.4	**% change**	FEM-0.6	FFT-0.6	**% change**	FEM-0.8	FFT-0.8	**% change**	FEM-1.0	FFT-1.0	**% change**	
1	118.76	112.07	**5.63**	119.78	117.94	**1.53**	120.94	115.75	**4.29**	121.83	117.62	**3.45**	122.26	118.56	**3.02**	**3.58**
2	164.75	160.40	**2.64**	167.16	162.27	**2.92**	169.42	163.21	**3.66**	170.97	171.58	**-0.35**	171.63	169.71	**1.11**	**1.99**
3	208.23	201.31	**3.32**	271.01	264.00	**2.58**	340.22	331.01	**2.70**	369.41	367.57	**0.49**	373.87	371.48	**0.63**	**1.99**
Aluminum Plate Cantilever Condition																
	Frequency (Hz)															**% Ave.**
MODE NO. ↓	*c/a*-0.2			*c/a*-0.4			*c/a*-0.6			*c/a*-0.8			*c/a*-1.0			
	FEM-0.2	FFT-0.2	**% change**	FEM-0.4	FFT-0.4	**% change**	FEM-0.6	FFT-0.6	**% change**	FEM-0.8	FFT-0.8	**% change**	FEM-1.0	FFT-1.0	**% change**	
1	40.939	39.57	**3.34**	40.829	38.63	**5.38**	40.805	39.32	**3.63**	40.808	36.75	**9.94**	40.909	41.37	**-1.12**	**4.23**
2	69.677	62.42	**10.41**	71.917	68.35	**4.95**	72.949	68.35	**6.30**	73.412	68.35	**6.89**	73.685	69.29	**5.96**	**6.90**
3	150.71	146.56	**2.75**	150.80	145.63	**3.42**	150.64	146.48	**2.76**	151.04	147.42	**2.39**	150.43	147.42	**2.00**	**2.66**

Table 1 Percentage change in FEM and FFT result of Steel and Allunimium Plates

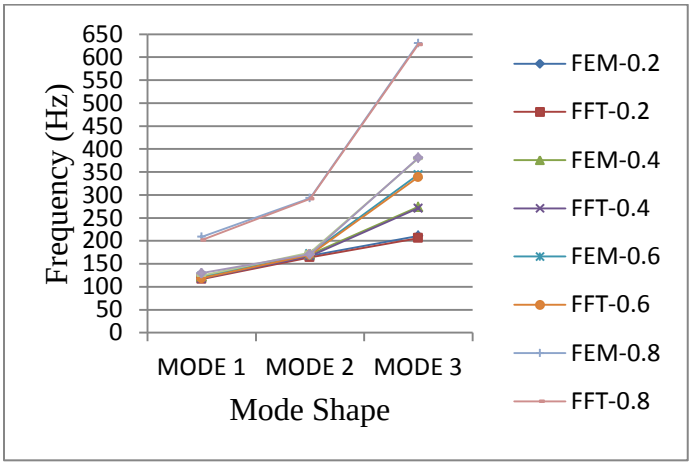

Fig. 4 Steel Plate Simply Supported Condition for different crack ratios of plate

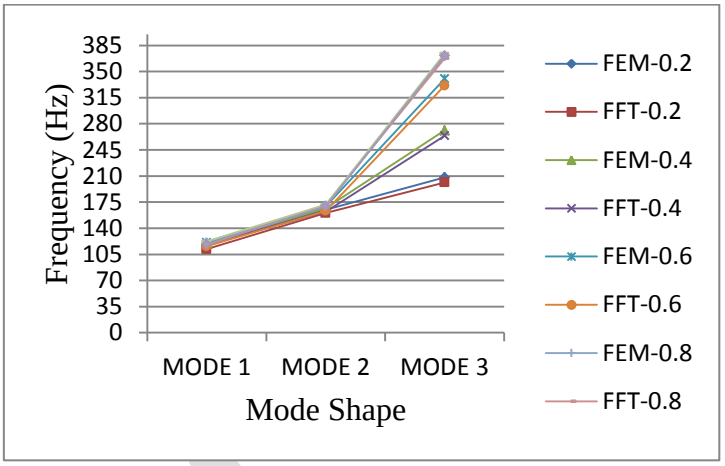

Fig. 5 Alluminium Plate Simply Supported Condition for different crack ratios of plate

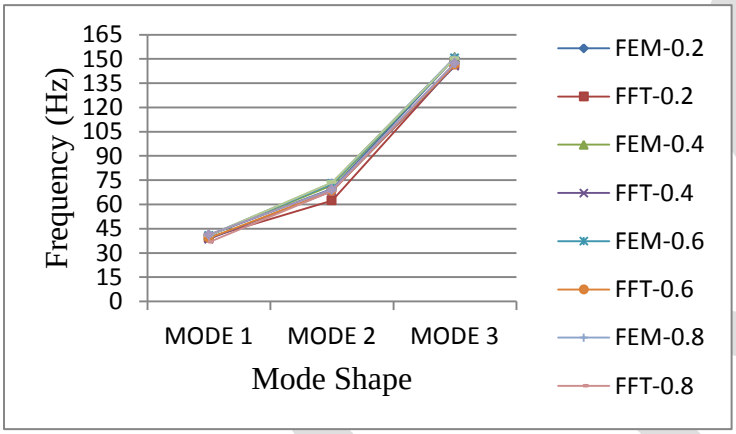

Fig. 6 Alluminium Plate Cantilever Condition for different crack ratios of plate

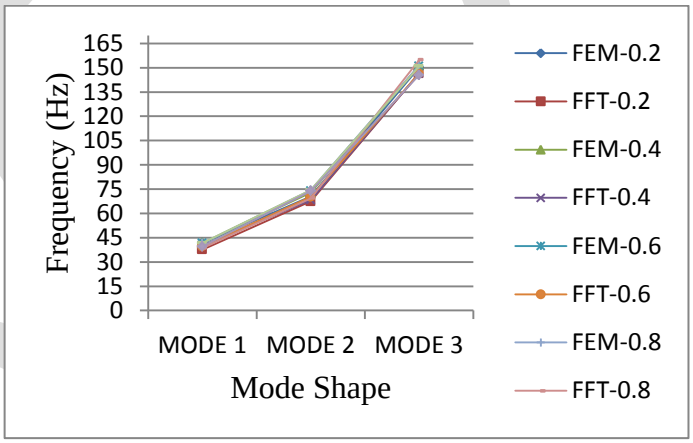

Fig. 7 Steel Plate Cantilever Condition for different crack ratios of plate

CONCLUSIONS

Based on classical plate theory, the vibration analysis of edge cracked circular plate is provided. The analysis results are determined experimentally and numerically by mode shapes. The maximum error of natural frequency is in the range of 1 % to 10 % and average error in the range of 0.9% to 6.9%.

In this study, the natural frequencies are determined for different crack ratios. It is found from graph that as crack increases the natural frequencies somewhat increases and decreases for steel cantilever plate, bur from graph of steel simply supported plate it is seen that natural frequencies decreases as crack in the plate increases. However, for an instance for crack ratio 0.2 of steel simply supported condition the natural frequency increases predominantly and then decreases. As move towards the aluminum plate, the natural frequencies are decreases as crack ratio increase for both cantilever and simply supported condition.

It is observe that when the value of ω is equal to the natural frequency of plate resonance occurs. We can find the difference between the two cases of AISI 304 stainless steel plate and a-2024 aluminum plate.

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Study on Pattern Revealing in Text Mining

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Abstract: Today most of the data available in the digital form. In the past lots of people using the phrases related to the hypothesis to the document of the information and topic should be performing better result of the terms. In this paper we use the more important point include in the data mining method and this method give the better improve the effectiveness or performance of the patterns also in that we implementing the pattern detection method these are solved the problem of the term based method and give the good result and which is helpful in information retrieval system. This paper present the effective pattern discovery technique which include the process of the pattern deployed and pattern evolving and it will give the better improvement to the effectiveness.

Keywords: Text Mining, Pattern Mining, Pattern Taxonomy, Pattern Evolution.

INTRODUCTION

The growth of the digital data made available in the last few years. The very important point is used in the Information discovery in the data mining technique and data processing has a good deal of the with associate with the close need for turning such that knowledge or basic idea which can be useful into helpful data and knowledge [1]. There are contain the large number of the several applications like business management and market analysis and research and, it will profit by the or the user and employment of the information and information extracted from large amount of the database and outsized quantity of data. That useful in the Information discovery will be viewed or look like a because that method of nontrivial is to be extraction of data from massive or huge amount of the databases, information that is local conferred within the knowledge discovery of the method, in the last part unknown and probably helpful for users. Data mining is to be containing the very important absolutely necessary step within the method of knowledge discovery in databases [4]. There are very important parts which contain the many types of data mining techniques are which represent the used sequential pattern mining and closed sequential pattern etc. this two pattern mining technique are very useful in the data mining. The very important concept is to be a Data mining and they can easy to be allow to the process of retrieving or accessing to the interesting or relevant data knowledge from the huge amount of the database or storage area like database [2]. In this proposed system, contain the very important part is to be discovery of patterns will be done efficient through the very important part is to be pattern evolution and another important part is to be pattern deploying technique [3]. And this technique useful in the system and it will not only find the useful patterns but also efficiently use the and update them and to be find the requirement of the relevant data and important requirement of the interesting information from the database. Always very difficult to solved the problem of low frequency and misinterpretation. In that the system is supposed to develop the concept of the knowledge discovery model and this model handle the problem and they can efficiently use and easy to update and understand the patterns [1].

LITERATURE SURVEY

Study on Phrase Based Approach

In these phrases based method contains the huge amount of data and occurs the number of the problem in the term. In this we assume that phrase-based method give better result to the term based method [1][3], that why always phrases may carry more semantic meaning like contain the huge amount of information. We know that phrases are always handles the small ambiguous and large types of discriminative or information than individual terms, there are some reasons for the discouraging performance include:
1) In that Phrases always contain the inferior statistical number of the properties to terms,
2) In this Phrase based always problem arias on the low frequency in the operation handling.
3) the most big problem arises of the Phrase based is the huge or large numbers of redundant or repeating and noisy or bugs phrases [1]

1. Feature Selection and Feature Extraction for Text Categorization

In this we study the effect of selecting problem varying numbers and related kinds of information features for use in the predicting large number of the category of the membership was investigated on the large number of the Reuters and MUC-3 which contain the number of the text categorization with the data sets [4]. And Good categorization performance the good achieved using a

large number of the statistical classifier and require. the proportional assignments of the strategy and method of the feature selection and feature extraction. In that important optimal feature set size for word- based indexing was found to be surprisingly low between the 10 to 15 features contain the large training sets or huge data. And extraction of large number of the new text features by syntactic analysis and generating the feature clustering was investigated on the number of the Reuters data set are to be contain in the data [2]. The Syntactic indexing phrases are very important things which use in the feature, and contain the clusters of this number of the phrases, and also contain the clusters of words and these are always present on the data were all found and provide the less or small effective representations than of the individual words or single word[5]. In that we use the indexing language which is very useful and used to represent the number of texts influences how they can handle the problem in the easily and effectively a text categorization system can be built, also which can be builds whether the system is built by human engineering and statistical training, or a combination of these two main part. The important things that are to be simplest indexing languages are very impotent which are formed by treating each word as a requirement of the feature. These are very important words which contain the same amount of the properties, such as synonymy and polysemy that make them a less than ideal indexing language. Synonymy which share the same meaning and polysemy which share the two or more different meaning that contains [5].

Study on Pattern Based Approach

1. Identifying Comparative Sentences in Text Documents

In this paper we study the number of problem is to be identifying in the sentences in the large number of text documents. In that contain the problem is related to the text document arises quite opinion and identification of the sentence or classification. In this sentiment classification studies the large number of problem of classifying a number of documents or a sentence based on the opinion of the author [3]. An the large number of important application area of the sentiment and opinion identification is business intelligence as a large number of the product manufacturer always needs to the consumers' related require opinions on the requirement of the user products or component. The differentials on the different method or other hand can be related to the subjective or objective requirement. Furthermore, a comparison is not only concerned with an object in isolation. Instead, it also compares the object with number of the others product. In this pattern based approach tells the identifying is the comparative sentences is also very useful in practice and understanding of the problem because direct comparisons are always very important thing perhaps to the one of the most convincing way to the author ways of evaluation, which may be more powerful than opinions on the each related individual object [3][2].

Study on Keyword Based Approach

In this Keyword based contain the bag of words scheme is a typical nothing but keyword based representation in the area of information retrieval. The main disadvantage of the keyword based is that relationship among word cannot be reflected. And another problem are coming that considering single word as a feature is the semantic ambiguity which contain the two part Synonyms and homonym [3].

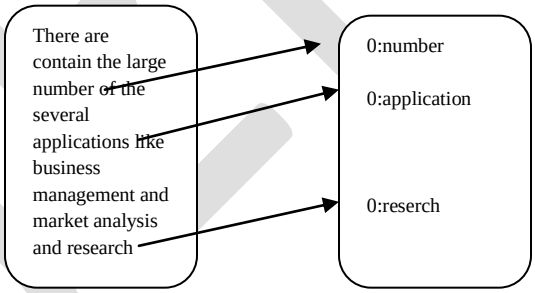

Figure 1: Bag of word

PROPOSED SYSTEM

1. In this problem we use the An effective pattern discovery technique is to discovered the problem.
2. And the next is to be Evaluates of the patterns and then evaluates term weights according to the number of the distribution of terms in the form of the discovered patterns.
3. Solves Missing value or element of the Problem
4. In this we Considers the influence of the patterns from the negative document of the training for examples to understand find ambiguous or noisy patterns and handle the problem and tries to reduce the influence for the related of the low-frequency problem.
5. In that process of updating number of the related noise or ambiguous and this can provide to the patterns can be referred as pattern evolution.
6. The proposed approach can improve the accuracy of evaluating term weights because discovered patterns are more specific than whole documents.

7. The important point of the In training phase the discovery patterns in positive documents based on a min_sup are found, and another part contain the evaluates term supports by deploying patterns to terms
8. In this Testing Phase to check the revise term supports and containing the document using noise negative documents in D based on an example of the algorithms coefficient
9. The number of the incoming documents then can be sorted in the based on these weights or order in the weight.

Advantages of proposed system:
1. In this proposed method is used to improve the accuracy of the evaluating term weights method.
2. The another part discovered patterns are more useful in the specific than contain the whole documents.
3. Avoid the problem of phrase-based method to the using the very important point is to be pattern-based method.
4. The very useful Pattern mining techniques can be used to find list of the text patterns.

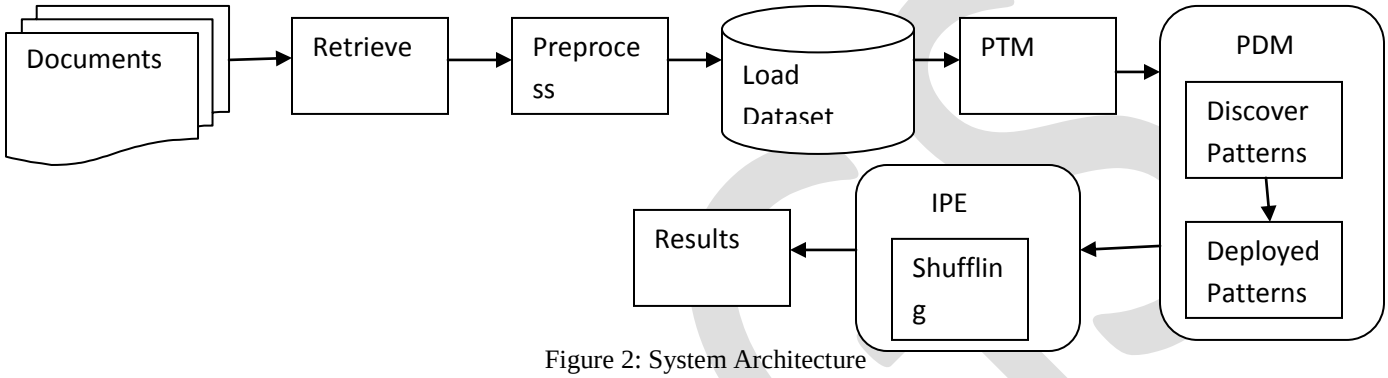

Figure 2: System Architecture

1. Loading document: In this above System Architecture, to load the number of all documents. And this Document is pass to the next step. And the user to retrieve number of the documents. This document is given to next process. That process is name call as preprocessing [3][4].

2. Text Preprocessing: once a completed the load document the next step is that Text Preprocessing. In that retrieved number of document preprocessing is done in module. In this text Preprocessing contain the two types of process is doing one is the stop words removal and second is that text stemming .The meaning of that Stop words are words which are filtered out the prior to, or after, processing of natural language data. And another meaning of the Stemming is the process for reducing inflected or sometimes derived words to their stem base or root form. It generally a written word forms [3][4].

3. Pattern taxonomy process: the third part of the system is the Pattern taxonomy model in this module; the number of documents is split into set of the paragraphs. Each paragraph is considered to be number of document. In each document, the set of terms are extracted. The terms which represent can be extracted from set of positive documents [3][4].

4. Pattern deploying: The second last step is that pattern discovery discovered patterns are summarized. The Deploying with Relevance Method algorithm is used to discover all patterns in positive documents are composed. The term supports are calculated by all terms in Deploying with Relevance Method. Term support means weight of the term is evaluated [3][4].

5. Pattern evolving: the final step is the pattern evolving In this module used to identify the noisy or bugs patterns in number of documents. Sometimes system which give the falsely identified negative document as a positive. So that noise is occurred in positive document. The noised pattern named as offender. If partial conflict offender contains in positive documents [3][4].

USING ALGORITHMS

There list of algorithms are use in the pattern taxonomy
1) SPMining [5]
2) Deploying with Relevance Method
3) Evolving of pattern
4) Shuffling

Algorithm 1. SPMining (PL, min_sup) [5]

Input: A set of nTerms frequent sequential patterns.PL; Minimum support (min_sup).

Output: A set of frequent sequential patterns (SP).

Method:

1) SP ←SP – {Pa ∈SP |∃Pb ∈PL} such that_len (Pa) = len(Pb) -1 ∧Pa ⊂Pb ∧suppa(Pa)= suppa(Pb) } /* pruning */
2) SP ←SP ∪PL /* add found patterns */
3) PL′ ← {∅} /* PL′: set of (n+1) Terms frequent sequential patterns */
4) foreach pattern p in PL do begin
5) Generate p-projected database PD
6) foreach frequent term t in PD do begin
7) P′ ←p ⋈t /* P′: set of (n+1) Terms sequential candidates */
8) If supp (P′) ≥ min_sup then
9) PL′ ←PL′ ∪ P′
10) End if
11) End for
12) End for
13) If |PL′ | = 0 then
14) Return /* no more patterns found */
15) Else
16) call SPMining(PL′, min_sup)
17) End if
18) Output frequent sequential patterns in SP

In this Sequential Pattern Mining Algorithms we use the pruning scheme for meaning that removing the non-closed related pattern during the process of Sequential Pattern discovery. And the main concept is to find the a set of frequent Sequential Pattern in this algorithms [5].

Algorithm 2. Deploying with Relevance Method [1]

Input: a set of positive documents (D^+), minimum Support (min_sup);

Output: New set of terms, a set of vectors (Δ).

Method:

1)Δ← ∅
2) Foreach document d in (D^+), do begin
3) Extract 1Term frequent pattern PL from d
4) SP=SPMining (PL, min_sup) // call Algorithm SPMining
5) $\vec{d} \leftarrow \emptyset$
6) Foreach pattern p in SP do begin
7) $\vec{d} \leftarrow \vec{d} \oplus$p // p' is the expanded form of p
8) End for
9) $\Delta \leftarrow \Delta \cup \{\vec{d}\}$ p
10) End for

In this Deploying with Relevance Method algorithms the main process of it pattern Deploying occurs in the above algorithms and return the output is to the set of vectors [1].

Algorithm 3. Evolving of pattern (Ω, D^+, D^-) [1]

Input: A list of deployed patterns Ω; a list of positive and negative documents, D^+ and D^-

Output: A set of term weight pairs $\vec{d}$

Method:

1.$\vec{d} \leftarrow \emptyset$ // It give minimum threshold Value

2. $\tau \leftarrow$Threshold (D^-)

3. $foreach\ negative\ documents$ "nd "$in\ D^-$ do begin

4. If Threshold ({nd}) $> \tau$ then

5.$\Delta p \leftarrow \{dp \in \Omega |$ termset (dp)$\cap$ nd $\neq \emptyset\}$

6. Shuffling (nd, Δ_p) // call shuffling Algorithms

7. End if

8. foreach deployed pattern dp in Ω do begin

9. $\vec{d} \leftarrow \vec{d} \oplus p$

10. End for

11. End for

In this Evolving of pattern algorithms we take the input A list of deployed patterns Ω; a list of positive and negative documents, D^+ and D^- and it will return a set of term weight pairs $\vec{d}$ also in that we call the Shuffling algorithms.

Algorithm 4. Shuffling (nd, Δ_p) [5]

Input: negative document $nd$and a list deployed patterns Δp.

Output: updated deployed patterns.

Method:

1: foreach deployed patterns dp in Δ_p**do begin**

2: if $termset(dp) \subseteq nd$ then // complete conflict offender

3: $\Omega=\Omega-\{dp\}$

4: else // partial conflict offender

5: $offering = (1-\frac{1}{\mu}) \times \sum_{t \in termset(dp)} \{t.weight | t \in nd\}$

6: base $= \sum_{t \in termset(dp)} \{t.weight | t \notin nd\}$

7: foreach term t in $termset(dp)$ do begin

8: if $t \in nd$ then //shrink offender weight

9 $t.weight = (\frac{1}{\mu}) \times t.weight$

10: else // shuffle weight

11: $t.weight = t.weight \times (1 + offering \div base)$

12: end if

13: end for

14: end if

15: end for

The main purpose of the Shuffling Algorithms is to the assign the weight Distribution to the Terms in the part of the deployed pattern and it will perform the different operation in these Algorithms for the each type of offenders [5].

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CONCLUSION

In this paper, the main issue regarding the pattern based user item information to rank the item features approach is low frequency and misinterpretation. In order to enable an effective clustering process, the word frequencies need to be normalized in terms of their relative frequency of presence in the document and over the entire collection This presents research pattern taxonomy model which includes pattern evolving and deploying method helps in the updating of useful pattern efficiently and the two issues can be solved. It helps in finding the useful information to the user. The inner pattern evolution outperforms the pattern deploying method.

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A study of Dengue Disease Model with Vaccination Strategy

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Abstract— In this paper, we proposed and analyzed the effects of vaccination strategy on the transmission of the Dengue diseases. We propose SIR model with logistic recruitment rate, and analyzed the Steady state and stability of the equilibrium points. If $R_0^* < 1$ then the non- infected steady state P_1^* will be stable. Also if $R_0^* > 1$ then the endemic equilibrium P_2^* is stable. Numerical simulations show that the effect of newborn vaccination is significantly less effective than vaccinating susceptible population. Also the effect of vaccination is to replace multiple outbreaks with a single outbreak.

Keywords— Dengue disease model, Vaccination strategy, Stability analysis, Numerical analysis.

Mathematics Subject Classification - 93D20, 92D30, 65L07.

1. Introduction

Dengue is the most important human viral disease transmitted by arthropod vectors. Annually there are an estimated 50–100 million cases of dengue fever (DF), and 250 000 to 500 000 cases of dengue haemorrhagic fever (DHF) in the world. Dengue infection is classified into three categories: Dengue fever (DF), Dengue hemorrhagic fever (DHF) and Dengue shock syndrome (DSS). DF, DHF and DSS are caused by the four dengue viruses DEN 1, 2, 3, and 4. Infection in humans with one serotype provides life-long immunity to that virus but not to the others. Dengue viruses are maintained in an urban transmission cycle in tropical and subtropical areas by the mosquito *Aedes aegypti*, a species closely associated with human habitation. In some regions other *Aedes* species, such as *Ae albopictus* and *Ae polynesiensis* are also involved.

There are some epidemiological and demographical factors that contribute to the transmission of the disease. From a practical point of view, many countries organized vaccination programs to control the spread of the disease. The effects of vaccination on the transmission of infectious diseases are studied by some researchers [2, 3, 4]. These researchers studied the direct transmitted disease. In our second model we studied the effect of vaccination on an indirect transmitted disease. Recently many researchers [4, 5, 6, 7] studied the vaccination strategy for all type of dengue viruses but it is not perfect. The mathematical models for Dengue Fever found in literature [2, 7, 8] are based on compartmental dynamics. We have also used the compartmental dynamics.

2. Formulation of the model

In this paper we consider the effects of vaccination strategy on the transmission of the Dengue diseases. The model assumes that the host population grows logistically, and has a constant disease death rate. We also assume that the vector population has constant size with birth and death rate equal to μ_V. The host population is subdivided into the susceptible S_H, infective I_H, and recovered R_H classes. The Vector population, due to a short life period, is subdivided into the susceptible S_V, infective I_V. The transmission model for the dengue disease is as follows:

$$\frac{dS_H}{dt} = \mu_H N_H \left(1 - \frac{N_H}{K_H}\right) - \lambda_H S_H \frac{I_V}{N_V} - \mu_H S_H$$

$$\frac{dI_H}{dt} = \lambda_H S_H \frac{I_V}{N_V} - (\gamma + \mu_H + \alpha_H)\mathrm{I}_H \qquad (2.1)$$

$$\frac{dR_H}{dt} = \gamma \mathrm{I}_H - \mu_H R_H$$

For Vector population:

$$\frac{dS_V}{dt} = \mu_V V - \lambda_V S_V \frac{I_H}{N_H} - \mu_V S_V$$

$$\frac{dI_V}{dt} = \lambda_V S_V \frac{I_H}{N_H} - \mu_V I_V \qquad (2.2)$$

The initial conditions

$N_H = S_H + I_H + R_H$ and $S_V + I_V = N_V$

$$\frac{dN_H}{dt} = \mu_H N_H \left(1 - \frac{N_H}{K_H}\right) - \mu_H N_H - \alpha_H \mathrm{I}_H \qquad (2.3)$$

It is convenient to reformulate the model (6.2.4) in terms of population proportion $x = \frac{S_H}{N_H}$, $y = \frac{I_H}{N_H}$ and $z = \frac{I_V}{N_V}$, which are the fractions of the susceptible, invectives and removals, respectively.

Hence the system can be written as

$$\frac{dx}{dt} = \mu_H \left(1 - \frac{N_H}{K_H}\right) - \lambda_H xz - \mu_H x$$

$$\frac{dy}{dt} = \lambda_H xz - My \qquad (2.4)$$

$$\frac{dz}{dt} = \lambda_V (1 - z) y - \mu_V z$$

where $\mathrm{M} = \gamma + \mu_H + \alpha_H$

We consider two types of vaccination, one that is being administered to a portion of new born host and another one is being administered to a portion of susceptible host. The main question here is whether it is enough to vaccine only new born host in order to control the spread of the disease or it is necessary to vaccinate the larger susceptible host [4].

Let a portion ρ, $0 \le \rho \le 1$, of newborn host be vaccinated. Assume that the vaccine is not perfect and assume that the effectiveness of the vaccine is s, and then $(1 - \rho s)\mu_H \left(1 - \frac{N_H}{K_H}\right)$ newborns remain susceptible, and $\rho s \mu_H \left(1 - \frac{N_H}{K_H}\right)$ directly being removed to R_H · The corresponding dynamic equation for x is given by

$$\frac{dx}{dt} = \mu_H(1-\rho s)\left(1-\frac{N_H}{K_H}\right) - \lambda_H xz - \mu_H x \qquad (2.5)$$

and the other two equations in (2.4) remain the same. On the other hand, let a portion σ , $0 \le \sigma \le 1$ of susceptible host be vaccinated. Then the dynamical equation of x and y is as follows:

$$\frac{dx}{dt} = \mu_H\left(1-\frac{N_H}{K_H}\right) - \lambda_H xz(1-\sigma s) - \mu_H x$$

$$\frac{dy}{dt} = \lambda_H xz(1-\sigma s) - My \qquad (2.6)$$

These two cases (2.5) and (2.6) are written on one system as follows:

$$\frac{dx}{dt} = \mu_H(1-\rho s)\left(1-\frac{N_H}{K_H}\right) - \lambda_H(1-\sigma s)xz - \mu_H x$$

$$\frac{dy}{dt} = \lambda_H xz(1-\sigma s) - My \qquad (2.7)$$

$$\frac{dz}{dt} = \lambda_V(1-z)y - \mu_V z$$

In succession by putting $\sigma = 0$ or $\rho = 0$, these two equations (2.6) and (2.7) can be generated. Rescale t by λ_V the system of equations (2.7) simplified to

$$\frac{dx}{dt} = b(1-r)\theta - \alpha xz - bx$$

$$\frac{dy}{dt} = \alpha xz - \beta y \qquad (2.8)$$

$$\frac{dz}{dt} = (1-z)y - \delta z$$

where $\delta = \frac{\mu_V}{\lambda_V}$, $\alpha = \frac{\lambda_H(1-\sigma s)}{\lambda_V}$, $\beta = \frac{M}{\lambda_V}$, $\theta = \left(1-\frac{N_H}{K_H}\right)$, $r = \rho s$, $b = \frac{\mu_H}{\lambda_V}$

3. Steady state and Stability Analysis

Equilibrium points are obtained by setting time derivatives of x, y and z equal to zero then the system(2.8) has two possible equilibria, i.e., the non-endemic equilibrium $P_1^*\left((1-r)\theta, 0, 0\right)$ and the endemic equilibrium $P_2^*(x^{**}, y^{**}, z^{**})$, where

$$x^{**} = \frac{b\theta(1-r)+\beta\delta}{\alpha+b} = \frac{\mu_H\lambda_V(1-\rho s)\left(1-\frac{N_H}{K_H}\right)+M\mu_V}{\lambda_V[\mu_H+\lambda_H(1-\sigma s)]}$$

$$y^{**} = \frac{b[\alpha\theta(1-r)-\beta\delta]}{\beta(\alpha+\mathrm{b})} = \frac{\mu_H\left[\lambda_H\lambda_V(1-\sigma s)(1-\rho s)\left(1-\frac{N_H}{K_H}\right)-M\mu_V\right]}{M\lambda_V[\mu_H+\lambda_H(1-\sigma s)]}$$

$$z^{**} = \frac{b[\alpha\theta(1-r)-\beta\delta]}{\alpha[b\theta(1-r)+\beta\delta]} = \frac{\mu_H\left[\lambda_H\lambda_V(1-\sigma s)(1-\rho s)\left(1-\frac{N_H}{K_H}\right)-M\mu_V\right]}{\lambda_H(1-\sigma s)\left[\mu_H\lambda_V(1-\rho s)\left(1-\frac{N_H}{K_H}\right)+M\mu_V\right]}$$

It is clear that the non-endemic equilibrium point $P_1^*\left((1-r)\theta,0,0\right)$ will be stable if $R_0^* < 1$.

At the endemic equilibrium point $P_2^*(x^{**}, y^{**}, z^{**})$ the variation matrix becomes

$$Z_2 = \begin{bmatrix} -\alpha z^{**}-b & 0 & -\alpha x^{**} \\ \alpha z^{**} & -\beta & \alpha x^{**} \\ 0 & (1-z^{**}) & -y^{**}-\delta \end{bmatrix}$$

its characteristics equation

$$\lambda^3 + A\lambda^2 + B\lambda + C = 0$$

where $A = \beta + \frac{b\theta(1-r)(\alpha+b)}{[b\theta(1-r)+\beta\delta]} + \frac{\alpha[b\theta(1-r)+\delta\beta]}{\beta(\alpha+\mathrm{b})}$

$$B = \frac{b\beta\theta(1-r)(\alpha+b)}{[b\theta(1-r)+\beta\delta]} + \frac{\alpha b\theta(1-r)}{\beta} + \frac{\mathrm{b}[\alpha\theta(1-r)-\delta\beta]}{(\alpha+\mathrm{b})}$$

$$C = \mathrm{b}[\alpha\theta(1-r)-\delta\beta]$$

It is clear that all the coefficient of the characteristics polynomial are positive. Direct calculation shows that A > 0, C > 0 and AB > C by Routh-Hurwitz criteria. Hence the endemic equilibrium will be stable if $R_0^* > 1$ where $R_0^* = \frac{\lambda_H\lambda_V(1-\sigma s)(1-\rho s)\left(1-\frac{N_H}{K_H}\right)}{M\mu_V}$

4. Results and Discussions.

The system of equation (2.8) was solved numerically using mathematical software. The values of the parameters are taken from [10]. After simulation, we observed that the dynamic of infected human and infected vector are not affected by newborn vaccination. In Figure 1, (a) and (b) show the proportion of the infective human population without vaccination. We see that first outbreak occurs at approximately *t*=6. Second outbreak begin from approximately *t*=2400. If the newborn vaccination is applied, Figure 1(c) shows that still one outbreak occurs followed by exponential decay. However, if the susceptible vaccination is applied, Figure 1(d) shows that there is almost no outbreak and the numbers of subsequent cases exponentially decay.

Fig. 2 presents the dynamics of S_H, I_H and I_V in 100 days after one infected entered the population. We found that S_H drops significantly in a relatively small period of time. Infected human I_H and infected vector I_V increases significantly during the period of 12 days and then oscillate around the endemic equilibrium state.

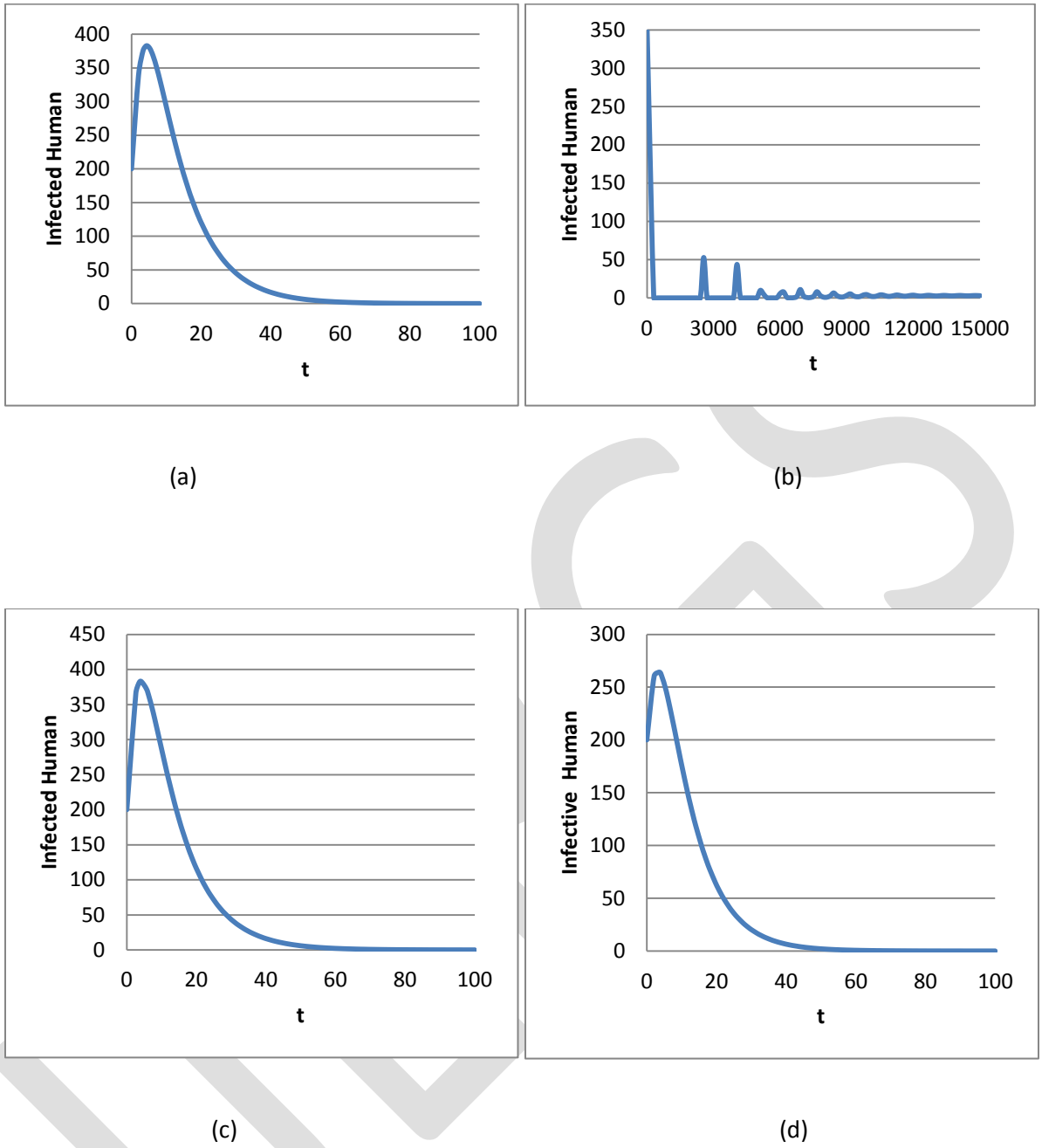

Fig. 1: Dynamics of I_H population without vaccination and the I_H population with newborn vaccination and susceptible vaccination.

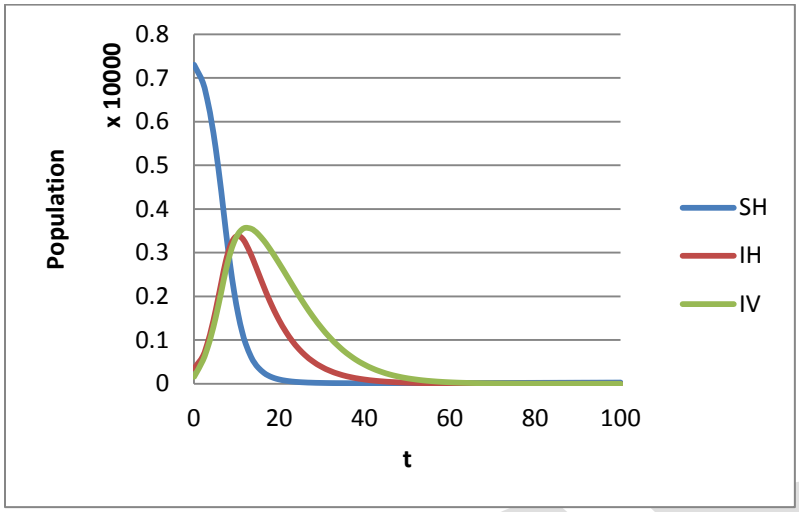

Fig. 2: Dynamics of S_H, I_H and I_V in 100 days with the initial condition (0.73, 0.035, 0.025) for

μ_V =0.25, μ_H =1/(60x365), γ =0.1428, λ_H =0.75, λ_V =1, $\alpha_H = 0$, $K_H = 4\times10^5$,

N_H=10000, $N_V = 6400$. With these parameters, R_0=11.51>1.

Fig. 3 shows simulations with different proportions of the susceptible vaccination in endemic equilibrium state for σ =0, 0.25, 0.50, 0.75, 1. We observed that vaccination decreases the number of infectives. That is, the dose of susceptible vaccination is increases then the number of infectives with respect to time is exponential decreases.

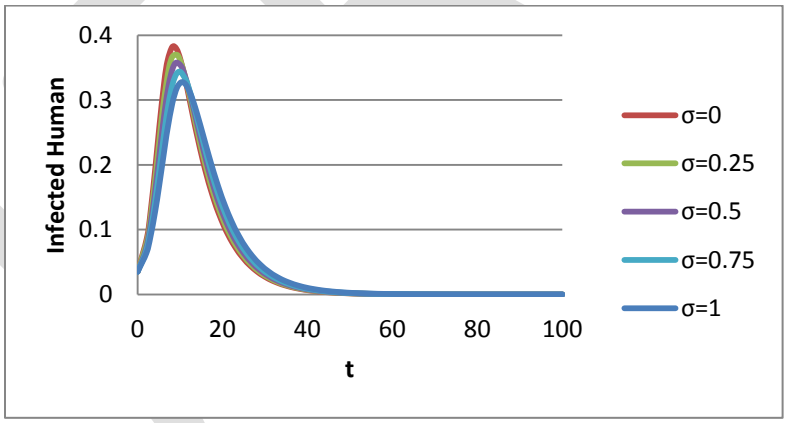

Fig. 3: Dynamics of infected Human with different proportions of the susceptible

Vaccination in endemic equilibrium state for σ =0, 0.25, 0.50, 0.75, 1.

5. Conclusion.

In this paper we consider two types of vaccination, one that is being administered to a portion of new born host and another one is being administered to a portion of susceptible host. If $R_0^* < 1$ then the non- infected steady state P_1^* will be stable and if $R_0^* > 1$ then the endemic equilibrium P_2^* is stable. Numerical simulations show that the effect of newborn vaccination is significantly less effective than vaccinating susceptible population. Also the effect of vaccination is to replace multiple outbreaks with a single outbreak. However, if we apply the susceptible vaccination there is almost no outbreak occurs and the cases exponentially decay approaching the disease-free equilibrium (Figure 1(d)).

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Securing Cloud Network Environment against Intrusion using Sequential Algorithm

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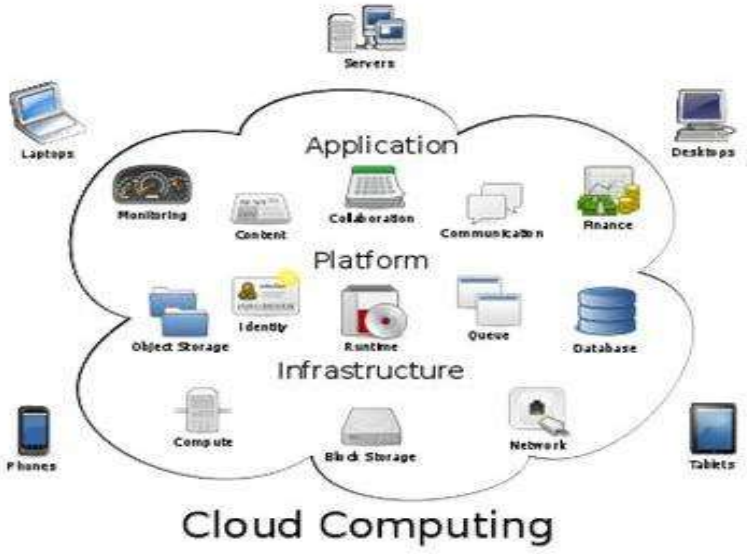
Abstract: - Cloud Computing is the newly emerged technology of Distributed Computing System. Cloud Computing user concentrate on API security & provide services to its consumers in multitenant environment into three layers namely, Software as a service, Platform as a service and Infrastructure as a service, with the help of web services. Attackers can explore vulnerabilities of a cloud system and compromise virtual machines to deploy further large-scale Distributed Denial-of-Service (DDoS). Particularly, DDoS attacks usually involve early stage actions such as multistep exploitation, low-frequency vulnerability scanning, and compromising identified vulnerable virtual machines as zombies, and finally DDoS attacks through the compromised zombies. Within the cloud system, especially the Infrastructure-as-a-Service (IaaS) clouds, the detection of zombie exploration attacks is extremely difficult. This is because cloud users may install vulnerable applications on their virtual machines. To prevent vulnerable virtual machines from being compromised in the cloud, we propose a multiphase distributed vulnerability detection, measurement, and countermeasure selection mechanism called "Securing Cloud Network Environment against Intrusion Using Sequential Algorithm", which is built on attack graph-based analytical models. The proposed framework significantly improves attack detection and mitigate attack consequences.

Keywords: DDoS, Zombies, Attack Graph, Sequential Search, Thresh hold value, Normal Mode, Danger Mode

1. INTRODUCTION

The term cloud is analogical to "Internet". The term cloud computing is based on cloud drawings used in the past to represent telephone networks & later to depict internet in.



Over the years, technology and Internet companies such as Google, Amazon, Microsoft and others, have acquired a considerable expertise in operating large data centers, which are the backbone of their businesses. Their know-how extends beyond physical infrastructure and includes experience with software, e.g., office suites, applications for process management and business intelligence, and best practices in a range of other domains, such as Internet search, maps, email and other communications applications. In cloud computing, these services are hosted in a data center and commercialized, so that a wide range of software applications are offered by the provider as a billable service (Software as a Service, SaaS) and no longer need to be installed on the users PC [5]. Recent studies have shown that users migrating to the cloud consider security as the most important factor. A recent Cloud Security Alliance (CSA) survey shows that among all security issues, abuse and nefarious use of cloud computing is considered as the top security threat [1], in which attackers can exploit vulnerabilities in clouds and utilize cloud systemresources to deploy attacks In traditional data centers, where system administrators have full control over the host machines, vulnerabilities can be detected and patched by the system administrator in a centralized manner. However, patching known security holes in cloud data centers, where cloud users usually have the privilege to control software installed on their managed VMs, may not work effectively and can violate the service- level agreement (SLA). Furthermore, cloud users can install vulnerable software on theirVMs, which essentially contributes to loopholes in cloud security. The challenge is to establish an effective vulnerability/attackdetection and response system for accurately identifying attacks and minimizing the impact of security breach to cloud users. In [2] Armbrust et al. Addressed that protecting "Business continuity and services availability" from service outages is one of the top concerns in cloud computing systems. Ina cloud system, where the infrastructure is shared by poten- tially millions of users, abuse and nefarious use of the shared infrastructure benefits attackers to exploit vulnerabilities of the cloud and use its resource to deploy attacks in more efficient ways [3]. Such attacks are more effective in the cloud environment because cloud users usually share computing resources, e.g., being connected through the same switch, sharing with the same data storage and file systems, even with potential attackers . The similar setup for VMs in the cloud, e.g., virtualization techniques, VM OS, installed vulnerable software, networking, and so on, attracts attackers to compromise multiple VMs.

In this paper, we propose Network Intrusion detection and Countermeasure sElection in virtual network systems (NICE) to establish a defense-in-depth intrusion detection framework. For better attack detection, NICE incorporates attack graph analytical procedures into the intrusion detection processes[4]. We must note that the design of NICE does not intend to improve any of the existing intrusion detection algorithms; indeed, NICE employs a reconfigure- able virtual networking approach to detect and counter the attempts to compromise VMs, thus preventing zombie VMs.

In general, NICE includes two main phases:

1) Deploy a lightweight mirroring-based network intrusion detection agent (NICE-A) on eachcloud server to capture and analyze cloud traffic. A NICE-A periodically scans the virtual system vulnerabilities within a cloud server to establish Scenario Attack Graph (SAGs), andthen based on the severity of identified vulnerability toward the colla-borative attack goals, NICE will decide whether or not to put a VM in network inspection state

2) Once a VM enters inspection state, Deep Packet Inspection (DPI) is applied, and/or virtual network reconfigurations can be deployed to the inspecting VM to make the potential attack behaviors prominent.

2 RELATED WORK

2.1 A New Alert Correlation Algorithm Based On Attack Graph :

Intrusion Detection Systems (IDS) are widely deployed in computer networks. As modern attacks are getting more sophisticated and the number of sensors and network nodes grows, the problem of false positives and alert analysis becomes more difficult to solve. Alert correlation was proposed to analyze alerts and to decrease false positives. Knowledge about the target system or environment is usually necessary for efficient alert correlation. For representing the environment information as well as potential exploits, the existing vulnerabilities and their Attack Graph (AG) is used. It is useful for networks to generate an AG and to organize certain vulnerabilities in a reasonable way. In this paper, design a correlation algorithm based on AGs that is capable of detecting multiple attack scenarios for forensic analysis. It can be parameterized to adjust the robustness and accuracy. A formal model of the algorithm is presented and an implementation is tested to analyze the different parameters on a real set of alerts from a local network.

An AG based correlation algorithm is proposed that overcomes the drawbacks of the algorithm described in [9]. It creates only explicit correlations and enables the identification of multiple attack scenarios of the same anatomy. The algorithm consists of a mapping of alerts to AG nodes, the alert aggregation function, a function for building an alert dependency graph, and a function for finding suspicious subsets using the Floyd-Warshall algorithm and the diameter value. In addition to the formal model of the correlation algorithm, multiple possibilities for the node matching and aggregation function analyzed in detail to parameterize the algorithm. Finally, the capabilities have tested and the influence of the parameters analyzed by using a real data set of alerts generated from

network.

2.2 Dynamic Security Risk Management Using Bayesian Attack Graphs

Security risk assessment and mitigation are two vital processes that need to be executed to maintain a productive IT infrastructure. On one hand, models such as attack graphs and attack trees have been proposed to assess the cause-consequence relationships between various network states, while on the other hand, different decision problems have been explored to identify the minimum-cost hardening measures. However, these risk models do not help reason about the causal dependencies between network states. Further, the optimization formulations ignore the issue of resource availability while analyzing a risk model. A risk management framework using Bayesian networks [6] that enable a system administrator to quantify the chances of network compromise at various levels. It shows how to use this information to develop a security mitigation and management plan. In contrast to other similar models, this risk model lends itself to dynamic analysis during the deployed phase of the network. A multi objective optimization platform provides the administrator with all trade-off information required to make decisions in a resource constrained environment.

The system administrators' dilemma, namely, how to assess the risk in a network system Hence, computing marginal probabilities either for prior or posterior cases, is O(2n) and does not scale very well for a large network. However, there are more efficient algorithms that can give a fair approximation for these probabilities. The administrator should plan to look into how these approximations can be used to speed up the analysis and what the corresponding impact is on the accuracy of the solution. In particular, the evaluation algorithm to include heuristic-based update mechanisms is revised in order to reduce the time required to complete the mitigation analysis, without scarifying the quality of results obtainable. Furthermore, the mitigation process in dynamic situations needs to be improved so that a security administrator can quickly identify the best security response that accounts for all former investments made as part of the static analysis stage.

2.3 Detecting Spam Zombies by Monitoring Outgoing Messages

This scheme focuses on the detection of the compromised machines in a network that are involved in the spamming activities, commonly known as spam zombies. Develop an effective spam zombie detection system named SPOT by monitoring outgoing messages of a network. SPOT is designed based on a powerful statistical tool called Sequential Probability Ratio Test, which has bounded false positive and false negative error rates. The evaluation studies based on a two-month email trace collected in a large U.S. campus network show that SPOT is an effective and efficient system in automatically detecting compromised machines in a network. For example, among the 440 internal IP addresses observed in the email trace, SPOT identifies 132 of them as being associated with compromised machines. Out of the 132 IP addresses identified by SPOT,
126 can be either independently confirmed or highly likely to be compromised. Moreover, only 7 internal IP addresses associated with compromised machines in the trace are missed by SPOT. In addition, it also compare the performance of SPOT with two other spam zombie detection algorithms based on the number and percentage of spam messages originated or forwarded by internal machines, respectively, and show that SPOT outperforms these two detection algorithms.

New scheme developed an effective spam zombie detection system named SPOT by monitoring outgoing messages in a network. SPOT was designed based on a simple and powerful statistical tool named Sequential Probability Ratio Test to detect the compromised machines that are involved in the spamming activities. SPOT has bounded false positive and false negative error rates. It also minimizes the number of required observations to detect a spam zombie. The evaluation studies based on a 2-month email trace collected on the FSU campus network showed that SPOT is an effective and efficient system in automatically detecting compromised machines in a network. In addition, SPOT outperforms two other detection algorithms based on the number and percentage of spam messages sent by an internal machine, respectively.

Intrusion detection system plays an important role in the security and perseverance of active defense system against intruder hostile attacks for any business and IT organization. IDS implementation in cloud computing requires an efficient, scalable and virtualization-based approach. In cloud computing, user data and application is hosted on cloud service provider‟s remote servers and cloud user has a limited control over its data and resources. In such case, the administration of IDS in cloud becomes the responsibility of cloud provider. Although the administrator of cloud IDS should be the user and not the provider of cloud services. In the paper we have proposed an integration solution for central IDS management that can combine and integrate various renowned IDS sensors output reports on a single interface. The intrusion detection message exchange format (IDMEF) standard has been used for communication between different IDS sensors. The authors have suggested the deployment of IDS sensors on separate cloud layers like application layer, system layer and platform layer. Alerts generated are sent to Event Gatherer program. Event gatherer receives and convert alert messages in IDMEF standard and stores in event data base repository with the help of Sender, Receiver and Handler plug-ins. The analysis component analyzes complex attacks and presents it to user through IDS management

system. The authors have proposed an effective cloud IDS management architecture, which could be monitored and administered by the cloud user. They have provided a central IDS management system based on different sensors using IDMEF standard for communication and monitored by cloud user.

3. EXSISTING WORK:

Cloud users can install vulnerable software on their VMs, which essentially contributes to loopholes in cloud security. Application DOS attack[6],[7], which aims at disrupting application service rather than depleting the network resource, has emerged as a larger threat to network services, compared to the classic DOS attack. Owing to its high similarity to legitimate traffic and much lower launching overhead than classic DDOS attack, this new assault type cannot be efficiently detected or prevented by existing detection In a cloud system where the infrastructure is shared by potentially millions of users, abuse and nefarious use of the shared infrastructure benefits attackers to exploit vulnerabilities of the cloud and use its resource to deploy attacks in more efficient ways[4]. Such attacks are more effective in the cloud environment since cloud users usually share computing resources, e.g., being connected through the same switch, sharing with the same data storage and file systems, even with potential attackers. The similar setup for VMs in the cloud, e.g., virtualization techniques, VM OS, installed vulnerable software, networking, etc., attracts attackers to compromise multiple VMs.

3.1 Drawbacks:

Each request is verified for dos, once it is posted to server. Sometimes continues verification or checking of some request or every request in sequence manner can increase the server work load.

Due to this existing system leads to failure randomly

4. PROPOSED WORK

To identify application IDS attack, proposed a novel group testing (GT)-based approach deployed on back-end servers, which not only offers a theoretical method to obtain short detection delay and low false positive/negative rate, but also provides an Underlying framework against general network attacks. More specifically, first extend classic GT model with size constraints for practice purposes, and then redistribute the client service requests to multiple virtual servers embedded within each back-end server machine, according to specific testing matrices.

Based on this framework, propose a two-mode detection mechanism using some dynamic thresholds to efficiently identify the attackers. The focus of this work lies in the detection algorithms proposed and the corresponding theoretical complexity analysis.

Advantages

- Every request or all the requests to the server are parallel checked for IDS by using GT.
- Due to this server performance is not affected and reduces the workload of Server.

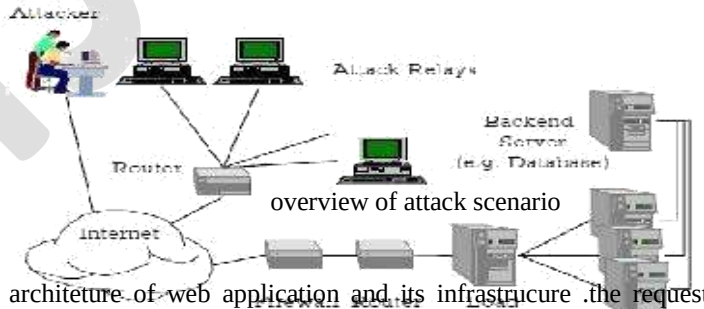
4.1 Architecture Design

:

Architectural Design

4.2 Node Analysis:

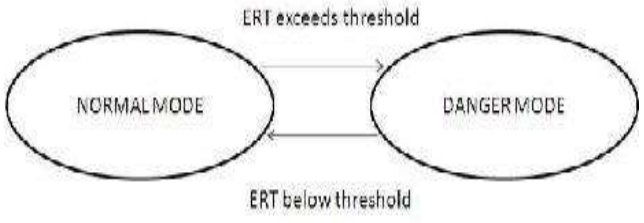
We consider the case each client provided with a non spoofed ID which is used in identifying client during our detection period. Attackers are assumed to launch the application service request either at high interarriaval rate or high workload or even both. By periodically monitoring the average response time to service requests and comparing them with the specific threshold values fetched from a legitimate profile each virtual server is associated with a negative or positive outcome by this we can identify a attacker from the pool of legitimate users.



overview of attack scenario

The above figure describes the architeture of web application and its infrastrucure .the requests are generated from users which consists of both legitamate and attackers are send to the proxy server via router The front end proxy server works as load balancer servers and distributes the requests to the back end servers depending on their usage The backend server cylces between two states which are refered as NORMAL mode and DANGER mode

If the estimated response time (ERT) of any back end server exceeds profile based threshold the system transfer to danger mode



Two state diagram of a system

The ERT value can be calculated using the formulae

$$ERT= (1-\alpha)\ ERT+ \alpha ART$$

If any virtual server has ERT>μ +4σ (μ and σ refer as expected value and standard deviation of the ART distribution). The backend server is probably under attack and it transferred to danger mode for detection. After the detection it is returned to the normal mode.

4.3 Algorithm Description

Sequential algorithm has proposed to block the attackers. It will search sequentially and block the attacker node in transmission path.

Sequential Algorithm

Pseudo-code

```
const
 MAX = ….;
type
 itemType = …;
 listType = array [1..MAX] of integer;
function int position (list: listType; item: itemType)
/* this function searches the array list with the bounds 0 to MAX for the value item. The
function returns the position in list of item, if item is found */
var
 i : integer;
begin
 for I := 0 to MAX do
 if list[i] = item then
 position := I;
 end for;
```

end;

4.3.1 Explanation

It is the easiest to implement and the most frequently used search algorithm in practice. Unfortunately the sequential search is also the most ineffective searching algorithm. However, it is so commonly used that it is appropriate to consider several ways to optimize it. In general the sequential search, also called linear search, is the method of consecutively check every value in a list until find the desired one.

4.3.2 Implementation

There is no guarantee about the order of elements in the list if insertions have been under a user's control.
Search starts at the first element in the list and continues until either the item is found in the list or entire list is searched .When searching the data set for a particular item, compare the key of the item with the keys of the items in the data set .For each iteration in the loop, the search item is compared with an element in the list, and a few other statements are executed. Loop terminates when search item is found in list. Therefore the execution of the other statement in loop is directly related to the outcome of the key comparisons. If the target is the kth element in the list k comparisons are made.

5. CONCLUSION

A novel technique for detecting application DOS attack by means of a new constraint-based group testing model. Motivated by classic GT methods, three detection algorithms were proposed and a system based on these algorithms was introduced. Theoretical analysis demonstrated the outstanding performance of this system in terms of low detection latency and false positive/negative rate. Focus is to apply group testing principles to application DOS attacks, and provide an underlying framework for the detection against a general case of network assaults, where malicious requests are indistinguishable from normal ones.

For the future work, investigate the potentials of this scheme and improve this proposed system to enhance the detection efficiency. Some possible directions for this can be:

- The sequential algorithm can be adjusted to avoid the requirement of isolating attackers
- Group testing will performed to identify whether the virtual server has affected by the attacker based on the performance of the virtual server.
- The users are identified and placed on appropriate mode by selecting either normal mode dangerous mode.

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Exploring Cloud Computing Services and Applications

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Abstract-Cloud computing, the use of more than one computer across the internet, to provide web base services, is a rapidly growing technology. It is enabling an ever increasing range of web services for businesses and the public. Cloud computing environment provides a great flexibility and availability of computing resources at a lower cost. This emerging technology opens a new era of e-services in different disciplines. In this paper, we explore cloud computing services and applications, we give examples for cloud services provided by the most common Cloud Service Providers (CSPs) such as Google, Microsoft, Amazon, HP, and Sales force and we studied innovative applications for cloud computing in e-learning, Enterprise Resource Planning (ERP) and e-governance. Our study helps individuals and organizations understand how cloud computing can provide them with customized, reliable and cost-effective services in a wide variety of applications.

Keyword- Cloud computing, Key services, ERP, e-learning, SaaS, Paas, Iaas, current cloud application.

INTRODUCTION

Cloud computing services provide technology (IT) as a service over the Internet or dedicated network, with delivery on demand, and payment based on usage. Cloud computing services range from full applications development platforms, to servers, storage, and virtual desktops .Cloud computing is a topic that received a great deal of attention by individuals and organizations from different disciplines in the last decade. This new environment implies great flexibility and availability of computing resources at different levels of abstraction at a lower cost. Cloud Service Providers (CSPs) (e.g., Google, Microsoft, Amazon) are vendors who lease to their customers cloud computing resources and services that are dynamically utilized based on customer's demand according to a certain business model. General services in different application areas such as business, education and governance are provided to the customers online and are accessed through a web browser, while data and software programs are stored on the cloud servers located in the data centres. These services are generally classified into three classes known as cloud service models and are shown in figure.

Cloud service models are a Service-Oriented Architecture (SOA) that describes cloud services at different levels of abstraction. These models are:

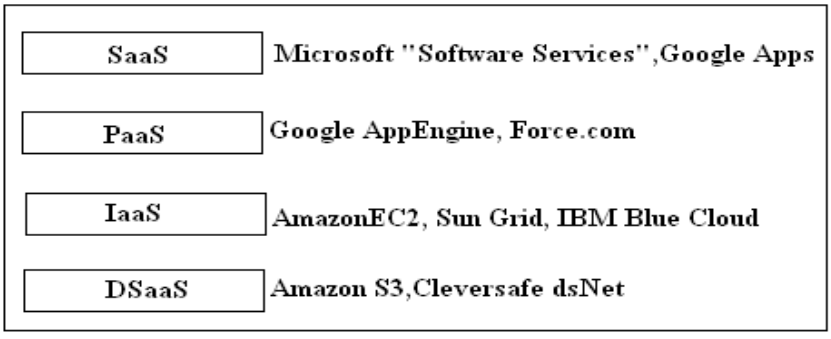


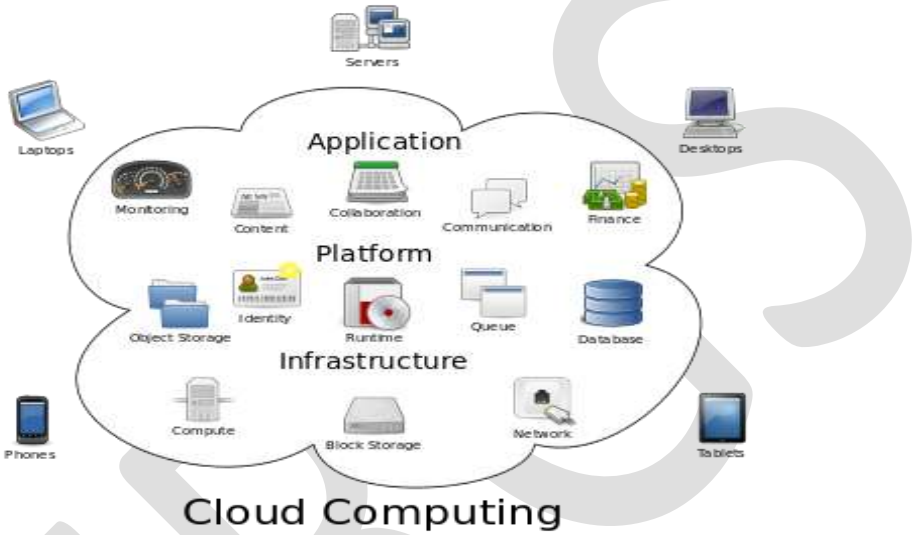
Fig: Services of cloud computing

Software as a Service (SaaS): The software applications like CRM, Office Suite, Email, etc., are offered as a service through the internet, instead of a shrink wrapped software on a physical medium (or in a downloadable form), which is the norm in the traditional desktop world. The applications are hosted on a highly scalable infrastructure and it is offered over the internet. Users can access it using an ordinary web browser, without any need to install software in their local computer. Companies like Google, Zoho, Salesforce, Microsoft, Wordpress offer their applications as a service to the end users.

Platform as a Service (PaaS): Some vendors are offering application development platform as a service. Developers can code the applications and upload it into the platform (offered as a service) and run the application on the cloud infrastructure. It helps developers to scale their apps without worrying about building the infrastructure. The platform scales automatically based on the resource needs of the app, without any efforts from the developer. Services like Google App Engine, Bungee Connect and Force.com are examples for PaaS.

Infrastructure/Hardware as a Service (HaaS)

Vendors offer computing infrastructure as a service to end users. The term Hardware as a Service is a bit of a misnomer. It is actually computing power offered through a virtualized environment rather than a physical hardware. This service is offered either as raw computing power or storage or both. Some examples of services offered in this category include Amazon's EC2 and S3, Mozy, GoGrid, etc.



ANALYSIS OF CLOUD COMPUTING SYSTEMS

Cloud computing systems are classified as public cloud, private cloud, community cloud and hybrid cloud. These classes are known as deployment models and they describe the scope of services offered on the cloud to the customers.

• **Public Cloud:** In public clouds the infrastructure and other cloud services are made available to the general public over the Internet. The cloud is owned and managed by a CSP who offers services to consumers on a pay-per-use basis. Public cloud users are by default treated as untrustworthy; therefore, security and privacy are big concerns about this type of cloud. Many popular cloud services are public including Amazon EC2, Google App Engine and Salesforce.com.

• Private Cloud: In private clouds the computing resources are operated exclusively by one organization. It may be managed by the organization itself or a CSP. Private clouds are considered to be more secure than public clouds since their users are trusted individuals inside the organization. The other two deployment models, community clouds and hybrid clouds, fall between public and private clouds.

• **Community clouds:** Community clouds are similar to private clouds but the cloud infrastructure and computing resources are shared by several organizations that have the same mission, policy and security requirements. An example of a community cloud is the educational cloud used by universities and institutes around the world to provide education and research services.

• **Hybrid Clouds:** In hybrid clouds, the cloud infrastructure consists of a combination of two or more public, private or community cloud components. The cloud components are bound together by standardized technology and managed as a single unit, yet each cloud remains a unique entity. Hybrid clouds allow organizations to optimize their resources, so the critical core activities can be run under the control of the private component of the hybrid cloud while other auxiliary tasks may be outsourced to the public component. Figure below shows different cloud deployment models and table compares these models with each other.

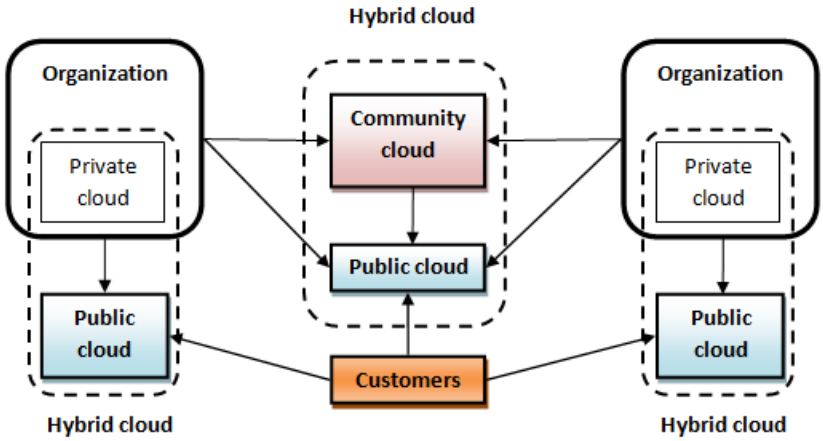


Fig. Cloud computing deployment model

Table: A Comparison of Cloud Deployment Models

Deployment Model	Scope of services	Owned by	Managed by	Security level	Location
Public	general public and large industry groups	CSP	CSP	Low	Off premise
Private	single organization	Single organization	Single organization or CSP	High	Off or on premise
Community	organizations that share the same mission, policy and security requirements	Several organization	Several organizations or CSP	High	Off or on premise
Hybrid	organizations and public	Organizations and CSP	Organizations and CSP	Medium	Off and on premise

WHO USES CLOUD COMPUTING SERVICES AND WHY?

Corporate and government entities utilize cloud computing services to address a variety of application and infrastructure needs such as CRM, database, compute, and data storage. Unlike a traditional IT environment, where software and hardware are funded up front by department and implemented over a period of months, cloud computing services deliver IT resources in minutes to hours and align costs to actual usage. As a result, organizations have greater agility and can manage expenses more efficiently. Similarly, consumers utilize cloud computing services to simplify application utilization, store, share, and protect content, and enable access from any web-connected device.

HOW CLOUD COMPUTING SERVICES WORK?

Cloud computing services have several common attributes:

• **On-demand self-service:** cloud services such as web applications, server time, processing power, storage and networks can be provisioned automatically as needed by the consumers without requiring human interaction.

• **Broad Network Access (mobility):** consumers can access cloud resources over the Internet at anytime and from anywhere (i.e., ubiquitous) through different types of platform (e.g., mobile phones, laptops, and PDAs).

• **Resource Pooling:** physical and virtual computing resources are pooled into the cloud. These resources are location independent in the sense that the customer generally has no control or knowledge over their location.

• **Rapid Elasticity:** computing resources can be rapidly and elastically provisioned and released based on the demand of the consumer. Consumers view these resources as if they are infinite and can be purchased in any quantity at any time.

• **Measured Services:** cloud resources and services are monitored, controlled and optimized by the CSPs through a pay-per-use business model. Consumers utilize these services in a way similar to utilizing electricity, water and gas. Other cloud computing characteristics are:

• **Multitenancy:** a cloud provides services to multiple users at the same time. Those users share cloud resources at the network level, host level and application level, however, each user is isolated within his customized virtual application instance.

• **Scalability:** the infrastructure of cloud computing is very scalable. Cloud providers can add new nodes and servers to cloud with minor modifications to cloud infrastructure and software.

• **Reliability:** is achieved in cloud computing by using multiple redundant sites. High reliability makes the cloud a perfect solution for disaster recovery and business critical tasks.

• **Economies of scale:** in order to take advantage of economies of scale, clouds are implemented to be as large as possible. Other considerations are also taken to reduce cost such as locating the cloud close to cheap power stations and in low cost real estate.

• **Cost effectiveness:** customers are allowed to lease computing resources and purchase IT services that match their needs instead of investing in complex and expensive computing infrastructure and services. This will lower the costs of the IT services for organization and individuals.

• **Customization:** a cloud is a reconfigurable environment that can be customized and adjusted in terms of infrastructure and applications based on user demand.

• **Efficient resource utilization:** delivering resources only for as long as they are needed allows for efficient utilization of these resources.

• **Maintainability:** CSPs reduce software and hardware maintenance burden of the users.

• **Collaboration:** PaaS allows for collaborative work between users within an organization or among Different organizations.

• **Virtualization:** users do not need to worry about physical resources since the cloud isolates them at the virtual level.

• **Green technology:** cloud computing shares resources between users and does not require large resources that consume a lot of power.

• **High performance:** cloud computing technology provides users with a high performance computing environment due to extremely large storage and powerful computing resources of the cloud infrastructure.

CLOUD COMPUTING SERVICES

Examples of cloud services provided by the most common CSPs are given in this section

a. Google Cloud Computing Services

Google integrates many applications and provides many services to cloud customers. This integration makes Google one of the best CSPs since it allows cloud's customers to have their tasks accomplished easily. It also saves money and time since developing and maintaining software to provide all of these services and applications is a time consuming and an expensive process. Among the Services provided by Google clouds are:

• **Gmail:** is an email service that provides users with 25GB storage, less spam and mobile access. It has an integrated chat applet that stores conversation in the form of email.

• **Google Docs:** is a service that allows users to create spread sheets, word documents and power point presentations and store them on the cloud servers. The documents are available online so that they can be accessed from anywhere and at anytime. This helps team members located in different countries to cooperate in completing their work. Google docs are secure since the files are encrypted using advanced encryption technology and are only accessed by authorized users.

• **Google analytics:** is used to monitor the traffic come onto a website.

• **Google Ad words and Ad Sense:** which are advertising tools?

• **Picasa:** which is a tool used to exhibit product and uploading their images in the cloud.

b. Microsoft Cloud Computing Services

Microsoft provides a cloud platform called Windows Azure platform which consists of a set of cloud services offered to users and application developers. All services run in Microsoft data centers located around the world. These services include:

• **Windows Azure:** a windows environment for storing data and running applications in the cloud.

• **SQL Azure:** is a relational database services in the cloud that use a special version of Microsoft SQL server.

• **Windows Azure App Fabric:** provides an infrastructure for applications that run in the cloud or inside an organization.

• **Windows Azure Marketplace:** is an online market to buy and sell application software and data.

c. Amazon Web Services (AWS)

AWS provides a cloud computing platform for all business sizes. With AWS companies can provision a flexible and cost-effective IT infrastructure and services that can be scaled up and down based on their needs. AWS helps companies select the platform that is suitable for the problem they have and pay only for what they use. In addition, AWS applies advanced physical security and data privacy techniques to protect user's data. AWS has security certifications and audits such as ISO 27001, FISMA moderate, HIPAA and SAS 70 Type II. AWS is a comprehensive cloud service platform which provides many web services such as:

• **Amazon Elastic Compute Cloud (Amazon EC2):** is a web service that provides configurable computing resources in the cloud.

• **Amazon Simple Storage Services (Amazon S3):** is a scalable, secure and reliable storage for the Internet that can be used to ubiquitously store and retrieve data of any size on the web.

• **Amazon Virtual Private Cloud (Amazon VPC):** connects the company's existing IT infrastructure to AWS cloud via a Virtual Private Network (VPN).

• **Amazon CloudFront:** is a web service for content delivery that transfers customer's data with high speed and minimum delay using a global network of edge locations

.• **Amazon Route 53:** is a scalable and highly available DNS service.

• **Amazon Relational Database Services (Amazon RDS):** is a web service that helps manage a relational database in the cloud.

• **Amazon Simple DB:** provides the core database functions.

• **Amazon Simple Queue Service (Amazon SQS):** is a scalable, reliable, hosted queue for storing messages.

• **Amazon SNS:** is a web service that helps manage and send notifications from the cloud.

• **Amazon Elastic Map Reduce:** is a web service that enables customers to process vast amount of data on the Cloud.

d. HP Cloud Services

HP provides several services through its public beta and we describe these services below:

• **HP Cloud Compute:** provides elastic scalable virtual servers that can be customized on user's demand as the workload changes. It allows customers to save time wasted in resource configuration and to save money since customers only pay for resources they provisioned. It also provides an open standards environment that ensures portability and prevents vendor lock-in and allows for collaborative work.

• **HP Cloud Object Storage:** an online massive storage capacity that allows customers to store large amount of data such as audio and video files. It can be scaled up and down on-demand to meet storage change needs and it achieves reliability by replicating objects many times in multiple availability zones so that customers can access their data when they need it.

• **HP Cloud Block Storage:** allows customers to store data on HP Cloud resources for as long as they need and easily move it from one compute resource to another.

• **HP Cloud CDN:** CDN refers to Content Delivery Networks and it is a web service that delivers data from HP Cloud Object Storage to customers around the world at high speed using global network of servers from HP and Akamai.

• **HP Cloud Relational Databases for MySQL:** is a web service that provides on-demand access to relational structured databases.

• **HP Cloud Identity Service:** provides a single method for managing HP cloud users' identities and authentication.

e. Sales force Cloud Services

Sales force provides cloud computing solutions such as Service Cloud and Sales Cloud:

• **Service Cloud:** is a platform for customer services that allows for thousands of conversations on the Cloud. It provides different conversation tools that help empower CRM around the world such as online communities, Social networks, Phone, email & chat, Partners and Search.

• **Sales Cloud:** provides a comprehensive and easy to customize tools that deliver information to users in real time, at anytime and from anywhere. These tools include: Chatter, Mobile, Files & libraries, App Exchange and Marketing & leads.

KEY SERVICES

Based on the strong experience in the development of Business Application Services, Zensar has developed following cloud based offerings: g it to the cloud platform with the help of questionnaire, workshop and pilot.

Cloud Application Management Services : These Cloud services allows development / maintenance of applications that runs on cloud infrastructure (public / private / hybrid) providing greater scalability / high availability and leveraging cloud services such as: Storage, Messaging, DB and NoSQL services.

Cloud Migration Services: Our Migration services are specifically for moving application from existing infrastructure to the Cloud using IaaS / PaaS / SaaS based service model and thereafter enhancing application considering other cloud services.

Cloud Integration Services : The Integration services on cloud platform using open standard APIs, ESB based framework or custom tools such as IBM Cast Iron, Informatica Cloud etc. to connecting from on-premise applications to cloud or cloud applications to another cloud infrastructure.

Cloud Infrastructure Services : Our Infrastructure services provides complete stack of servers, network / bandwidth capacities, storage and database services to the potential customers considering public / private and hybrid cloud scenarios along with backup & restore / DR strategy

BENEFITS OF CLOUD COMPUTING SERVICES

Cloud computing services offer numerous benefits to include:

- Faster implementation and time to value

- Anywhere access to applications and content
- Rapid scalability to meet demand
- Higher utilization of infrastructure investments
- Lower infrastructure, energy, and facility cost
- Greater IT staff productivity and across organization
- Enhanced security and protection of information assets

CLOUD COMPUTING APPLICATIONS

In this section, we present some applications for cloud computing:

a. Cloud Computing For E-Learning:

E-learning is a new trend in education that tries to make the best use of information technology (IT). Cloud computing is an attractive environment for students, faculty members and researchers. As an emerging IT, cloud computing can provide universities and research centers with powerful and cost-effective computational infrastructure. Students can connect to campus educational services through their personal mobile devices from anywhere. Faculty members can have efficient and flexible access to their course material in their class rooms. Researchers can find articles, models and run their experiments on the cloud faster than ever. And shorter payback period by leasing resources and services on the cloud rather than purchasing new equipments and software applications. This is important especially for small and medium scale business where budgets are limited.

b. India to use the 'Cloud' Services for e-governance:

India is to become one of the first countries in the world to deliver e-Governance services to citizens using cloud-based IT services. The government is in talks with software industry body, Nasscom, on the roll-out of e-Governance services using the emerging technology. The advantage of using this technology is that the IT infrastructure need not be set up by the government. In addition, because of the ability of the technology to handle large number of transactions, citizens can look forward to less congestion bottlenecks

CONCLUSIONS

Cloud computing is a new emerging technology that is expected to significantly change the field of IT in the next few years and lead it for the coming decades. Numerous services and applications can be provided in the Cloud due to its many interesting and promising characteristics. In this paper, we explored some of these services and applications and we are certain that many others will see the light in the near future. Cloud services and applications are expected to attract many individuals and organizations from different disciplines and our study helps them understand the impact of these services on their work, however, cloud computing technology is not free of risks and concerns. Security and privacy issues continue to be the biggest concern on cloud computing that limits its adoption in practice. The Multitenancy nature and resource and data outsourcing are the main reasons for the security issue in cloud computing. Organizations and individuals are still concerned about storing and processing their sensitive data and critical applications on the cloud.

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An Adaptive MIMO-OSDM Prototype for Next Generation Communication Systems under fading Channels

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***Abstract*—** Increasing demand for high-performance 4G broadband wireless is enabled by the use of multiple antennas at both base station and subscriber ends. Multiple antenna technologies enable high capacities suited for Internet and multimedia services, and also dramatically increase range and reliability. However, in fast fading channels, the time variation of a fading channel over an OFDM symbol period results in a loss of sub-channel orthogonality, which leads to inter-carrier interference (ICI). In this paper, introduce an orthogonal spatial division multiplexing in which divide the central signal streams into both time and frequency. Also to increase the spatial diversity we are going to introduce spatial modulation along with STBC for our new MIMO-OSDM. Experimental results show that, proposed system outperform the existing MIMO-OFDM system in terms of bit and symbol error rate for various modulation schemes.

Keywords— Multiple Input Multiple output (MIMO) system, orthogonal spatial division multiplexing, space time block coding, spatial modulation, 4G wireless communication.

INTRODUCTION

The development of wireless communication systems for high-bit-rate data transmission and high-quality information exchange between terminals is becoming one of the new challenging targets in telecommunications research. The market demand for broadband multimedia services, ubiquitous networking, and Internet access via portable devices is expected to grow enormously, pushing the development of modem and system architectures for high-bit-rate transmission. Multiple input multiple output (MIMO) systems are currently stimulating considerable interest across the wireless industry because they appear to be a key technology for future wireless generations.

MIMO systems have been recently under active consideration because of their potential for achieving higher data rate and providing more reliable reception performance compared with traditional single-antenna systems for wireless communications [1, 2]. A space-time (ST) code is a bandwidth-efficient method that can improve the reliability of data transmission in MIMO systems [3]. It encodes a data stream across different transmit antennas and time slots, so that multiple redundant copies of the data stream can be transmitted through independent fading channels. By doing so, more reliable detection can be obtained at the receiver. As an example of MIMO applications, the IEEE 802.11n standard is still being discussed, but one prototype can offer up to 250 Mb/s. This is more than five times the (theoretical maximum) speed of the existing IEEE 802.11g hardware. General configuration of a MIMO communication system is shown below communication system

Figure 1. General Configuration of a MIMO

Introduction to fourth generation of communication system

The first-generation (1G) radio systems put away analog communication schemes to transmit voice over radio, such as Advanced Mobile Phone Services (AMPS), the Nordic Mobile Telephone (NMT) scheme, & the Total Access Communication System (TACS), which were developed in the 1970s & 1980s. The 2G systems were accumulated in the 1980s & 1990s, & featured the execution of digital technology, such as Global System for Mobile Communications (GSM), Digital-AMPS (D-AMPS), code-division multiple access (CDMA), & personal digital cellular (PDC); among them GSM is the mostly successful & widely used 2G system. 3G mobile technologies offer users with high-data-rate mobile access, which developed rapidly in the 1990s & is still budding today.

However, there are two restrictions with 3G. One is the tricky expansion to very high data rates such as 100 Mb/s with CDMA due to severe interference between services. The other is the difficulty of providing a phase of multi-rate services, all with

different quality of service (QoS) & performance requirements, due to the restrictions required on the core network by the air interference standard. This design is encouraged by the growing demand for broadband Internet access.

Multiple Input Multiple Output Systems

MIMO wireless communication refers to the transmissions over wireless links formed by multiple antennas equipped at both the transmitter and receiver.

This constructs multiple antenna elements transceivers a possibility at both sides of the link, even though pushing much of the processing & cost to the network's side (i.e., BTS) still makes engineering sense. Clearly, in a MIMO link, the advantages of conventional smart antennas are reserved since the optimization of the multi-antenna signals is carried out in a larger space, thus providing extra degrees of freedom. In particular, MIMO systems can offer a joint transmit-receive diversity gain, and array gain upon coherent combining of the antenna elements.

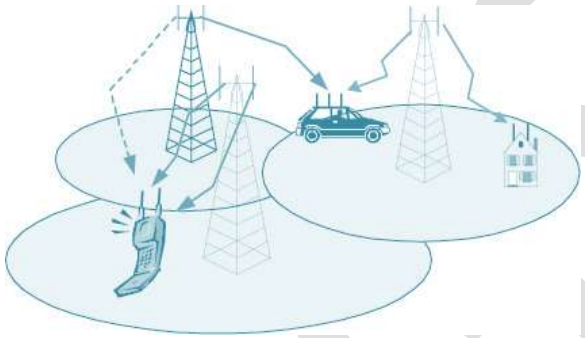

Figure 2. MIMO transmission and reception in a dispersive environment in a MIMO system, different information is transmitted simultaneously on each transmit antenna

The key advantages of employing multiple antennas lie in the more reliable performance obtained through *diversity* and the achievable higher data rate through *spatial multiplexing* [1]. These concepts are briefly discussed below.

Diversity — the signal transmission over broadband wireless channels always suffers from attenuation due to the detrimental effect of multipath fading, and this can severely degrade the reception performance. In the MIMO systems, the similar info can be communicated from the multiple transmit antenna & received at multiple receive antenna concurrently. Meanwhile the fading for every link b/w a couple of transmit & receive antenna can typically be measured to be autonomous, the possibility that the info is detected correctly is improved. Apart from the spatial diversity, other forms of diversity are commonly available, namely, temporal diversity & diversity of frequency, if the imitations of the distressed signals are received in the way of dismissal in the temporal & the frequency--- domains, respectively. The simplest way of achieving variety in the systems of MIMO is through replication coding that sends the similar info symbol at dissimilar slots of time from dissimilar transmit antennas. A more bandwidth efficient coding scheme is ST coding [3], where a block of information symbols are transmitted in the dissimilar order from every antenna.

The association steps of this paper is as follows. The Preliminary Section ends with a concise introduction of MIMO systems & its necessity in today's communication. The part A, B & C in introduction shows a brief description about fourth generation of communication, ideology of MIMO system & transmission over multiple input multiple output system.

Section II, explains a common review & related work of different coding & multiplexing techniques in multiple antenna system, many techniques have been proposed for the MIMO systems which are classified in this section.

Section III provides the information about the fundamental problem definition & proposed methodology. This section is further sub-classified into numerous subsections like spatial modulation, spatial division multiplexing, space time coding scheme.

Section IV gives information about the simulation results, it also shows some comparative graphs which proved that the proposed approach surmount the traditional approach.

Section V shows the observations, discussion & tabular comparison of different researches reviewed in earlier sections & a general conclusion of the paper, regarding review is presented.

BACKGROUND AND RELATED WORK IN DETAIL

In wireless communication systems, deploying the multiple-input multiple-output (MIMO) concept together with an efficient coding and modulation scheme has been shown to be an effective way to increase link capacity without sacrificing bandwidth [6]. In the case of frequency-nonselective fading channels, space-time (ST) codes [7]–[9] have been proposed to explore spatial and temporal

diversities that are available in MIMO links. In the case of frequency-selective channels, the MIMO concept has been deployed with orthogonal frequency- division multiplexing (OFDM) modulation, called MIMO-OFDM, to obtain available diversities and combat frequency selectivity of the channels. Various space-frequency (SF) codes [10]–[12] (and references therein) and space-time-frequency (STF) codes [13]–[15] were proposed for MIMO-OFDM systems.

SF coding aims to exploit both spatial and frequency diversities, whereas the additional temporal diversity can be obtained when STF coding is employed under time-varying channels. However, most of the above coding techniques require reliable multichannel estimation, which inevitably increases the cost of frequent retraining and number of estimated parameters to the receiver. Although the channel estimates may be available when the channel changes slowly compared with the symbol rate, it may not be possible to acquire them in fast fading environment. Differential space-time (DST) modulation [16]–[19] has been widely known as one of many practical alternatives that bypasses multichannel estimation in frequency-nonselective MIMO systems. The differential scheme in [16] and [17] utilizes unitary group constellation which can be applied for arbitrary number of transmit antennas. The differential space-time block codes (DSTBC) in [18] and [19] differentially encode the existing space-time block codes in [8] and [9] and allow possible multilevel amplitude modulation to improve the MIMO link performance.

As a consequence of advantages of MIMO wireless systems have captured the attention of international standard organizations. The use of MIMO has been proposed multiple times for use in the high-speed packet data mode of third generation cellular systems (3G) [20], [21] as well as the fourth generation cellular systems (4G) [22], [23], [24]. MIMO has also influenced wireless local area networks (WLANs) as the IEEE 802.11n standard exploits the use of MIMO systems to acquire throughputs as high as 600Mbps [25], [26].

Focusing on MIMO systems using STBC, one class of approaches exploits the structure of the space time codes to enable channel estimation [27]–[36]. Budianu and Tong [27] and Larsson et al. [28] present training based schemes for the orthogonal codes of Alamouti [37] and Tarokh [38]. Training bits, however, reduce effective throughput and such schemes are inappropriate for systems where bandwidth is scarce. By restricting themselves to real signals and transmit diversity order, Ammar and Ding estimate channels for STBC from the null space of the received signal [29]. Swindlehurst and Leus present a scheme for blind channel estimation with a generalized set of space-time codes [30]. Larsson et al. [32] present a blind optimal, in maximum likelihood (ML) sense, scheme for channel estimation. Ma and co-authors [33]–[35] simplify the problem by exploiting the O-STBC structure and semi-definite relaxation [11] or sphere decoding [34]. However, the complexity of ML decoding remains. Similarly, Shahbazpanahiet al. present a closed form channel estimate used for ML decoding of transmitted symbols [36].

Space–time coding methodologies, includes space–time trellis coding (STTC) [39], [40] & the Space–Time Block Coding (STBC) [41-43], which assimilate the methods of the antenna array spatial diversity & the channel coding. As shown by Tarokhet al. in [39], the STTC executes well in gently fading atmospheres, but has the disadvantage that complexity of decoding produces the exponentially with the no. of antenna. The unconventional multi-antenna transmit concept of diversity of the STBC appeared in work of Alamouti [41] & was further established & put into the hypothetical framework by the Tarokhet al. in [42]. The vital characteristics of the STBC is its intrinsic orthogonality, thus the guaranteeing that a humble technique of linear decoding offers the all-out likelihood results. In fact, Tarokhet al. in [42] showed that if the fades connecting pairs of transmit & receive the elements of antenna are uncorrelated, the STBC proposals the large growth in the quality of signal as associated with the uncoded systems.

Although the above-mentioned supposition of the uncorrelated fading has been complete in numerous earlier works that discover the presentation of the STBC systems [41], [42], [43], there are numerous conditions in which fading is correlated amongst the channels. For e.g., in the actual propagation atmospheres, the physical restraints may not permit use of the spacing of antennas that is essential for the independent fading crossways the elements of antenna.

PROPOSED MIMO SYSTEM

In this paper, introduce an orthogonal spatial division multiplexing in which divide the central signal streams into both time and frequency. Also to increase the spatial diversity we are going to introduce spatial modulation along with STBC for our new MIMO-OSDM.

The figure below shows the transmitter side block diagram of proposed scheme

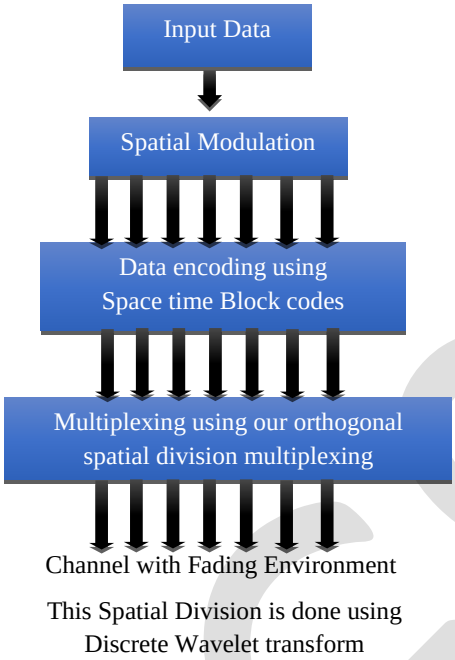

Figure 3. Shows the transmitter side model of proposed work, we have to send only constellation points with respect to antenna number.

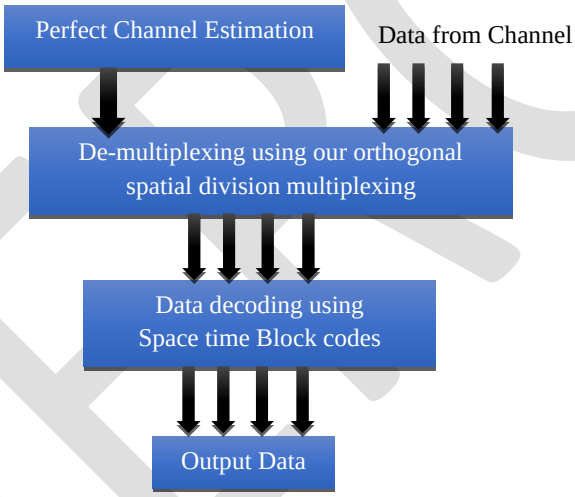

Figure 4. Shows the receiver side model for the proposed work. Perfect channel estimation is done to find best suited channel. Also, Channel consist with Rayleigh Fading Environment.

Furthermore, this chapter also explains a detailed view of technologies used in the proposed work as follow:

A. Spatial Modulation

Spatial modulation (SM) is a recently developed transmission technique that uses multiple antennas. The basic idea is to map a block of information bits to two information carrying units:

1. A symbol that was chosen from a constellation diagram and
2. A unique transmit antenna number that was chosen from a set of transmit antennas.

The use of the transmit antenna number as an information-bearing unit increases the overall spectral efficiency by the base-two logarithm of the number of transmit antennas. At the receiver, a maximum receive ratio combining algorithm is used to retrieve the transmitted block of information bits. Here, we apply SM to orthogonal spatial division multiplexing (OSDM) transmission.

In general, any number of transmit antennas and any digital modulation scheme can be used. The constellation diagram and the number of transmit antennas determine the total number of bits to be transmitted on each sub-channel at each instant.

Instead, four quadrature-amplitude modulation (QAM) and two transmit antennas can be used to transmit the same number of information bits from spatial modulation mapping table.

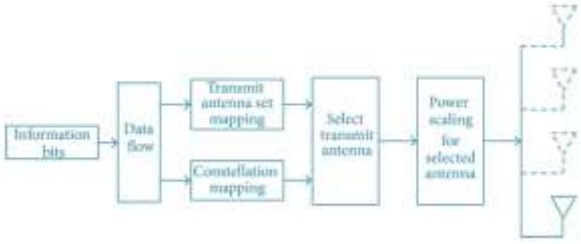

Figure 5: Block diagram of SM-MIMO system.

In SM, a block of any number of information bits is mapped into a constellation point in the signal domain and a constellation point in the spatial domain. At each time instant, only one transmit antenna of the set will be active. The other antennas will transmit zero power. Therefore, ICI at the receiver and the need to synchronize the transmit antennas are completely avoided. At the receiver, maximum receive ratio combining (MRRC) is used to estimate the transmit antenna number, after which the transmitted symbol is estimated. These two estimates are used by the spatial demodulator to retrieve the block of information bits.

B. Orthogonal Spatial Division Multiplexing

In our case the spatial division multiplexing is performed using complex wavelet transform as fast Fourier transform used in orthogonal frequency division multiplexing can split the signal into frequency signal only. The transform of a signal is just another form of representing the signal. It does not change the information content present in the signal.

The Wavelet Transform provides a time-frequency representation of the signal. It was developed to overcome the short coming of the Short Time Fourier Transform (STFT), which can also be used to analyze non-stationary signals. While STFT gives a constant resolution at all frequencies, the Wavelet Transform uses multi-resolution technique by which different frequencies are analyzed with different resolutions.

A wave is an oscillating function of time or space and is periodic. In contrast, wavelets are localized waves. They have their energy concentrated in time or space and are suited to analysis of transient signals. While Fourier Transform and STFT use waves to analyse signals, the Wavelet Transform uses wavelets of finite energy.

The wavelet analysis is done similar to the STFT analysis. The signal to be analyzed is multiplied with a wavelet function just as it is multiplied with a window function in STFT, and then the transform is computed for each segment generated. However, unlike STFT, in Wavelet Transform, the width of the wavelet function changes with each spectral component. The Wavelet Transform, at high frequencies, gives good time resolution and poor frequency resolution, while at low frequencies, the Wavelet Transform gives good frequency resolution and poor time resolution [29].

C. Transceiver of proposed OSDM system

The general block diagram of an OSDM transceiver has been shown in Figure 7. The digital data if first up-converted by a modulation scheme and then the symbols are put into parallel streams that the CWT block is going to work on. After ICWT is taken an appropriately sized cyclic prefix is appended at the end of the signal. Finally, the signal is sent into the channel. This channel is either the AWGN or the flat fading Rayleigh channel. At the receiver the first task is to remove the cyclic prefix and then apply CWT. Afterwards, the parallel streams are serialized and then the symbols put through the demodulator for obtaining the input source data.

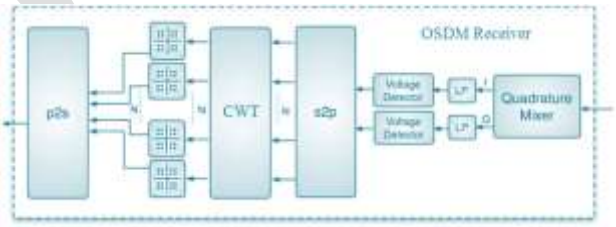

Figure 6. Block diagram of Proposed OSDM Receiver

Once the cyclic prefix is removed taking ICWT of the signal is equivalent to multiplying the constellation points by sinusoids whose frequencies are equal to the frequency of a carrier signal and then summing these products.

The **complex wavelet transform (CWT)** is a complex-valued extension to the standard discrete wavelet transform (DWT). It is a two-dimensional wavelet transform which provides multi-resolution, sparse representation, and useful characterization of the structure of an image. Further, it purveys a high degree of shift-invariance in its magnitude. However, a drawback to this transform is that it is exhibits 2^d (where d is the dimension of the signal being transformed) redundancy compared to a separable (DWT).

D. Space-time Coding

Space-Time Codes (STCs) have been implemented in cellular communications as well as in wireless local area networks. Space time coding is performed in both spatial and temporal domain introducing redundancy between signals transmitted from various antennas at various time periods. It can achieve transmit diversity and antenna gain over spatially uncoded systems without sacrificing bandwidth. The research on STC focuses on improving the system performance by employing extra transmit antennas. In general, the design of STC amounts to finding transmit matrices that satisfy certain optimality criteria. Constructing STC, researcher have to trade-off between three goals: simple decoding, minimizing the error probability, and maximizing the information rate.

There are several distributions used to model the fading statistics. The most commonly used distribution functions for the fading envelopes are Rice, Rayleigh and Nakagami-m. Rayleigh is a special case of Nakagami-m, when m equals one. The fading models are related to some physical conditions that determine what distribution that best describe the channel.

- The Rayleigh distribution assumes that there are a sufficiently large number of equal power multipath components with different and independent phase.
- The Nakagami one distribution equals the Rayleigh distribution above. It is a general observation that an increased m value corresponds to a lesser amount of fading and a stronger direct path.

Figure 7: Diagram of a MIMO wireless transmission system. The transmitter and receiver are equipped with multiple antenna elements. Coding (STBC), modulation, and mapping of the signals onto the antennas may be realized jointly or separately.

RESULTS & DISCUSSION

In this section we will be presenting the link level performance of STBC and SM coded OSDM using either BPSK or QPSK modulation. All simulations have been carried out using the readily available MATLAB platform and writing dedicated functions for different parts. The simulation results obtained have been presented in four parts. The first part provides the bit error rate performance for BPSK modulated data transmitted over a Rayleigh fading channel. This is then followed by a performance analysis of OFDM over the AWGN channel using either BPSK or QPSK modulation. Third part demonstrates the BER vs. SNR for STBC and Spatial modulation coded data transmitted over a Rayleigh fading channel without using OSDM. Finally, part four will provide STBC and SM coded OFDM performance when BPSK and QPSK are the preferred modulation and the channel is again the Rayleigh fading channel.

Receiver Reconfigurability

As presented in figure 3, the reconfigurable receiver has two main tasks. First, according to information provided by the channel estimation block, the adaptation module will compute the Condition number and prepare a decision vector. Then the demodulation and spatial processing stages are configured to support the selected communication scheme.

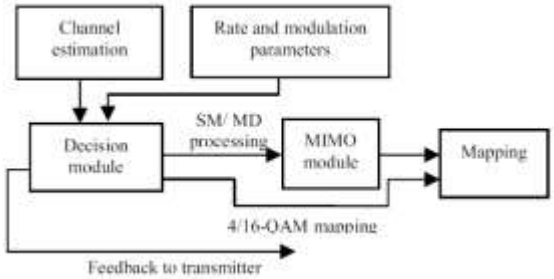

Figure 7. Receiver reconfigurable architecture

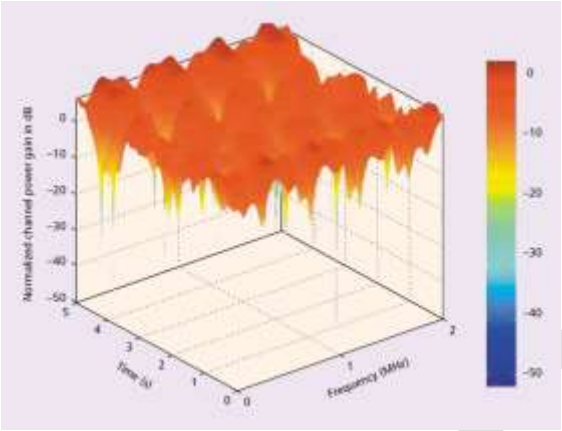

Figure 8. Frequency response vs. time for a multipath channel.

Simulations are carried out in MATLAB R2013b (Version 8.2.0.703), graphical user interface is created for the simulation of proposed work on MIMO systems. When there is a direct path between the transmitter and receiver the channel is usually referred to as the Rician channel and when LOS component is missing it will be referred to as the Rayleigh fading channel. In this section we demonstrate the BER performance of BPSK modulated data over a single path Rayleigh fading channel.

The MIMO system needs to be integrated and be backward compatible with an existing non MIMO network. MIMO signalling imposes the support of special radio resource control (RRC) messages. The terminals need to know via broadcast down link signalling if a base station is MIMO capable. The base station also needs to know the mobile's capability, i.e., MIMO or non-MIMO. This capability could be declared during call set up. Handsets are also required to provide feedback to the base station on the channel quality so that MIMO transmission can be scheduled if the channel conditions are favourable. These downlink and uplink RRC messages are then mapped on to the layer 2 signalling messages.

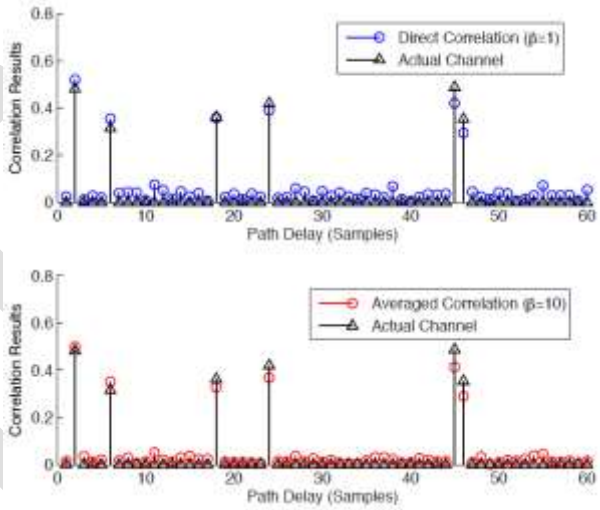

Figure 9. Averaged path delay estimation over the communication channel considering the fading environment between the links.

The analytical expression for the BER for BPSK modulated data in a Rayleigh fading channel is

$$P_b = 0.5\left(1 - \sqrt{\frac{(E_b/N_0)}{(E_b/N_0)+1}}\right)$$

And for the AWGN channel P_b is defined as:

$$P_b = 0.5\,erfc\left(\sqrt{\frac{E_b}{N_0}}\right)$$

This section will provide BER analysis for Alamouti STBC and SM over slow fading Rayleigh channels. For both schemes the simulations have been carried out using two transmit and one receive antenna

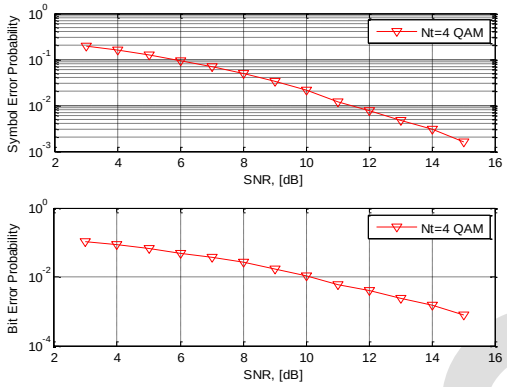

Figure 10. Comparison of Bit error probability and symbol error probability with respect to signal to noise ratio in case of 4 antenna quadrature amplitude modulation.

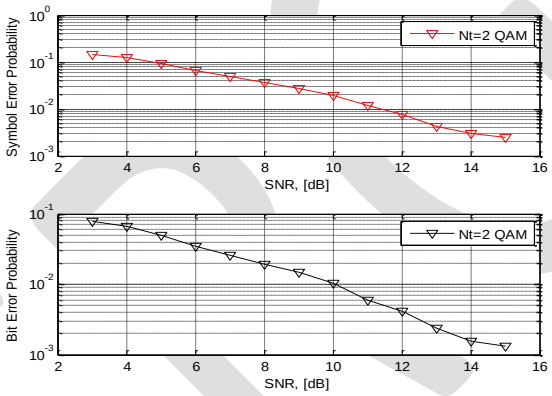

Figure 11. Comparison of Bit error probability and symbol error probability with respect to signal to noise ratio in case of 2 antenna quadrature amplitude modulation

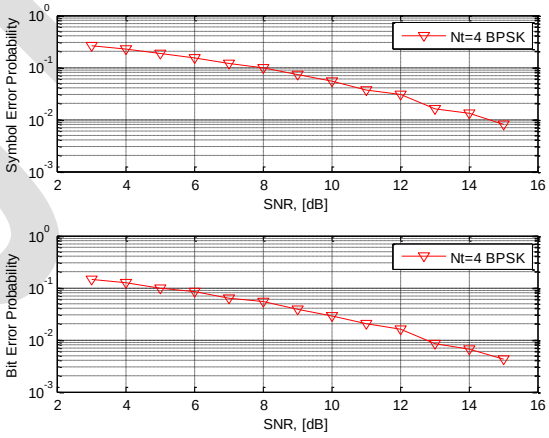

Figure 12. Comparison of Bit error probability and symbol error probability with respect to signal to noise ratio in case of 4 antenna binary phase shift keying modulation.

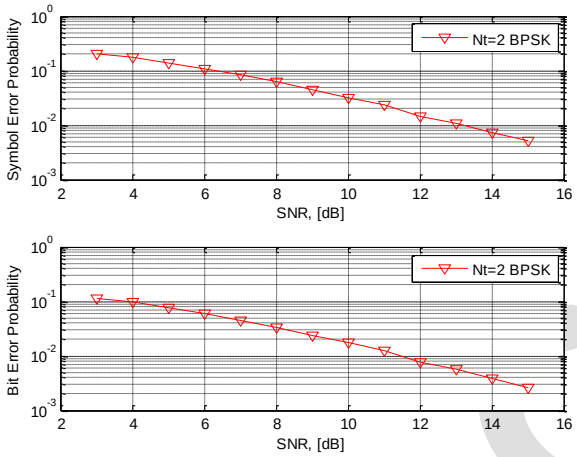

Figure 13. Comparison of Bit error probability and symbol error probability with respect to signal to noise ratio in case of 2 antenna binary phase shift keying modulation.

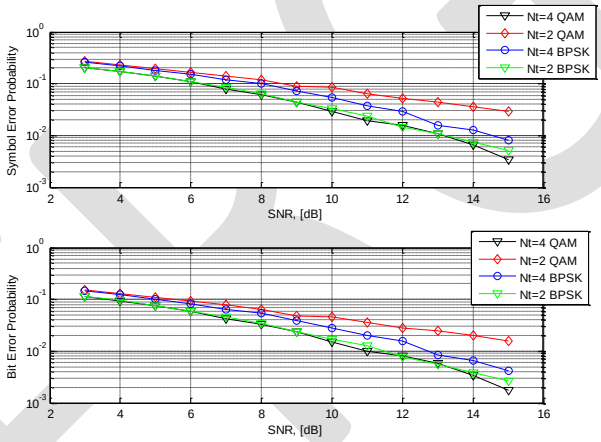

Figure 14. Overall Comparison of proposed SM-STBC-OSDM system for different modulation schemes and antenna numbers

CONCLUSION & DISCUSSION

Following the development of a system concept for future wide-area macro cellular wireless networks, a prototype has been built to evaluate its feasibility and investigate the implementation of MIMO and OFDM technologies. This prototype has been used to evaluate performance in different conditions typical of macro-cellular wireless networks.

With MIMO-related research entering a maturing stage and with recent measurement campaign results further demonstrating the benefits of MIMO channels, the standardization of MIMO solutions in third generation wireless systems (and beyond) has recently begun, mainly in fora such as the International Telecommunications Union and the 3GPPs. Several techniques, seen as complementary to MIMO in improving throughput, performance and spectrum efficiency are drawing interest, especially as enhancements to present 3G mobile systems.

In this paper, we first compared the BER performance of 4×1 and 2×1 transmit diversity STBC data transmission over a Rayleigh fading channel using both BPSK and QPSK modulation. The communication system used spatial modulation to encode random data signal to achieve a higher transmit diversity. The proposed multiplexing system using complex wavelet transform we named it as orthogonal spatial division multiplexing which is motivated from orthogonal frequency division multiplexing performs better in multiple input multiple output system. Results with BPSK modulation indicate that using two antennas at the receiver instead of one will bring approximately an extra gain of 9dB at a BER value of 10-4.

Also comparison between 2×1 STBC using BPSK and 2×1 STBC using QPSK indicate that STBC with BPSK modulation would be ~4.2 dB better than the 2×1 STBC with QPSK for BER value of 10-3. These results indicate that to get a better performance over a Rayleigh fading channel MIMO approach would be better than MISO case and low level modulation should be preferred.

In the second phase of the simulations, transmission of data encoded using STBC and spatial modulation over a Rayleigh fading channel was compared. Since the STBC scheme makes use of a channel estimate and spatial modulation does not for both BPSK and QPSK modulations, the BER performance for STBC was better using spatial modulated encoded data. This however does not mean that spatial modulation should not be considered. In fact when there is high mobility and the channel conditions are fluctuating rapidly it may be difficult to obtain estimates for the channel and the detection of transmitted.

The improvement in BER performance when OSDM is used mainly comes due to the use of the guard interval. When the duration of the guard interval is selected larger than the maximum excess delay time of the radio channel this will help reduce the inter-symbol interference in a fading environment and help improve the BER results. Secondly since OSDM splits a broadband channel into multiple spatial sub-channels this changes the behavior of each sub-channel to be flat fading and hence better performance can be observed.

We provided a brief overview of MIMO wireless technology covering channel models, capacity, coding, receiver design, performance limits, and MIMO-OFDM. The field is attracting considerable research attention in all of these areas. Significant efforts are underway to develop and standardize channel models for different systems and applications. Understanding the information-theoretic performance limits of MIMO systems, particularly in the multiuser context, is an active area of research. Space–time code and receiver design with particular focus on iterative decoding and sphere decoding allowing low complexity implementation have attracted significant interest recently.

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Image Quality Estimation of Tree Based DWT Digital Watermarks

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Abstract—A new and novel semi-fragile-watermarking technique has been proposed in this paper. The watermark is embedded in the tree structure of the colored digital image. Three different watermarks are embedded in a single cover picture in order to enhance the security of the digital media. But these digital images incorporating watermarks may get tampered many a times while traveling from sender's end to the receiver's end. Hence, the paper also addresses the Image Quality Assessment (IQA) problem using the objective metrics of the watermarks. Here, a general Digital watermarking based quality evaluation framework is proposed which shows how three watermarks are embedded in a tree structure of an image using "*wavelet packet decomposition (wpdec)*". The proposed framework also evaluates the level degradation in original image. The added parameters wPSNR and MSSIM (compared with MSE and PSNR) in the proposed framework makes the quality evaluation procedure more flexible. The experimental results suggest that the proposed framework works effectively and efficiently.

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Keywords— Digital watermarking, wpackets, Quality evaluation, Tree-structure, IQA, MSE, PSNR, wPSNRand MSSIM

I. INTRODUCTION

With the advent of digital media and advances in digital technology, media is often created or recorded, stored and distributed in digital domain. But since these are digital, once available on the network it is difficult to protect them unless they have a copyright protection or secured by some technique. Thus, protecting content against unauthorized access is considered as a major task. Among such new challenges of multimedia computing many mechanisms were introduce to protect this media. One such discovery is Digital Watermarking. It is a well-known protection and identification technique in which a visible/invisible mark is hidden in the multimedia information such as audio, image, video, or text. It is developed to protect the digital signal which is information, **against illegal reproduction, modifications**.

Watermarks are broadly classified in two categories: visible or invisible watermarks. Major property of an unseen watermark must be that it must be inseparable from the host image and unbreakable i.e. strong enough to resist any manipulations while keeping up with the image quality. This way, properties of the image remains accessible.
Keeping the above criteria's in mind, algorithms related to watermarking are proposed. Two domains where most commonly watermarking is applied are- a) Spatial domain & b) Transform domain. Former one is a normal image space in which a change in the position of image (I) directly projects a change in the scene of the image. It can be presumed that this technique works directly on pixels and used where robustness is not necessary. And the later one is based on modifying the Fourier transform of the image. It first changes the original image into frequency domain using Fourier Transform (FT), Discreet Wavelet Transform (DWT), and Discreet Cosine Transform (DCT) etc. With this watermark is not embedded in the image but to the values of its transform coefficient then inverse transforming coefficients forms watermarks.

Image quality assessment of watermarked images is one of the supreme needs in today's internet era. The speed at which images are exchanged over internet, there seems to be a threat of security amongst the media owners. Images undergo many transformations right from the sender's end to the receiver's end. The quality of an image may get deteriorated in between a several times. To add a watermark, compression and various other steps takes place during which many a time the quality of image degrades. This can mainly be due to compression and/or when travelling through the channel which is already corrupted. In order to keep up with the original features or characteristics of the image its quality evaluation at the receiver end becomes necessary. Human eye is considered to be the best evaluator for quality estimation but it isn't feasible to make out all the flaws between the images i.e. the original and the distorted one. Such way of picking up the flaws is known as subjective metric and the other one in which algorithms and calculations are involved is known as objective metrics [2]. Usually, the later one is used in order to evaluate the quality of an image. Numerous quality metrics are proposed in the literature to evaluate image quality. The commonly used quality metrics for signals are the Mean Squared Error (MSE) and Peak-Signal-to-Noise Ratio (PSNR). Objective quality metrics can be classified depending upon the amount of information required to evaluate a given quality measurement. Depending on this, three criteria's for objective evaluation has been made and they are [3]:

- **Full reference** (FR) image quality: meaning that a complete reference image is assumed to be known.
- **Reduced reference** (RR) image quality: In a third type of method, only partial information is available in the form of a set of extracted features as side information to help evaluate the quality of the distorted image.
- **No reference** (NR) image quality: In many practical applications, however, the reference image is not available, and a no-reference or "blind" quality assessment approach is desirable.

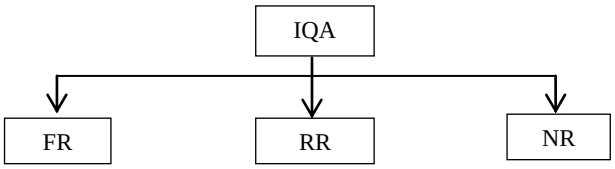

Figure1: IQA Classification

II. IMPLEMENTATION STRATEGIES

The previous work is based on the single image decomposition using wavelet tree. In the previous approach grey images are taken into account for watermarking. This will be possible only if one takes a single frame of the transmitted color image or if the color image can be converted into grey image. Here the watermarking is performed using one image and the quality estimation is performed using MSE and PSRN. Set Partitioning Hierarchical Tree Structure (SPIHT) is the algorithm used most commonly these days for the tree based wavelet decomposition. It basically is an image compression method which works on the concept of spatial orientation of tree where it defines the spatial relationship between the sub-bands in the form of pyramid formed from those four band split. A node of the tree corresponds to the pixel and identified by its pixel coordinate. Each node has four offspring.

Figure2: L-level DWT

An image in the form of signal is made to pass through the high-pass and low-pass filter. The output achieved is comprised of low-pass and high-pass sub-bands. The procedure is repeated to achieve one low-pass and three high-pass components. DWT may repeat this process for as many levels required.

To understand better let us consider an N*M image. Each row is filtered and down-sampled in order to obtain two N*(M/2) images. Then filter each column and subsample the filtered output to obtain four (N/2)*(M/2) images. All the resultant four images are named as LL, LH, HL, HH. LL is the one obtained by low pass filtering of row and column; LH is the one obtained by low pass filtering of row and high pass filtering of column; HL is the one obtained by high pass filtering of row and low pass filtering of column and in the same vain HH is obtained by high pass filtering of both row and column.

The successors of a pixel are four other pixels in the same space location of the same sub-band ant the next level. When they reach at the most finest level of the wavelet they are then said to be leaves and have no children. Pixels are of 2x2 block size. These are the independent resultant of hierarchical trees because each one of them comes from the same parent as they belong to same block. The pixel at the upper left of the block has no children.

III. PROPOSED ALGORITHM

In normal tree based wavelet decomposition, the generic step splits the approximation coefficients in two parts. The next step is again splitting of the new approximation coefficients; in this entire process the successive detailed coefficients are never re-analyzed. So, the *wpdec* has been chosen as a strategy for embedding watermarks. Basically, *wpdec* are a generalization of tree based wavelet decomposition (WD) which offers much richer signal analysis. The only difference between two is WD only keep splitting the approximation field every time whereas *wpdec*also splits detailed sub-bands as well. .

a). cover image b). watermark

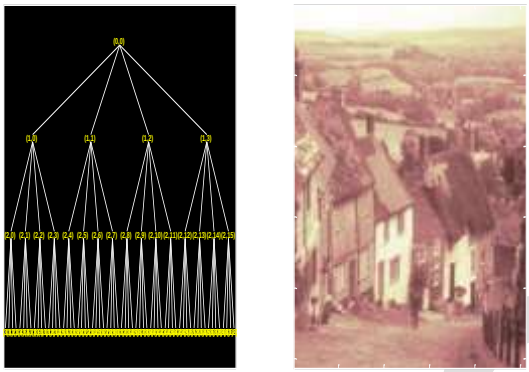

Figure 5: Wpdec

Figure6: Detailed components

Now the idea is to embed the watermarks in the diagonal detailed coefficients of the original image. This is because most of the information of any image is concentrated in their sharp edges that constitute the image. Looking at these edges one can realize that they are predominantly oriented horizontally and vertically. This explains why algorithm has chosen diagonal detailed coefficients for embedding as they have least information in them.

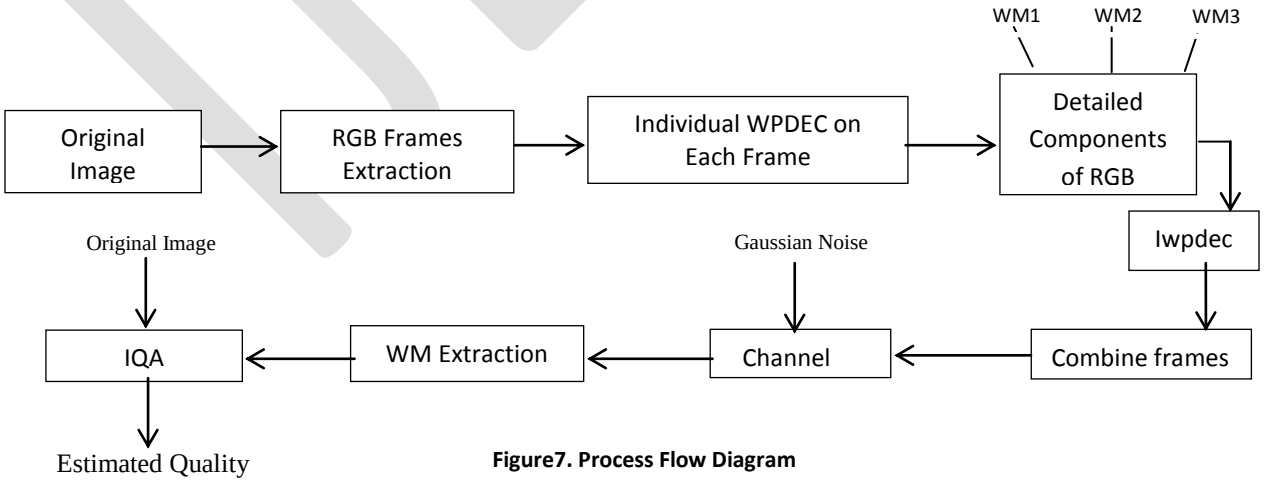

Figure7. Process Flow Diagram

First the cover image is loaded where the watermark is made to hide. Frame extractorextracts the RGB color features individually are extracted out of the image using the fame extractor and respectively are sent to the next phase. Wavelets energy is concentrated in time and is well suited for the study of the ephemeral, time varying signals. Thus, the wavelet decomposition is performed in order

break down an image into its n-level wavelet decomposition coefficients. These coefficients are used to embed the watermark more firmly and perceptually in most significant parts of the original image using *wpdec* function. In the next phase, the watermark image is embedded in the detailed component of the cover image where the coefficients are left vacant by taking the mean value of the pixels. This process is performed for green and blue components also and in the same lane all the components are added together to form a watermarked image. This watermarked image is then transferred through a channel where Gaussian noise is added resulting in a distorted watermarked image. Watermark is extracted by applying the inverse process of decomposition using watermark extractor. Quality evaluator checks the amount of distortion present in the received image and this is evaluated by quality evaluator using different metrics. For IQA wPSNR and MSSIM has been chosen. They are the emerging IQA matrices as they explore a digital image more in terms of their structure and symmetry then pixel differences like traditional metrics MSE and PSNR. In the Estimated quality phase the evaluated quality is displayed.

IV. EXPERIMENTS & RESULTS

A. System Parameters for Simulation

S.No.	Parameters	
1.	Cover image	Baboon
2.	Size of Cover Image	256*256
3.	Watermark Images	Lena, Kid and Horse
4.	Size of Cover Image	32*32
5.	Method of Watermarking	Tree based DWT
6.	No. of Decompositions	3
7.	Noise Introduced	Gaussian Noise

B. Embedding Phase

NOISE LEVEL	IMAGES	MSE	PSNR	MSSIM	wPSNR
0.001	kid	138.136	26.7277	0.61893	84.0105
	Lena	64.0728	30.0641	0.775771	85.6561
	Horse	99.1728	28.1669	0.707571	83.8964

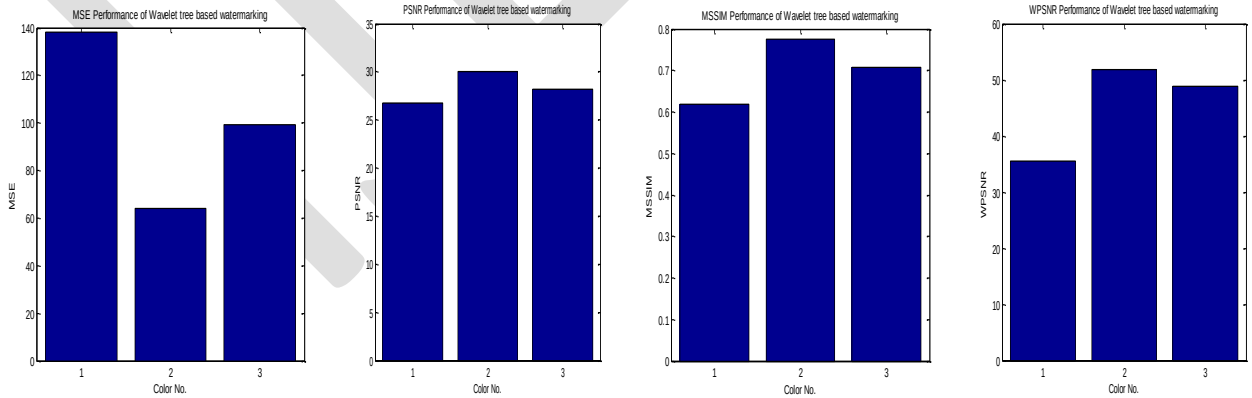

Figure 7: The experimental results tested on 3 images against Gaussian noise.

C. Extreaction Phase

NOISE LEVEL	IMAGES	MSE	PSNR	MSSIM	wPSNR

0.001	kid	91.4352	8.5197	0.851898	35.4686
	Lena	13.128	36.948	0.943895	51.803
	Horse	16.1828	36.0403	0.947405	4.781

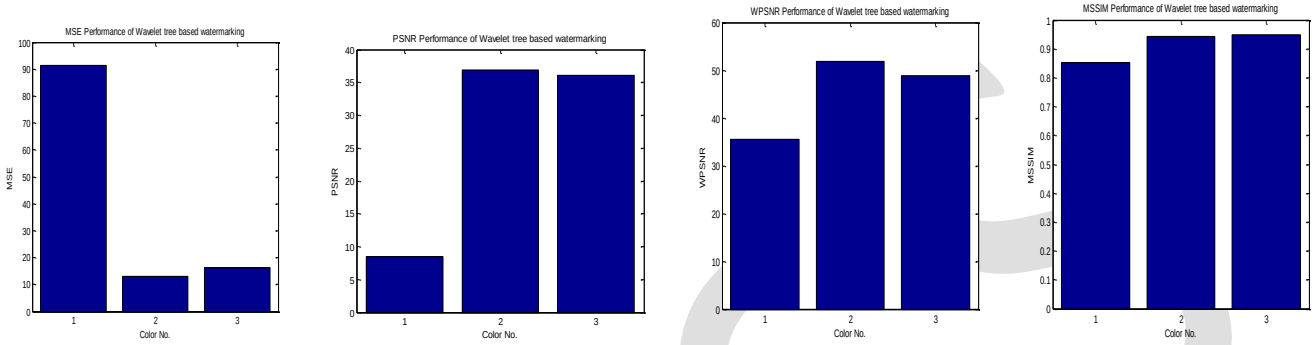

Figure 8: The experimental results tested on 3 images against Gaussian noise.

V. CONCLUSION & FUTURE WORK

The main aim of the research work is to design a framework for watermarks which is capable of assessing the degradation in the original and the watermarked image as well. After extensive research it was observed that the PSNR must range between 20db to 40db, MSSIM must result closer to 1db, MSE must be close to The estimated quality by wPSNR and MSSIM shows better results. With this approach user can find if the image at the receiver end is distorted or not. The proposed method promises to provide the more accurate search results then previously designed techniques.

In the future, emphasis will be made to incorporate more feature based information into the proposed approach. Secondly, efforts will be made to incorporate more objective based metrics like JND in the implementation. We believe the proposed scheme will perform well as expected.

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Experimental Study on Non Destructive Testing Techniques (NDTT)

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Abstract— Defects are needed to develop new methods and to assess the performance and reliability of used methods and procedures. It is crucial to have representative defects in order to have an accurate and realistic assessment of the performance of NDT. Representativeness should be to the actual service-induced defects that the NDT method is used to evaluate. While various techniques have been used to create such defects, all conventional techniques seem to have some shortcomings that limit true assessment of the NDT performance. This paper describes developments of NDT technology. It is well known that water has a detrimental effect on the performance of adhesive joints, and is amongst the most common elements for a bond to encounter in service. Surface analysis has subsequently been performed on the failure surfaces of these specimens, which has helped to explain the variations seen in the mechanical performance after exposure to moisture. It is well known that introduction of a crack-like defect into a structure reduces its stiffness. . It is shown that most of the traditional limitations can be overcome using the currently available technology. Finally, three real-world application cases are presented showing the use of such cracks**.**

Keywords— NDT[1], Penetrant[2], Cracking[3], and Corrosion[4]

INTRODUCTION

As we all know that every product in the Industry is made up of material .So the material which we are selecting should be a QUALITY in order to get a final product as a QUALITY PRODUCT. For that reason QUALITY CHECK is important in the Industry in Industry we can check the **QUALITY** of a product by two ways

1. Destructive testing
2. Non-Destructive testing

In DESTRUCTIVE TEST the specimen is subjected to fracture under load and mechanical properties are measured by this testing.
Eg. Tensile test, Impact test, Hardness test and Fatigue test. Compressive Strength test.
NON DESTRUCTIVE TESTS are employed for finished products to determine Internal defects such as Slag Inclusion, Porosity, Blow holes etc and Surface defects.

1.1 IMPORTANCE OF NDT

1. To improve the quality of a product
2. To improve the customer satisfaction
3. To reduce in-service accidents
4. Inspection of Raw Products
5. Inspection Following Secondary Processing
6. In-Services Damage Inspection
7. Flaw Detection and Evaluation
8. Leak Detection
9. Estimation of Mechanical and Physical Properties

2. COMMON APPLICATION OF NDT

1. Welding
2. Cracking
3. Corrosion
4. Erosion/Wear
5. The US has 578,000 highway bridges.
6. Corrosion, cracking and other damage can all affect a bridge's performance.
7. The collapse of the Silver Bridge in 1967 resulted in loss of 47 lives.

8. Bridges get a visual inspection about every 2 years.
9. Some bridges are fitted with acoustic emission sensors that "listen" for sounds of cracks growing.

Figure 1 **Bridge failure**

Figure 2 **inspection for in-service damage**

Figure 3 Cracking

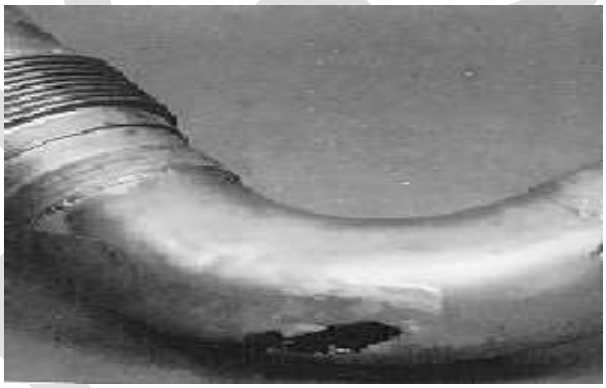

Figure 4 Corrosion

3. METHODS OF NDT

The following are the NDT methods that are most often used to inspect defects in material
Visual and optical testing,
Penetrate testing,
Magnetic particle testing,
Radiography testing and
Ultrasonic testing.

3.1 VISUAL AND OPTICAL TESTING

It is the simple method.
Visual inspection involves using an inspector's eyes to look for defects. The inspector also uses special tools such as magnifying glasses, mirrors to gain access and more closely inspect the subject area. Surface defects, dimensional accuracy and penetration in the welded joints are inspected by this method.
Most basic and common inspection method**.** Tools include fiber scopes, bore scopes, magnifying glasses and mirrors are used to inspect.

3.2 LIQUID PENETRANT INSPECTION

Is applicable to discontinuities that are open to the surface or surface connected. As surface opening is required, it cannot detect anomalies like inclusion, segregation etc. Liquid Penetrant Inspection detects only those discontinuities that are present on or open to the surface part. The principle of the technique is that a liquid is drawn by capillary action in to the defect and, after subsequent development; any surface breaking defects may be rendered visible to the human eye. This method of examination involves the use of a solvent soluble colored dye, which penetrates in to surface discontinuities by capillary attraction. After an interval or penetrant dwell time, the excess dye is removed and the exact position of any discontinuities present is detrained by the use of a non-aqueous wet developer, which gives a white background against the colored penetrant in the discontinuity.

3.2.1 MATERIALS:

The materials that may be used in this procedure are:
Penetrant: P-Met Company PP 110/NDT-19 or equivalent
Remover : P-Met Company PC 120/NDT-17 or equivalent
Developer: P-Met Company PD 130/NDT-18 or equivalent
Pre-cleaner: Remover may be used for this purpose.

3.2.2SURFACE CONDITION

The surface undergoing examination and any adjacent area within at least 1 mm shall be dry and free of any dirt, grease, lint, scale, welding flux, spatter, of or any extraneous matter that would observe surface openings or otherwise interfere with the examination. Weld ripples or surface irregularities shall be removed by any suitable process to a degree the irregularities cannot mask or be confused with the flux files of any discontinuity.
Temperature of the test surface will not be less than 10˚ C and not more than 52˚ C through out the test.

3.2.3 CRACK INDICATION.

A liquid with high surface wetting characteristics is applied to the surface of the part and allowed time to seep into surface breaking defects. The excess liquid is removed from the surface of the part, developer (powder) is applied to pull the trapped penetrant out the defect and spread it on the surface where it can be seen. Visual inspection is the final step in the process. The penetrant used is often loaded with a fluorescent dye and the inspection is done under UV light to increase test sensitivity. It is most preferred to check the gas lines.

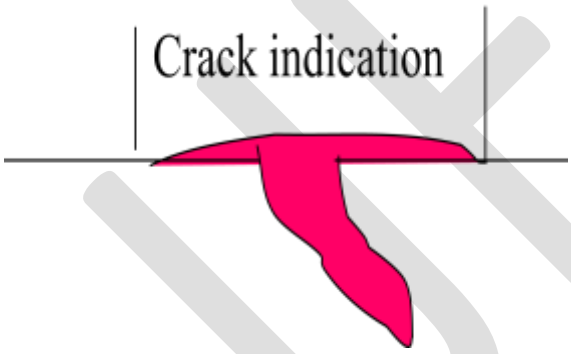

Figure 5 Actual discontinuity

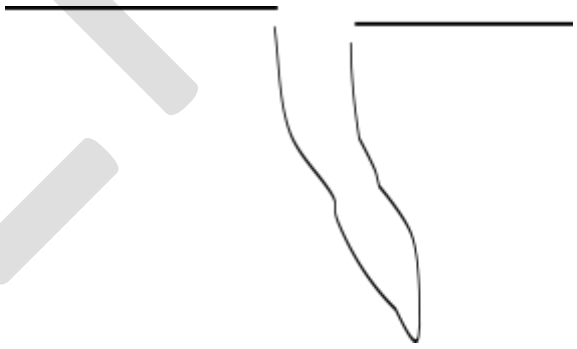

Figure 6 Human eye acuity

Figure 7 liquid penetrant inspection

Figure 8 liquid Penetrant inspection

3.2.4 STAGES IN PENETRANT TESTING

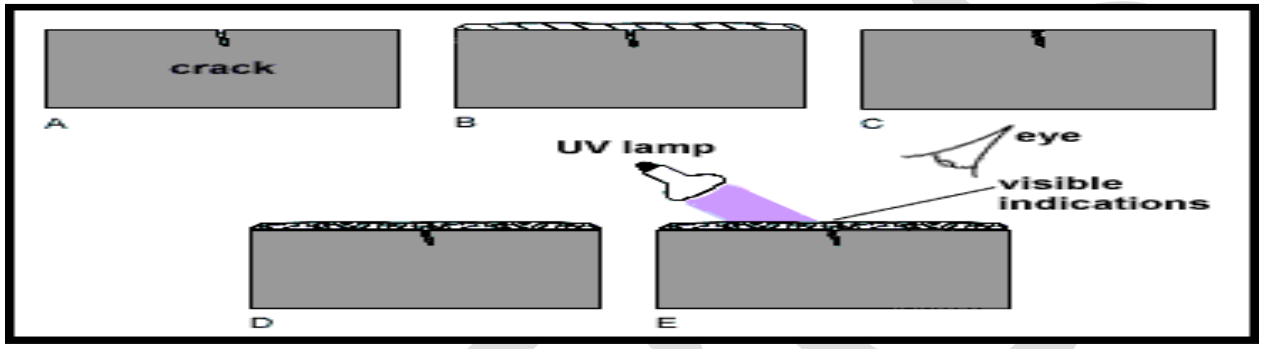

Figure 9 liquid penetrant examination steps.

Stage 1 Pre-examination cleaning: Ensure that the part or area of the part is free from grease and oily films. To accomplish this step use a clean wiper moistened with pre-cleaner.

Stage 2 Penetrant applications: A uniform coating of red dye is applied to the dry surface of the part under examination by dipping, brushing or spraying. If the penetrant is applied by spraying using compressor air type apparatus, filters shall be placed at the air outlet to preclude contamination of the penetrant from oil, waste and dirt sediment that may have collected in the lines. Avoid pools of penetrant on the part. Penetration times shall be as below, table-1, during which time the temperature of the material surface will be between 10˚.C - 52˚C.

Material **Form**	**Type of discontinuity**	Penetrant dwell time	Developer dwell time
Alluminium, -**castings**	Cold shuts, porisity,	10 Min.	10 Min.
Steel or high temperature alloy **welds**	Lack of fusion or cracks	10 Min.	10 Min.
Wrought iron Extractions **Forgings plate**	Laps cracks (all forms)	20 Min.	10 Min.

Table-1 penetration & development time for solvent removable penetrants

At any point of time penetrant should not be allowed to dry on the surface of the part. In the event of this occurring, further application of penetrant must be made for the original dwell time again before continuing with the sequence of this procedure.

Stage 3 Penetrant removal: Removal of the excess wet penetrant will be accomplished by using clean dry wipers. This operation shall be replaced until most traces of penetrant have been removed. Final removal of the trace residue of the penetrant can be removed by a clean wiper lightly moistened with solvent remover.Allow the part to dry by evaporation or with the assistance of a cold blast of air. Under no circumstances has the surface of the part to be flooded with solvent remover and excessive cleaning has to be avoided as there is a possibility of removing penetrant from shallow discontinuities.

Stage 4 Development: Immediately after the removal has been removed from the part and the surface is dry apply a uniform thin layer of non aqueous developer. Ensure that spraying covers the area of the part under examination. The minimum development time would be as per figure-1 and the time shall begin directly after the developer coating has dried on the surface of the part. The maximum bleaded out time shall be 30 minutes.

Stage 5Inspection: After the developer has been allowed to dry and the appropriate development time has been allowed to else, assessment of the indications shall be made either in natural or artificial light.

Stage 6 Post examination cleaning: After inspection has been carried out, the part shall be cleaned using a dry wiper. To assist in the removing of the developer a lightly moistened wiper in remover or water spray may be used

Note: It is important that this step 6 should be carried out as soon as possible to prevent the developer fixing itself on to the part.

ADVANTAGES

1.Highly sensitive to small surface flaws.
2.Simple in application.
3.Large areas & No. of parts can be inspected rapidly.
4.Complex geometric shapes are routinely inspected.
5.Visual representation of flaw.
6.Spray cans are very portable
7.Relatively inexpensive

LIMITATIONS:

1.Only surface breaking defects can be detected.
2.Only nonporous surface can be inspected
3.Pre cleaning is very critical.
4.Surface finish & roughness can affect inspection sensitivity.
5.Proper disposal of chemicals is essential.

INTERPRETATION RESULTS

All indications revealed by penetrant inspection do not necessarily represent defect, since a spurious indication may be encountered. In such a case, those areas exhibiting spurious indications should be re-tested by surface cleaning and reapplication of developer.

CONCLUSIONS

1. Discontinuities at the surface will be indicated by bleeding out of the penetrant; however, localized surface imperfections such as may occur from machining marks or surface conditions may produce similar indications which are not relevant to the detection of unacceptable discontinuities. Any indication in excess of the acceptance standard, which is believed to be non- relevant shall be regard as a defect and shall be re-examined, in accordance with paragraph 9.0, to verify whether or not actual defects are present. Non relevant indications and broad areas of pigmentation, which would mask indications of defects, are unacceptable.

Defects which occur as discontinuities at the surface will be indicates by the bleeding out of the penetrant.
1.However, localized surface imperfection, suction may occur from machining marks or surface conditions may produce similar indications, whichever not relevant to the detection of defects.
2.Any indication which is suspected to be non-relevant is to be considered relevant till it is proved otherwise.

3.Relevant indications are those which result from mech. Discontinuities linear indications are those indications in which the length is more than 3 times rounded indications are those indications which are circular or elliptical with the length less than three times the width.

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Dynamic Cluster based Cooperation for Fair Spectrum Sensing and Sharing in Cognitive Radio Networks

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Abstract— Spectrum sensing is a decisive measure for cognitive radio networks (CRN) to shelter transmission of primary users. Cooperative spectrum sensing is considered as the utmost auspicious technique to improve the consistency of spectrum sensing. Nevertheless, such cooperation also acquaint with overhead traffic of control signaling and consequence transmission which devours more power in battery-operated mobile terminals. In this research, an energy effectual transmission structure is proposed. An energy dependent dynamic Clustering technique is implemented to save energy disbursed in broadcasting results and swapping information. All cognitive lumps are detached into a few clusters, and report indigenous decisions to cluster heads to make cluster decisions through certain data fusion scheme. Cluster decisions are forwarded to the common fusion center to decide whether the spectrum of interest is idle or not, this distributed energy criteria clustering based cooperative spectrum sensing scheme using Centralized energy based selection scheme which can reduce the power consumption and prolong the network's lifetime. Results show that the spectrum sensing approach overwhelmed the traditional clustering based approaches in terms of network throughput, end-to-end delay and in terms of network lifetime of cognitive radio.

Keywords— Cognitive radio; cooperative spectrum sensing; spectrum sharing; clustering technique; energy efficiency.

introduction

Cognitive Radio (CR) is referred to as one of the best ideas to relief the conflict between the increasing spectrum demand and the inefficient spectrum utilization of licensed users (primary users, PU) [1]. In CR systems, when there are some data to be transmitted, SU should play spectrum sensing to find an idle spectrum channel as soon as possible. On the other hand, to avoid harmful interference to PU, SU will continuously perform spectrum sensing [2]. Among a variety of existing approaches, cooperative spectrum sensing is regarded as the most promising method to improve the reliability of spectrum sensing [3]-[5]. By introducing spatial diversity of data resources, cooperation can decrease the error detection probability of a single SU [4] and alleviate the negative impacts on performance caused by multipath fading and shadowing [6].

However, such above advantages of cooperation are at the cost of overhead traffic of control signalling and result transmission, which consumes more power and introduces additional transmission delay. Generally, power resource is limited, especially for battery-operated mobile terminals. Some researchers have proposed approaches to solve this problem. A censoring scheme is adopted to decrease reporting power consumption by dis-considering uninformative test statistics or local decisions in [8] and [9]. In [10], an adaptive time scheduling algorithm is proposed to decrease the number of local decisions. In [11], a voting scheme based on users' own confidence is developed to reduce the energy for information transmission by avoiding unnecessary transmission. The main idea of above methods is to reduce the amount of reporting results. However, either sensing performance loss is paid or high level management components are introduced

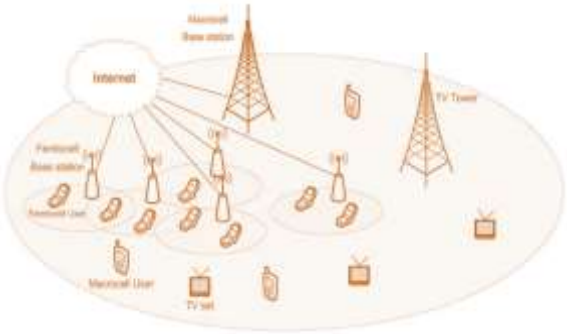

Figure 1. Spectrum sensing and sharing between cognitive radios in a CRN.

In above works, local decisions of every SU are reported to the common receiver directly. Some SU may be placed far away from the common receiver to improve the spectrum sensing performance [7], and their decisions are valuable. To ensure their results are received correctly, much transmission power is required because signal will be decayed with the increase of transmission distance. Thus, the life cycle of battery-operated mobile terminals will be shortened greatly when they are placed far away from the common receiver.

To reduce the transmission energy consumption, a cluster-based cooperation scheme is proposed in this paper. All SU are separated into a few clusters and one cluster head is set for each cluster to collect the sensing results, make cluster decisions and forward results to the common receiver. Thus the transmission energy consumption of SU will be reduced greatly because most of them are closer to cluster heads than to the common receiver and much less power is needed to transmit local decisions. Analytical results show significant transmission energy can be saved with our proposed method.

Building on spectrum sensing and other basic tasks, the ultimate objective of a cognitive radio network is twofold:

- Provide highly reliable communication for all users of the network, wherever and whenever needed;
- Facilitate efficient utilization of the radio spectrum in a fair-minded and cost-effective manner.

Spectrum sensing, defined as the task of finding spectrum holes by sensing the radio spectrum in the local neighbourhood of the cognitive radio receiver in an unsupervised manner. The term "spectrum holes" stands for those sub bands of the radio spectrum that are underutilized (in part or in full) at a particular instant of time and specific geographic location. To be specific, the task of spectrum sensing involves the following subtasks [15]:

1. *Detection of spectrum holes;*
2. *Spectral resolution of each spectrum hole;*
3. *Estimation of the spatial directions of incoming interferes;*
4. *Signal classification.*

Cognitive modules in the transmitter and receiver must work in a harmonious manner which is achieved via a feedback channel connecting them. Receiver is enabled to convey information on the performance of the forward link to the transmitter. Thus CR by necessity is an example of a feedback communication system [12, 13, 14 and 16]. Mainly three techniques are in vogue for transmitter detection, which are described below:

1. *Matched Filter*
2. *Energy Detector*
3. *Cyclostationary Feature Detector*

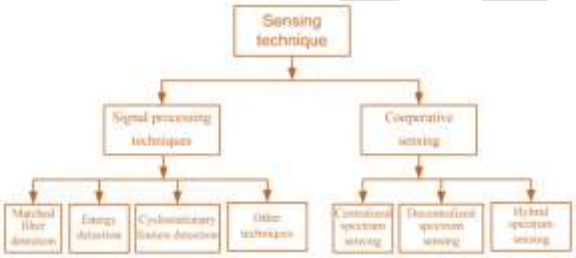

Figure 2. Main Sensing methods in terms of their sensing accuracies and complexities.

While for simple AWGN channels most classical approaches perform well, as we have seen, in the case of fading these techniques are not able to provide satisfactory results due to their inherent limitations and to the hidden node problem. To this end, several works have looked into the case in which cooperation is employed in sensing the spectrum.

Consider the scenario depicted in figure below, in which primary users (in white) communicate with their dedicated (primary) base station. Secondary receivers $\{RX_1, RX_2, RX_3,...,RX_K\}$ cooperatively sense the channel to identify a white space and exploit the medium. The main idea of the cooperative sensing techniques is that each receiver RX_i can individually measures the channel and interacts on their findings to decide if the medium is available. The main drive behind this idea is that each secondary receiver will have a different perception of the spectrum, as its channel to the receiver will be different from the other secondary receivers, thus decreasing the chances of interfering with hidden nodes [8].

Figure 3. Cooperative sensing scenario

Alternative scenarios exist, we will concentrate on the one pictured in Figure below, although all sensing techniques presented herein can be also applied to scenarios such as the one in which a deployment of a secondary network exclusively for spectrum sensing is

The association steps of this paper is as follows. The Introductory Section ends with a brief introduction of Spectrum sensing and its necessity in cognitive radio network. Section III addresses the proposed methodology and system model along with the technical specifications of proposed work including the clustering in network environment. Section IV gives details about the simulation results, it also shows some comparative graphs which prove that the proposed approach overcome the traditional clustering based approach. Section V shows a general conclusion of the paper, regarding review is presented.

RELATED WORK

Generally, the energy efficiency includes main several aspects: energy consumption of transmission, energy consumption of channel switching, energy consumption of spectrum sensing. In addition, there are more other energy consumptions in the cognitive network. In this paper, we only focus on the energy efficiency problem considering these aspects [27].

There are three constraints needed to be considered in the energy consumption problem: reliability of sensing, the throughput, the delay of SU. Reliability of sensing can be measured by two probability of detection: probability of detection and probability of false alarm. The probability of detection is the probability in the following situation: if the channel is busy, it is sensed as busy. The higher probability of detection means, SU can catch a PU communication more accurately. The probability of false alarm is the probability under this situation: the channel is idle, it is sensed busily [29, 30, and 31].

As mentioned before, the energy problem gets more attentions nowadays. Since energy problem is considered to be more serious these days, a plenty of research are done to study it. In [21], theoretical analysis is given about the energy efficiency in cognitive radio network. It mainly analyses the physical layer of the OSI model.

In [22], two spectrum sensing strategies are introduced to improve the energy efficiency. The simulation results show that 10% to 40% transmission energy is saved by using Confidence Voting (CV) algorithm and 65% to over 95% energy is saved by using Cluster-Collect-Forward (CCF) instead of broadcasting scheme. Also, energy detection in cognitive radio networks can be optimized by using a voting rule [23].

In [24], the energy efficiency is considered in transmission. The transmission duration and power allocation methods are come up with. However, this is based on the full information is known to the transmitter and receiver. In [25], distributed spectrum access is discussed.

In [26], the design of transmission frame is studied. Optimal frame duration can be found out to maximize the throughput. In this report, we build a system model and analyse the simulation result.

PROPOSED CLUSTER BASED APPROACH

In this paper, we propose cluster-based cooperative spectrum sensing algorithm using our new energy distribution check mechanism based protocol for cognitive radio networks. We demonstrate that our clustering approach extends the lifetime of cognitive networks and try to maintain a balance energy consumption of CR users. Furthermore, we present a reporting strategy that reduces the average number of reporting decisions, by allowing only the CR with detection information to send its binary decision (0 or 1) to CH.

First, primary signal or noise is collected as raw data by SU to get observations or make decisions. Then observations or local decisions will be reported to the common receiver to make a final decision

Figure 4. Function model of each SU in cooperative spectrum sensing.

System Model for proposed work

In proposed system model, this work consider a cognitive radio network with M cognitive radio users (CRs) that act as local sensing devices are assumed to be organised into clusters, where each cluster has a cluster head that makes a cluster decision based on the local decisions received from its cluster members and report the result to the cognitive base station that acts as a fusion centre FC. We assume that the primary user signal at CRs is not initially known, therefore, we adopt an energy detector to conduct the local sensing, which is suitable for any signal type. In this energy detection algorithm, only the transmitted power of the primary system is known. Therefore, this power will be detected firstly, and then compared with a predefined threshold to determine whether the spectrum band is greater than the detection threshold λ, the detector will available or not. When the energy of the received signal indicate that the primary user is present, which will depicted by exist hypothesis H_1, otherwise, the primary user is absent, which will be represented by null hypothesis H_0.

The system structure of a cognitive radio network according to our clustering approach is illustrated in Figure below. First, all CRs are grouped into clusters using our proposed energy distribution based protocol, which proposed for cooperative cognitive radio network. This protocol provides an efficient clustering configuration algorithm, in which the cluster heads CHs are selected by the FC in centralised and intelligent way, with minimisation of data transmission energy between a CH and other members in a cluster, according to the best reporting channel gain and the energy level of the CRs.

The process of our cluster-based spectrum sensing algorithm is conducted through the following steps:

1. CR*j* in cluster *i* conducts spectrum sensing individually and makes a local decision D_{ij} for $i = 1,\ldots,K$, $j = 1,\ldots,N_i$, where K is the number of $= \sum M_i$, where M is the total number of CRs clusters, N is the number of CR in cluster i and in the network.

Then, only the CR_{ij} that has a local binary decision will report its results to the CH_i to make a cluster decision C_i based on OR-rule data fusion method, otherwise no reporting decision is taken. If the CH_i receives local decision 0 instead of 1 due to imperfect reporting channel, it considered as a reporting error and this is auto corrected to 1.

$$= \begin{cases} 1, & \sum_{j=1}^{N_i} D \\ 0, & otherwise \end{cases} \geq 1 \quad (1)$$

2. Finally, all the CHs_i for $i = 1,2,\ldots,K$ that have a cluster decision $C_i = 1$ are allowed to send their results to FC and then a final decision F is made by a FC using OR-rule, as

$$F = \begin{cases} 1, & \sum_{i=1}^{K} C \\ 0, & otherwise \end{cases} \geq 1 \quad (2)$$

If no cluster decision is reported (i.e. $C_i = 0$), which means no primary signal is detected, and then a final decision $F = 0$ is taken.

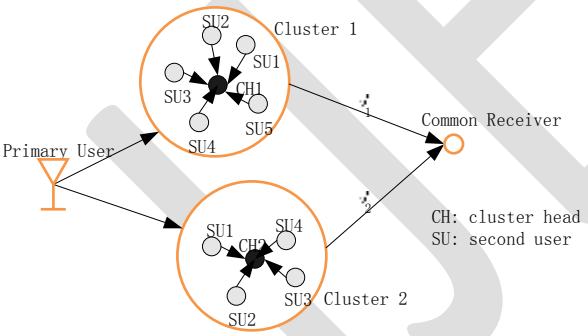

Figure 5. Cluster-based cooperative spectrum sensing.

This energy efficient spectrum sensing protocol maintains such clustering hierarchy. In our protocol, the clusters are re-established in each round. New cluster heads are elected in each round and as a result the load is well distributed and balanced among the nodes of the network. Moreover each node transmits to the closest cluster head so as to split the communication cost to the sink (which is tens of times greater than the processing and operation cost.

This work apply Method in a Wireless Field of Area 100×100 m. However we can change the field area as per the result variations. Also, the base Station is Placed at the Centre of CR Field initially, however we can change the Position of base Station. Initially the dissipated energy is Zero & residual energy is the Amount of initial energy in a Node, Hence Total energy E_t also the Amount of residual energy because it is the sum of dissipated & residual energy.

Also we can calculate the average energy Ea of a Node after the particular round with the Knowledge of Total Energy and a particular number of round numbers.

$$Ea = E_t \times \left(\frac{1-(r/Rmax)}{n}\right) \quad (3)$$

This work calculated the Dead Statistics before assigning a Cluster Head, and its value renewed every new round. The New Expression for Optimum Probability can be calculated from Different Energy Levels and Optimum Probability Defined Earlier. The selection probability mentioned in equation 4 for the selection of cluster head is taken as 0.1 (user defined).

$$p(i) = \frac{p \times n \times current\ Energy \times residual\ energy}{total\ energy \times average\ energy} \quad (4)$$

Here, a Node will becomes Cluster Head, if a Temporary number (between 0 to 1) assigned to it is less than the Probability Structure Below,

$$T(s_i) = \begin{cases} \frac{P_i}{1-P_i\left(rmod\frac{1}{P_i}\right)} & if\ \in G \\ 0 & otherwise \end{cases} \quad (5)$$

Here, *Pi* is come out from New Expression for Optimum Probability P (i)

Hence only the nodes with higher energy amongst the other nodes can fulfill the criteria above and hence a node can transmit data as a cluster head for a longer period which results in increment of network lifetime and throughput.

After a higher energy node becomes Cluster Head, Energy Models are applied to calculate the Amount of Energy Spent by it on that Particular Round and complete the round of steady state phase.

$$E_{TX}(l,d) = \begin{cases} lE_{dec} + l\varepsilon_{fx}d^2, d < d_0 \\ lE_{dec} + l\varepsilon_{fx}d^4, d \geq d_0 \end{cases} \quad (6)$$

If a Node will not a higher energy node and Discarded from the criteria above, than it goes to a Set of Normal node, and follow the behavior of normal node and complete the round of steady state phase.

RESULTS & DISCUSSION

In this detection algorithm, only the transmitted power of the primary system is known. Therefore, this power will be detected firstly, and then compared with a predefined threshold to determine whether the spectrum band is greater than the detection threshold λ, the detector will available or not. When the energy of the received signal indicate that the primary user is present, which will depicted by exist hypothesis H1, otherwise, the primary user is absent, which will be represented by null hypothesis H0.

Simulations are carried out in MATLAB R2013b (Version 8.2.0.703), graphical user interface is created for the simulation of proposed work on energy efficient clustering solution for cognitive radio networks.

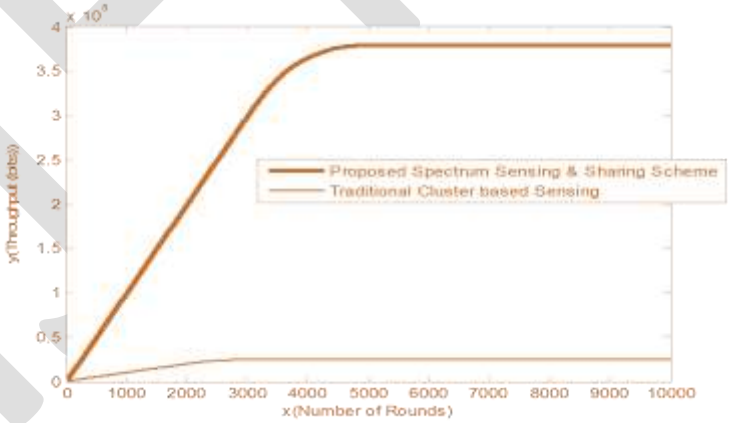

Figure 6. Figure above show a comparative view of network throughput with respect to rounds in both the proposed approach and traditional clustering approach for 100 cognitive radios

The above figure shows the Network throughput in bits/sec with respect to number of rounds or pause time of packet delivery in the network for the protocols we considered. Throughput is the number of the packets received at the destination with respect to the packet sent from the sources.

Throughput of receiving bits: It is the ratio of the total number of successful packets in bits received at destination in a specified amount of time.

$$\text{TH} = \sum \text{Transmission of Routing Packets}$$

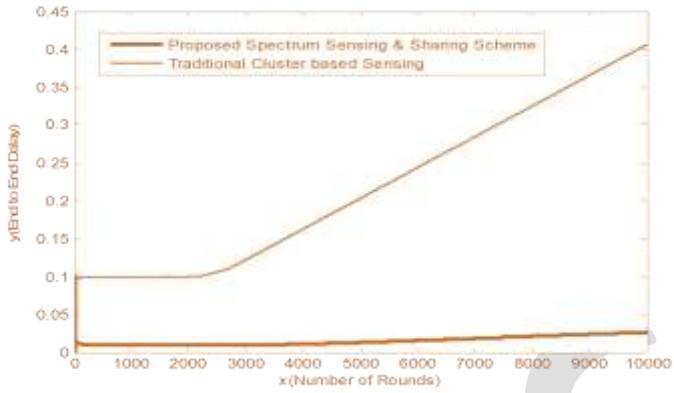

Figure 7. Figure above show a comparative view of network end to end delay with respect to rounds in both the proposed approach and traditional clustering approach for 100 cognitive radios

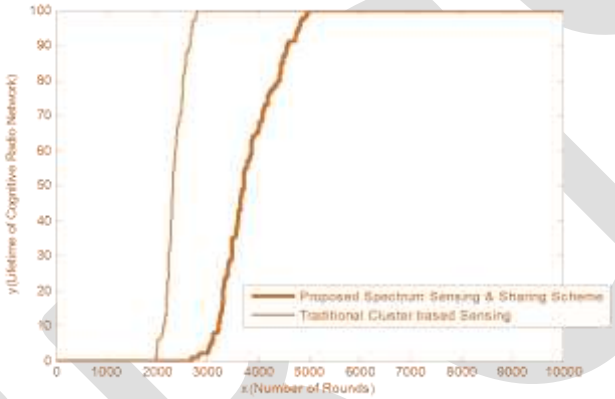

Figure 8. Figure above show a comparative view of network lifetime with respect to rounds in both the proposed approach and traditional clustering approach for 100 cognitive radios

TABLE 2. COMPARISONS OF NETWORK LIFETIMES (NUMBER OF ROUNDS)

nodes	Protocol	Nodes Dead(in Rounds)			
		1%	20%	50%	100%
25	Traditional	968	1006	1157	1326
	Proposed	2612	3382	4186	4934
100	Traditional	947	1095	1319	1509
	Proposed	2741	3448	3862	4893

Result is taken when the base station is placed at the centre of sensor field and the selection probability is defined through the energy values considered. It is clear from the figure that both the network lifetime and stability of lifetime of network is achieved through proposed protocol.

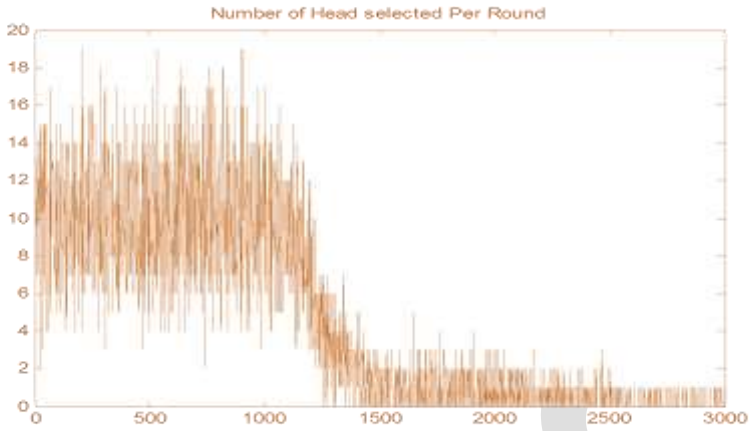

Figure 9. This figure shows the number of cluster head selected during the communication period in each round when communication is done for 3000 rounds. It is clear from the figure that maximum 19 cluster head is selected in a single round not more than that, when taking a sensor network of 100 sensors.

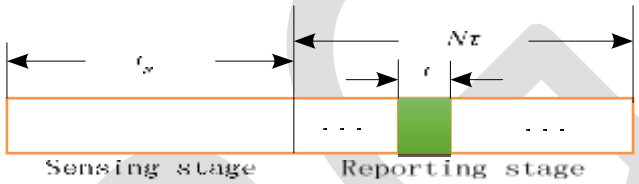

Figure 10. Sensing frame structure of CR users.

TABLE 3: Mean and variance of residual energy in both the proposed method and the WEEC method

	Range (J)	Mean residual energy (J)	Variance residual energy (J)
Proposed	98.5569	43.9161	38.5569
Traditional	29.7538	13.1419	11.7406

TABLE 4. COMPARISONS OF NETWORK THROUGHPUT (BITS)

Nodes	Method	Network Throughput (in bits)
100	Traditional	20000 bits
	Proposed	379000 bits

CONCLUSION & DISCUSSION

Cooperative spectrum sensing for CR systems has been studied under energy constraints in this paper. This is an Energy efficient and a cost effective co-operative spectrum sensing technique which performs well in fading and shadowing environment is to be developed. A cluster-based co-operative network architecture with the concept of detection center is introduced which actually helps to reduce the power consumption and in turn increase the energy efficiency. To decrease the transmission energy consumption, a scheme of cluster-based cooperative spectrum sensing was developed. The transmission energy consumption of our proposed method

has been derived and compared with that of the conventional one. In addition, the transmission delay is analyzed theoretically. Simulation results demonstrate significant decrease of transmission energy consumption. Other than that, with some frequency reuse methods, the proposed method can run much faster than conventional scheme due to the parallelism benefited from clustering. Simulation results indicate that the optimal scheme varies the number of users so that error is kept as minimum as possible without compromising the detection probability.

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Development of Back Propagation Neutral Network Model for Ectracting the Feature from a Satellite Image using Curvelet Transform

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Abstract— New adaptive representation method is proposed to reduce the size of visible satellite images that is present in very high resolution. The development of high resolution remote sensing systems demands new intelligent approaches of acquisition, transmission, and storage of the received data. Such approaches for enormous data volumes look for the aid of data compression. It offers a novel adaptive technique of image representation. This method is based on an inverse pyramidal decomposition of original data and neural networks. Around the basic advantage of the pyramidal decomposition in comparison with the other methods for image compression is the ability to perform Y progressive Z transfer (or storage) for every consecutive decomposition layer. In result, the image could be restored with high compression ratio and gradually improving quality. The image which are processed are .lan (Rural Image), and .bmp (Urban Image) with the size of 454x 477 and 442 x 442 respectively.
Exploring the useful information for the image classification it is noticeable that Artificial Neural Network is a composed method for the Neural Network for Satellite images with additional features for the images and also the Statistical features. But in Haar Transform, it is not continuous and is not differentiable. The transformed image is presented by values of coefficients of the hidden layer of a neural network. They are calculated during the period of training of 3 layer Back Propagation Neural Network (BPNN). The fusion of high-spectral but low spatial resolution multispectral and low spectral but high spatial resolution panchromatic satellite images is a very useful technique in various applications of remote sensing.
Recently, it shows that wavelet-based image fusion method provides high quality of the spectral content of the fused image. The texture image analysis is found within in the range of 86.2- 99.06 % of the performance. To overcome non continuity and non differentiability there is an introduction of a new method based on the Curvelet transform, which represents edges better than wavelets. Since edges play a fundamental role in image understanding, one good way to enhance spatial resolution is to enhance the edges. Curvelet-based image fusion method provides richer information in the spatial and spectral domains simultaneously. The curvelet transform is a very young signal analyzing method with good potential. It is recognized as a milestone on image processing and other applications

Keywords— Curvelet Transform, Back propagation Neural Network, Haar transform, .lan , .bmp , multispectral, Artifical Neural Network.

INTRODUCTION

Image Processing is a technique to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-today life for various applications. Various techniques have been developed in Image Processing during the last four to five decades. Most of the techniques are developed for enhancing images obtained from unmanned spacecrafts, space probes and military reconnaissance flights. Image Processing systems are becoming popular due to easy availability of powerful personnel computers, large size memory devices, graphics softwares etc. In Neural Networks is a field of Artificial Intelligence (AI) it is inspired from the human brain, find data structures and algorithms for learning and classification of data.

Many tasks that humans perform naturally fast, such as the recognition of a familiar face, proves to be a very complicated task for a computer when conventional programming methods are used. By applying Neural Network techniques a program can learn by examples, and create an internal structure of rules to classify different inputs, such as recognizing images.

ARTIFICIAL NEURAL NETWORKS

Artificial Neural Networks are commonly used in pattern classification, function approximation, optimization, pattern matching, machine learning and associative memories. They are currently being an alternative to traditional statistical methods for mining data sets in order to classify data. Artificial Neural Networks are well-established technology for solving prediction and classification problems, using training and testing data to build a model. However, the success of the networks is highly dependent on the performance of the training process and hence the training algorithm. It has training feed-forward neural networks to classify different data sets which are widely used in the machine learning community.

Broad applicable areas of artificial neural networks, pattern recognition is one of the most important applications in such problems: speech synthesis, diagnostic problems, medicine, finance, robotic control, signal processing, computer vision and many other problems that fall under the category of pattern recognition. Among many different neural network classifiers, the multilayer feed-forward networks have been mainly used for solving classification tasks, due to their well-known universal approximation capabilities. The success of neural networks largely depends on their architecture, their training algorithm, and the choice of features used in training.

Artificial neural networks (ANN) are very important tools for solving different kind of problems such as pattern classification, forecasting and regression. However, their design imply a mechanism of error-testing that tests different architectures, transfer functions and the selection of a training algorithm that permits to adjust the synaptic weights of the ANN. This design is very important because the wrong selection of one of these characteristics could provoke that the training algorithm be trapped in a local minimum. Because of this, several met heuristic based methods in order to obtain a good ANN design have been reported.

Neural Networks mimic the pattern of human learning to solve many difficult tasks in the field of applications which include nonlinear regression, classification, pattern recognition and control systems .By configuring virtual neural networks that function like the human brain, computers can perform tasks at greater speeds and with increased flexibility of application. These networks are capable of offering invaluable insights into the vast information stockpiles that are common today. The artificial networks simulate the complex neural network by clustering the artificial neurons. In every neuron system, there must be some input nodes as well as some output nodes. Some of the neurons interface the real world to receive the inputs and some other neurons provide the real world with the outputs of the network. The rest of the neurons are hidden layers whose number depends on the problem to be solved.

LITERATURE SURVEY

Various work has been carried out in Neural Network for various applications .Some deals with the study, analysis and implementation of neural network algorithm in-order to analysis different types of satellite images using ANN technique. Following references were reviewed in order to obtain details on the general concepts of object-based image classification, image processing, segmentation, training of neural networks and corresponding algorithm of this project work: Object-based image classification methods are increasingly being used for classification of land use/cover units from high-resolution satellite images with results closer to human interpretation compared to per-pixel classifiers. The problem of nonlinear separability of classes in a feature space consisting of spectral/spatial/textural features is addressed by kernel-based nonlinear mapping of the feature vectors
[1]. This facilitates use of linear discriminate functions for classification as used in artificial neural networks (ANNs). The most common approach used for building objects is image segmentation, which dates back to the 1970s. In contrast to typical Land sat resolutions, high resolution images support several scales within their images.

[2]. The object-based, multi scale classification and inventory framework provides an effective and flexible way of showing different mixes of human development and forest cover in a hierarchical fashion for human-dominated forest. The wavelet domain features have been intensively used for texture classification and texture segmentation with encouraging results. More of the proposed multi-texture analysis methods are quite successful, but all the applications of the texture analysis so far are limited to gray scale images.

[3]. The wavelet-based feature extraction algorithms have been developed to explore the useful information for the hyper spectral image classification. On the other hand, the idea of using artificial neural network (ANNs) has also proved useful for hyper spectral image classification.

[4]. To combine the advantages of ANNs with wavelet-based feature extraction methods, the wavelet network (WN) has been proposed for data identification and classification. A new approach for image classification is based on the color information, shape and texture .Use of three RGB (red green blue) bands of a color image in RGB model to extract the describing features. The increased synergy between neural networks (NN) and fuzzy sets has led to the introduction of granular neural networks (GNNs) that operate on granules of information, rather than information itself. The fact that processing is done on a conceptual rather than on a numerical

level, combined with the representation of granules using linguistic terms, results in increased interpretability. This is the actual benefit, and not increased accuracy, gained by GNNs.

[5].The constraints used to implement the GNN are such that accuracy degradation should not be surprising. For high dimensional pattern recognition problems, the learning speed of gradient based training algorithms (back-propagation) is generally very slow. Local minimum, improper learning rate and over-fitting are some of the other issues. Extreme learning machine was proposed as a non-iterative learning algorithm for single-hidden layer feed forward neural network (SLFN) to overcome these issues. The input weight and biases are chosen randomly in ELM which makes the classification system of nondeterministic behavior.

BACK PROPAGATION NEURAL NETWORKS

INTRODUCTION

If the human brain is an 'ultimate' neural network, then ideally a device which imitates the brain's functions. However, because of limits in technology, it must settle for a much simpler design. The obvious approach is to design a small electronic device which has a transfer function similar to a biological neuron, and then connect each neuron to many other neurons, using RLC networks to imitate the dendrites, axons, and synapses. This type of electronic model is still rather complex to implement. Further constraints are needed to make the design more manageable. First,change the connectivity between the neurons so that they are in distinct layers, such that each neuron in one layer is connected to every neuron in the next layer. Further,the defined signals flow only in one direction across the network, and can simplify the neuron and synapse design to behave as analog comparators being driven by the other neurons through simple resistors. Therefore building up of a feed forward neural network model that may actually be practical to use.

Referring to figures 1.1 and 1.2 below, the network functions as follows: Each neuron receives a signal from the neurons in the previous layer, and each of those signals is multiplied by a separate weight value. The weighted inputs are summed, and passed through a limiting function which scales the output to a fixed range of values. The output of the limiter is then broadcast to all of the neurons in the next layer. So, to use the network to solve a problem, we apply the input values to the inputs of the first layer, allow the signals to propagate through the network, and read the output values.

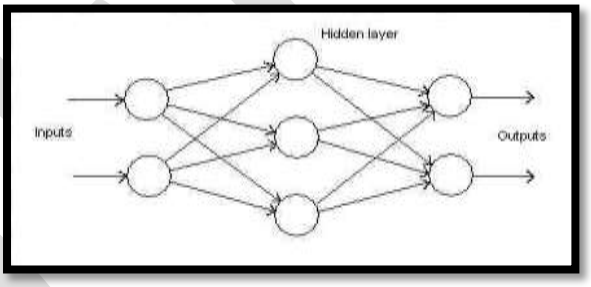

Figure 1.1. A Generalized Network.

Stimulation is applied to the inputs of the first layer, and signals propagate through the middle (hidden) layer(s) to the output layer. Each link between neurons has a unique weighting value.

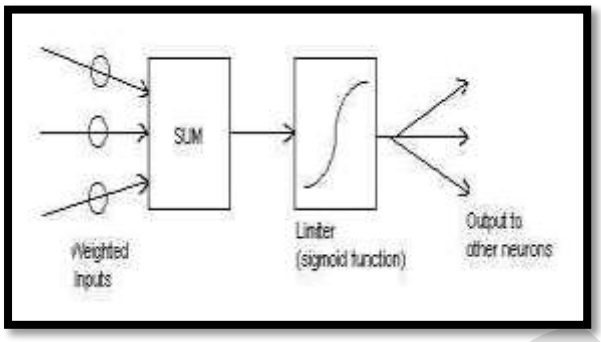

Figure 1.2. The Structure of a Neuron.

Inputs from one or more previous neurons are individually weighted, then summed. The result is non-linearly scaled between 0 and +1, and the output value is passed on to the neurons in the next layer

Since the real uniqueness or 'intelligence' of the network exists in the values of the weights between neurons, we need a method of adjusting the weights to solve a particular problem. For this type of network, the most common learning algorithm is called Back Propagation (BP). A Back Propagation network that is, we must provide a learning set that consists of some input examples and the known-correct output for each case. So, we use these input-output examples to show the network what type of behavior is expected, and the BP algorithm allows the network to adapt.

The Back Propagation learning process works in small iterative steps: one of the example cases is applied to the network, and the network produces some output based on the current state of its synaptic weights (initially, the output will be random). This output is compared to the known-good output, and a mean-squared error signal is calculated. The error value is then propagated backwards through the network, and small changes are made to the weights in each layer. The weight changes are calculated to reduce the error signal for the case in question. The whole process is repeated for each of the example cases, then back to the first case again, and so on. The cycle is repeated until the overall error value drops below some pre-determined threshold. At this point we say that the network has learned the problem "well enough" - the network will never exactly learn the ideal function, but rather it will asymptotically approach the ideal function.

Back propagation is a form of supervised learning for multi-layer nets, also known as the generalized delta rule. Error data at the output layer is "back propagated" to earlier ones, allowing incoming weights to these layers to be updated. It is most often used as training algorithm in current neural network applications. The back propagation algorithm was developed by Paul Werbos in 1974 and rediscovered independently by Rumelhart and Parker. Since its rediscovery, the back propagation algorithm has been widely used as a learning algorithm in feed forward multilayer neural networks.

In general, the difficulty with multilayer Perceptrons is calculating the weights of the hidden layers in an efficient way that result in the least (or zero) output error; the more hidden layers there are, the more difficult it becomes. To update the weights, one must calculate an error. At the output layer this error is easily measured; this is the difference between the actual and desired (target) outputs. At the hidden layers, however, there is no direct observation of the error; hence, some other technique must be used. To calculate an error at the hidden layers that will cause minimization of the output error, as this is the ultimate goal.

The Back Propagation algorithm is an involved mathematical tool; however, execution of the training equations is based on iterative processes, and thus is easily implementable on a computer.

CURVELET TRANSFORM:

Curvelets are a non-adaptive technique for multi-scale object representation. Being an extension of the wavelet concept, they are becoming popular in similar fields, namely in image processing and scientific computing.

Wavelets generalize the Fourier transform by using a basis that represents both location and spatial frequency. For 2D or 3D signals, directional wavelet transforms go further, by using basis functions that are also localized in orientation. A curvelet transform differs from other directional wavelet transforms in that the degree of localisation in orientation varies with scale. In particular, fine-scale basis functions are long ridges; the shape of the basis functions at scale j is 2^{-j} by $2^{-j/2}$ so the fine-scale bases are skinny ridges with a precisely determined orientation.

Curvelets are an appropriate basis for representing images (or other functions) which are smooth apart from singularities along smooth curves, where the curves have bounded curvature, i.e. where objects in the image have a minimum length scale. This property holds for cartoons, geometrical diagrams, and text. As one zooms in on such images, the edges they contain appear increasingly straight. Curvelets take advantage of this property, by defining the higher resolution curvelets to be skinnier the lower resolution curvelets. However, natural images (photographs) do not have this property; they have detail at every scale. Therefore, for natural images, it is preferable to use some sort of directional wavelet transform whose wavelets have the same aspect ratio at every scale.

When the image is of the right type, curvelets provide a representation that is considerably sparser than other wavelet transforms. This can be quantified by considering the best approximation of a geometrical test image that can be represented using only n wavelets, and analysing the approximation error as a function of n. For a Fourier transform, the error decreases only as $O(1/n^{1/2})$. For a wide variety of wavelet transforms, including both directional and non-directional variants, the error decreases as $O(1/n)$. The extra assumption underlying the curvelet transform allows it to achieve $O((log(n))^3/n^2)$.Efficient numerical algorithms exist for computing the curvelet transform of discrete data. The computational cost of a curvelet transform is approximately 10–20 times that of an FFT, and has the same dependence of $O(n^2 log(n))$ for an image of size $n \times n$.

Wavelet transforms are based on small wavelets with limited duration. The translated-version wavelets locate where we concern. Whereas the scaled-version wavelets allow us to analyze the signal in different scale.The wavelet transform provide a multiscale basis as seen in Figure 1.3:

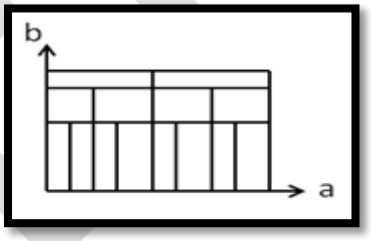

Figure 1.3 : Basics of Wavelet

Althought multiscale can handle point discontinue well,but it is not optimal up to curve. Because the wavelet basis is isotropic, and the curve have direction so it take lot of coefficients to account for edges as shown in figure 1.4.

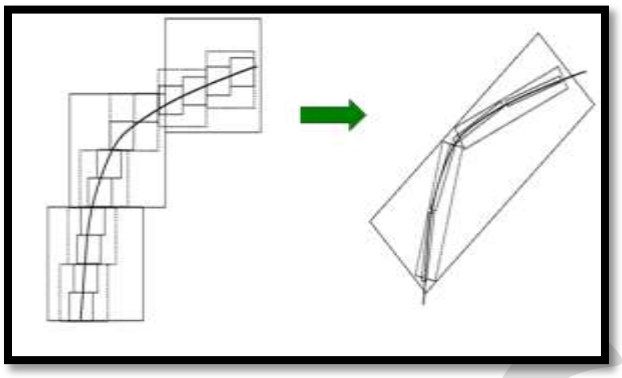

Figure 1.4: Difference between Wavelet approach and Curvelet approach

Point and Curve Discontinuities Discussion	
FT	● A discontinuity point affects all the Fourier coefficients in the domain. Hence the FT doesn't handle points discontinuities well.
Wavelet	● Point: it affects only a limited number of coefficients. Hence the WT handles points discontinuities well. ● Curve: Discontinuities across a simple curve affect all the wavelets coefficients on the curve.Hence the WT doesn't handle curves discontinuities well.
Curvelet	● Curvelets are designed to handle curves using only a small number of coefficients. Hence the Curvelet handles curve discontinuities well.

Table 1.1: Point and Curve Discontinuities Discussion of FT, Wavelet and Curvelet

Generation curvelet transform is limited because the geometry of ridgelets is itself unclear, as they are not true ridge functions in digital images. Later, a considerably simpler second-generation curvelet transform based on frequency partition technique was proposed. The second-generation curvelet transform has been shown to be a very efficient tool for many different applications in image processing.

IMPLEMENTATION DETAIL

The methodology includes image acquisition, image segmentation data preprocessing, , Artificial Neural Network training, image classification (using pixel based and object based feature extraction), post classification using accuracy assessment. It also highlights how the Curvelet transform helps in achieving the accurate Segmented Image which is shown in Figure 1.5.

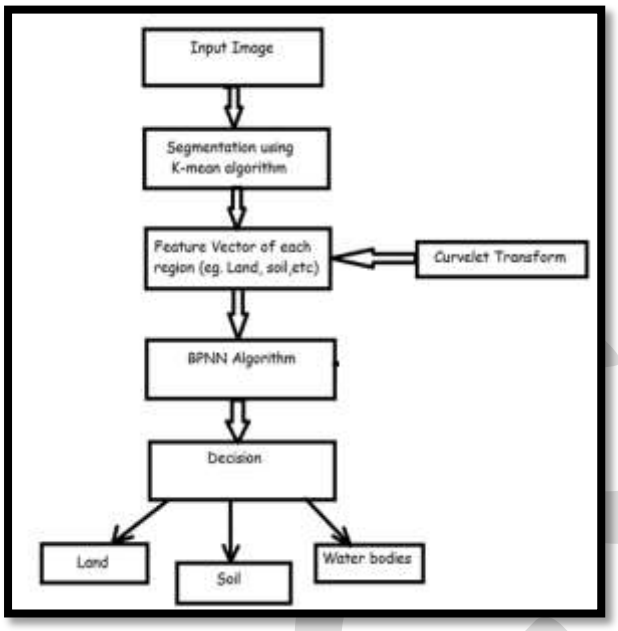

Figure 1.5 : Methodology

Step 1: When the input image is taken it is resized and then segmented using the K-Means algorithm. In K-means algorithm the segmentation is done in 3 planes. And we get the segmented region at the output.
Step 2: Curvelet transform gives the statistical features (Standard deviation and mean value) and better line features and borders and better visual effect.
Step 3:- BPNN Algorithm gives the real identification of the feature with the help on Knowledge Base (Prior Information of the the feature)
Step 4: Decision is made of the image whether the cluster is of Land, Soil or water bodies.

RESULT AND DISCUSSIONS

Lan Satellite Image (Rural Image) : Figure 1.6 shows the original satellite image in the .Lan format. The resolution of the urban image is 454 x 477 pixels.

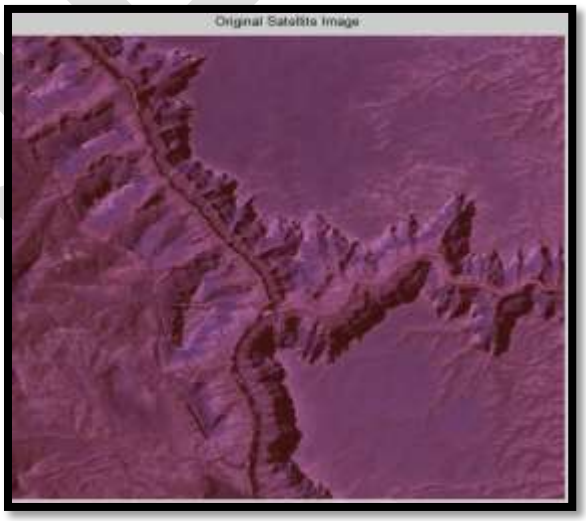

Figure 1.6: Satellite Image in .Lan Format

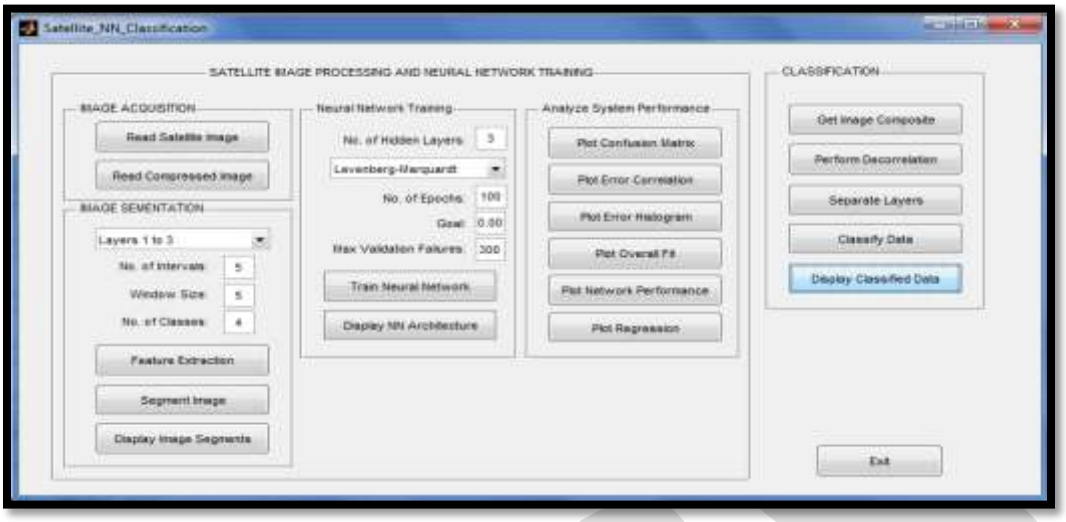

Figure 1.7: GUI Model for Satellite .Lan Image

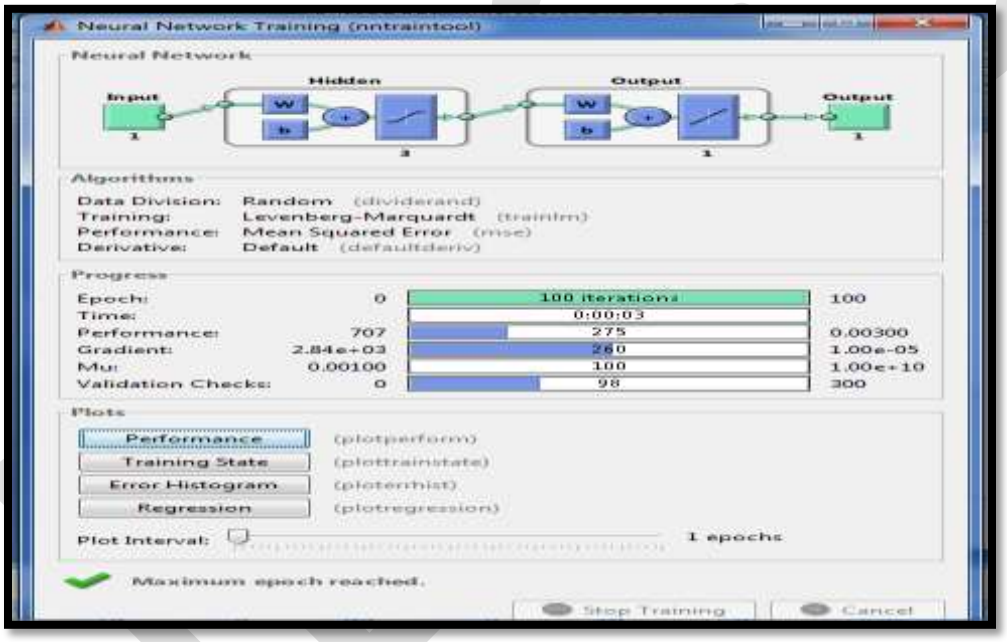

Figure 1.8: Neural Network Training for .Lan Satellite Image

Figure 1.8depicts the training of neural network using LM algorithm for the .Lan Satellite image.

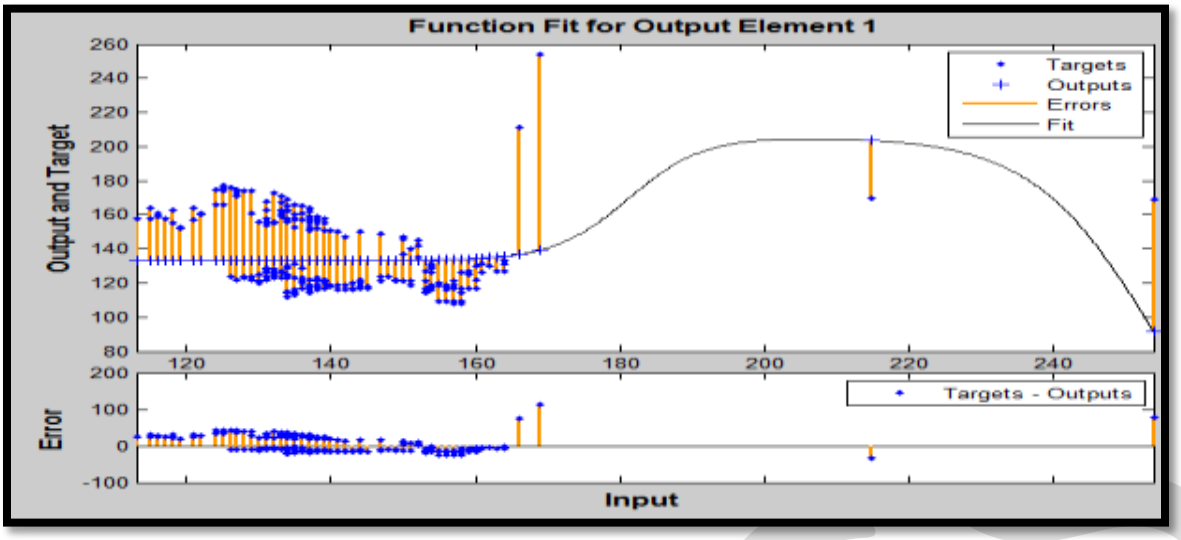

Figure 1.9: Plot fit for the .Lan image.

The fit plot is done for the output and the target. The same is plot for the Error also as shown in figure 1.9

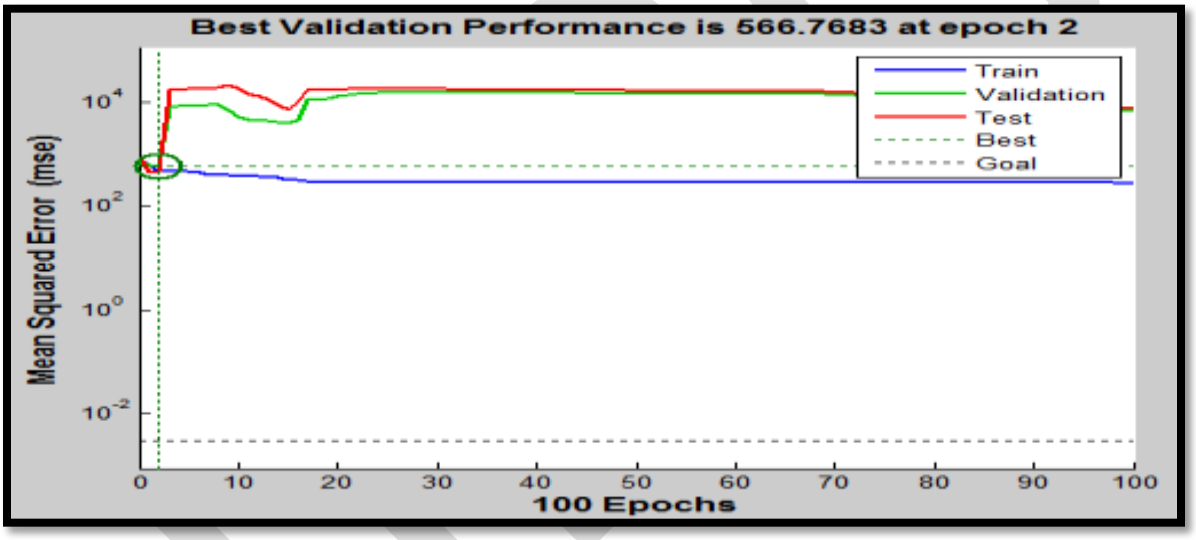

Figure 2.0: Performance plot of the .Lan image.

Figure 2.0 depicts the performance plot of the train, validation, test, best and goal.

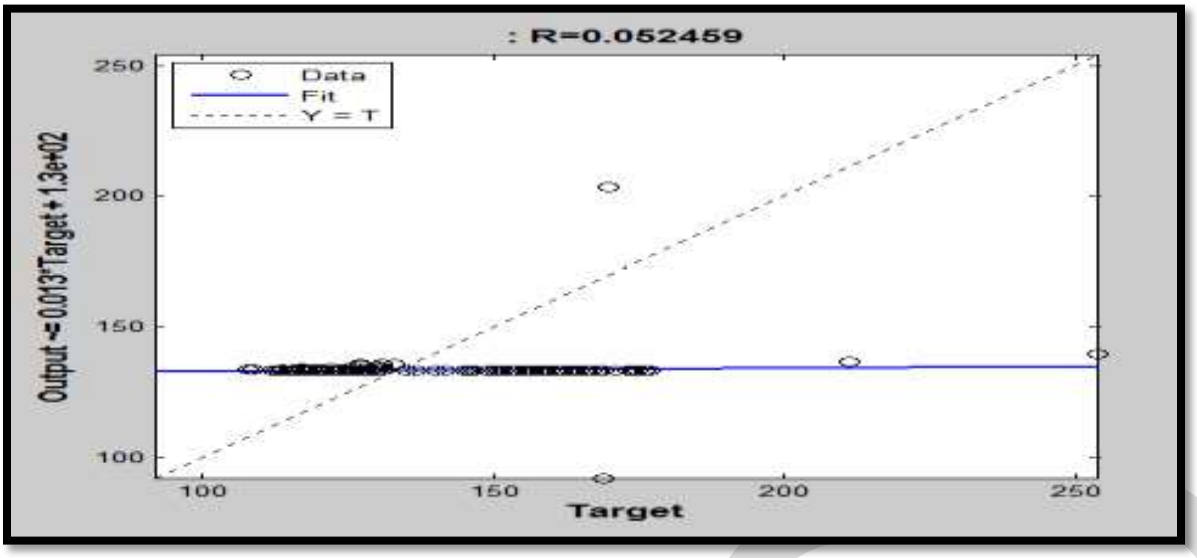

Figure 2.1: Regression plot of the .Lan Satellite image.

The regression R is found to be 0.052459. The regression plot of the output with the target is shown in figure 2.1

CONCLUSION AND FUTURE

Conclusion

In the proposed image classification system we have introduced new approach using Curvelet transform and Back Propagation Neural Network. We used the correlation coefficient, mean and standard deviation features of the various combinations of coefficients produced by the Curvelet transform. A number of texture images not considered in the work have been analyzed in this work and have been found working within the range 86.2- 99.06% of the performance and also the segmented Curves are more towards High accuracy than Haar transform. This work may further be extended by finding out the parameters like finding out the depth of water, location of sand, detecting the target for the satellite images for the military purpose.

Future Scope

A new approach for Image Classification with Higher Accuracy. There Is Good Potential for Future Developments for Development of BPNN Model for Extracting the Feature's from Satellite Image Using Ridgelet Transform Include Integration of The Algorithm with Higher Level Artificial Intelligence and Pattern Recognition Methods for Classification. This work may further be extended by finding out the parameters like finding out the depth of water, location of sand , detecting the target for the satellite images for the military purpose.

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Object Tracking Using Background Subtraction Algorithm

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Abstract— Identifying moving objects from a video sequence is a fundamental and critical task in many computer-vision applications. An efficient algorithm for detecting a moving object using background elimination technique is proposed in this paper. In the post processing step, the morphological gradient operation with median filter is used to remove the noise and shadow regions which are present in the moving object. The experimental result shows that the clarity of the image obtained using background elimination technique is much better than using background registration technique. The experimental results show that the accuracy of detected counting vehicles is 94%.

Keywords— Frame Difference, Background Elimination, Background Registration, Background Subtraction Algorithm

INTRODUCTION

Identifying moving objects from a video sequence is a fundamental and critical task in many computer-vision applications. A common approach is to perform background subtraction, which identifies moving objects from the portion of a video frame that differs significantly from a background model. There are many challenges in developing a good background subtraction algorithm. First, it must be robust against changes in illumination. Second, it should avoid detecting non-stationary background objects such as moving leaves, rain, snow, and shadows cast by moving objects. Finally, its internal background model should react quickly to changes in background such as starting and stopping of vehicles.

This research began with a comparison of various background subtraction algorithms for detecting moving vehicles and pedestrians in urban traffic video sequences (Cheung and Kamath 2004). The approaches vary from simple techniques such as frame differencing and adaptive median filtering, to more sophisticated probabilistic modeling techniques is considered. While complicated techniques often produce superior performance, the proposed experiments show that simple techniques such as adaptive median filtering can produce good results with much lower computational complexity.

In addition, the pre-and post-processing of the video might be necessary to improve the detection of moving objects. For example, by spatial and temporal smoothing, the snow can be removed from a video. Small moving objects, such as moving leaves on a tree, can be removed by morphological processing of the frames after the identification of the moving objects.

The rate and weight of model updates greatly affect foreground results. Slow adapting background models cannot quickly overcome large changes in the image background (such as a cloud passing over a scene). These results in a period of time where many background pixels are incorrectly classified as foreground pixels. A slow update rate also tends to create a ghost mask which trails the actual object. Fast adapting background models can quickly deal with background changes, but they fail at low frame rates. They are also very susceptible to noise and the aperture problem. These observations indicate that a hybrid approach might help mitigate the drawbacks of each.

The new foreground validation technique have been created that can be applied to any slow-adapting background subtraction algorithm (Cheung and Kamath 2005). Slow adapting methods produce relatively stable masks and tend to be more inclusive than fast adapting methods. As a result, they can also have high false positive rate. Foreground validation further examines individual foreground pixels in an attempt to eliminate false positives. The proposed algorithm first obtains a foreground mask from a slow-adapting algorithm, and then validates foreground pixels by a simple moving object model built using foreground and background statistics as well as a fast-adapting algorithm.

Ground-truth experiments with urban traffic sequences have shown that the proposed algorithm produces performances that are comparable or better than other background subtraction techniques.

PRINCIPLE OF WORKING

If the subsequent frames can be subtracted which is clicked by cam, then the part of image which does not change (background) gets subtracted to give zero intensity (black). Only the part of image moved (moving object) don't get reduced to zero as intensity of pixels of two subsequent frames are different. So non-zero intensity is obtained for pixels which are corresponding moved object. Rest is simple. Just convert the image into binary and obtain the centroid of largest area of connected pixels!!

Background Subtraction

Background Subtraction is a process to detect a movement or significant differences inside of the video frame, when compared to a reference, and to remove all the non-significant components (background). Background subtraction is applied in many areas, such as surveillance system (to effectively segment the only moving object).

Steps to implement background subtraction

1. Learning Background – Capture the ten background frames and calculate the mean (μ) and the standard deviation (σ) with the below equations (1.1) & (1.2).
2. The assumption is that the value of the background was iid-normal distribution.

$$\mu = \frac{1}{n}\sum_{i-1}^{n} x_i \qquad \text{----------} \quad (1.1)$$

$$\sigma = \sqrt{(\frac{1}{n}\sum_{i=1}^{n}(x_i - \mu)^2)} \quad \text{----------} \quad (1.2)$$

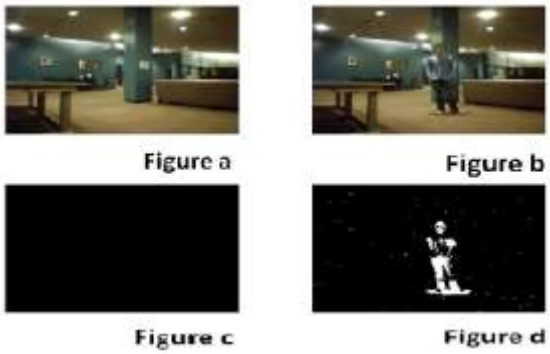


Fig. 1 a) Background Frame b) Non-background object is introduced d) Segmented Object

Algorithm

The idea of this algorithm is got from a paper "Implementation of an Automated Single Camera Object Tracking System Using Frame Differencing and Dynamic Template Matching" by guys from IIT-Kanpur and NIT-Nagpur. Although the paper is modified it to directly take and operate on rgb images. The algorithm works as follows:

1. Grab ith frame.
2. Grab subtract it from (i-3) th frame.
3. Convert the image into binary.
4. Fill small holes.
5. Label the connected pixels.
6. Run the loop to number of labels and find the label for maximum area.
7. Find centroid of the obtained area.
8. Mark the area if you just want to track or use the centroid information for other applications.
9. Go to step 1

Here subtraction is done with (i-3)th frame keeping in mind slow moving objects and implemented this algorithm completely in MATLAB.

ARCHITECTURE & MODELING

In many real-time applications like video conferencing, the camera is fixed. Some techniques proposed in paper [12] use global motion estimation and comparison to compensate the change in background due to camera motion. In the present algorithm, the assumption is that the background is stationary for the video clips considered.

The flow of the algorithm for background elimination is as follows: The first step is to read the video clip and it is converted to frames. In the first stage difference between frames are computed i.e. Fi and Fi+k.

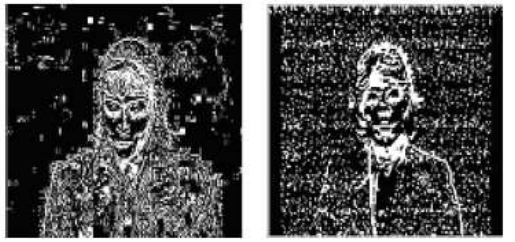
In the next stage these differences are compared, and in the third stage pixels having the same values in the frame difference are eliminated. The fourth phase is the post processing stage executed on the image obtained in third stage and the final phase is the object detection.

Frame Difference

Frame differences are computed by finding the difference between consecutive frames but this will introduce computational complexity in case the video clips having slow-moving objects. Moreover this algorithm assumes a stationary background. Hence the difference between the frames at regular intervals (say, some integer k) is considered. If there are n frames, then (n/k) frame differences (FD) is obtained. The frame difference follows Gaussian distribution as indicated in equation (1.3).

$$p(FD) = \frac{1}{\sigma\sqrt{2\pi}} \exp(-\frac{(FD-\mu)^2}{2\sigma^2}) \qquad \text{---------- (1.3)}$$

Here, the mean and standard deviation of FD. The frame differences of some test sequences are as shown in Fig 2.



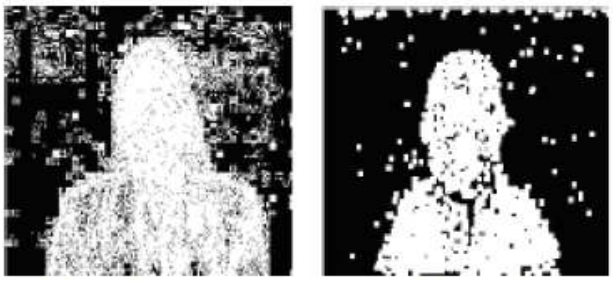
(a) Difference between 30th and 35th frames of Akhiyo (b) Difference between 12th and 15th frames of Claire

Fig 2: Frame Difference

Background Elimination

Once the frame differences are computed the pixels that belong to the background region will have a value almost equal to zero, as the background is assumed stationary. Many times because of camera noise, some of the pixels belonging to the background region may not tend to zero. These values are set to zero by comparing any two frame differences, say, FDi and FDj.

Thus, the background region is eliminated and only the moving object region will contain nonzero pixel values. The images obtained after background elimination is as shown in the Fig 3.



(a) Image of Moving Hands (b) Image of Claire

Fig 3: Background Elimination

Background Registration

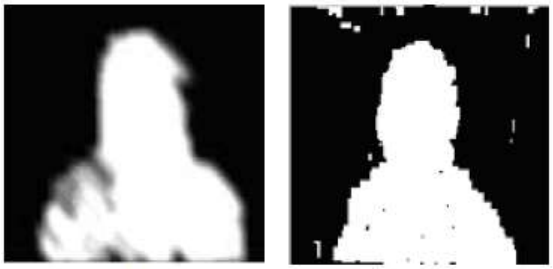
A general tracking approach is to extract salient regions from the given video clip using a learned background modeling technique. This involves subtracting every image from the background scene and thresholding the resultant difference image to determine the foreground image. Stationary pixels are identified and processed to construct the initial background registered image. Here the fact that vehicle is a group of pixels that move in a coherent manner, either as a lighter region over a darker background or vice versa. Often the vehicle may be of the same color as the background, or may be some portion of it may be camouflaged with the background, due to which tracking the object becomes difficult. This leads to an erroneous vehicle count.

Foreground Detection (Object Tracking)

Most vision based traffic monitoring system must be capable of tracking vehicles through the video sequence. Tracking helps in eliminating multiple counts in vehicle counting applications and it also helps in deriving useful information while computing vehicle velocities. Tracking information can be used to refine the vehicle type and also to correct errors caused due to occlusions. After registering the static objects the background image is subtracted from the video frames to obtain the foreground dynamic objects. Post processing is performed on the foreground dynamic objects to reduce the noise interference.

Post Processing

Many times due to camera noise and irregular object motion, there always exists some noise regions both in the object and background region. Most of the post processing techniques are applied on the image obtained after background elimination. Initially, order statistics filters are used, which are the spatial filters and whose response is based on ordering (ranking) the pixels contained in the image area encompassed by the filter. The response of the filter at any point is then determined by the ranking result. The current algorithm uses Median filter which is the best-known order-statistics filter. This filter replaces the value of a pixel by the median of the gray levels in the neighborhood of that pixel. The formula used is ˆ f (x, y) = median {g (s, t)}. After applying the median filter, the resulting image is converted into a binary image. The morphological opening technique is applied on this binary image. The opening of A by B is simply erosion of A by B followed by dilation of the result by B. This can be given as $A.B = (A\_B) \oplus B$. Here, A is the image and B is a structuring element. After applying the above explained pre-processing techniques, the new image obtained is as shown in the Fig 4.



(a) Image of Moving Hands (b) Image of Claire

Fig 4: After Post Processing

Object Tunning

This is a post processing technique applied in some application. In the proposed algorithm median filter is used for noise elimination in both i.e. object and background. As the object boundaries are not very smooth, a post processing technique is required on the foreground image. The final output of the object tuning phase is a binary image of the objects detected termed mask1.

Object Identification

The image obtained after the pre-processing step has relatively less noise, so, the background area is completely eliminated. Now, if the pixel values of this image are greater than a certain threshold, then, those pixels are replaced by the pixels of the original frame. This process identifies the moving object as shown in Fig 5.

(a) Moving Hands (b) Claire

Fig 5: Identification of Objects

Object Counting

The tracked binary image mask1 forms the input image for counting. This image is scanned from top to bottom for detecting the presence of an object. Two variables are maintained i.e. count that keeps track of the number of vehicles and count register countreg, which contains the information of the registered object. When a new object is encountered, it is first checked to see whether it is already registered in the buffer, if the object is not registered then it is assumed to be a new object and count is incremented, else it is treated as a part of an already existing object and the presence of the object is neglected. This concept is applied for the entire image and the final count of objects is present in variable count. A fairly good accuracy of count is achieved. Sometimes due to occlusions two objects are merged together and treated as a single entity.

IMPLEMENTATION

Here two algorithms are proposed background elimination and background registration method which are implemented using Matlab. The performance analysis is done through the method of Least Squares. The least square method is normally used to find the bestfit, given two sets of data. According to the method of least squares, the best-fit must satisfy the rule given by equation (4).

Simulation is performed using Matlab Software. This is an interactive system whose basic data element is an array that does not require dimensioning. It is a tool used for formulating solutions to many technical computing problems, especially those involving matrix representation. This tool emphasis's a lot of importance on comprehensive prototyping environment in the solution.

The algorithm for Background Registration is as follows

```
ALGORITHM BGRegist ()
//Input: M Array
//Output: An Image with Registered Background in bg array
//Initialize array [b] to zeros
1. for i=1 to m
   for j=1 to n
   for k=1 to l-1
   if abs(double(T(i,j,l-k))-double(T(i,j,k)))¡10
      b(i,j)=T(i,j,k)
   end if
   end for
   end for
   end for
2. Convert b array values to unsigned integers and store it into array called background.
3. Fill the hole regions in image background and store it in bg array
4. Show the output images background, bg.
5. Declare two global variables m and n which stores the row and column values of video frames respectively.
```

The algorithm for counting is as follows

```
ALGORITHM Count()
//Input: d is specific video frame
//Output: An image with Foreground Objects is stored in c
//Initialize count=0 and count register buffer
//countveg=0
1. Traverse the mask1 image to detect an object
2. If object encountered then check for registration in countveg
3. If the object is not registered then increment count and register the object in countveg, labeled with the new count.
4. repeat steps 2-4 untill traversing not completed
```

A. Performance Analysis

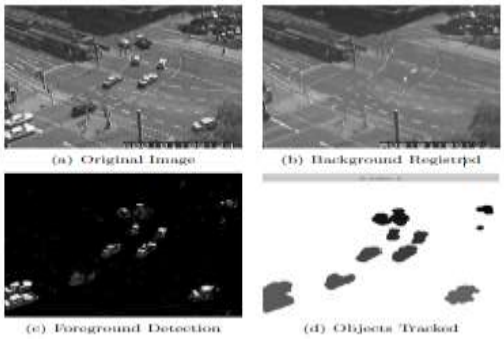


Fig 6 Video1

This video segmentation method was applied on three different video sequences two of which are depicted below. For the first video sequence Fig 6(a) depicts the original image, Fig 6(b) shows the background registered image, Fig 6 (c) the foreground detected objects obtained after background subtraction, and finally Fig 6(d) shows the count of the detected objects. The same is repeated for the next video sequence. The system is able to track and count most vehicles successfully. Although the accuracy of vehicle detection was 100%., the average accuracy of counting vehicles was 94%. This is due to noise which causes detected objects to become too

large or too small to be considered as a vehicle. However, two vehicles will persist to exist as a single vehicle if relative motion between them is small and in such cases the count of vehicles becomes incorrect. An added advantage of this algorithm is, the segmentation logic is not intensity based, and hence vehicles whose intensities are similar to the road surface are not missed out. The results were successfully carried out on three videos; the accuracy of detecting the objects was 100%. The detected objects are then counted.

CONCLUSIONS

The proposed method introduces an efficient algorithm for detecting a moving object using background elimination technique. The experimental results obtained indicate that the clarity of the image obtained using background elimination technique is much better than using background registration technique. Good segmentation quality is achieved efficiently.

This paper also discusses an application system of traffic surveillance. Here an algorithm is developed to track and count dynamic objects efficiently. The tracking system is based on a combination of a temporal difference and correlation matching. The system effectively combines simple domain knowledge about object classes with time domain statistical measures to identify target objects in the presence of partial occlusions and ambiguous poses in which the vehicles are moving. The background clutter is effectively rejected. The experimental results show that the accuracy of counting vehicles reached 94%, although the vehicle detection was computational complexity of our algorithm is linear to the size of a video clip and the number of vehicles tracked.

As a future work a combination of higher dimensional features with some additional constraints may be tried so that adverse effects of some features can be compensated by contribution of others.

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Relative improved differential box-counting approach to compute fractal dimension of gray-scale images

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ABSTARCT- Fractal theory is used in image processing. The dimension of complex objects in nature is calculated by Fractal Dimension. Fractal Dimension is used in shape classification, graphic analysis in many fields, texture segmentation. FD's can be used to aid in several data mining tasks. Mainly box counting method is used to calculate the FD of an image. In this paper various methods used to calculate the FD of gray scale images are emphasized. Key problems involved in the computation of Differential box count method is presented. Experiments are conducted using the methods and FD is compared.

Keywords- Blocks, Boxes, Box count, Differential box-counting, Fractal Dimension, Gray scale images, Linear scale

INTRODUCTION:

Fractal geometry was put forwarded by Mendelbrot in 1983 [1] to describe the self similar parts called fractals. FD provides many mathematical model for for coastlines, mountains, clouds. Fractal based analysis are great for digital image analysis[1-3]. It is followed by many other theories applicable to a wider class of fractals. Gangepain and Roques-carmes described the popular reticular cell counting method [10,11]. Keller et al. gave even more interesting theories [10,12]. Sarkar et. al. suggested a differential box-counting (DBC) method [4, 10, 13] that was considered to be an effective method [14,15]. The box-counting dimension is the most frequently used for measurements in various application fields. The reason for dominance lies in its simplicity and automatic computability [3].. It has an extremely wide area of applications such as finance, stock markets, medicine, quality of food analysis and even art[7]. Fractal dimension is the tool of fractal geometry is used to characterize, classify or to segment images or regions. Fractal dimension has many definitions, such as Hausdorff dimension, Self-similar dimension, Box-counting dimension, Correlation dimension, etc. Among these box-counting is most widely used dimension. Because it has usefulness for both linear and non-linear fractal images, its easy realization by computer, its effectiveness to describe image surface complexity and irregularity.

In this paper, the DBC and improved DBC are studied and the key problems involved are discussed like precise no.of boxes, range of linear scale etc, then the experiments are performed on various images. The results show that the improved DBC approach is more effective than DBC approach.

METHODOLOGIES:

Here, in this section a review of Fractal Dimension estimation using DBC[2], improved DBC[2,4], are discussed. The basic principle to estimate FD is based on the concept of self-similarity. The FD of a bounded set A in Euclidian n-shape is defined as

$$D = \frac{\log(Nr)}{\log(1/r)} \quad \text{.....(1)}$$

Where N_r is the least number of distinct copies of A in the scale r. The union of N_r distinct copies must cover set A completely.

Fractal dimension estimation using DBC approach :

The DBC method was introduced as follows[2,4]. Let a 2-D gray sale image of size $M*M$ pixels scaled down to a size $s*s$ where $M/2 > l > 1$ and l is an integer. Then estimation of scaling ratio $r = l/M$. Let consider the image as a 3-D space with (x,y) denoting 2-D position and third co-ordinate (z) denoting gray level. The (x,y) space is divided in to grids of size $l*l$. On each grid there is a column of boxes of size $l*l*l'$. If the total no.of gray level is G then $l' = l*G/M$.

Let the minimum and maximum gray level of the image in the (i,j)th grid fall in box no. p & q respectively. Then

$$n_r(i,j) = q - p + 1 \quad \text{.....(2)}$$

Is the contribution of N_r in (i,j) th grid. For example , in fig.1, $n_r(i,j) = 3-1+1$.(Although in this figure, for simplicity , smooth surface is taken, but in reality it will be digital image surface)[6,8]. Because of the differential nature of computing n, named as differential box-counting (DBC) approach. Taking contribution from all grids

$$N_r = \sum_{i,j} nr(i,j) \quad \text{.....(3)}$$

N_r is counted for different values of r, i.e, different values of l. Using eq^n (1) we can estimate D, the fractal dimension from least square linear fit of $\log(N_r)$ versus $\log(1/r)$.

A typical plot of log (Nr) versus log (1 /r) of the image Lena is shown in Fig. 3. Let y = mx+c be the fitted straight line, where y denotes log (Nr) and x denotes log (1/r). Then error can be expressed as the root distance of the points from the fitted line. There are two major problems in the aforementioned procedure in the original DBC method (1) Box height selection, (2) Box number calculation [1,2,5,15]

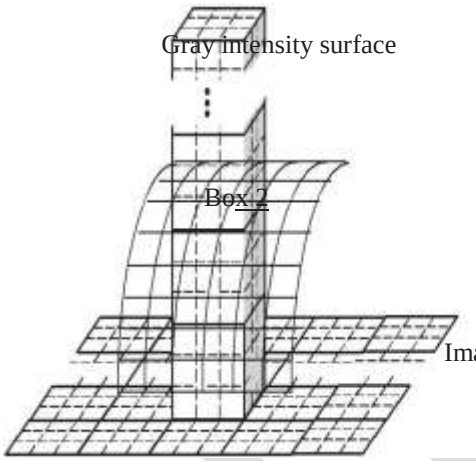

Fig. 1. Sketch of determination of the number of boxes by the DBC method

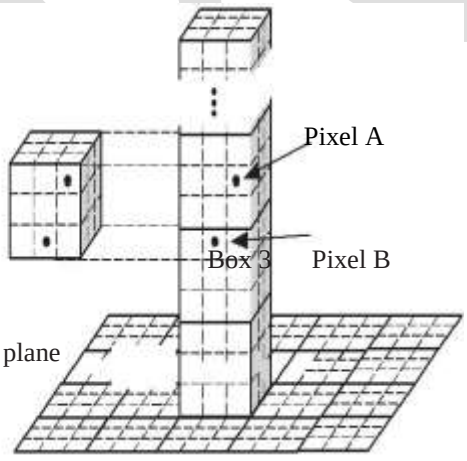

Fig.2. Two pixels fall in to 2 boxes

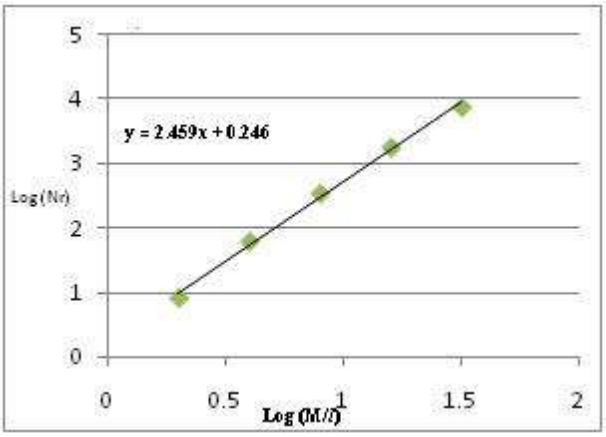

Fig. 3 Plot of log(Nr) vs. log(1/r) of a gray image

1) Box height Selection:

If the height of boxes is selected as $l' = l * G / M$, it may have a larger value when l is increased , then the box in the larger scale may result in greater computational error when counting the box numbers[9].

2) Box Number Calculation:

This method assigns a column of boxes on a block starting from the gray level zero. This problem is clearly visible in Fig.2 where pixels A and B represents the maximum and minimum gray levels of the block. The distance between the two pixels are less than 3 if a column of boxes of size 3×3×3 covers this block and the two pixels lie in boxes 2 and 3. Here the minimum box can be one but as the pixels fall in to different boxes so it is two which is not able to calculate least number of boxes.

A. Fractal dimension estimation using improved DBC approach:

Let $z = f(x, y)$ be an ideal fractal image with a 3-D continuous surface. It is divided in to distinct copies and a copy has a minimum denoted as $z_1 = f(x_1, y_1)$ and a maximum denoted as $z_2 = f(x_2, y_2)$, when $x_1 \le x \le x_2$ and $y_1 \le y \le y_2$. Let dx and dy be the lengths of the copy in the directions of x and y respectively and dz be the height in the direction of z. Because $z = f(x, y)$ is continuous , then $d_x = x_2 - x_1$, $d_y = y_2 - y_1$, and $d_z = z_2 - z_1$. Suppose $d_x = d_y$ and define the box sales as $r = d_x = d_y$. Assume a column of boxes with the size of $d_x * d_x * d_x$ cover the copy of the surface completely[2]. The number of this column of boxes is equal to integer part of $(d_z / r + 1)$. Using Eq.(1) the FD o an ideal fractal can be determined via least squares linear fit[12,13]. Or Eq.(1) indicates there exists definitely a scale range [r_1,r_2] in which FD estimate of the ideal fractal surface an be calculated as

$$D = -\frac{\log N_{r1} - \log N_{r2}}{\log r_1 - \log r_2} \quad \text{.....(4)}$$

Where Nr1 and Nr2 are the number o boxes covering the ideal fractal surface when the box scales are r1 and r2, respectively . When r1 and r2 approach zero , the scale range can be found such that the FD estimate error approaches zero[13]. Any two values of r in $[r_1, r_2]$ and their corresponding N_r can be used to substitute the parameters in (4) and obtain D since N_r versus r is an exact straight line in log-log plot in the scale range. The negative range of the slope is equal to D[2].

1. Let a new scale $r' = r / c$, where c is a positive real number greater than 1. The number of boxes covering a copy is calculated as the integer part of $(d_z / r' + 1)$. Because $r' < r$ and $d_z / r' > d_z / r$. Thus the errors introduced by the scale r' are smaller than r in the original DBC method[2-5].
2. D_z is used to count the numbers of box covering a image surface instead of z , the gray levels of pixels being used for Eq.(2) in the original DBC method, resulting in more accurate box number counting[8,7].

3. The scale r for an ideal continuous surface is defined as $r = d_x = d_y$, where $d_x = x_2 - x_1$ and $d_y = y_2 - y_1$. Therefore, for a digital image if the distance between any two neighboring pixels are 1, then the scale $r = l - 1$rather than r in the original DBC method, when $l * l$ pixels exists in a copy of a digital image surface[6-9].

Box height selection:

Let the mean and standard deviation of a digital image be μ and σ. Suppose most pixels fall in to the interval of gray level within $[\mu - a\sigma, \mu + a\sigma]$[2,6,12]. The box height r' is selected as

$$r' = \frac{r}{1+2a\sigma} \quad \text{.....(5)}$$

Where a is a positive integer and 2aσ can indicate image roughness[2,4,6]. As a result a box with smaller height is chosen for an image surface with higher intensity variation. Compared with the height of boxes in the DBC method, the height o boxes in the improved DBC method is much smaller at different box sale for r. For an example if an image has the size of $256 * 256$ with 256 gray levels and he standard deviation σ being 15, while the box height is $r' = r = 3$ in the DB method and it becomes $r' = r / 91$when $a = 3$ in the improved DBC method. So this method uses finer scales to count the number of boxes covering each block and the entire image surface through automatic adjustment based on image smoothness.

Box number calculation:

If the maximum and minimum gray levels of the (I,j)th block are p and q respectively , the number of boxes that cover the block surface can be calculated as

$$n_r(i,j) = \begin{cases} ceil\left(\frac{p-q}{r'}\right), p \neq q \\ 1, p = q \end{cases} \quad \text{.....(6)}$$

Where ceil(.) denotes the function to round a value to the nearest and greatest integer. The physical meaning of Eq.(3) is that the boxes are assigned from the minimum gray level of the block rather than gray level 0. It is expected that n_r(I,j) is the least number of boxes covering the surface of the (I,j)th block[2,8,13].

Problem associated with box height selection in improved DBC method:

In improved DBC method we are finding the standard deviation(σ) and mean(μ) of each window of an image in order to calculate very negligible height. FD have variation range computed by the improved DBC method for different values of 'a'. When a is chosen as 3 for a gray scale image, its FD is found to be greater than 3.

Due to this problem the accuracy of the improved DBC method is limited.

I. NEW APPROACH TOWARDS BOX OUNTING METHOD

If M×M is the size of image and grids of size $l * l$ where $M / 2 > l > 1$ and l is an integer, then we an cover up the entire image by boxes of sides $l * l * l'$ in the vertical direction. Here $l' = l * G / M$ can be multiple of the gray level units where G represents the total number of gray levels.

a) Box height selection:

When divide the image in to blocks of size $l*l$,are assign to cover the image surface, height of the $l*l$ size of window is defined as

$$H = \text{ceil}(MI/l')$$

Where MI=maximum intensity of particular window. H may not be same for each window because each window contains different gray level intensity.

b) Box number calculation:

Box interval of each window in between the minimum and maximum intensity gray level $=\frac{MI-MN}{Number\ of\ boxes\ present\ in\ this\ window}$

Where MN=Minimum gray level intensity of the particular window

Number of boxes present= Height of particular window

$$n_r(i,j) = \begin{cases} 1, & MI = MN \\ \text{Box interval having value}, & MI \neq MN \end{cases} \quad \text{.....(7)}$$

n_r= Number of boxes that can cover the block surface

N_r is calculated by counting the total number of boxes that contains at least one gray level intensity surface. FD is calculated by various l values. N_r is calculated and log-log plot of N versus (1/r) is drawn.

SUMMARY OF ALGORITHM:

1. If $M*M$ is the size of an image and blocks of size $l*l$ then the entire image size is covered up by the boxes of sides $l*l*l'$. Where $l'=l*G/M$ and G =total number of gray levels.
2. The boxes are assigned with a scale of $l*l*l'$ starting the pixel with minimum gray level in the block.
3. Number of boxes in each window is equal to $ceil(MI/l')$ where MI=maximum intensity of particular window.
4. Box interval of each window in between minimum and maximum intensity level is calculated and is equal to (MI-MN)/Number of boxes present in this window, where MN is the minimum intensity o the particular window. Then n_r is calculated using Eq.(7).
5. For different scale l, the total number of boxes covering the full image surface is calculated.

The Fractal Dimension is calculated as the slope of the best fit line $\log(N_r)$ vs. $\log(1/r)$.

EXPERIMENTS:

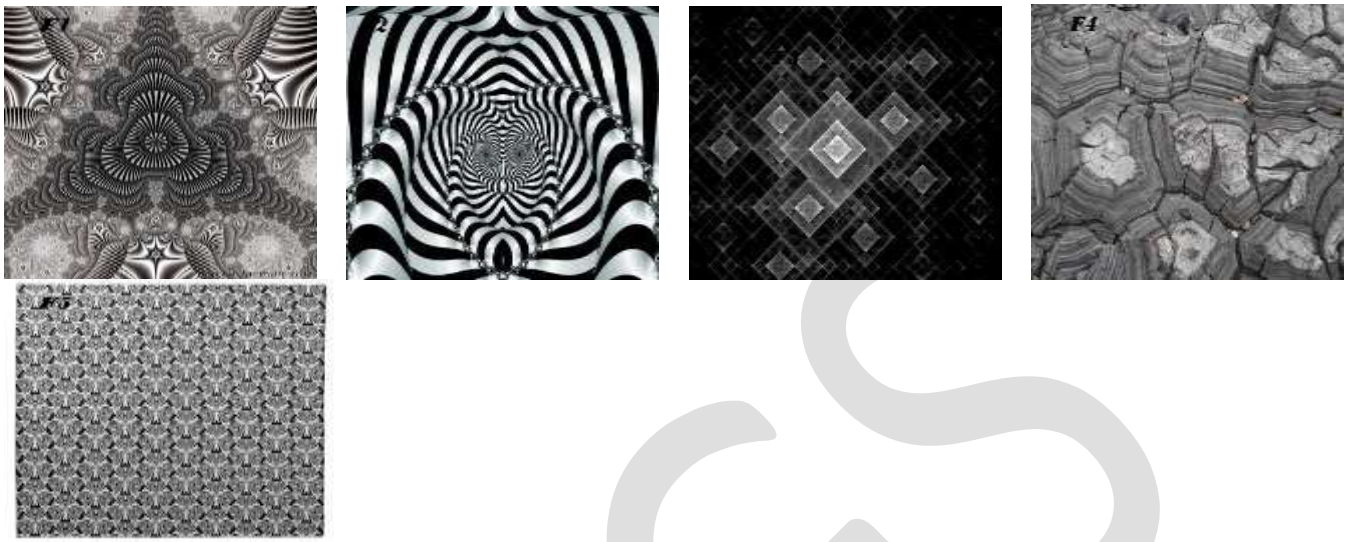

Fig. 4 Smooth gray scale image

For experiment we consider 5 gray scale images. The gray levels lie in the range 0-255 and size is equal to $256*256$. The algorithms are tested on gray images.

Table 1: Fractal dimensions of gray images obtained by various methods

Gray Images	DBC method FD	Fit Error	Improved DBC FD	Fit Error	Proposed method FD	Fit Error
F1	2.2000	0.500	2.5500	0.083	2.5172	0.011
F2	1.8024	0.187	2.0020	0.023	2.0617	0.053
F3	2.2120	0.155	1.3520	0.059	2.4284	0.085
F4	1.7248	0.255	2.5290	0.050	1.4534	0.002
F5	2.0000	0.0641	2.1610	0.015	2.7372	0.004

Fit Error[12,13] is used to measure the least square linear fit of the $\log(N_r)versus\log(r)$.The fit error E of points(x,y) from their fitted straight line satisfying $y = cx + d$ is defined as

$$E = \frac{1}{n}\sqrt{\sum_{i=1}^{n}\frac{cx_i + d - y_i}{1+c^2}}$$ where y and x denote $\log(N_r)$ and $\log(r)$

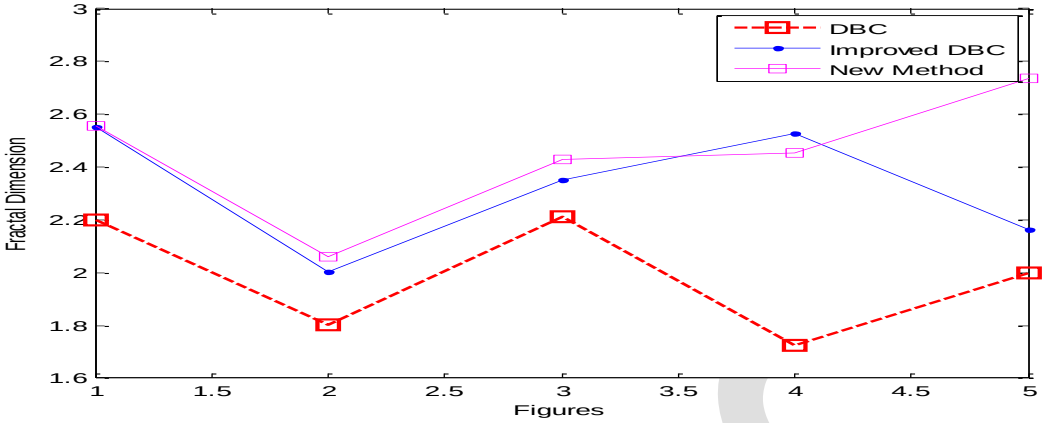

Fig. 5 Fractal dimension estimation of a gray image with various methods

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CONCLUSION:

Due to rapid development of box counting method for calculating fractal dimension of an image, one new method is proposed to find more accurate FD results. The proposed technique was extensively tested with many types of images. FD of improved DBC is quite better than DBC and the result of new method gives promising result than improved DBC. This approach can also be extended to a 3-dimensional image as well

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Cloud-based OLPM System for Centralized Lesson Plan in Educational Institutions

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Abstract— Nowadays, maintaining and managing lesson plan for each course is a difficult task in educational institutes. Firstly, though the faculty members prepare their own lecture notes and access it through mails or any web storage resources, centralized system should be needed which enables the faculty members can upload their lecture notes through online and should be accessed by any device at any time by anybody. Secondly, though there are more existing technologies, but there is no automated task, also it needs more level of monitoring and optimization. With the cloud computing platform, it is possible to run an application in networked computers anywhere anytime. Taking cloud computing and Google platform as our benefits, we introduce an Online Lesson Plan Management system which minimizes the job of a lecturer at traditional educational institutes. The proposed system OLPM introduces a centralized system for an effective cloud lesson plan management system using google products such as google drive, google spreadsheet, google cloud SQL etc. This enables anyone can access the lesson plan documents at any time with their google account through any devices. The proposed system is capable enough to automate the tasks , requires less level of monitoring and optimization, Server is capable enough for the centralized system which provides efficient query performance.

Key terms—OLPM(Online Lesson Plan Management), LPSS(Lesson plan submission system), LVSS (Lesson plan verification system), RECORDS(google spreadsheets), IaaS (Infrastructure as a Service), PaaS (Platform as a Service), Software as a Service (SaaS), Google drive, Google Cloud SQL, Google Apps script.

INTRODUCTION

Cloud Computing is an evolved type of computing which provides platform, infrastructure and software as a service. Based on the types of provided services of cloud computing, it can be divided into 3 levels. Infrastructure as a Service (IaaS) provides infrastructure services like CPU, storage, etc. Platform as a Service (PaaS), is the hosting environment platform made for the special needs facing service. The top level Software as a Service (SaaS) provides users with applications which they are going to use. Cloud computing is one that transforms the way how service was delivered previously. An educational institute has various departments where every department comprises list of courses that has to be taught for each batch of students. Previously faculty members, who have been allocated for the course, will make lecture notes for the particular course for the odd and even semesters of every academic year. Earlier the teaching was confined to the physical domain of the student, teacher and the institute[1]. This leads to wastage of papers in preparing the lecture notes for the same courses for every consecutive year. Also, there is not a centralized approach in order to access the lesson plan documents in a federal way. The idea of national on-the-job professional and technical personnel "continuing education, lifelong learning" has become an important direction for the country's future education development[2]. With centralized approach, Lesson plans can be viewed and accessed even by the students for their references at any time provided with their privileges. It will be highly constructive for both the faculty members and the students of any educational institutes. The lesson plan documents are maintained efficaciously with a new emerging technology such as google apis. A Google cloud application has

been developed for the lesson plan maintenance and retrieval purposes.

EXISTING SYSTEM

Higher education institutions in India are not on par with their counterparts in the developed world. More than 50% of the institutions in the developing countries are following traditional approach of managing information system with stand alone computer systems and store data in different departmental systems due to lack of infrastructure[3]. This is sadly the case in addition to the presence of well qualified teachers and state-of-the-art facilities. Studies have shown that this could be largely attributed to the absence of information to the managers of education in India. Curriculum, Instruction and Assessment is a major support component in Education Developmental Transformation (EDT)[4]. Also, universities and colleges are huge consumers of paper. In tune with the global trend of organizations reducing their environmental footprints, higher education institution in India have to employ paperless management systems. Universities and colleges have to take the lead in steering Indian organizations to a more responsible future. Present information needs are largely handled by file systems, Excel sheets and paper records. Clerical staffs laboriously maintain paper records of every member of faculty and student. Some institutions query their databases to obtain just satisfactory results. Universities spend a lot of money on paper and storing paper records. In addition, paper records are prone to damages. Backups on paper are costly and environmentally imprudent.

PROPOSED SYSTEM

SYSTEM SPECIFICATION

Google has introduced a product called “Google drive” which act as a storage resource where any kind of stuffs such as documents, pdf files, images, audios and videos can be stored and accessed in an efficient way. Google drive and Gmail offer free storage space to store the files, email messages and photos, with the ability to access them from any device, anywhere. It provides 15 GB of storage space and a pop up box will appear in Google drive by indicating the utilized storage. If storage limit exceeds all the files will be accessible except new uploads in the free storage limit. So there is no need to agonize about hardware if it is a damaged one. There is an assortment of purchase plans in Google for storage purposes provided billing will be enabled according to the purchase plans. The files can be accessed from Google drive by any devices and there is no need of email attachments instead we can share the files or folders by any devices. In Order to access all the google applications, the user can visit drive.google.com.

Google Apps Script is a JavaScript cloud scripting language that provides easy ways to automate tasks across Google products and third party services and build web applications. Javascript is a scripting language which is used in the cloud to manage all these Google API’s. The developers can use the script editor tool and the scripts can be executed directly from the script editor. Any number of javascript function in the script editor can be created and executed by clicking the run button.

Google spreadsheets service is used to create, access and modify Google sheet files. Google spreadsheets can be used for the user level purposes and this can be treated as a centralized view where anyone can access the documents any time. Google Apps script is used here to define the behaviour of spreadsheet for storing and reading a data from a google spreadsheet using javascript objects. Google Cloud SQL is a service that allows us to create, configure, and use relational databases in the Google's cloud. It is a fully-managed service that maintains, manages, and administers our databases, allowing us to focus on the applications and services. By offering the capabilities of a familiar MySQL database, the service enables to easily move your data, applications, and services in and out of the cloud. This enables high data portability and achieves faster time-to-market because we can quickly leverage our existing database.

This paper has implemented three approaches such as Document submission, Format verification and Technical Verification to validate the lesson plan documents for each course. In document submission system, the lesson plan documents are submitted for each course. The system will ensure the authentication before submitting the documents. Because of this, there is no chance of

unauthorized access and also uploading irrelevant documents are prevented.

Format verification system is implemented to validate the document format in an appropriate document structure. Once the documents are validated and processed through format verification system, the document will be moved to the next status for technical verification. In case of technical verification system, the lesson plan documents are verified technically by the expert and approve the document to the access level. All the three categories are implemented by two systems namely LPSS and LVSS in the following proposed architecture.

DESIGN OF USER INTERFACE

The user interface is designed for submission panel, format verification panel, technical verification panel. All these panels are designed and the respective panel will be displayed on the web page according to the user identity. If a user is a submitter then submission panel will be automatically fetched and it will be displayed on the browser. The system will recognize which user is accessing the application according to the user's email id. Submission system panel will be expanded if the user still has rights to submit the documents with a provided document constraints. If the document limit is exceeded, the user cannot able to upload further documents. In the same web page, submission panel alone is expanded and other panels such as format verification and technical verification are visible but with hidden widgets. Though those panels appears in the web page, it cannot be accessed except if user has privilege to access those stuffs.

The format verification panel will be expanded for the concerned user where the submitted documents are fetched and it is displayed in the list. Now this panel will be displayed where the user will access the documents and verify the formats. The other panels will be visible with disabled widgets.

The technical verification panel will be enabled for the concerned user where the formatted documents are fetched and it is displayed in the list.The user will now evaluate the documents technically and approves the document.

Thus in a same web page all the divisions are visible but can be accessible if the user has privileges to do so.

PROPOSED ARCHITECTURE

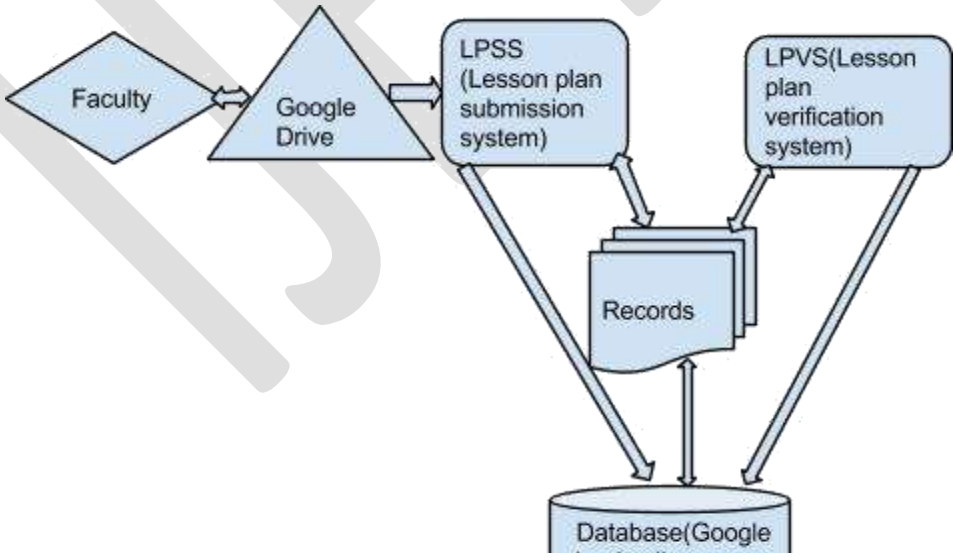

Fig: Online Lesson Plan Management (OLPM) System Architecture

IMPLEMENTATION

The main components in this architecture are LPSS (Lesson plan submission system), LPVS(Lesson plan verification system),

Database (Google cloud SQL) and records.

The LPSS is designed to submit the documents by the faculty members according to the document pattern. In this system, the documents must be submitted for the verification. Once the document is uploaded on the Google drive, the privilege will be given to the Verification members and LPVS will be followed. Data Warehouse is maintained using Google Cloud SQL which contains the link of the document and be useful for the other members to view and gain information about the document.

The LPVS is designed to verify the documents for both format verification and technical verification according to the document pattern. In this system, the documents are listed with the status value as SUBMITTED and hence the user who has a privilege can accept the document or reject the document according to the document pattern and its technical stuffs. If the document is not according to the document pattern, then the format verifier will reject the document with the status value of RE-SUBMIT, else the document is verified by reflecting the status value as F-VERIFIED (FORMAT VERIFICATION). Once the document format is verified, the documents are moved to the next status for technical verification. The documents are technically verified by the subject expert. The documents with the status value as F-VERIFIED are listed in the users panel and the documents are verified technically by updating the status value as T-VERIFIED. If the document is not technically qualified, then the document is rejected with the status value as RE-SUBMIT. The rejected documents will be reflected in the submitter panel and so, the submitter should re-consider the rejected document for the further corrections and should resubmit the rejected document.

In the database, user id (who may be the submitter or format verifier or technical verifier), courseid, document links with the status values are stored which can be accessed and manipulated efficiently. Both, LPSS and LVSS are interacting with the database for the every updations in the documents. So in this regard, there is no chance of uploading a technical less or format less document since it is validated by the experts. Thus, we access the 100% worthy lesson plan document.

Finally the records are displayed in google spreadsheets as document links which is used to access the documents in a centralized way. In this system, a separate spreadsheet is created for each and every courses and all the courses spreadsheets are mapped to the respective programmes. We can access the spreadsheets by using spreadsheet keys. Thus, the system follows multi-level indexing where the list of programmes are displayed as an index and in turn the courses can be selected accordingly by selecting any of the programmes. The status value of every document is reflected in the own course spreadsheet by retrieving the status value from the database. All the users who want to view the document can visit the record index to know the status of the documents and last updated time. The records are kept at the user view level where the document retrieval is not accessed continuously from the database. To reduce the continuous database access, the spreadsheets are triggered and so the updated documents are reflected in the view level. Finally the documents are accessed by anyone. The record keeps on retrieving the data from the Google cloud SQL. If there is any updations in the document, that will be reflected in the own course spreadsheet.
A google site is created as an user interface to incorporate all LPSS(Lesson plan management system), LPVS(Lesson plan verification system) and the records. Also, to view the documents we can create link of the master record sheet to access the respective documents, thus anyone who has authority to access the site can view the master spreadsheet. Thus we can achieve centralized access for any document in the cloud.

How this framework differ from other older approaches:

The proposed system will help the faculty members of higher educational institute by providing right information at right time on any device securely. All the lesson plan documents pertaining to the institute will be stored in the cloud.

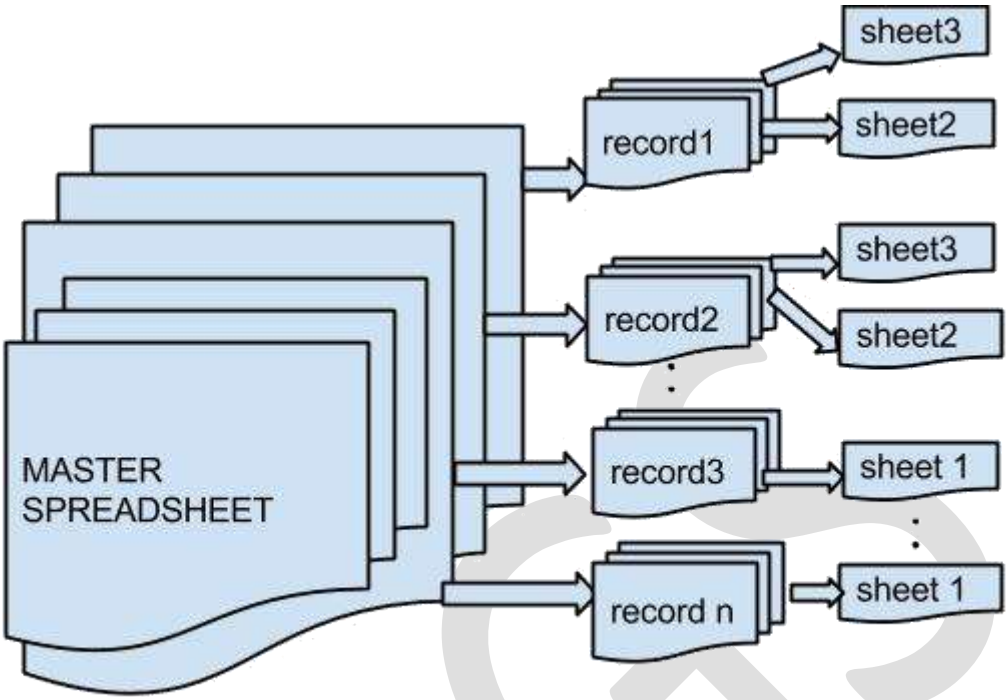

Fig.2 Architecture for Multi level indexing using google spreadsheet

ADVANTAGES:

The proposed system will yield various advantages such as adhering to healthy ecosystem which leads a paperless world, reduces manpower resources for collecting the documents and provides the centralized access for all the document at anytime, documents can be accessed anywhere, anytime and by any device, searching and retrieval of the documents is easier and faster compared to manual searching of the document or files, data can be used over lifetime , it effectively reduces deforestation, server is capable of handling 1000s of requests at a time without any application crashes. The query performance will be better when compared to other conventional systems. There is no chance of server crash due to the mirroring storage technology, the documents are distributed to the servers located in various places in the world. Even though the mirroring technology enables increases memory usage, various algorithms and compression techniques are implemented to overcome the disadvantages of the mirroring technology. Ultimately the system remains fault tolerant and provides 24x7 support for incoming requests. In addition, this approach promises to provide highly secured documents that give an extensible LP management and scalability, easy and faster retrieval of the documents anytime with way in using any devices.

CONCLUSIONS AND FUTURE WORK:

With the vast and rapidly growing technology “Cloud Computing” which is a new evolving research field since the entire world is moving towards cloud, that attracts the attention of an astonishingly diverse set of software developers or researchers from various related fields. This article has introduced the concept of how to utilize the Google APIs in an efficient way since it is a global cloud service provider. So that we can achieve high energy efficiency in the cloud and can adhere to a paperless world for all our data retrieval purposes. It gives a substantial impact to the entire world economy if it is implemented in all major business areas. The proposed approach will emerge and has the potential to become a very popular in near times. We believe our work is highly valuable and interesting for further research in cloud applications. In our future work, we will integrate the Online Lesson Plan Management (OLMP) System in mobile phones so that the managed materials are still easier to access.

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Safe Overtake Monitoring System for Public Transport Vehicles

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Abstract— Every year many people in India die in road accidents and year by year this number is growing. Many agencies and organization have done studies on finding out root causes of these accidents. One of the major reasons came out of those studies is overtaking of vehicles on the road.

This paper proposes a real-time on board safe overtaking monitoring system with major focus on public transport buses. Proposed system monitors vehicle parameters like speed, engine speed, brake pedal status and steering angle. All above parameters are measured by microcontroller based embedded board. Additionally there are four laser sensors attached to vehicle to measure distance from the surrounding vehicles. Systems monitor these parameters and based on algorithm it gives alert to driver if overtaking is not safe. If driver ignores these overtaking algorithms many times then it is informed to nearest police control room and bus agency supervisor. The proposed system is self-decision making driving supervisor which helps drivers to improve their driving skills and also prevent accidents caused due to overtaking.

INTRODUCTION

Driving is very sensitive task which needs to be done very consciously and with high care. Careless driving causes both human and economic damage. More than 70% of the people in India use public transport for travel out of which mostly it is through buses. Past years survey shows that bus accidents contribute more in total accidents happened on road. Some of major reasons for these accidents are inadequate road infrastructure compared to traffic density, rash driving and unsafe overtaking.

Several attempts have been made by public transport system authority and also by road transport department of state government to educate and aware drivers to drive vehicles safely but that did not helped much to prevent the accidents happening every year. There are some systems already available to control speed of bus like “speed governor” but that increases the travelling time and in some cases drivers overload the engines to gain speed which cause reduction in uptime and performance of the vehicle.

Some solutions have been designed which detects rash driving and gives intimation using some or other kind of wireless media but most of them failed due to reliability issues and most of them are just indicative systems and not preventive. There is need of self-control system which detects overtaking intention of driver, guide driver for safe overtaking condition and based on drivers response takes necessary action to prevent the further disaster.

In this paper an onboard safe overtake monitoring system is proposed. Unlike other existing systems this system will act as on board driving supervisor. It monitors few essential vehicle parameters like vehicle speed, steering movement, brake pedal, vehicles current location, and distance measurement sensors to guide driver for overtaking and control speed of vehicle.

If driver doesn’t following the instructions then system sends required text message to police control rooms.

The rest of paper is organized in following way: section II explains system architecture of the proposed system; section III elaborates design and algorithms of major features in the proposed system; section IV has system validation results and section V will give some conclusion remarks and future enhancements; section VI references.

SYSTEM ARCHITECTURE

Figure 1 shows overall system architecture of proposed system. All the major components involved in this system are represented in the figure. Brief information about each component is given.

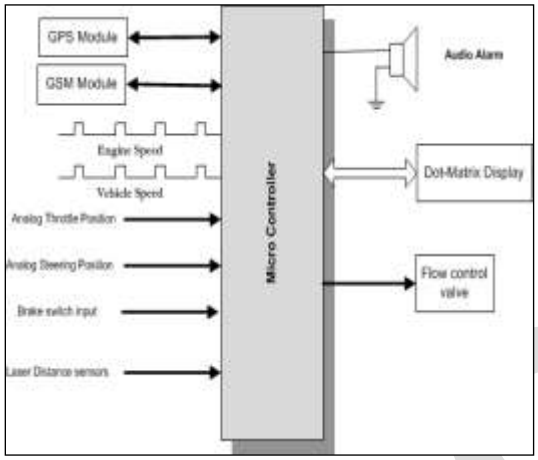

Fig 1.System architecture

[1] Analog Inputs (throttle position & steering position)

There are two analog inputs, throttle position which will be mapped to throttle position. So as throttle pedal moves, resistance of analog pot changes. Second input is steering position analog pot, it will give current steering wheel position or angle.

[2] Frequency Inputs (Engine Speed & Vehicle Speed)

These are magnetic pick up sensors frequency inputs which gives Engine speed frequency and vehicle speed frequency. These frequency inputs will be further converted into engine RPM and vehicle speed in terms of kms/hrs.

[3] Brake switch Input

It is push button switch that will give logic output of zero or one for brake pedal.
Zero for brake pedal not pressed and one for brake pedal pressed.

[4] Laser sensors(L1,L2,L3 & L4)

Three laser sensors are used to measure relative speed of machine, for detecting overtaking conditions and measuring distance of vehicles from opposite lane.

[5] Audible Alarm

It is used to alert driver as well as other passenger about different system warnings. This will be control by using low current relay switch by microcontroller.

[6] Display

16x2 dot matrix display is used to display text warnings for driver as well as for other text info.

[7] Fuel flow control valve

Fuel flow control valve limits vehicle speed to predefined maximum value by controlling fuel flow. Microcontroller controls valve opening by controlling current flowing through solenoid valve.

[8] Microcontroller

XC2224L processor chip is used to design this system. Its 16 bit processor with 12 kB of RAM and 160 kB on chip flash considering future application expansion.
CPU uses 80 MHz high speed clock & works on 3.3 V ± 10 % power supply.

[9] GSM module

GSM module is used for sending emergency text message to pre-defined GSM numbers.
SIM900 is chip used in this system. Its industry standard GSM chip with smaller form factor, GPRS enabled which works for text, voice and data as well.

[10] GPS module

GPS module is used to get local GPS co-ordinate where the vehicle is going on its route.
PA6B GPS chip is used for this design which has higher accuracy and high sensitivity and tracking capabilities.

I. SYSTEM DESIGN

In this system four laser distance sensors are used which are placed at four unique locations Two sensors(L1 & L2) are placed on front side of the bus next to headlights to measure relative distance of vehicle ahead of bus and relative distance of vehicle in opposite lane when bus shift to opposite lane for overtaking. These sensors along with steering angle sensor help system to detect overtaking condition.

Rests of two sensors (L3 & L4) are place on left side of bus one at front and another at rear end as shown in Figure 2. System monitors steering angle sensor continuously and any time system finds steering angle is more than 10 degree continuously for some time, system consider it as intention for lane change.

At the same time feedbacks from the front laser sensors are taken, and distance of the bus from the front vehicle is calculated and using existing vehicle speed system calculates whether measured relative distance and speed is safe enough to continue overtaking.If the distance is not safe system will give audio and visual warning to driver for not overtaking the front vehicle and if still driver go ahead system will log this event as violation of

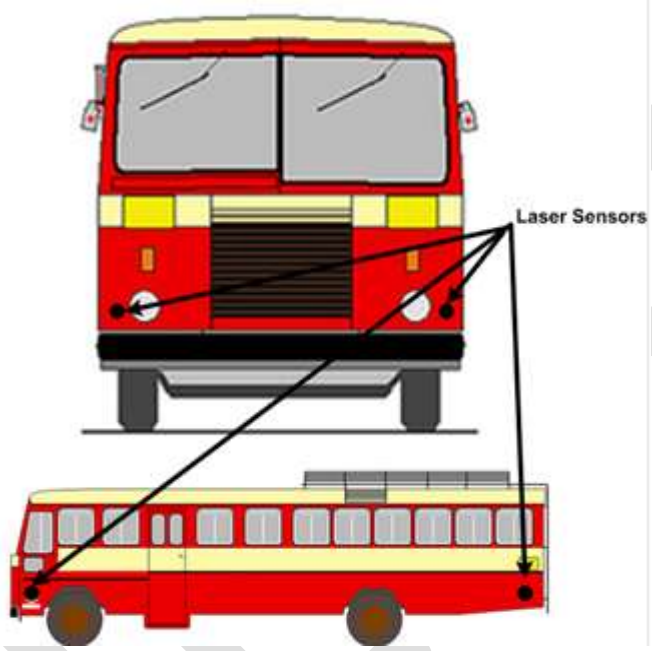

Fig. 1. Distance sensor locations

driving safety. As soon as bus starts entering into opposite lane, right side front laser sensor L2 measures distance of vehicle in opposite lane. Based on the sensor feedback if there is rate of change in distance measured system detects vehicle from opposite lane and measure distance from bus. Based relative bus speed (speed with respect to front vehicle) and distance of vehicle in opposite lane system takes decision if overtaking is possible or not and informed driver accordingly (Figure 3).

Complete lane change is detected with the help of feedback of both laser sensors L1 and L2 and at the same time If it's possible system will not give any indication to driver and keeps monitoring vehicle's speed and left side two laser sensors.While bus overtaking front vehicle system measures left side two sensors L3 and L4 to check side wise distance between two vehicles and also detecting whether bus has crossed vehicle or not.If system detects lane change (back to home lane) started through steering angle sensor before bus has crossed vehicle completely with safe marginal distance system will give audio indication to driver for that and log the event in memory.During this complete overtaking process system keeps accumulating distance travelled by bus starting from lane crossing into opposite lane to coming back to home lane after overtaking and calculated total distance.And if that distance is less than safe overtaking distance that bus has to travelled for overtaking another vehicle, system will do nothing but if it's not system will give audio indication to diver about it and log this event in the memory.If driver does unsafe overtaking even after system has given

warning to him, after third attempt system will send the text message predefined number belonging to either Police department and/or Public bus transport authorized person and also lock vehicle speed by controlling fuel supply through flow control valve activated by relay.Here is the formula how safe overtaking distance is calculated (figure 4),

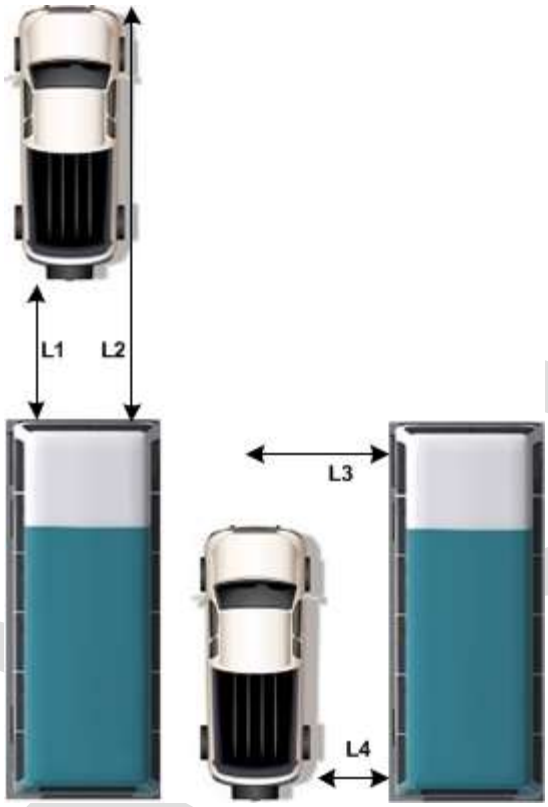

Fig. 2. laser sensors operation during overtaking

Lmin = L + Lfront + Lsafe

Where,

L: length of bus in meters
Lfront: length of front vehicle in meters
Lsafe = (Lsafe1+ Lsafe2): safe overtaking dist. between two vehicles
Lmin: Minimum distance travel to overtake vehicle

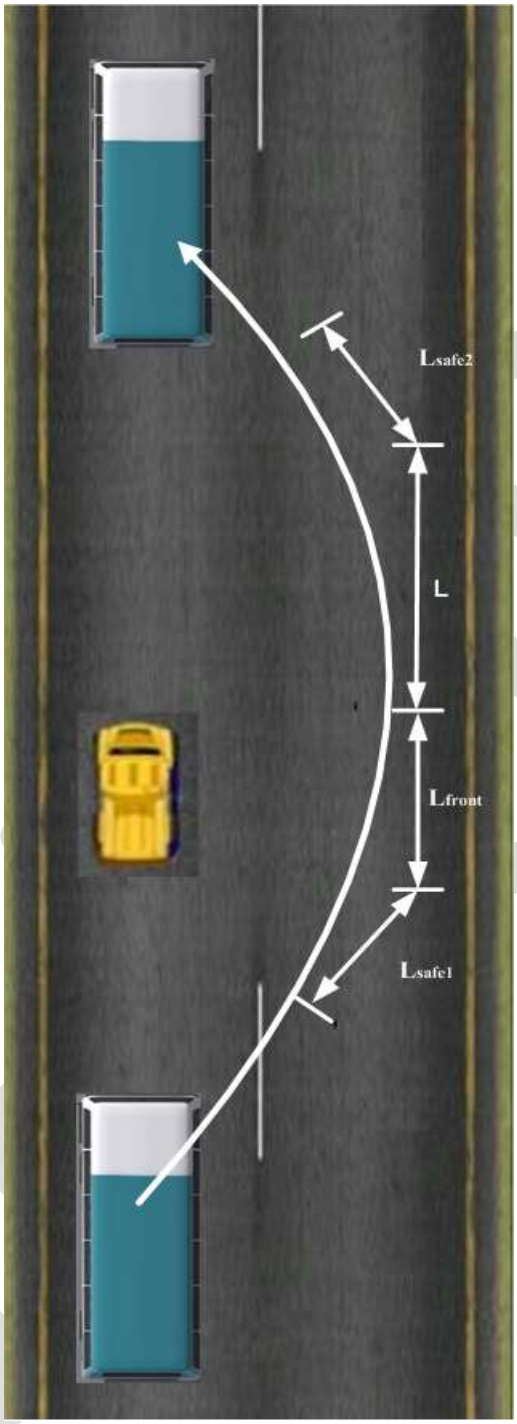

Fig 3.Overtaking scenario

II. SYSTEM VALIDATION

This system tested in simulation environment where system is implemented on embedded board in which throttle sensor, steering sensor are interfaced and rest of the inputs are taken from the virtual test simulator developed in visual basics where test scenarios are created. In this test setup embedded board gives throttle information and steering information to test application and simulators provide laser sensors output to board back, where application is running.

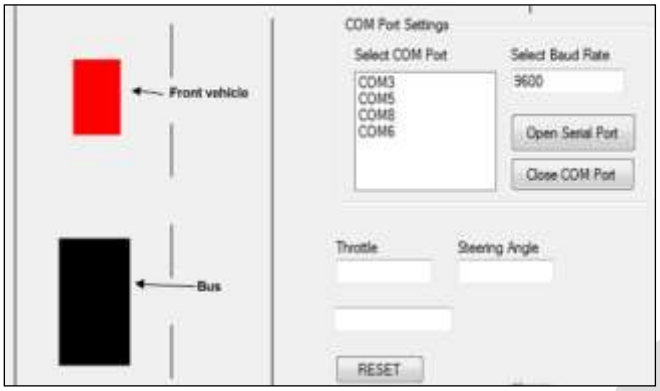

Fig:4 Driving Simulator window

Following are the test scenarios simulated and results captured from those scenarios.

1. Initiating overtaking from unsafe distance from front vehicle:

   In this scenario simulator sent front lasers output to application and application then took decision of not overtaking the front vehicle and sent text information through communication port and message was shown on application window.

   This test was repeated for multiple distances between two vehicles where in system could be able to give correct indication for driver.

2. Overtaking front vehicle for both safe and unsafe total distance travelled:

   For all scenarios where total distance travelled was less than actual total distance travelled system have shown warning for driver for unsafe overtaking.

III. CONCLUSION

In this system is designed in order to address one of the major reasons of bus accidents observed majority of time. Based on simulated testing after applying certain testing conditions, results shows that system is responding good to all the scenarios that are been considered while designing this system.Advantage of this system is it is able to help in improving driving skills which can cause accidents. It helps in reducing road accidents.Considering deployment of this feature, it will be very simple to deploy and cost effective solution for country like India.

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Exploration of a novel plant growth promoting bacteria Stenotrophomonas maltophilia AVP27 isolated from the chilli rhizosphere soil

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ABSTRACT: The present research is aimed for isolation and characterization multiple plant growth promoting activities of chilli rhizobacteria and enhancement of chilli plant growth. Bacterial strains were isolated from chilli rhizosphere by using Jensen's media and screened for plant growth promoting traits such as Indole acetic acid production, phosphate solubilization, Hydrogen cyanide production, Siderophore production and Ammonia production. Three bacterial strains (AVP 22, AVP 23 and AVP 27) were identified as potential PGPR and they were identified as genus Klebsiella, Alcaligenes and Stenotrophomonas by biochemical and physiological characterization. AVP 27 was identified as Stenotrophomonas maltophilia by 16s rRNA partial sequence and their multiple plant growth promoting traits were characterized. The bacterial isolate AVP 27 (KM14433) showed of inorganic phosphate solubilization (818ppm), Acid phosphatase activity (1.62 IU/ml), IAA production (93µg/ml), Ammonia production (80 µg/ml) and able to produce siderophore and HCN under optimized growth conditions and Trehalose, as carbon source. Present research revealed that Stenotrophomonas maltophilia AVP 27 is a promising plant growth promoting rhizobacteria with wide variety of mechanisms. First time report of using Stenotrophomonas maltophilia AVP 27 as plant growth promoting rhizobacteria from chilli rhizosphere and use of this isolate AVP27 as Plant growth promoting rhizobacteria offers attractive way to replace chemical fertilizers, pesticides and supplements.

KEYWORDS: Plant growth promoting rhizobacteria, Multiple PGPR traits, 16s rRNA partial sequence, Stenotrophomonas maltophilia.

INTRODUCTION

The term Rhizobacteria is used to describe a subset of rhizosphere bacteria capable of colonizing the root environment [1,2].Beneficial, root colonizing, and plant growth promoting (PGP) rhizobacteria, are defined by three intrinsic characteristics: (1) must be able to colonize the root (2) must survive and multiply in microhabitats associated with the root surface, in competition with other micro biota, and (3) must promote plant growth. Plant growth promoting rhizobacteria when applied to seeds/soil or crops; enhance the growth of the plant directly by providing nutrients to plants or indirectly by reducing the damage from soil- borne plant pathogens [3]. The Concept of rhizosphere was a narrow zone of soil surrounding the roots where microbe populations are stimulated by root activities[4]has now been extended to include the soil surrounding a root in which physical, chemical and biological properties have been changed by root growth and activity[5].Since bacteria are the most abundant microorganisms in the rhizosphere, it is highly probable that they influence the plants physiology to a greater extent, especially considering their competitiveness in root colonization [6,7,8].Plants select those bacteria

contributing most to their fitness by releasing organic compounds through exudates [9] creating a very selectiveenvironment where diversity is low [10].Rhizobacteria inhabit plant roots and exert a positive effect ranging from direct influence mechanisms to an indirect effect. So, the bacteria inhabiting the rhizosphere and beneficial to plants are termed PGPR [3].In the last few years, the number of PGPR that have been identified has seen a great increase, mainly because the role of the rhizosphere as an ecosystem gained importance in the functioning of the biosphere. Various species of bacteria like Pseudomonas, Azospirillum, Azotobacter, Klebsiella, Enterobacter, Alcaligenes, Arthrobacter, Burkholderia, Bacillus and Serratia have been reported to enhance the plant growth[11,12].There are several PGPR inoculants currently commercialized that seem to promote growth through at least one mechanism; suppression of plant disease (Biocontrol), improved nutrient acquisition (Bio fertilizers), or phytohormone production (Bio stimulants), induction of systemic resistance, and production of siderophore or antibiotics. Exposure to the PGPR triggers a defense response by the crop as if attacked by pathogenic organisms. Siderophore produced by some PGPR scavenge heavy metal

micronutrients in the rhizosphere (e.g. iron) starving pathogenic organisms of proper nutrition to mount an attack of the crop. Antibiotic producing PGPR releases compounds that prevent the growth of the pathogens.

Phosphates and other nutrient are also solubilized by PGPR strains to increase the availability of Phosphorus for plants in soil with large amount of precipitated phosphates [13]and nitrogen fixation. These bacteria are also capable to suppress the growth of deleterious microorganisms by production of siderophore, β 1, 3 glucanases, chitinases and antibiotics [14].Siderophore producing bacteria promote plant growth indirectly by sequestrating the limited iron in the rhizosphere and reduce availability for growth of phytopathogens [15].several fluorescent Pseudomonas and Bacilli have been used as seed or root inoculants for higher growth yield of various crops[11] The common traits of growth promotion includes production or changes in the concentration of plant hormones such as Auxin, gibberellins, cytokinins and ethylene. Indole acetic acid (IAA) is one of the most physiologically active auxin. IAA is release as secondary metabolite because of rich supplies of substrates exuded from the roots [16,17].Microbial biosynthesis of IAA in soil is enhanced by tryptophan secreted from roots or decaying cells[18].Gibberellins are implicated in promotion of root growth, root hair abundance and inhibition of floral bud differentiation in woody angiosperms, regulation of vegetative and reproductive bud dormancy and delay of senescence in many organs of a range of plant species[19,20,21].Bacillus is the most abundant genus in the rhizosphere, and the PGPR activity of some of these strains has been known for many years, resulting in a broad knowledge of the mechanisms involved[22,23].There are a number of metabolites that are released by these strains [24].Which strongly affect the environment by increasing nutrient availability of the plants [25].Stenotrophomonas maltophilia is a common microorganism in the rhizosphere of cruciferous plants, and has also been found in association with corn and beets [26].Excretion of sulphur-containing amino acids such as methionine by roots of cruciferous plants may favour the growth of this species. However, S. maltophilia is also quite dominant in the rhizosphere of cereal crops [27].Stenotrophomonas maltophilia can even colonize and persist inside tissues of potato plants [28].However, S. maltophilia has not been evaluated yet for its potential to control potato brown rot. However, it was proven to be an effective biocontrol agent for the control of various fungal and oomycetous plant pathogens[29,30,31,32,33] Stenotrophomonas maltophilia inhibited the growth of Rhizoctonia solani and Verticillium dahliae in vitro, possibly as a result of antibiosis and production of lytic enzymes [34].Three antifungal compounds, designated xanthobaccins A, B and C were isolated from the culture filtrate of a strain of Stenotrophomonas isolated from sugar beet that suppressed damping-off of beet seedlings caused by Pythium spp.[32].Xanthobaccins were in vitro not effective against three bacterial species (R. solanacearum was not included)Stenotrophomonas maltophilia can take up iron (to a limited extent) from the siderophore pseudobactin [35],but it is unknown if it produces a siderophore. However much attention has not been paid so far on Stenotrophomonas maltophilia In the present investigation multiple potential of rhizobacteria Stenotrophomonas maltophilia isolated from chilli rhizosphere has been characterized in terms of phosphate solubilization, PGP traits and Acid phosphatase.

MATERIALS AND METHODS

ISOLATION AND CHARACTERIZATION

A bacterium (AVP 27) was isolated from chilli rhizosphere peddakurapadu, Guntur district of Andra Pradesh in India, on normal nutrient agar medium with Glucose at pH7.0, Temperature 370c with incubation period 48 hrs. The bacterial isolate was characterized by its cultural conditions, morphological and biochemical characteristics [36].

IN VITRO SCREENING OF PHOSPHATE SOLUBILIZATION

The isolate was screened for phosphate solubilization [37].On modified Pikovskaya agar with insoluble Tricalcium phosphate (TCP). A loop full of culture was placed on the center of agar plate and incubated at 30±0.1 °C for 5 days. The Solubilization zone was determined by subtracting the diameter of bacterial colony from the diameter of total zone.

QUANTITATIVE ESTIMATION OF PHOSPHATE:

Inorganic phosphate Solubilization was Quantitative estimation [38].Bacterial isolate was grown in National Botanical Research Institute's Phosphate (NBRIP) broth containing 0.5% Tricalcium phosphate (TCP).500µl of bacterial inoculum was added to 50 ml of medium and incubated at 30±0.1 °C at 180 rpm for 5 days in Incubator Shaker and uninoculated medium was taken as control . The culture was centrifuged at 10,000 rpm for 10 min. Inorganic phosphate present in supernatant was estimated by vanado-molybdate-yellow color method by using Barton's reagent and 0.5 ml of the supernatant was added to 2.5 ml Barton's reagent and volume was made to 50 ml with de-ionized water. After 10 min of incubation the absorbance was read at 430 nm in UV/Visible Spectrophotometer

and the total soluble phosphorous was calculated from the regression equation of standard curve. And values were expressed in ppm. The pH of culture supernatants were also measured. The experiment was repeated in triplicates.

GROWTH OPTIMIZATION:

Growth optimization of isolate was studied at different temperatures (25ºc,37 ºc,50 ºc), pH ranging from(3,5,7,9,12),NaCl(0.3%,0.5%,0.7%,0.9%,1%),Carbon sources(Sucrose ,Maltose, Lactose, Dextrose)

IN VITRO SCREENING OF BACTERIAL ISOLATE FOR PLANT GROWTH PROMOTING

ACTIVITIES:

IAA PRODUCTION

IAA production was detected [39].Quantitative analysis of IAA was performed using the method of Loper and Scot at a concentration of 1000µg/ml of tryptophan. Bacterial culture grown for 48hrs on the respective media at 30±1°C.Fully grown culture was centrifuged at 10,000rpm for 10 minutes. The supernatant (1 ml) was mixed with 4 ml of Salkowski reagent(50ml,35% of perchloric acid,1 ml 0.5M FeCl3 solution) with few drops of Orthophosphoric acid. Development of pink color indicates IAA production. Optical density was taken at 535nm in UV/Visible Spectrophotometer. Concentration of IAA produced by culture was measured with the help of standard graph f IAA obtained in the range of 10-100 µg /ml.

AMMONIA PRODUCTION

Ammonia production was estimated by Nesslerization reaction. Freshly grown culture was inoculated into 4ml of peptone water and incubated for 48hrs at 370

c.Broth was collected, centrifuged and 1ml Nessler's reagent was added to 1ml of supernatant and the volume of this mixture was made up to 10ml by addition of ammonia free distilled water. Development of brown to yellow color was a positive test for ammonia production and optical density was measured by spectrophotometer at 450nm[40].The concentration of ammonia was estimated based on a standard curve of ammonium sulfate ranging from 0.1 to 1µmol ml

PHOSPHATASE ACTIVITY

Acid phosphatase activity was also estimated [41].Cells grown overnight in citrate salt medium (g/l) [trisodiumcitrate,3 ; K2HPO4,10.5; KH2PO4,5.4; (NH4)2SO4,1.2; MgSO4,0.4; CaCl2,0.15 (PH7.0)] were harvested by centrifugation at 8,000 rpm for 8 min. Cell pellets were suspended in normal saline (O.D of 1.0 at 600 nm) .Incubation mixture for acid phosphatase enzyme assay contained 50 µl of cell suspension ,50 µl of 0.12 M pNPP (p-nitrophenyl phosphate) and 500µl of 50mMTris-Malate buffer (pH5.3).The suspended cells were incubated for 30 min at 30˚c.After centrifugation ,1 volume of 0.5 M NaOH was added to 1 volume of supernatant ,and O.D420 was measured .Results were expressed in µmol units of product formed per OD600 of cells .One unit was defined as thhydrolysis of 1µM of pNPP to pNP(p-nitrophenol) per minute at 30˚c.

CATALASE

Presence of catalase was checked qualitatively using the method [42].Six percent hydrogen peroxide was added on the colonies grown on nutrient agar plates; effervescences of O2 released from the bacterial colonies indicate the presence of catalase activity.

HCN PRODUCTION

Qualitative estimation of HCN production was done by Picrate assay[43].Nutrient agar medium was amended with 4.4g glycine L-1 and bacterium was streaked on plate. A whatman filter paper no.1 soaked in 2% sodium carbonate in 0.5% picric acid solution was placed between the base and the lid of the petri dish. Plates were sealed with Para film and incubated at 27±20c for 4 days. After incubation, the color change of filter indicates the release of cyanide from bacterial isolate.

MOLECULAR IDENTIFICATION OF BACTERIAL ISOLATE

Pure culture of AVP 27 bacterial isolate was grown until log phase achieved and genomic DNA was isolated essentially according to Bazzicalupo[44].The amplification of 16S rRNA gene was done by using universal bacterial primer 1492R (5´-TACGGYTACCTTGTTACGACTT-3´) and 27F (5´ AGAGTTTGATCMTGGCTC AG- 3´) as per the conditions described by Pandey[45] .The PCR product was sequenced at Macrogen South Korea. The sequences obtained were compared with those from the GenBank using the BLAST program[46]and Phylogenetic trees reconstructions were obtained by the Neighbor joining method 1000 bootstrap replicates were performed to assess the statistical support for each branch in the tree[46,47].

RESULTS:

ISOLATION AND CHARACTERIZATION:

Out of 55 bacteria isolated from chilli rhizosphere, one of the colonies AVP27 showed mucoid and water bubble morphology (Plate-1A).On the basis of culture, morphological, biochemical and molecular characteristics, the bacterial isolate was identified as Stenotrophomonas maltophilia AVP 27.

Plate-1A

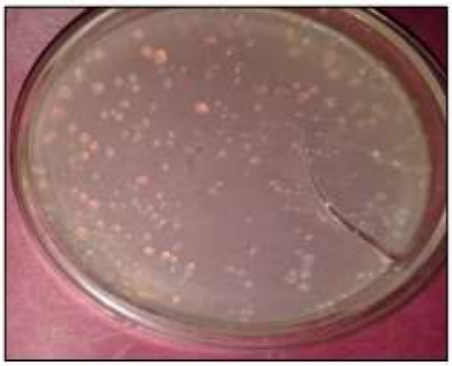


Table 1: Morphological physiological and Biochemical characteristics of AVP27

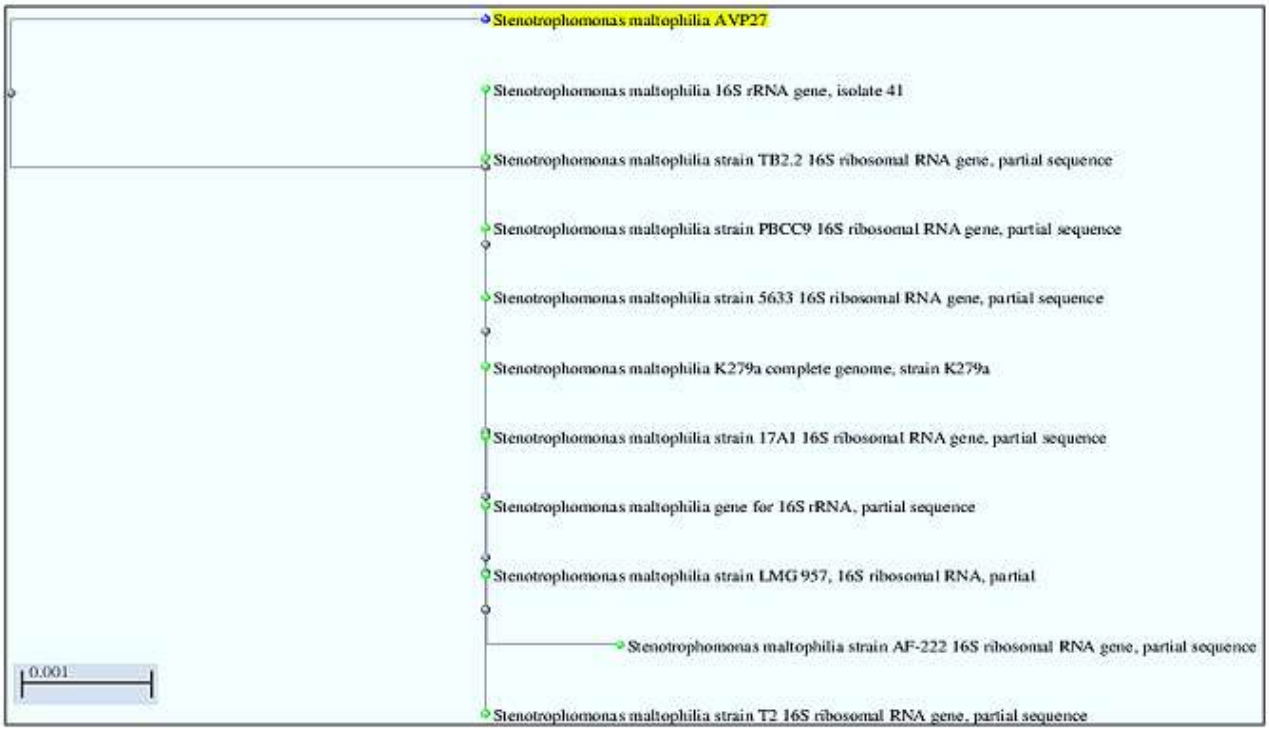
Morphological and physiological characteristics								
Test	Morphology Arrangement	Gramstaining/ Pigmentation	Motile	Urease	Starch	Glucose	Lactose	Sucrose
AVP27	Rod& single	Pink and No pigmentation	-ve	-ve	-ve	+ve	+ve	+ve

Biochemical characteristics								
Test	Oxidase	Catalase	H_2S	Nitrate reduction	Indole	Methyl red	Voges Proskuaer	Citrate utilization
AVP27	-ve	-ve	-ve	+ve	-ve	-ve	-ve	+ve

MOLECULAR CHARACTERIZATION

1000bp PCR product of 16SrRNA gene was amplified from genomic DNA of Stenotrophomonas maltophilia AVP 27 strain.16S ribosomal RNA partial gene analysis was done at Macrogen South Korea. Phylogenetic analysis of 1000bp of fasta sequence by

BLAST n,NCBI revealed that the strain AVP 27 showed 99% similarity with Stenotrophomonas maltophilia 2DT.Hence the sequence was submitted in GenBank NCBI with a name Stenotrophomonas maltophilia AVP 27 (Accession No. KM14433). Fig : 1 PHYLOGENETIC TREE OFSTENOTROPHOMONAS MALTOPHILIA AVP 27 BASED ON 16S rRNA GENE ANALYSIS



SCREENING OF PHOSPHATE SOLUBILIZATION

Qualitative characterization of AVP 27 isolate of phosphate solubilization showed zone of clearance on Pikovskaya's agar medium after 4 days .(Plate-1B)

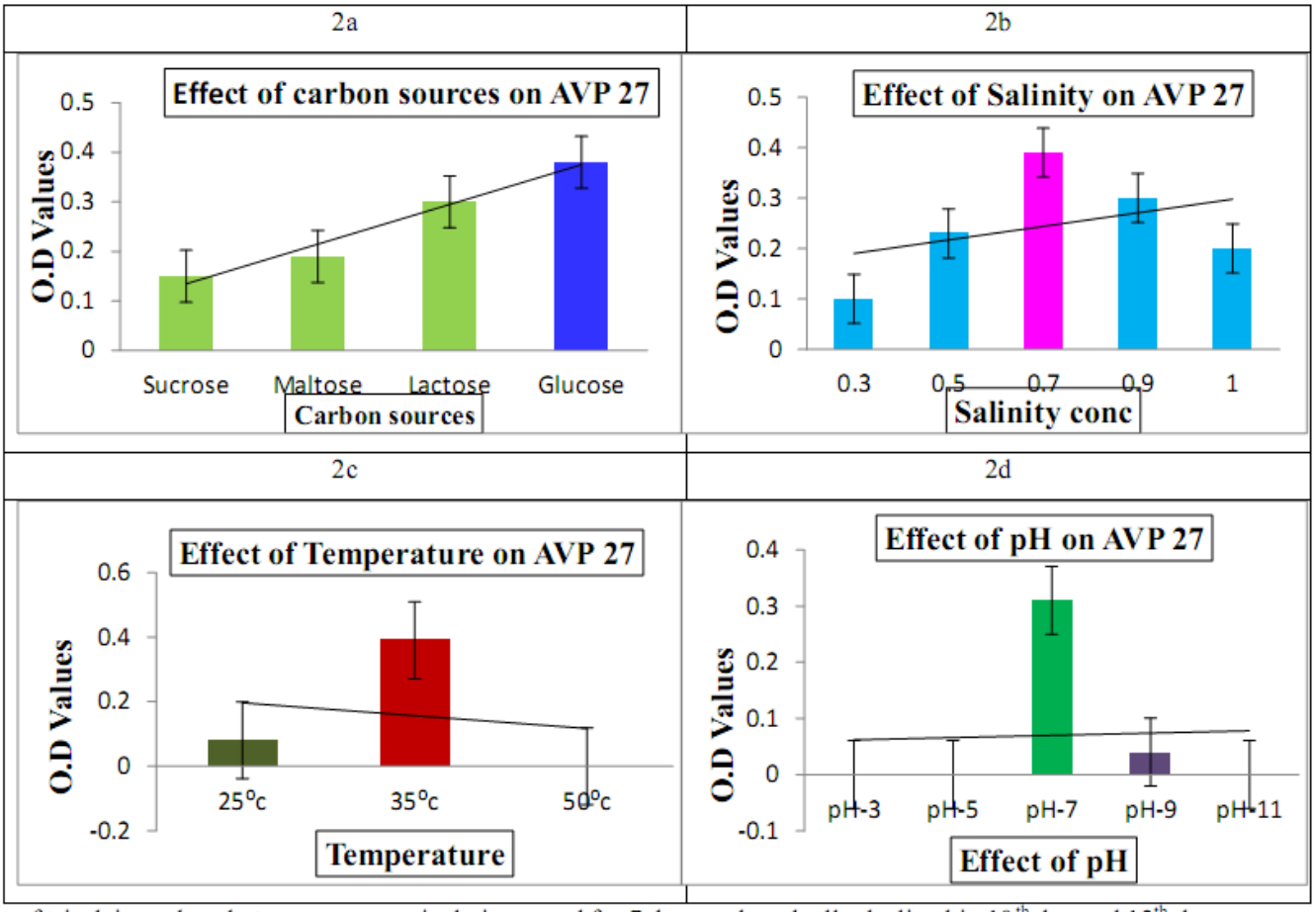
Plate-1B

GROWTH OPTIMIZATION OF AVP27

AVP 27 showed variation in growth in different carbon sources such as Sucrose, Maltose, Lactose and Dextrose (fig 1a). Maximum growth was observed in Glucose and found to be very minimum in Sucrose. It is observed that growth pattern of AVP27 showed variation at different concentrations of NaCl. AVP 27 showed maximum growth rate at 0.7% NaCl and moderately high growth rate at 0.9% NaCl (fig1b). It is also observed that AVP 27 showed growth variation at different temperatures and found to be maximum at 37˚c and moderate at 25˚c.(fig1c) .Growth at different pH ranging from pH3.0- pH 12 also showed variation and observed to be high at pH7 and relatively moderate at pH9 (fig1d) . Based on the results cited in fig1, growth of AVP-27 was optimized in a medium containing Sucrose, 0.7%NaCl, pH7 at 37˚c temperature.

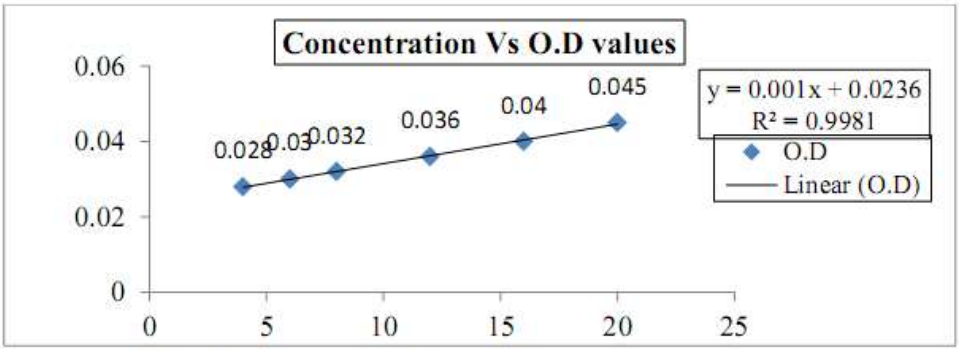
Figure: 2

QUANTITATIVE ANALYSIS OF PHOSPHATE SOLUBILIZATION Results revealed that the solubilization



of tricalcium phosphate was progressively increased for 7 days and gradually declined in 10th day and 13th day. .Phosphate solubilization was observed to be maximum (818 ppm) on 7th day and also noted that the solubilization was gradually decreased with rapid decline of pH from 7 to 4(fig 2).

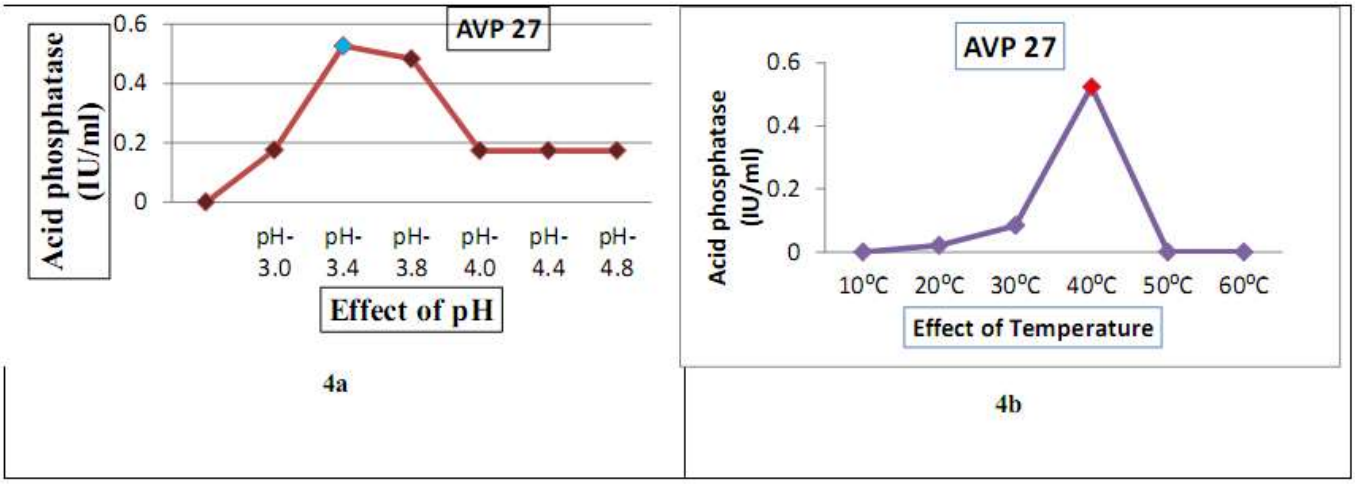
Figure 3: STANDARD GRAPH OF PHOSPHATE SOLUBILIZATION AT VARYING CONCENTRATIONS OF TRI CALCIUM PHOSPHATE

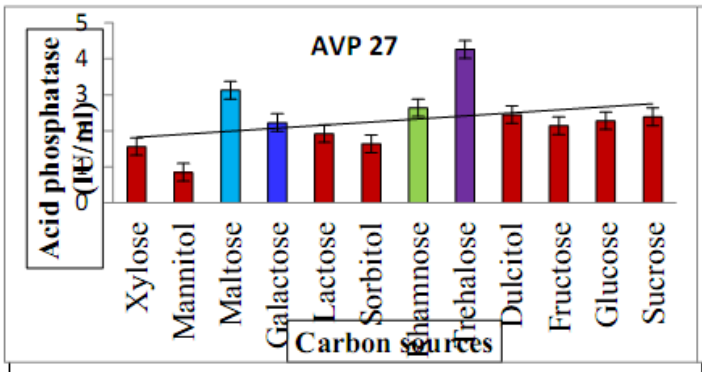


QUANTITATIVE ANALYSIS OF ACID PHOSPHATASE

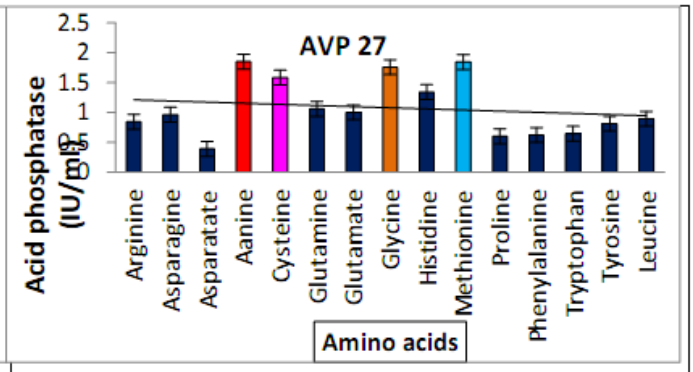
Results revealed that AVP 27 showed high acid phosphatase activity (0.527 IU/ml) at pH3.4 and temperature 40°C (Fig3). For the first time, acid phosphatase activity of AVP 27 was also estimated quantitatively at 12 different sugars and 15 amino acids and relative activity was measured in international units (IU). It has been observed that the isolate showed acid phosphatase activity in all 12 different types of sugars. Figure 4 revealed that the activity was very high in Trehalose (4.260 IU/ml), Maltose (3.128 IU/ml), Rhamnose (2.640 IU/ml), Dulcitol (2.450 IU/ml) and Sucrose (2.390 IU/ml). AVP 27 isolate also showed acid phosphatase activity in all 15 different types of amino acids. Significant increase of acid phosphatase activity was observed (fig 5). The isolate showed acid phosphatase activity high in Alanine (1.852 IU/ml), Methionine (1.844 IU/ml), Glycine (1.760 IU/ml), Cysteine (1.584 IU/ml) and Histidine (1.340 IU/ml). Growth and acid phosphatase production of AVP27 was studied at 12 different sugars and 15 different amino acids. It was observed that Rhamnose and Sucrose proportionately enhances the enzyme activity along with growth. Enzyme activity was not proportionately increased along with growth in presence of Trehalose. It clearly indicates that sugars like Fructose and Mannitol act as inducers for enzyme acid phosphatase. Effect of sugars on growth of AVP9 was also studied (fig-6) and observed that the growth is very high in sugars like Xylose, Mannitol, Maltose, Trehalose, Glucose and sucrose and also found that the growth was maximum in Trehalose.

Figure 4: QUANTITATIVE ANALYSIS OF ACID PHOSPHATASE





4c



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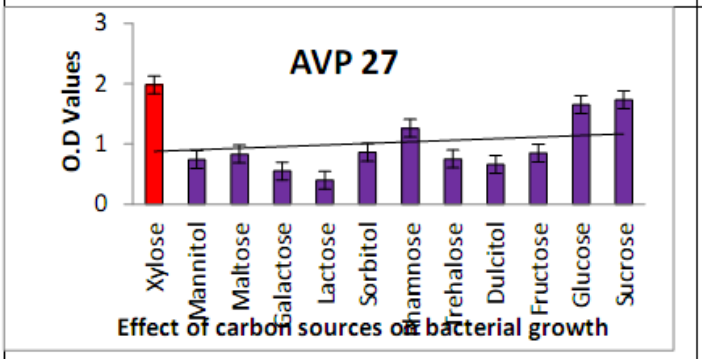

4e

QUALITATIVE AND QUANTITATIVE ANALYSIS OF PLANT GROWTH PROMOTING TRAITS OF AVP27

Bacterial Isolate	IAA (µg/ml) production	Ammonia (µg/ml) Production	Siderophore production	HCN Production	Catalase production
AVP27	93	80	Positive	Positive	Positive

DISCUSSION

Several factors viz. root morphology, the stage of plant growth, root exudates, and the physical and chemical properties of the soil are reported to influence the occurrence and distribution of microbial communities in the soil and rhizosphere. Previous isolations of nitrogen fixing bacteria have revealed a broad diversity of diazotrophs to inhabit the crop rhizosphere [48] and this study surveyed the rhizosphere soil of agriculturally important crops widely cultivated in Peddakurapadu,Guntur A.P,India for the presence of plant growth promoting bacteria.

Nitrogen and phosphorus are two most limiting nutrients in the soil as well as plant enhancing nutrients[49].Phosphate fertilizer represents a high cost to the former and most of the soils are poor in available phosphorus contents and therefore it is of interest to take advantage of soil microorganisms for the mobilization of phosphorus in the soil[50].In present investigation *Stenotrophomonas maltophilia* AVP 27 was screened invitro for

phosphate solubilization and Acid phosphatase activity both qualitatively and quantitatively. After seven days of incubation the isolate AVP 27 showed high phosphate solubilization. 37˚c Temperature, 0.7%, NaCl (salinity), pH 7 and Glucose were identified as influencing factors for optimization of growth and maximum phosphate solubilization. In the present study AVP 27 showed significant production of ammonia and strong phosphate solubilization. This infers that AVP 27 isolate in the rhizosphere makes ammonia and phosphorus available to the plant by which nutritional needs of the plant can be fulfilled.

The morphological and biochemical analyses indicated highest (98%) similarity of the isolate with the genus Stenotrophomonas when compared with Bergey's Manual of Determinative Bacteriology [51]. In addition the phenotypic characteristic of this species correlate well with the molecular analyses based on 16SrRNA partial sequence analyses. Naz et al., (2010) [52] identified phosphate solubilizing bacteria belonging to genera Stenotrophomonas maltophilia by 16S-rRNA. The PGPR strains have been reported to produce IAA either with or without the tryptophan supplement in culture media [53,54]. Greater production of IAA obtained during the present study might be due to the presence of tryptophan deaminase enzyme in Stenotrophomonas maltophilia that utilized tryptophan as precursor of IAA. Auxin biosynthesis is wide spread among soil and plant associated bacteria[55] including Stenotrophomonas maltophilia[56] .

Microbial IAA has been implicated in the stimulation of growth or pathogenesis of plants. A diverse group of microbes, including soil, epiphytic and tissue colonizing bacteria have been found to synthesize IAA [57].In this study bacterial strains produced considerable amount of IAA, which is comparable with earlier studies on various bacteria including Pseudomonas and Stenotrophomonas [58,56] This study reports the isolation and characterization of the strain S. maltophilia AVP 27 from the rich rhizosphere soils of Chilli crop confirming their plant growth potential. Bacteria from this genera was generally regarded as good phosphate solubilizers and as biofertilizers [59,56,48].So it clearly reveals that apart from the normally encountered rhizosphere microflora: Azospirillum, Azotobacter, Herbaspirillum, Klebsiella, etc., other species may also possess diazotrophy. S. maltophila has an ambivalent character, first as a biocontrol and bioremediation agent and second as a multiresistant pathogen in nosocomial infections. There are numerousreports on the isolations from diverse rhizospheres. The clinical isolates are separated from the rhizosphere isolates by 16s rDNA analysis [60] .However it requires further studies on the virulence of the rhizosphere isolates before recommending it as a bioinoculant. Conventionally, insoluble phosphates are chemically processed by reacting with sulphuric acid or phosphoric acid into soluble P. However, this process increases P fertilizer cost, and has environmental implications. In view of environmental concerns and current developments in sustainability, research efforts are concentrated on the development of a technique that uses phosphatesolubilizing microorganisms to solubilize insoluble phosphates [61,62]. In this work, a phosphate solubilizing bacterium, which is identified as S. maltophilia, was isolated from Chilli rhizosphere soil (Pedakuraadu,Guntur,A.P, India). Generally, the action of microorganisms leading to the solubilization of minerals is recognized as direct and indirect actions [63].On one hand, for the direct action,microorganisms utilize minerals as their growth substrate, the growth cause the solubilization of minerals. On the other hand,for the indirect action, microorganisms produce some metabolites during the solubilizing periods,such as organic acids, which also solubilize minerals. It has been well established that, as a common strategy to release soluble P from insoluble phosphates, phosphate solubilizing microorganisms reduce the pH of the surroundings by the production of organic acids[64] .In this work, S.
maltophilia AVP 27 presents high growth rate in NBRIP growth medium containing 0.1 g TCP, and a positive correlation between the concentration of soluble P and the population of the isolate in the culture medium is observed .The results show that the isolate can solubilize TCP as its growth substrate. It was reported that acid phosphatase produced in this process, thus also cause TCPsolubilization[65]. In this study we also made an attempt to characterize acid phosphatase enzyme activity at different pH, different carbon sources and amino acids. Best of our knowledge, relation between growth of isolate and acid phosphatase activity has not been reported so far. First time an attempt was made to correlate growth of isolate with acid phosphatase activity at different carbon sources. Our reports revealed that there is no direct correlation between bacterial growth and enzyme activity in presence of carbon sources. However some of the carbon sources such as Mannitol and Fructose act as inducers and enhance the activity of acid phosphatase. No significant enhancement of acid phosphatase activity was observed in presence of amino acids. To hornets the dual potential of AVP27 in the field of Agriculture and Industry, future studies should be carried out.
This indicates that the direct action by S. maltophilia AVP 27 is one of the reasons for TCP solubilization. In addition, a decrease of pH is presented, depletion of pH in the broth was due to the production of organic acids that cause TCP solubilization are detected in the culture medium inoculated with S. maltophilia AVP 27 during the solubilizing experiment .
The results indicate that the indirect action by S. maltophilia AVP 27 is another reason for TCP solubilization. It further affirms that phosphate solubilization by microorganisms is involved with the production of organic acid released by microorganisms and followed by a decrease in the pH of the culture medium[66]. However, the mechanism of phosphate solubilization by microorganisms is also a subject of controversy today. Therefore, it needs further studies to understand the characteristics and mechanisms of phosphate solubilization by phosphate solubilizing microorganisms. Moreover, the role of phosphate solubilizing microorganisms on plant growth under field conditions is also important and necessary to be studied.

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CONCLUSION:

It is expected that this report will prompt further screenings of phosphate solubilizing microorganisms so as to enhance agronomic value of soils and benefit crop growth. Evaluation of this isolate under the field condition and thorough investigation of Stenotrophomonas maltophilia AVP 27 use as a plant growth promoting rhizobacterial agent constitute future research. This shows that multiple potential of AVP 27 can help in plant protection and enhance plant growth.

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Labeling Techniques in Friendship Graph

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Abstract— This paper aims to focus on some labeling methods of Friendship Graphs. We investigate friendship graph with four types of labeling such that Harmonious, Cordial, distance antimagic labeling and sum labeling. The approach will be to summarize them in different flavor and possible different labeling. Also we will discuss about some important theorems and examples based on those theorems.

Keywords— Friendship graph, Harmonious labeling, cordial labeling, distance antimagic labeling, generalised friendship graph, sum labeling, optimal summable.

Introduction

Lots of research work is been carried out in the labeling of graphs in past few work since the first initiated by A. Rosa [7]. Sum labeling of graphs was introduced by Harary [3] in 1990 and since that time the problem of finding an optimal labeling for a family of graphs has been shown to be difficult, even for fairly simple graphs.

Definitions

1. The ***fan*** fn ($n \geq 2$) is obtained by joining all vertices of P_n (Path of n vertices) to a further vertex called the center and contains n+ 1 vertex and 2n-1 edges. i.e. $f_n = P_n + K_1$.Fan f4 is shown in the following Figure I.

Figure I

2. A ***friendship graph*** F_n is a graph which consists of n triangles with a common vertex. Friendship graph F_4 is shown in the following Figure II.

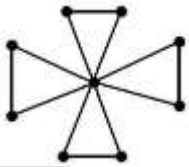


Figure. II

3. The ***wheel graph*** W_n is defined to be the join of $K_1 + C_n$ i.e. the wheel graph consists of edges which join a vertex of K_1 to every vertex of C_n. Figure III shows a wheel W_3.

Figure III.

4. The ***helm*** H_n is a graph obtained from a wheel by attaching a pendant vertex at each vertex of the n – cycle as shown in the Fig. IV

Figure IV

5. If the vertices of the graph are assigned values subject to certain conditions than it is known as ***graph labeling***. Most of the graph labeling problem will have following three common characteristics.

- A set of numbers from which vertex labels are chosen,
- A rule that assigns a value to each edge,
- A condition that these values must satisfy.

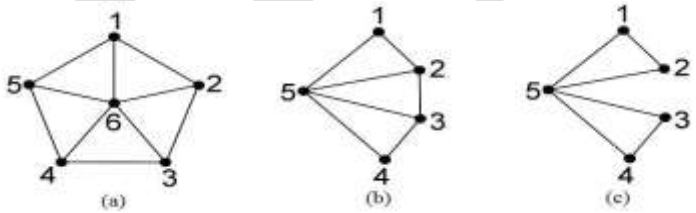
6. Let G be a graph with q edges. A function f is called ***harmonious labeling*** of graph G if f: V →{0, 1, 2,,,,q-1} is injective and the induced function f*: E → {0, 1, 2,,,,,,q} defined as f*(e = uv) = (f(u) +f(v))(mod q) is bijective. A Graph which admits harmonious labeling is called harmonious graph

7. A mapping $f : V(G) \rightarrow \{0,1\}$ is called ***binary vertex labeling*** of G and $f(v)$ is called the *label* of vertex v of G under f. The induced edge labeling $f^* : E(G) \rightarrow \{0,1\}$ is given by $f^*(e = uv) = |f(u) - f(v)|$. Let $v_f(0)$, $v_f(1)$ be the number of vertices of G having labels 0 and 1 respectively under f and let $e_f(0)$,$e_f(1)$ be the number of edges of G having labels 0 and 1 respectively under f^*.

8. A binary vertex labeling of graph G is called ***cordial labeling*** if $|v_f(0) - v_f(1)| \leq 1$and $|e_f(0) - e_f(1)| \leq 1$. A graph G is ***cordial*** if it admits cordial labeling.

9. Let G be a graph, x be a vertex in G, f be a bijection from V onto {1, 2,…… v}, and D ⊆ {0,1,…… diam(G)}.The bijection f is called ***distance antimagic labeling*** if all vertices have distinct vertex-weights. A graph is called ***distance antimagic*** if it admits a distance antimagic labeling.

10. The bijection f is called a ***D-distance antimagic labeling*** if the D-vertex-weights are all different. The bijection f is called an ***(a, d)-D-distance antimagic labeling*** if all D-vertex-weights constitute an arithmetic progression with difference d and starting value a, for a and d fixed integers with d≥0. A graph G is ***D-distance antimagic or (a, d)-D-distance antimagic*** if it admits a D-distance antimagic labeling or an (a, d)-D-distance antimagic labeling, respectively.



(a, d)-distance antimagic labeling for wheel-related graphs

11. A ***sum labeling*** is a mapping λ from the vertices of G into the positive integers such that, for any two vertices u, v belongs to V (G) with labels λ(u) and λ(v), respectively, (uv) is an edge if and only if λ(u) + λ(v) is the label of another vertex in V (G). Any graph supporting such a labeling is called a ***sum graph***.

12. The friendship graph f_n is a collection of n triangles with a common vertex. It may be also pictured as a wheel with every alternate rim edge removed, see Figure II. The ***generalised friendship graph*** $f_{q,p}$ is a collection of p cycles (all of order q), meeting at a common vertex. In this section we will refer to the friendship graph f_n as an instance of the generalised friendship graph and write it as $f_{3,n}$. The generalised friendship graph is, because of its shape, also referred to as a flower.

Theorem : Friendship graph F_n is harmonious except n≡ 2(mod 4)

Proof: We consider the following three cases

Case (1): If $n \equiv 2 \pmod 4$, then F_2 is not harmonious according to a theorem. Since number of vertices is 5 and number of edges are 6. Which is not divisible by 4 or 8. are 6. Which is not divisible by 4 or 8.

Case (2): If $n \equiv 0$ or $1 \pmod 4$, then the numbers $\{0,1,2,,,,2n\}$ may be partitioned into n pairs (a_r, b_r) with $b_r - a_r = r$ for r = 1,2,,,,n. then a harmonious labeling is obtained by labeling the vertices of the triangle with $(0,r, n+a_r)$ for r = 1,2,,,n.

Case (3): If $n \equiv 3 \pmod 4$, then $\{1,2,3,,,,2n-6\}$ may be partitioned into n-3 pairs (a_r, b_r) with $b_r - a_r = r+2$ for r = 1,2,,,,n-3. We label the triangles of Fn with (0,1, 3n-1), (0,2, 3n-6), (0,3n-2, 3n-3) and $(0,r+2, n+ a_r)$ for r = 1,2,,,n-3. Thus, F_n is harmonious except $n \equiv 2 \pmod 4$.

Theorem : fn is harmonious.

Proof: Let m = [n/2] and label the centre with 0 and the vertices of path with m, n, m+1, n+1, m+2,,,. Then we get the harmonious labeling of fan.

In the following figure. V and VI the harmonious labeling of F_4 and F_5 is shown.

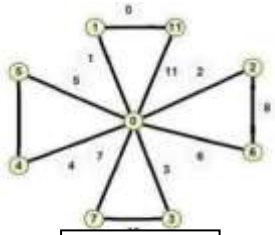


Figure V

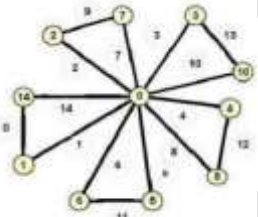


Figure VI

Theorem : F_n is product cordial.

Proof :

Let F_n be the friendship graph with n copies of cycle C_3.

Let v′ be the apex vertex, $v_1, v_2, ..., v_{2n}$ be the other vertices and $e_1, e_2, ..., e_{3n}$ be the edges of F_n.

Define $f : V(F_n) \rightarrow \{0,1\}$, we consider following two cases.

Case 1: When *n* is even.

$f(v_i) = 0, \quad 1 \leq i \leq n$
$f(v_i) = 1$ otherwise
$f(v') = 1$

In view of the above labeling pattern we have,

$v_f(0) = v_f(1) - 1 = n$
$E_f(0) = e_f(1) = \frac{3n}{2}$

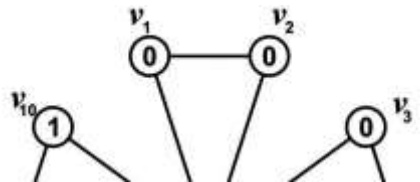
Case 1: When *n* is odd.

$f(v_i) = 0, \quad 1 \leq i \leq n$
$f(v_i) = 1$ otherwise
$f(v') = 1$

In view of the above labeling pattern we have,

$v_f(0) + 1 = v_f(1) = n + 1$
$E_f(0) = e_f(1) + 1 = \frac{3n}{2}$

Thus in each cases we have $|v_f(0) - v_f(1)| \leq 1$ and $|e_f(0) - e_f(1)| \leq 1$. Hence F_n is product cordial.



F_5 with product cordial labeling.

Theorem : A friendship graph f_n is (a, d)-distance antimagic if and only if n = 1 or n = 2.

Proof:

For i = 1, 2,……. 2n, we have $3 \leq w(x_i) \leq 4n + 1$ and so d is at most $\frac{(4n+1)-3}{2n} = 2 - \frac{1}{n} \leq 2$.

On the other hand $n(2n+1) \leq w(x_0) \leq n(2n + 3)$.

Thus we have $w(x_0) - w(x_i) \geq n(2n+1) - (4n+1) = 2n^2 - 3n - 1$.

For $n \geq 3$, $w(x_0) - w(x_i) \geq 8$, a contradiction.

To complete the proof, we need to consider f_1 and f_2. Since $f_1 \simeq K_3$ then f_1 has a (3, 1)-distance antimagic labeling. Finally, a simple vertex labeling leads to the distance antimagicness of friendship graphs.

Theorem : All friendship graphs are distance antimagic.

Proof. We de ne a vertex labeling f of f_n as follow $f(x_i) = \begin{cases} n+1, & \text{for } i=0, \\ i, & \text{for } i=1,2\ldots n. \end{cases}$

and so we obtain the following vertex-weights $w(x_i) = \begin{cases} n(2n+1), & for \quad i = 0, \\ n+2+i, & for \quad i = 1,3 \ldots\ldots\ldots 2n-1, \\ n+i, & for \quad i = 2,4 \ldots\ldots\ldots\ldots 2n. \end{cases}$

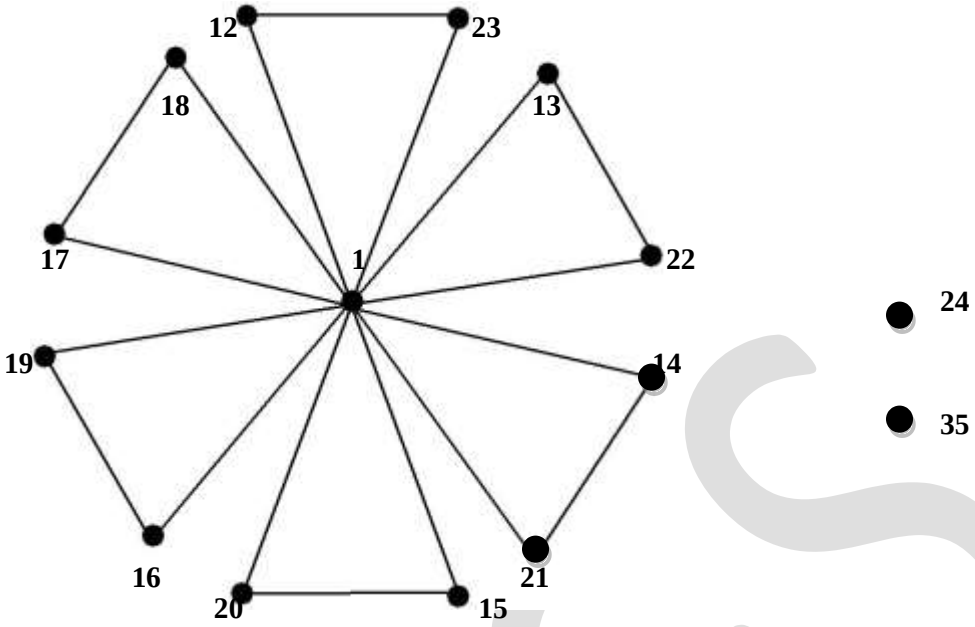
We can see that the weights are all distinct.

Constructing a sum labelling for $f_{q,p}$

Theorem : $f_{3,p}$ is optimal summable.

Proof: Begin a sum labelling for $f_{3,p}$ by labelling the centre vertex c = 1. Commencing from any triangle, distribute the labels a, a + 1, a + 2, . . . clockwise about the centre, one label for each triangle. The maximum label at this stage is a + (p − 1) on the p^{th} triangle. Then continue the labelling sequence, distributing the labels a + p, a + (p + 1), . . . counterclockwise from the p^{th} triangle. The maximum label is now a + (2p − 1) and is adjacent to the label a. Now all of the edges independent of the centre join vertices whose combined sum is 2a + (2p − 1) and the only edge not yet accounted for in the labelling is the edge between the maximum label and the centre (whose vertex sums add to a + 2p).

Since both 2a + (2p − 1) and a + 2p are larger than the maximum label in the graph, they must be (the only required) isolates. It only remains to ensure that no further edges are induced.Setting a large enough (say a = 2p) suffices.



The flower $f_{3,6}$ and its labeling

Theorem: $f_{4,p}$ is optimal summable.

Proof: Give the centre vertex the label 5 and label the outer vertices according to the scheme,

$$v_1^{\,1} = 8,\ v_2^{\,1} = 1,\ v_3^{\,1} = 2^{p-3} \times 50 - 2^{p-1} - 1$$

$$v_1^{\,2} = 2^{p-3} \times 50 - 2^{p-1} - 10,$$

$$v_2^{\,2} = 9,$$

$$v_3^{\,2} = 2^{p-3} \times 50 - 2^{p-1} - 5$$

$$v_1^{\,i} = v_2^{\,i} - 5,$$

$$v_2^{\,i} = 2^{i-4} \times 50 - 2^{i-2},$$

$$v_3^{\,i} = v_2^{\,i} - 10.$$

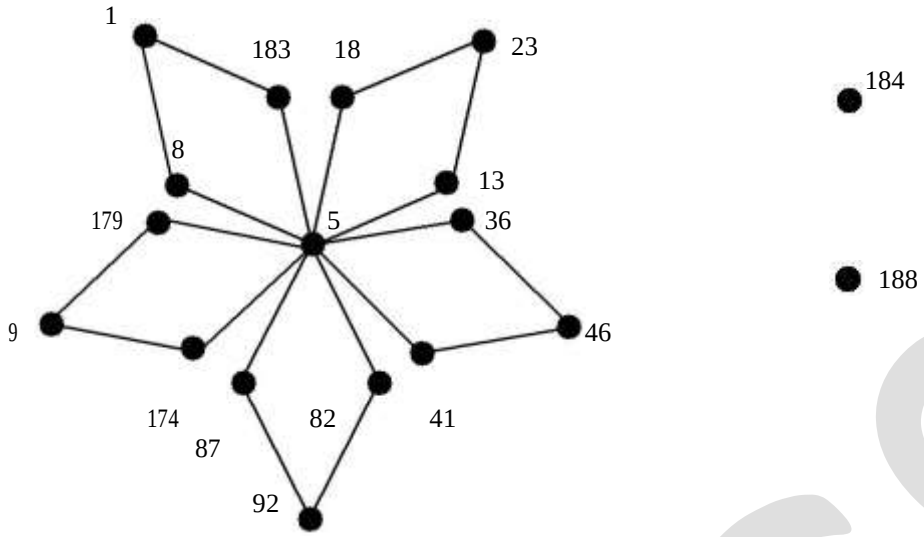
This labeling provides for 2 isolates (x, y) of the form

$$x = 2^{p-3} \times 50 - 2^{p-1},\ y = 2^{p-3} \times 50 - 2^{p-1} + 4.$$

Simple arithmetic verifies that the edges on the first two cycles are witnessed by the labelling. The following equations show that all edges of intermediate cycles are witnessed.

$$v_1^i = v_3^i + 5 = v_1^{i-1} + v_2^{i-1}$$
$$v_2^i = v_1^i + 5$$
$$v_3^i = v_3^{i-1} + v_2^{i-1}$$

The relationship $v_2^{\,i} = 2 \times v_2^{\,i-1}$ ensures that the labels on the individual cycles are sufficiently well spaced so as to prevent edges being induced between cycles.



The flower $f_{4,5}$ and its labeling

Theorem : $f_{5,p}$ is optimal summable.

Proof: Label the centre c = 1 and the vertices on the first petal by

$v_1^1 = 3,$
$v_2^1 = 5,$
$v_3^1 = 8,$
$v_4^1 = 4$

and similarly for subsequent petals (except for the last) following the scheme

$$\lambda(v_1^i) = \lambda(v_3^{i-1}) + \lambda(v_4^{i-1})$$
$$\lambda(v_2^i) = \lambda(v_4^i) + c$$
$$\lambda(v_3^i) = \lambda(v_1^i) + \lambda(v_2^i)$$
$$\lambda(v_4^i) = \lambda(v_1^i) + c.$$

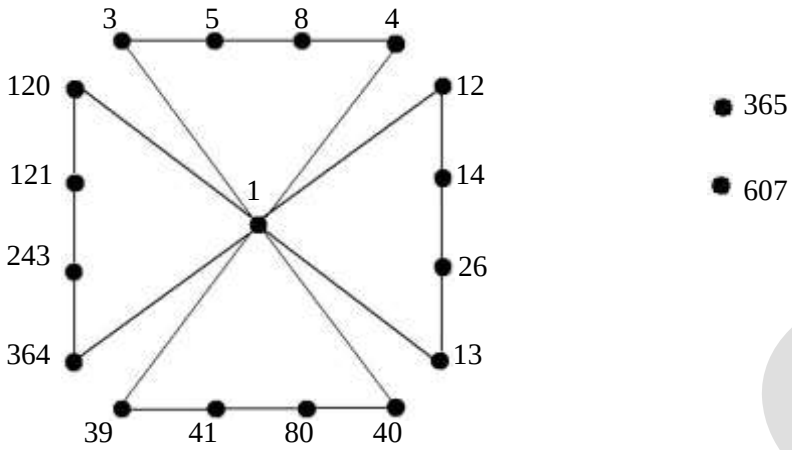
Note that every vertex is working except for the two smallest and that the multiplicity of v_4^i is 2

$$\lambda(v_4^i) = \lambda(v_1^i) + c = \lambda(v_2^{i-1}) + \lambda(v_3^{i-1}).$$

The last cycle is labelled conventionally from v_1^i to v_4^i to avoid inducing any extra edges. More formally,

$$\lambda(v_1^p) = \lambda(v_3^{p-1}) + \lambda(v_4^{p-1})$$
$$\lambda(v_2^p) = \lambda(v_1^p) + c$$
$$\lambda(v_3^p) = \lambda(v_1^p) + \lambda(v_2^p)$$
$$\lambda(v_4^p) = \lambda(v_2^p) + \lambda(v_3^p)$$

leaving just two isolates to account for the edges adjacent to the vertex with the highest label(v_4^p).



An optimal sum labelling of the graph $f_{5,4}$.

That no further edges are induced can best be shown using an explicit formula for the labelling. For the i^{th} cycle, an alternative description of the labelling is as follows.

$$\lambda(v_1^i) = 2.3^{i-1} + \frac{1}{2}(3i-1)\text{-}1$$

$$\lambda(v_2^i) = \lambda(v_1^i) + 2$$

$$\lambda(v_3^i) = 2.\lambda(v_4^i)$$

$$\lambda(v_4^i) = \lambda(v_1^i) + 1$$

These formulae keep any "unwanted" edges being induced within a petal and the exponents of 3 forbid the inducing of any extra edges between the petals

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CONCLUSION

It is very interesting to investigate the labeling types of friendship graphs. Here we investigate the four types of labeling techniques. In our next paper we discuss more about friendship graphs and its labeling.

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Low leakage Architecture of Static Random Access Memory using LECTOR Technique

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Abstract—The integrated circuits that have memories, a major share of total circuit power is required by the memory architecture of the circuit. With the day-to-day changing circuit designs, the need to store increasing amount of processing data has resulted in the growing memory size in an integrated circuit. Most of the memory data remains un-altered during the memory data handling operation. The stored data is thus affected by the sub-threshold leakage power / current that leads to the degradation of data signal quality. The data integrity is maintained using a feedback path / architecture in SRAM memory architecture. Still, the amount of power loss due to leakage contributes a major part of the total power loss of the integrated circuit. This loss increases with the decrease in the physical feature size of the component / transistors. A low power system offers the benefits like device portability, long battery life, good performance criteria, etc. Today's increasing data handling require more random access memory to process the dynamic data and hence more power. Various SRAM architectures and its Design techniques are proposed in previous work. SRAM low power design using Sleepy Stack Transistor for is proposed by S.Lakshmi Narayan et al [1]. Dynamic Threshold and Stand-by Voltage leakage reduction technique is presented by Yashwant Singh and D. Boolchandani in [2].Power reduction using Power Gating is shown by AdreaCalimera et al [3]. Static Power Reduction Techniques for Asynchronous circuits is given by Carlos Ortega, Jonathan Tse and RajitManohar in [4]. These are some suggested techniques that can offer a solution towards low power in the design of SRAM architecture.In the present work, we have used leakage control transistor technique called LECTOR to modify the design of SRAM architecture to reduce the leakage current and hence the leakage power. The absence of requirement of control circuit for the operation of leakage control transistor in this technique is the major advantage of LECTOR technique over the other available leakage current reduction techniques. The proposed design is simulated on 90nm CMOS fabrication technology using Microwind Tool.

Keywords— Address Decoder, CMOS, Dynamic Power, Leakage Control Transistor, Load Line Capacitance, Memory Array, SRAM, Subthreshold Leakage Current, Threshold Voltage, Microwind.

INTRODUCTION

The basis requirement of any Integrated Circuit is high speed and low power processing of the data signals to perform the desired execution. The minimization of feature size plays an important role in increasing the performance of integrated circuits. But the feature minimization inversely affects the percentage of leakage current when compared to the total current requirement of the circuit. The main causes of the dissipation of power are: 1) short-circuit current, 2) load capacitance charging and discharging current, and 3) transistor leakage current in the sub-threshold operating condition. The data value transition activity during memory data processing is the main cause of short circuit power dissipation. There are various proposed techniques to reduce the short circuit current dissipation but at the cost of extra control and monitoring circuit. This additional circuit further contributes in the dissipation of power. The improving semiconductor processing techniques have made it possible to reduce the size of memories leading to a higher density of memory elements per square unit of area. This has also contributed in decreasing the power dissipation by reducing the load charging and discharging current due to smaller size of the parasitic capacitance of the load capacitors. The leakage current is more effective in deep sub-micron technologies. A number of leakage reduction techniques for CMOS based transistor level design and techniques have been proposed in previous works like leakage lector techniquefor CMOS circuits by H. Narender and R. Nagarajan[5],SonamRathore[6], P. Verma and R. A. Mishra[7] andB. Dilip et al[8].The previously proposed design techniques are Transistor stack based low leakage approach by M. C. Johnson et al[9],sleeper keeper technique for leakage reduction by S. H. Kim and V. J. Mooney[10], Resource allocation and binding approach by C. Gopalakrishnan and S. Katkoori[11], scaling of stack for leakage reduction byS. Narendra et al [12], gate level design modification for low power CMOS by J. P. Halter and F. Najm [13], etc. Multiple Threshold Transistor Design Technique is proposed by V. Sundarajan and K. K. Parhi [14], Q. Wang and S. Vrudhula [15]. Gated-Clock based low power design is referenced as proposed by J. Shinde and S. S. Salankar [16],M. D. Powellet al[17]. Various proposed techniques provide benefits with respect to specific design application.

LECTOR TECHNIQUE IN CMOS CIRCUIT DESIGN

Lector approach to reduce leakage current is based on the effective stacking of transistors between the supply voltages to the ground voltage. In Lector approach two leakage control transistors are introduced between the conventional pull-up and pull-down logic circuits of a functional block. For example, the conventional CMOS NAND Gate circuit is shown in Fig-1 and the Lector based CMOS NAND Gate circuit is shown in Fig-2. The wiring configuration in the Lector approach ensures that one of the two leakage control transistors is always near its cut-off region of operation irrespective of the input voltage. The Lector follows the concept that, "a state with more than one transistor OFF in a path between supply and ground voltage is less leaky than a state with only one transistor OFF between any supply and ground path". Thus the lector approach leads to a current limited resistive path between the supply voltages to reduce the leakage power dissipation through the lector circuit.

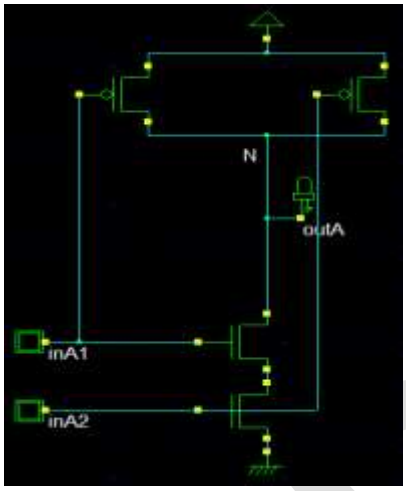

Fig -1: Conventional CMOS NAND Gate Circuit

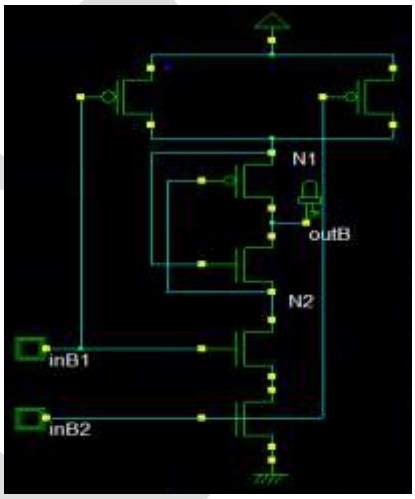

Fig -2: Lector CMOS NAND Gate Circuit

CONVENTIONAL 6-T SRAM MEMORY ARCHITECTURE

The conventional architecture of SRAM Cell has 6-transistors. It is shown in Fig-3. At deep sub-micron scale the leakage power of SRAM circuit is comparatively high as compared to the other operational circuits. The concept of SRAM architecture is based on the stabilization of logic values to maintain its existence against any current or power loss with the ease of data modification using two feedbacks coupled CMOS Inverters. The output terminals of the two inverters act as internal load lines of the SRAM cell to store the memory data bit value on one of the internal load line and its complement logic value on the other internal load line.

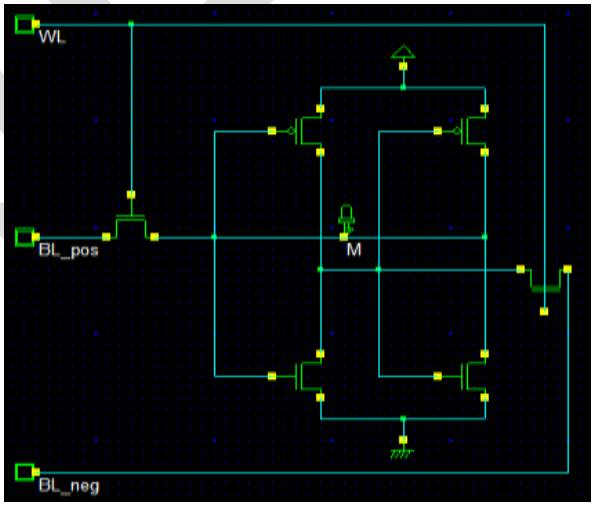

Fig -3: Architecture of SRAM 6-T Cell

Write Operation- The logic data bit to be written in a SRAM cell is provided on the BL_pos and its complement logic value is provided on BL_neg. The WL input is provided a logic high pulse on NMOS data access transistors to enable the transfer of charge from the data lines (BL_pos and BL_neg) to the SRAM cell internal circuit. The duration of pulse should be more than the duration in which the charge on BL_pos and BL_neg should get shared by the SRAM internal load lines to store the desired logic value in the SRAM cell.

Read Operation- To read the data from the SRAM cell, logic high values are set on BL_pos and BL_neg. The WL input is provided a high pulse to enable the sharing of charge between the data lines, BL_pos and BL_neg, and the internal load lines. The data line (BL_pos or BL_neg) connected to the cell internal load line with logic value'1' will not show any change in the logic value after sharing of charge because of the same voltage on both the data lines. Whereas, the other data line will be affected by a small change in its voltage value after sharing the charge with the cell internal load line. Since the current driving capacity of the cell is very low, the change sharing will have a small voltage change effect when logic '0' at the internal load line is shared with the logic '1' of the data line. This voltage difference developed in the load lines is measured using the sense amplifier circuit to know the logic value that is stored in the cell.

PROPOSED SRAM ARCHITECTURE USING LECTOR TECHNIQUE

The architecture of SRAM 6-T cell is the basic architecture for all SRAM architectures. The proposed SRAM architecture of SRAM using leakage control transistors (Lector) technique is shown in Fig-4. The modified design has leakage control transistor pairs connected to the cell internal load lines. The output to the internal load lines is taken from in-between the two transistors of each of the pair of the leakage control transistor. This approach introduces 4-transistors in the existing SRAM architecture. The connection of transistors is shown in Fig-4. The voltage on each of the internal load line will be a constant voltage for a particular memory data in an application, one of the two transistors of the leakage control configuration will remain in its cutoff state leading to a control over the leakage current.

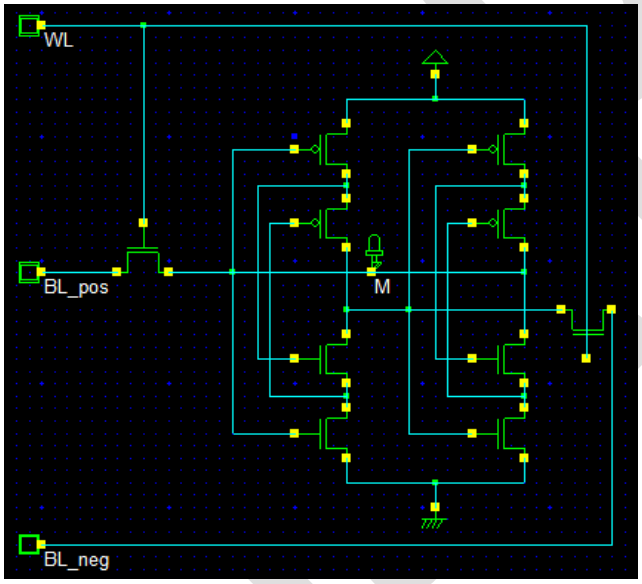

Fig -4: Architecture of SRAM Cell using Lector

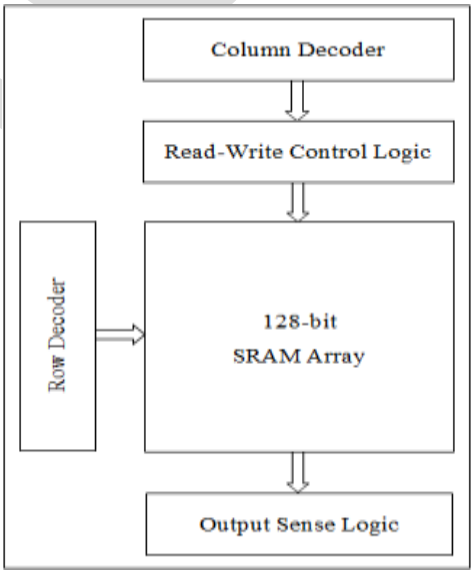

Fig -5: Block Diagram of SRAM Array with control Logic

128-bit SRAM Array: An array of SRAM cells require some additional circuit blocks for its operation. These additional blocks mainly include Row Decoder, Column Decoder, Read-Write Control Logic, Output Sense Logic. The architecture of 128-bit array and control circuit block using Lector is shown in Fig-5.

The Row Decoder logic enables a particular row for performing the operation of data read from array or data write in to the array. A Similar logic is used to enable a particular row or more than one rows to enable a single SRAM cell or multiple cells respectively. Fig-6 shows Row Decoder connection with the 128-bit memory array of the proposed Lector based design. The array has 8x16 bit memory capacity. The internal circuit connections for desired control of the Row Decoder are shown in Fig-7. The input 'E' is used to enable a

particular Row. Inputs A,B,C, represent the 3-bit encoded address. Z1, Z2, …Z8 represent the address lines that are connected to one of the row of the array.

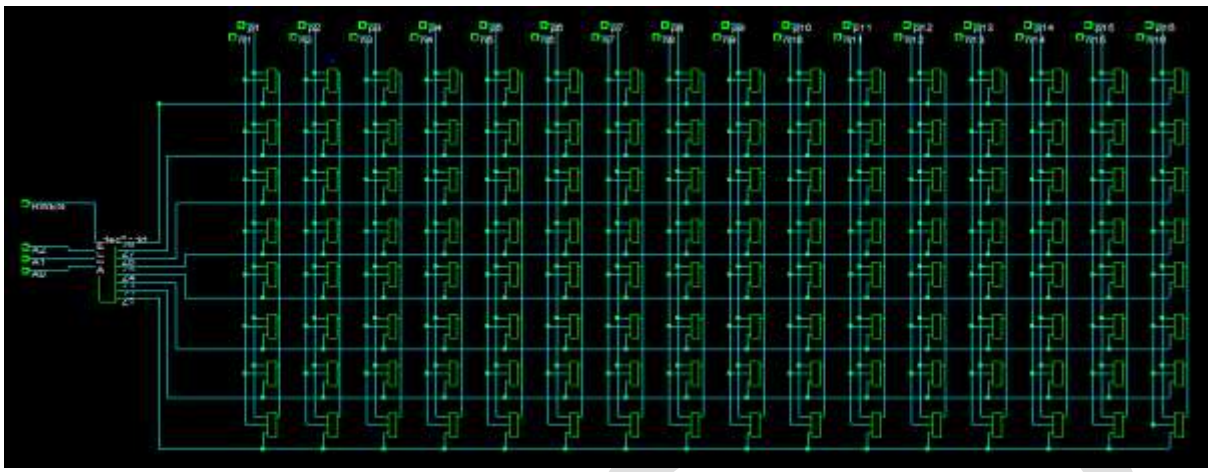

Fig -6: Architecture of SRAM Cell using Lector

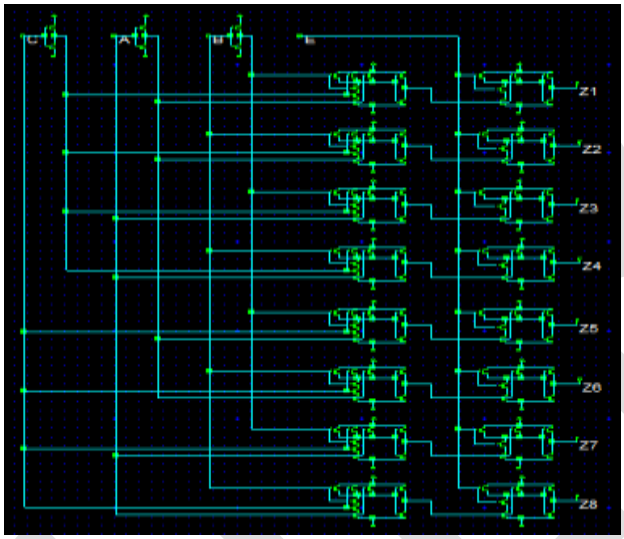

Fig -7: Address Decoder Circuit for 8-Address Length

Address Enable (E)	Address (A B C)	Output (Z1 Z2 Z3 Z4 Z5 Z6 Z7 Z8)
0	X X X	0 0 0 0 0 0 0 0
1	0 0 0	1 0 0 0 0 0 0 0
1	0 0 1	0 1 0 0 0 0 0 0
1	0 1 0	0 0 1 0 0 0 0 0
1	0 1 1	0 0 0 1 0 0 0 0
1	1 0 0	0 0 0 0 1 0 0 0
1	1 0 1	0 0 0 0 0 1 0 0
1	1 1 0	0 0 0 0 0 0 1 0
1	1 1 1	0 0 0 0 0 0 0 1

Table -1: Truth Table of 8-bit Address Decoder

The truth-table of Row Decoder is shown in Table-1. For Enable, E='0', none of the row of the array is enabled for Read / Write operation. For E='1', the address value from the inputs A-B-C is decoded to enable a particular address Row.

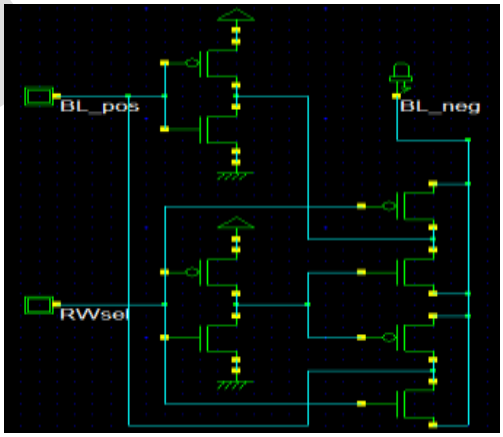

Fig -8: Architecture of Read-Write control Logic Circuit for single column.

The Read-Write Control Logic sets the voltages on the BL_pos and BL_neg load lines to enable the Date Read and Data Write operations depending on the value of the RWsel control input. In the proposed design of Read-Write control logic block, the control logic performs Read operation for RWsel='1' and Write operation for RWsel='0'. The architecture of the Read-Write Control Logic for a single column output is shown in Fig-8.

SIMULATION AND RESULT

The date Read and Write operational waveform result obtained during waveform simulation is shown in Fig-9.

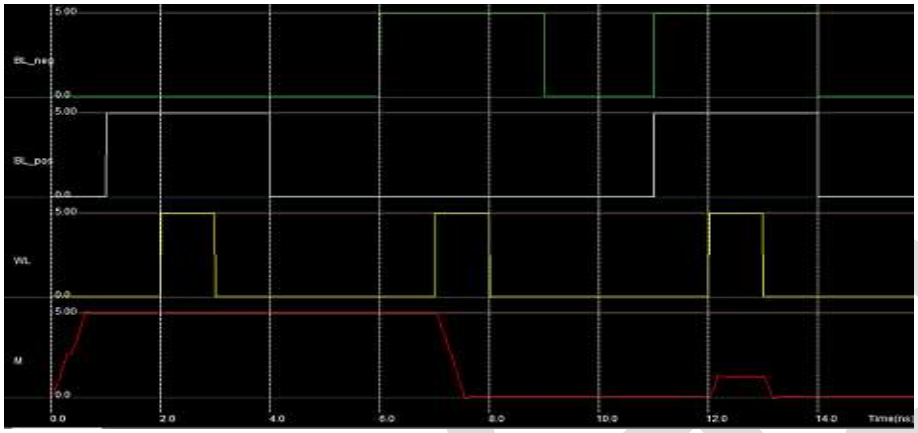

Fig -9: Simulation Waveform of Read-Write Bit operation

The proposed design is simulated using Microwind Tool [18] on multiple deep sub-micron fabrication technologies. The comparison of the proposed design performance with the conventional design is shown in Table-2. Power reduction of the Lector based design at 90nm fabrication technology is ~13%. It can be concluded from the simulation results that the percentage reduction in the power consumption is decreases as simulation is performed towards deep sub-micron technologies.

Technology	Power Consumption		% Decrease in Power
	Conventional design	Lector based design	
50nm	6.416 uW	5.037 uW	22.5
90nm	46.827 uW	40.634 uW	13.3
120nm	73.5 uW	59.73 uW	17.7
180nm	196 uW	103.00 uW	47.5

Table -2: Power Consumption Simulation Result

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CONCLUSION

Memory hardware are very important and mandatory part of all real time processing hardware in the present world of emerging electronic applications. So, a power efficient design is always an expectation of fabrication technology from the hardware designers. The proposed work is an attempt to give an option in the same direction. The area overhead of Lector based design can be compromised with the reduction in power consumption of the SRAM circuit. Further, the existing techniques can be improved in future works in accordance with the day-by-day advancing fabrication methodologies to obtain more improved performance of the memories and other operational circuits.

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STUDIES ON FUEL PROPERTIES OF NEEM OIL METHYL ESTER AND ITS CONVENTIONAL DIESEL AND KEROSENE BLENDS

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ABSTRACT

Fuel properties such as specific gravity, viscosity, gross calorific value, flash and fire point of Neem oil methyl ester and its blends with conventional diesel oil in the proportions of 20:80 (B20), 40:60 (B40), and 60:40 (B60), 80:20 (B80) have studied. It has found that the fuel properties were found to deviate more from those of diesel oil with the increasing in the percentage of methyl ester in the blend. It was also found that the properties of blend of B20 were found very close to those of conventional diesel oil.

An attempt has also made to study the fuel properties of Neem oil methyl ester blends with domestic kerosene oil and conventional diesel oil in the proportions (Methyl ester : Conventional diesel : Kerosene) of 20:75:5 (B20K5),40:50:10(B40K10),60:25:15(B60K15),and80:0:20(B80K20).

KEYWORDS*:* Neem oil methyl ester, conventional diesel oil, Neem oil, transesterification

INTRODUCTION

Crude oil prices have been increasing rapidly which increases the burden on foreign exchange reserves of oil importing countries like India. It has severe effect on the economy of oil importing countries. Efforts are going on all over the world to find alternative automotive fuel due to increase in the demand for petroleum products, global warming due to emission of harmful gases, degradation of air quality and fast depletion of supply of fossil fuel.

Noticeable research work has been made to use methyl ester (Bio-diesel) in place of conventional diesel oil. It has received attention all over the world as an alternative fuel to diesel oil because it has produced from renewable sources such as straight vegetable oil (edible and non –edible oil), animal fats and oil and waste cooking oil and fried oil [1]. It is eco-friendly [2, 3, 4] in nature and referred as green energy source.

Considerable research work has been done in past to study the fuel properties of methyl esters. It was reported that properties of methyl ester are close to diesel oil [5] and deviates more with the increase in the percentage of methyl ester in the blends because methyl ester contains nearly 10% lower calorific value than conventional diesel oil [6].

Property	Neem oil	Diesel	B100	B20	B40	B60	B80	Kerosene	B20 K5	B40 K10	B60 K15	B80 K20

Viscosity is an important transport property of fuel and it strongly affects the flow behaviour at different temperatures [7]. In general, viscosity increases with the increase in un-saturation. So, vegetable oil containing low molecular weight tricylglycerol is slightly less viscous than the oil containing high molecular weight tricylglycerol.

It was reported that viscosity of soybean oil and beef tallow reduced from 28.08 cSt and 51.15 cSt to 4.06 cSt and 4.11cSt respectively after transesterification [6, 7]. It was reported that viscosity of linseed oil, sunflower oil, and jatropha oil reduced from 37.85cSt, 44.86cSt and 49.04 cSt respectively to 9.75cSt, 9.42 cSt, and 8.1 cSt respectively after transesterification [6, 7].

In this paper, an attempt has made to investigate the fuel properties such as viscosity specific gravity, viscosity, gross calorific value, flash and fire point of Neem oil methyl ester and its blends with conventional diesel oil in the proportions of 20:80 (B20), 40:60 (B40), and 60:40 (B60), 80:20 (B80).

An attempt has also made to study the fuel properties of Neem oil methyl ester blends with domestic kerosene oil and conventional diesel oil in the proportions (Methyl ester : Conventional diesel : Kerosene) of 20:75:5 (B20K5),40:50:10(B40K10),60:25:15(B60K15),and80:0:20(B80K20).

MATERIAL AND METHOD

Neem oil methyl ester was prepared by using two-stage transesterification process because their free fatty acids (FFA) level is greater than 1%. In the first stage, esterification reaction was carried out to minimize the FFA level. Minimum value of FFA was obtained by adding 15ml methanol and 1ml H_2SO_4 to 100ml of Neem oil. This reaction was carried at temperature range between 55^0C to 60^0C with a reaction period of 60 minutes using magnetic stirrer. In the second stage, maximum yield was obtained by adding 35ml methanol and 0.3 % NaOH to the sample (100ml) obtained from the first stage which has lowest FFA level. During this process, temperature range of 55^0C to 60^0C was maintained for a reaction period of 90 minutes.

Neem oil methyl ester-diesel oil blends were prepared by mixing 20% (B20), 40% (B40), 60% (B60) and 80% (B80) respective methyl ester with diesel oil on volume basis. In addition another four blends were prepared by replacing diesel oil proportion by 5% (B20K5), 10% (B40K10), 15% (B60K15) and 20% (B80K20) respectively in B20, B40, B60 and B80 with domestic kerosene oil on volume basis. The relative density of all test samples were determined in accordance with IS: 1448[P: 32]:1992. Redwood viscometer No 1 was used for measurement of kinematic viscosity in cSt was calculated from time units as per IS No. 1448[P: 25]:1976. Heating value was determined as per IS No 1448[P: 6]:1984 by using Isothermal bomb calorimeter. Pour point was determined as per IS NO, 1448 [P: 10]: 1970. Pensky –Martens closed cup) was used to find flash and fire point of test samples as per IS NO 1448 [P: 21]: 1992.

Properties of Neem oil methyl ester and its blends with diesel oil and kerosene

Table 1 shows characteristic fuel properties such as specific gravity, viscosity, gross calorific value, flash and fire point of diesel oil, Neem oil, Neem oil methyl ester and its blends with diesel oil and kerosene in different proportions. Table 1 indicates that density, viscosity, specific gravity and flash point of Neem oil are larger than Neem oil methyl ester and diesel oil.

Density in kg/m^3	910	816	870	826.8	837.6	848.4	859.2	780	825	834	843	852
Specific gravity	0.91	0.816	0.87	0.8268	0.8376	0.8484	0.859	0.78	0.825	0.834	0.843	0.852
Viscosity at 40 ^{0}C in cSt	40.75	4.3	4.5	4.34	4.38	4.42	4.46	1.12	4.181	4.062	3.943	3.824
Flash point in ^{0}C	250	53	175	77.4	101.8	126.2	150.6	52	77.35	101.7	126.05	150.4
Heating value in MJ/kg	39.82	45.7	41.5	44.86	44.02	43.17	42.34	43	44.72	43.75	42.77	41.8

Table 1.1 Properties of Neem oil, Neem oil methyl ester (B100), and diesel oil and kerosene blends

Result and Discussion

Effect of specific gravity

The density of fuel is correlated with particulate emission. Figure 1.1 shows the specific gravity of Neem oil, diesel oil, and B20, B40, B60, and B100, B20K5, kerosene, B40K10, B60K15 and B80K20. Neem oil has highest specific gravity (0.910) which is reduced to 0.870 after transesterification. Specific gravity of B20 is very close to that of conventional diesel which is 1.032 times higher than conventional diesel oil. B100 has specific gravity of 0.870 which is 1.0661 times higher than the conventional diesel oil. Figure 1.1 indicates that specific gravity increases with the increase in percentage of methyl ester in the blend.

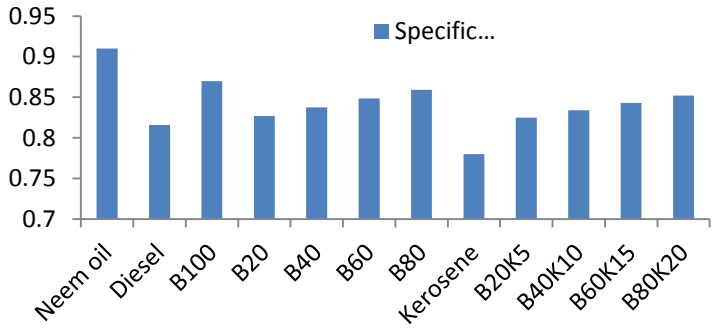
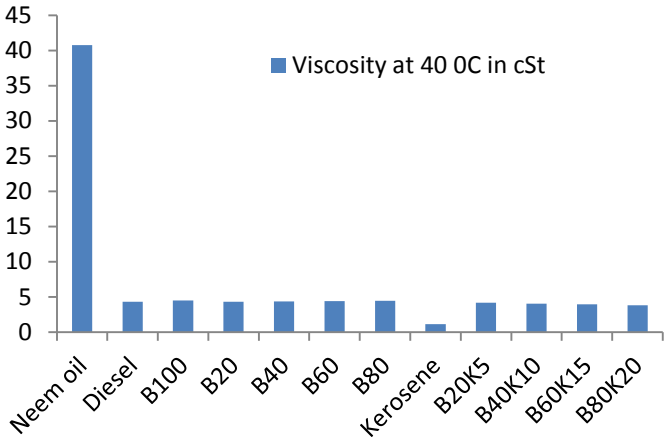


Figure 1.1 Specific gravity of Neem oil, biodiesel and its blends with conventional diesel oil and kerosene

From Figure1.1 it is observed that, biodiesel, conventional diesel oil and kerosene blends have lower specific gravity than biodiesel and conventional diesel oil blends. B20K5 has specific gravity of 0.825 which is very close to conventional diesel oil (0.816). Specific gravity of biodiesel, conventional diesel oil and kerosene blends increases with the increase in percentage of kerosene and corresponding decrease in conventional diesel oil in the given percentage of biodiesel.

Effect of viscosity

Viscosity of fuel is an important fluid property because it determines flow characteristic when a liquid fuel flows through flow line, injector nozzle and orifices. Figure 1.2 shows the kinematic viscosity of Neem oil, diesel oil, and B20, B40, B60, and B100, kerosene, B20K5, B40K10, B60K15 and B80K20. Viscosity of B20 was observed 4.34 cSt which is 1.009 times higher than conventional diesel oil, Neem oil has highest viscosity (40.75 cSt at 40 ^{0}C) which is 9.477 times higher than conventional diesel oil after transesterification viscosity has decreased from 40.75 cSt to 4.5 which is 1.0465 times higher than diesel oil.



. Figure 1.2 Kinematic viscosity of Neem oil, biodiesel and its blends with conventional diesel oil and kerosene

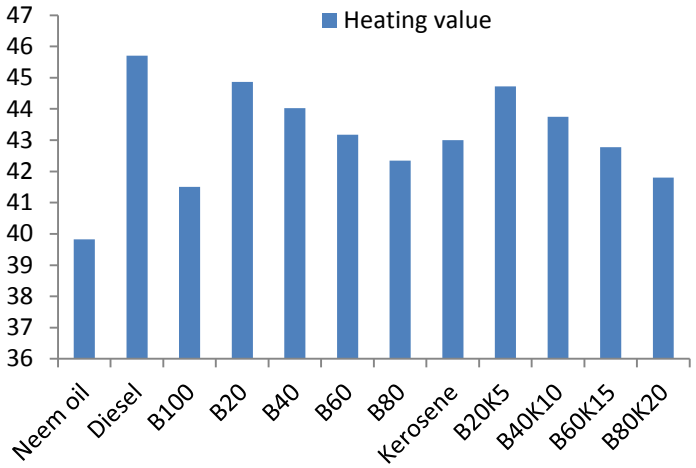
Figure 1.2 also indicates that viscosity increases with the increase in percentage of methyl ester in the blends. Viscosity of Neem oil is higher than all other samples which is 9.056 times higher than B100 (4.5cSt).Viscosity of B20 (4.34 cSt) very close to that of conventional diesel oil which is 1.0093 times higher than conventional diesel oil. High viscosity of Neem oil and B100 attributed to molecular composition and structure, greater carbon chain length and reduced number of double bonds , high viscosity leads to pour atomisation of fuel spray which results in larger droplet size. This in turn leads to poor mixing of fuel and air, finally leads to incomplete combustion that results in loss of power and efficiency.

From Figure1.2 it is observed that, biodiesel, conventional diesel oil and kerosene blends have lower kinematic viscosity than biodiesel-conventional diesel oil blends. B20K5 has kinematic viscosity of 4.181 which is lower than conventional diesel oil (4.3). Kinematic viscosity of biodiesel, conventional diesel oil and kerosene blends decreases with the increase in percentage of kerosene and corresponding decrease in conventional diesel oil in the given percentage of biodiesel.

Effect of heating value

Table 1.1 indicates the heating values of Neem oil, diesel oil, and B20, B40, B60, and B100, kerosene, B20K5, B40K10, B60K15 and B80K20. Figure 1.3 indicates that Neem oil has heating value of 39.82MJ/kg which is 12.866% lower than the diesel oil. B100 has the heating value of 41.5 MJ/kg which is 9.19% lower than the diesel fuel. B20 has the heating value of 44.86 MJ/kg which is 1.838 % lower than the diesel. The lower heating value for all samples could be attributed to the presence of few hydrogen atoms and large number of oxygen atoms in the molecule. The lower heating value of methyl ester and their blends could result in loss of thermal efficiency as compared to conventional diesel oil.

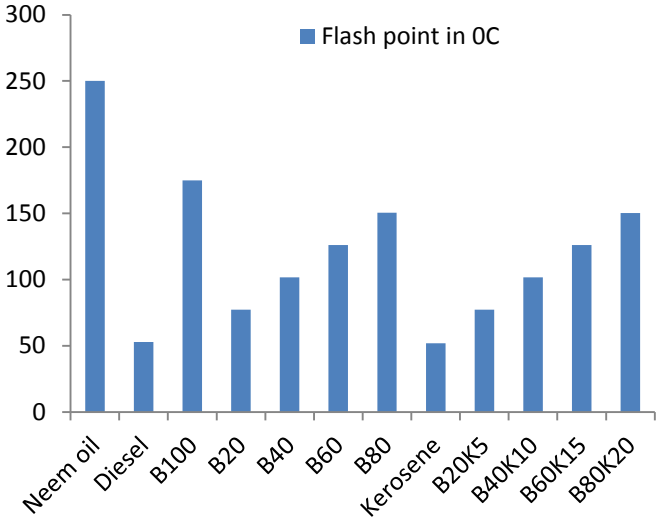
From Figure1.3 it is observed that, biodiesel, conventional diesel oil and kerosene blends have lower heating value than biodiesel-conventional diesel oil blends. B20K5 has heating value of 44.725MJ/kg which is lower than conventional diesel oil (45.7 MJ/kg). Heating value of biodiesel, conventional diesel oil and kerosene blends decreases with the increase in percentage of kerosene and corresponding decrease in conventional diesel oil in the given percentage of biodiesel.



. Figure 1.3 Heating values of Neem oil, biodiesel and its blends with conventional diesel oil and kerosene

Flash point

Table 1.1 shows the flash point Neem oil, diesel oil, and B20, B40, B60, and B100, kerosene, B20K5, B40K10, B60K15 and B80K20.The flash point of B20 (77.4 ^{0}C) is 1.46 times higher than the conventional diesel oil. Figure 1.4 shows that flash point increases with the increase in percentage of methyl ester in the blend.



. Figure 1.4 Flash points of Neem oil, biodiesel and its blends with conventional diesel oil and kerosene

From Figure1.4 it is observed that, biodiesel, conventional diesel oil and kerosene blends have slightly lower flash point than biodiesel-conventional diesel oil blends. B20K5 has flash point of 77.35^{0}C which is higher than conventional diesel oil (53^{0}C). Flash point of biodiesel, conventional diesel oil and kerosene blends increases with the increase in percentage of kerosene and corresponding decrease in the percentage of conventional diesel oil in the given percentage of biodiesel.

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FIR Filter Design and Analysis Using Neural Network

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Abstract— This paper proposed to provide an alternative approach for comparison of FIR digital filter by using neural network. This proposed approach exhibit a relation between order and cutoff frequency of the filter having different order. In this paper using FDA tool to design digital FIR filters of different order, and neural network tool box to compare different filters. As the simulation results , the proposed neural-based method is capable of archiving a better performance for filter design.

Keywords— FDA tool, FIR filters, NN tool, Kaiser window, Hamming window, MATLAB.

1. INTRODUCTION

Digital filters are generally used for detachment of signals that have been combined, and reconstruction of signals that have been distorted in some manner. Digital filter design techniques are used to remove unwanted spectral content from the signal [1]. The input and output in the digital filter is in digital or discrete form. Generally, digital filters are linear time invariant (LTI) systems which are distinguish by unit sample response with minimum interference and other effects [2]-[3]. FIR Digital filters can extract signal components from a signal that contains different signal components concentrated at different frequencies [4]. The Filter Design and Analysis Tool (FDA Tool) is mainly used to represent graphical user interface for designing and analyzing filters quickly. FDA Tool allows you to design digital FIR filters by adjusting filter specifications [4]-[5], by importing filters from MATLAB.

2. METHODOLOGY

In this paper we are designing a high pass FIR filter using different orders and window techniques with the help of FDA tool in MATLAB. The window techniques used are Hamming, Kaiser and Blackman [6]. Imported data from FDA tool is to train on the Artificial Neural Network by using feed forward back propagation algorithm. In this research the result of different order filter which shows that main width lobe decrease and decreasing the cutoff frequency as order increases [7] which is shown in table 1.Data shown in table 1 is implemented on NN tool. In this paper different order of filter are selected and other parameters are considered as:

Sampling frequency- 1000 HZ
Pass band frequency-160 HZ
Stop band frequency-260 HZ
Pass band ripple- 1db
Stop band ripple-40db

The Cutoff frequency can be calculated by using formula

$$\omega_c = \frac{\omega_p + \omega_s}{2} \quad (1)$$

3. DIGITAL FIR FILTER

FIR filters are those digital filters which are having impulse response of finite duration, because in this signal settles to zero in finite duration. In particular to convert an "ideal" impulse response of finite duration, such as a sine function to a finite impulse response filter design, that is called the window method [8]. The ideal high pass filter is one that permits through all frequency components of a signal above a designated cutoff frequency and rejects all frequency components of a signal below. The FIR filter also known as non recursive digital filter as they do not have the feed-back even though recursive algorithm can be used for FIR filter realization [9].

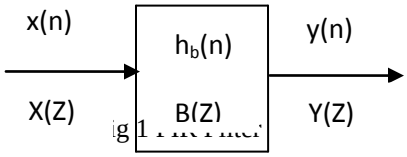

Fig 1 FIR Filter

Algorithm:

$$b(n) = \omega(n).h(n), \quad 1 \leq n < N \qquad (2)$$

Where h(n) is the impulse response of ideal filter and ω(n) is the window function.

A. HAMMING WINDOW

We analyze the filter using Hamming window technique by using FDA tool in MATLAB and the frequency response of the filter is given in figure 2 respectively with order 10, 30, 50 & 70 [10].

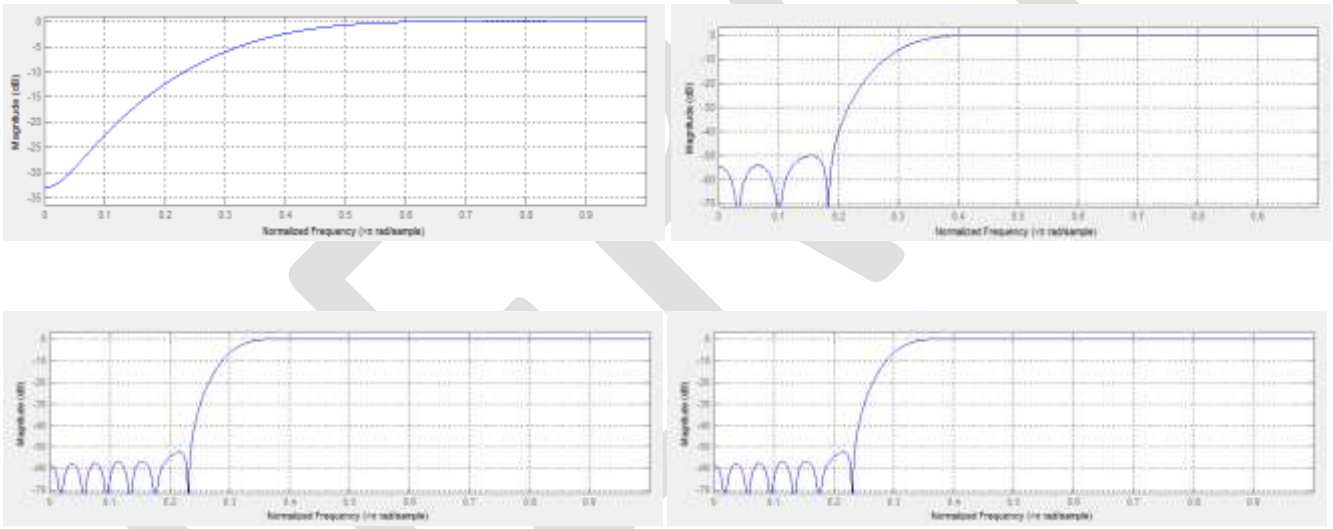

Fig 2 .Hamming Window Filter with Order 10, 30, 50 and 70.

B. KAISER WINDOW

We analyze the filter using adaptive window or Kaiser window technique by FDA tool in MATLAB and the frequency response of the filter is given in figure 3 respectively with order 10, 30, 50 and 70 [11].

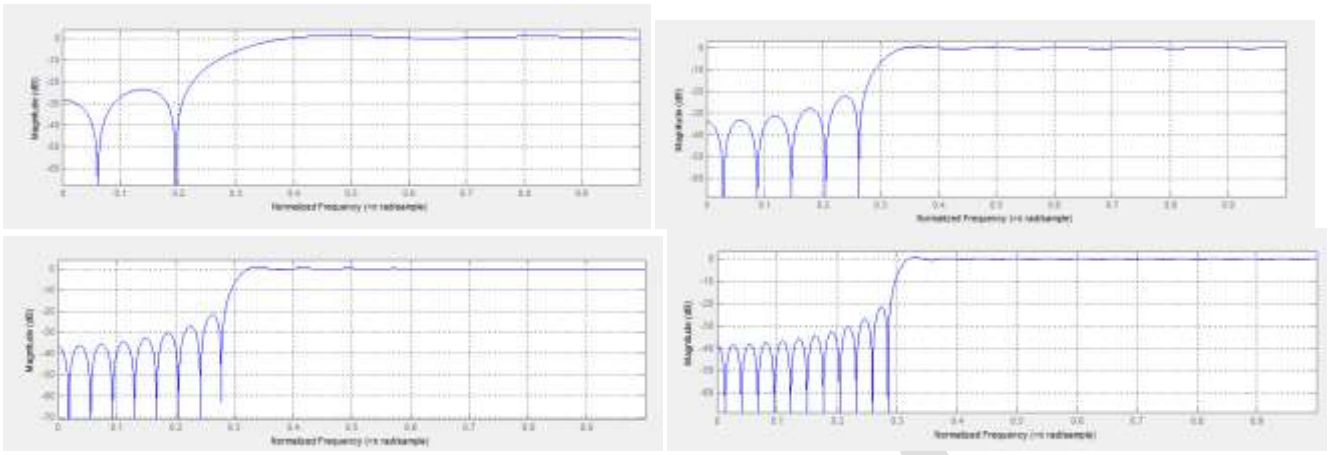

Fig 3 Kaiser Window Filter with Order 10, 30, 50 and 70

C. BLACKMAN WINDOW

We analysis the filter using Blackmann window By FDA tool in the MATLAB and the response of the filter is given in figure 4 respectively at the order 10, 30, 50 and 70. [12]

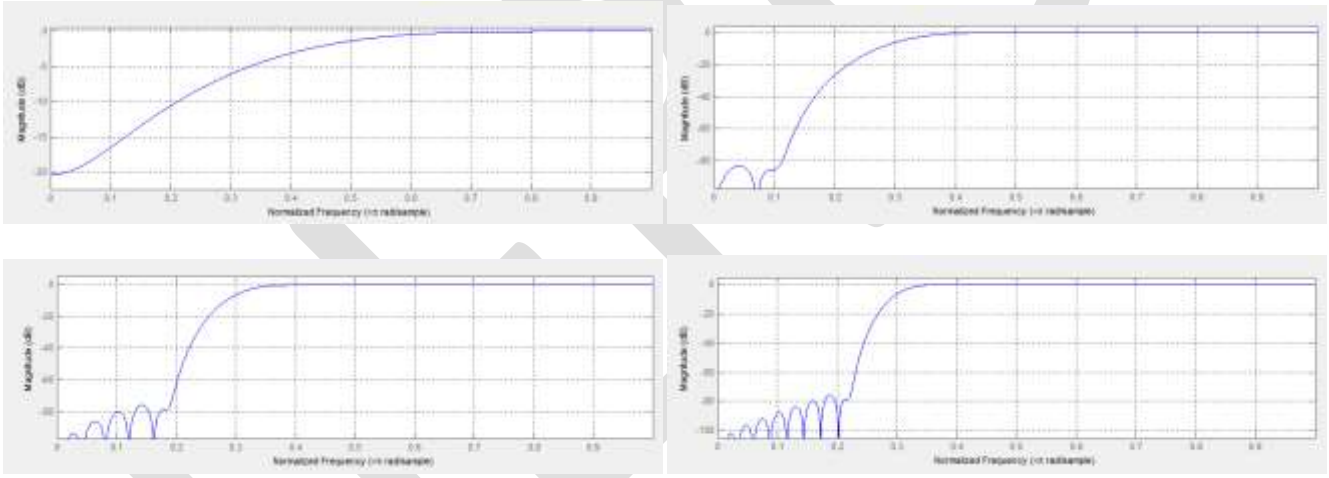

Fig 4 Blackman Window Filter with Order 10, 30, 50 and 70.

4. NEURAL NETWORK

The fig obtained with the help of neural network is shown below. The Figure 5 shows the best validation performance for cutoff frequency and different order of High pass FIR filter.

Table 1(a)

(Comparison of different FIRfilter)

s.no	order	Cutoff freq(Hz)	Main width lobe (db)	No of side lobe
1	10	0.3353	66.26637	2
2	20	0.3260	61.36727	3
3	30	0.3166	59.7629	5
4	40	0.3127	57.3919	6
5	50	0.3100	53.21346	8
6	60	0.3090	67.36309	9
7	70	0.3081	54.8122	11

(a) Kaiser window cutoff frequency with order 10-70

Table 1(b)

s.no	order	Cutoff freq.	Main lobe width	No of side lobe
1	10	0.3985	19.8635	0
2	20	0.3507	66.2323	0
3	30	0.3342	96.9096	1
4	40	0.3278	86.7607	3
5	50	0.3225	95.6394	4
6	60	0.3194	94.7614	6
7	70	0.3178	104.547	7

(b) Blackman window cutoff frequency with order 10-70

Table 1(c)

s.no	order	Cutoff freq	Main width lobe	Side lobes
1	10	0.3791	32.70531	0
2	20	0.3437	70.9076	1
3	30	0.3288	69.23793	3
4	40	0.3218	70.4234	4
5	50	0.3187	69.9837	6
6	60	0.3149	69.5544	7
7	70	0.3140	73.3426	9

(c) Hamming window cutoff frequency with order 10-70

Table 2
(Best validation based on order and cutoff frequency)

Window technique	Best validation
Hamming window	1.9699e-05
Blackman window	0.00086549
Kaiser window	1.3105e-05

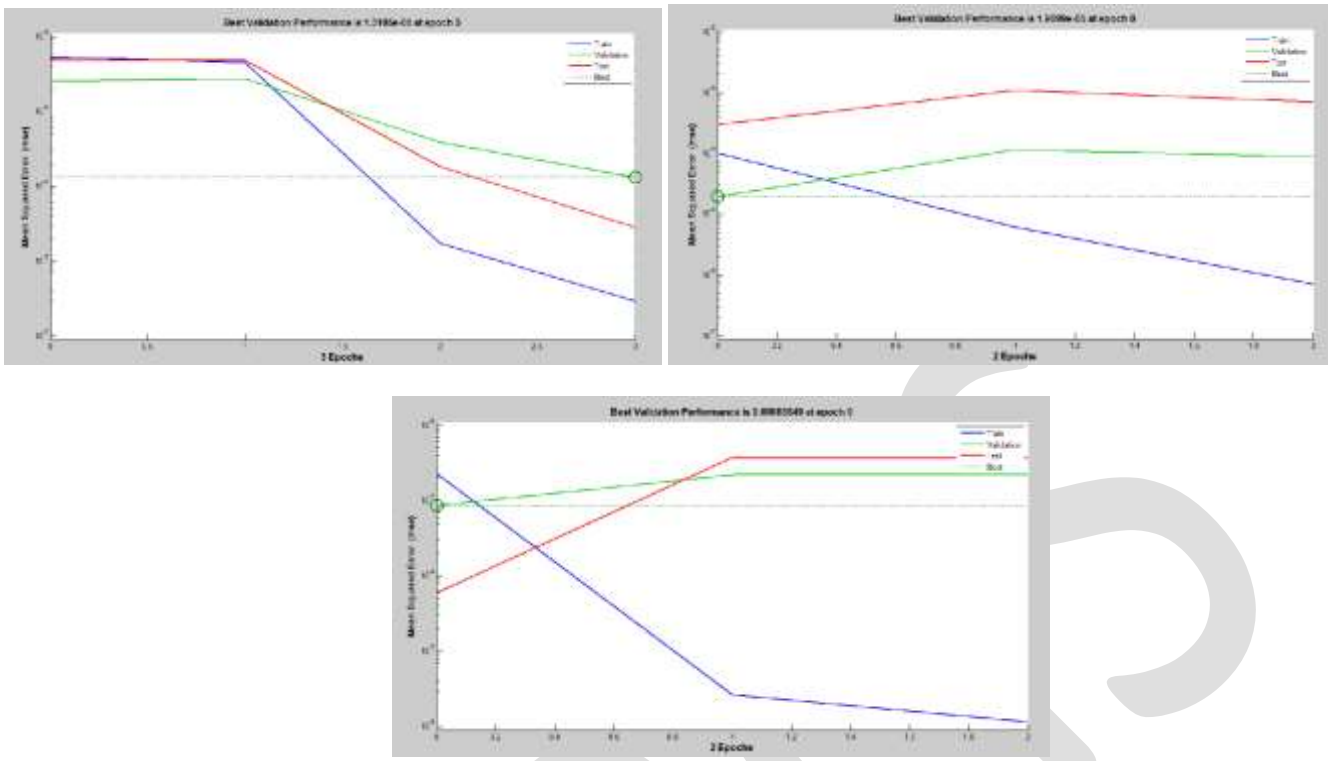

Fig 5 Best validation performance of Kaiser, Hamming and Blackman Window Filter respectively, based on cutoff frequency.

5. CONCLUSION

In this paper comparative study of different digital filters and evaluation of best validation point with the help of Artificial Neural Network (NN) tool has been done. This paper shows BlackmanFilter based on order and cutoff frequency having best validation performance among other three filters. Results shows side lobe increases with respect to increase in order of digital filters which enhance the loss of information.Blackman window shows better performance as compared to other three window techniques.

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Performance Enhancement of Wi-Max Mobile Network using OFDM and Trellis Encoder

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Abstract - Wi-Max is the communication network used widely over almost all the wireless and mobile devices to connect with internet and sharing, videos, photos, information and music etc. The performance of Wi-Max Mobile network should be significant enough to exploit the available wireless media against the noises and interferences. The impacts of the interferences and noises can be minimized using detection techniques, encodings, error detection with correction etc. In this paper the Wi-Max Mobile network is implemented with the help of most efficient technology i.e. Orthogonal Frequency Division Multiplexing(OFDM) with BPSK, QPSK and 4-QAM modulation techniques and the performance of the system i.e. BER is improved by adopting Trellis Encoder. The system is simulated for the high volumes of data and achieved better results.

Keywords- Wi-Max, OFDM, Trellis Encoder(TE), BPSK, QPSK and 4-QAM.

I. INTRODUCTION

Some decades ago, we were purely dependent on analog method. Equally the sources and communication system were on analog format but the advancement of technology made it possible to transmit data in digital structure. Beside with those, the processor was getting faster to the fastest, the data payload capability and transmission time increased from kilobit to megabit and megabit to gigabit. As of wire to wireless concept emerged and after researching and investing so large amount money, engineers became successful to invent wireless transmitter to transmit data. Applications like Internet contact, voice, instant messaging, SMS, file transferring, paging, gaming, video conferencing and entertainment etc became a part of life. Cellular mobile phone systems, WLAN, wide-area wireless data systems, satellite communication systems and ad-hoc wireless networks etc are wireless communication. Every emerged based on wireless technology to provide maximum throughput, enormous mobility, longer range, vigorous backbone to thereat. The vision extended a bit more by the engineers to provide smooth transmission of multimedia anywhere on the globe through variety of applications and devices leading a new concept of wireless communication which is cheap and flexible to implement even in odd environment.

Wi-MAX is called the next generation broadband wireless technology which offers high speed, sophisticate secure, and last mile broadband services along with a cellular back haul and Wi-Fi hotspots. The evolution of Wi-MAX began a few years ago when scientists and engineers felt the need of having a wireless Internet access and other broadband services which works well everywhere especially the rural areas or in those areas where it is hard to establish wired infrastructure and economically not feasible. IEEE 802.16, also called as IEEE Wireless-MAN, enhanced both licensed and unlicensed band of 2-66 GHz which is standard of fixed wireless broadband and included mobile broadband application. Wi-MAX forum, a private organization was formed in June 2001 to coordinate the components and develop the equipment those will be compatible and inter operable. After several years, in 2007, Mobile Wi-MAX equipment developed with the IEEE 802.16e standard got the certification and they announced to release the product in 2008, provided mobility and nomadic access.

Fixed Vs Mobile Wi-MAX:

There are certain differences between Fixed Wi-MAX and Mobile Wi-MAX. 802.16d (Rev 2004) is known as Fixed Wi-MAX and 802.16e standard is fondly referred as Mobile-Wi-MAX. The 802.16d standard supports fixed and nomadic applications such as 802.16e standard supports fixed, mobile, nomadic and portable uses. The 802.16e standard carries all the features of 802.16d along with new specifications that enables full mobility at vehicular speed, better QoS and power control but 802.16e stander devices are not compatible with 802.16d standard base stations as 802.16e based on TDD where 802.16d is on top of FDD. Due to other compatibility issue with offered networks, 802.16e adopted S-OFDMA and 2048-FFT size.

II. BASIE ARCHITECTURE OF OFDM

With OFDM the used bandwidth is divided into several frequency sub-carriers so that they are orthogonal to each other. The input data stream is separated into multiple. Parallel sub- data streams with reduced data rate. Then the sub-data streams are modulated individually and sent on separate sub-carriers. As result of this is the increase in symbol duration. As the long signal duration decreases Inter Symbol Interference (1ST) caused by multipath propagation. It is proficient to transmit the low-rate streams in parallel, as a substitute of one high-rate data stream. The signal duration is long. Thus by using a proper guard interval, the 1ST can be avoided totally, assume the guard interval is longer than the difference between the first and last multipath echo. The Figure 2. 1 below shows the principle of several sub-streams combined at the transmitter and separated again at the receiver.

As seen in the Figure 2.1 the information is coded and modulated across the sub-carriers before performing an Inverse Fast Fourier Transform (IFFT). The IFFT takes advantage of the frequency diversity of the multipath channel. To finish, before transmitting the data, the data streams are combined to a single signal and sent to the air interface. At the receiver side the procedure is same except in reversed order. The 802. 16e specification defines the Fast Fourier Transform (FFT) size to be 128, 512. 1024 and may be 2048 with respective channel bandwidths 1.25, 5, 10, and 20 MI-Iz. However, the Mobile Wi-MAX allows other bandwidth profiles to be used as well, but the sub-carrier frequency cannot be kept constant anymore (more in the next sub- subsection)

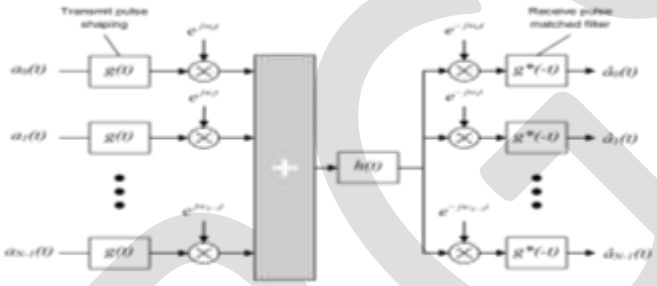

Fig. 2.1 Basic System Architecture of an OFDM System

III. TRELLIS ENCODER/DECODER

The name trellis was coined because a state diagram of the method, when drawn on document, closely resembles the trellis network used in rose gardens. The method is mainly a convolutional code of rates (r,r+1). Ungerboeck's unique contribution is to apply the parity check on a per symbol basis instead of the older technique of applying it to the bit stream then modulating the bits. The key system he termed Mapping by locate Partitions. This scheme was to set the symbols in a tree like fashion then separate them into two limbs of the same size. At each branch of the tree, the symbols were further apart. Although hard to visualize in multi-dimensions, a easy one measurement example illustrates the basic procedure.

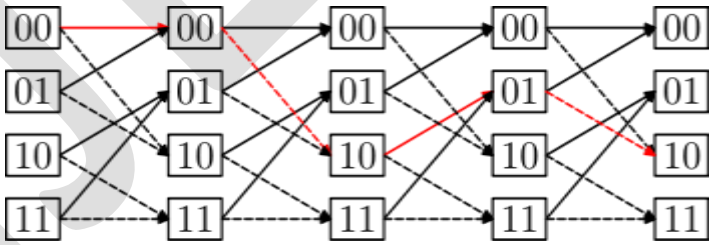

Fig. 3.1 Trellis Encoding

Then take all odd symbols and place them in one set and the even symbols in the second set. It is not quite correct because Ungerboeck was looking at the two dimensional problem, but the principle is the unaffected, take every other one for every group and repeat the procedure for every one of tree limb. He after that explained a method of assigning the encoded bit stream onto the symbols in a very systematic procedure.

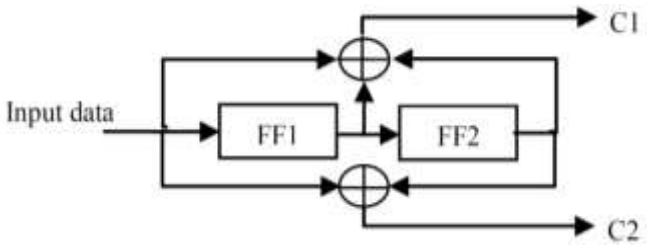

Fig. 3.2 Trellis Encoder

Once this procedure was fully explained, after that next step was to program the algorithms into a computer and let the computer search for the best codes. The results were astonishing. Even the most simple code (4 state) produced error rates nearly one one-thousandth of an equivalent uncoded system.

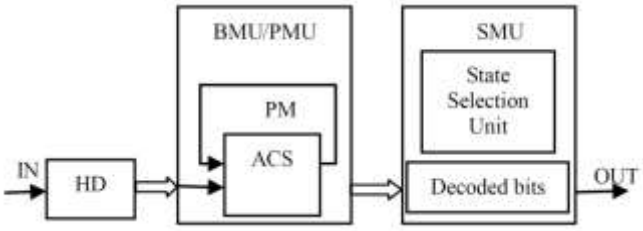

Fig. 3.3 Trellis Decoder

For two years Ungerboeck kept these results private and only conveyed them to close colleagues. Forward Error Correction (FEC) improves the bit error rate (BER) performance of power-limited and/or bandwidth-limited channels by adding structured redundancy to the transmitted data. The type of additive noise experienced on the channel determines the class of FEC used on the channel. Tree codes are used for channels with Additive White Gaussian Noise (AWGN) and block codes are used for channels with additive burst noise. Trellis Encoder is typically used for systems that both power and bandwidth limited. The standard modulation are mainly 8-PSK and 16-PSK.

The Trellis Encoder supports two codes rates: 2⁄3 for 8 PSK and 3⁄4 for 16 PSK. The Trellis Mode also supports built-in phase synchronization for 8-PSK and 16-PSK.

IV. PROPOSED METHODOLOGY

Wi-Max Mobile network has numerous applications in the field of information and media broadcasting, digital video broadcasting, internet, personal area networks (PANs), local area networks (LANs) and wide area networks (WANs).

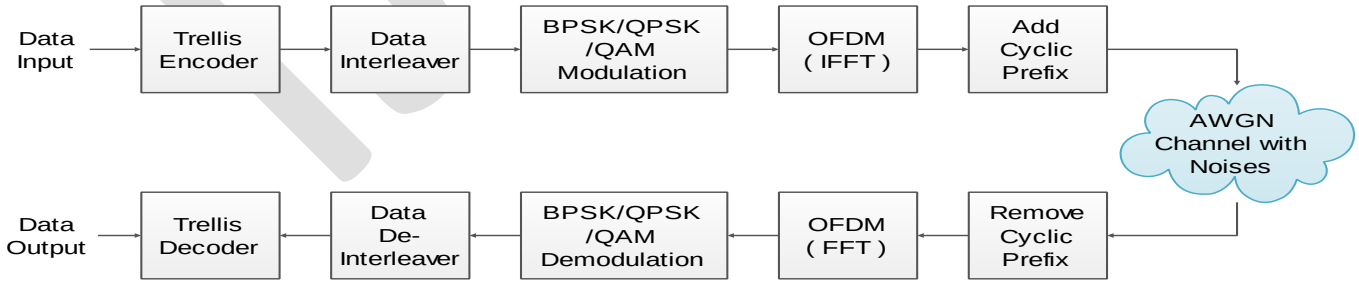

Fig. 4.1 Block Diagram of Proposed Methodology

All these listed application need continuity of link from source to data with high data rates. In this part a proposed approach is explained to facilitates the Wi-Max Mobile networks in terms higher data handling capacity and less noise susceptibility.

In Fig. 4.1 the block diagram of proposed Wi-Max Mobile system with OFDM and Trellis Encoder (TE) is presented. The scheme has major blocks like trellis encoder, data interleaver, modulator, OFDM modulator and AWGN channel having noises etc.

The above mentioned proposes system is implemented for simulation purposes and the implemented algorithm has been described in the Fig. 4.2.

The flow chart of proposed model is having important steps which are as follows:

a) *Creation of simulation environment*
b) *Generate data to transmit over system*
c) *Encode data using Trellis Encoder(TE)*
d) *Pass data through Data Interleaver(DI)*
e) *Modulate with BPSK, QPSK and 4-QAM separately to compare*
f) *Apply OFDM Modulation (IFFT + Add Cyclic Prefix)*
g) *Transmit signal trough AWGN channel*
h) *OFDM Demodulation (eliminate Cyclic Prefix + FFT)*
i) *Demodulate with BPSK, QPSK and 4-QAM*
j) *Pass through Data De-Interleaver*
k) *Decode data with Trellis Decoder*
l) *Calculate Bit Error Rate*
m) *Compare and Display Results for variable data sizes and FFT points*

Bit Error Rate

In the case of QPSK modulation and AWGN channel, the Bit error rate as function of the Eb/N0 is given by:

$$\mathrm{BER} = \frac{1}{2}\mathrm{erfc}(\sqrt{\mathrm{E_B} - \mathrm{N_0}})$$

Signal to Noise Ratio

The signal-to-noise-ratio (SNR), Eb /N0, of unit is in decibels, but we must convert decibels to an standard ratio before we can make further apply of the SNR. If we place the SNR to m dB, then

$$E_b/N_0 = 10m/10.$$

Using Matlab, we get the ratio,of 'ebn0', from the SNR in the decibels, 'snrdb', as:

$$e_b n_0 = 10\text{^} (snrdb/10).$$

The E_b/N_0 is a dimensionless quantity.

E_b Energy-per-bit is the total energy of the signal, divided by the number of bits contained in the signal.

$$\mathrm{E_b} = \frac{1}{\mathrm{N.fbit}}\sum_{\mathrm{n=1}}^{\mathrm{N}} \mathrm{x}^2(\mathrm{n})$$

Here N is the total number of samples in the signal, and f bit is the bit rate in bits-per-second.

Using Matlab, The energy-per-bit, 'e_b', of our broadcast signal, 'x', that has a bit rate 'f_b', as:

$$e_b = sum(x.\text{^}2)/(length(x) * fb).$$

Since our signal, x (n), is in units of volts, the units of are E_bJoules.

N_0

With the SNR and energy-per-bit known, for calculating N_0, the one-sided power spectral density of the noise. Divide E_b by the SNR, providing the SNR from decibels to a ratio. by Matlab, we get the power spectral density of the noise, 'n_0', given energy- per-bit 'e_b', and SNR '$e_b n_0$', as:

$n_0 = e_b/e_b n_0$.

The noise has units of Watts per Hertz (Hz) of power spectral density

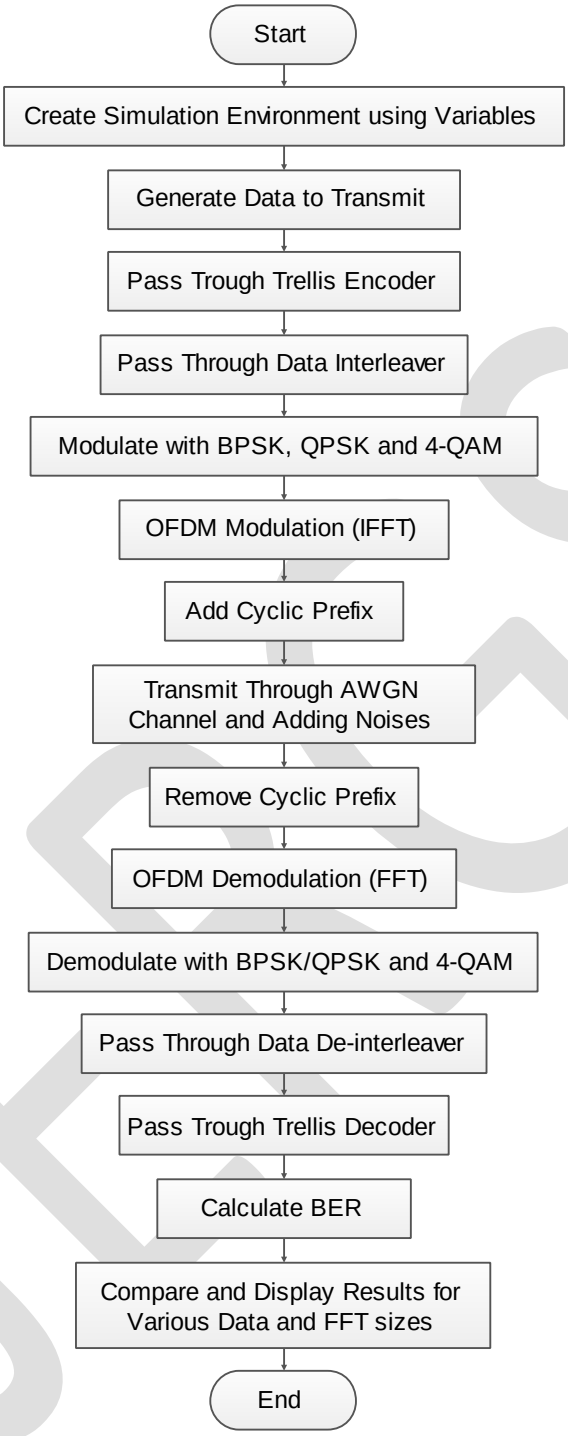

Fig. 4.2 Flow Chart of Proposed Approach

V. SIMULATION RESULTS

The proposed methodology for proposed Wi-Max Mobile system using orthogonal frequency division multiplexing (OFDM) with Trellis Encoder (TE) is explained in the previous sections.

Simulation Parameters:

The simulation of Wi-Max PHY layer model has been

carried out using the following system parameters.

a) Digital modulation: BPSK, QPSK, QAM.
b) Encoder: Trellis Encoder
c) Interleaver size: [8 * 16].
d) Channel : AWGN.
e) Packet size : 128 bits (Frame length).
f) Code rate : 171/133.
g) Decoder : Trellis Decoder.

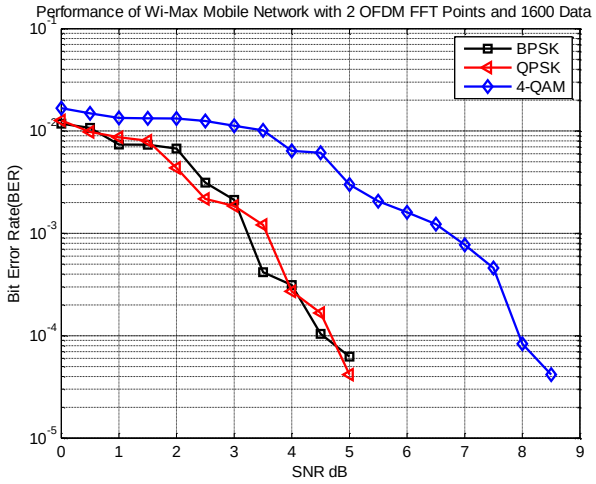

Fig. 5.1 BER performance of Wi-Max Mobile system with Trellis Encoder and 2 FFT points with 1600 bits data

TABLE I: SNR OF DIFFERENT CODING SCHEMES

TYPES OF CODES	SNR AT BER=10^{-2}	SNR AT BER=10^{-3}
Proposed Methodology (Trellis Encoding)	3.2 dB	6.4 db
Convolution Codes	9.2 dB	10.8 db
Turbo Codes (SOVA)	1.0 dB	7.5 dB
Turbo Codes (Log-MAP)	0.5 dB	1.8 db

TABLE II: SNR OF DIFFERENT CODE RATES

TYPES OF CODES	CODE RATES	SNR AT BER=10^{-3}
Proposed Methodology (Trellis Encoding)	177/133	6.4 dB
Turbo Codes (SOVA)	1/2, 1/3	7.5 dB, 5.0 dB
Turbo Codes (Log-MAP)	1/2, 1/3	1.8 dB, 1.5 dB

TABLE III: SNR WITH FRAME RATES

TYPES OF CODES	SNR	FRAME

		RATE
Proposed Methodology (Trellis Encoding)	6.4 dB	128
Turbo Codes (SOVA)	2.45, 2.3, 2.1 dB	280, 512, 1024
Turbo Codes (Log-MAP)	4.5, 1.6, 1.4 dB	280, 512, 1024

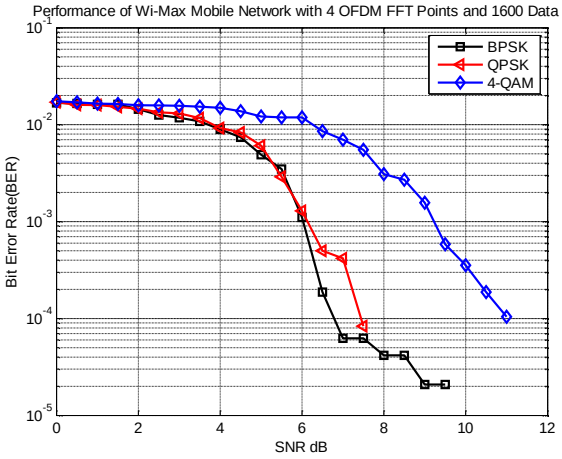

Fig. 5.2 BER performance of Wi-Max Mobile system with Trellis Encoder and 4 FFT points with 1600 bits data

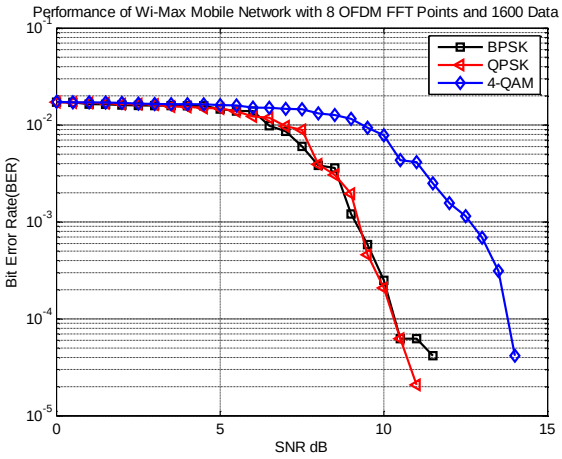

Fig. 5.3 BER performance of Wi-Max Mobile system with Trellis Encoder and 8 FFT points with 1600 bits data

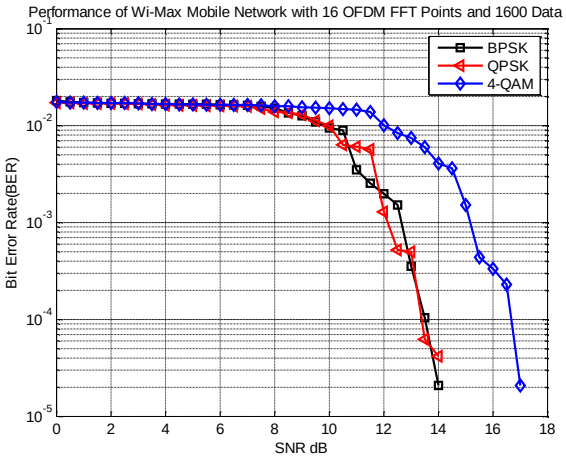

Fig. 5.4 BER performance of Wi-Max Mobile system with Trellis Encoder and 16 FFT points with 1600 bits data

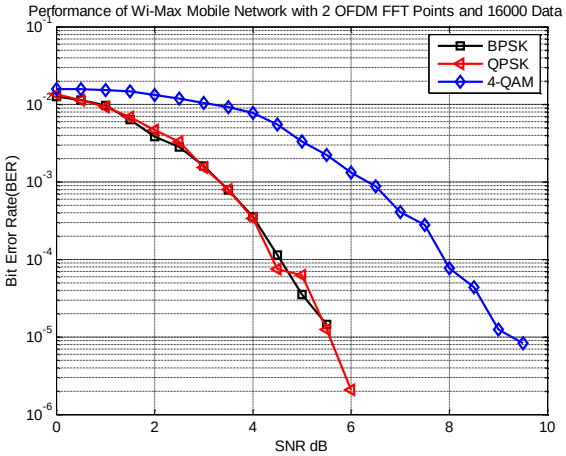

Fig. 5.5 BER performance of Wi-Max Mobile system with Trellis Encoder and 2 FFT points with 16000 bits data

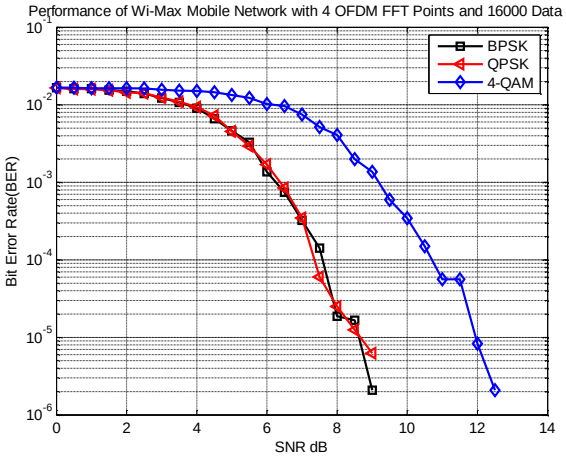

Fig. 5.6 BER performance of Wi-Max Mobile system with Trellis Encoder and 4 FFT points with 16000 bits data

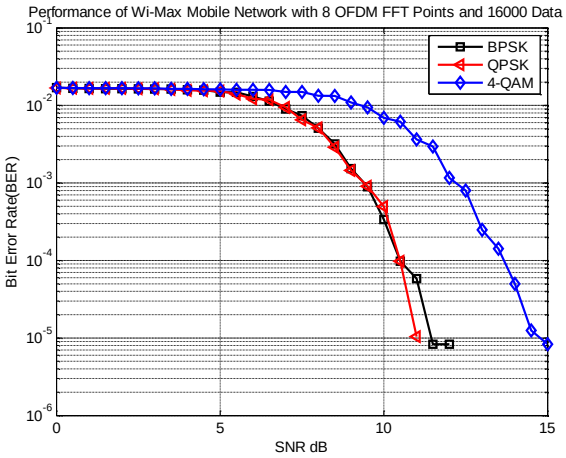

Fig. 5.7 BER performance of Wi-Max Mobile system with Trellis Encoder and 8 FFT points with 16000 bits data

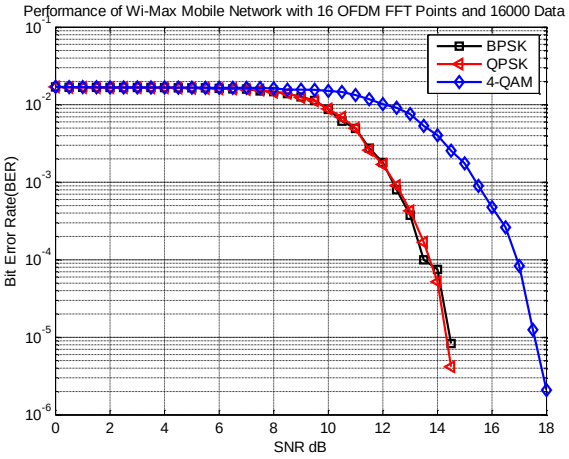

Fig. 5.8 BER performance of Wi-Max Mobile system with Trellis Encoder and 16 FFT points with 16000 bits data

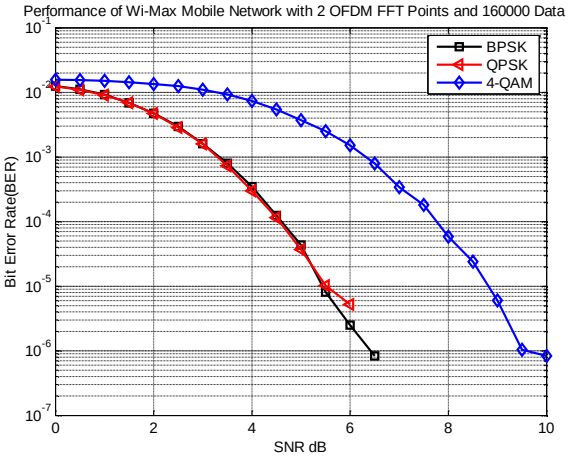

Fig. 5.9 BER performance of Wi-Max Mobile system with Trellis Encoder and 2 FFT points with 160000 bits data

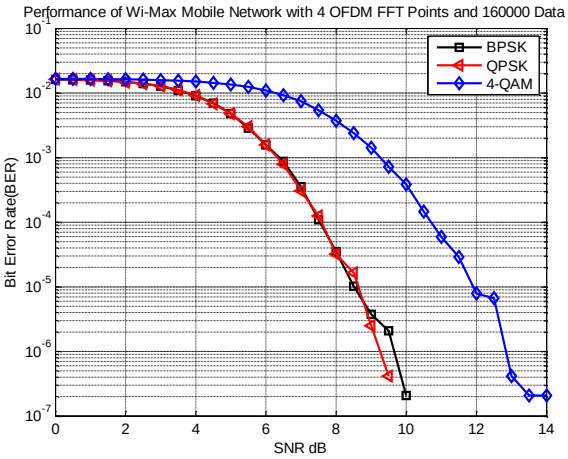

Fig. 5.10 BER performance of Wi-Max Mobile system with Trellis Encoder and 4 FFT points with 160000 bits data

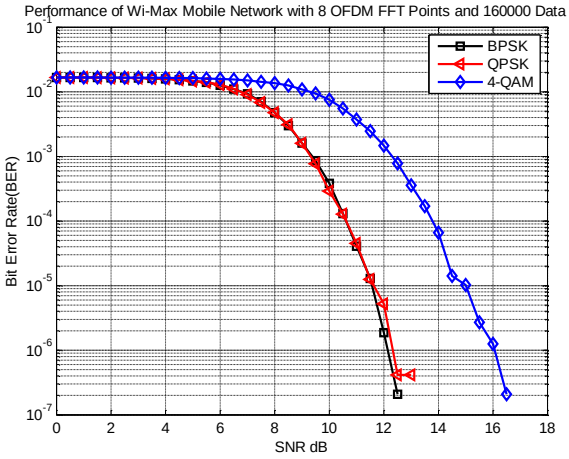

Fig. 5.11 BER performance of Wi-Max Mobile system with Trellis Encoder and 8 FFT points with 160000 bits data

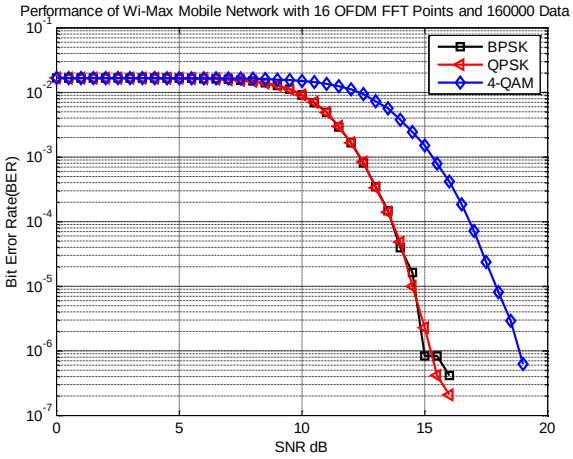

Fig. 5.12 BER performance of Wi-Max Mobile system with Trellis Encoder and 16 FFT points with 160000 bits data

In this the simulation results of the proposed approach are given. The simulations are performed on various data sizes. The changes in system performance seen when the FFT sizes of the OFDM are changed.

VI. CONCLUSION AND FUTURE WORK

From the system implementation and its results it is clear that the Trellis Encoder(TE) is making best out of Wi-Max Mobile Network System. The use of OFDM technology significantly enhances the data handling capacity of the system as seen in the results i.e. when the FFT sizes is reduces the error probability significantly go down and the makes system better. The optimum value of BER is achieved between 10^{-6} and 10^{-7} for 16 FFT points and BPSK modulation on 160000 bits data. The significance of encoder making system robust against noise and interference. In future if the system adopting better modulation technique with applications of some filters will make system better for wireless channels having noises, multipath fading, and interferences.

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NANO FERTILIZERS AND NANO SENSORS – AN ATTEMPT FOR DEVELOPING SMART AGRICULTURE

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Abstract

Nanotechnology is a novel discovery being explored in almost all the fields and is benefitted too; it may provide keener solutions for the current problems in the field of agriculture. Various research activities are carried out with sensors and fertilizers therefore paper is reviewed various kinds of fertilizers developed and acquaint with facts about the sensors in the same field. Nanotechnology concepts can help the farmers to know the effects before and input solutions for a better after. Controlled use of the technology will help the sustainability. In concern with the ecosystem and the farmers, these technologies will benefit the agricultural engineering and technology in overcoming all the local myths and ethics decreasing the mega problems in the agriculture arena. Availability of technology is more only proper utilization of it is.

Keywords: Nanotechnology, Agriculture, Fertilizer, Herbicide, Pesticide, Nano Sensors, Wireless Sensor, Smart Dust Technology, Aptamers

INTRODUCTION

Agriculture is always the backbone of many developing countries. It does not only fill the people abdomen but also it is the part of economy. According to 2014-2015 censuses, India's population is almost equal to 1,270,272,105 (1.27 billion), which is really a huge number. In concern of providing food to such a big population there has to be a new technology giving more yield in short period. In that manner, nature is complex which will have imbalances which directly affects plants and crops and indirectly animals and human. In according to this, other factors which affect agriculture are deficiencies in macro and micro nutrient content, population explosion, industrialization, depletion of water source, difference in soil condition, and erosion of top soil. In agriculture the main reason to use fertilizer is to give full-fledged macro and micro nutrients which usually soil lacks. 35-40% of the crop productivity depends upon fertilizer, but some of the fertilizer affects the plant growth directly.To overcome all these drawbacks a smarter way i.e., nanotechnology can be one of the source. Since fertilizers are the main concern, developing nano based fertilizer would be a new technology in this field. Fertilizers are sprayed in many ways either to soil or through leaves, even to aquatic environments; these inorganic fertilizers are supplied in order to provide three main components, nitrogen, phosphorous and potassium in equal ratios [1]. It increases the Nutrient use efficiency (NUE) by 3 times and it also provides stress tolerating ability. Irrespective of the type of crop it can be used, it will be the complete bio source increasing the eco friendly nature, builds carbon uptake, improves soil aggregation. Since these nano fertilizers contain nutrients, growth promoters encapsulated in nano scale polymers, they will also have a slow and a targeted efficient release. Nanotechnology is gathering information of atom in nano scale range, with considering the physical, catalytic, magnetic, optical properties [2]. However, the concentration of usage chronically exposes soil microbes and micro fauna, as well as the plants themselves, to level of chemical reactivity that may be toxic [3]. When comparing to chemical fertilizers requirement and cost, nano fertilizers are economically cheap and are required in lesser amount. For years farmers have found that nitrogen uptake is the main reason for improper yield. In past recent days development of sensing devices are in boom. When it comes to test a particular analyte from the soil causing disturbance in the filed there are assays which give accurate result but it has a drawback of consumption of time and also the high cost for performing. Sensors are those give better results with the live pictures and conditions of the field [4]. Sensors do monitor changes or the effects caused by various pesticides, fertilizers, and herbicide, also the physical conditions of soil like pH, moisture level, and growth conditions of crop, stem fruit or even root, toxicity studies, it can constantly monitor the toxicity produced in the field. Since it is a human friendly sensor starts detecting and alarms farmer so as to indicate any correct measures to be taken before rather than acting for a consequence after. When it comes towireless technology certain node installation is carried out which makes the person to monitor the happenings in the fieldall the nodes can be controlled at the same time through cloud computing or even through air programming. Therefore various types of new sensors and types of fertilizers are reviewed at glance to place nanotechnology in highest level.

NANO FERTILIZERS

Fertilizers play an important role where the ancient chemical fertilizers are replaced with nano and bio fertilizers with their efficiency and environment friendly nature. Primary use of adding is fast uptake of nutrients from the soil and giving better, faster yield. The symbiotic exchange between soil and the plant system is very efficient. When the same is applied in slow and efficient way all the required nutrients is taken up by the plant and restores the required and efficient energy in it for which the yield increases drastically. When fertilizers are in the form of encapsulated this can be achieved. Main element Nitrogen is needed in abundant and uptake of this itself causes many problems to the plants. A different type of fertilizers for different crop problems is reviewed.

Nitrogen fertilizers

There are ways where N is being lost in the atmosphere, and those processes include volatization, denitrification, leaching, and run off. There is a error in applying this N fertilizer to the crop, in fact continuous applying of these to the pre plants will not benefit in optimum utilization of the entire amount addedWhen the plants are harvested, they take away the nutrients which are present in the soil, therefore it is necessary to replace it by a readily available fertilizer to constantly make the nutrients available to the plants. The element required in abundant, nitrogen (N), is essential for plant growth and animal nutrition and is the nutrient taken up in largest amount by all plants. Source ofnitrogen include ammonia, diammonium phosphate, ammonium nitrate, ammonium sulphate, calcium cyanamide, calcium nitrate, sodium nitrate and urea[5] Its widely used because it is easily available, rapid action. This element's role in the environment is complex [6]. When coming to Nitrogen fertilizers, slow release of the same will be plant beneficiary. This is because a farmer can fertilize less often by providing the nutrients slowly and steadily. There was an attempt to increase the uptake of nitrogen with the application of 25 kg Mg Oha^{-1} which increased the positive uptake [7].

Potash fertilizers

Potash fertilizer taken by the plants as K^+ forming no organic compound in the plant, helps in photosynthesis process, controlling water storage and stomata opening in leaves.For the slow release of potash fertilizer, polyacrylamide based coating of pellets were used. Potash and clay was mixed together and dried for an hour, this was coated with a tooth paste for proper attachment of the polymer. This polymer was dipped in polyacrylamide polymer.The study showed the difference of dissolution with and without the coating, when the potash used is less the release is also slowed down and the release can also be maintained with less water [8]. Since the main cash crop of India and Srilanka is rice, there were studies done on rice using nano potash fertilizer as the source of potassium in rice, which resulted in increase number of grains per panicle and also the amount compared to muriate of potash was less. There are studies conducted for wheat and corn with nano coating fertilizer and slow release of the same to crops has increased the yield rate, and also effective recovery of N fertilizer [9].

Nano porous Zeolite

They usually help in slow release of the fertilizer to the plant, this way of doing makes the plant to grab entire amount of nutrients from the fertilizer supplied rather than the minimal uptake. Since it has larger surface area many molecules can fit into it and get released whenever the plant requires [10] Zeolite (Clinoptilolite) was made nano sized particles with ball mill. 1 g of this was taken in a centrifuge and stirred with 1.5M 50 ml of calcium sulphate solution for 8 hours, filtered and washed with de-ionized water, air dried. Solid: liquid ratio was maintained up to 1: 10 for synthesis purpose. [11]. Nitrogen fertilizers are very important but due to its high solubility nature it causes severe damage to the pants and the surroundings therefore a nano porous zeolite was used with urea and there was considerable increase in the uptake of nitrogen efficient urea with controlled release [12]. Aluminium zeolites are also used because they are highly porous and allow the retention of the soil. These zeolites help the dry soil also to retain all the moisture content and help to grab nutrients from the soil [13].

Zinc Nano Fertilizer

Micro nutrient, zinc has a serious deficient crisis in the world. The amount of zinc intake through daily food is very less therefore by utilizing zinc based fertilizer there are least chances of indirect supply to human. For the same nano particles can be used to coat zinc

in order to get a diffusedand soluble zinc [14]. When the pH increases solubility of zinc decreases [15]. Equal ratios between surface area and size of nano particles should be carefully designed If not, total solubility of the zinc will be affected. This is shown taking ratio ofNanoZnO and bulk ZnO available on whole [16].

Nano Herbicide

In a field to consider there are unwanted plants grown along with the desired plant crops and those are called weeds. To kill these weeds, herbicides are used but conventional herbicide when sprayed has a chance of getting affected to the good crops too by this there can be huge loss in the crop yield. By using Nano herbicide which is 1-100nm range will try to mingle with the soil particle and try to destroy the entire weed kingdom from their roots by not affecting other good crops. Since the nano particles are target specific they can be used to kill the weeds and destroy it to get better yield [13]. Also there are works carried out for the controlled release of the herbicide limiting the damage caused by it to human. More widely used herbicide include triazine, herbicidesametryn and atrazin were nano encapsulated to get 84% effiecient release to the plants [17]. Adsorptive stripping voltammetry process was developed to detect herbicide fenclorim with carbon nanotubes at pH 4.0 with the adsorption techniques on the electrodes [18]. Atrazine is the widely used herbicide in order to kill the weeds and unwanted grass growing near the crops, continuous use of herbicides makes soil loose all the nutrients and make them resistant to the plants, therefore application of modified silver with nano particles and carboxy methyl cellulose makes degradation of herbicide easier [19]

Nano Pesticide

Pesticide contains four different sub categories which will act on different target objects but action is the same either completely destroy or making plant resistant. Those categories include herbicide acting on unwanted weeds and grasses, insecticide on various insects, fungicides for few molds, algae and disinfectants for the control of bacteria and making them not to spread. So preparing this pesticide in the form of a shell or in a closed envelope will make it a slow and efficient release, soil run off rate can be decreased, increase solubility [20]. An emulsion coating of pesticide was developed, with the proper mixing of oil and water, a water insoluble , β-cypermethrin was developed and compared with uncoated product for stability and effectiveness in spraying [21] . Another spodopteralitoralis, an important pest which affects major plant kingdom developing its resistivity to almost all the pesticides was effectively controlled against hydrophobic nano silica coated tomato and it showed positive response of destroying the pests at 300-350 ppm respectively [22] . When citric acid molecules were combined with multi walled carbon nano tubes certain pesticides like Zineb and Mancozeb are trapped in aqueous solution which led to encapsulated pesticide which led to a serious threat for a particular fungi type *Alternaria alternate* fungi [23]

NANO SENSORS

Carbon Nano tube

Tubes are in cylindrical shape and mostly made up of carbon molecule with the difference in number of wall construction. These carbon molecules are held in position with strong van der Waals force making its application in packaging of particles, filtration, energy storing device, monitoring environment and many more. The reason for this numerous application is its flexibility alone. When it comes to agriculture sector, these multi walled carbon nano tubes have played a beneficial role in increasing the growth rate, water intake, uptake of essential nutrients from the soil. With the incorporation of varied ranges of carbon tubes different yields were noticed along with this when an external Fe supplement given the Ca ion made balance and maintained the yield [24]. To other crops like maize, wheat, peanut and garlic this multi walled tube with concentration of 50 µg ml^{-1} has given good results in increase in the length of root and shoot, seed germination time, enhancement in growth and had well developed root system [25]. C nano tubes help plants to retain their water content and it also increases the production rate drastically with very less amount of nano material like just 50 µg ml^{-1}, tomato production increased with treatment of fullerene which is an unbelievable event in agriculture [26].

Nano Aptamers

Aptamers are those which work with the principle of target specific binding with high affinity, they are single stranded nucleic acid, they fit for the target in all the way forming three dimensional with strict bonding can be produced in vitro [27]. Aptamer selection have certain criteria based on which it is selected for different process it includes the size range between nano or pico molar ranges. SELEX (Systematic Evolution of Ligands by Exponential enrichment) [28]. This kind of sensors gives more specific and effective detecting plant diseases, crop resistances and yield production. Initial detection can help irradiate the problems well before. In order to know the proper regulation happening in the system there is no need to distress the cell instead a sensor to monitor cell to cell signaling with the help of photoluminescence target specific device, i.e insulin binding aptamer was deviced to monitor extinction of lights from cells to get the signal [29]. In cases dealing with herbicide and pesticide (Atrazine and Malachite green) respectively, an efficient aptamer sensor was devised to monitor the toxicity level in food which is kept for consuming with the luminescent assay technique [28]

Smart Dust Technology

Mainpurpose of creating smart dust technology was to monitor the environmental hazards, energy usage and create awareness to human about the same. It can almost detect everything in the surrounding like monitor the temperature, track traffic, etc. It gains popularity in a way of its operation. It can be monitored with wireless radios, transducers irrespective of location of the sensor, its size is very small due to which it can be undetectable [30]. These are the devices made up of micro sized electro chemical sensors contained in it. Major power of sensing itself to the environmental changes, automation and computing has made it come to greater extent but still there are major drawbacks faced by this technology like the impact on environment, toxicity, how far will this be helpful in the field of agriculture. Mainly it works on three principles, sensing, processing and computing

Wireless Sensors

Technology has improved, a strong proof for this sentence is that monitoring all the activities from any place and not necessary to be present at the location of the activity happening. For the same purpose, wireless technologies has been developed, but still it is in its baby steps going through all the required field trials before the full fledge utilization. In spite of all these it is in a position of use where radio frequency and transducer incorporated sensors are in use [31]. These kind of sensors help in maintaining optimal growth of the plant by continuous monitoring the soil and environmental conditions. There are CCTV installed at the field which takes picture of the site and it is easy to maintain a database of all these for further purposes [32]**.** This technology is well used in cattle monitoring, rain water quality, ground water quality. Nodes will be placed at certain distances to monitor every act happening in the field [33]

ADVANTAGES OF NANO FERTILIZERS

Nano coatings and technology can help in numerous ways to reduce costs and increase productivity around the farm. Insulation can be a major issue for farmers, keeping products chilled or livestock at safe temperature. Even bee hives can be protected. Cold rooms can be coated to reduce temperature loss by 40%, reducing the need to run refrigerators. Condensers can be coated to also run much more efficiently. Here nano coatings can offer compelling value. By simply coating the stone, wood, glass, metal, plastic (almost any surface) around the farm, one can create an "easy-clean" and anti-corrosive coating to the surface without the need to apply detergents and aggressive cleaning materials. Cleaning cycles become much easier with around 40% less water usage and labour. Farm buildings, fences and assets can be badly damaged by mildew, mold and corrosion. Nano technology can help here too by preventing surfaces becoming spoiled by rain, bacteria & environmental corrosion. Painted surfaces can remain perfect for up to 21 years and more using environmentally friendly nano solutions. All electrical connections can be nanomimized to operate safely in wet and damp conditions. Some sheep farmers complain about loss of wool caused by dirt on healthy sheep.Nanomaterials could even be used to control the release of the fertilizer such that the nutrients are only taken up by the plant, and not lost to unintended targets like soil, water, or microorganisms [34]. These days nano particles are almost used in all the products like room fresheners, shampoos, laundry objects, biomedical products, and textiles [34].The silver released from all these products are in the form of elemental Ag-NP which at end reaches the waste water stream [35]. Nevertheless of all these when coming to risk assessment when Ag-NP were present in a pilot waste water treatment plant which transformed to Ag_2s thereby strongly decreases the release of toxic Ag+ in solution [36]

DISADVANTAGES OF NANOTECHNOLOGY

The Catchy term 'Nanotechnology' also pose some risks and problem towards the health and also towards environment. When considering risk and safety interm of the same will be relevant to only certain area. The initial studies performed for nano materials

have caused serious health hazards and also showed toxic effects, also when entered into human body caused tissue damage reaching all the vital organs. Another emerging technique is utilizing silver nano particles for the delivery of fertilizers to plants because of their antimicrobial properties, but studies have considered that it poses serious threat to ecosystem causing membrane damage, reducing the annual growth of grass, depletion photosynthesis in alga (chlamydomonasreinnardtii). Silver nano particles are usually difficult to recover, some plant species tends to use this nano particle maximum and accumulates in its tissue exceeding the limit. Soybean an important cash crop in most of the country was produced using manufactured nano materials with fossil fuel equipment that will allow NNM to locally deposit on the crop. With routine waste water treatment plants, Results were impacts on plant - microbe interaction affecting N_2 fixing symbiosis for which some metals are sensitive.

CONCLUSION

Nanotechnology in many fields is in its primary stage, seeing al such new innovations it clearly tells that it has a great scope and for any new technology to that matter there will be objection and rejections, overcoming all the myths and ethics this will reach heights in its own manner. While comparing it to the ancient assay techniques there is huge difference in the accuracy, smart nature, effectiveness, cost for operation, ease of construction and many others. But still when it comes to agriculture sector it is behind from all other existing techniques. The only way is to educate people of interest and provide them few sample products and make them use it and get the satisfaction of the same pupil for the technology to rise. If there is equal supports from both public and private sectors more novel techniques and more researches can be carried out but because of lack of knowledge in common man many dreams of reputed institutions and young budding research fellows innovative ideas are shattered. This technology will help in feeding generations and not a single one. There is awareness created on the risks of consuming and performing few operations rather than the benefits and effectiveness of the technology. In spite of all these drawbacks there is continuous research carried out in nanotechnology, there will be a day which will come in near future for an accepted nanotechnology.

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Development of PC based transient current analysis system using microcontroller and Hall effect sensor

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Abstract — In electrical power system transient condition occur during transformer switching, motor starting or during fault conditions. Therefore, the accurate measurement of transient current is a critical input to protection relays which monitor the current and / or voltage signals to determine whether the monitored portion is faulted and should be isolated, or whether conditions are normal and should remain closed to maintain the flow of power. If protection relays receive the "true" representation of current flowing on a transmission line, or into transformers, capacitor banks, or reactor banks, they will make decisions based on the current that is actually flowing, not based on a distorted representation of the current which the relay may need to compensate for. An undistorted view could improve the ability of the relay to trip when it should and to prevent false trips.

Keywords — Transient current, Current analysis system, Microcontroller, Hall effect, Hall effect sensor, PC with RS232 port, Transient.

Introduction — A transient event is a short – lived burst of energy in a system caused by sudden change of state. In electrical engineering, oscillation is an effect caused by a transient response of a circuit or system. It is a momentary event preceding the steady state (electronics) during a sudden change of circuit. Mathematically, it can be modeled as a damped harmonic oscillator. Transient current is an oscillatory or a periodic current that flows in a circuit for a short time following an electromagnetic disturbance.

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input / output peripherals. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory and input/output devices, microcontrollers make it economical to digitally control even more device and processes.

The Hall Effect is the production of a voltage difference across an electrical conductor, transverse to an electric current in the conductor and a magnetic field perpendicular to the current. It was discovered by Edwin Hall in 1879.

A Hall effect sensor is a transducer that varies its output voltage in response to a magnetic field. Hall effect sensors are used for proximity switching, positioning, speed detection, and current sensing applications. In its simplest form, the sensor operates as an analog transducer, directly returning a voltage. With a known magnetic filed, its distance from the Hall plate can be determined.

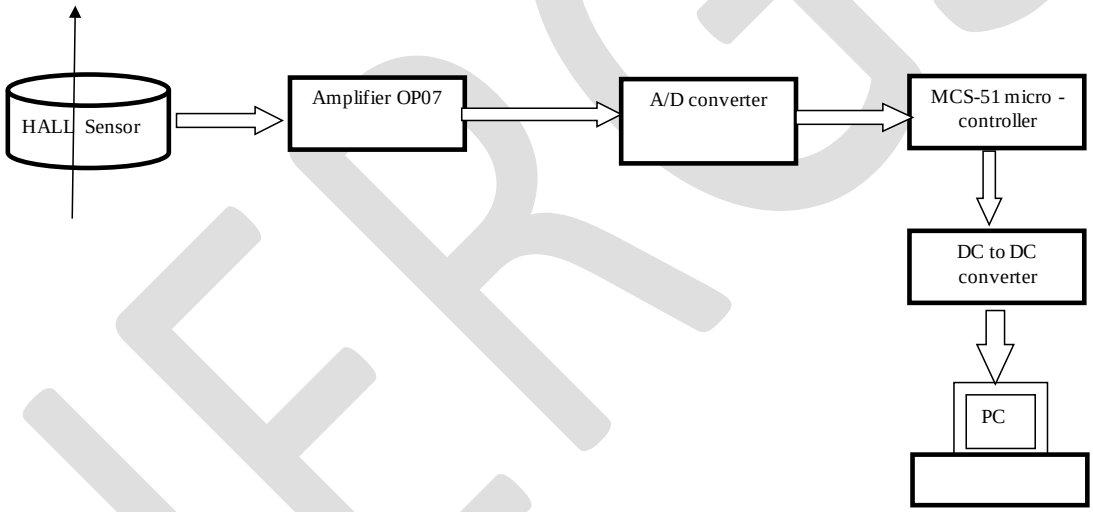
A Hall effect sensor may operate as an electronic switch.

- Such a switch costs less than a mechanical switch and is much more reliable.
- It can be operated up to 100 kHz.
- It will not be affected by environmental conterminal since the sensor is in a sealed package. Therefore it can be used under severe conditions.

Hall effect sensors provide much lower measuring accuracy than fluxgate magnetometers or magneto resistance based sensors. Moreover, Hall effect sensors drift significantly, requiring compensation.

Methodology — The procedure involved the following steps :-

- Developed PC based software for current analysis.
- Developed interface between Hall effect sensor and microcontroller.
- Captured transient data in PC via microcontroller and Hall effect transducer using serial port RS 232.



Hardware and Software used

- Hall Effect Transducers – CSNE151
- A/D Converter – ADC 0804
- Microcontroller – MCS51 family - 89C51 (8 bit, 32 I/O)
- DC-DC converter – MAX232C
- PC with RS232 serial port
- Software Programme – Visual Basic (VB6.0)
- Backend Database – MS Access/Excel

Results & Discussions —

No.	Primary Current	Hall Output (Peak to	Cycle RMS (mV)	Frequency (HZ)	Load in WATT	Remarks

	(Amps)	Peak mV)				
1.	1.6	100	35	50.20	500	Lamp Load
2.	1.9	146	51.99	50.00	800	Lamp Load

Hall Sensor Specification :

Nominal Primary Current : 36A

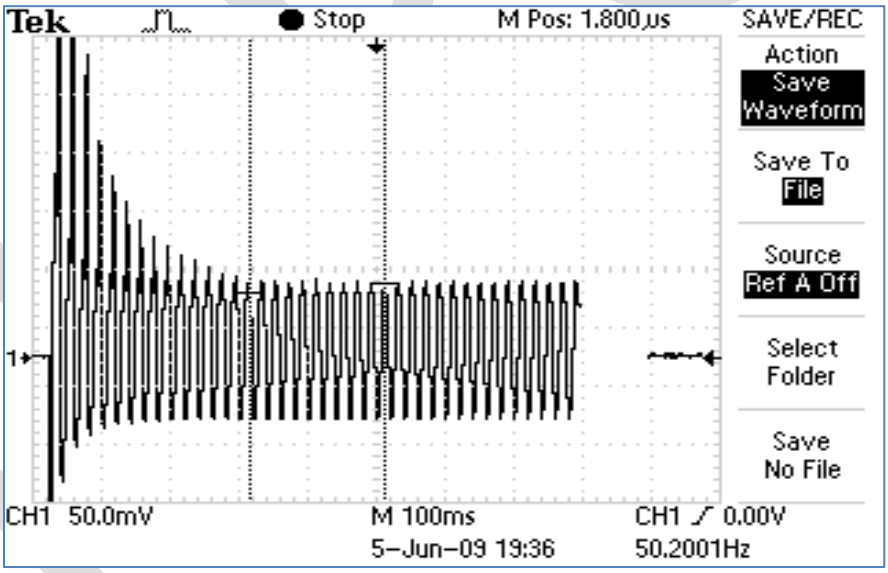
Nominal Output Current : 25mA

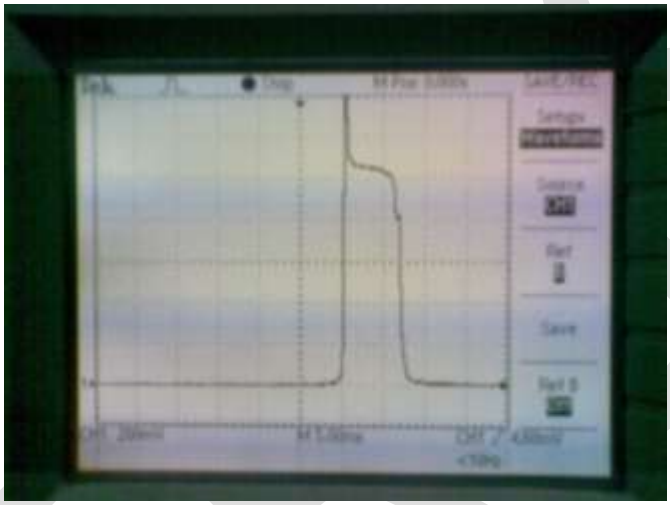
Measuring Range : 0 to 36A

Load Resistance : 190 Ohm

Supply Voltage : +/- 15 V

Waveforms :





Program – Transmitting serial data from microcontroller

```
org 00 ; Source program starts with 00 address
                clr P2.0 ;
                NOP
                Set B P2.0
                MOV th1, # 253 ; Load TH1 with preset value
                MOV tl1, # 253 ; starting count = preset value
                MOV TMOD, # 20H ; Set Timer in auto Reload mode
                MOV SCON, # 40H ; mode,9600,N,8,1
                SET B TR1          ; start timer
   L1:          MOV SBUFF,P1     ; load data in Sbuf for transmission
   HERE:        JNB t1; here
                clr Tr1
                SJUMP L1
```

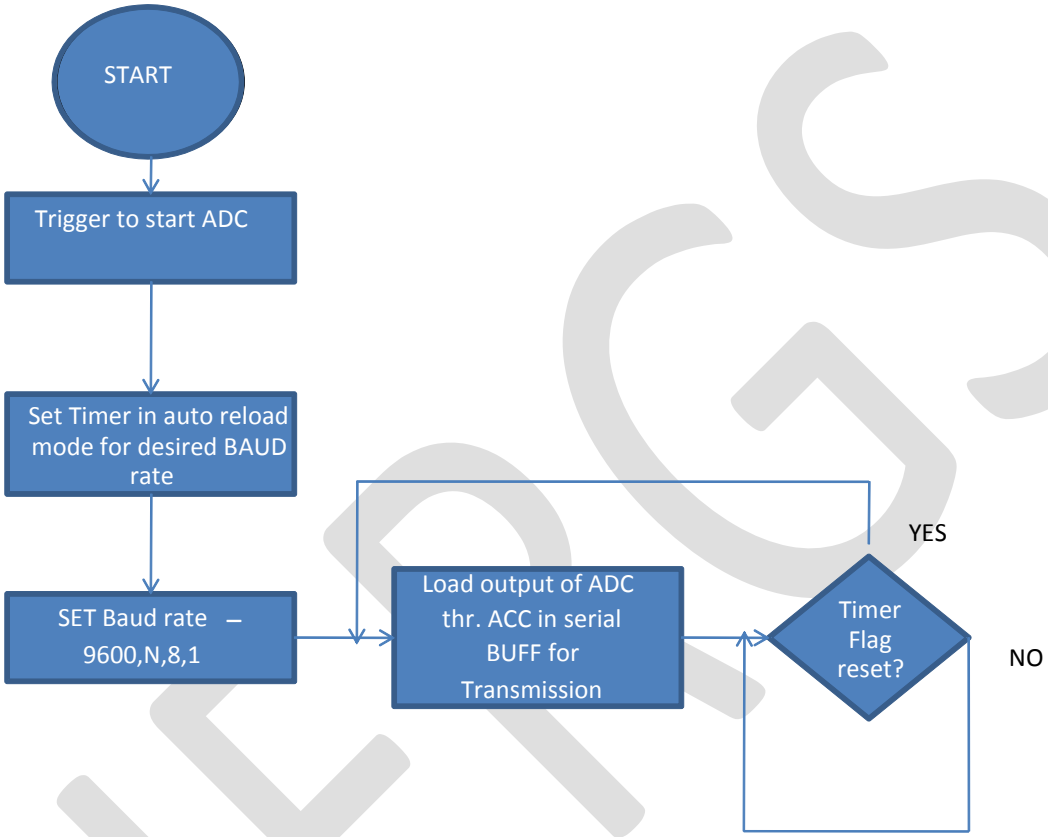
Program – Reading serial data in PC

```
MSCOMM1.COMMPOST = 2 ; SET THE PORT NO
MSCOMM1.SETTINGS = "9600,N,8,1" ; SET UART PARAMETERS
```

MSCOMM1.PORT0PEN = TRUE

BUFFER$ = BUFFER$ & MSCOMM1.INPUT :READ DATA

Flowchart



Conclusion — Hall effect sensor CSNE151 has been used which is apparently considered to be suitable for the project due to its higher band width (DC-150kHZ). Conventional current sensor has not been considered due to its low bandwidth. I have measured transformer inrush current using Hall effect current transducer.

CSNE151 sensor is suitable for 415V system. Maximum voltage it can withstand is 5 KV. The maximum current rating available is 1200A. So, we need to explore more about suitability of Hall sensor for high power high voltage application.

The sampling rate is approx. 1000 samples/data per sec. If baud rate can be improved the data will be more accurate.

This waveform can be analyzed to find out the actual harmonic content using FT or WEBLET. Hence, nature of over current can be distinguished and accordingly an intelligent protection system can be made. Possibility of using this Hall sensor in high voltage system needs to be explored.

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Simplified views of a complex 3-Dimensional object in 2-Dimensional technical drawing for image processing

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Abstract- Drawing is to be considered as universal language. Drafting is a technical drawing[5] used by designers to graphically present ideas and represent objects necessary for a designed environment. A set of this drafted illustration is called a construction document. There are common rules and standards to ensure that all designers are able to understand what is in the drawing. These design drawings use a graphic language to communicate each & every piece of information necessary to convey an idea and ultimately create a design. The basic principle of the Technical drawing is the representation of a three-dimensional body (usually it is a component or assembly) in a two-dimensional drawing. To the uniqueness of the drawing to realize in various views (e.g. from the front, from the side and rear).Complex components may require that the carcasses of several pages (ie, multiple views) must constitute representations or even cut through the component must draw round. In this paper we will show the representation of technical drawing in the standard view.

Keywords : technical drawing, assembly, complex components, carcasses, construction document, multiple views, three dimensional body.

INTRODUCTION

An engineering drawing is a legal document (that is, a legal instrument), because it communicates all the needed information about "what is wanted" to the people who will expend resources turning the idea into a reality. Industry requires many millions of drawings every year. Every part must have a working drawing. These drawings communicate the details to a skilled craftswoman or man so the item can be correctly manufactured[10]. Engineering drawings specify requirements of a component or assembly which can be complicated. Standards provide rules for their specification and interpretation. Drawings convey the following critical information:

- Geometry – the shape of the object, represented as views, how the object will look when it is viewed from various angles, such as front, top, side, etc.
- Dimensions – the size of the object is captured in accepted units.
- Tolerances – the allowable variations for each dimension.
- Material – represents what the item is made of.
- Finish – specifies the surface quality of the item, functional or cosmetic. For example, a mass-marketed product usually requires a much higher surface quality than, say, a component that goes inside industrial machinery.

1. *Sets of technical drawings*

Working drawings

Working drawings are the set of technical drawings used during the manufacturing phase of a product. In architecture[8,11], these include civil drawings, architectural drawings, structural drawings, mechanical systems drawings, electrical drawings, and plumbing drawings.

Assembly drawings

Assembly drawings show how different parts go together, identify those parts by number, and have a parts list, often referred to as a bill of materials. In a technical service manual, this type of drawing may be referred to as an exploded view drawing or diagram, we can use these parts in engineering.

As-fitted drawings

These are also called As-Built drawings, or As-made drawings. As-fitted drawings represent a record of the completed works, literally 'as fitted'. These are based upon the working drawings and updated to reflect any changes or alterations undertaken during construction or manufacture.

2. Types of technical drawings

The two types of technical drawings are based on graphical projection. This is used to create an image of a three-dimensional object onto a two-dimensional surface.

Two-dimensional representation

Two-dimensional representation uses orthographic projection to create an image where only two of the three dimensions of the object are seen.

Three-dimensional representation

In a three-dimensional representation, also referred to as a pictorial, all three dimensions of an object are visible.

Difference between 2D & 3D drawing:

A 2D drawing is a flat drawing that focuses on balance and symmetry, while a 3D drawing focuses on depth and space.
Standard 2D art focuses on the contrast, rhythm, scale and proportion of a drawing, whereas 3D art looks at the depth and sculpture or the drawing. Examples of 2D art are graphic design, digital imaging and fabric design. Examples of 3D art include animation, sculpting and metal work. The visual contrast between the two types of drawings is a 2D drawing is a flat drawing and a 3D drawing looks like it has jumped off the page.

3. Different types of view : In most cases, a single view is not sufficient to show all necessary features, and several views are used. Types of views include the following:

3.1 Orthographic projection

Orthographic Projection[2] is a way of visualizing different views of an object from there different sides such as a top view, front view, side view, the object is rotated so that the viewer viewing the object can see each individual side as the part is rotated. These Views are then drawn on a sheet of paper, enough views are drawn of the object to Help the person manufacturing the part to get a good visualization of what the part looks Like. The most common views drawn of an object in an orthographic drawing are the front view, top view, and right side view. After the views have been drawn on a sheet of paper notes and dimensions are then added. In orthographic projection there are 6 principle views of an object, front, top, L side, R side, rear, and back views. The three most commonly views drawn on a technical drawing are the front, back, and side views most other views are not needed. Other views may be needed in order for the person who is creating the Part, to better visualize it in order to properly manufacture it. The orthographic projection shows the object as it looks from the front, right, left, top, bottom, or back, and are typically positioned relative to each other according to the rules of either first-angle or third-angle projection. The origin and vector direction of the projectors (also called projection lines) differs, as explained below. In first-angle projection, the projectors originate as if radiated from a viewer's eyeballs and shoot through the 3D object to project a 2D image onto the plane behind it**.** The 3D object is projected into 2D "paper" space as if you were looking at a radiograph of the object: the top view is under the front view, the right view is at the left of the front view. First-angle projection is the ISO standard and is primarily used in Europe. In third-angle projection[3], the projectors originate as if radiated from the 3D object itself and shoot away from the 3D object to project a 2D image onto the plane in front of it. The views of the 3D object are like the panels of a box that envelopes the object, and the panels pivot as they open up flat into the plane of the drawing. Thus the left view is placed on the left and the top view on the top; and the features closest to the front of the 3D object will appear closest to the front view in the drawing. Third-angle projection is primarily used in the United States and Canada, where it is the default projection system according to ASME standard ASME Y14.3M.

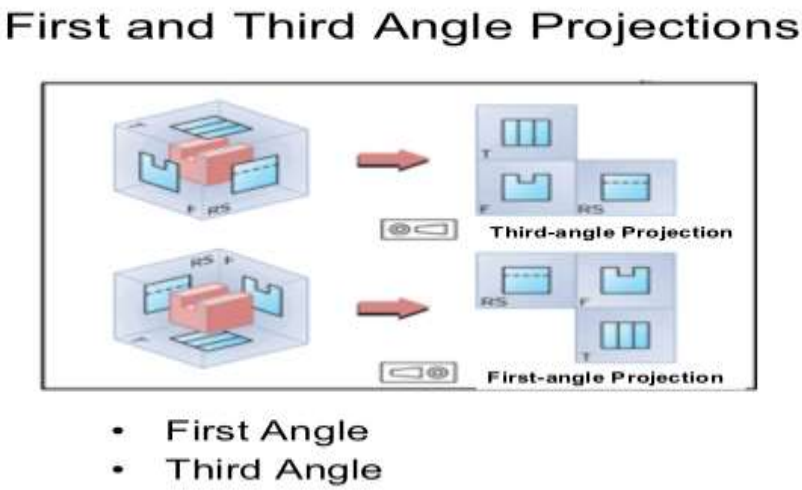

Fig. 3.1 1st angle & 3rd angle view.

As shown above, the determination of what surface constitutes the front, back, top, and bottom varies depending on the projection method used.

Not all views are necessarily used. Generally only as many views are used as are necessary to convey all needed information clearly and economically. The front, top, and right-side views are commonly considered the core group of views included by default, but any combination of views may be used depending on the needs of the particular design.

3.2 Auxiliary projection

An auxiliary view[1] is an orthographic view that is projected into any plane other than one of the six principal views. These views are typically used when an object contains some sort of inclined plane. The auxiliary view allows for that inclined plane (and any other significant features) to be projected in their true size and shape. The true size and shape of any feature in an engineering drawing can only be known when the Line of Sight (LOS) is perpendicular to the plane being referenced. It is shown like a three-dimensional object.

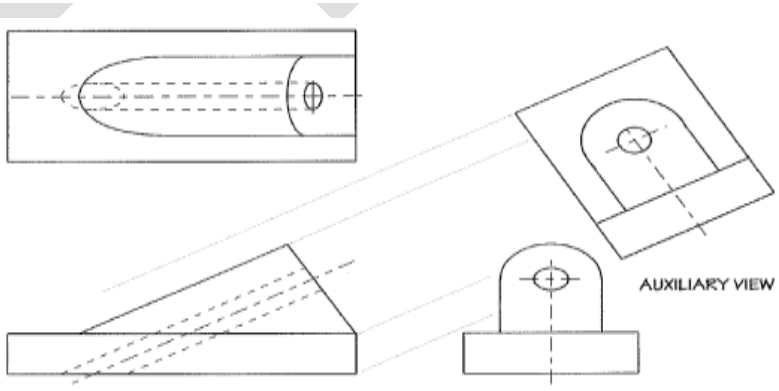

Fig 3.2 auxiliary projection.

3.3 Axonometric projection

It is a type of parallel projection used for creating a pictorial drawing of an object, where the object is rotated along one or more of its axes relative to the plane of projection. There are three main types of axonometric projection: isometric, dimetric, and trimetric projection.

3.3.1 Isometric projection

The isometric projection[4] show the object from angles in which the scales along each axis of the object are equal. Isometric projection corresponds to rotation of the object by ± 45° about the vertical axis, followed by rotation of approximately ± 35.264° [= arcsin(tan(30°))] about the horizontal axis starting from an orthographic projection view. "Isometric" comes from the Greek for "same measure". One of the things that makes isometric drawings so attractive is the ease with which 60 degree angles can be constructed with only a compass and straightedge.

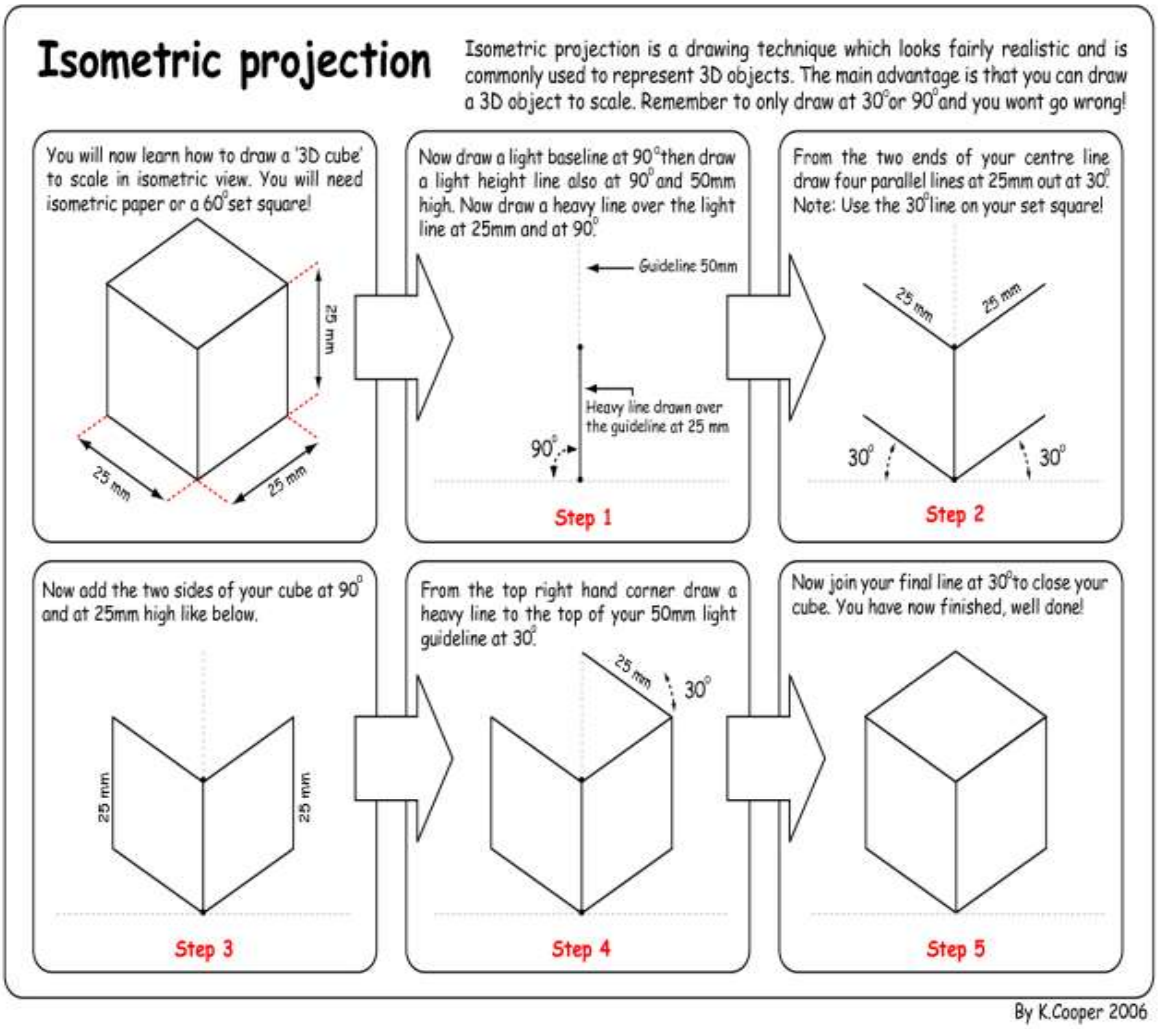

Fig. 3.3.1 steps for drawing isometric view.

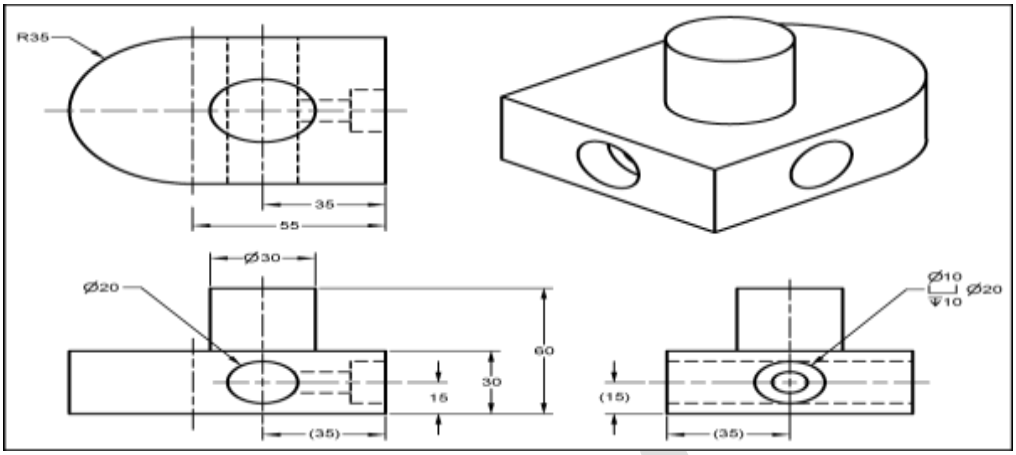

Fig. 3.3.2 isometric view of an object.

3.3.2 Dimetric projection

In dimetric projection, the direction of viewing is such that two of the three axes of space appear equally foreshortened, of which the attendant scale and angles of presentation are determined according to the angle of viewing; the scale of the third direction (vertical) is determined separately.

3.3.3 Trimetric projection

In trimetric projection, the direction of viewing is such that all of the three axes of space appear unequally foreshortened. The scale along each of the three axes and the angles among them are determined separately as dictated by the angle of viewing. Trimetric perspective is seldom used, and is found in only a few video games

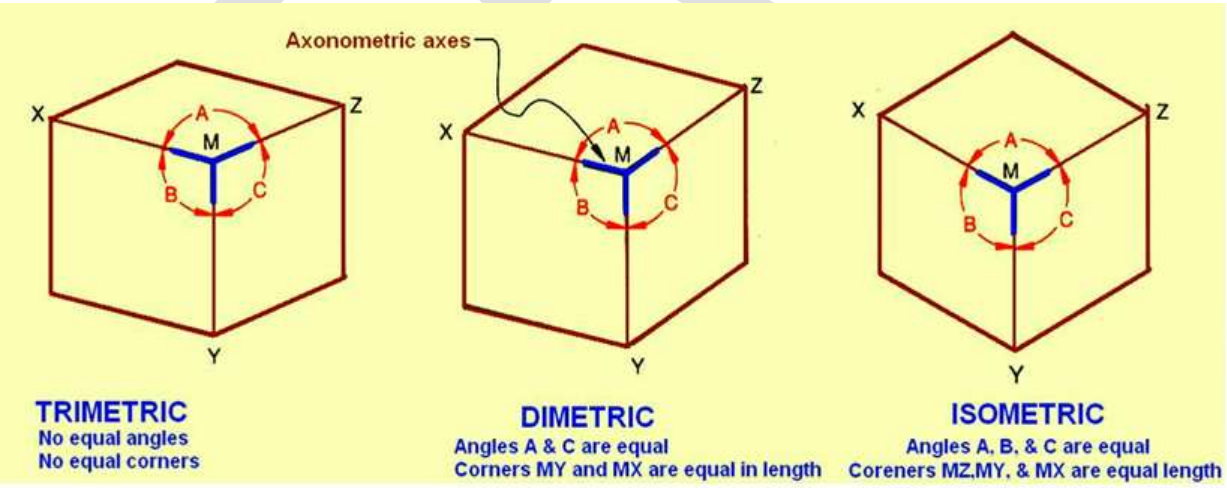

Fig. 3.3 Axonometric projections

3.4 Oblique projection

An oblique projection is a simple type of graphical projection used for producing pictorial, two-dimensional images of three-dimensional objects. It projects an image by intersecting parallel rays (projectors) from the three-dimensional source object with the drawing surface (projection plan).

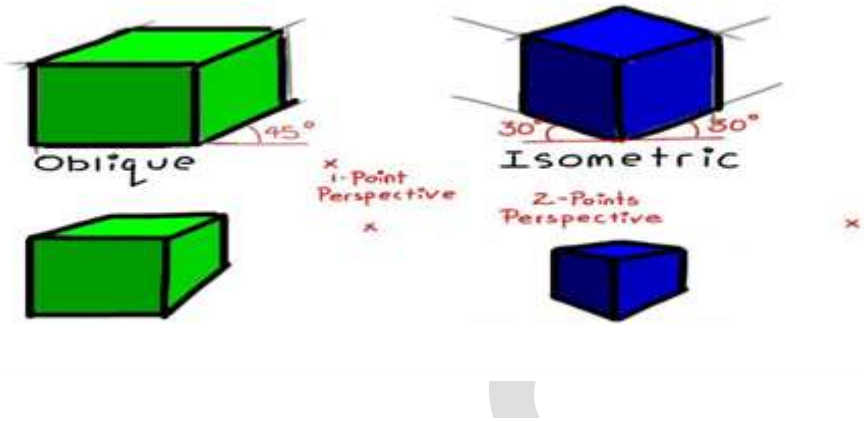

Fig. 3.4 difference between oblique & isometric view

In both oblique projection and orthographic projection, parallel lines of the source object produce parallel lines in the projected image.

3.5 Perspective projection

Perspective[12] is an approximate representation on a flat surface, of an image as it is perceived by the eye. The two most characteristic features of perspective are that :

- objects are drawn Smaller as their distance from the observer increases.
- Foreshortened: the size of an object's dimensions along the line of sight relatively shorter than dimensions across the line of sight.

Perspective projection is a type of drawing that graphically approximates on a planar[13] (two-dimensional) surface (e.g. paper) the images of three-dimensional objects so as to approximate actual visual perception. It is sometimes also called perspective view or perspective drawing or simply perspective. All perspectives on a planar surface have some degree of distortion, similar to the distortion created when portraying the earth's surface on a planar map.

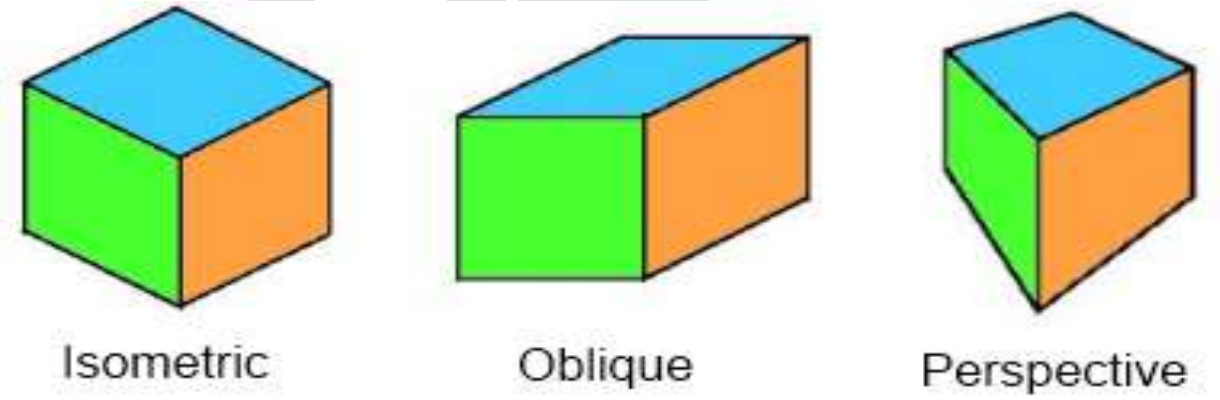

Fig 3.5 different types of views

3.6 Section Views

A section view[7] is a view used on a drawing to show an area or hidden part of an object by cutting away or removing some of that object. The cut line is called a "cutting plane", and can be done in several ways.

Projected views (either Auxiliary or Orthographic) which show a cross section of the source object along the specified cut plane. These views are commonly used to show internal features with more clarity than may be available using regular projections or hidden lines. In assembly drawings, hardware components (e.g. nuts, screws, washers) are typically not sectioned. Projected views are of two types :

3.6.1 Full Section

In a full section, the cutting plane line passes fully through the part. Normally a view is replaced with the full section view. The section-lined areas are those portions that have been in actual contact with the cutting-plane.

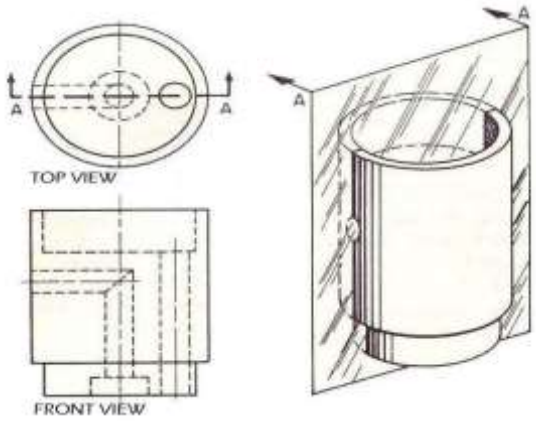

Fig. 3.6.1 full section view.

3.6.2 Half Section

Half Section[7] is used to the exterior and interior of the part in the same view. The cutting-plane line cuts halfway through the part and removes one quarter of the material. The line that separates the different types (interior and exterior) may be a centerline or a visible line.

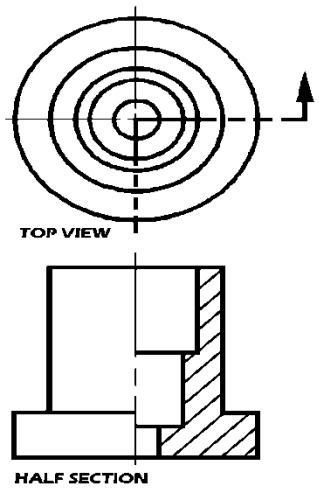

Fig. 3.6.2 half section view.

CONCLUSION

Technical drawing is a way on which creation of an object is fully depended. So it is necessary to make an accurate drawing for error free production. This paper presents a basic idea for representing complex 3D objects in 2D view in projection line drawings. Main aim of this paper to 1) separate a complex line drawing into simpler ones along its internal faces, 2) reconstruct the 3D shapes from these simpler line drawings, and 3) combine the shapes into a complete object. The future work includes using these drawings with image processing[6] for quality control at production time.

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RESEARCH ON MANUFACTURE AND TEST OF ADVANCED COMPOSITE MATERIAL FLANGE

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ABSTRACT- Due to the problems of potential corrosion and thermal expansion differences between traditional metal connecting pieces and carbon fiber poles, it is difficult for them to meet the operating requirements of truss structures in the environment of stratosphere. Based on the large scale composite space truss structure of stratosphere aerostats, the carbon fiber flange connection joints were studied in the present paper Adopting the three-dimensional full five -directional braiding technology, Toray T700 S–12K carbon fiber is used as the raw material to manufacture flange joint preform, and to manufacture flange forming by RTM (resin transfer molding) process. As demonstrated by tensile and bending tests, the composite flange joints have better mechanical properties than flanges manufactured by aviation aluminum alloy, and meet requirements of stratosphere truss structure connecting pieces. In conjunction with the results of finite element analysis, mechanical properties can be further enhanced by the improvements of the braiding process, the forming process and the physical dimension.

Keywords: Advanced composite material flange, manufacture, test, finite element analysis, carbon fiber, aviation, braiding technology.

1. INTRODUCTION

Three-dimensional braided composite material, a new type of composite material, is a combined product of the three-dimensional braiding technology and the advanced composite material technology. It is essentially developed and applied in high and new technology fields represented by the aerospace technology. As the fiber bundles extend along a plurality of spatial directions and cross with each other, the integrity of the composition is good and the drawbacks of low intensity and easy lamination between layers of the laminated composite material are overcame [1- 6]. Meanwhile, the high specific strength, the high specific stiffness, and the very strong design ability of the three-dimensional braided composite material play an essential role in the weight reducing of aerospace structures. Aerostats have become the public research hotspot. One of the key technologies is the research of large scale truss structure which is light in weight and high in strength. The large scale truss structure in spacecraft is usually composed of carbon fiber poles and metal joints. Through the improvements of the connection between the carbon fiber poles, the weight of the truss structures is further reduced, the bearing efficiency of the structure is improved, and problems of the potential corrosion and the thermal expansion rate between the aluminum alloy and carbon fiber are solved. In the present paper, the carbon fiber flange preform is manufactured by the four steps three-dimensional braiding technology, and the three-dimensional braided flange specimen is developed in combination with the RTM process. Also, advanced composite material flange is used to substitute the aviation aluminum alloy joint of carbon fiber truss structure. As tested by tensile and bending tests, under the condition of same quality, the tensile and bending property of the former is better than latter, so that the expected result is reached. The whole manufacturing process is divided into five steps: manufacture of three-dimensional braided preform, manufacture of the RTM process mold, injection, curing and release of the resin.

2. THE PROCESSING OF THE THREE-DIMENSIONAL BRAIDED PREFORM

One of the characteristics of three-dimensional braiding is that different shapes of heterotype whole pieces can be directly braided. As for the reasons, in one aspect, the size of the cell cube of the basic structure of three-dimensional braidings can be changed with the changes of the shape and size dimension of the preforms. In another aspect, braiding process is varied, and processing parameters can be changed to adjust the process to meet the requirements of the shape of the preforms, thereby to achieve whole braiding. In the present paper, the four steps three-dimensional braiding process is used to manufacture the flange preform. Many structures with different cross-sectional shapes can be braided by the four steps, for example, tabular, tubular, semi cylinder, and cylinder. The four steps braiding method is introduced as follows, taking tabular structure as example. A square machine is used to braid the tabular structure. The theory of the four steps process of the 6 lines 4 rows structure is described in Fig. (**1**). In the first step, all the bobbins in row move horizontally, in which, adjacent rows move in reverse directions, as shown by the arrows in Fig. (**1b**). In the second step, all

the bobbins in column move vertically, in which, adjacent rows move in reverse directions, as shown by the arrows in Fig. (**1c**). The third step is similar with the first step, except that the rows move reversely, that is to say, all the rows return to the state of the first step (Fig. **1d**). In the fourth step, all the columns return to the state of the second step, only the position of respective bobbin is changed (Fig. **1e**). Thus, one braiding cycle is completed and the braider returns to the initial state of the circle again, only that the position of respective bobbin is changed (Fig. **1a**). These four steps are repeated afterwards, and the four steps braiding is achieved. **Fig.**

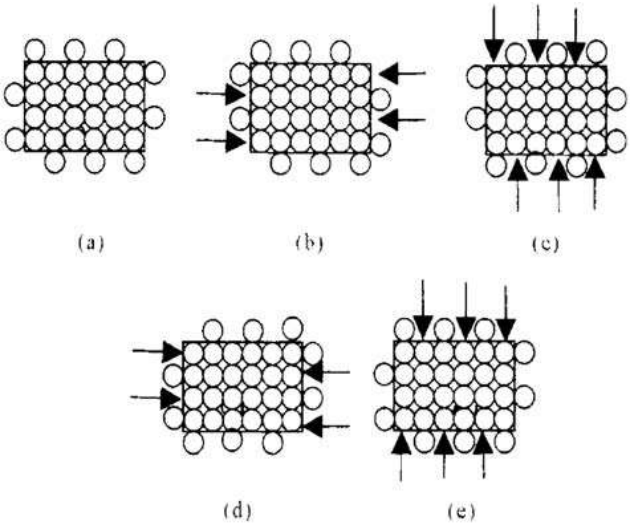

Fig. (1). The theory of four steps tabular braiding process of three dimensional

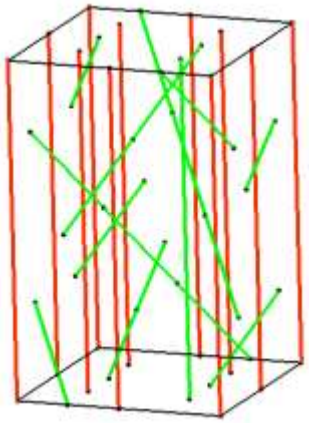

Fig. (2). Schematic illustration of the fiber structure of the three dimensional

The braider used for tubular braiding is a round machine. The round machine is actually a square machine and the rows of which are connected between the beginning and the end. The process of a four steps tubular braiding is similar to the tabular braiding, only that the horizontal movement is changed to the tangential movement and the vertical movement is changed to radial movement. The fabric construction is divided into many types including three-dimensional four directions, three-dimensional five directions, three-dimensional full five-directions, three dimensional six directions or even three-dimensional seven directions. In the structure of three-dimensional four directions, there is no axial direction yarn passing through the pitch of the braiding. In the structure of three-dimensional five directions, there is one axial direction yarn passing through the pitch every other pitch length. Whereas in the structure of three-dimensional full five-directions, there are axial direction yarns passing through all pitches, and the thickness of which is far larger than the structure of three dimensional four directions or three-dimensional five directions. The present flange which has the structure of three dimensional full five-directions [7] is shown as Fig. (**2**).

3. PHYSICAL DIMENSION OF THE FLANGE

According to the requirements of the connection size of the truss structure, the internal diameter of the flange cylinder is 45mm, and the external diameter is 51mm; the external diameter of the flange disc is 90mm, and the thickness is 3mm. According to the requirements of bonding strength, the length of the flange cylinder is 90mm, and there is a round transition with a radius of 10mm between the flange disc and the flange cylinder, to decrease the stress concentration. The shape and size of the flange is shown in Fig. (**3**).

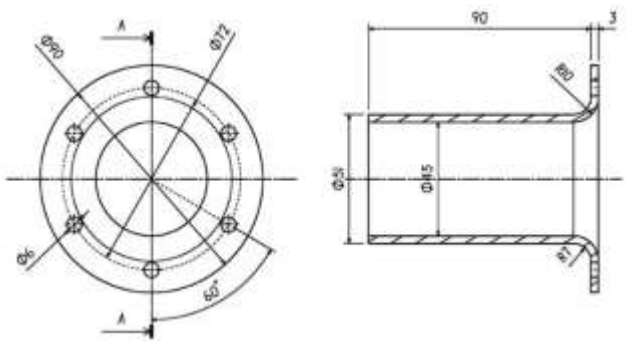

Fig. (3). Physical dimension of the flange.

Since the mechanical properties of the composite material are greatly impacted by processing parameters, and theories on design criteria of the mechanical properties of three-dimensional braiding composite material are not yet completed, the one dimension quantity method is adopted to carry out the research. The volume content of the fiber is set as 50%(±2%), the braiding angle of the flange as 20°, and the pitch length as 5mm, the braiding is completed by Beijing Boruiding Science and Technology Co. Ltd. Under set-up parameters adopting three-dimensional full five directions braiding technology. The flange preform is shown in Fig. (**4**). After braiding by the weaving technology, the preform units are cut and separated one by one. Because of the cutting, the flange neck and the edges of the flange disk are provided with burr, and the braiding parameters cannot be guaranteed, such that after curing, this region cannot reach the requirements of the designed properties. But in view of the process, the loosening at the edges cannot be avoided. Therefore, it is only necessary to make the braiding size of the preform lager than the physical dimension of the part, and cut off the related region after curing.

Fig. (4). Manufacture of the flange preform.

4. THE FORMING PROCESS OF THE FLANGE

The RTM process is adopted to form the flange, it mainly includes steps of the manufacture of the RTM process mold,

injection, curing and release of the resin.

4.1. Designing of the Mold

The designing of the mold is one of the key steps of the RTM forming process. The quality of the mold not only decides the inherent quality of the composite material, but also decides the surface grade of the composite material. As the property of the composite material is greatly impacted by the composite process, the dispersibility of the properties of the product is frequently large. Therefore, designing an appropriate mold can insure that the dispersibility of the properties of the cured composite material is relatively smaller. The height of the projection of the male mold is slightly higher than the flange neck, and the higher part is the area for the main passage and bypass passage. The end face of the projection of the male mold is in connection with the end face of the intra-cavity of the female mold. The resin is injected from the pores at the end face and flew from the four pores at the side surface to the braiding uniformly. The design figure of the mold is shown as Fig. (**5**). The male mold and the female mold is shown as Fig. (**6**).

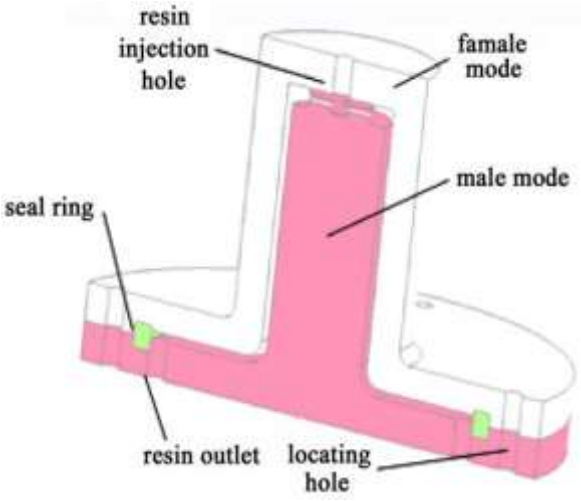

Fig. (5). Half sectional view of the mold.

Fig. (6). Photos of the male mold and the female mold.

Fig. (6). Photos of the male mold and the female mold

4.2. Forming

In the three-dimensional braided carbon-fiber composite flange, the base material is TDE - 85# epoxy resin, and the reinforcement material is carbon fiber. Also, 70# anhydride is chosen as the curing agent, and aniline is chosen as the accelerant. Upon curing, the resin, curing agent and the accelerant is mixed in the ratio of 100:113.7:0.1, and the curing is carried out at an injection pressure of 0.3mpa and at 85^0C for one hour, then raised to 120^oC for another one hour, followed by natural cooling and releasing. The flange joint is shown as Fig. (**7**).

Figure 7 - Advanced composite material flange.

5. TESTS

Through the tensile and bending tests of advanced composite material flange, the mechanical properties of which is obtained, and in conjunction with the tensile and bending tests of aviation aluminum alloy flange, the mechanical properties of both are compared. In the tests, the physical dimensions and the test methods of the aviation aluminum alloy flange are in accordance with those of the advanced composite material flange.

5.1. Tensile Tests of Advanced Composite Material Flange

A tensile test is carried out to the flange joint to test its tensile property. Currently, there are no test criteria as reference on the mechanical properties of composite material flange joints. The present paper designed the above mentioned experiment according to the operating requirements of the flange. The loading rate of the testing machine is 0.5mm / min, and the loading mode for tensile test of the flange joint is shown as the Fig. (**8**).

Fig. (8). Composite material flange tensile test.

As observed by the test, when the experimental load reached 20000N, the specimen started to make a cracking sound. As the load continued, the bolt holes for connecting of the flange started to deform, after which, a crack was first seen at the round corner which connects the flange disc and the flange cylinder. At last, the whole round corner of the flange neck and the flange disc were seriously deformed, and the flange neck was completely broken. The whole destructed flange is shown as Fig. (**9**).

The load - displacement curve of the flange by the tensile test is shown as Fig. (**10**). It can be recognized in the curve that the whole test curve of the flange is changed as a line. The load is decreased rapidly after reaching a maximum of 29321N, and the test is finished after the load is decreased to 24000N, by then the flange is completely damaged.

Fig. (9). Destroy of the composite material flange by the tensile test

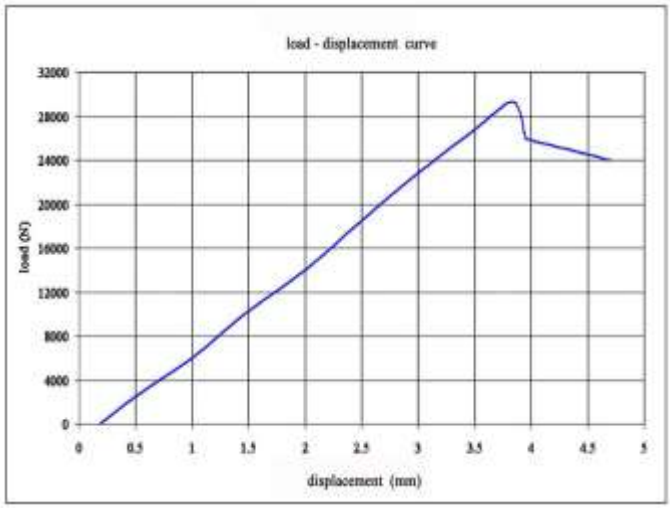

Fig. (10). Load - displacement curve of the composite material flange by the tensile test.

5.2. Bending Tests of Advanced Composite Material Flange

A bending test is carried out to an advanced composite material flange joint, to measure its bending property. Considering the use and the stress conditions of the flange joint on the aerostat truss structure, the present paper designed an experiment program: the distance between the bearings of both sides of the specimen is 520mm, the distance from the loading head to the bearing is 260mm, and the loading rate of the test machine is 0.5mm / min. The bending test of the flange joint is shown in Fig. (**11**).

Fig. (11). Composite material flange bending test.

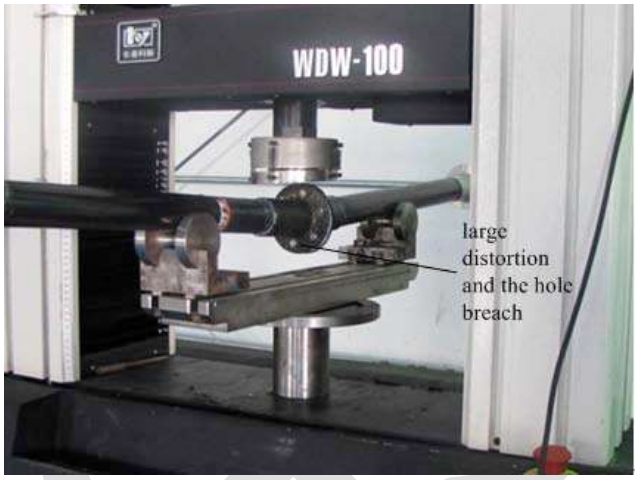

Fig. (12). Destroy of the composite material flange by the bending

As observed by the test, when the experimental load reached 3620N, the specimen started to make a cracking sound. As the load continued, the sound did not stop, and the connecting bolt holes at the down side of the flange started to deform, after which, a crack condition appeared at the transition round corner near the bolt holes. Along with the increasing of the load, the crack enlarged and extended along both sides. At last, the flange disc was seriously deformed. The destructed form of the whole flange by the test is shown as Fig. (**12**). The load - displacement curve of the flange bending test is shown as Fig. (**13**). From the load curve, it can be seen that the whole test curve of the flange is basically changed in line.

The slope of the curve is slightly decreased when the load reaches 4000N. After the maximum of 5110N, the load rapidly drops, and when the load draps to 3800N, the test is stopped, by then the flange is completely damaged.

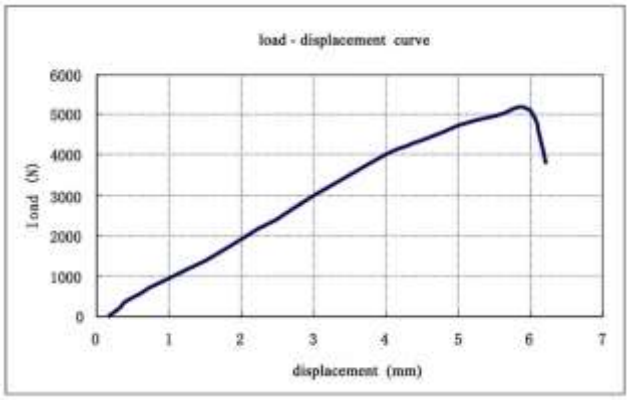

Fig. (13). Load - displacement curve of the composite material flange by the bending test.

Fig. (14). Aviation aluminum alloy flange tensile test.

Fig. (15). Destroy of the aviation aluminium alloy flange by the tensile test.

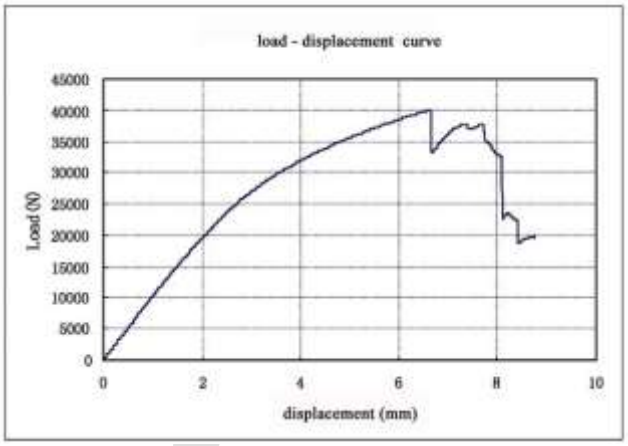

Fig. (16). Load - displacement curve of the aviation aluminium alloy flange by the tensile test.

5.3. Tensile Tests of the Aviation Aluminum Alloy Flange

Referring to the tensile test method of advanced composite material flange, the tensile test of aviation aluminum alloy flange is carried out. The flange is fixed with the test machine by adhesively bonding carbon fibre pipes. The loading rate of the test machine is 0.5mm / min. The loading test is shown as Fig. (**14**). When the load reaches 30000N, the flange begins to deform, and when reaching 40000N, the bolt holes crack and the flange is destroyed. The destroyed flange is shown as Fig. (**15**). with the bearing by adhesively bonding carbon fibre pipes. The distance between two bearings is 520mm, the distance from the bearing to the center loading point is 260mm, and the loading rate of the test machine is 0.5mm / min. The bending test is shown as Fig. (**17**). When the load reaches 4500N, the flange begins to deform, and when reaching 6150N, a bigger deform appears at the bottom of the flange, by then the test is stopped. The deform condition is shown as Fig. (**18**).

The load - displacement curve of the tensile test of a typical metal flange is shown as Fig. (**19**). The whole load curve is basically changed in line, although the load vibrates in small amplitude after 5800N. When the load reaches its maximum of 6150N, the flange is largely deformed and the test is stopped.

Fig. (17). Aviation aluminium alloy flange bending test.

Fig. (18). Deform of the aviation aluminum alloy flange by the bending test.

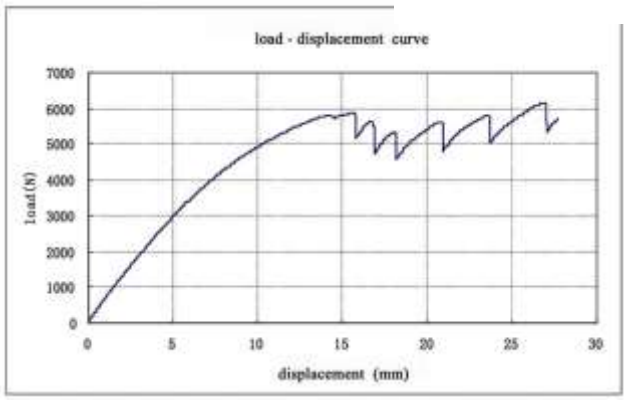

Fig. (19). Load - displacement curve of the aviation aluminum alloy flange by the bending test.

5.5. Summary of the Tests

As is known from the tensile and bending tests of the advanced composite material flange and the aviation aluminum alloy flange, under the condition of same physical dimension, the tensile and bending properties of the advanced composite material flange are slightly lower than those of the aviation aluminum alloy flange. However, the weight of the former is 57% of the latter, thus under the condition of same weight, the tensile property of the advanced composite material flange is 1.28 times of that of the metal flange, and the bending property 1.45 times. The equivalent mechanical properties of the former are apparently better than those of the latter.

7. CONCLUSION

The present flange is manufactured by a weaving perform and the RTM forming process. The manufacturing process is feasible and the processing efficiency is high. By this process, three-dimensional braided composite material joint can be manufactured in mass production. The carbon fiber braided composite material joint in concern with the present paper is better than aviation aluminum alloy joint under the condition of the same quality, which suggests that the carbon-fiber composite flange joint researched in the present paper has obvious advantages in substituting aluminum alloy joint in the manufacturing of the truss structures for stratosphere aerostats. The use of advanced composite material flange connecting pieces has solved the problems of electrical erosion and thermal stress which existed in carbon fibre composite truss structure when using traditional metal connecting pieces. In conjunction with the results of the finite element analysis, mechanical properties can be further enhanced by the improvements of the braiding process, the forming process and the physical dimension.

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Comparative Analysis of Data Mining Algorithms on EHR of Rheumatoid Arthritis of Multiple Systems of Medicine

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Abstract: Data mining techniques are applied usually to uncover concealed knowledge from massive data stacked up in databases. One of the potential fields of Data mining application is healthcare systems in which the increasingly large amount of data are populated in the databases. Such populated databases needs the application of suitable data mining techniques to extract the knowledge patterns which are vital decision making as well as care taking systems. In the field of healthcare enormous amount of data is generated and populated in databases. These databases are vital for knowledge extraction and its uses for futuristic betterment of health of populace. The Electronic Health Record (EHR) database for a disease of Rheumatoid Arthritis is considered in the research work. It includes the data from multiple systems of medicine which include Ayurvedic system of medicine and Allopathic system of medicine. The classification algorithms - BayesNet, Naïve Bayes, ZeroR, JRip, OneR and PART are implemented on EHR of Rheumatoid Arthritis. Results are obtained for 100, 500 and 1000 instances of EHR to encompass a comparative approach for analytics.

Keywords: Data mining, Electronic Health Record (EHR), Rheumatoid Arthritis (RA), multiple systems of medicine, Classification algorithms, BayesNet, Naïve Bayes, ZeroR, JRip, OneR and PART

I. INTRODUCTION

To uncover the hidden information from these large databases data mining techniques come at the aid. The uncovered information usually includes relationship and patterns within these datasets subjected to clustering and classification. The organized uncover information takes the shape of a knowledgebase which is vital information.

There was also the introduction of new methods for knowledge representation in addition to traditional statistical analysis of data. It was recognized that information is at the heart of any field operations and decision-makers could make use of the data stored to gain valuable insight into it. Data Mining or Knowledge Discovery in Databases is the process which helps to fetch the knowledge from the bundle of information [1]. Clinical databases have accumulated large quantities of information about patients and their medical conditions. Relationships and patterns within these data could provide new medical knowledge [2].

Data mining has many different techniques like Association, Classification, Clustering, Prediction etc. out of that here classification techniques are applied on dataset as it is more relevant for retrieving result according to literature survey. Classification is a task of predicting the value of a categorical variable (target or class) by building a model based on one or more numerical and/or categorical variables (predictors or attributes).

Classification is a data mining function that assigns items in a group to target classes. The purpose of classification is to accurately envisage the target class for each case in the data. [3] Here the proposed system model will also classify the records based on the available dataset of EHR. The EHR used for the research study is including the multiple systems of medicine and is unique itself [4]. The Ayurvedic system of medicine and allopathic system of medicine is taken in EHR [5].

From the classification techniques algorithms - BayesNet, Naïve Bayes, ZeroR, JRip, OneR and PART are taken as benchmark for the study of the proposed model.

II. CLASSIFICATION TECHNIQUES

In this paper five classification techniques BayesNet, Naïve Bayes, ZeroR, JRip, OneR and PART are selected to apply on the database and deriving results from it using Weka tool. Each of this classification technique has its specialty as a classifier.

a. Navie Bayes

The Naive Bayesian classifier is based on Bayes' theorem with independence assumptions between predictors. A Naive Bayesian model is easy to build, with no complicated iterative parameter estimation which makes it particularly useful for very large datasets. [6]

b. Bayes Net

Bayes Nets or Bayesian networks are graphical representation for probabilistic relationships among a set of random variables. Given a finite set $X = \{X_1, \ldots, X_n\}$ of discrete random variables where each variable X_i may take values from a finite set, denoted by $Val(X_i)$. [7]

c. ZeroR

ZeroR is a learner used to test the results of the other learners. ZeroR chooses the most common category all the time. ZeroR learners are used to compare the results of the other learners to determine if they are useful or not, especially in the presence of one large dominating category. In the ZeroR method, the result is the class that is in majority when the attributes are categorical and, when they are numerical. [8]

d. JRip

This implements a propositional rule learner, Repeated Incremental Pruning to Produce Error Reduction (RIPPER), which is proposed by William W. JRip is an inference and rules-based learner (RIPPER) that tries to come up with propositional rules which can be used to classify elements. [9]

e. ONER

OneR, short for "One Rule", is a simple, yet accurate, classification algorithm that generates one rule for each predictor in the data, and then selects the rule with the smallest total error as its "one rule". To create a rule for a predictor, we construct a frequency table for each predictor against the target. It has been shown that OneR produces rules only slightly less accurate than state-of-the-art classification algorithms while producing rules that are simple for humans to interpret. [10]

f. PART

This is a class for generating a PART decision list. It uses separate-and-conquer approach and builds a partial C4.5 decision tree in each iteration and makes the "best" leaf into a rule. [11]

III. IMPLEMENTATION OF CLASSIFICATION TECHNIQUES ON EHR FOR RA:

The above described classifiers are implemented with the Weka tool. This work is targeted to obtain the results in terms of correctly classified instances from the supplemented dataset. Here the EHR dataset is taken of various sizes as to check the consistency in result with respect to number of records in dataset.

IV. EHR FOR RA DATABASE STRUCTURE

Special attributes are selected for designing the EHR of RA with the help of medical experts. It includes general patients' attributes and disease specific attributes. The attributes are selected by considering the vitality of both the system of medicine. The EHR dataset is taken in 3 different sizes of 100, 500 and 1000 for better evaluation purpose.

V. RESULTS & DISCUSSION

The implementation of above selected algorithm is done in Weka environment with 3 different EHR datasets of 100, 500 and 1000. The above Screenshots are for EHR with the dataset 1000 with all five algorithms.

The EHR dataset is subjected to BayesNet, Naïve Bayes, ZeroR, JRip, OneR and PART algorithms. The obtain results are tabulated and analyzed. In Table I Correctly classified instances are given for all this DM algorithms for the mentioned different dataset size. Table II shows the Average of Correctly Classified Instances with implemented DM Algorithms in Weka Environment.

TABLE I

Correctly Classified Instances (in percentage) with implemented DM Algorithms

	DM Algorithms					
	BayesNet	**Navie Bayes**	**ZeroR**	**JRip**	**OneR**	**PART**
Size of Dataset						
100	**53**	**57**	**57**	**49**	**54**	**49**
500	**53.8**	**53.4**	**53.4**	**52.8**	**55.2**	**48.4**
1000	**51.6**	**52.1**	**50.4**	**51.8**	**50.4**	**52.8**

VI. GRAPHICAL REPRESENTATION OF THE RESULTS WITH DIFFERENT CLASSIFICATION ALGORITHMS

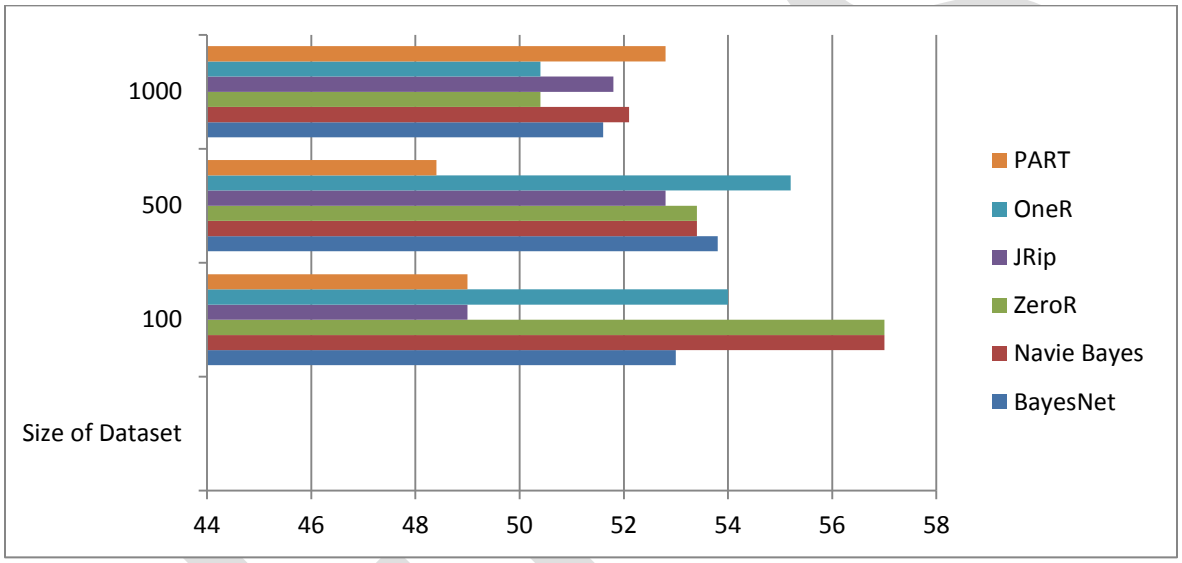

Fig. 6: Graphical representation of the Results with different classification algorithms

TABLE III

Average of Correctly Classified Instances with implemented DM Algorithms

	DM Algorithms					
	BayesNet	**Navie bayes**	**ZeroR**	**JRip**	**OneR**	**PART**

Average of correctly classified instances	**52.8**	**54.167**	**53.6**	**51.2**	**53.2**	**50.067**

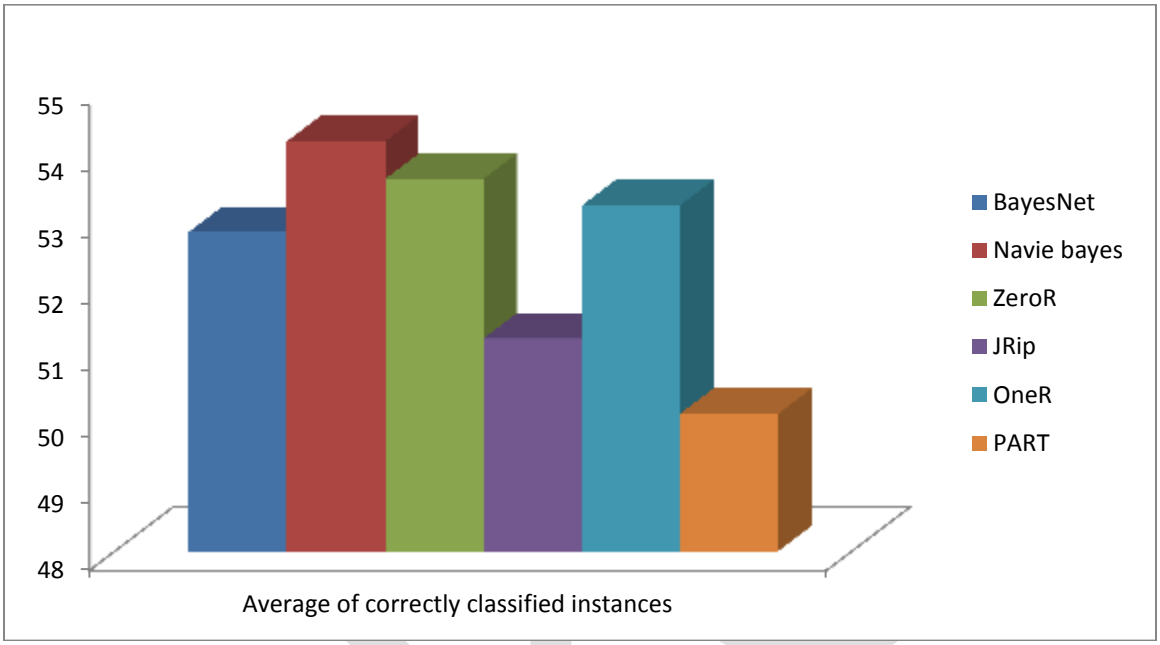

Fig. 7: Average of correctly classified instances with different classification algorithms

Result can be analyzed from the above tested data. The results of BayesNet are improved from 53 to 53.8 if the size of dataset is increased but again when data size becomes 1000 results are decreased to 51.6. In Naïve Bayes results are decreases from 57 to 53.4 when data size becomes 500 and again it decreases to 52.1 when data size grows to 1000. In ZeroR results are decreased from 57 to 53.4 when data size is increased to 500 and again it decreases to 50.4 when data size grows to 1000. In JRip results are increased from 49 to 52.8 when data size becomes 500 from 100. But again when data size increases to 1000 results are decreased to 51.8. In OneR results are increased from 54 to 55.2 when data size increases to 500. But again the result decreases to 50.4 when data size grows to 1000. In PART result decreases from 49 to 48.4 when data size increases up to 500, but when data size grows to 1000 the result is increased from 48.4 to 52.8.

The result analysis reveals that Naïve Bayes has comparative good results as compare to other algorithms in terms of consistency and average of correctly classified instances. But still improved results are desired to benefit more no of patients.

VII. CONCLUSION

The result of classification algorithms applied on different size of EHR of Rheumatoid Arthritis has been evaluated from the above tables and charts. These results show that Naïve Bayes has good results as compare to other algorithms in terms of consistency

and average of correctly classified instances. By modifying the Naïve Bayes algorithm some improved algorithms can be designed to achieve better level of consistency and better results based on the EHR of single disease. The modified algorithm SSOM has been designed for the improved results and will disclose in the subsequent research paper. As SSOM has good results more number of patients can be benefited in the selection of system of medicine. By following Optimal Data Analysis (ODA) technique the accuracy can be refined further [12] [13].

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Fuzzy Logic Based Spectrum Sensing Technique for Cognitive Radio

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Abstract.- A cognitive radio is a type of intelligent radio system. It automatically detects available spectrum in a given frequency band. It automatically and intelligently changes its parameters. These parameters include transmission and reception. Therefore, frequent wireless communication is achieved for a given frequency band at specific location. There are multiple techniques used to sense and avail the spectrum in a cognitive radio. Most important among them are spectrum sensing, spectrum mobility, spectrum management and spectrum sharing. Many regulatory bodies in world have found that most radio frequency spectrum is utilized in efficiently. we all know that Cellular network bands are overloaded due excessive use but other bands (like for military and paging frequencies) are insufficiently utilized. Basically utilization of spectrum is dependent on two factors which are time and place. The crux of this research is to design and simulate a controller in MATLAB for SS using FLT. We chose two inputs one is mobility of SU and transmit power. Output is Saa. We defined membership functions for inputs and output. Analyze system and calculate outputs to get minimum percentage error difference between calculated and simulation end results.

Key Words: Ttransceiver (Transmitter & receiver). FL (Fuzzy Logic), FIS (Fuzzy Inference System). Secondary User (SU),

FLC(FuzzyLogicController),Saa (SpectrumAccessAvailiability),SS(SpectrumSensing),FLT(FuzzyLogicTechnique)

1: INTRODUCTION

The term "fuzzy logic" was introduced by Lotfi A. Zadeh, Professor while he taught in University of California at Beckley in 1965. Fuzzy logic has been utilized in many sectors like different domestic goods, microwave ovens, vacuum cleaners and other intelligent systems. Unlike ordinary binary system, the range of values would be in between 0 to 1. We designed and implemented a controller which can replace complex algorithms and designs. At present, wireless communication system has allocated and fixed frequency spectrum. And this is not accessible for unlicensed users. Even, this spectrum is not in use. Regulatory bodies in the world have been considering whether to allow unlicensed users in licensed bands if they would not cause any interference to licensed users. Due to above discussion, overall scope of research on cognitive radio in enhanced for dynamic spectrum access

2: LITERATURE REVIEW

2.1 Cognitive Radio

Cognitive radio basically works in such a manner that it automatically adjust/adapts its parameters according to network and user demand. And this is achieved by complete reconfigurable wireless transceiver. Federal Communications Commission in the United States and Ofcom in the United Kingdom have found that most of radio frequency spectrum is inefficiently utilized. Many Cellular network bands are not completely utilized and are overloaded in many parts of the world. Basically, utilization of spectrum is dependent on time and place. Fixed and already allocated frequency bands don't allow other user to use it even when it is not being used. Regulatory bodies in world are considering whether to allow unlicensed users in licensed frequency bands without any interference. This research leads to cognitive radio for dynamic spectrum access. Actually Cognitive Radio systems access spare sections of the radio frequency spectrum. And it keeps monitoring the spectrum to ensure that this does not cause any undue interference. Designed Cognitive radio spectrum should be capable to detect any other transmissions, analyse it. Then it should be informed to central processing unit within the Cognitive Radio so that the required action can be taken [1].

Cognitive radio performs three main tasks. First is spectrum sensing second is spectrum analysis and third is spectrum allocation. The main function of Spectrum sensing is to get spectrum usage characteristics. While having multiple dimensions like space, frequency, time and code and determining what type of signals are occupying the spectrum [2].

In this paper, we propose a novel approach using Fuzzy Logic System (FLS) to control the spectrum access. The linguistic knowledge to access the desired frequency spectrum is based on three main factors.First, how much secondary user has spectrum utilization efficiency,second, its degree of mobility, and third , its distance to the primary user. This technique will chose a frequecny spectrum which has maximum possiblility to use frequency spectrum [3].

2.2 Spectrum Sensing Technique

Some studies have revealed that utilization of spectrum is dependent on two things. One is time and other is place. Already allocated frequency bands don't allow other users to use this band even when it is not being used. Many regulatory bodies in world are considering this point, whether to allow unlicensed users in licensed frequency bands without any interference. This research leads us to cognitive radio for dynamic spectrum access. Actually, Cognitive Radio systems access spare/unused sections of the radio frequency spectrum. Also, it keeps monitoring the spectrum to make ensure that this does not cause any undue interference. Designed Cognitive radio spectrum should be capable to detect/analyse any other transmissions in region. Then it should be informed to central processing unit within the Cognitive Radio so that the required action can be taken. [4]
In this work, a spectrum sensing controller is designed by using fuzzy logic in MATLAB. Cognitive radio performs following three main tasks. One is spectrum sensing, second is spectrum analysis and third is spectrum allocation. Cognitive Radio presents a technique for utilizing the spectrum holes. Spectrum usage has its characteristics. These characteristics have many dimensions like

1. Time
2. Space
3. Frequency
4. Code
5. Type of signals for spectrum. [5]

The opportunistic spectrum access has become the most feasible approach to achieve near-optimal spectrum utilization. Which is achieved by secondary users to locate and contact available frequency spectrum opportunistically. However, an immature spectrum access for secondary users can make different problems like inefficient spectrum utilization and increase interference to nearby users.
We have to minimize the call blocking and interference. Spectrum access in terms of linguistic knowledge is based on three descriptors namely

1. Spectrum utilization efficiency of the secondary user
2. Its degree of mobility
3. Its distance to the primary user.

The spectrum is chosen for accessing which is based on the maximum possibility for better utilization of the spectrum. [6]

2.3: Fuzzy Logic Technique

In this paper, We design a controller in which we have two inputs and one output fuzzy logic is MATLAB tool which is used to design a controller. Fuzzy logic technique is used to analyse nonlinear systems. It deals with those systems which are difficult to resolve using conventional mathematical models.
The concept of fuzzy logic to solve the problem has been reported first time by Lotfi Zedeh. He also reported the concept of linguistic variables. For designing, here we utilize mamdani model in fuzzy logic tool to control different parameters of cognitive radio.
As shown in figure that two parallel systems doing same control function. One is fuzzy logic base system and other is non fuzzy logic base system. In fuzzy logic design, we deals only three steps:- first is understand physical system. Secondly control requirement and the third is design the controller by using fuzzy rules. Simulate and implement design. Fuzzy logic includes different processes in itself such as

1. fuzzification
2. defuzzification
3. membership functions domain
4. Linguistic variables and rules

Domain determines the range of values in which membership of fuzzy is defined. The basic part of fuzzy sets is membership function. The relation between a domain value and its degree of membership is determined by membership function. Fuzzy logic has many similarities and differences with Boolean logic. Fuzzy logic performs Boolean logic results when all the fuzzy membership functions have range from 0 to 1.FL uses natural/common language techniques and variables. These are based on the degree of truth. And it is easier to understand for human beings.

Fuzzy control is based on fuzzy logic. FL provides us an effective means of confining, approximate, inexact nature of real world. The important part of this logic is linguistic control rules. Rules are defined by our requirements based on if-then statements. Then fuzzy logic controller provides an algorithm which convert linguistic control strategy into an automated control system. Fuzzy logic controller is an approach between mathematical control model and human decision making control/ approach [7].

In this paper work author design a control system for elid grinding . This control system avail fuzzy logic design consist of four inputs and matlab based fuzzy tool having output to control the system[8].

Ahmed .Zahoor. etl narrates the control system in this paper for Automatic night switch to operate the lightning ON/OFF according to the conditions and requirements. Fuzzy Logic tool is used for this designing. In this control system, two inputs light, fog and one output lamp[9] .

Ashraf.waseem.etl describes in this paper about simulation and designing of a fuel consumption control system with the help of fuzzy logic technique. This research can plays a vital role to enhance the performance of the fuelling system of the vehicles depending upon there speed and load. MATLAB based fuzzy-simulation is used to achieve the our goal[10].

Mushtaq.Z.etl explains the control system for liquid level control for many applications. our work is to control the liquid level of a container/boiler. PID and PI also been used to control the level of a tank. We used fuzzy logic technique for liquid .controller consist of two input one is level of fluid in the tank and drain/consumption of fluid from the tank. He used fuzzy inference system with specific defined rules by using valve as output[11].

Khan.saleem.etl describe the system for time control for industrial applications using fuzzy logic based DEV processing system [12].

3: MATLAB SIMULATION

Our (FLC) fuzzy logic controller consists of two input parameters and one output parameter. These parameters used for spectrum sensing technique for cognitive radio, there are many other important parameters that can also be used for the same purpose. We consider mobility of secondary users and transmit power as input for controller and spectrum access availability as an output parameter for FLC

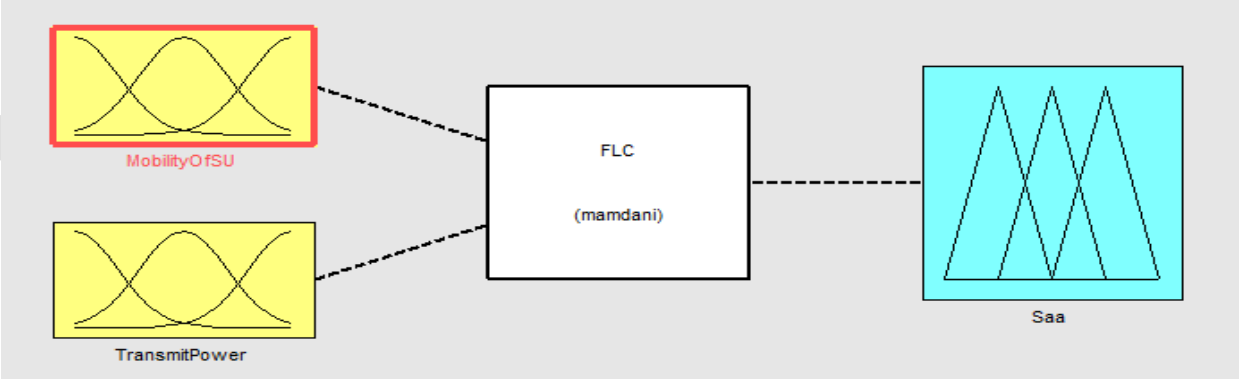

Fig 1: FLC model

Now we discuss input and output parameters separately with their specific ranges and membership functions. Mobility of secondary user having ranges from 0 to 100% .This range defines three membership functions and two regions. Three membership functions are slow from 0 to 50, Adequate (Adeq) from 0 to 100 and fast from 50 to 100. Region 1 having membership functions slow and Adequate and Region 2 Adequate and fast.

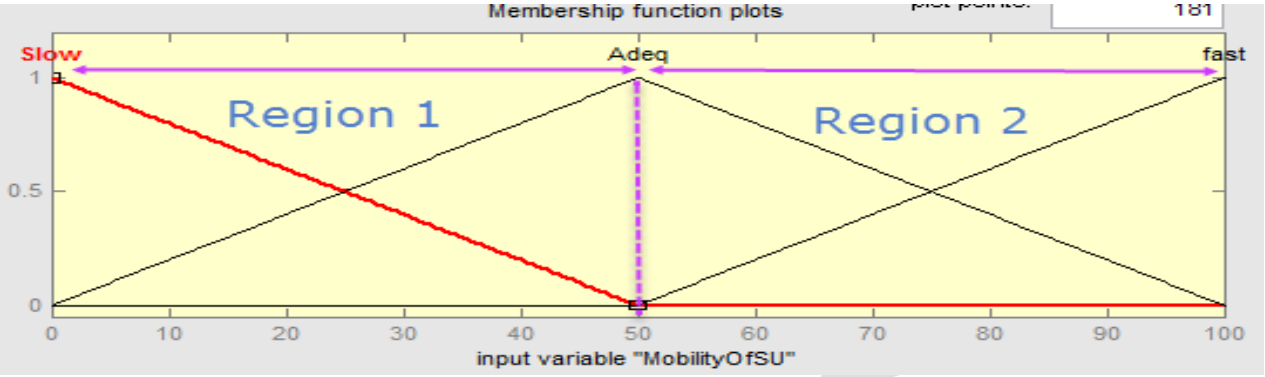

Fig 2: Membership functions of input Mobility of SU.

In second input parameter Transmit Power it consist of two regions and three membership functions. These membership functions are minimum (min) , Medium (med) , maximum (max) , having ranges 0 to 50 and 0 to 100 and 50 to 100.Minimum to Medium are in Region 1 and Medium to Maximum are in Region 2.

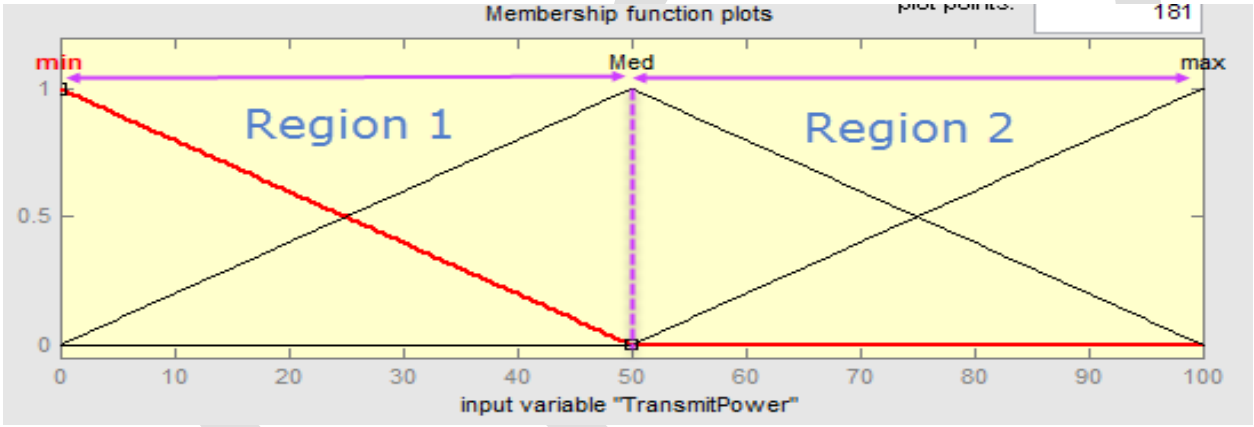

Fig 3: Membership functions of input Transmit Power

Output parameter for spectrum sensing of cognitive radio spectrum access availability. It also consist of three membership functions small, normal and large. Their ranges are from 0 to 50, 0 to 100 and 50 to 100.

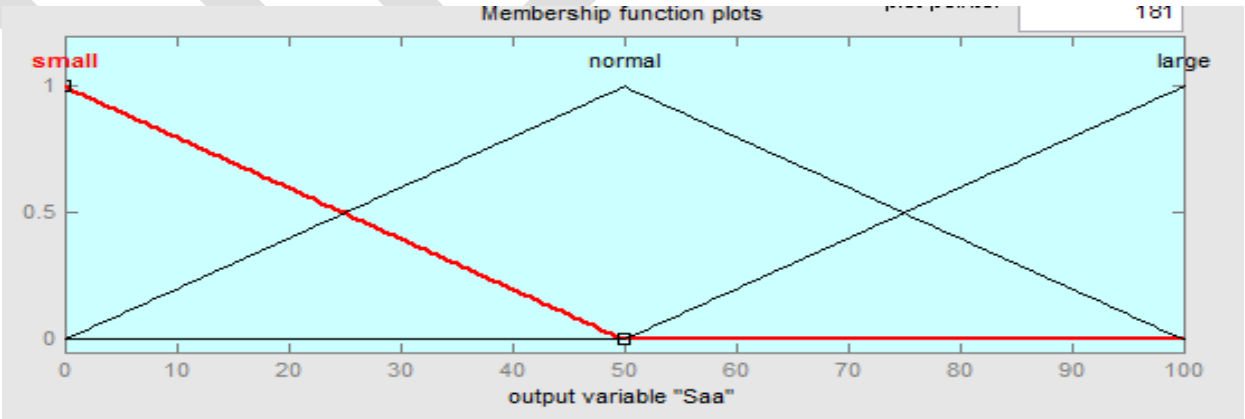

Fig 4: Membership functions of Output Saa.

Membership functions	Ranges in %	Mobility of SU	Transmit Power	Spectrum Access Availability (Saa)
MF1	0 to 50	Slow	Minimum(min)	Small
MF2	0 to 100	Adequate	Medium (med)	Normal
MF3	50 to 100	Fast	Maximum (max)	Large

Table 1: Ranges of input and output membership functions

4: FUZZY RULES

The fuzzy rules upon which FLC behave depends upon 'if' and 'then' statements. These fuzzy rules can be find out with the help of formula

$m^n = 3^2 = 9$.

Here m = inputs memberships functions.

And n = total number of inputs.

IF			THEN
Rules	Mobility of SU(MOSU)	Transmit Power (TP)	Spectrum Access Availability(saa)
R0	Slow	Min	Small
R1	Slow	Med	Small
R2	Slow	Max	Normal
R3	Adeq	Min	Small
R4	Adeq	Med	Normal
R5	Adeq	Max	Large
R6	fast	Min	Normal
R7	fast	Med	Large
R8	fast	Max	Large

Table 2: Rules used in FLC

Fig shown below is fuzzy logic rules editor which is used to edit ,modify and arrange the fuzzy rules that will be used in FLC. We can also made different arrangement regarding the selection of OR & AND logic. Here we used AND logic between the rules. Controller will follow these rules to specify future decisions.

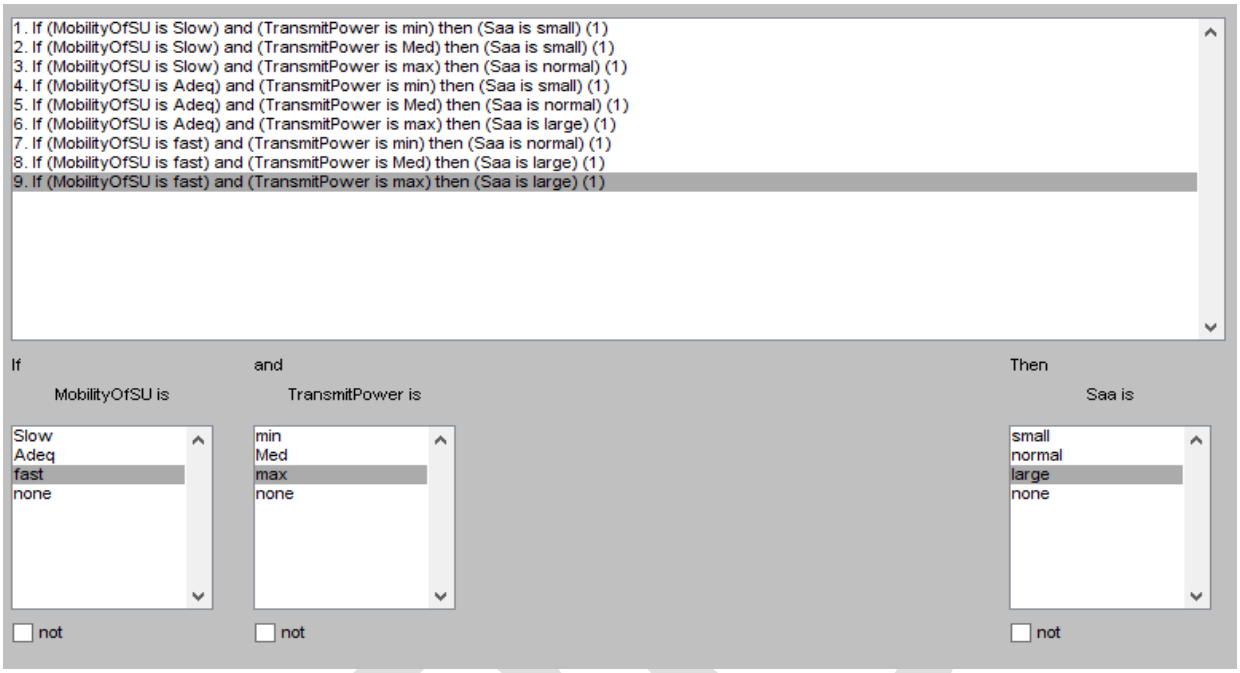

Fig 5: Fuzzy Logic Rules used in editor for FLC

The figure as below shows rule viewer with inputs and outputs values for the fuzzy logic controller. This figure is consider as a Mat lab simulated results for desired output.

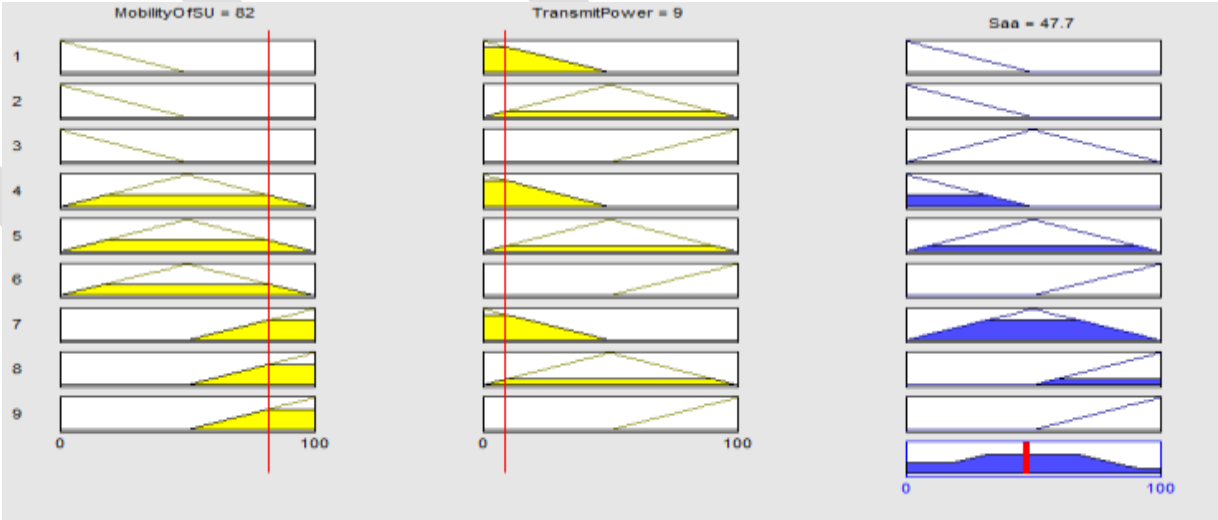

Fig 6: Rule Viewer for FLC.

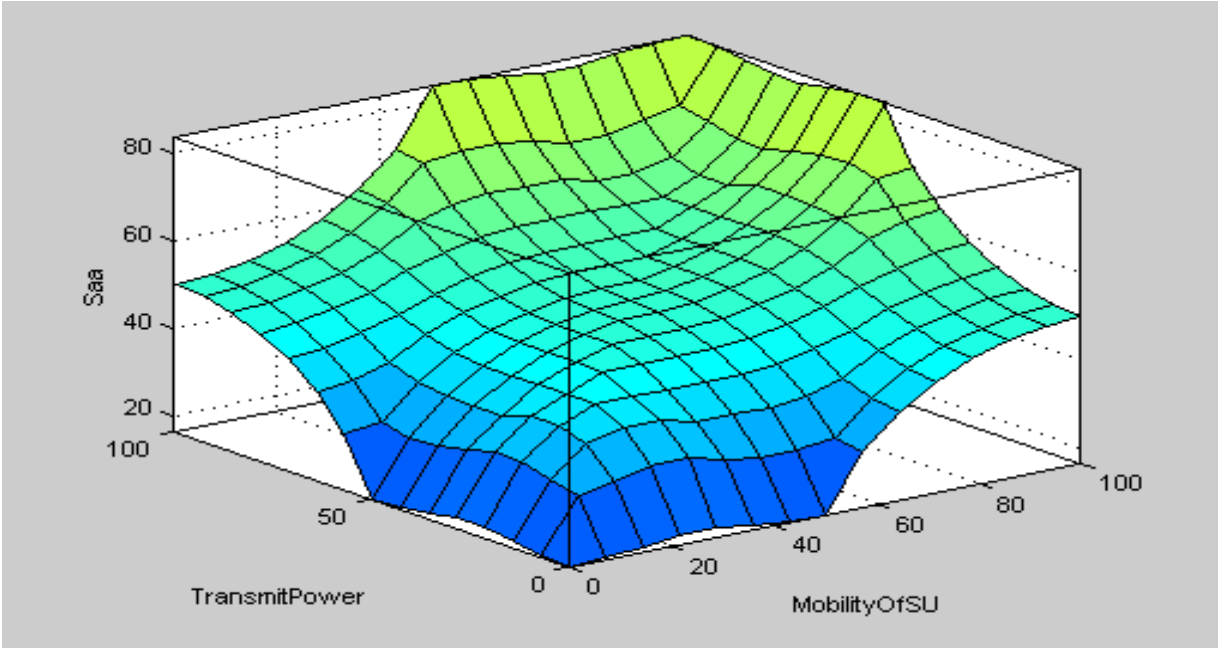

Fig 7: graphical overview of surface of Fuzzy Logic Controller

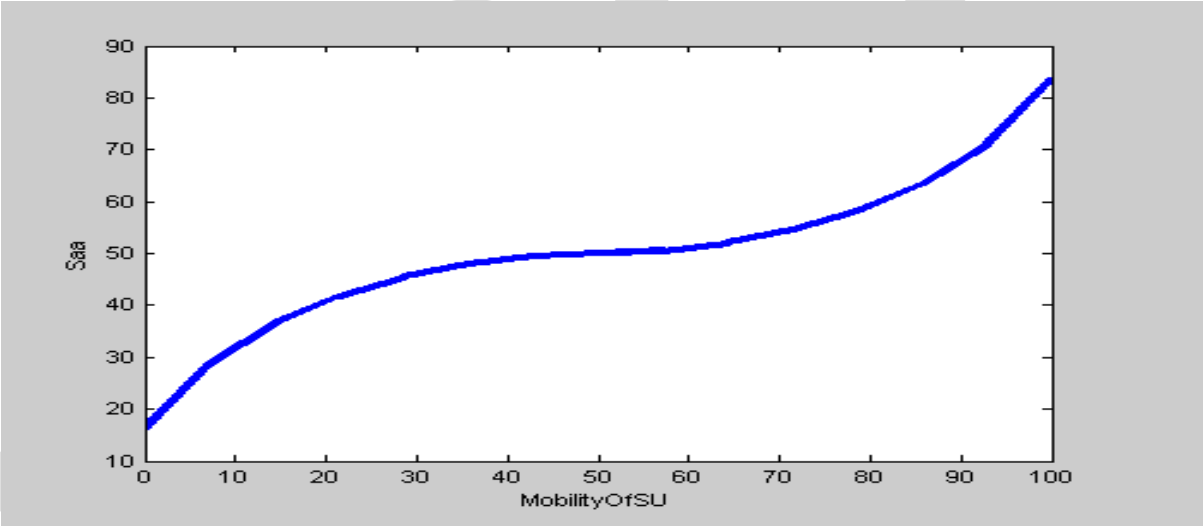

Fig 8:Two dimensional graph of Input w.r.t Output.

5:MATHEMATICAL ALGORITHM DESIGNING FOR FLC

The input and output values are in percentage the software oriented values are as below

MobilityofSU = 82, Transmit Power = 9, and output value = 47.7.As there are two different model in a fuzzy logic system Sugeno and Mamdani we are using Mamdani model for designing most of the nonlinear problems can be achieve by this.

(∑Ri *Si/∑Ri) * 100.

5.1) Mobility of Secondary Users (SU)

It is an input parameter for having values in percentage having two regions and three membership functions slow, Adeq and fast. We consider a value which is in region 2 and the membership functions involve in this region are Adequate (Adeq) and fast. We firstly find the linguistic variables separately for Mobility of Secondary Users its linguistic variables are f1 and f2.

The figure as below is the surface viewer graphical over view of the effects and behaviors of respective inputs with desired output. Here is the figure showing the nonlinear behavior of input without put. Each input behaves in a same manner separately with their output.

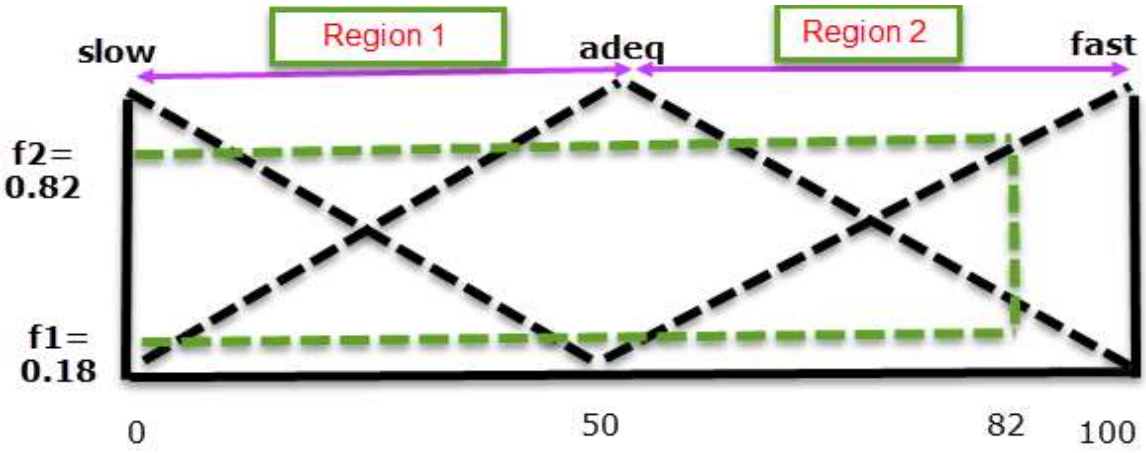

Fig8: Linguistic variables f1 and f2 for Mobility of SU

f1 =100 – 82/100 = 18/100 = 0.18

f2= 1 – 0.18 = 0.82

5.2) **Transmit Power**

Second input parameter for the FLC is Transmitted Power having two linguistic variables three membership functions. Specific value used is in region 1 involving two membership functions.

Minimum (min) and medium (med).Linguistic variables involve in this are f3 and f4.

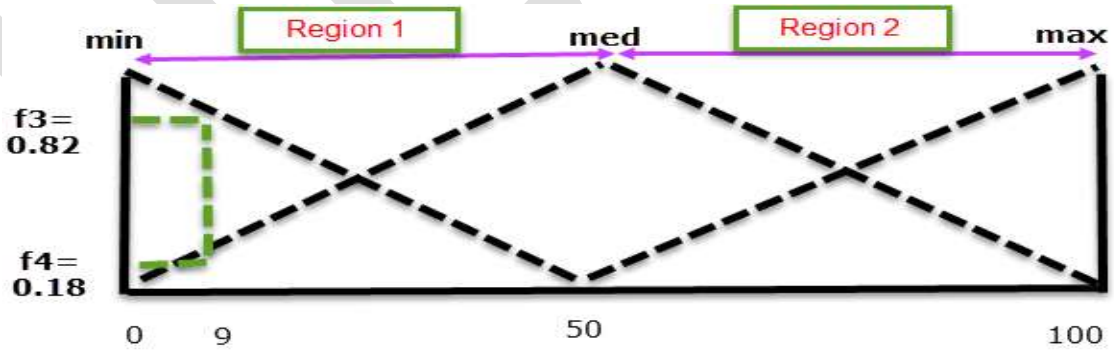

Fig 9: Linguistic variables f3 and f4 for Transmit Power

f3 = 50 – 9/50 = 41/50 = 0.82

f4 = 1-0.82 = 0.18

6: RESULTS

After finding the composite rules and their values by using linguistic variables its singleton values calculated.

Rules Numbers	Membership functions Values
R0	f1 ^ f3 = 0.18^0.82 = 0.18
R1	f1 ^ f4 = 0.82^0.18 = 0.18
R2	f2 ^ f3 =0.82^0.82 = 0.82
R3	f2 ^ f4= 0.82^0.18 = 0.18

Table 3: Composite Rules Values

Rules	Mobility of SU	Transmit Power	Saa	Single ton Values
R0	Adeq	min	Small	0
R1	Adeq	med	Normal	0.5
R2	Fast	min	Normal	0.5
R3	Fast	med	Large	1

Table 4: Singleton Values for Composite Rules

Mamdani Model

$(\sum Ri * Si / \sum Ri) * 100$

$\sum Ri = 0.18+0.18+0.82+0.18 = 1.36$

$\sum Ri * Si = 0.18*0+0.18*0.5+0.82*0.5+0.18*1 =0+0.09+0.41+0.18 = 0.68$

After putting values in Mamdani Model formula

0.68/1.36 *100 = 50

Mat lab simulated value for Spectrum access availability = 47.7

Difference = Mathematically Model value – Mat lab Simulated value

= 50 – 47.7 =2.3

Error Rate=2.3/47.7 *100 = 4.8%

7: ERROR's

Total error rate between simulated & designed value

Results	**Output Value**
Mat lab Simulated Value	47.7
Mathematically Designed Value	50
% Error	4.8

Table 5: Error Rate

8: DISCUSSION AND CONCLUSIONS

This paper concludes the software and mathematical design base FIS for cognitive radio spectrum sensing .As there are many input parameters use to locate spectrum by sensing its path. We use fuzzy logic technique for this purpose. After simulation and different mathematical calculation the total error rate among them is 4.8% which shows the prove of successful hardware system if implemented.

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Direct Torque Control of Induction Motor With Fuzzy Logic for Minimization of Torque Ripples

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Abstract -The induction motor, which is the most widely used motor type in the industry, has been favored because of its good self-starting capability, simple and rugged structure, low cost and reliability etc. Over last few decades, Direct Torque Control (DTC) is known to provide high dynamic performance and also fast and robust response for induction motors (IM). Conventional DTC produces notable torque and flux ripples. Several techniques have been developed to improve the torque performance. In this paper, Fuzzy Logic Direct Torque Control (FLDTC) has been suggested to improve the system performance which gives better torque and flux response and also reduces the undesirable torque ripple

Keywords – Direct torque control (DTC), Fuzzy logic direct torque control (FLDTC), Induction motor, D-Q Model

1 INTRODUCTION

IN the mid – 1980s, an advanced scalar control technique, known as direct torque and flux control or direct self-control, was introduced for voltage fed PWM inverter drives. This technique was claimed to have nearly comparable performance with the vector controlled drives. The scheme, as the name indicates, is the direct control of torque and stator flux of a drive by inverter voltage space vector selection through a look up table. Conventional direct torque controller mainly consists of two level hysteresis comparator for calculating stator flux error and three level hysteresis comparator for calculating electromagnetic torque error. After determining the stator flux error and electromagnetic torque error the proper state of voltage vector is selected.

2 DYNAMIC D-Q MODEL OF AN INDUCTION MOTOR

In an adjustable speed drive, the machine normally constitutes an element within a feedback loop, and therefore its transient behavior has to be taken into consideration. Besides, high performance drive control, such as vector or field oriented control is based on the dynamic d-q model of the machine.[1]
The voltages vdss and vqss can be resolved into as-bs-cs components and can be represented in the matrix form as

$$\begin{bmatrix} v_{as} \\ v_{bs} \\ v_{cs} \end{bmatrix} = \begin{bmatrix} cos\theta & sin\theta & 1 \\ cos(\theta - 120^0) & sin(\theta - 120^0) & 1 \\ cos(\theta + 120^0) & sin(\theta + 120^0) & 1 \end{bmatrix} \begin{bmatrix} v_{qs}^s \\ v_{ds}^s \\ v_{0s}^s \end{bmatrix}$$

The corresponding relation is

$$\begin{bmatrix} v_{qs}^s \\ v_{ds}^s \\ v_{0s}^s \end{bmatrix} = \frac{2}{3} \begin{bmatrix} cos\theta & cos(\theta - 120^0) & cos(\theta + 120^0) \\ sin\theta & sin(\theta - 120^0) & sin(\theta + 120^0) \\ 0.5 & 0.5 & 0.5 \end{bmatrix} \begin{bmatrix} v_{as} \\ v_{bs} \\ v_{cs} \end{bmatrix}$$

The electrical transient model in terms of voltages and currents can be given in matrix form as

$$\begin{bmatrix} v_{qs} \\ v_{ds} \\ v_{qr} \\ v_{dr} \end{bmatrix} = \begin{bmatrix} R_s + SL_s & \omega_e L_s & SL_m & \omega_e L_m \\ -\omega_e L_s & R_s + SL_s & -\omega_e L_m & SL_m \\ SL_m & (\omega_e - \omega_r)L_m & R_r + SL_r & (\omega_e - \omega_r)L_r \\ -(\omega_e - \omega_r)L_m & SL_m & -(\omega_e - \omega_r)L_r & R_r + SL_r \end{bmatrix} \begin{bmatrix} i_{qs} \\ i_{ds} \\ i_{qr} \\ i_{dr} \end{bmatrix}$$

Where S is the Laplace operator. For a singly fed motor such as cage motor, vqr = vdr = 0.
The speed ωr cannot be treated as constant. It can be related to the torque and it is given by

$$T_e = \frac{3}{2}\left(\frac{P}{2}\right) L_m\left(i_{qs} i_{dr} - i_{ds} i_{qr}\right)$$

3 ELECTRICAL SUB MODEL OF THE INDUCTION MOTOR

The three-phase to two-axis voltage transformation is achieved by

$$\begin{bmatrix} v_{qs}^{s} \\ v_{ds}^{s} \\ v_{0s}^{s} \end{bmatrix} = \begin{bmatrix} 2/3 & -1/3 & -1/3 \\ 0 & -1/\sqrt{3} & 1/\sqrt{3} \\ 1/3 & 1/3 & 1/3 \end{bmatrix} \begin{bmatrix} v_{as} \\ v_{bs} \\ v_{cs} \end{bmatrix}$$

A. Simulation System of Induction Motor

The complete simulation system of the Induction Motor includes a power supply sub-model and the Induction Motor model. Fig.1 shows the complete simulation model of Induction Motor consisting of all sub models used in MATLAB / SIMULINK.

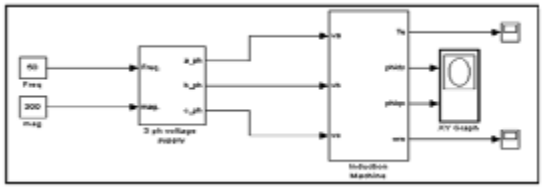


Fig.1 Simulation model of Induction Motor in SIMULINK

4 DIRECT TORQUE AND FLUX CONTROL (DTC)

Direct torque control technique was claimed to have nearly comparable performance with the vector controlled drives. The name direct torque control is derived from the fact that on the basis of the errors between the reference and the estimated values of torque and flux it is possible to directly control the inverter states in order to reduce the torque and flux errors within the prefixed band limits

A. Control strategy of DTC

The block diagram for direct torque control is shown in Fig. 2. The command stator flux ψs* and torque Te* magnitudes are compared with the respective estimated values, and the errors are processed through hysteresis band controller. The flux loop controller has two levels of digital output according to the following relation.[1]

$$H_{\psi} = 1 \text{ for } E_{\psi} > + HB_{\psi}$$

$$H_{\psi} = -1 \text{ for } E_{\psi} < - HB_{\psi}$$

Where 2 HBψ = total hysteresis band width of the flux controller.

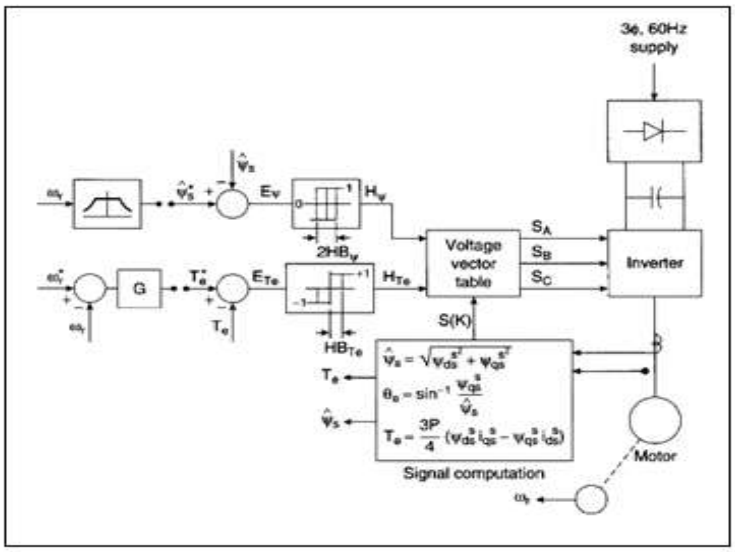


Fig. 2 Block Diagram of DTC

The circular trajectory of the command flux vector ψs* with the hysteresis band rotates an anti-clockwise direction. The actual stator flux ψs is constrained within the hysteresis band and it tracks the command flux in a zigzag path. The torque control loop has three levels of digital output, which have the following relations

HTe = 1 for ETe> + HBTe
HTe = -1 for ETe< - HBTe
HTe = 0 for -HBTe<ETe< + HBTe

The feedback flux and torque are calculated from the machine terminal voltages and currents. The signal computation block also calculates the sector number S(k) in which the flux vector ψs lies. There are six sectors each Π/3 angle wide. The voltage vector block in Fig. 2 receives the input signals Hψ, HTe, and S(k) and generates the appropriate control voltage vector for the inverter by a look up table, which is shown in table 1

Table 1Switching Table Of Inverter Voltage Vectors

Hψ	The	S(1)	S(2)	S(3)	S(4)	S(5)	S(6)
1	1	V2	V3	V4	V5	V6	V1
	0	V0	V7	V0	V7	V0	V7
	-1	V6	V1	V2	V3	V4	V5
-1	1	V3	V4	V5	V6	V1	V2
	0	V7	V0	V7	V0	V7	V0
	-1	V5	V6	V1	V2	V1	V2

B. Switching Selection

Due to the decoupled control of torque and stator flux in DTC, a high performance torque control can be established. If the stator flux lies in sector k with the motor rotating in counter clockwise, active voltage vector VS,k+1 is used to increase both the stator flux and torque. Voltage vector VS,k+2 is selected to increase the torque but decrease the stator flux. The two zero voltage vectors (VS,7 and VS,8) are used to reduce the torque and at the same time, freezes the stator flux. Reverse voltage vector VS,k-2 is used to decrease the torque and flux in forward braking mode. Whereas VS,k-1 will reduce the torque and increase the flux. Table 2 shows flux and torque variations due to applied voltage vector in sector II (Arrow indicates magnitude and direction).

Table 2Flux and Torque Variations Due to Applied Voltage vector

Voltage Vector	V1	V2	V3	V4	V5	V6	V0 or V7
ψs	↑	↑	↓	↓	↓	↑	0
Te	↓	↑	↑	↑	↓	↓	↓

Fig. 3 shows SIMULINK diagram for DTC of IM Drives.

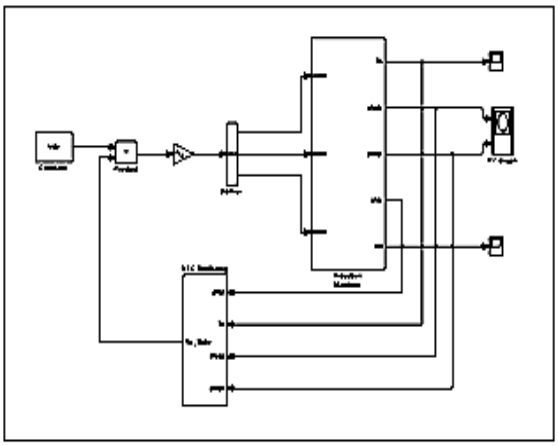


Fig. 3 SIMULINK diagram for DTC of Induction Motor Drive.

5 FUZZY LOGIC CONTROLLER

The Fuzzy Logic Controller is designed to have three fuzzy state variables and one control variable for achieving Direct Torque Control of the Induction Motor. These three input variable are the stator flux error, electromagnetic torque error, and the position of stator flux space vector and the output variable is the voltage space vector.

Each control rule can be described using the state variables flux error, torque error, and flux sector and the control variable 'n' which characterize the inverter switching state. The inference method used in this simulation is Mamdani's procedure based on min-max decision.

For flux linkage error two terms are used for the fuzzy sets i.e. negative value and positive value which are denoted ne and ps respectively. The fuzzy sets are then defined by the triangular membership functions.

For electromagnetic torque error three linguistic terms are used for the fuzzy sets i.e. negative value, zero value and positive value which are denoted by ne, zo and ps respectively. The fuzzy sets for negative value and positive value are defined by the trapezoidal membership functions and for zero value it is defined by the triangular membership function.

The flux sector indicates the position of flux within the path of rotation. The total angle i.e. 3600 is divided into six sectors and these sectors are defined by membership functions 1 to 6. The six numbers i.e. 1 to 6 are used for the fuzzy sets which are denoted by mf1 to mf6 respectively. The fuzzy sets for these sectors are defined by the triangular membership function.

The output of Fuzzy Logic Controller gives the proper selection of switching state. These possibilities are numbered from 1 to 8 at the output of multiport switch. The eight numbers i.e. 1 to 8 are used for the fuzzy sets which are denoted by mf1 to mf8 respectively. The fuzzy sets for these output possibilities are defined by the triangular membership function.

Rule Base For FLC

The proper activities of fuzzy system are based on derivational (inferential) rules, similarly to expert systems. The benefit of such representation of knowledge is the transparency for users. These rules are of type IF and THEN and are illustrated with the help of Look-up table. The total number of rules after their reduction is 36.

Fig. 4 shows SIMULINK diagram for fuzzy logic controller for Direct Torque Control of Induction Motor Drives.

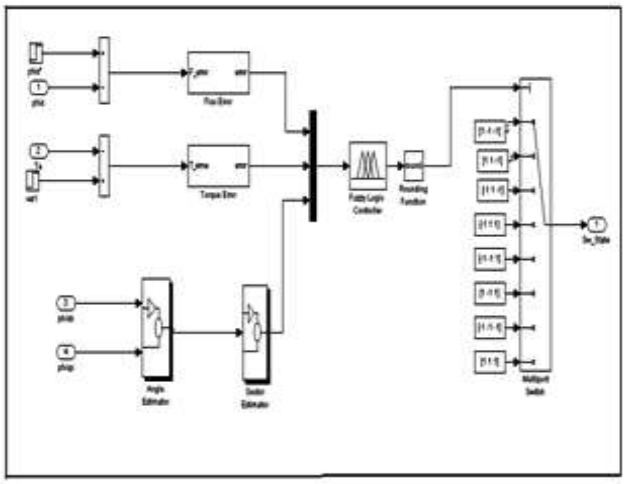
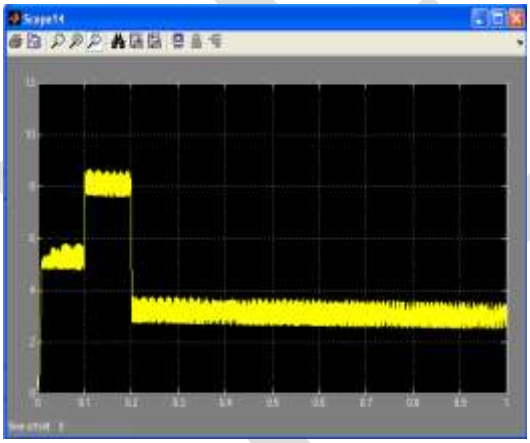


Fig. 4 SIMULINK diagram for fuzzy logic controller for DTC of IM

6 SIMULATION WITH CONVENTIONAL DTC

Simulation of the developed model is done with a Flux reference value and variable Torque reference value with conventional DTC. Fig. 5 to Fig. 7 shows the Torque response, Stator Flux locus and Stator Current obtained using conventional DTC. Fig. 5 shows the Torque response which is less than the reference with some ripples. Fig. 6 shows the locus of Stator Flux. From which it is observed that the value of Stator Flux decreases between the sectors. Fig.7 shows the Stator Current taken by motor which is a sinusoidal in nature. The IM takes high current initially and then it becomes a sinusoidal. For high torque it takes more current as compared to low Torque reference. The current remains constant during constant Torque reference.



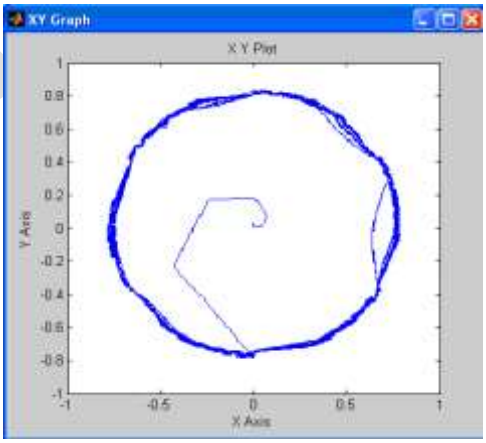


Fig. 5 Torque response obtained using conventional DTCFig. 6 Stator flux locus using conventional DTC

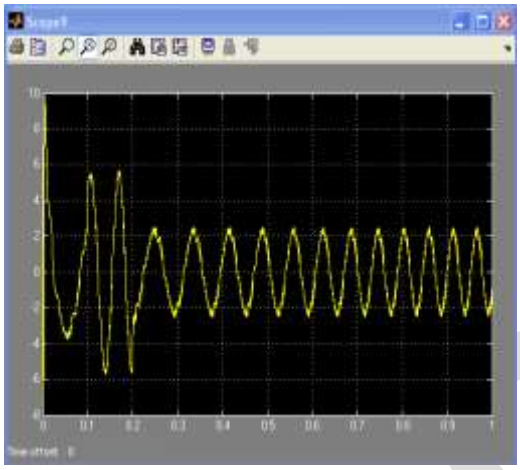
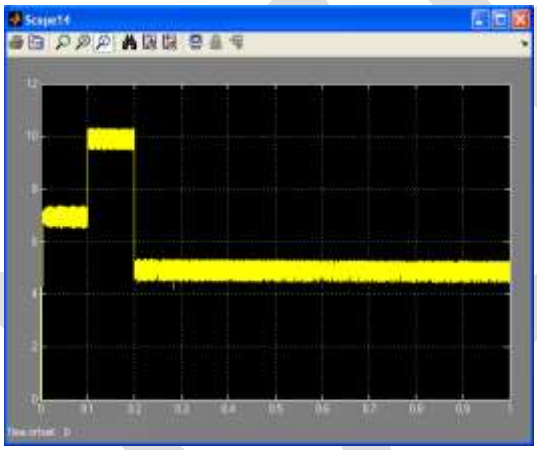


Fig.7 Stator Current using conventional DTC

SIMULATION WITH FLDTC

Simulation of the developed model is done using fuzzy logic direct torque control with the same reference of Flux and Torque used for conventional DTC. Fig. 8 to Fig. 10 shows the Torque response, Stator Flux locus and Stator Current obtained using FLDTC. Fig. 8 shows the Torque response which gives the Torque equal to the reference value with some ripples. Fig. 9 shows the locus of Stator Flux. From which it is observed that the value of Stator Flux remains constant during its circular trajectory. Fig. 10 shows the Stator Current taken by motor which is a sinusoidal in nature which changes according to the Torque.



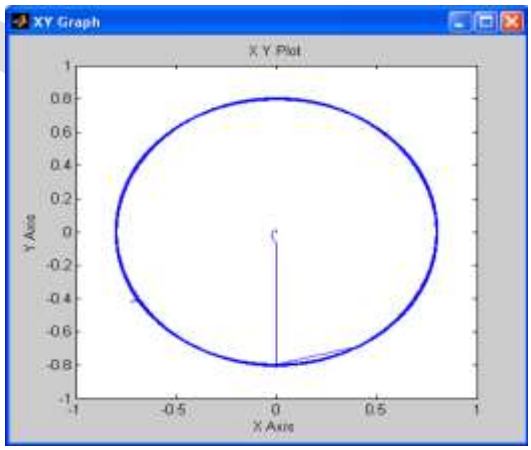


Fig. 8 Torque response obtained using FLDTCFig. 9 Stator flux locus using FLDTC

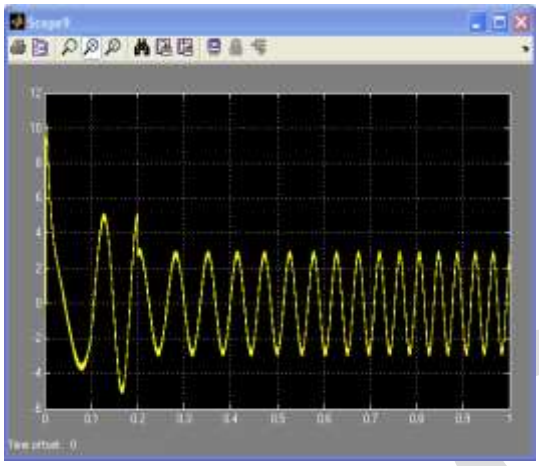


Fig. 10 Stator Current using FLDTC

7 CONCLUSION

This paper has presented improvements on direct torque control of induction machine drives. The main contribution of this paper is to propose Fuzzy Logic based controller that significantly reduce torque and stator flux ripples. At the same time a constant switching frequency is achieved. The controllers have also managed to reduce the phase current distortion. Simulations results had verified the feasibility of the proposed controllers. Results proved that the proposed controllers are capable of significantly reducing torque ripples and flux ripples as compared to the conventional hysteresis based controller.

The main improvements shown are:

a. Reduction of torque and current ripples.
b. No flux droppings caused by sector changes circular trajectory.
c. Fast torque response.
d. Increase in output torque with almost same stator current.
e. Increase in efficiency of the Drive.

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E-Agro Android Application (Integrated Farming Management Systems for sustainable development of farmers)

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Abstract— this software application is basically for sustainable development of farmers. Many times farmer is confused to take decision regarding selection of fertilizer, pesticide and time to do particular farming actions. So to avoid this problem this application is very useful. Fertilizer schedule of each type of crop will get registered. Based on sowing date of crop, farmer will get reminders about application of fertilizer as per schedule. Additional advice will be given based on Soil type, climatic condition etc. This system combines modern Internet and mobile communication systems with GPS for efficient and smooth farming. This review paper presents the introduction, theories and analysis of DBMS in agriculture. This paper is developed on brief study of some common problems faced by the farmers across the nation. This project aims at bringing the spark of 21st century to that 70% population who are land worshipers.

Keywords— Android, Smart phone, Agriculture, SQLite, Weather Forecasting, Management, Sustainable Development, GPS.

INTRODUCTION

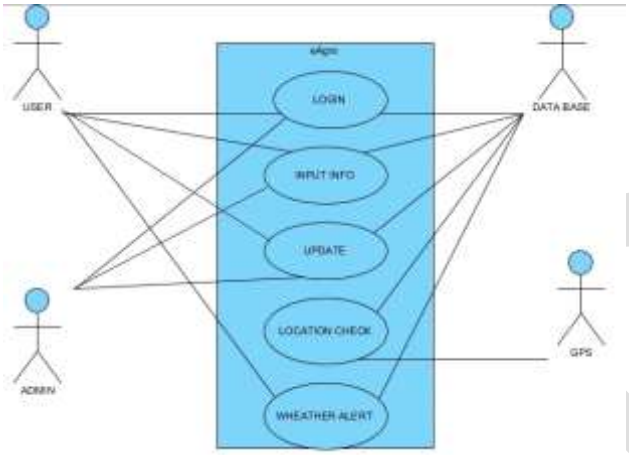
Indian agriculture currently faces a host of diverse challenges and fresh constraints due to the ever growing population, increasing food and fodder needs, natural resources degradation, higher cost of inputs & concerns of climate change. A phenomenal increase in food grain production from 51mt. in 1950-51 to a record production of 251mt. in the year 2011-12 could be achieved using improved technology. The country's population is expected to reach 1660 million by the year 2050 and for which 349 million tons of food grains will be required. It is anticipated that land area available in 2050 would be only 137 million hectares. To meet this requirement there is urgent need to double the productivity of agricultural crops from the existing level. Since there is no further scope for horizontal expansion of land for cultivation of farm enterprises, the emphasis should be on vertical expansion by increasing the productivity using the available resources properly and choosing the best enterprises. With decline in farm size due to explosion of population, it would be increasingly difficult to produce enough food for the family by the end of 21st century. The farmers need to be assured of regular income for living at least above poverty line. The progress in production or steady growth in output is necessary to face the challenges posed by present economic, political and technological environment. In this context, modern farming approach is one of the important solutions to face this peculiar situation. It is also a fact that highly productive lands have been diverted from agriculture to infrastructural development, urbanization and other related activities. Under these circumstances the only option is to increase the productivity vertically. In view of these situations, using Information technology is the only way through which the target could be achieved. As we know IT is continuously increasing its roots in every fields and increasing their efficiency and from current scenario only farmers seems to be untouched with it, and probably the reason for the backwardness of our farmers. IT can improve the agriculture technique and hence a noticeable increase in crop yield can be noticed.

MATERIAL AND METHODOLOGY

1. SQLite:

SQLite implements most of the SQL standard, that uses a dynamically and weak typed SQL syntax that does not guarantee the domain integrity. SQLite operations can be multitasked, though writes can only be performed sequentially. The source code for SQLite is in the public domain. SQLite has many buildings to programming languages. It is the most widely used database, the most widely deployed database engine.

2. Conceptual Architecture:



In this section, included basic framework of **'eAgro Android application'** which will be very helpful for farmers for decision making. In the fig 1 we clearly get the idea how eAgro will work. In above class diagram user and admin are primary actors and database and GPS are secondary actors. User is connected to eAgro infrastructure .It can log in, add, update the information. Admin can access database and update it whenever required .User get the pop up messages about different farming actions, fertilizer, pesticide, weather alert using GPS technology etc. Application designed in such a way that it is simple and easy to use .It will work on smart phones with versions (4.0 and next to that)and supports 2G,3G,4G technologies.

3. Android:

Android is a mobile operating system (OS) based on the Linux kernel and currently developed by Google. With a user interface based on direct manipulation, Android is designed primarily for touchscreen mobile devices such as smartphones and tablet computers, with specialized user interfaces for televisions (Android TV), cars (Android Auto), and wrist watches (Android Wear). The OS uses touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, and a virtual keyboard. Despite being primarily designed for touchscreeninput, it also has been used in game consoles, digital cameras, regular PCs and other electronics[11].

Android's source code is released by Google under open source licenses, although most Android devices ultimately ship with a combination of open source and proprietary software. Initially developed by Android, Inc., which Google backed financially and later bought in 2005,Android was unveiled in 2007 along with the founding of the Open Handset Alliance—a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices[10].

Android's default user interface is based on direct manipulation, using touch inputs, that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, and a virtual keyboard. The response to user input is designed to be immediate and provides a fluid touch interface, often using the vibration capabilities of the device to provide hepatic feedback to the user. Internal hardware such as accelerometers, gyroscopes and proximity sensors are used by some applications to respond to additional user actions, for example adjusting the screen from portrait to landscape depending on how the device is oriented, or allowing the user to steer a vehicle in a racing game by rotating the device, simulating control of a steering wheel

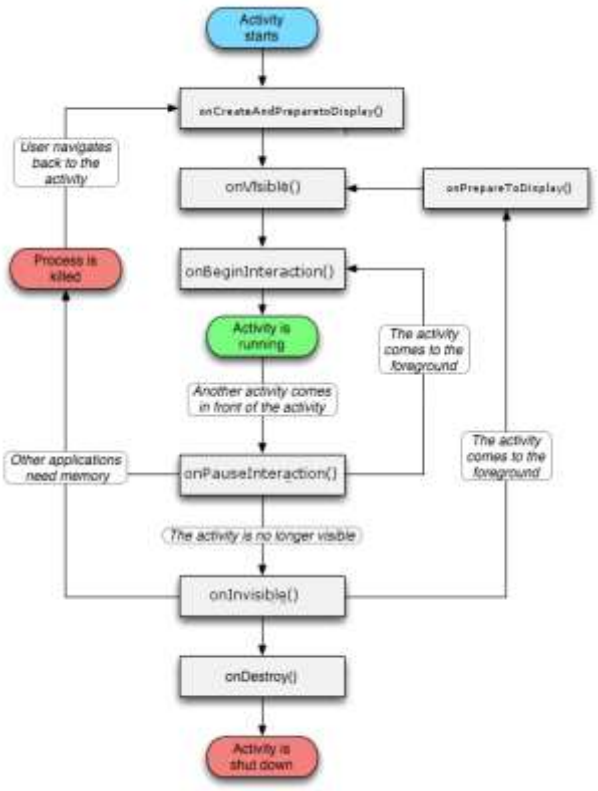


Figure 2: android cycle

PROPOSED SYSTEM

eAgro is an integrated farm management application. It is targeted to those farmers who wish to professionally manage their farm by planning, monitoring, recording, tracking and analyzing all farming activities. eAgro is designed specifically to work on all android platform mobile devices and exploits their GPS activity to implement the aspects of Precision Farming.

- **System function**

eAgro is an integrated software application, designed for android based mobile devices, targeted to the modern farmer for the professional management of agricultural farms. Using eAgro the farmer can:

- Keep records for all assets of his farm (fields, machines, raw-materials).
- Get access to pesticides, fertilizers and seed databases. Manage all inputs inventories and stock, keep track of inflow and outflow
- Plan farming activities, monitor execution and have a full log of all farming activities.
- Receive information, warnings and alerts regarding natural calamities and weather disturbance and also comes with proper suggestions.
- Prepare financial budgets and monitor its execution.
- Monitor detail farming costs per crop, field, task and individual task input and have a complete picture of financials of his farm.
- Full portability. All required data is available locally on the mobile device. No Internet connection is required to operate the application.
- GPS location tracking. All land fields and farming tasks can be located and annotated on Google Maps[6].
- Use of device camera to capture images/photos and associate/store them with fields, persons, machines, crops etc.

The application features SQLite technology to remotely store (backup) user data to remote servers and supports advanced data

synchronization for updating application databases (pesticides etc.).

- **Weather forecasting**

Indian farmers very often have the prior knowledge of weather and seldom have the idea for the measures to best deal with the natural calamities. From a wide period of time many fields and crops are destroyed by natural calamities and are continuously proved as a disease for farmers. The frost and freeze harms the crops in spring and thus what is the effect in future[3]. And for this disease the farmers are dependent on cure rather than prevention. A prior knowledge of such natural calamities will provide its prevention techniques and certainly will less harm the agriculture. eAgro will continuously provide weather updates and in case any natural calamities it alerts the farmers and also provides them the measures to overcome it. eAgro provides SaaS to monitor the weather conditions without typing any location or position as it will be automatically located using the mobile device GPS system[3]. And also farmers can query for the temperature and humidity required for the particular crop(s) as an Android application.

- **Crop advice and analysis**

India has mainly two agricultural seasons in a year: the Kharif season or summer season and the Rabi seasons or winter season. Indian farmers mainly rely on these traditional techniques for their cultivation[3]. This results in degradation of efficiency of soils. eAgro helps farmers to circulate the crops and helps soil fromreduce the farmer's work by providing tools to assist in automating alert system, which would otherwise have to be performed manually. By maximizing the farmer's work efficiency and production of crop's the system will meet the farmer's needs while remaining easy to understand and use.

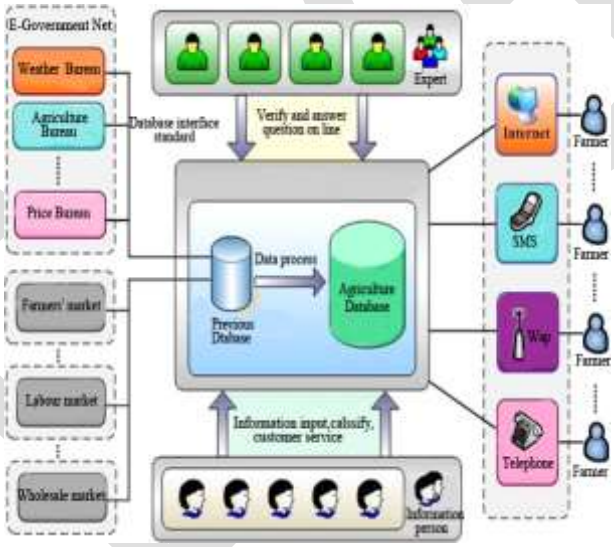


Figure 3: Block Diagram for E-agro

ACKNOWLEDGMENT

We would like to sincerely thank Prof. S. P. Godse, our guide from Sinhgad Academy of Engineering for his support and encouragement and also we would like to sincerely thank sponsored company Shaurya Technosoft Pvt. Ltd for their help.

CONCLUSION

eAgro will offer expertise service to farmers regarding cultivation of crops, pricing, fertilizers, and disease detail method of cure to be used etc. and even suggestions regarding modern techniques for cultivation, usage of bio-fertilizers, can obtain best crop cultivation in the recent history of the region etc. Our main aim will be concentrated on bringing the modern agricultural techniques to the remote farmers. The relentlessly increasing importance and application of Information Technologies (ITs) in Agriculture have given birth to a new field called e-Agro, which focus on improving agricultural and rural development through a variety of technologies. Our android application eAgro will support all the smart phones on android platform. It will fetch the user workspace through the GPS, and will suggest them the most suitable crop and even with the required fertilizers throughout their work.

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Selection of Radio Propagation Model for Long Term Evolution (LTE) Network

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Abstract— Path loss causes attenuation of an electromagnetic wave when it transmits through space. In our project we are considering path loss as a major component in the analysis and design of the of a telecommunication system. We are simulating radio propagation models for the upcoming 4^{th} Generation (4G) of cellular network known as Long Term Evolution (LTE). There are different models like SUI model, Okumura Model, Hata COST 231 model, COST Walfisch-Ikegami and Ericsson 9999 model. The radio propagation models or path loss model calculates path loss in transmission. In this paper path loss is used as constraint for comparison, between different proposed radio propagation models that would be used for LTE, Path loss varies as per different terrain. So the path loss for different terrains e.g. urban, suburban, and rural areas is calculated and comparison is made.

Keywords— Long Term Evolution, Path loss, Radio Propagation Models, Shadowing, uplink, downlink, Correction factor

INTRODUCTION

Long Term Evolution (LTE) is the next step to the cellular 3rdGeneration (3G). It is also known as 4th Generation (4G) service. 3rd Generation Partnership Project (3GPP) has developed some standards. LTE is based on 3GPP standards.

The main objectives for LTE [1] are as follows.

- Downlink and uplink peak data rates are increased.
- Bandwidth is scalable
- Spectral efficiency has improved
- All IP network
- Multitude of user types are supported by standard's based interface

LTE will be having Bandwidth of channel scalable between 1 MHz to 20 MHz. Frequency Division Duplex (FDD) and Time Division Duplex (TDD) [1] both are supported by it. Downlink speed of 100 Mbps and an uplink of almost 50 Mbps will be given by LTE. By increasing number of antennas both at the transmitter and receiver the data rates can be further increased.

There are different propagation models for LTE. By comparing different models the selection of a suitable radio propagation model for LTE is very important. The suitable radio propagation model is chosen by comparing the behaviour of the signal during transmission from transmitter to receiver. The behaviour of the signal during transmission depends on the path loss and the distance of transmitter and receiver. Suitable propagation model gives the relation between the path loss and the distance of transmitter and receiver. The model gives an idea of allowed path loss and the maximum cell range. There are different factors that can affect path loss like environmental conditions, frequency on which we are operating, condition of atmosphere and the distance between the transmitter and receiver.

RADIO PROPAGATION MODELS

SUI Model

Stanford University Interim (SUI) model is developed for IEEE 802.16 by Stanford University [2], [3]. It is used for frequencies above 1900MHz. In this propagation model, three different types of terrains or areas are considered (Table 1). These are

called as terrain A, B and C. Terrain A represents an area with highest path loss, a very dense populated region while Terrain B represents an area with moderate path loss, a suburban environment. Terrain C has least path loss which represents a rural or flat area. These different terrains and their factors used in SUI model are described in following table.

TABLE 1: DIFFERENT TERRAINS & THEIR PARAMETERS

Parameters	Terrain A	Terrain B	Terrain C
A	4.6	4	3.6
B(1/m)	0.0075	0.0065	0.005
C(m)	12.6	20	20

The path loss in SUI model can be given as

$$PL = A + 10\gamma log\left(\frac{d}{d_0}\right) + X_f + X_h + S - - - (1)$$

Where PL is path loss in dBs, d is the distance between the transmitter and receiver, d_0 is the reference distance (Here its value is 100), X_f is the frequency correction factor, X_h is correction factor for Base station height, A is free space path loss, S is shadowing factor and γ is the path loss component.

The path loss component is given as

$$\gamma = a - bh_b + \frac{c}{h_b} \quad - - - (2)$$

Where h_b is the height of the base station and a, b and c represents the terrain factors for which the values are selected from the above table.

The free space path loss is given as

$$A = 20\log\left(\frac{4\pi d_0}{\lambda}\right) \qquad - - - - - (3)$$

Where d_0 is the distance between transmitter and receiver and λ is the wavelength.

The correction factor for frequency is

$$X_f = 6\log\left(\frac{f}{2000}\right) \qquad - - - (4)$$

Where f is frequency in MHz.

The correction factor for base station height is

$$X_h = -10.8log\left(\frac{h_r}{2000}\right) \qquad - - - -(5)$$

Where h_r is height of receiver antenna.

The above expression is used for terrains A and Band for terrain C the expression is as given below:

$$X_h = -20log\left(\frac{h_r}{2000}\right) \qquad - - - -(6)$$

The shadowing factor S is given as following:

$$S = 0.65(log\ f)^2 - 1.3\log(f) + \alpha \quad ---(7)$$

Here, α=5.2 dB for rural and suburban environments (Terrain A and Terrain B) and 6.6 dB for urban environment (Terrain C).

Okumura Model

Okumura's model[4], [9] is one of the most widely used models for signal prediction. It can be used for frequencies in the range 150–1920 MHz (it can be expanded up to 3000 MHz) [12] and distances between transmitter and receiver of 1–100 km. It can be used for base-station antenna heights ranging from 30–1000 m. while the receiver height can be 3 m to 10 m. This model is basic model for development of almost all other models. To determine path loss using Okumura's model, the free space path loss is first calculated. Median attenuation relative to free space (Amu) is added to it. Later correction factors according to the type of terrain are added to it. The path loss in model can be calculated as

$$pl(db) = L_f + A_{(m,n)}(f,d) - G(h_c) - G(h_r) - G_{AREA} \quad ----(8)$$

Here L_f is the free space path loss. Free-space path loss is proportional to the square of the distance between the transmitter and receiver, and also proportional to the square of the frequency of the radio signal. Free space path loss is calculated by

$$L_f = -20\log(\frac{\lambda}{4\pi d_0}) \quad ----(9)$$

Here $G(h_c)$ and $G(h_r)$ gives the Base Station antenna gain factor and receiver gain factors respectively. They are calculated as follows:

$$G(h_b) = 20\log(\frac{h_b}{200}) \quad ----(10)$$
$$G(h_r) = 10\log(\frac{h_r}{3}) \quad ----(11)$$

Where h_b and h_r are the heights of base station and receiver respectively. The area gain G_{AREA} depends on the area being used. Okumura developed a set of curves giving the median attenuation relative to free space, $A_{(m,n)}(f,d)$ is median attenuation relative to free space.

Cost – 231 Hata Propagation Model

The Cost hata model [6] is a radio propagation model, which is based on the Okumura model to cover a more elaborated range of frequencies. It is also known as the COST 231 Hata Propagation Models. This model is applicable to urban areas. It works for Frequency up to 1500–2000 MHz. Mobile station antenna height is 1–10 m [12]. Base station antenna height is 30–200 m [12]. Median path loss in urban areas is given by

$$PL(db) = 46.3 + 33.9\log(f) - 13.02\log(h_b) - a(h_r) + [44.9 - 6.55\log(h_b)]\log d + c \quad ----(12)$$

Here, f represents the frequency in MHz, distance between the transmitter & Receiver is denoted by d, *C*orrection factors for base station height and receiver height are h_b & h_r respectively. The parameter *c* has a value of 3 for urban. It is zero for suburban & rural environments. a(h_r) is Mobile station antenna height correction factor, for urban areas it is given by

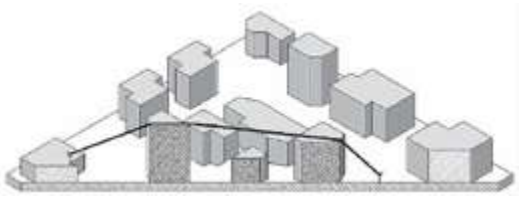
$$a(h_r) = 3.2(\log(11.75h_r))^2 - 4.97 \quad ----(13)$$

And for rural area it is given by

$$a(h_r) = (1.1\log(f) - 0.7h_r - (1.58f - 0.8)) \quad ----(14s)$$

Cost – 231 Walfisch – Ikegami Model

This model is a combination of the models of J. Walfisch and F. Ikegami,developed mainly for operating in Urban area.



Scenerio of Walfisch-Ikegami Model in Urban Area.

The main idea behind Walfisch-Ikegami model is to consider the vertical plane between the transmitter and the reciever.

The classical COST Walfisch-Ikegami model determines the mean street width, mean building height, mean building separation for the whole building database.

To understand the working of this model we need to consider following parameters.

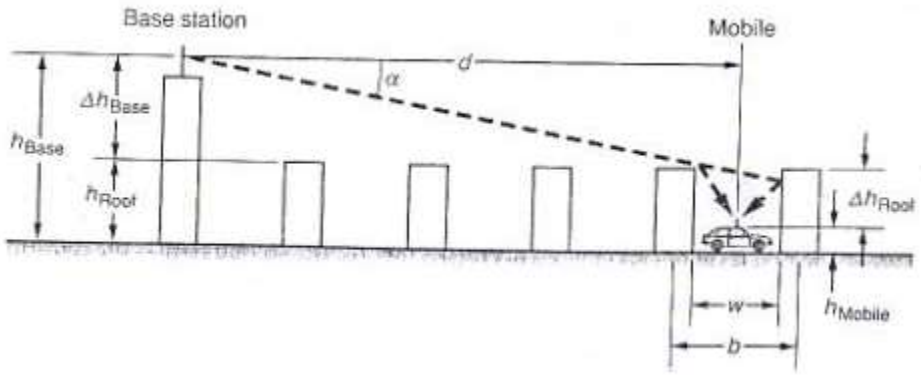
- Frequency f (800...2000 MHz)
- Height of the transmitter h_{TX} (4...50 m)
- Height of the receiver h_{RX} (1...3 m)
- Distance d between transmitter and receiver (20...5000 m)
  These parameters are shown as follows

But the main problem in implementing this model is that the urban areas are not homogenous i.e the building heights and separations between them differs on a large scale.

Parameters and Formulations of Walfisch - Ikegami Model

Cost - 231 Walfich-Ikegami is a combination of the parameters and the excess pathloss from Walfisch-Bertoni model and building path loss from Ikegami model. How ever this model is restricted to urban areas only.

The figure given below denotes various parameters considered in this model.



If a free LOS exists in a street canyon then, path loss defined as

$$L_{los} = 42.6 + 26 \log R + 20 \log f \quad for\ R\ 20\ m$$

If a non-LOS exists, path loss defined as follow:

$$L_b = \begin{cases} L_{FS} + L_{rts} + L_{msd} & \text{IF} \quad L_{rts} + L_{msd} < 0 \\ L_{FS} \end{cases}$$

L_{FS} represents free space loss, L_{rts} is rooftop to street diffraction and scatter loss, L_{rts} is the multiscreen loss.

The rooftop to street diffraction and scatter loss L_{rts} represents the coupling of wave propagating along the multi –screen path into the street mobile located.

$$L_{rts} = \begin{cases} -16.9 - 10 \log f + 20 \log \Delta h\ (mobile) + L_{ori} & h_{roof} > h_{mobile} \\ 0 & if\ L_{rts} < 0 \end{cases}$$

where L_{ori} defined as,

$$L_{ori} = \begin{cases} -10 + 0.354 \dfrac{\emptyset}{deg} & for\ 0 =< j < 35 \\ 2.5 + 0.075 \left(\dfrac{\emptyset}{deg} - 35 \right) & fro\ 35 \leq j < 55 \\ 4 - 0.114 \left(\dfrac{\emptyset}{deg} - 55 \right) & for\ 55 \leq j \leq 90 \end{cases}$$

The multiscreen diffraction loss L_{msd} is an integral for which Walfisch-Bertoni model approximate a solution to this for the cases base station antenna height is greater than the average rooftop. COST 231 extended this solution to the cases base station antenna height is lower than the average rooftop by including empirical functions.

Restrictions of the model is given as follow:

Frequency (MHz)	**800-2000 MHz**

Base Station Height (h_{base})	4-50 m
Mobile Height (h_{mobile})	1-3 m
Distance R,in Km	0.02 - 5 Km

Ericsson 9999 Model

This model is an extension of hata model [2], [11] which is used for frequencies upto 1900 MHz

implemented by Ericsson.

Path loss in Ericsson 9999 model is evaluated by formula as follows:

$$PL = a_0 + a_1 \log(d) + a_2 \log h_b + a_3 \log(h_b) \log(d) - 3.2(\log(11.75))^2 + g(f)$$

where

$$g(f) - 44.49 \log(f) - 4.78 (\log(f))^2$$

a_0, a_1, a_2 etc are constants which can also be changed as per scenerio(environment).

where as the default values for this model are

$$a_0 = 36.2$$

$$a_1 = 30.2$$

$$a_2 = 12.0$$

$$a_3 = 0.1$$

and the parameter f represents frequency.

PROBLEM STATEMENT

Our aim of project is to find out the radio propagation model which will give us the least path loss in a particular terrain. LTE uses various range of frequency bands in different regions of the world. For these frequency bands, there are many different radio propagation models that can be used in different terrains. We are going to make a comparison between different radio propagation models and find out the model that is best suitable in particular terrain. The comparison will be made mainly on the basis of path loss, antenna height and transmission frequency.

PROBLEM SOLUTION

In our simulation, we are going to use the empirical formulas of path loss calculation as described in the earlier section. These formulas take input parameters as frequency, distance between transmitter and receiver, height of transmitter and receiver and calculate the expected path loss of whole path during transmission of radio waves.

We will implement these formulas by developing a simple path loss calculator for Window operating system. For input parameters we have created database from different terrains. Thus based on the database we will calculate path loss for different terrains and update the tables with results. Then we will plot the path loss against different input parameters with the help of updated database.

CONCLUSION

Based on our simulation results we will make tables for path loss in different terrains (rural, suburban, urban) for different radio propagation models. Based on the tables we will also plot graphs and then compare different radio propagation models. Finally we will present the result of our simulation by representing the best suitable radio propagation model for a particular terrain.

In this way we will be able to select the best radio propagation model for design of any wireless communication system following Long Term Evolution (LTE) Network technology. Thus by following our result we can design a very efficient wireless communication system under 4G Technology which will be having very high peak data rates in comparison to under-going 3G Technology. We all know the importance of high data rates in today's wireless mobile communication system. The 4G technology will also have scalable bandwidth and large spectral efficiency with respect to 3G Technology.
One of the most advantageous thing is that 4G technology supports all IP network and thus it provides a standard's based interface that can support multitude of user types.

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Solar Power Roads: Revitalising Solar Highways, Electrical Power and Smart Grids

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Abstract—when the phrase "Global Warming" began gaining popularity, The researchers started batting around the idea of replacing asphalt and concrete surfaces with solar panels that could be driven upon. The solar Roadways can save the world from energy crisis and climate change. The day by day the human beings are looking for the answers to our deteriorating highway infrastructure, our crumbling power grid, and the climate crisis. For all such questions the answer is "SOLAR ROADWAYS". An intelligent highway infrastructure and a self-healing decentralized power grid will eliminate our need for fossil fuels and also it will lead to less investment in antiquated technology and overhead power lines. As the day by day the price of petroleum products are getting huge hike & resources are very less there will be no longer feasible material such as asphalt for our road surfaces. When Solar Road Panels are refurnished, the solar cells will be upgraded to newest technology, which will allow keeping up with population growth and increased energy needs.

In 2009, 'solar roadways' in U S received a contract from the Federal Highway Administration to build the first ever Solar Road Panel prototype. During the course of its construction, the technocrats learned many lessons and discovered new and better ways to approach this project. Using this technology No more power shortages, no more roaming power outages, no more need to burn coal (50% of greenhouse gases), Less need for fossil fuels and less dependency upon foreign oil and Much less pollution. How about this for a long term advantage: an electric road allows all-electric vehicles to recharge anywhere: rest stops, parking lots, etc. They would then have the same range as a gasoline-powered vehicle. Internal combustion engines would become obsolete. Our dependency on oil would come to an abrupt end.

Keywords— Global warming, Solar panels, Solar roadways, power generation, Much less pollution, Eliminating fossil fuel

INTRODUCTION

Limitation of petrol, diesel and other fossil fuels in nature will create a resource crisis in near future. It's hazardous pollution and global warming is creating severe environment problem even for the survival of human. So this has attracted attention all around the world and alternative resources and technologies are becoming significant today. Solar energy collected from radiant light and heat from sun had given a range of ever-evolving technologies such as solar voltaic, solar heating, solar thermal energy, solar architecture, satellite based solar power plants and artificial photosynthesis.

The concept of solar roadways is to replace the all traditional fuel driven power generation system by using solar energy plates providing eco-friendly environment and an ultimate infrastructure to meet the energy challenges. The Solar Roadways consists of structurally engineered solar panels that we drive on. Each Solar Road Panel (roughly 12' by 12') interlinks with neighbouring panels to form the Solar Roadways system. The Solar Roadway replaces the traditional crumbling petroleum-based asphalt highway infrastructure with an intelligent road that pays for itself through the generation of electricity. The Solar Roadway generates electrical power from the sun and gives decentralized power, intelligent and self-healing power grid, replacing our current deteriorating power distribution infrastructure.

The Solar Roadway can distribute its electrical power to all businesses and homes connected to the system via their parking lots and driveways (made up of Solar Road Panels). In addition to electrical power, data signals (cable TV, high-speed internet, telephone, etc.) also travel through the Solar Roadways, which acts as a conduit for these signals (cables). This feature eliminates the power lines, utility poles, and relay stations we see all over the countryside. It also eliminates power interruption caused by fallen or broken electrical lines or poles. Solar roadways enabled driving infrastructure would produce three times total electricity demand. There are additional benefits as well, which is a built-in smart grid, major new investment and job creation and the most important clean energy using solar radiations available without cost. The Solar Roadways system would might, at present, cost about three times what it costs to install an asphalt road, but would be more durable more easily replaceable in modular fashion, and able to pay for itself by generating more electricity than our economy can consume. The solar roadways are also driver friendly which can communicate smartly with drivers and alerting drivers with visual messages to the presence of pedestrians in its path. Solar Roadways can pay dividends for the public budget, making our spending on infrastructure more efficient and significantly reducing electricity costs to consumers and businesses. They can make the emerging electric vehicle far more affordable, and easier to manage. They can help us

to eliminate costs of burning fossil fuels by a powerful clean energy technology, capable of rolling back massive pollution and climate change problems. Solar power sources are rapidly becoming cheaper and more reliable , making it feasible to talk about solar power becoming the leading cost-reducing trend in the energy sector, expanding rapidly and have still more potential for major long-term growth.

Figure 1: Solar highway
Source : www.sustainablebrands.com

SOLAR ROADWAYS TECHNOLOGY

The Solar Roadways consists of structurally engineered solar panels. Each Solar Road Panel uses some of its own power to light up embedded LEDs, which "paint" the road lines from beneath the road surface. This feature also allows the traffic controlling messages to be spelled out on the road surface, such as "SLOW DOWN", or "ACCIDENT AHEAD". Road lines can be instantly "repainted" to direct traffic to a single lane or to detour. This eliminates the need for cones or flares. Better visibility at night with the road lines illuminated, it will be like driving on a well-lit runway. The Solar Road Panels heat themselves for snow and ice removal in northern climates. These features give safer driving conditions. The Solar Roadway, being an "electric road", will also make all-electric vehicles more practical. All additional power, unused by the panels themselves is sent to electricity consumers. We could produce three times the total electrical power used by the country and almost enough electricity to power the entire world.
The Solar Roadway produces clean, renewable energy. No pollution, no greenhouse gases, no by-products, and the Solar Road Panels are completely recyclable or reusable. The main cause of global warming is creation of electricity by fossil fuels which will contribute to production of green house gases and effect on ozone layer. The Solar Roadways eliminates this entirely.
The solar panels are divided into three basic layers:-
(a) Road Surface Layer.
(b) Electronics Layer.
(c) Base Plate Layer.

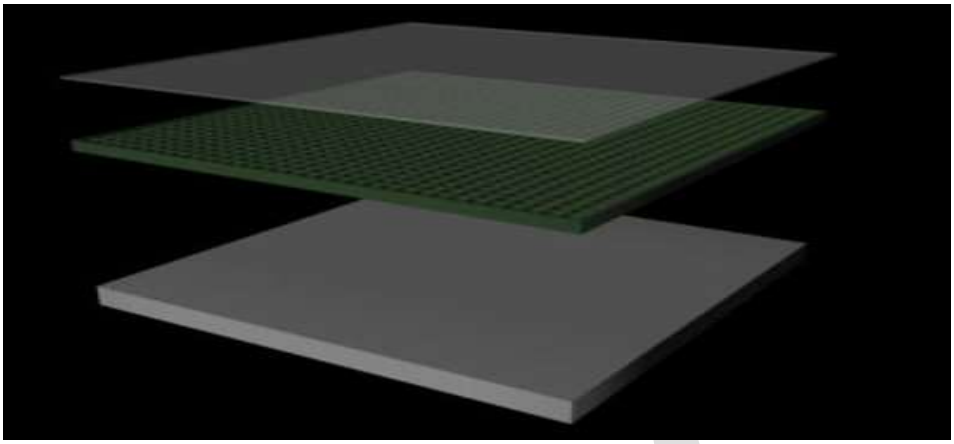

Figure 2: different layers of solar panel
Source : ingenieriaenlared.wordpress.com

Road Surface Layer

As this is the top most layers of the assembly and also from this layer the solar rays will reach up-to the photovoltaic cells; they should be translucent and should have very high-strength. Also this is made in such a fashion that it is rough enough to provide great traction to avoid the skidding of vehicles. As the material is made rough but the material used is translucent, it still passes sunlight through it to the solar collector photovoltaic cells embedded within it, along with LEDs and a heating element. And it is tough enough for handling today's heaviest loads under the worst conditions and it is made water-proof so that it can prevent electronics layer beneath it.

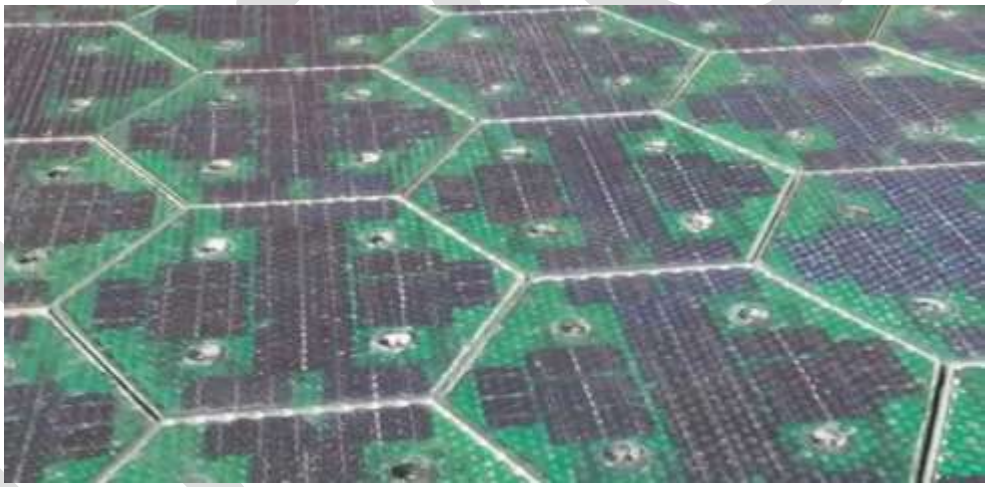

Figure 3 : hexagonal solar panel
Source : www.smartweek.it

Electronics Layer

Electronics Layer Contains a microprocessor board with support circuitry for sensing loads on the surface and controlling a heating element. By implementing this technology there will be no more snow or ice removal problem due to inclement weather in the snow falling regions. A recent study shows that the solar-road studs to light-up the lines of roads during night time in an area of England, which has reduced night time accidents by 70%. There is no need to expend energy lighting desolate roads when no cars are travelling, so the intelligent roadways will tell the LEDs to light up only when it senses cars on its surface - say 1/2 mile ahead and 1/4 mile behind the vehicle as it travels. This way, drivers will know an oncoming car is ahead when they see the lights on the other side of the road begin to light up ahead. The LEDs can also be programmed to move along with cars at the speed limit and it gives warning to the drivers instantly when they are driving too fast or the speed of the car increases beyond the speed limit. The LEDs will also be used to paint words right into the road, it gives warning to drivers if an animal arrives on the road, a detour ahead, an accident or construction work. Central control stations will be able to instantly customize the lines and words in real time, alleviating traffic congestion and

making the roads more efficient. The on-board microprocessor controls lighting, communications, monitoring, etc. which are fitted at every 12 feet distance makes the Solar Roadways as an “Intelligent Highway System”.

Figure 4 : electronic arrangements in solar panel
Source : thespiritscience.net

Base Plate Layer

While the electronics layer collects energy from the sun, it is the base plate layer that distributes power (collected from the electronics layer) and data signals (phone, TV, internet, etc.) "down-line" to all homes and businesses connected to the Solar Roadway. The base layer is made weatherproof so that it can provide the electronic layer above it.

SOME APPLICATIONS

ILLUMINATED ROADS

Accidents drastically reduced unlike the dark roads we drive on by night today, the Solar Roadways will have LEDs which will "paint" the lanes, and can be instantly customized as needed. Many people face the problem during the night driving as they face the trouble seeing the road lines at night, particularly when the oncoming headlights are blinding them or when it's raining. By implementation of these illuminated roads, the country can over come from this problem & also accidents at night time will get reduced henceforth the night-time driving will be safer for all.

ELECTRIC VEHICLES

Since the Solar Roadway creates and carries clean renewable electricity, EVs can be recharged at any conveniently located rest stop, or at any business places that incorporates Solar Roadways Panels in their parking lots for. Owners can plug-in their cars in and recharge while they're eating or shopping. Engineers are even investigating ways to use mutual induction to charge EVs while they are driving down the Solar Roadway. By the way using electric cars would eliminate most of the other half of the cause of global warming and could virtually wean the world off oil entirely.

SMART GIRD

The Solar Roadways replaces all current centralized power stations including coal and nuclear-powered electricity generation plants. With the Solar Roadway, the road becomes the power grid, eliminating the need for unsightly utility poles and relay stations. Power is generated everywhere - every road, parking lot and driveway. No more power outages, roaming or otherwise. The Solar Roadways generates "secure" energy; it can't be deliberately shut down. Not by terrorists, not by power companies, it simply can't be shut down.
A smart grid would be more automated and more "self-healing," and so less prone to failures. It would be more tolerant of small-scale, variable power sources such as solar panels and wind turbines, in part because it would even out fluctuations by storing energy.

RECENT PROJECT STATUS

This innovation begun in early 2009 and later the company was established by name Solar Roadways in U.S. and awarded a contract by federal government. They started the project by name 'solar roadways' in Idaho, U S. The phase 1 has been completed and second phase also under completion and opened for testing in December 2014. Some latest facts are..

Figure 5: ongoing solar roadways project, Sagle, IDAHO, United states

Source : www.indiegogo.com

- Solar Roadways has received two phases of funding from the U.S. Federal Highway Administration for research and development of a paving system that will pay for itself over its lifespan. They are about to wrap up Phase II contract (to build a prototype parking lot) and now need to raise funding for production.
- The glass surface has been tested for traction, load testing, and impact resistance testing in civil engineering laboratories around the country, and exceeded all requirements.
- Solar Roadways is a modular system that will modernize United State's aging infrastructure. On August 21, 2013, Solar Roadways was selected by their peers as a Finalist in the World Technology Award For Energy, presented in association with TIME, Fortune, CNN, and Science.
- Solar Roadways has given presentations around the country including: TEDx Sacramento, Google's Solve for X at Google's NYC Headquarters, NASA, Keynote Speaker for the International Parking Institute's Conference and much more...
- Solar Roadways is tackling more than solar energy: The FHWA tasked it with addressing the problem of storm water. Currently, over 50% of the pollution in U.S. waterways comes from storm water. So they created a section in their Cable Corridors for storing, treating, and moving storm water.
- The implementation of the concept on a grand scale could create thousands of jobs in the U.S. and around the world. It could allow all the ability to manufacture economic crisis.
- A solar roadway structure with an intelligent system can become the new Smart Grid using wireless power transmission.

CHALLENGES

In spite of these advantages, initially, the start up and maintenance costs of building such roadways and parking lots may be extremely high. (However, advances in this technology will (hopefully) cause the costs to fall.) Another issue to deal with is the efficiency of

solar panels. The average efficiency is currently a matter of concern. Another disadvantage is that it cannot be constructed in the poorest developing nations due to the high initial start-up costs. Road surfaces also accumulate rubber, salt, etc., which block sunlight. Salt might be easy to wash off, but not rubber. It would also be quite costly.

Solar roadways may not be feasible and economical as it initial and installation cost may be three times more compared to our convectional roads, but if this is evaluated as a long term investment this may prove to be much more economical as it pays back.

CONCLUSION

Solar Roadways has taken the first step to creating the world's largest solar panel: The Company uses tempered glass and photovoltaic cells to create intelligent, energy-harvesting pavement, complete with built-in heating elements for melting ice and LEDs for signage. The technology is still in its infancy, but with funding from the Federal Highway Administration and an Indiegogo campaign, the company finished a prototype parking lot in Idaho last year. Solar Roadway has released the first pictures of their new Solar Roadways prototype parking lot. Initial installation is complete, with some additions still to come (i.e., covers for mounting holes, mastic between panels, software for LED patterns).The parking lot is fully functional with solar cells, LED's, heating elements, and the textured glass surface. The prototype results show the significance of solar power roads uniquely. However installation cost is very high this new technology is capable of replacing the costly fossil fuel system and can give us clean energy without any climate change.

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SMART-GRID IN ELECTRICAL AND ELECTRONICAL COMMUNICATION TECHNOLOGY

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ABSTRACT- The electric power systems (smart grid) are study intensively as a solution for energy . The important feature of the smart grid is the integration of high-speed, reliable and secure data communication networks to manage the complex power systems effectively and intelligently. The survey on the communication architectures in the power systems, including the communication network compositions, technologies, functions, requirements, and research challenges. As these communication networks are responsible for delivering power system related messages. The emerging energy crisis is a global attention on finding alternative energy resources that can sustain long-term industry development. The identified renewable energy resources include wind, small hydro, solar, tidal, geothermal, and waste.

Keyword: Smart grid, Power communications, Communication networks, Communication protocols, Grid standards

INTRODUCTION

A smart grid is a modernized electrical grid that uses analogue or digital information and communications technology to gather and act on information, such as information about the behaviors of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity.

Smart grid policy is organized in Europe as Smart Grid European Technology Platform.Roll-out of smart grid technology also implies a fundamental re-engineering of the electricity services industry, although typical usage of the term is focused on the technical infrastructure.

In the 20th century local grids grew over time, and were eventually interconnected for economic and reliability reasons. By the 1960s, the electric grids of developed countries had become very large, mature and highly interconnected, with thousands of 'central' generation power stations delivering power to major load centers via high capacity power lines which were then branched and divided to provide power to smaller industrial and domestic users over the entire supply area. The topology of the 1960s grid was a result of the strong economies of scale: large coal-, gas- and oil-fired power stations in the 1 GW (1000 MW) to 3 GW scale are still found to be cost-effective, due to efficiency-boosting features that can be cost effective only when the stations become very large.

A common element to most definitions is the application of digital processing and communications to the power grid, making data flow and information management central to the smart grid. Various capabilities result from the deeply integrated use of digital technology with power grids, and integration of the new grid information flows into utility processes and systems is one of the key issues in the design of smart grids. Electric utilities now find themselves making three classes of transformations: improvement of infrastructure, called the *strong grid* in China; addition of the digital layer, which is the essence of the *smart grid*; and business process transformation, necessary to capitalize on the investments in smart technology.

Apart from power systems, networking technologies have gained tremendous development in the past decades as a separate industry sector. The creation of the Internet,mobile cellular networks, satellite networks, communitynetworks, wired and wireless local area and personal networks, as well as the invention of diversified networking services has enormously enhanced our capability for information exchange. However, the modern networking technologies have not been leveraged sufficiently in power systems for optimized management. When we develop the smart grid, it is critical to take advantage of the advancements in networking technologies to enable the automated and intelligent system management. Although the currently available networking technologies have greatly satisfied our personal communication needs, applying them to power systems and addressing the specific requirements for power communications are challenging by all means. We need to identify the communication scenarios and characteristics in

power systems and develop practically usable network solutions. Particularly, our network infrastructuresshould be able to meet the promptness, reliability and security expectations of the power system communications.

FEATURES OF THE SMART GRID

The smart grid represents the full suite of current and proposed responses to the challenges of electricity supply. Because of the diverse range of factors there are numerous competing taxonomies and no agreement on a universal definition. Nevertheless, one possible categorisation is given here.

Reliability

The smart grid will make use of technologies, such as state estimation, that improve fault detection and allow self-healing of the network without the intervention of technicians. This will ensure more reliable supply of electricity, and reduced vulnerability to natural disasters or attack.

Although multiple routes are touted as a feature of the smart grid, the old grid also featured multiple routes. Initial power lines in the grid were built using a radial model, later connectivity was guaranteed via multiple routes, referred to as a network structure. However, this created a new problem: if the current flow or related effects across the network exceed the limits of any particular network element, it could fail, and the current would be shunted to other network elements, which eventually may fail also, causing a domino effect. See power outage. A technique to prevent this is load shedding by rolling blackout or voltage reduction (brownout).

The economic impact of improved grid reliability and resilience is the subject of a number of studies and can be calculated using a US DOE funded methodology for US locations using at least one calculation tool.

SMART GRID REFERENCE MODEL

In the smart grid, many distributed renewable energy sources will be connected into the power transmission and distribution systems as integral components. The typical renewable energy sources include wind, solar, small hydro, tidal, geothermal, and waste. These sources generate extra electricity that supplements the electricity supply from large power plants and, when the electricity generated by distributed small energy sources exceeds the local needs, the surplus is sold back to the power grid.

Efficiency

Numerous contributions to overall improvement of the efficiency of energy infrastructure are anticipated from the deployment of smart grid technology, in particular including demand-side management, for example turning off air conditioners during short-term spikes in electricity price, reducing the voltage when possible on distribution lines through Voltage/VAR Optimization (VVO), eliminating truck-rolls for meter reading, and reducing truck-rolls by improved outage management using data from Advanced Metering Infrastructure systems. The overall effect is less redundancy in transmission and distribution lines, and greater utilization of generators, leading to lower power prices.

Load adjustment/Load balancing

The total load connected to the power grid can vary significantly over time. Although the total load is the sum of many individual choices of the clients, the overall load is not a stable, slow varying, increment of the load if a popular television program starts and millions of televisions will draw current instantly. Traditionally, to respond to a rapid increase in power consumption, faster than the start-up time of a large generator, some spare generators are put on a dissipative standby mode. A smart grid may warn all individual television sets, or another larger customer, to reduce the load temporarily (to allow time to start up a larger generator) or continuously (in the case of limited resources). Using mathematical prediction algorithms it is possible to predict how many standby generators need to be used, to reach a certain failure rate. In the traditional grid, the failure rate can only be reduced at the cost of more standby generators. In a smart grid, the load reduction by even a small portion of the clients may eliminate the problem.

Sustainability

The improved flexibility of the smart grid permits greater penetration of highly variable renewable energy sources such as solar power and wind power, even without the addition of energy storage. Current network infrastructure is not built to allow for many distributed feed-in points, and typically even if some feed-in is allowed at the local (distribution) level, the transmission-level infrastructure cannot accommodate it. Rapid fluctuations in distributed generation, such as due to cloudy or gusty weather, present significant challenges to power engineers who need to ensure stable power levels through varying the output of the more controllable generators such as gas turbines and hydroelectric generators. Smart grid technology is a necessary condition for very large amounts of renewable electricity on the grid for this reason.

COMMUNICATION ARCHITECTURE AND FUNCTIONAL REQUIREMENTS

Network architecture

The communication infrastructure in smart grid must support the expected smart grid functionalities and meet the performance requirements. As the infrastructure connects an enormous number of electric devices and manages the complicated device communications, it is constructed in a hierarchical architecture with interconnected individual subnetworks and each taking responsibility of separate geographical regions . An illustrative example of this architecture. In general, the communication networks can be categorized into three classes:wide area networks, field area networks, and home area networks.

Wide area networks

Wide area networks form the communication backbone to connect the highly distributed smaller area networks that serve the power systems at different locations. When the control centers are located far from the substations or the end consumers, the real-time measurements taken at the electric devices are transported to the control centers through the wide area networks and, in the reverse direction, the wide area networks undertake the instruction communications from control centers to the electric devices.

Home area networks

Home area networks are needed in the customer domain to implement monitoring and control of smart devices in customer premises and to implement new functionalitie like DR and AMI. Within the customer premises, a secure two-way communication interface called ESI acts as an interface between the utility and the customer. The ESI may support different types of interfaces, including the utility secured interactive interface for secure twoway communications and the utility public broadcast interface for one-way receipt of event and price signals at the customer devices. The ESI may be linked (either be hardwired or through the home area networks) to a smart meter capable of sending metering information. This information is communicated to the utility. The ESI also receives RTP from the utility over the AMI infrastructure and provides it to the customers. The customers may use a display panel (called IHD) linked to the ESI or a web-based customer EMS (residing in the smart meter, an independent gateway, or some third party) and respond to pricing signals from the utility. The ESI and smart devices provide utility with the ability to implement its load-control programs by accessing the control-enabled devices at the customer site. Using AMI, ESI and home area networks, the demand response process can be implemented in the following ways:

DR through AMI gateway.

An AMI gateway, though generally used for automatic billing through AMR, can be used to send load control commands to the smart devices using the secure interface of the ESI. Thus, the load control algorithm may reside with the ESI.

DR through DLC.

In this case, either the utility or an authorized energy service provider may directly control the smart appliances or DERs configured with such capability. The energy service provider may act as an aggregator of individual customers, negotiate RTP prices with the utility companies, and determine the demand response policy for the registered customers.

DR through BAS.

In this case, the BAS uses the RTP information available on the public channel of the ESI. A BAS has load controllers linked to security installations and building HVAC systems through wireline (e.g., ethernet) or wireless (e.g., ZigBee) communication medium and can exercise demand response.

DR through embedded control.

In this case, the smart device not only has a communication link to the home area network, but also its own load control algorithm. The smart device receives RTP information from the public ESI interface and exercises demand response. For example, a computer implements its own load control algorithm to take charge in accordance with RTP signals.

WHY WE MAKE SMART GRID

Demand for electricity continues to accelerate due to population growth and increased global reliance on electrical technologies.Simultaneously, electric grid infrastructure in the U.S. is aging. As a result,improvements in the underlying electricity infrastructureare necessary the flow of electricity from centralized power plants to the end user in the current grid system. Smooth operation of the electrical system as a whole depends on reliable performance of each one of these components. As electricity needs increase, each component must be able to handle these new demands—or the entire system becomes unreliable.

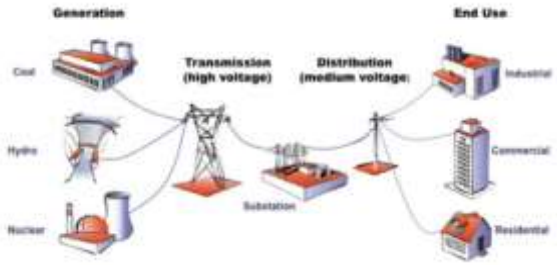

Fig: **current path of electricity generation and delivery to end users.**

IS A SMART GRID A GREEN GRID

Greater integration of renewable generation:

Smart grid technologies help gridoperators better predict daily wind and solar energy generation potential, and more easilyadjust the system for the peaks and valleys of these intermittent resources.

Dynamic pricing and demand response:

Awareness of changing prices can helpencourage consumers to reduce electricity demand during times of peak demand, therebyreducing strain on the system and overall energy consumption.

Enhanced measurement and verification capabilities:

Smart meters allow utilities andcustomers to track electricity use in real time, and to see how behaviors or energy.

SMART GRID IMPLEMENTATION

Difficulty in Measuring Benefits

Many of the benefits of a smart grid come from expected changes in consumer behavior.However, it is difficult to accurately predict how customers will react to price signals. It ispossible that customers may not change their electricity demands much, even when faced withdifferent prices at different times of the day. For example, in Connecticut, customers were given aglobe that glowed different colors based on the price of electricity. Even with this visual signal,however, customers did not change their electricity usage behavior to the extent predicted. Ifoutweigh the benefits. Putting into place proper, complementary policies (such as funding broaderprogrammatic efforts to educate and encourage customers to save energy, and adopting fair ratesand interconnection standards for distributed generation) are therefore critical for successfulimplementation of smart grid.

Cyber security and Privacy Concerns:

Installation of "smart" devices gives potential hackers new targets for exploitation. Because thesedevices monitor and collect large amounts of information, there is concern that customer privacycould be at risk. Since advanced metering infrastructure often relies on wireless technologies,hackers could infiltrate the computer systems to extract recorded information, insert malicioussoftware, identify network authentication keys, and then access other parts of the system using thegrid's communication systems.

Message from the Assistant Secretary

The adoption of smart grid technologies varies across the nation and depends on many factorsincluding state policies, regulatory incentives, load growth, and technology experience levelswithin utilities. There is a need to share cost, benefit and performance data, as utilities andregulators work to determine the value of the technology and determine appropriateinvestment strategies. It is essential that the industry effectively shares lessons learned andbest practices along the way, especially as new challenges emerge in this transformative time.In addition, the adoption of renewable and distributed energy resources is on the rise; growinginterest in resilience and microgrids has resulted from extreme weather events; and the role ofutilities is evolving as customers also become energy producers. These future demands willrequire a faster-acting, flexible, and sophisticated grid that maintains high reliability andefficiency while integrating new capabilities. This report describes the challenges andopportunities that will shape the next several years of grid modernization

Making the Transitionto a Smart Grid

Smart grid technologies can help enable renewables,but the lack of experience and associated uncertainties—intechnology cost and performance, in costs andbenefi ts and in nontechnical issues such as privacy—make it challenging to settle on a strategy that makesbest use of these technologies.

Fig: Smart Grid Transition

Purpose, process andstructure of the roadmap

To provide guidance to government and industrystakeholders on the technology pathways neededto achieve energy security, economic growth andenvironmental goals, the IEA is developing a seriesof global low-carbon energy roadmaps covering arange of technologies. The roadmaps are guidedby the IEA Energy Technology Perspectives BLUE MapScenario, which aims to achieve a 50% reductionin energy-related CO2 emissions by 2050. Eachroadmap represents international consensus onmilestones for technology development, legal andregulatory needs, investment requirements, publicengagement and outreach, and internationalcollaboration.

THE SMART GRID ROADMAP AIMS TO:

1 Increase understanding among a range ofstakeholders of the nature, function, costs andbenefits of smart grids.

2 Identify the most important actions required todevelop smart grid technologies and policies thathelp to attain global energy and climate goals.

3 Develop pathways to follow and milestones totarget based on regional conditions.

Smart grid technologies

The many smart grid technology areas – eachconsisting of sets of individual technologies –span the entire grid, from generation throughtransmission and distribution to various types ofelectricity consumers. Some of the technologiesare actively being deployed and are consideredmature in both their development and application,while others require further development anddemonstration. A fully optimised electricity systemwill deploy all the technology areas.However, not all technology areas need to beinstalled to increase the "smartness" of the grid.

Wide-area monitoringand control

Real-time monitoring and display of powersystemcomponents and performance, acrossinterconnections and over large geographic areas,help system operators to understand and optimisepower system components, behaviour andperformance. Advanced system operation toolsavoid blackouts and facilitate the integration ofvariable renewable energy resources. Monitoringand control technologies along with advancedsystem analytics – including wide-area situationalawareness (WASA), wide-area monitoring systems(WAMS), and wide-area adaptive protection,control and automation (WAAPCA) – generate datato inform decision making, mitigate wide-areadisturbances, and improve transmission capacityand reliability.

Information and communicationstechnology integration

Underlying communications infrastructure,whether using private utility communicationnetworks (radio networks, meter mesh networks)or public carriers and networks (Internet, cellular, cable or telephone), support data transmissionfor deferred and real-time operation, and duringoutages. Along with communication devices,significant computing, system control softwareand enterprise resource planning software supportthe two-way exchange of information betweenstakeholders, and enable more efficient use andmanagement of the grid.

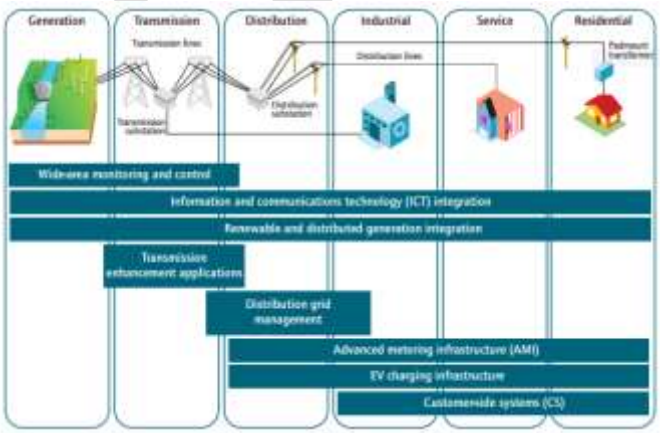

Fig:Smart Grid Technology Areas

Renewable and distributedgeneration integration

Integration of renewable and distributedenergy resources – encompassing large scaleat the transmission level, medium scale at thedistribution level and small scale on commercialor residential building – can present chalengesresources and for operation of the electricitysystem. Energy storage systems, both electricallyand for themally based, can alleviate suchproblems by decoupling the production anddelivery of energy. Smart grids can help throughautomation of control of generation and demand(in addition to other forms of demand response) toensure balancing of supply and demand.

Conclusion

Although there are notable exceptions within some agencies, the federal government hasgenerally failed to provide needed leadership and vision. Congress and high level policymakersseem to be committed more to protecting established industrial and financial interests than toplotting a viable course for the future. At the state level, PUCs and other public officials are tiedto large corporate interests in carbon, to lobbyists, and to political careers. Too often, ratepayers,citizens, and communities are abandoned to their own resources. It is left to the people to"occupy" the grid and transform it to shape a sustainable clean energy. Reliability and securityare thus very challenging problems in the communicationnetwork. Fourth, preliminary experiments indicate that acommunication network must be planned carefully in orderto meet the performance requirement in energy management.Our survey summarizes the current research status on communication networks in the next generationpower systems. Many research efforts are still required before the communication infrastructure can be implementedfor intelligent energy management.

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Mobile Backhaul Network in wireless Sensor

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I Abstract- The mobile backhaul networks have to catch up with all these changes and counterbalance the enhancements on the rest of the networks. Wireless service providers have very specific transport requirements and specifications for their services; understanding these requirements is key to choosing the right technology and type of network for the application. A large number of the existing backhaul networks are based on legacy technologies, incapable of supporting higherspeeds or service requirements. Explosion of packet data traffic over voice, unlimited data/voice services, faster download rates have demand for higher backhaul network capacity and intelligence.The technologies can be support quality of service (QoS) to separate traffic streams, timing synchronization, lower packet loss, and high availability (HA) along with maintaining low operational expenditure. A thorough understanding of these factors ensures operators choose the right technology,network and architecture to implement a successful wireless backhaul business strategy.
Keywords: Mobile Backhaul, Flat IP Network Architecture, Pure Packet Protocol Stack, Migration Methodologies

II Introduction

In recent years, broadband services over optical access networks have spread widely throughout the world, and they continue to be developed as various cloud services. Since optical access is anultimate broadband infrastructure with high capacity and good reliability, telecom operators have invested steadily in it by employing passive optical network (PON) technology such as G-PON/1G-EPON, and this has led to its deep penetration. The standardization of the second next-generation passive optical network (NG-PON2) has also been progressing , and it is expected to have additional values on the deployed optical access infrastructure and provide various attractivservices. At the same time, wireless broadband services are also of great interest, because attractive mobile handsets such as smart phones and tablet devices have recently been launched. Furthermore, machine to machine (M2M) communications designed for a big-data society will trigger further mobile traffic expansion. Therefore, to avoid the problem of a lack of bandwidth and diversity, the deployment of high-speed mobile networks such as the Long Term Evolution-Advanced (LTE-A) system has been scheduled for this decade, and Future RadioAccess (FRA) is now being discussed by the Third Generation Partnership Project (3GPP). The backhaul can be considered to be the portion ofthe network that connects the BTS

(and air interface) to the BSCs and mobile core network. The backhaul can consist of a group of cell sites that are aggregated at a series of hub sites. The generic model for the newer backhaul networks consists ofa cell, hub sites, or both connected to aggregation devices that inturn can either belong or be connected to a Metro network. A Transport type handling data from the different cell sites is carried over pseudo wires which supports circuit emulation, Timing Synchronization type which supports Clocking for the TDM data needs to be synchronized across the network. The framework includes also a reference architecture covering flat mobile networks with generic MPLS use cases that can be used for mobile backhauling.

Multiple wireless services based onsmall-cells over optical access platform:

A new information society we can handle big-data, variouswireless services will be co-existed. Figure 4 shows an image of an optical access platform providing multiple wireless services such as WiFi spot and M2M sensoservices, as well as broadband optical access services. These services shouldbe provided on the same network architecture, which is based ondeep-penetratedopticalaccess infrastructures, because of the need to suppress the huge investment on mobile entrance networks for small-cells from the operator's viewpoint. There is a need to provide various wireless services with different bit rates,required reach, and reliability, through the same optical access infrastructures. To this end, the software-defined OLT based on the DSP technology is an attractive approach [6]. It willalso accommodate RoF signals for realizing centralized signal processing. In such a case, simplification and unification of the hardware, especially on the ONU side, is definitely important if we are achieve significant CAPEX/OPEX reduction.

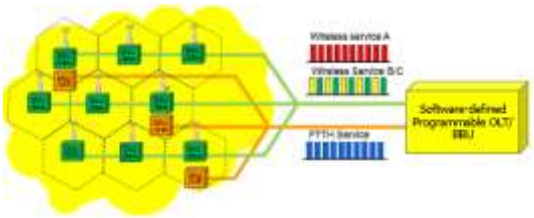

Fig1: Multiple wireless services platform over optical access network

Typical2G/2.5GGSMNetworkOverview:

In a typical wieless network Base station transceivers(BTS)arelocated.Thcontrandradioairinterfaceforeacell.Basestationcontrollers(BSC)providecontrolovermultiplecellsitesand multiple base station transceivers.The base station controllers can be located in a separate office or co-located at the mobile switching center(MSC)

Fig2: Multiple wireless services platform

Flat IP Network Architecture :

To support multi-service traffic with cost effectively,toincreasingtransportbandwidthcapacity for data services by widening frequency band of carriers, maximizing efficiency forbandwidth utilisation, providing carrier grade manageability and survivability and architectures like Flat IP network architectures are the main requirements in mobile backhaul network. The term flat IP architecture can be applied to a network where all the nodes can reach each other via IP connectivity. A flat IP architecture can be applied toa network where the radio and routing functionality is pushed to the edge of the network.The end-to-end connectivity is achieved through a packet-based core network. Technologies such as LTE are based on a flat IParchitecture. One of the main advantages of using IP-based networks is the capability to transport different traffic types over a common IP/MPLS-based infrastructure in addition to providing QoS guarantees and security requirements, low latency and low cost.

Synchronized Access Network:

One of the fundamental requirements for a converged network is the synchronization of the access network This is because it is necessary to consider the migration path fromthe legacy frequency synchronized (i.e. ATM-based) mobile system. Furthermore, future mobile systems will need cooperative operation between cells using coordinated multi-point transmission/reception (CoMP) and heterogeneous network (HetNet) techniques to improve their throughput and coverage. Of course, a cost-effective method is preferable to the currently used global positioning system (GPS). A typical way of achieving synchronization is to employ Synchronization Ethernet (Sync-E) and the Precision Time Protocol (PTP). Sync-E enables us to realize highly precise frequency synchronization with a physical layer based technique. However, this function should be implemented in all interfaces and intermediate nodes. Therefore, it is not easy to apply it smoothly to existing optical systems. On the other hand, the PTP enables us to provide both phase and frequency synchronization with a packet-based technique. Of practical concern is the fact that the PTP is easily affected by traffic conditions. A hybrid configuration based onSync-E has been investigated taking these features into consideration, and only the timing offset is realized by the PTP

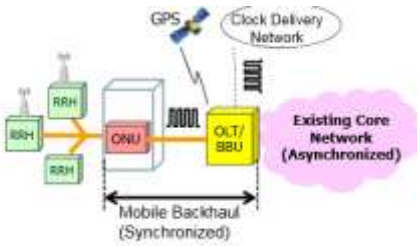

Fig3:Synchronized Network

III Design Considerations for IP Based Mobile Backhaul Network

3.1. VLAN Models

The traffic in the backhaul can be separated either based on services or location into tagged frames and untagged frames. Tagged frames can be location and service tags (Q- in- Q) or only location based tags. Considering untagged frames, the BTS is not capable oftagging the frames with the appropriate location or service information. The appropriate location and ser
vice VLAN tags are added on the cell site device.

3.2. CoS

In general, services signalling, user plane transport, and management traffic can be classified, prioritized, and scheduled using CoS. The mobile backhaul network needs to be capable of recognizing the CoS settings, doing any re-marking of packets if required, prioritizing between the packets, and applying CoS rules to the different traffic streams. Backhaul networks need to be able to support the main traffic type voice,video,networksignalling/management , and best-effort data and also be able to providing low packet loss.

3.3. Transport and Services

MPLS and pseudo wires are used as the transport mechanism in both the IP/Ethernet and hybrid types of mobile backhaul networks. The advantage of using MPLS for transporting pseudo wires is that it is agnostic to the transport media and more scalable than pure Layer networks. Loops and flooding can be avoided. A Layer 3 network can solve such an
issue since the routing information is obtained from the control plane, thus making it more deterministic. Layer 3 networks offer reliability, convergence of services (2G/3G traffic),
QoS, OAM, inherent security and synchronization. MPLS (and pseudo wires) can support transport of multiple technologies such as ATM, TDM, and Ethernet over the same physical links. MPLS protection schemes ensure faster convergence and failure detection times.

3.4. Synchronization

Clock synchronization in a mobile backhaul network is an essential requirement for handoff support, voice quality, and low interference. Loss of timing synchronization can result in poor user experience, service disruptions, and wastage of frequency spectrum. Hence, timing in a mobile network can be distributed by using GPS or a legacy TDM network that is external to the IP-packet based network, Packetbased dedicated streams (IEEE1588- or NTP-based), using Synchronous Ethernet over the physical layer, adaptive clocking, DSLclocking. Thus clock synchronization is obtained.

3.5. Reliability and Fault Detection

Fault detection mechanisms need to be in place at different levels of the network. OAM can be used to detect failures at both Ethernet physical and link layers. MPLS protection schemes offer options such as make-before-break, and link- and node-level failure detection with better convergence times. All these schemes enable faster detection, notification, and recovery from failures; thus increasing the reliability .

3.6. Network Configuration and Monitoring

It is essential to use software tools that provide ease of network provisioning, management, and monitoring. The tools need to be able to maintain a
database of the network nodeinformation in order to
support configuration and monitoring.

IV Methodology

It is nothing but the migration steps from legacy backhaul networks towards carrier Ethernet technology along with maintaining backward compatibility. There are scenarios considered under two cases when migrating from existing legacy networks to Carrier Ethernet. The initial scenario mainly depends upon the extent of Ethernet support available on the BTS. Irrespective of the level of Ethernet support, the migration path involves an intermediate step of a TDM/ATM/Packet hybrid backhaul. Thehybrid nature of the backhaul will depend upon eitherusing an interworking function between the BTS and BSC or running a dual TDM/Ethernet stack on the BTS and BSC .

V Next Generation Backhaul Network

High-speed packet access (HSPA) subscribe growth and increased usage ofmobile multimedia services are driving the success of mobile broadband This serious complement tofixed broadband has become a source of new revenue streams for mobile network

operators. Indeed, the increasein data traffic in mobile networks has been dramatic – a study of Ericsson enabled networks mobile data traffic surpassed voice traffic in most operators' HSPA-enabled networks. Many operators are seeing exponential increases in traffic, to attractive offerings and to consumer trends toward high-bandwidth applications,Such as video sharing, peerto-peerand enterprise use of mobile internet and remote office connectivity.These developments are driving the need for next- generation backhaul.

VI Conclusion

Furthermore, with the coming deployment of LTE and 4G mobile systems, it is expected to increase even more. To cope with the changed traffic composition operators need to migrate their legacy TDM networks to packet-switched backhaul networks capable of supporting high volumes of packet traffic while maintaining low OPEX. LTE systems are based on a flatter, all-packet (IP/Ethernet)architecture with significantly higher bandwidths than existing GSM 2G and UMTS 3G networks. Reliance on Ethernet to provide physical layer connectivity is driving the need for Ethernet services. Finally, while the industry has focused on the backhaul of mobile services from cell sites, a far more interesting, lucrative and-near term opportunity exists for transport providers in the core metro networks.

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DEDUCTION TECHNIQUES FOR UNSUPERVISED CLUSTERING WITH SIMILARITY HIDDEN CLUSTERING MODEL

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Abstract— Document clustering is automatically group related document into cluster. In this clustering frame work focus on correlations between the documents in the local patches are maximized while the correlations between the documents outside these patches are minimized simultaneously. The proposed systems are adopts both supervised and unsupervised constraints to demonstrate the effectiveness of the proposed algorithm in this framework. The novel proposed classical K-Mean clustering algorithm applied for data preprocessing in stop word removal, stemming and synonym word replacement to apply semantic similarity between words in the documents. In addition, content can be retrieved from text files, HTML pages as well as XML pages. Tags are eliminated from HTML files. Attribute name and values are taken as normal paragraph words in XML files and then preprocessing (stop word removal, stemming and synonym word replacement) is applied. In addition, TEXT, HTML and XML documents are cluster using cosine similarity model implement these research works.
Keywords: clustering,supervised constraints, un supervised constraints,co-clustering,k-means clustering

INTRODUCTION

Clustering is a data mining technique of grouping set of data objects into multiple groups or clusters so that objects within the cluster have high similarity, but are very dissimilar to objects in the other clusters. Dissimilarities and similarities are assessed based on the attribute values describing the objects. Clustering algorithms are used to organize data, categorize data, for data compression and model construction, for detection of outliers etc. Common approach for all clustering techniques is to find clusters centre that will represent each cluster. Cluster centre will represent with input vector can tell which cluster this vector belong to by measuring a similarity metric between input vector and all cluster centre and determining which cluster is nearest or most similar one .

Cluster analysis can be used as a standalone data mining tool to gain insight into the data distribution, or as a preprocessing step for other data mining algorithms operating on the detected clusters. Many clustering algorithms have been developed and are categorized from several aspects such as partitioning methods, hierarchical methods, density-based methods, and grid-based methods. Further data set can be numeric or categorical. Inherent geometric properties of numeric data can be exploited to naturally define distance function between data points. Whereas categorical data can be derived from either quantitative or qualitative data where observations are directly observed from counts.

When clustering textual data, one of the most important distance measures is document similarity. Since document similarity is often determined by word similarity, the semantic relationships between words may affect document clustering results. For example, sharing common named entities (NE) among documents can be a cue for clustering these documents together. Moreover, the relationships among vocabularies such as synonyms, antonyms, hypernyms, and hyponyms, may also affect the computation of document similarity. Consequently, introducing additional knowledge on documents and words may facilitate docu-ment clustering. To incorporate word and document constraints, we propose an approach called constrained information-theoretic coclustering (CITCC). It integrates constraints into the information theoretic coclustering (ITCC) framework [4], where KL-divergence is adopted to better model textual data. The constraints are modeled with two-sided hidden Markov random field (HMRF) regular-izations. We develop an alternating expectation maximiza-tion (EM) algorithm to optimize the model. As a result, CITCC can simultaneously cluster two sets of discrete random variables such as words and documents under the constraints extracted from both sides.

2. RELATED WORK

2.1 CITCC METHOD

Clustering is a popular technique for automatically organizing or summarizing a large collection of text there have been many approaches to clustering. Unlike traditional clustering methods that focus on 1D clustering, co clustering examines both document and word relationship at the same time. In addition to co clustering approaches, researchers have also developed constrained clustering methods to enhance document clustering.The purely un-supervised document clustering is often difficult, most constrained clustering approaches are semi-supervised and requires the use of manually labeled constraints.

The Constrained information theoretic co-clustering (CITCC) method describes the constrained co clustering problem as a two-sided HMRF regularized ITCC (HMRF2 -ITCC) model is formulated. Then we present how to use an alternating EM algorithm to optimize the model.

2.1.1 PROBLEM FORMULATION

The document set and word set as D= {d_1; d_2; ...; d_M} and V={ U_1, U_2... ; U_V}. Then the joint probability of p(d_m; U_i) can be computed based on the co- occurrence count of d_m and U_i

$$q(d_m, v_i) = p(\hat{d}_{k_d}, \hat{v}_{k_v}) p(d_m|\hat{d}_{k_d}) p(v_i|\hat{v}_{k_v}),$$

where $\hat{d}_{k_d}$ and $\hat{v}_{k_v}$ are cluster indicators, k_d and k_v are the cluster indices, is used to approximate p=(d_m, U_i) by minimizing the Kullback-Leibler (KL) divergence where $\hat{\mathcal{D}}$ and $\hat{\mathcal{V}}$ are the cluster sets $p(\mathcal{V}|d_{k_d})$ denotes a multinomial distribution based on the probabilities $(p(v_1|\tilde{d}_{k_d}), \ldots, p(v_V|\tilde{d}_{k_d}))^T$, $p(v_i|\tilde{d}_{k_d})) = p(v_i|\hat{v}_{k_v}) p(\hat{v}_{k_v}|\tilde{d}_{k_d})$ and $p(v_i|\hat{v}_{k_v}) = p(v_i)/p(l_{v_i} = \hat{v}_{k_v})$. Symmetrically, we can define the probability for words: $p(\mathcal{D}|\hat{v}_{k_v})$ denotes a multinomial distribution based on the probabilities

$(p(d_1|\hat{v}_{k_v}), \ldots,$ $p(d_V|\hat{v}_{k_v}))^T$, $p(d_i|\hat{v}_{k_v})) = p(d_i|\hat{d}_{k_d}) p(\hat{d}_{k_d}|\hat{v}_{k_v})$ and $p(d_i|\hat{d}_{k_d}) = p(d_i)/p(l_{\tilde{d}_i} = \tilde{d}_{k_d})$.

$$\begin{aligned} & D_{KL}(p(\mathcal{D}, \mathcal{V}) \| q(\mathcal{D}, \mathcal{V})) \\ &= D_{KL}(p(\mathcal{D}, \mathcal{V}, \hat{\mathcal{D}}, \hat{\mathcal{V}}) \| q(\mathcal{D}, \mathcal{V}, \hat{\mathcal{D}}, \hat{\mathcal{V}})) \\ &= \sum_{k_d}^{K_d} \sum_{d_m : l_{d_m} = k_d} p(d_m) D_{KL}(p(\mathcal{V}|d_m) \| p(\mathcal{V}|\hat{d}_{k_d})) \\ &= \sum_{k_v}^{K_v} \sum_{v_i : l_{v_i} = k_v} p(v_i) D_{KL}(p(\mathcal{D}|v_i) \| p(\mathcal{D}|\hat{v}_{k_v})), \end{aligned}$$

2.2 UNSUPERVISED CONSTRAINTS

Unsupervised Constraints show how to generate additional semantic constraints for clustering. Specifically, introduce named-entity-based document constraints and un reliable word -based constraints using the following approaches.

Document Constraints

In practice, document constraints constructed based on the human annotations are difficult to obtain. To scope with this problem, in this work, we propose new methods to derive "good but imperfect" constraints using information retrieval automatically extracted from either the content of a document (e.g., NE constraints) or existing knowledge sources (e.g., Wordnet constraints). Similarly, if two documents share the same organization names such as "AIG," "Lehman Brothers," and "Merrill Lynch," then both of them may be belong to the same document cluster about the financial markets. Consequently, the document must-link constraints can be constructed from the correlated named entities such as person, location, and organization. Specifically, if there are overlapping NEs in two documents and the number of overlapping NEs is larger than a predefined threshold, add a must-link to these documents.

Word Constraints

Besides named-entity-based document constraints, it is possible to incorporate additional lexical constraints derived from existing knowledge sources to further improve clustering results. In our experiment result the information in WordNet, an online lexical database, to construct word constraints. Specifically, the semantic distance of two words can be computed based on their relationships in WordNet.

Word document is construct word must-links based on semantic distances, for example, we can add a word must-link if the distance between two words is less than a threshold, additional lexical information can be seamlessly incorporated into the clustering algorithm to derive better word clusters. Moreover, since word knowledge can be transferred to the document side during coclustering, with additional word constraints, it is possible to further improve document clustering.

2.3 KL DIVERGENCE

In probability theory and information theory, the Kullback–Leibler divergence (also information divergence, information gain, relative entropy or KLIC, here abbreviated as KL divergence) is a non-symmetric measure of the difference between two probability distributions *P* and *Q*. Specifically, the Kullback–Leibler divergence of *Q* from *P*, denoted $D_{KL}(P||Q)$, is a measure of the information lost when *Q* is used to approximate *P*:[4] The KL divergence measures the expected number of extra bits required to code samples from *P* when using a code based on *Q*, rather than using a code based on *P*. Typically *P* represents the "true" distribution of data, observations, or a precisely calculated theoretical distribution. The measure *Q* typically represents a theory, model, description,

or approximation of *P*.Although it is often intuited as a metric or distance, the KL divergence is not a true metric for example, it is not symmetric: the KL divergence from *P* to *Q* is generally not the same as that from *Q* to *P*. However, its infinitesimal form, specifically its Hessian, is a metric tensor: it is the Fisher information metric.

2.4 K MEANS CLUSTERING

K-means clustering is a data mining the machine learning algorithm used to cluster observations into groups of related observations without any prior knowledge of those relationships. The k-means algorithm is one of the simplest clustering techniques and it is commonly used in medical imaging, biometrics and related fields.

The k-means algorithm is an evolutionary algorithm that gains its name from its method of operation. The algorithm clusters observations into k groups, where k is provided as an input parameter. It then assigns each observation to clusters based upon the observation's proximity to the mean of the cluster. The cluster's mean is then recomputed and the process begins again. Here's how the algorithm works:

Step 1: The algorithm arbitrarily selects k points as the initial cluster centers ("means").

Step 2: Each point in the dataset is assigned to the closed cluster, based upon the Euclidean distance between each point and each cluster center.

Step 3: Each cluster center is recomputed as the average of the points in that cluster.

step 4: Steps 2 and 3 repeat until the clusters converge. Convergence may be defined differently depending upon the implementation, but it normally means that either no observations change clusters when steps 2 and 3 are repeated or that the changes do not make a material difference in the definition of the clusters.

2.5. PROPOSED CLUSTERING METHODS

2.5.1 K-MEANS

K-means is the most important flat clustering algorithm. The objective function of K- means is to minimize the average squared distance of objects from their cluster centers, where a cluster center is defined as the mean or centroid μ of the objects in a cluster C.

The ideal cluster in K-means is a sphere with the centroid as its center of gravity. Ideally, the clusters should not overlap. A measure of how well the centroids represent the members of their clusters is the Residual Sum of Squares (RSS), the squared distance of each vector from its centroid summed over all vectors.

K-means can start with selecting as initial clusters centers K randomly chosen objects, namely the seeds. It then moves the cluster centers around in space in order to minimize RSS. This is done iteratively by repeating two steps until a stopping criterion is met

- Reassigning objects to the cluster with closest centroid
- Recomputing each centroid based on the current members of its cluster.

The following termination conditions as stopping criterion for using termination process

- A fixed number of iterations I has been completed.
- Centroids μ i do not change between iterations.
- Terminate when RSS falls below a pre-established threshold.

2.5.2 CLASSICAL K-MEANS ALGORITHMS (Both TEXT, HTML, and XML Documents)

1. procedure KMEANS(X,K)
2. {s1, s2, · · · , sk} SelectRandomSeeds(K,X)
3. for i ← 1,K do
4. μ(Ci) ← si
5. end for
6. repeat
7. min k~x n −~μ(C k)k C k = C k [{~x n }
8. for all C k do
9. μ(C k) = 1
10. end for
11. until stopping criterion is met
12. end procedure

The proposed algorithm fall within a subcategory of the flat clustering algorithms, called Model-based clustering. The model-based clustering assumes that data were generated by a model and then tries to recover the original model from the data. This model then defines clusters and the cluster membership of data. The proposed algorithm is a generalization of K-Means algorithm in which the set of K centroids as the model that generate the data. It alternates between an expectation step, corresponding to reassignment, and a maximization step, corresponding to re computation of the parameters of the model.

2.5.3 COSINE SIMILARITY

In this approach, two documents are selected. Then the vector values for two documents are found out. The cosine similarity measure is applied. Then the correlation between two documents is found out using the following formula.

$$Corr(u,v) = \frac{u^T v}{\sqrt{u^T u}\sqrt{v^T v}} = \left\langle \frac{u}{\|u\|}, \frac{v}{\|v\|} \right\rangle$$

Correlation Formula

For example, the string "I have to go to school" is present in one document. the string "I have to go to temple" is present in other document.

Then the data is prepared such that

[i , have , to , go, school , temple] = [1,1,2,1,1,0]

[i , have , to , go , school , temple] = [1,1,2,1,0,1]

[i , have , to , go , school , temple] = [1,1,2,1,0,1]

Formula: cos = 1*1 + 1*1 + 2*2 + 1*1 + 1*0 + 0*1 / sqrt((1^2 + 1^2 + 2^2 + 1^2 + 1^2 + 0^2) * 1^2 + 1^2 + 2^2 + 1^2 + 1^2 + 0^2).

3. EXPERIMENTAL RESULT

The following Table 1 describes experimental result for proposed system analysis. The table contains weight of text document, HTML documents and XML documents, weight of clustering text document, HTML documents, XML documents and average of text document, HTML documents, and XML documents clustering details are shown.

s.no	Weight of Document (TEXT, XML, HTML)	Weight of Clustering Document			Proposed system Clustering Document [%]		
		HTML	XML	TEXT	HTML	XML	TEXT
1	200	166	172	176	83	86	88
2	250	230	234	234	92	93.6	93.60
3	300	286	287	291	95.33	97	97
4	350	334	338	342	95.42	96.57	97.71
5	400	391	394	398	97.75	98.5	99.50
6	450	436	442	445	96.88	98.22	98.89
7	500	473	479	489	94.60	95.80	97.80
8	550	537	545	547	97.62	99.10	99.45
9	600	586	589	592	97.77	98.17	98.62
10	650	638	643	646	98.15	98.92	99.38

The following **Fig 1** describes experimental result for proposed system analysis. The table contains weight of text document, HTML documents and XML documents, weight of clustering text document, HTML documents, XML documents and average of text document, HTML documents, and XML documents clustering details are shown.

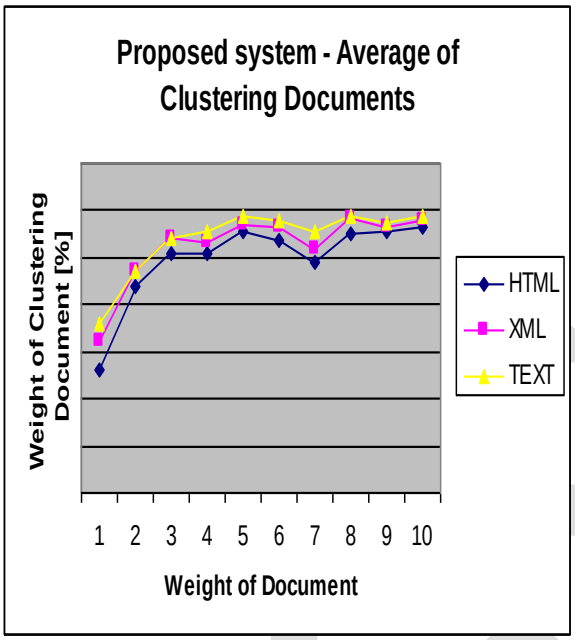

Figure 1 - Average of Clustering Documents

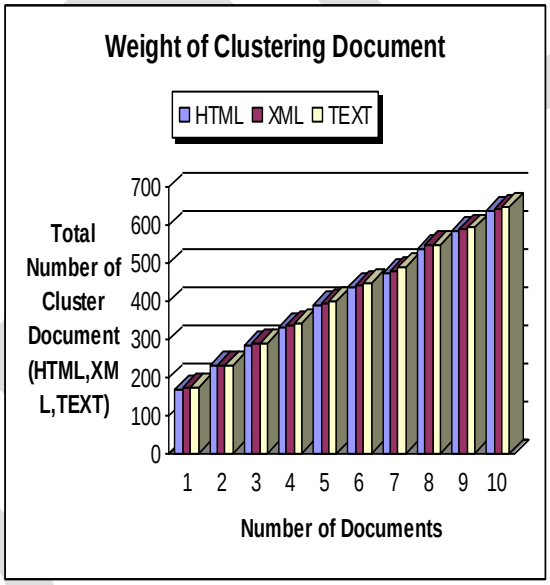

Figure 2- Weight of Clustering Documents

4. CONCLUSION

This proposed framework demonstrated how to construct various document and word constraints and apply them to the constrained coclustering process. A novel constrained coclustering approach is proposed that automatically incorporates various word and document constraints into information-theoretic coclustering. It demonstrates the effectiveness of the proposed method for clustering textual documents.

There are several directions for future research. The current investigation of unsupervised constraints is still preliminary. Furthermore, the algorithm consistently outperformed all the tested constrained clustering and coclustering methods under different conditions. The enhanced cosine similarity approach results in better clustering process.

5. FURTHER WORK

The future enhancements can be made for documents of different languages. Investigation for better text features that can be automatically derived by using natural language processing or information extraction tools can be made.

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Vulnerability of married fisher women for premalignant cervical lesions at Coastal TamilNadu

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Abstract: Background: Cervical cancer is the second highest reported in India with Incidence of 22.9 % and mortality rate of 20.7%. It increases in the areas prone for most known risk factor of cervical cancer. Recent research findings have shown the married fisher women in the coastal areas being more prone for cervical cancer. **Aim:** This study aimed at identifying the vulnerability of the married fisher women for acquiring premalignant lesion. **Setting:** The study was conducted in 5 fishermen communities under Sadras a coastal area in Tamilnadu, India. **Participants:** 250 married fisher women residing at the area. **Methodology:** Quantitative descriptive approach with cross sectional study design was used. Data was collected by using structured interview schedule for identifying the vulnerability and Pap smear test was done for identifying the premalignant cervical lesions among the married fisher women. Data was analyzed using descriptive and inferential statistics. **Results:** The study findings showed that about 6 (2.4 %) were found to have Precancerous cervical lesions such as Atypical Squamous Cell of Undifferentiated Significance (ASCUS) (5) and Mild dysplasia (1), 178(71.2%) had abnormal Cervix such as infection, inflammatory changes with the Pap smear findings. The study findings also showed the significant association of risk factors such as advanced age, lack of education, low socio economic status, using tobacco, multiparity, pre marital sex, extra marital relationship, using cloth as sanitary napkin with the abnormal findings which is supported by the odds ratio. **Conclusion:** Study findings clearly show the increased vulnerable state of the fisher women for acquiring cervical cancer as they had many risk factors contributing to cervical cancer.

Keywords: Cervical cancer, Pre malignant lesions, Fisher Women, Pap smear.

Introduction:

Cervical cancer is the second largest killer among the cancer in the developing countries. In India the incidence of cervical cancer is about 1,22,844 (22.9 %) while the mortality is 67,477(20.7%) in the overall mortality **[1]**. In TamilNadu it also accounts the second largest with incidence varying in different districts, In Chennai the incidence of cervical cancer is 15. 1% **[2].** There is a high incidence felt in north eastern districts of TamilNadu, Thiruvallur (28.6), Villupuram (31.1), Pondicherry (39.2), Cuddalore (29.9)**[3]**.

The investigator on literature search and personal field experience came to witness the increase in the incidence of cervical cancer among the among the married fisher women residing at the coastal areas of TamilNadu. The above verdict was supported by studies done in coastal areas of Andhra Pradesh[4] and Karnataka[5] where increase in the prevalence rate of cervical premalignant lesions was presented.

Materials and Methods:

Study Participants: The study used a cross sectional design where the participants were selected in 5 fisher women communities at Sadras, TamilNadu. The study participants were all married woman with the age between 20 – 45 years of age. The total target population of these women in the study area was 980 where more than 600 participants were contacted and about 250 women gave willingness to participate. Convenient sampling technique was used to select the samples.

Objectives: The primary objective was to identify the vulnerability of married fisher women for acquiring pre malignant cervical lesions.

Tools & Techniques: The investigator used a structured questionnaire which consisted of Part I- Demographic data , Part II consisted of Section A- Personal Habits, Section B- factors related to Perineal Hygiene, Section C- Factors related to sexual behavior and hygiene, Section D – factors related to family welfare practices and gynecologic problems and Part III consisted of Observational tool for vaginal examination where External Genitalia, Vaginal and Cervix appearance was assessed by the investigator and Pap smear collected from all study participants. The Pap Smear was investigated and reported by the pathologist of Govt.Chengalpettu Medical College Hospital, Chengalpattu.

Ethical Clearance: The study was approved by the Institutional Ethical committee of Chettinad Hospital and Research Institute, TamilNadu. All participants were given privacy and information's collected individually and confidentiality was maintained. The clients who have been identified with having premalignant cervical lesions were referred to the regional cancer centre in Chennai, TamilNadu, India for further testing and treatment.

Statistical Methods: The investigator has used frequency and percentage distribution to show the overall findings. Logistic Regression was used to determine the Odds ratio.

Results: The study findings showed that about 6 (2.4%) were found to have precancerous lesion such as ASCUS (5) and Mild dysplasia (1), 178(71.2%) had abnormal Cervix such as infection, inflammatory changes with the Pap smear findings (as shown in figure 1).

Figure 1: Finings of Pap smear among 250 fisher woman.

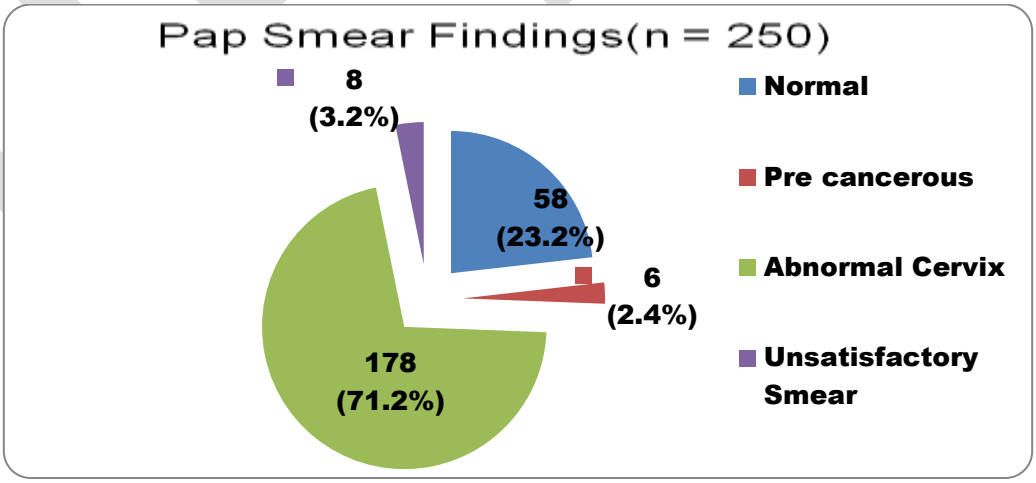

Table 1 depicts the risk factors which contributed to the abnormal cervical findings identified by Pap smear test. among the risk factors low socio economic status with regard to family income level below Rs 4000 per month ; lack of education in terms of

lack of formal education ;use of tobacco; alcohol; having extra marital relationship; pre marital sex; husband without circumcision; Frequent shellfish eating; using cloth as sanitary napkin; not performing vaginal douching after coitus; frequency of sexual intercourse i.e. having daily/more than thrice weekly; not using any temporary methods of family planning and having post coital bleeding showed significant abnormal cervical findings.

Table 1: Frequency and percentage distribution of the risk factors of the participants and their abnormal Pap smear findings such as Pre cancerous lesions, inflammatory changes and infection

S.No	Risk factor	Having Risk factor		Abnormal Cervix	
	Demographic and personal habits	**N**	**%**	**N**	**%**
1.	Age between 41 -15 years	68	27.2	61	24.4
2.	Married before 18 years	67	26.8	50	20
3.	Parity 3 and above	99	39.6	82	32.8
4.	Family Income below Rs.4,000/Month	182	71.8	132	52.8
5.	No formal education	101	40	81	32.4
6.	Tobacco use	58	23.2	49	19.6
	Factors related to perineal hygiene				
1.	Cloth as sanitary napkin	133	53.2	102	40.8
2.	Drying napkin under sun	96	38.4	70	28
	Factors related to sexual behavior and Hygiene				
1.	Not performing vaginal Douching after coitus	69	27.6	59	23.6
2.	Coitus daily/Thrice a week	28	11.2	21	8.4
3.	Extra marital relationship	12	4.8	11	4.4
4.	Pre marital sex	9	3.6	6	2.4
5.	First sex before 15 years of age	36	14.4	31	12.4
	Factors related to family welfare practices and gynecological problems				
1.	Not using temporary methods of family Planning	196	78.4	141	56.4
2.	Having problem in uterus	111	44.4	84	33.6
3.	Post coital bleeding	9	3.6	7	2.8

The odds ratio calculated using logistic regression which showed significant risk of acquiring premalignant cervical lesions were presented in the table 2.

Table 2: odds ratio for risk factors associated to Pap smear findings

S.No	Risk factor	Odds ratio for Pap Smear Precancerous lesion at 95 % Confidence interval (lower – upper)
1.	Family Income (< Rs.4000)	1.229 (0.389 - 3.885)
2.	Wife Education(Illiterate)	3.026 (1.293 - 7.079)
3.	Husband Education(Illiterate)	1.625(0.510 - 5.180)
4.	Tobacco Use	2.185 (0.949- 5.030)
5.	Alcohol Use	1.639 (0.263- 10.206)
6.	Extra Marital relationship	1.054 (1.023 - 1.086)
7.	Pre marital sex	1.040(1.014 - 1.066)
8.	Husband with STI	1.093 (0.178 - 6.705)
9.	Husband No Circumcision	1.058 (1.026 - 1.091)
10.	Shellfish eating	1.844 (1.640 - 2.073)
11.	Using Cloth as sanitary pad	1.158(1.096 - 1.224)
12.	Washing after intercourse	1.413(1.302 - 1.534)

13.	Frequency of Sexual Intercourse	1.129(1.079- 1.182)
14.	Not using temporary family planning methods	1.639 (0.514- 5.225)
15.	Bleeding after sexual intercourse	1.040(1.014 - 1.066)

Discussion:

The present study has clearly showed the risk of exposure of the fisher woman community to cervical cancer and the association of the no of risk factors with the findings shows how vulnerable these groups of woman are. The current study findings were similar to the studies done by **Bhagya Lakshmi et al**[6] in vishakapattinam , AndhraPradesh, **Ushadevi G et al**[7] among rural women of Kancheepuram district, Tamil Nadu and **Ravikiran E et al**[8] in rural women of Nalgonda, AndhraPradesh.

Conclusion:

The current study showed the vulnerability of the fisher women community in acquiring cervical cancer and the study also recommends a real need of urgent intervention in terms of mass awareness and screening program to be initiated to the fisher woman community to reduce the magnitude of problem in future.

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FROM SOUND TO NOISE INSULATION: A JOURNEY

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INTRODUCTION:

Life is full of sounds and we want to hear the pleasant and vital ones; while shunning the unpleasant and dangerous variety. All told we are becoming steadily more sound conscious, as the relatively enormous growth of the telephone, radio, phonographic recording and talking motion picture industries sufficiently attests. Sounds touch people in different ways. Sound is extremely important to feel the taste of life. It is what we experience through the senses that make life meaningful. Sound is important for communication, signaling system, for finding depth of objects (SONAR) etc.

Sound has been used to study earth's history, to explore for oil and gas, to study undersea earthquakes and volcanic eruptions, to research wind energy, to measure temperature in ocean, to measure global climatic change. Even during the Cold War, the U.S. Navy allowed a small number of oceanographers to make use of the SOSUS (SOund SUrveillance System) for research in tracking soviet submarines at long ranges.

SOUND

The vibrations in machines and structures result in oscillatory motion that propagates in air and/or water and that is known as sound. Sound can also be produced by the oscillatory motion of the fluid itself, such as in the case of the turbulent mixing of a jet with the atmosphere, in which no vibrating structure is involved. The simplest type of oscillation is vibration and a sound phenomenon is known as simple harmonic motion, which is sinusoidal in time.

Sound can propagate through compressible media such as air, water and solids as longitudinal waves and also as a transverse waves in solids. During propagation, waves can be reflected, refracted, or attenuated by the medium. The speed of sound depends on the medium that the waves pass through, and is a fundamental property of the material. According to Newton-Laplace equation the velocity of sound c, is given by

$c=\sqrt{(\frac{K}{\rho})}$; K = elastic bulk modulus of medium, ρ = density of medium.

Those physical properties and the speed of sound change with ambient conditions. Sound waves travel faster and more effectively in liquids than in air and travel even more effectively in solids. This is because the molecules of solids are more tightly packed together than in liquids and those in liquids are more tightly packed than in gases. Vibrating effects are more easily passed on from one molecule to the next when they are in close proximity. It has been observed that velocity of sound is about 4 times faster in water than in air. Velocity of sound in a steel bar is about 16 times greater than velocity of sound in air as calculated by Rayleigh[1]. Velocity of sound is affected by many parameters like temperature, density, wind, frequency of sound waves, amplitude of sound waves. Rayleigh showed that in case of hydrogen the velocity of sound is greater than for air in the ratio 3.792:1

The vibrations of a bar are of three kinds longitudinal, torsional, and lateral. Of these the last are the most important, but at the same time the most difficult in theory. The unit of sound is decibel (dB) and is measured in room as Sound pressure level (L) by Sound Level Meter (SLM) and calculated manually

$L = 10 \log \frac{p1^2+p2^2+ \ldots\ldots+pn^2}{n\,p0^2}$ ---------- EN ISO140-6:1998

where p_1, p_2, …… p_n are the rms sound pressures at n different positions in the room and p_0=20μPa is the reference sound pressure. The difference (D) in space and time average sound pressure levels produced in two rooms by one or more sound sources in one of them is calculated by

$D = L_1 - L_2$ ---------- IS : 9901(Part IV) - 1981

Where L_1 is the average sound pressure level in the source room, L_2 is the average sound pressure level in receiving room.
If sound power W is measured in watts then sound pressure level in dB is

$L = 10 \log \frac{W}{10^{-12}}$

The total sound produced by a number of machines of same type can be determined by adding 10 log n to the sound produced by one machine alone. That is $L_p(n) = L_p + 10 \log n$

Thus sound produced by two individual sound pressure of 80dB will produce a total sound pressure level of (80 + 10 log 2 =) 83dB.

Human ear range of sound intensity: from 10^{-16} W/cm^2 to 10^{-3} W/cm^2
• Zero decibels is the threshold of human hearing and 130dB is the threshold for pain
- 20 – 30dB = whisper
- 40 - 50dB = general office noise
• In open space, when distance is doubled between receiver and sound source intensity level (L) decreases 6dB
- Sound intensity (I) (different from intensity level) will decrease to 1/4
• Doubling the mass = 6dB decrease
• Doubling number of sound sources of equal intensity = increase of 3dB

NOISE

Noise means any unwanted sound. Sounds, particularly loud ones, that disturb people or make it difficult to hear wanted sounds, are noise. Noise exposure can cause two kinds of health effects. These effects are non-auditory effects and auditory effects. Non-auditory effects include stress, related physiological and behavioral effects, and safety concerns. Auditory effects include hearing impairment resulting from excessive noise exposure, Acoustic trauma, Tinnitus, Temporary hearing loss. Noise-induced permanent hearing loss is the main concern related to occupational noise exposure.

SOUND ABSORPTION

The sound-absorbing ability of a material is given in terms of an absorption coefficient, designated by *a*.. Absorption coefficient is defined as the ratio of the energy absorbed by the surface to the energy incident on the surface. Therefore, *a* can be anywhere between O and 1. When a = O, all the incident sound energy is reflected; when a = 1, all the energy is absorbed.
The value of the absorption coefficient depends on the frequency. Therefore, when specifying the sound-absorbing qualities of a material, either a table or a curve showing a as a function of frequency is required. Sometimes, for simplicity, the acoustical performance of a material is stated at 500 Hz only, or by a noise reduction coefficient (NRC) that is obtained by averaging, to the nearest multiple of 0.05, the absorption coefficients at 250, 500, 1000, and 2000 Hz.
The absorption coefficient varies somewhat with the angle of incidence of the sound wave. Therefore, for practical use, a statistical average absorption coefficient at each frequency is usually measured and stated by the manufacturer. It is often better to select a sound-absorbing material on the basis of its characteristics for a particular noise rather than by its average sound-absorbing qualities.
Sound absorption is a function of the length of path relative to the wavelength of the sound, and not the absolute length of the path of sound in the material. This means that at low frequencies the thickness of the material becomes important, and absorption increases with thickness. Low-frequency absorption can be improved further by mounting the material at a distance of one-quarter wavelength from a wall, instead of directly on it.

Average absorption coefficient, $\bar{a}$ is calculated as follows:

$$, \bar{a} = \frac{\alpha 1 \square 1 + \alpha 2 S2 + \ldots\ldots\ldots + \alpha n Sn}{S1 + S2 + \ldots\ldots\ldots + Sn}$$

Where $\bar{a}$ = the average absorption coefficient
α_1, α_2, α_n = the absorption coefficient of materials on various surfaces
S_1, S_2, S_n = the areas of various surfaces

SOUND ISOLATION

Noise may be reduced by placing a barrier or wall between a noise source and a listener. The effectiveness of such a barrier is described by its transmission coefficient. Sound transmission coefficient of a partition is defined as the fraction of incident sound transmitted through it.
Sound transmission loss is a measure of sound-isolating ability, and is equal to the number of decibels by which sound energy is reduced in transmission through a partition. By definition, it is 10 times the logarithm to the base 10 of the reciprocal of the sound transmission coefficient.
That is,

$$\text{TL} = 10\ log\ \frac{1}{\tau}$$

Where TL = transmission loss in Db, τ = Transmission coefficient
$\tau = \frac{W2}{W1}$; W_1 represents the sound power incident on the wall and W_2 the sound power transmitted through the wall.

Transmission loss (TL): It is the difference in decibels between sound power incident on a barrier in a source room and the sound power radiated into a receiving room on the opposite side of the barrier.

Noise reduction (NR): It is the difference in decibels between the intensity levels in two rooms separated by a barrier of a given transmission loss.

- Dependent on the transmission loss of the barrier, area of barrier and absorption of the surfaces in the receiving room

$$NR = TL+10 \log (\frac{A}{S})$$

A = total acoustical absorption (sabins), S = area of barrier

Reverberation time (RT): The time which takes the sound level to decrease 60dB after the source has stopped

$$TR = 0.05 (\frac{V}{A})$$

TR = reverberation time, V = room volume, A = total acoustical absorption

Recommended reverberation times

Space	**time (sec)**
Auditoriums	1.5 – 1.8
Churches	1.4 – 3.4
Classrooms	.6 - .8
Lecture/conference rooms	.9 – 1.1
Offices	.3 - .6
Opera halls	1.5 – 1.8
Symphony halls	1.6 – 2.1

DOUBLEWALLS

A 4-in. thick brick wall has a transmission loss of about 45 dB. An 8-in. thick brick wall, with twice as much weight, has a transmission loss of about 50 dB. After a certain point has been reached it is found to be impractical to try to obtain higher isolation values simply by doubling the weight, since both the weight and the cost become excessive, and only a 5 dB improvement is gained for each doubling of weight.

An increase can be obtained, however, by using double-wall construction. That is, two 4-in. thick walls separated by an air space are better than one 8-in. wall. However, noise radiated by the first panel can excite vibration of the second one and cause it to radiate noise. If there are any mechanical connections between the two panels, vibration of one directly couples to the other, and much of the benefit of double-wall construction is lost.

There is another factor that can reduce the effectiveness of double-wall construction. Each of the walls represents a mass, and the air space between them acts as a spring. This mass-spring-mass combination has a series of resonances that greatly reduce the transmission loss at the corresponding frequencies. The effect of the resonances can be reduced by adding sound-absorbing material in the space between the panels.

MUFFLERS

Silencers, or mufflers, are usually divided into two categories: absorptive and reactive. The absorptive type, as the name indicates, removes sound energy by the use of sound-absorbing materials.

Fiberglass or mineral wool with density approximately (8-96 kg/m^3)0.5-6.0 lb/ft^3 is frequently used in absorptive silencers. These materials are relatively inexpensive and have good sound-absorbing characteristics. They operate on the principle that sound energy

causes the material fibers to move, converting the sound energy into mechanical vibration and heat. The fibers do not become very warm since the sound energy is actually quite low, even at fairly high decibel levels. The simplest kind of absorptive muffler is a lined duct, where the absorbing material is either added to the inside of the duct walls or the duct walls themselves are made of sound-absorbing material. The attenuation depends on the duct length, thickness of the lining, area of the air passage, type of absorbing material, and frequency of the sound passing through. The acoustical performance of absorptive mufflers is improved by adding parallel or annular baffles to increase the amount of absorption. This also increases pressure drop through the muffler, so that spacing and area must be carefully controlled.

Reactive mufflers have a characteristic performance that does not depend to any great extent on

the presence of sound-absorbing material, but utilizes the reflection characteristics and attenuating properties of conical connectors, expansion chambers, side branch resonators, tail pipes, and so on, to accomplish sound reduction. An effective type of reactive muffler, called a Helmholtz resonator, consists of a vessel containing a volume of air that is connected to a noise source, such as a piping system. When a pure-tone sound wave is propagated along the pipe, the air in the vessel expands and contracts. By proper design of the area and length of the neck, and volume of the chamber, sound wave cancellation can be obtained, thereby reducing the tone. This type of resonator produces maximum noise reduction over a very narrow frequency range,

DAMPING

Mass, stiffness and damping are three important parameters that determine the dynamic responses of a structure and its sound transmission characteristics. Mass and stiffness are associated with storage of energy. Damping results in the dissipation of energy by a vibration system. There are many damping mechanisms that convert mechanical energy from a vibratory system into heat and other energy forms. Basically damping mechanisms fall into one of the two categories: external and internal.

External damping mechanisms include acoustic radiation damping, Coulomb friction damping, joint and boundary damping and so on. The dynamic response of a structure couples with the surrounding fluid medium, such as air, water or other liquid, in different ways, for example, by the creation of bending and shear waves.

Internal damping, or material damping, refers to the conversion of vibrational energy into heat within the volume of the material. Any real material subjected to stress/strain cycles dissipates energy. Generally the damping of viscoelastic materials is higher than that of conventional metals. High damping is not the only beneficial property for good noise and vibration control.

DAMPING IN SANDWICH STRUCTURES

A sandwich structure consists of three elements: the face sheets, the core and the adhesive interface layers. The great advantage of sandwich structures is that optimal designs can be obtained for different applications by choosing different materials and geometric configurations of the face sheets and cores. By inserting a lightweight core between the two face sheets, the bending stiffness and strength are substantially increased compared with a single layer homogenous structure, without the addition of much weight. The viscoelastic core has a high inherent damping capacity. When the beam or plate undergoes flexural vibration, the damped core is constrained to shear. This shearing causes the flexural motion to be damped and energy to be dissipated.

When a damping layer is attached to a vibrating structure, it dissipates energy by direct and shear strains. When a solid beam or plate is bending, the direct strain increases linearly with distance from the neutral axis. So unconstrained damping layers which dissipate energy mainly by direct strain are attached to the remote surfaces. On the other hand, the shear stress is the largest at the neutral axis and zero on the free surfaces. Therefore, constrained layers dissipate energy by shear stress. It has been shown that shear damping in viscoelastic materials is higher than in typical structural materials. And the constrained treatment has higher stiffness than unconstrained damping treatment. For these reasons sandwich composite structures are widely used. Besides the three-layer sandwich structures, multi-layer sandwich structures are also used.

SOUND INSULATION SOFTWARES

INSUL is a program for predicting the sound insulation of wall, floors, ceilings, roofs & windows. INSUL uses robust theoretical models that are quick to calculate and only require easily obtainable construction information. The program can make good estimates of the Transmission Loss (TL). Weighted Sound Reduction Index (R_w or STC) and Impact Sound Insulation ($L_{n,w}$ or IIC).

BASTIAN uses a graphical window-user interface and event-controlled programming in its calculation of sound insulation between rooms. It is based primarily on the European Standard series EN 12354 but also utilizes other parameters and definitions from other Standards such as ISO 140 and ISO 717.

REDUCT is another sound insulation program used to calculate the sound reduction index of various building elements. It is primarily based on Kaj Bodlund's[1] report that was done in 1980 and is used within Ingemansson acoustical consultants in Sweden. It is extremely similar to INSUL.

ENC is an acoustical program that is essentially a supplement to the book Engineering Noise Control [2]. The program covers every area outlined within this book ranging from calculations concerning some of the fundamentals of acoustics (such as the addition of decibels) to more complicated calculations involving the power radiated from machines.

WinFlag is a program designed to calculate the sound reduction index, impedance and absorption coefficient for various materials. This program is modeling the acoustic properties of a combination of such layered materials using the transfer matrix method. Basically, each layer in the combination, assumed to be in finite extent, is represented by a matrix giving the relationship between a set of physical variables on the input and the output side of the layer. These matrices may then be combined to give the relationship between the relevant physical variable for the whole combination. Characteristic data as the absorption coefficient, input impedance and the transmission loss (sound reduction index) may then be calculated assuming wave incidence.

ANALYSIS OF VIBRATION

Analysis of the vibratory behavior of a complex structure can be undertaken in two basically different ways: deterministic and statistical analysis.

The two approaches to the problem, deterministic and statistical, are not in competition for the great majority of applications statistical techniques take over from deterministic techniques, both in feasibility and usefulness, as the frequency range of interest rises through the mode series of the structure. With the deterministic approach, computation of individual modal behavior becomes increasingly difficult and unreliable as we go to higher mode numbers (beyond twenty or thirty, perhaps). The statistical approach, on the other hand does not require such detailed calculations and becomes increasingly successful as the resonance frequency spacing gets smaller (compared with the half-power bandwidth of each mode) the more modes one can average over, the more reliable the average becomes as an estimate of what actually happens in the structure There may be an intermediate frequency range where both approaches can be tried, but in such a situation it is possible that neither method will give entirely satisfactory results

There are four reasons for this First, the modes crowd together in frequency so that many more of them need to be considered Secondly, higher frequency (l e shorter length-scale) modes are more sensitive to the inevitable small variations in structural detail even in nominally identical structures, so that they are harder to predict reliably Thirdly, related to the previous point, numerical accuracy decreases as one goes higher up the mode series so that, even if the real structure behaves like the model under study, the numerical predictions from the model may not be reliable

STATISTICAL ENERGY ANALYSIS METHOD

Statistical Energy Analysis was developed in the 1960's, to a great extent to clarify and handle structural acoustic problems in conjunction with space-crafts. The statistical energy analysis (SEA) or power balance method is attractive at high frequencies where a deterministic analysis of all resonant modes of vibration is not practical. In SEA model, a complex structure is virtually divided into coupled subsystems. Energy flows from one subsystem to others. Based on the assumption of power balance of these subsystems, the averaged behavior of the whole structure can be predicted. Because SEA calculates the spatial and frequency averaged response, the SEA model for a complex structure could be quite simple. Modal density, internal loss factor for each subsystem, and coupling loss factors between the subsystems are the basic SEA parameters. The most obvious disadvantage with SEA is that the energy quantities obtained for the different subsystems are statistical estimates of the true energy quantities and accordingly involve some uncertainty.

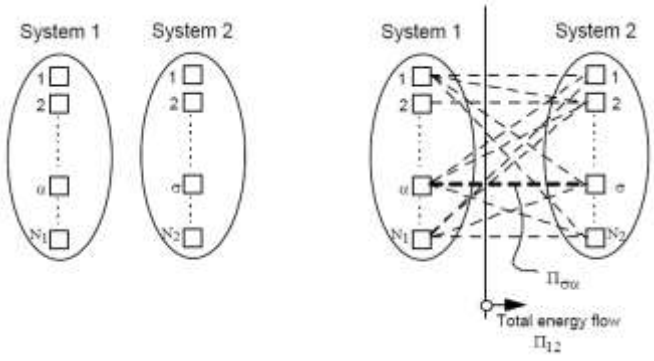

Illustration of interaction and coupling between multi-modal systems

The interaction between two simple oscillators which are assumed to be linear and coupled by linear, non-dissipative elements (no energy lost at the connecting boundaries) constitute the fundamental model from which some important theorems in SEA can be deduced. To summarize it is appropriate to start from the basic equation

$$\Pi`2\ 1 = B(E1 - E2)$$

Consider the coupled system in Figure above. If the energies in the two subsystems are *E1* and *E2* then the net energy flow between them is found from eqn. above. In this equation *B* is a function of the coupling strength. This coupling is solely governed by the properties of the subsystems and the coupling elements.

From this equation we may state:

• the energy flow is proportional to the actual vibrational energies of the two subsystems

• the coupling function or proportionality is positive, definite and symmetric in the system parameters therefore the system is reciprocal and the energy flows from the subsystem with the higher energy to the one with the lower energy

• if only one subsystem is directly excited the highest possible energy for the indirectly driven subsystem is that of the first.

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Interfacing Raspberry Pi With Led to interact with hand gestures in MATLAB: A Research

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Abstract — In this paper a device named as Raspberry Pi is used which is less expensive, credit-card sized computer that plugs into a computer, monitor or TV and it uses a standard keyboard and mouse. Raspberry Pi board is also called system on chip. This research aims to provide a remote free approach to control a LED by allowing the user to interact in a more natural way by using hand gestures with the help of raspberry pi. Gestures are processed using image processing and data acquisition toolbox.

Keywords-Raspberry Pie, Models , Detection ,Gestures, Normalized, GPIO, LINUX

1) INTRODUCTION

The **Raspberry Pi** is a small-sized single-board computer developed using Raspberry Pi in UK. Whose purpose is to support the teaching of basic computer science in schools . The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which has an ARM1176JZF-S 700 MHz processor, Video Core IV GPU and was originally shipped with 256 megabytes of RAM, later improved (Model B & Model B+) to 512 MB. It does not include a built-in hard disk . It has SD card which is used for booting and continous storage, with Model B+ using a Micro SD card. Raspberry Pi behaves as a computer. It has different kind of processor in it, so Microsoft Windows can't install on it. Instead of Microsoft Windows, we install number of versions of Linux operating system seems like Microsoft Windows. Internet surfing is also done using raspberry Pi and also we can send an email and many more. It is easy to use, robust, reasonable, the Raspberry Pi is the ideal tool for pursuing computer scientists.[1]

1.1) Models-

The Raspberry Pi is available in three editions:

The Model A
The Model B
The Model B+

Named for the differing editions of the classic BBC Micro from British computing giant Acorn, the two models differ only in their capabilities: the B has a 10/100M Ethernet jack and two USB ports to the A's single port and lack of any form of on-board networking. For now, only the Model B is being produced. At its heart is a Broadcom BCM2835 system-on-chip processor running at 700MHz, with a Video Core IV GPU running at 250MHz.[1]

MODEL A : Primary model of raspberry-pi. It has maximum two USB ports. It doesn't have Ethernet port so for having Ethernet connection, but there is a need of USB cable with Ethernet connector. So, It is not much efficient.

MODEL B : Secondary model of raspberry-pi. It has 4 USB ports, and also have Ethernet port. It has audio out port but do not have video out port. It is costlier than MODEL A.

MODEL B+ : Tertiary model of raspberry-pi. It also contains 4 USB ports and do have a Ethernet port. It contains both audio out and video out port. It is costlier than the above two. MODEL B+ is used in this project.[1]

1.2) Specifications-

Table no.1: specifications of raspberry pi [1]

	MODEL A	MODEL B	MODEL B+
Memory(SDRAM)	256 MB	512 MB	512 MB
Power Ratings	300 mA	700mA	600 Ma
Power Source	5 v via micro USB	5 v via micro USB	5 v via micro USB
Size	85.60 mm x 56 mm		

1.3) Colored Object Tracking -

As we know that colored object is easier to track than a hand, the different algorithms were applied on color objects. This object was detected in the live video stream by using color detection eg. Red color and the direction of its motion was determined with the help of raspberry pie board. The algorithm used to detect colored objects and estimate their direction of motion is discussed below in flow chart.

1.3.1) Color Detection-

As the frames came from the webcam were in RGB format. These RGB values were converted to normalized RGB form to remove the effects caused because of varying light intensities coming from different areas of the same object. This color scheme is used for further calculations in this paper due to the same reason. The conversion of RGB values to their normalized form was carried out by using the following formulae:

$r = R / (R+G+B).$ (1)

$g = G / (R+G+B).$ (2)

$b = B / (R+G+B).$ (3)

where r, g, b are normalized RGB color coefficients. The normalized frames were searched for the particular color and based on a threshold value, binary images were formed with white pixels indicating the presence of the object.

1.3.2) Direction Estimation- Direction estimation is done using a simple yet effective method using the board. In this method, the object moving in a certain direction if in eight successive frames acquired, the object's centroid moves in the same direction continuously and shows in a particular spatial window. For example, suppose the centroid moves up continuously in eight successive frames and lands at a particular distance above the initial location with a small amount of horizontal movement, then, the direction of motion is taken to be upwards.

1.3.3) Hand Detection- In order to calculate the differences between two images, background removal technique is used, one of which is a stationary background. Only the object present in the foreground is detected and the stationary background gets cancelled off. A background image is captured in the beginning for this purpose. Skin regions are segmented in this image by using the skin color that is already determined. This results in a skin segmented binary background image. After this process is complete, a combination of skin segmentation and background removal schemes is applied to the images acquired to detect the presence of hand. For this, a binary image is constructed, for every image acquired, with the white pixels representing the presence of skin color. Every such binary image is subtracted from the original skin segmented binary image. The absolute difference in the two images is taken to be the final binary image representing the hand. Skin segmentation helps in detecting the errors due to motion of any other colored object in view while background removal helps in detecting moving objects only.[2]

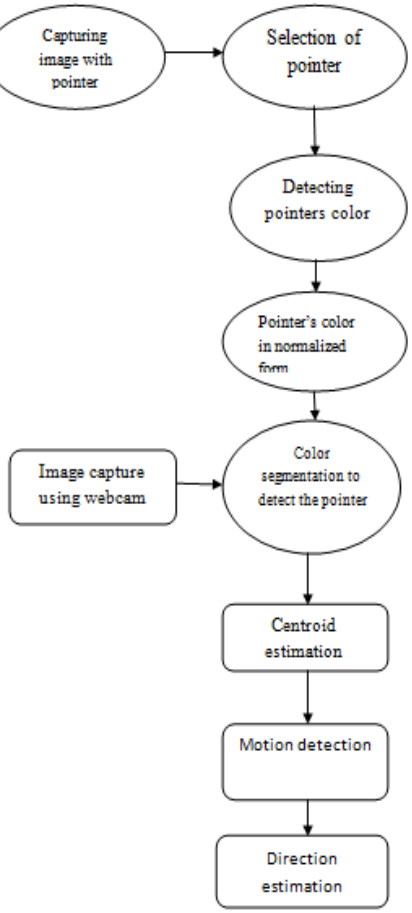

Fig-1: Systematic block diagram showing procedure for gesture recognition.

2.RESEARCH MEHODOLOGY

Step 1- Install SD card formatter in raspberry pie.

Step 2 –Connect cable and display .

Step 3 – Install raspberry pie hardware.

Step 4- Install webcam.

Step 5 – GPIO pin used to connect LED .

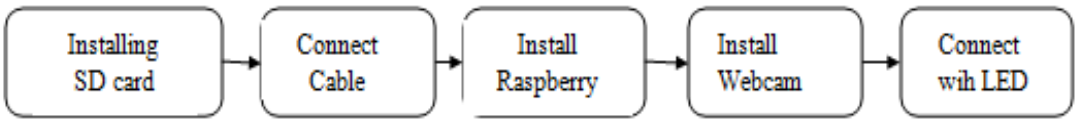

Fig 2: Research methodology used shown in 'appendix-A'

4. RESULTS

LED'S are glowing by showing the gestures using raspberry pi as interfacing with matlab. This research aims to provide a remote free approach to control a LED by allowing the user to interact in a more natural way by using hand gestures with the help of raspberry pi. Gestures are processed using image processing and data acquisition toolbox.

5. CONCLUSION

Raspberry pi interfacing with led shall be used as wearable technology. It is remote free approach to control a LED set by allowing the user to interact in a more natural way by using hand gestures with the help of **raspberry pi** and also used in number of operations in our daily life like. We should lock or unlock the car door with simply wearing this device using gestures. Control music player with gestures. Playing games with gestures. Useful technology for blind persons. Camera controlling using gestures.

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Modelling and Analysis of Single Machine Infinite Bus System with and without UPFC for Different Locations of Unsymmetrical Fault

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Abstract— In this research paper, two simulation models of single machine infinite bus (SMIB) system, with & without UPFC, have been developed. These simulation models have been incorporated into MATLAB based Power System Toolbox (PST) for their transient stability analysis. These models were analyzed for line to line fault at different locations, i.e. at sending end of transmission line, middle of the line and receiving end of transmission line keeping the location of UPFC fixed at the receiving end of the line. Transient stability was studied with the help of curves of fault current, active & reactive power at receiving end, shunt injected voltage & its angle, series injected voltage & its angle, excitation voltage and speed of rotor. With the addition of UPFC, the magnitude of fault current reduces and oscillations of excitation voltage also reduce. It can be concluded that transient stability of SMIB is improved with the addition of Unified Power Flow Controller.

Keywords— SMIB, UPFC, Shunt Injected Voltage, Series Injected Voltage, Transient Stability, STATCOM, SSSC, Unsymmetrical Line to Line Fault

INTRODUCTION

UPFC is a combination of Static Synchronous Compensator (STATCOM) and Static Series Compensator (SSSC). These two are coupled via a common dc link, to allow bidirectional flow of real power between the series output terminals of the SSSC and the shunt output terminals of the STATCOM, and are controlled to provide concurrent real and reactive series line compensation without an external electric energy source [1][3][4][13]. UPFC is able to control, concurrently or selectively, the transmission line voltage, impedance, and angle or, alternatively, the real and reactive power flow in the line [2][5][6][9][10]. The schematic of the UPFC is shown in Figure 1.

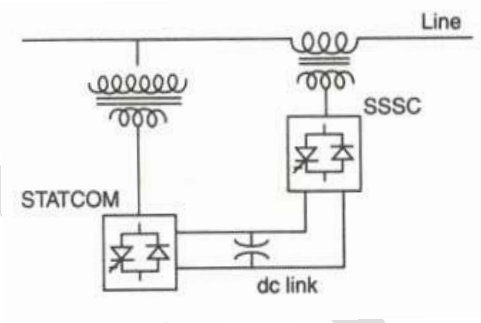

Fig.1 Unified Power Flow Controller

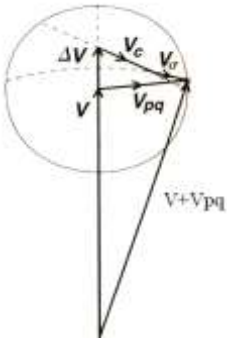

Fig.2 Conventional Transmission Control Capabilities of UPFC (Simultaneous Control of Voltage, Impedance & Angle)

Multifunctional power flow control executed simultaneously with terminal voltage regulation, series capacitive line compensation and phase shifting as shown in Figure 2, where Vpq= ΔV+ Vc+ Vσ. This capability is unique to UPFC. No single conventional equipment has the similar multifunctional capability [1][3][4][11].

SIMULATION MODELLING AND TRANSIENT STABILITY ANALYSIS OF SMIB WITH & WITHOUT UPFC

In this research work, simulation models of Single Machine Infinite System (with & without Unified Power Flow Controller) for different type of faults at different locations are developed, keeping UPFC fixed at the receiving end of SMIB. Simulation models have been prepared in MATLAB/ SIMULINK to study the transient stability of SMIB as shown in Figure 3 & 4. [8][12][14].

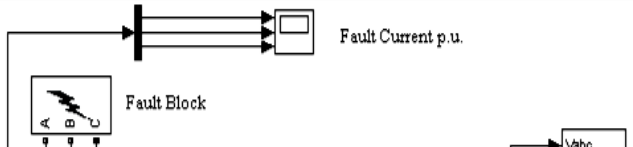

Fig.3 Simulation Diagram of SMIB without UPFC and Fault at Receiving End of Transmission Line

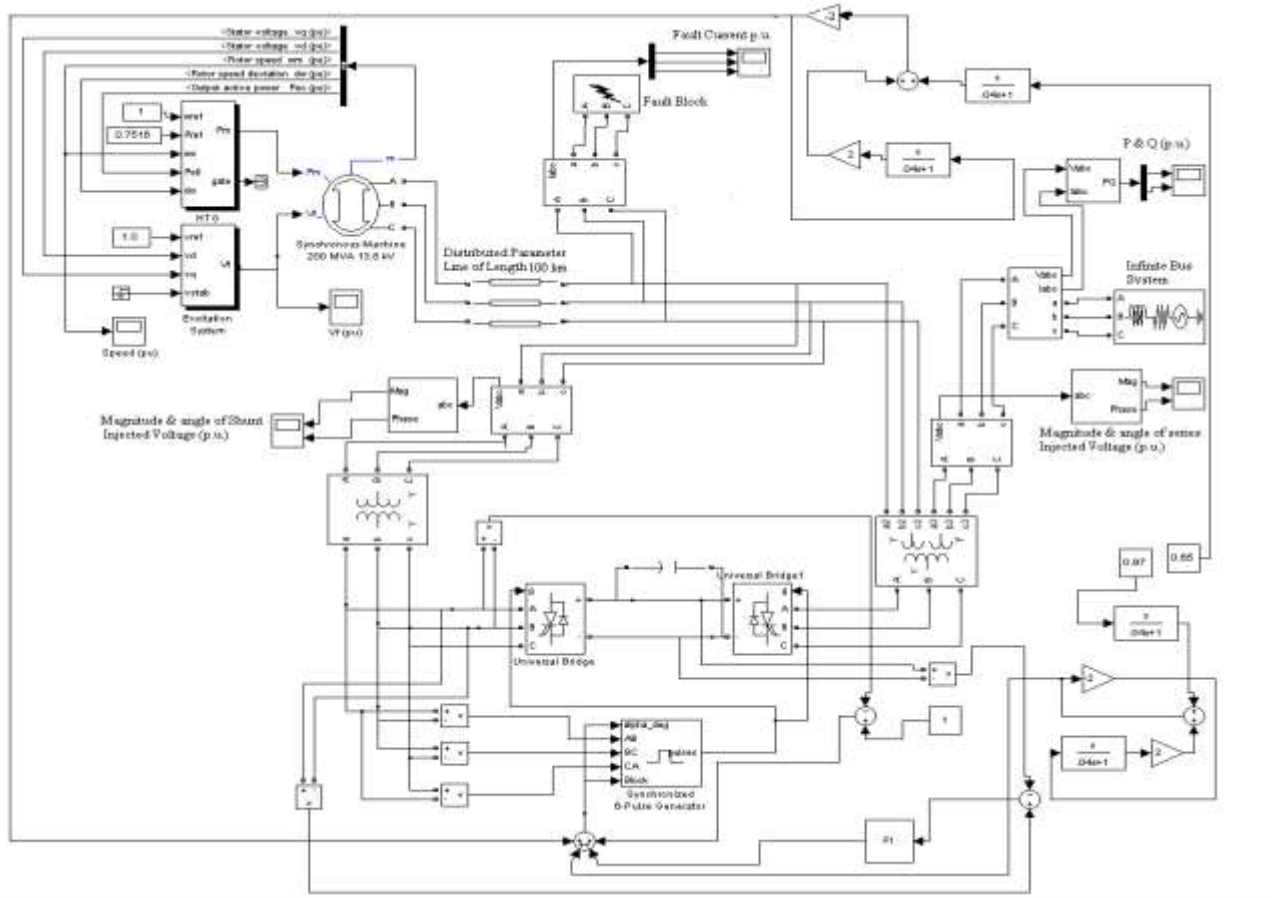

Fig.4 Simulation Diagram of SMIB with UPFC and Fault at Receiving End of Transmission Line

RESULTS OF UNSYMMETRICAL LINE TO LINE FAULT AT DIFFERENT LOCATIONS OF TRANSMISSION LINE WITH AND WITHOUT UPFC

I. Fault at Receiving End of Transmission Line

Single Machine Infinite Bus (SMIB) System without UPFC at Receiving End

Resulting curves of the variation of speed of rotor, excitation voltage, fault current and active & reactive power at receiving end are presented in Figures 5 to 7.

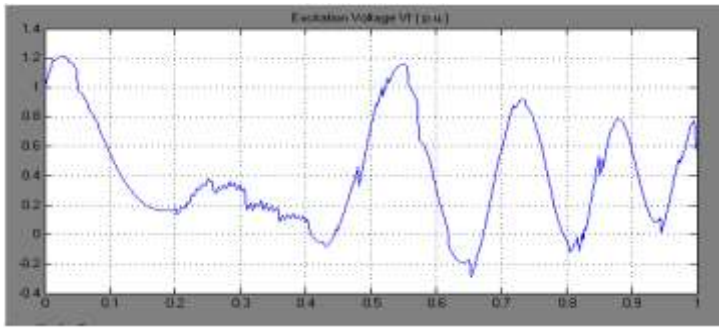

Fig.5 Variation of Excitation Voltage Vs Time

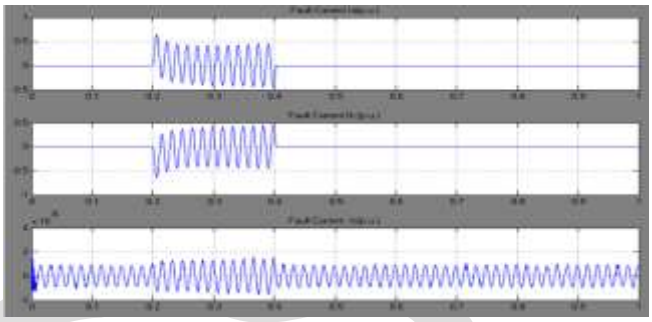

Fig.6 Variation of Fault Current Vs Time

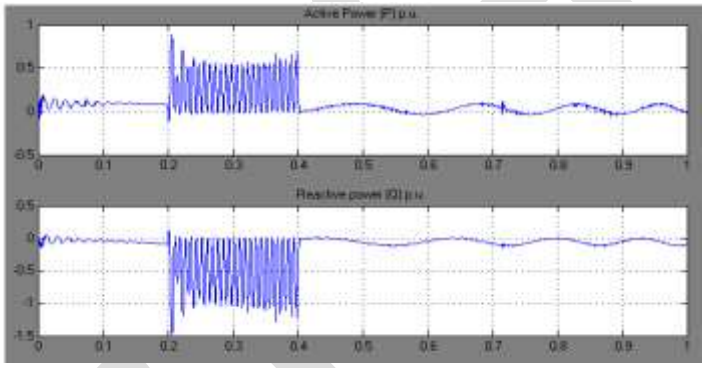

Fig.7 Variation of Active & Reactive Power Vs Time

Single Machine Infinite Bus (SMIB) with UPFC at Receiving End

Resulting curves of the variation of speed of rotor, excitation voltage, fault current, active & reactive power at receiving end, magnitude & angle of series injected voltage and magnitude & angle of shunt injected voltage are shown in Figures 8 to 12.

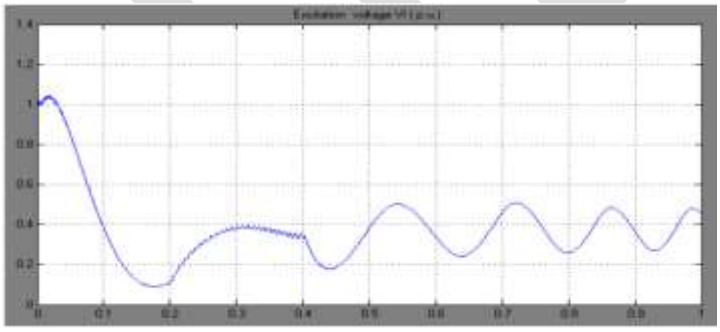

Fig.8 Variation of Excitation Voltage Vs Time

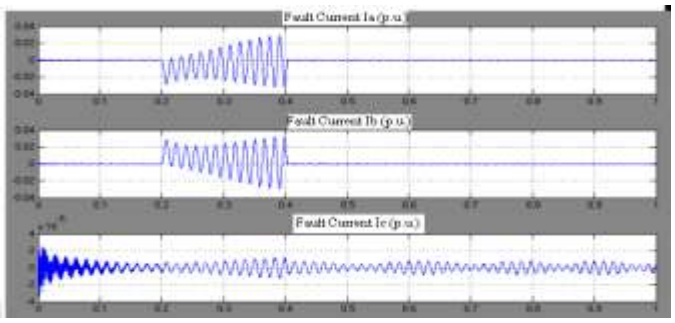

Fig.9 Variation of Fault Current Vs Time

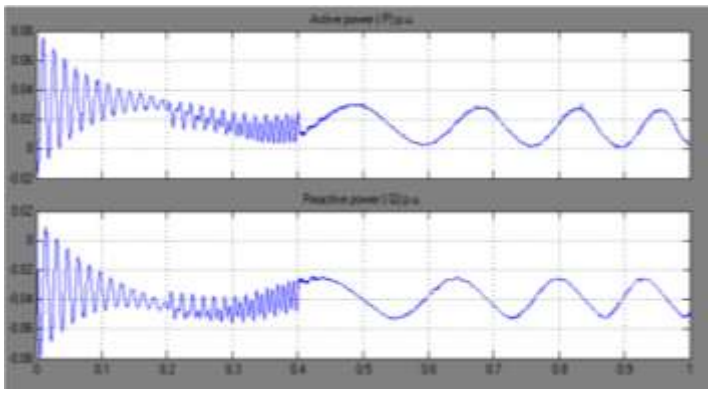

Fig.10 Variation of Active & Reactive Power Vs Time

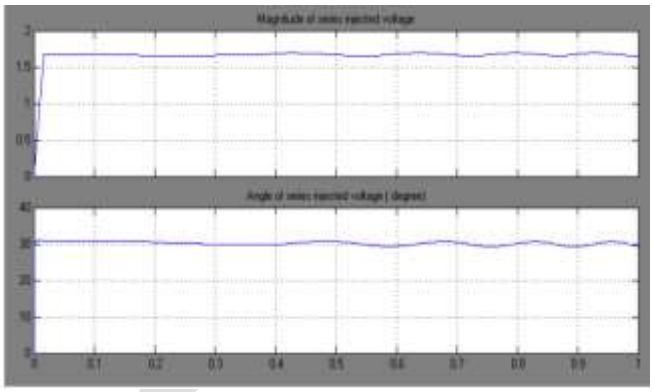

Fig.11 Variation of Series Injected Voltage & its Angle Vs Time

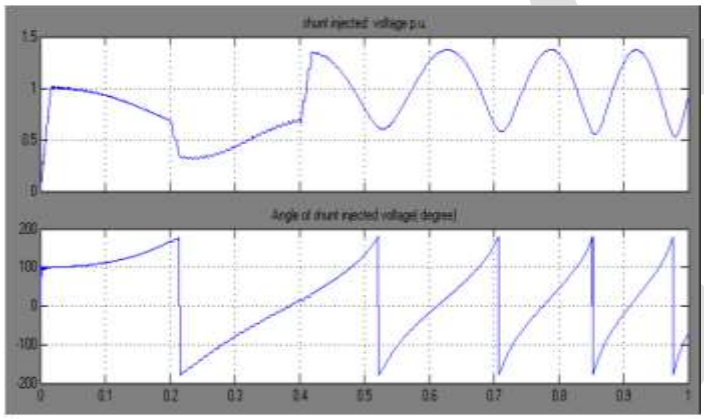

Fig.12 Variation of Shunt Injected Voltage & its Angle Vs Time

Fault Current : Without UPFC, during fault interval, fault current in phases a, b & c lies between 0.60 to -0.50 p.u., -0.60 to 0.50 p.u. & 1.5×10^{-6} respectively (Figure6). With UPFC, fault current in phases a, b & c is reduced to (0.03 to -0.03 p.u., 0.03 to -0.03 p.u. & 0.5×10^{-6} p.u.) respectively (Figure9.). So, using UPFC, the magnitude of fault current has reduced in **a** & **b** phases.

Excitation Voltage: Without UPFC, before occurrence of fault, excitation voltage lies between 1.2 p.u. to 0.2 p.u., during the fault, it lies between 0.4 p.u. to 0.15 p.u. with large oscillations and it lies between 1.15 p.u. to -0.30p.u. with oscillations after the fault (Figure5). With UPFC, before occurrence of fault, excitation voltage lies between 1.0 p.u. to 0.1 p.u., during the fault, it lies between 0.1 to 0.4 p.u. and it lies between 0.2 to 0.5 p.u. with oscillations dieing out after the fault (Figure 8). So, using UPFC, the number of oscillations of excitation voltage have decreased and die out more smoothly.

Series Injected Voltage: Series part of UPFC injects a voltage of 1.7 p.u. at an angle of 30 degree (Figure11).

Shunt Injected Voltage: Shunt part of UPFC injects a voltage of 1.0 p.u. to 0.7 p.u. with an angle of 100 to 180 degree before the fault, voltage of 0.3 p.u. to 0.7 p.u. with an angle of -180 to 180 degree during the fault and voltage of 1.3 p.u. to 0.6 p.u. with an angle of 180 to -180 degree after the fault (Figure12).

Active and Reactive Power: With addition of UPFC, there is no appreciable change in the values of active and reactive power (Figures 7&10).

II. Fault at Middle of Transmission line

Single Machine Infinite Bus (SMIB) System without UPFC at Middle of Transmission line

Resulting curves of the variation of speed of rotor, excitation voltage, fault current and active & reactive power at receiving end are presented in Figure 13 to 15.

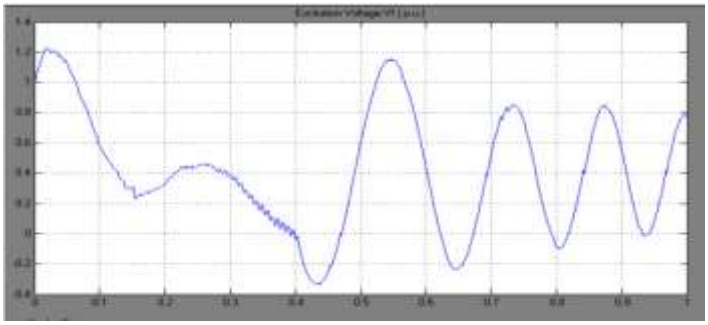

Fig.13 Variation of Excitation Voltage Vs Time

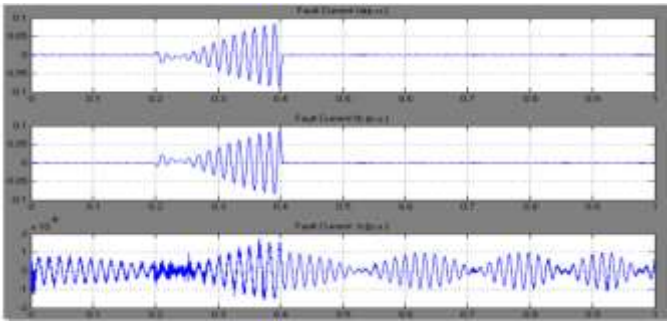

Fig.14 Variation of Fault Current Vs Time

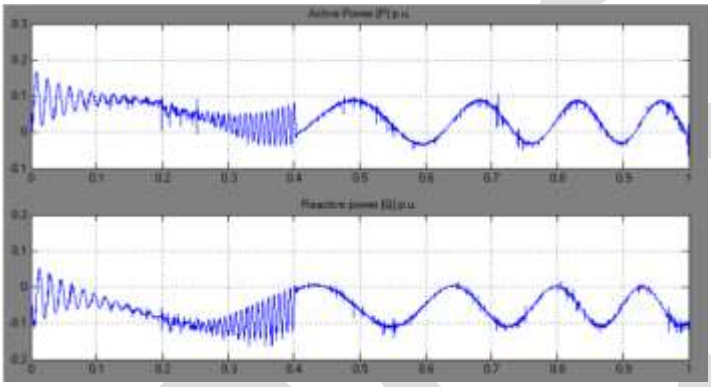

Fig.15 Variation of Active & Reactive Power Vs Time

Single Machine Infinite Bus (SMIB) System with UPFC at Middle of Transmission line

Resulting curves of the variation of speed of rotor, excitation voltage, fault current, active & reactive power at receiving end, magnitude & angle of series injected voltage and magnitude & angle of shunt injected voltage are shown in Figures 16 to 20.

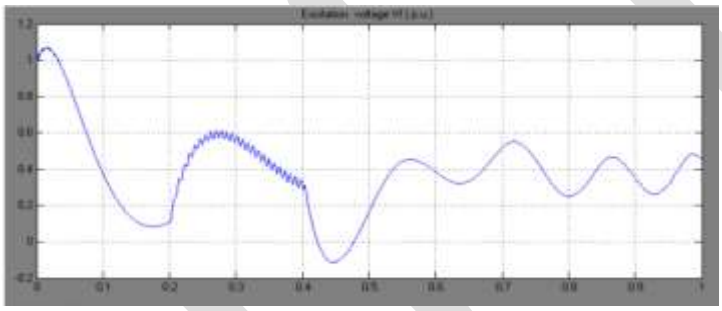

Fig.16 Variation of Excitation Voltage Vs Time

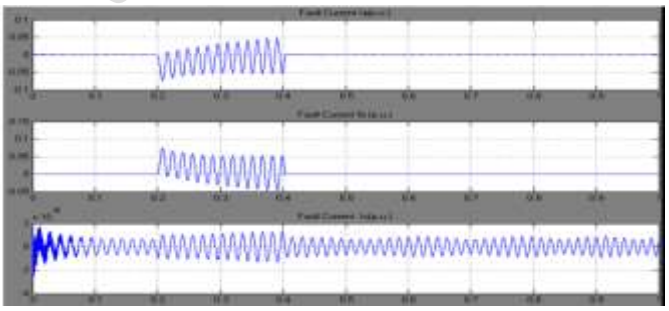

Fig.17 Variation of Fault Current Vs Time

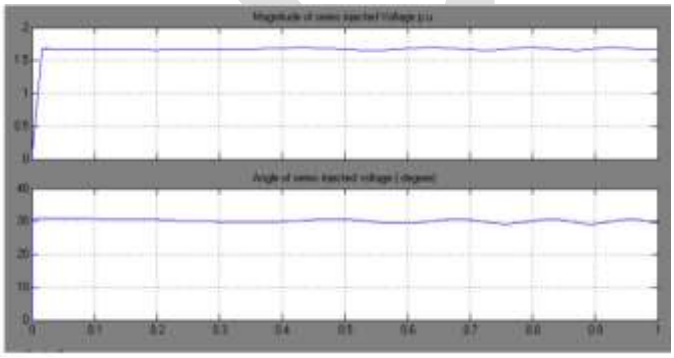

Fig.18 Variation of Active & Reactive Power Vs Time

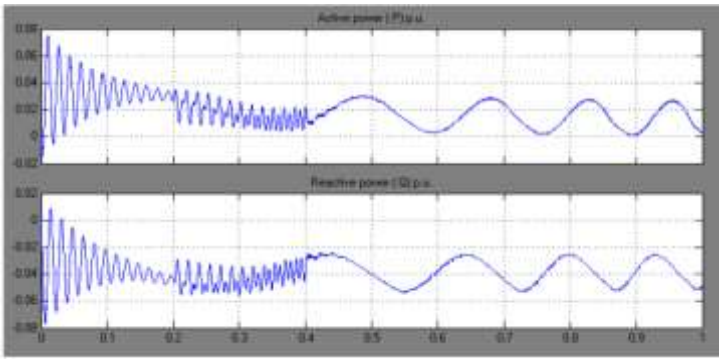

Fig.19 Variation of Series Injected Voltage & its Angle Vs Time

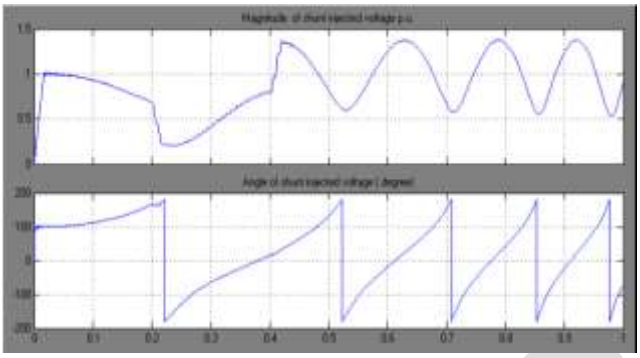

Fig.20 Variation of Shunt Injected Voltage & its Angle Vs Time

Fault Current: Without UPFC, during fault interval, fault current in phases a, b & c lies between 0.10 p.u. to - 0.10 p.u., 0.10 to -0.10 p.u. & 1.5×10^{-6} to 1.5×10^{-6} p.u. respectively (Figure 14). With UPFC, fault current in phases a, b & c is reduced to (0.05 p.u. to -0.07 p.u., 0.07 p.u. to -0.05 p.u. & 1×10^{-6} to -1×10^{-6} p.u.) respectively (Figure 17). So, using UPFC, the magnitude of fault current has reduced in all the three phases.

Excitation Voltage: Without UPFC, before occurrence of fault, excitation voltage lies between 1.2 p.u. to 0.3 p.u., during the fault, it lies between 0.45 p.u. to 0.0 p.u. with oscillations and it lies between -0.3 p.u. to 1.15 p.u. with oscillations after the fault (Figure 13). With UPFC, before occurrence of fault, excitation voltage lies between 1.0 p.u. to 0.1 p.u., during the fault, it lies between 0.1 p.u. to 0.6 p.u. and it lies between -0.1 p.u. to 0.55 p.u. with oscillations dieing out after the fault (Figure 16). So, using UPFC, the number of oscillations of excitation voltage have decreased and die out more smoothly.

Series Injected Voltage: Series part of UPFC injects a voltage of 1.7 p.u. at an angle of 30 degree (Figure 19).

Shunt Injected Voltage: Shunt part of UPFC injects a voltage of 1.0 p.u. to 0.7 p.u. with an angle of 100 to 180 degree before the fault, voltage of 0.25 p.u. to 0.8 p.u. with an angle of 180 to -180 degree during the fault and voltage of 1.3 p.u. to 0.7 p.u. with an angle of 180 to -180 degree after the fault (Figure 20).

Active and Reactive Power: With addition of UPFC, there is no appreciable change in the values of active and reactive power (Figures 15 &18).

III. Fault at Sending End of Transmission line

SMIB System without UPFC at Sending End of Transmission line

Resulting curves of the variation of speed of rotor, excitation voltage, fault current, active & reactive power at receiving end are presented in Figures 21 to 23.

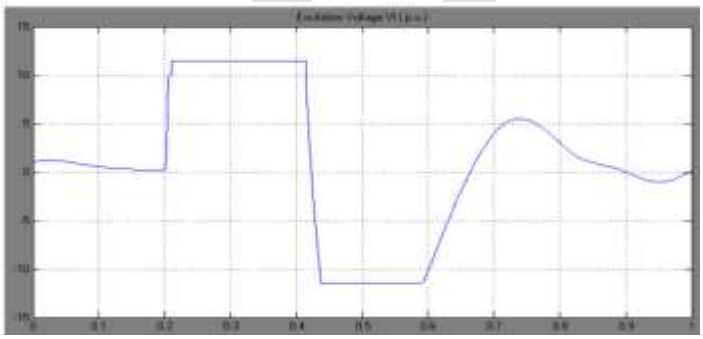

Fig.21 Variation of Excitation Voltage Vs Time

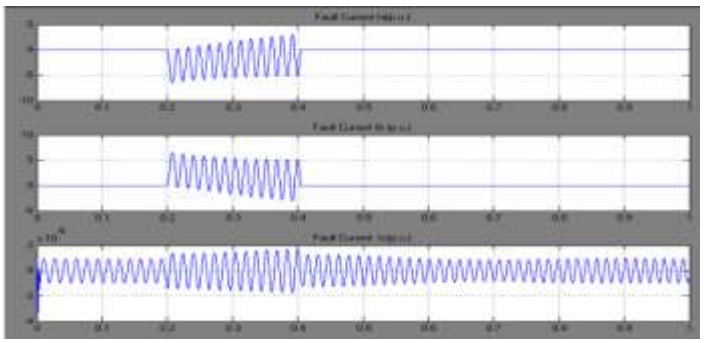

Fig.22 Variation of Fault Current Vs Time

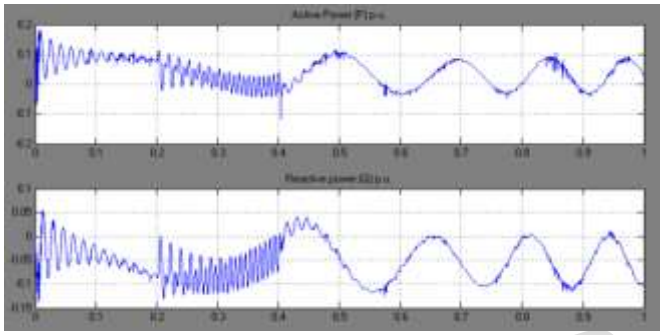

Fig.23 Variation of Active & Reactive Power Vs Time

SMIB System with UPFC at Sending End

Resulting curves of the variation of speed of rotor, excitation voltage, fault current, active & reactive power at receiving end, magnitude & angle of series injected voltage and magnitude & angle of shunt injected voltage are shown in Figures 24 to 28.

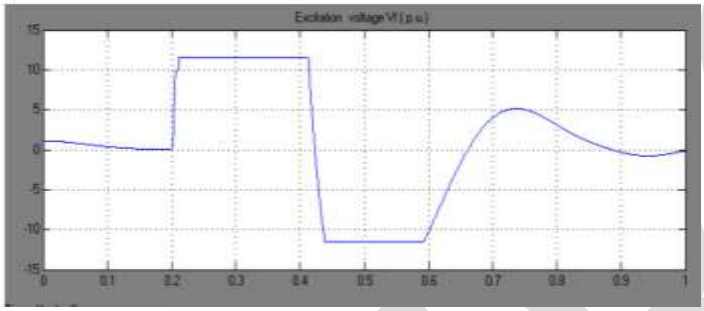

Fig.24 Variation of Excitation Voltage Vs Time

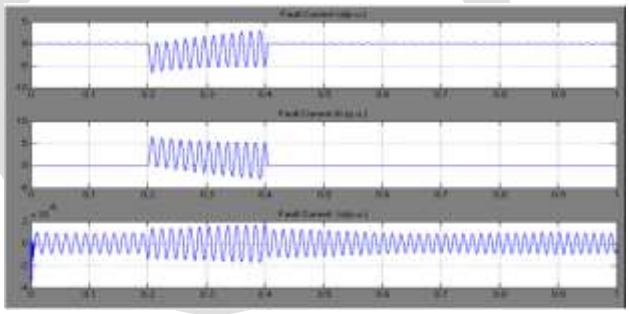

Fig.25 Variation of Fault Current Vs Time

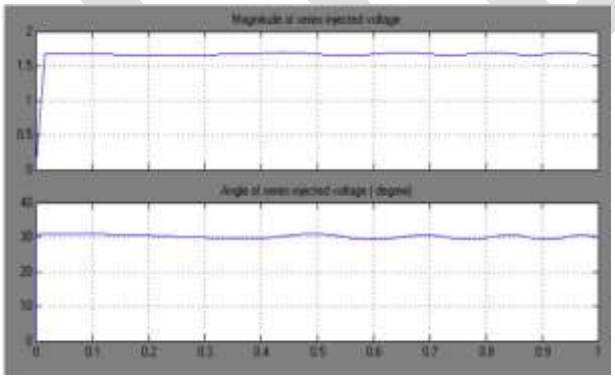

Fig.26 Variation of Active & Reactive Power Vs Time

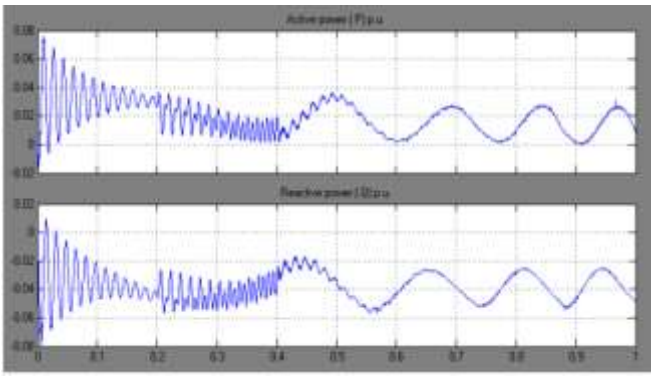

Fig.27 Variation of Series Injected Voltage & its Angle Vs Time

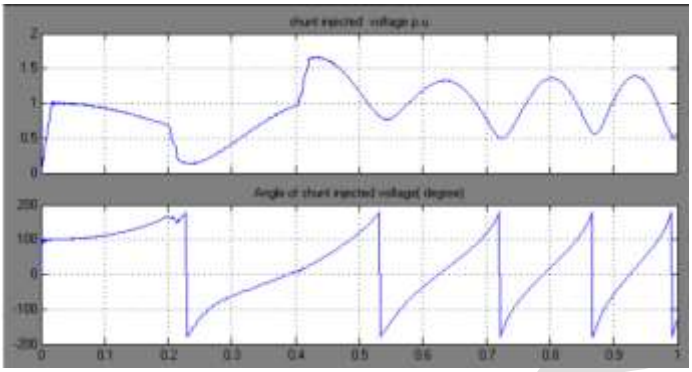

Fig.28 Variation of Shunt Injected Voltage & its Angle Vs Time

Fault Current: With & without UPFC, during fault interval, fault current in phases a, b & c lies between -6.0 to 4.0 p.u., 6.0 p.u. to -4.0 p.u. & 2×10^{-6} p.u. respectively (Figures 22 & 25). So, use of UPFC does not reduce the fault current as UPFC is located at receiving end & fault occurs at sending end of transmission line.
Excitation Voltage: With & without UPFC, before occurrence of fault, excitation voltage has the constant value of 1.0 p.u., during the fault, starting at 1.0 p.u., it has the constant value of 12.0 p.u. and it lies between -12.0 p.u. to 5.0 p.u. after the fault (Figures 21 & 24). So, use of UPFC does not modify the excitation voltage as UPFC is located at receiving end & fault occurs at sending end of transmission line.
Series Injected Voltage: Series part of UPFC injects a voltage of 1.7 p.u. at an angle of 30 degree (Figure 27).
Shunt Injected Voltage: Shunt part of UPFC injects a voltage of 1.0 p.u. to 0.7 p.u. with an angle of 100 to 180 degree before the fault, voltage of 0.2 p.u. to 1.0 p.u. with an angle of -180 to 180 degree during the fault and voltage of 1.7 p.u. to 0.5 p.u. with an angle of 180 to -180 degree after the fault (Figure 28).
Active and Reactive Power: With addition of UPFC, there is no appreciable change in the values of active and reactive power (Figure 23 & 26).

CONCLUSION

Fault current is reduced when fault occurs at middle of the line or receiving end of the line. But there is no change in fault current when fault occurs at sending end of the line as UPFC is kept fixed at receiving end of transmission line.
Excitation voltage is modified with damping out of oscillations when fault occurs at middle of the line or receiving end of the line. But there is no change in excitation voltage when fault occurs at sending end of the line as UPFC is kept fixed at receiving end of transmission line.
On the whole, the transient stability of SMIB is improved at middle of the line & receiving end of the transmission line if UPFC is included at receiving end of the line.

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Comparison and application of Forest fire detection system based on a ZigBee wireless sensor Network

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ABSTRACT: The significance of forest fire monitoring was determined by the importance of forest resource and the destructive of forest fire. In the paper, according to the limitation of traditional forest fire monitoring schemes, a new wireless network implementation scheme oriented to forest fire monitoring was presented based on GPRS communication technology and ZigBee technology. The related hardware schemes and software program flows were given. The forest environmental information was collected by ZigBee network and transmitted to FTP server with public network IP on the internet through GPRS network by GPRS module which was controlled by coordinator node. The monitoring center got the data, which was provided for relative experts and decision maker, from FTP server to implement the achievement of remote data from monitoring region. Through the analysis of historical data and real-time data, correct judges and decisions were made. It had strategic significance to improve the level of modernization of forest fire monitoring.

KEYWORDS: Zigbee , Real time data, Historical data, Forest fire monitoring, GBRS communication Technology, FTP server.

INTRODUCTION

Forests are part of the important and indispensable resources for human survival and social development that protect the balance of the earth ecology. However, because of some uncontrolled anthropogenic activities and abnormal natural conditions, forest fires occur frequently. These fires are among the most serious disasters to forest resources and the human environment. In recent years, the frequency of forest fires has increased considerably due to climate change, human activities and other factors. The prevention and monitoring of forest fires has become a global concern in forest fire prevention organizations. Currently, forest fire prevention methods largely consist of patrols, observation from watch towers and lately satellite monitoring (Lai, 2004; Huang et al., 2005). Although observation from watch towers is easy and feasible, it has several defects. In the first place, this method requires many financial and material resources and a trained labor force. Second, many problems with fire protection personnel abound, such as carelessness, absence from the post, inability for real-time monitoring and the limited area coverage. The scope of application of satellite detection systems is also restricted by a number of factors, which reduces its effectiveness in forest fire detection. For example, a satellite monitoring system has a long scanning cycle and the resolution of its saturated pixel dots of images is low. Another problem is cloud layers may mask images during the scanning period and the real-time mathematical quantification of fire parameters is very difficult to achieve (Shu et al., 2005; Yu et al., 2005; Calle et al., 2006). Given these shortcomings of traditional monitoring, we suggest the ZigBee wireless sensor network technology and explain its application as a monitoring system. This system can monitor real-time related parameters, e.g., temperature, relative humidity, and send the data immediately to the computer of the monitoring center. The collected data will be analyzed and managed by the computer. Compared with the normal meteorological information and basic forest resource data, the system can make a quick assessment of a potential fire danger. The analytical results will then be sent to the relevant department as the policy-making basis by which the department will make the decision of fire fighting or fire prevention.

LITERATURE SURVEY

Three factors compose the basis of a forest fire: the fire source, environmental elements and combustible material. A forest fire usually occurs as the result of their combined effects (Song et al., 2006). According to the Canada Fire Weather Index Forecast Model, the moisture content of the combustible material plays an important role in forest fires, which means the probability of forest fires depends on the moisture content (Tian et al., 2006). Therefore, the moisture content of combustible materials is a major point of assessment and predicts whether a fire will take place. The moisture content has much to do with relative humidity in the atmosphere, air temperature,wind and similar factors (Shu et al., 2003; Zhang, 2004). Water evaporation can be directly affected by relative humidity. At the same time, the physical properties of combustible materials can be changed indirectly by air temperature. Thus, relative humidity and air temperature are regarded as the two main factors which affect the moisture content of the fuel. Therefore, to reflect the moisture content indirectly, these two parameters are the main objects of our investigation, which should provide an important basis for the prediction and monitoring of forest fires. Certainly, forest fires are also caused by other factors, such as the active degree of thunder and lightning above the forest, human factors, wind speed, and condition of area vegetation. However, these factors will be ignored in our discussion.

METHODOLOGIES

1) RFID data transmission problem:

GIS and RFID to achieve the separate wiring problem of personnel location under the traditional way; Because of geographical complexity of the mine, bad environment wired connections will cause the data route in the mine complex and redundant and data lines will be influenced by poor environments to rotten skin, breaking leading to data transfer instability.; and effective data are collected precisely to ensure personnel safety of important security; relying on wireless sensor networks to transmit data, security, high reliability and eliminating the need for separate wiring problems, reducing input costs.

2) Personnel positioning problem:

The combination of RFID technology and GIS, can solve based on ZigBee technology the personnel positioning inaccuracy of theproblem; Under the ZigBee technology to realize personnel positioning mode, Personnel to wear the positioning of a ZigBee module which regularly sent the existed information, the sensor node which distributed in mine roadway to receive this signal, according to signal strength to determine its location ; When the mine tunnel barrier is greater, the existed signal attenuation occurs during transmission, detection accuracy of sensor nodes will be reduced or even fail. And when the network transmission links due to the malfunctioning of a node failure, the data will not reach the ground control center. Using RFID technology, Anti-pollution features of the electronic tag and the reader transmission and the diffraction function, to minimize the environmental impact of geography; with GIS analysis of the surrounding environment, truly accurate personnel positioning. And when the mine accidents occur, RFID tag will bring help to rescue; use of handheld devices that have targeted the location of facilities, staff side edge detection rescue, relief to improve greatly.

3) Under the mine the personal safety of staff problem:

Implantation of clothes in the wireless data receiver can be realized well into the double protection of personnel; it apart from the ground control center received a warning message sent over in addition to the autonomy of the receiving sensor node detection data;

when the data transmission is not stability or failure of data link control center to send the correct data can't be reached, it still can be achieved well into the safety of the personnel on alert.

PROBLEM DEFINITION:

Zigbee wireless communication technology has wide perspective, Zigbee will be used in a couple of years in the area of industry control, industrial wireless location, home network, building automation, medical equipment control, mine safety, etc, especially home automation and industry control will be the main application fields. Zigbee wireless communication is applied in families. With the development of people's life, the concept of smart home and home automation is well known, but it must relate to the transmission of information and signal if it comes true, so it is troublesome to wire cables. Zigbee is a new short-range technology for wireless communication, it is specially designed for applications of wireless communication of low speed and low power dissipation, and it is ideally suited for establishing family wireless net. It is effortless to realize home temperature regulation, remote control of interior lighting systems, and automatic adjustment of curtain. Zigbee wireless communication technology is applied in meter reading system in the monitoring center just needs to analyze and calculate data acquired from users and obtain electricity consumption of users. After that, electric charge of the month is deducted from electricity account of users, the workers who is obliged to read the meter in user's home, the thing that users are not at home when workers are to read the meter is avoided[8]. Compared to working expediently for workers, it is the most important to be used in safety. introduces an experimental home security monitoring and alarming system based on Zigbee technology, it is capable of monitoring door and window magnetic contact, smoke, gas leak, water flooding, providing simple controls such as turning off the valves, and sending the alarms to the residential area security network, etc. Zigbee wireless communication technology is applied in factories or enterprises. It is applied in information system of coal preparation enterprises in, all kinds of disadvantages of traditional cable network system are avoided by coal preparation enterprises, it highly improves the level of information automatic, automation, and management. Zigbee wireless communication technology is applied in ARM NC system network in Experimental results showed that the improved method can guarantee the processing efficiency of NC system with satisfied accuracy and data transmission speed. Aiming at substation perimeter safety, a novel laser alarm system based on Zigbee is proposed in. It consists of laser railing security subsystem and data central monitoring subsystem, the communication between the two subsystems is realized by Zigbee wireless technology, a real-time human-machine interface can be provided for worker. Zigbee wireless communication is applied in mine. Aiming at improving safety of production and staff safety, Zigbee technology is applied in the Miner's Lamp Monitoring in.This system can realize underground staff orientation and achieve monitoring and control of the state of charge on the miner's lamp, and the high effective control and management on use of miner's lamp [10]. Utilizing the underground existing net and the extension Zigbee nodes, the system also can be more easily increased the humidity, gas and other sensors, to achieve mine environmental monitoring, ensure safety in production, the improved method has been researched in Zigbee has been widely used in many areas due to the advantage of low power consumption and low cost, it is good for wide-scale application. But there are some problems now, the coordinator carry too much nodes, especially in the large scale wireless sensor network, it is necessary to result in bad real-time, data packet loss, and stability decrease; also, there are some places where it is difficult for humans to change the batteries of nodes, or there is a fairly large number of nodes which is troublesome to change presents an improved design, the coordinator only deal with the task on the Zigbee network, the rest tasks will be processed by another processor. Prolonging the lifetime of the Zigbee network is the important goal of designing the Zigbee routing protocol. An energy-aware routing mechanism EA-AODV is presented in it can save energy and improve the performance of Zigbee network. Zigbee wireless communication technology is applied in container Information system in the paper presents the strategy of networking and routing in order to keep energy load balancing between network nodes, prolonged the lifetime of node and network effectively. It is highly necessary to research these respects. ZigBee technology is a new standard in wireless personal area after Bluetooth. After an

introduction to this technology, a new wireless meterreading system based on ZigBee protocol is possible. This system, which is comprised of ZigBee network and database management system, has many important advantages such as low cost, low power consumption, and low date rate

CONCLUSION

In this paper, a forest fire monitoring system is built based on ZigBee wireless sensor network and GPRS wireless communication technology, from the perspective of construction cost, flexible networking, real-time monitoring. ZigBee network is used to monitor forest areas relative parameters such as temperature, relative humidity, UV intensity of flame, smoke concentration. GPRS controlled by coordinator node is used to connect, log on GPRS network to transmit data to FTP server with public IP. Finally monitoring center obtain the data from FTP server. The successful connection between ZigBee network and internet through GPRS network makes the functional complementarities of several networks and implements remote access to the data of forest monitoring region. Compared to traditional forest fire monitoring system, the program is good at flexible structure, low one-time cost, easy operation, wide expansion and better promotional value.

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Congestion Avoidance and Control Using Tokens at the Network Edge

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ABSTRACT: Presently the Internet accommodates simultaneous audio, video, and data traffic. This requires the Internet to guarantee the packet loss which at its turn depends very much on congestion control. A series of protocols have been introduced to supplement the insufficient TCP mechanism controlling the network congestion. CSFQ was designed as an open-loop controller to provide the fair best effort service for supervising the per-flow bandwidth consumption and has become helpless when the P2P flows started to dominate the traffic of the Internet. Token-Based Congestion Control (TBCC) is based on a closed-loop congestion control principle, which restricts token resources consumed by an end-user and provides the fair best effort service with O(1) complexity. As Self-Verifying CSFQ and Re-feedback, it experiences a heavy load by policing inter-domain traffic for lack of trust. In this paper, Stable Token-Limited Congestion Control (STLCC) is introduced as new protocols which appends inter-domain congestion control to TBCC and make the congestion control system to be stable. STLCC is able to shape output and input traffic at the inter-domain link with O(1) complexity. STLCC produces a congestion index, pushes the packet loss to the network edge and improves the network performance. Finally, the simple version of STLCC is introduced. This version is deployable in the Internet without any IP protocols modifications and preserves also the packet datagram.

KEYWORDS: IP Protocols, Token Based Congestion Control(TBCC), P2P, Stable Token Limited Congestion Control(STLCC), Network Congestion, Inter Domain Link.

INTRODUCTION

Modern IP network services provide for the simultaneous digital transmission of voice, video, and data. These services require congestion control protocols and algorithms which can solve the packet loss parameter can be kept under control. Congestion control is therefore, the cornerstone of packet switching networks. It should prevent congestion collapse, provide fairness to competing flows and optimize transport performance indexes such as throughput, delay and loss. The literature abounds in papers on this subject; there are papers on high-level models of the flow of packets through the network, and on specific network architecture .Despite this vast literature, congestion control in telecommunication networks struggles with two major problems that are not completely solved. The first one is the time-varying delay between the control point and the traffic sources. The second one is related to the possibility that the traffic sources do not follow the feedback signal. This latter may happen because some sources are silent as they have nothing to transmit. originally designed for a cooperative environment. It is still mainly dependent on the TCP congestion control algorithm at terminals, sup plemented with load shedding [1] at congestion links. This model is called the Terminal Dependent Congestion Control case Core-Stateless Fair Queuing (CSFQ) [3] set up an open- loop control system at the network layer, which inserts the label of the flow arrival rate onto the packet header at edge routers and drops the packet at core routers based on the rate label if congestion happens. CSFQ is the first to achieve approximate fair bandwidth allocation among flows with O(1) complexity at core routers. According to CacheLogic report, P2P traffic was 60% of all the Internet traffic in 2004, of which Bit-Torrent [4] was responsible for about 30% of the above, although the report generated quite a lot of discussions around the real numbers. In networks with P2P traffic,

CSFQ can provide fairness to competing flows, but unfortunately it is not what end-users and operators really want. Token-Based Congestion Control (TBCC) [5] restricts the total token resource consumed by an end-user. So, no matter how many connections the end-user has set up, it cannot obtain extra bandwidth resources when TBCC is used. In this paper a new and better mechanism for congestion control with application to Packet Loss in networks with P2P traffic is proposed. In this new method the edge and the core routers will write a measure of the quality of service guaranteed by the router by writing a digital number in the Option Field of the datagram of the packet. This is called a token. The token is read by the path routers and interpreted as its value will give a measure of the congestion especially at the edge routers. Based on the token number the edge router at the source, thus reducing the congestion on the path. In Token-Limited Congestion Control (TLCC) [9], the inter-domain router restricts the total output token rate to peer domains. When the output token rate exceeds the threshold, TLCC will decreases the Token-Level of output packets, and then the output token rate will decrease.

LITERATURE SURVEY

Modern IP network services provide for the simultaneous digital transmission of voice, video, and data. These services require congestion control protocols and algorithms which can solve the packet loss parameter can be kept under control. Congestion control is therefore, the cornerstone of packet switching networks . It should prevent congestion collapse, provide fairness to competing flows and optimize transport performance indexes such as throughput, delay and loss. The literature abounds in papers on this subject; there are papers on high-level models of the flow of packets through the network, and on specific network architecture . Despite this vast literature, congestion control in telecommunication networks struggles with two major problems that are not completely solved. The first one is the time-varying delay between the control point and the traffic sources. The second one is related to the possibility that the traffic sources do not follow the feedback signal. This latter may happen because some sources are silent as they have nothing to transmit. Congestion control of the best-effort service in the Internet was originally designed for a cooperative environment. It is still mainly dependent on the TCP congestion control algorithm at terminals, supplemented with load shedding [1] at congestion links. This model is called the Terminal Dependent Congestion Control case. Although routers equipped with Active Queue Management such as RED [2] can improve transport performance, they are neither able to prevent congestion collapse nor provide fairness to competing flows. In order to enhance fairness in high speed networks, Core-Stateless Fair Queuing (CSFQ) [3] set up an open- loop control system at the network layer, which inserts the label of the flow arrival rate onto the packet header at edge routers and drops the packet at core routers based on the rate label if congestion happens. CSFQ is the first to achieve approximate fair bandwidth allocation among flows with O(1) complexity at core routers. According to CacheLogic report, P2P traffic was 60% of all the Internet traffic in 2004, of which Bit-Torrent [4] was responsible for about 30% of the above, although the report generated quite a lot of discussions around the real numbers. In networks with P2P traffic, CSFQ can provide fairness to competing flows, but unfortunately it is not what end-users and operators really want. Token-Based Congestion Control (TBCC) [5] restricts the total token resource consumed by an end-user. So, no matter how many connections the end-user has set up, it cannot obtain extra bandwidth resources when TBCC is used.

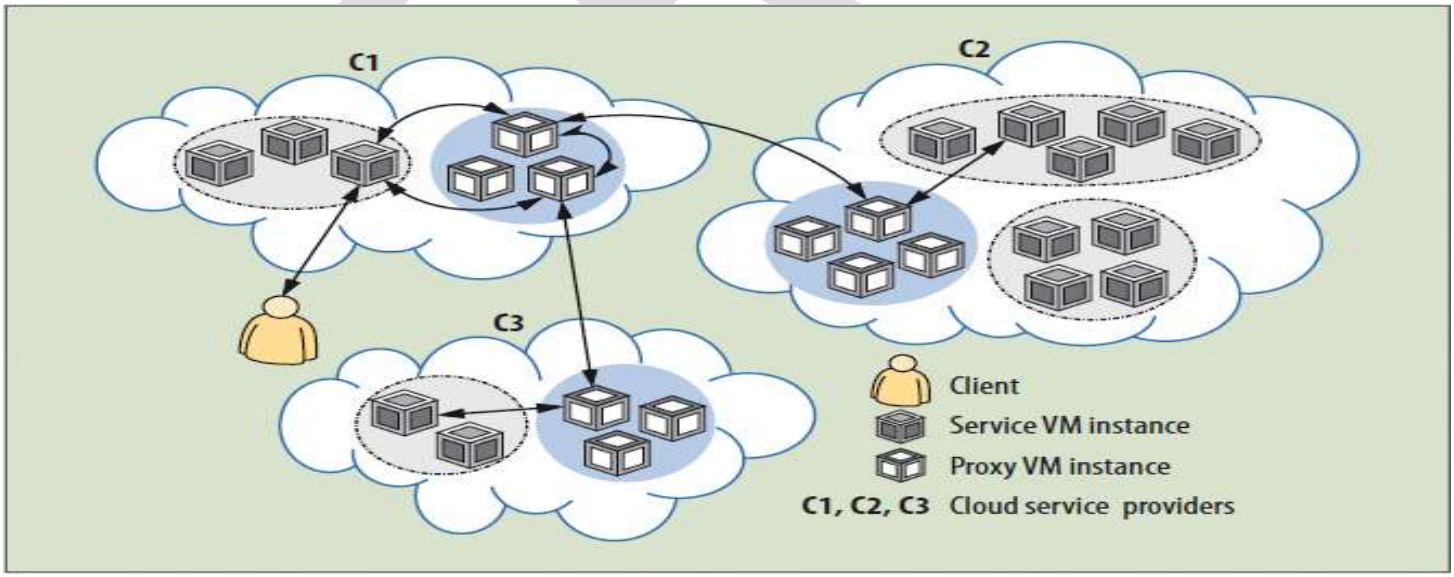
The Self-Verifying CSFQ [6] tries to expand CSFQ across the domain border. It randomly selects a flow, re-estimates the flow's rate, and checks whether the re-estimated rate is consistent with the label on the flow's packet. Consequently Self-Verifying CSFQ will put a heavy load on the border router and makes the weighted CSFQ null and void. In [7][8], the authors present a congestion control architecture Re-feedback, which aims to provide the fixed cost to end-users and bulk inter-domain congestion charging to network operators. Re-feedback not only demands very high level complexity to identify the malignant end-user, but also is difficult to provide the fixed congestion charging to the inter-domain interconnection with low complexity. There are three types of inter-domain interconnection polices, the Internet Exchange Points, the private peering and the transit. In the private peering polices, the Sender

Keep All (SKA) peering arrangements are those in which traffic is exchanged between two domains without mutual charge. As Re-feedback is based on congestion charges to the peer domain, it is difficult for Re-feedback to support the requirements of SKA. In this paper a new and better mechanism for congestion control with application to Packet Loss in networks with P2P traffic is proposed. In this new method the edge and the core routers will write a measure of the quality of service guaranteed by the router by writing a digital number in the Option Field of the datagram of the packet. This is called a token. The token is read by the path routers and interpreted as its value will give a measure of the congestion especially at the edge routers. Based on the token number the edge router at the edge routers. Based on the token number the edge router at the source's edge point will shape the traffic generated by the source, thus reducing the congestion on the path. In Token-Limited Congestion Control (TLCC) [9], the inter-domain router restricts the total output token rate to peer domains. When the output token rate exceeds the threshold, TLCC will decreases the Token-Level of output packets, and then the output token rate will decrease.

PROBLEM DEFINITION

The data packets has been losses many and time is wasted. Retransmission of data packets is difficulty. Modern IP network services provide for the simultaneous digital transmission of voice, video, and data. These services require congestion control protocols and algorithms which can solve the packet loss parameter can be kept under control. Congestion control is therefore, the cornerstone of packet switching networks . It should prevent congestion collapse, provide fairness to competing flows and optimize transport performance indexes such as throughput, delay and loss. The literature abounds in papers on this subject; there are papers on high-level models of the flow of packets through the network, and on specific network architecture.

SYSTEM ARCHITECTURE



METHODOLOGIES

1. NETWORK CONGESTION:

- Congestion occurs when the number of packets being transmitted through the network approaches the packet handling capacity of the network
- Congestion control aims to keep number of packets below level at which performance falls off dramatically

2. STABLE TOKEN LIMIT CONGESTION CONTROL (STLCC):

STLCC is able to shape output and input traffic at the inter-domain link with O(1) complexity. STLCC produces a congestion index, pushes the packet loss to the network edge and improves the network performance. To solve the oscillation problem, the Stable Token-Limited Congestion Control (STLCC) is introduced. It integrates the algorithms of TLCC and XCP [10] altogether. In STLCC, the output rate of the sender is controlled according to the algorithm of XCP, so there is almost no packet lost at the congested link. At the same time, the edge router allocates all the access token resource to the incoming flows equally. When congestion happens, the incoming token rate increases at the core router, and then the congestion level of the congested link will also increase. Thus STLCC can measure the congestion level analytically, allocate network resources according to the access link, and further keep the congestion control system stable.

3. TOKEN

In this paper a new and better mechanism for congestion control with application to Packet Loss in networks with P2P traffic is proposed. In this new method the edge and the core routers will write a measure of the quality of service guaranteed by the router by writing a digital number in the Option Field of the datagram of the packet. This is called a token. The token is read by the path routers and interpreted as its value will give a measure of the congestion especially at the edge routers. Based on the token number the edge router at the source, thus reducing the congestion on the path.

4. CORE ROUTER

A core router is a router designed to operate in the Internet Backbone or core. To fulfill this role, a router must be able to support multiple telecommunications interfaces of the highest speed in use in the core Internet and must be able to forward IP packets at full speed on all of them. It must also support the routing protocols being used in the core. A core router is distinct from an edge routers.

5. EDGE ROUTER

Edge routers sit at the edge of a backbone network and connect to core routers. The token is read by the path routers and interpreted as its value will give a measure of the congestion especially at the edge routers. Based on the token number the edge router at the source, thus reducing the congestion on the path.

CONCLUSION AND FUTURE WORK

This paper is organized as follows. In section II, the architecture of Token-Based Congestion Control (TBCC), which provides fair bandwidth allocation to end-users in the same domain will be introduced. Section III evaluates two congestion control algorithms CSFQ and TBCC. In section IV, STLCC is presented and the simulation is designed to demonstrate its validity. Section V presents the Unified Congestion Control Model which is the abstract model of CSFQ, Re-feedback and STLCC. In section VI, the simple version of STLCC is proposed, which can be deployed on the current Internet. Finally, conclusions will be given. To inter-connect two TBCC domains, the inter-domain router is added to the TBCC system as in Figure 8. To support the SKA arrangement, the inter-domain router should limit its output token rate to the rate of the other domains and police the incoming token rate from peer domains.

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Production of Bioplastic (PHA) from Emulsified Cotton Seed Oil Medium by *Ralstonia Spp*.

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Abstract: Polyhydroxyalkanoates (PHAs) are polyoxoesters produced by a wide range of bacteria when they find themselves in an environment with an available carbon source but limited in additional nutrient's required for growth. Cotton seed oil is important agricultural product; it primarily consists of triacylglycerols in which three fatty acids are attached to glycerol backbone. Growth experiments with cotton seed oil are difficult to conduct in quantitative manner due to heterogeneity of the two phase medium. To overcome this obstacle a new culture method was developed with a newly designed medium. This medium was emulsified using the plant gum or resins as the emulsifying agent. Ralstonia spp was grown on the emulsified medium and PHA production was measured over time by cell dry weight method. The medium used in this study was minimal salt medium lacking nitrogen source designed to stimulate PHA accumulation by *Ralstonia spp,* and it contains fructose, cotton seed oil and water clarified solution of plant gum or resins in different concentration and trace elements and antibiotic was added. Additionally an extraction method was developed to monitor oil consumption. The cells accumulated high levels of PHB content i.e 78 - 80. % of cell dry weight was reached after 72 h. This method may prove to be useful for production of PHA from cotton seed oil and may also be useful for studying byproduct.

Key words: Cotton seed oil, Emulsifying agent, plant gum, Cell dry weight (CDW), Polyhydroxyalkanoates (PHAs), *Ralstonia spp*, Emulsified cotton seed oil medium.

Introduction:-

The world is facing the problem of plastic, which are non-biodegradable. In search of biodegradable plastic, it has been found that there are some microorganisms and plants which are producing biodegradable polymers, which had been used to produce biodegradable plastics from these polymers. Plastic pollution is "the accumulation in the environment of man-made plastic products to the point where they create problems for wildlife and their habitats as well as for human populations." Plastic pollution is found "from Mount Everest to the bottom of the sea."

The genus *Ralstonia* is thus a most unusual genus, unifying species that are opportunistic human pathogens able to survive in oligotrophic environments with economically important plant pathogens and organisms that are of considerable biotechnological interest because of their potential for biodegradation a large list of chloroaromatic compounds and chemically related pollutants.[1] *Ralstonia eutropha* has a natural tendency that under stressed condition stop growing and put all its energy into making complex carbon compounds. [2]. *Ralstonia spp* is well known for its wide application in biopolymer production from palm oil, fruit waste and from grass. It is easily bioengineered by inserting some new genes and knocking out some genes. PHAs are renewable by nature; PHA would have been produced from renewable resources like plant oils [3, 4] sugars [5, 6, 7, 8] and carbon dioxide [9, 10, 11, 12].

Polyhydroxyalkanoates (PHAs) are polyoxoesters produced by a wide range of bacteria when they find themselves in an environment with an available carbon source but limited in additional nutrient(s) required for growth. Cotton seed oil is important agricultural product; it primarily consists of triacylglycerols in which three fatty acids are attached to glycerol backbone. Growth experiments with cotton seed oil are difficult to conduct in quantitative manner due to heterogeneity of the two phase medium. To overcome this obstacle a new culture method was developed with a newly designed medium.

The entitled study shows a great hope and a little way to solve the problem of using cotton seed oil directly in the medium and also solves the problem of pollution by plastic.

Materials and Methods:-

- Isolation and identification of *Ralstonia spp* from soil: Dextrose free tryptic soy broth (TSB) rich medium was used to maintain the culture. Isolation followed by Phenotypic and Genotypic Analysis of *Ralstonia spp*. was carried out.
- Shake Flask Experiment: 50-ml minimal media was used in 250-mL conical flasks. *Ralstonia spp* was grown aerobically at 30 °C and 200 rpm. O.D was taken at 600nm after 12 hrs interval.
- PHB production by Ralstonia Spp. in minimal medium with fructose: Minimal Medium with Sodium phosphate and K2SO4 lacking NH4Cl was prepared with fructose as a carbon source and trace elements were added. O.D was taken at 600nm after 12 hrs interval.
- PHB production by Ralstonia Spp. in Minimal Medium with cotton seed oil: Minimal Medium with Sodium phosphate and K2SO4, lacking NH4Cl was prepared with cotton seed oil as a carbon source and trace element was added. O.D was taken at 600nm after 12 hrs interval.
- PHB production by Ralstonia Spp. in emulsified cotton seed oil medium: This medium was emulsified using the plant gum or resins as the emulsifying agent. Plant gum or resins constitutes glycoprotein hence did not influence the growth of the Ralstonia spp. To prepare the medium, a 10X solution of plant resin was prepared in water. Resins dissolve slowly at room temperature, so the solution was stirred fast for rapid dissolution. Resin solution was then centrifuged (10,500×g) to separate

out insoluble particles [13]. Water, clarified Resin solution, and cotton seed oil were combined, along with the sodium phosphate and K2SO4 needed for the minimal medium. The medium used in this study was designed to stimulate PHA accumulation by *Ralstonia spp* contains Na_2HPO_4, K_2SO_4, $MgSO_4$, $CaCl_2$, water clarified solution of the plant gum or resins in different concentration and cotton seed oil, trace elements and antibiotic was added. O.D was taken at 600nm after 12 hrs interval.

- PHB and Dry cell weight estimation: PHB sample was extracted from *Ralstonia spp* biomass by the method described by Hahn et al. (1993) and the concentration was determined from the biomass by method described by Law and Slepecky (1960). For Dry Cell Weight determination, known volume of bacterial culture was centrifuged (8000 rpm, 15 min) and pellet was then lyophilized followed by determination of the dry weight of the lyophilized cell powder.

Result and Discussion:-

The effect of Emulsified cotton seed oil supplementation in the growth phase: Considering the low solubility of cotton seed oil at 30 °C, Which has no influence on the initial absorbance, it can be observed in Fig. 1 that an emulsified cotton seed oil from initial phase growth starts where as only in cotton seed oil increase in cotton seed oil concentration leads to an increase of the specific growth rate, which is confirmed by the slopes obtained at the beginning of the process for the different cotton seed oil and emulsified cotton seed oil concentrations tested. Akiyama *et al.* [*14*]

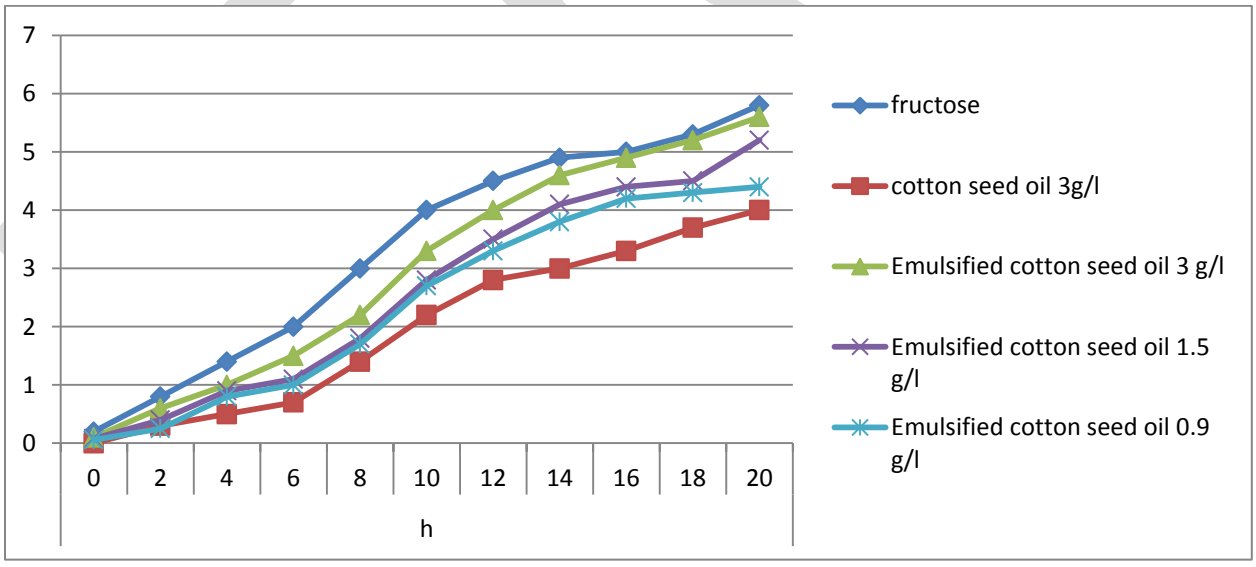

Fig: 1 **Fig 1.** Cell growth of *Ralstonia eutropha* (*A*/*A*0) with time for fructose, cotton seed oil and different concentrations of emulsified cotton seed oil used as supplement at 30 °C

The results obtained in this work allowed reaching a biomass concentration of 6.48 g/L for 6 h of cultivation, with fructose and emulsified cotton seed oil being used as substrate (30g/L) and emulsified cotton seed oil (3.0 g/L) as nutritional supplement. From

Fig.1 we can also notice two exponential phases. The value of the first exponential phase increased as the Emulsified cotton seed oil concentration increased. Considering the first exponential phase and the biomass produced in the medium containing 3.0 g/L of emulsified cotton seed oil in 6 hours of cultivation, the cell yield was equivalent to 1.46 g/g, if just fructose was considered as substrate. This result shows clearly that the microorganism used another substrate. According to Rolls [15].

In order to conduct quantitative, reproducible experiments with fructose, cotton seed oil and Emulsified cotton seed oil as the carbon source, we developed an emulsified oil culture method for R. eutropha. Two-phase bacterial cultures have previously been investigated as a method for increasing the rate of biotransformation of compounds with low water solubility [16]. The PHB initially present in these cells was accumulated during pre culture.

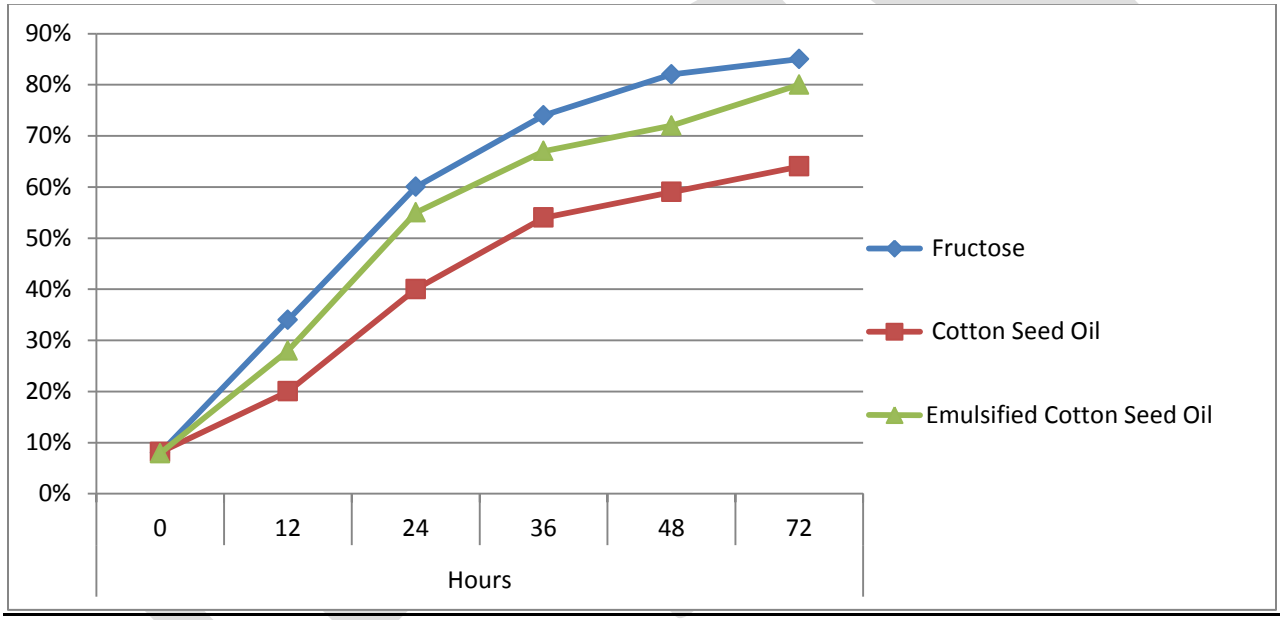

Fig No 2: Ralstonia was grown in Fructose Minimal Medium , Cotton Seed Oil Minimal Medium, and Emulsified Cotton Seed Oil Medium . PHB content as a CDW.

Our group is most interested in cotton seed oil, a major agricultural product in Vidarbha region of Maharashtra where farmer suicides due to poverty where cotton is a major crop. In this study the cells using fructose accumulated high levels of PHB content i.e 80 - 86. % of cell dry weight, the cells using emulsified cotton seed oil accumulated 78-80% PHB content of cell dry weight and cells using only cotton seed oil accumulated 60-64% PHB content of cell dry weight was reached after 72 h. Fig shows that cell finds difficulty to consume only cotton seed oil as a carbon source stored as PHA, where as the emulsified cotton seed oil is easily consumed and stored as PHA when compared with fructose.

Conclusion:-

Emulsified Cotton seed oil has been projected to be more efficient carbon sources for industrial PHA production than sugars. This method may prove to be useful for production of PHA from cotton seed oil other vegetative oils and may also be useful for studying byproduct. The emulsified oil medium can be used in both shake flask and fermentors. There is one minor issue when using emulsified cotton seed oil. The emulsifying agent some parts gets precipitated at the time of autoclaving this will lead to slight decreased in PHB production but this issue neither had a major impact on growth of Ralstonia and PHB production.

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Potentiometric determination of Benzydamine hydrochloride using PVC membrane and coated wire sensors in pure form, pharmaceutical compounds and biological fluids.

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Abstract- The construction and electrochemical response characteristics of PVC membrane and coated wire sensors for the determination of Benzydamine hydrochloride (Benz) are described. PVC membrane sensors, include sensors 1, 2 and 3, and coated-wire sensors include sensors 4, 5 and 6. Sensors 1 and 4 based on benzydamine - phosphotungstate (Benz-PTA) as ion-pair, sensors 2 and 5 based on benzydamine - phosphomolybdate (Benz-PMA) as ion-pair and sensor 3 and 6 based on benzydamine - reineckate (Benz-RN) as ion-pair. Sensors 1, 2 and 3 (PVC membrane sensors) have a linear concentration range from 7.0×10^{-6} to 1.0×10^{-2}, 1.0×10^{-5} to 1.0×10^{-2} and 1.0×10^{-5} to 1.0×10^{-2} mol L^{-1}, with a Nernstian slope of 58.6±0.3, 59±0.4 and 58.7±0.2 mV/decade and a detection limit of 5.0×10^{-6}, 7.2×10^{-6} and 1.0×10^{-5} mol L^{-1}, respectively. Sensors 4, 5 and 6 (coated-wire sensors) have the same linear concentration range from 1.0×10^{-6} to 1.0×10^{-2} mol L^{-1}, with the same detection limit of 1.0×10^{-6} mol L^{-1} and with a Nernstian slope of 58.9±0.1, 60.0±0.5 and 59.5±0.4 mV/decade, respectively. The response is independent of the pH of test solution within the range 3–8 for PVC membrane sensors and within 2-8 for coated-wire(CW) sensors. All sensors show fast response time which is 5, 3, 3, 8, 6 and 7 s for sensors 1, 2 , 3, 4, 5 and 6, respectively. The sensors showed good selectivity towards benzydamine with respect to large numbers of species. . The sensors have been applied to the determination of benzydamine in pure solution, pharmaceutical compounds and biological fluids.

keywords: Benzydamine hydrochloride; Potentiometry; Sensors; Biological fluids.

1 Introduction

Benzydamine (1-benzyl-3-(3-dimethylamino-propoxy)-1H-indazole hydrochloride) is a tertiary amine (Fig. 1).Benzydamine (Benz) is a non-steroidal drug that reportedly possesses analgesic, anesthetic, anti-inflammatory, and antimicrobial properties [1].Several analytical techniques have been used to determine benzydamine hydrochloride in pharmaceutical products including non-aqueous titration method [2,3], spectrophotometric methods [4-6], high performance liquid chromatography [7-11], and amperometric biosensor[12]. However, most of these methods comprise sample manipulations, extraction operations and derivatization reactions that are liable to various interferences as well as being not applicable to colored and turbid solutions also these methods are expensive for they require large infrastructure backup and qualified personnel. Thus, there is a critical need for the development of selective and inexpensive diagnostic tool for the determination of this analyte. Analytical methods based on potentiometric detection with ion-selective electrodes (ISEs) can be considered good alternatives for their attractable characteristics such as simple design, ease of

construction, reasonable selectivity, fast response time, applicability to colored and turbid solutions providing possible interfacing with automated and computerized systems.

The most common type of ISEs employed for drug analysis is the conventional liquid membrane electrode. The construction of a liquid membrane ion-selective electrode traditionally required a relatively high concentration of the ion of interest in the inner filling solution (IFS); however, experimental evidence suggested that this has a deteriorating influence on the detection limit [13]. The way to reduce the size of the conventional ISEs and to overcome the abovementioned limitations is the use of coated-wire(CW) sensors. coated-wire sensors were first introduced by Cattrall and Freiser in 1971 [14]. A suitable polymeric membrane, containing a dissolved electro-active material was directly coated on a conducting substrate (generally a metal, although any material, whose conductivity is substantially higher than that of the film can be used) [15]. These sensors have certain advantages over conventional ones such as the small size, simple construction, lower cost, and ability to work in any position. Furthermore, this type of sensors allows for low detection limit, which was attributed to the absence of trans-membrane ion fluxes [16, 17] . No studies in the literature have reported potentiometric sensors for determination of benzydamine hydrochloride yet.

The present study is concerned with preparation, characterization and application of simple potentiometric sensors for rapid determination of Benz in pure and dosage forms. Both PVC and Coated-wire sensors were fabricated and subjected to a series of tests to select sensors possessing the most favorable analytical characteristics. The developed sensors were applied in the potentiometric determination of Benz in batch analysis using standard addition and potentiometric titration.

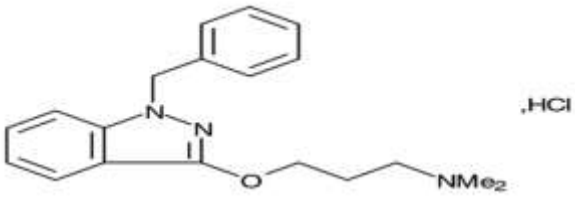


Fig. 1 The chemical structure of benzydamine hydrochloride.

2 Experimental

2.1 Reagents and materials

All chemicals were of analytical grade. Double distilled water was used throughout all experiments. Pure grade Benz and the pharmaceutical preparation TANTUM VERDE were provided by Egyptian International Pharmaceutical Industry Co. (EIPICO). Phosphotungstic acid (PTA), ammonium reineckate (RN), poly(vinyl chloride) of high molecular weight (PVC), dioctyl sebacate (DOS), dioctyl adipate (DOA), sodium tetraphenylborate (NaTPB), and tricresyl phosphate (TCP) were obtained from Fluka (U.S.A.). Phosphomolybdic acid (PMA), tetrahydrofuran (THF), dibutyl phthalate (DBP), and dioctyl phthalate (DOP) were purchased from Merck (Germany). The metal salts were provided by BDH as nitrates or chlorides. Stock solutions of the metal salts were prepared in bidistilled water and standardized when-ever necessary. In the analysis of biological fluids, human urine and plasma were used, plasma was obtained from Regional Blood Transfusion Services, Beni-Suef, Egypt and used within 24h.

2.2 Apparatus

Laboratory potential measurements were performed using Metrohm titroprocessor model 702. Metrohm PH electrode (6.0232.100). Silver-silver chloride double - junction reference electrode (Metrohm 6.0222.100) in conjugation with different drug ion selective electrode was used. A mLw W20 circulator thermostat was used to control the temperature of the test solutions.

2.3 Preparation of the ion-pairs

The ion pairs, Benz-PTA, Benz-PMA and Benz -RN were prepared by mixing 100 mL 10^{-2} mol L^{-1} Benz solution with 100 ml of 10^{-2} mol L^{-1} of phosphotungstic acid, Phosphomolybdic acid or ammonium reineckate. The formed precipitates were filtered, washed thoroughly with bidistilled water and dried at room temperature.

2.4 Preparation of PVC membrane sensors

The sensor were prepared by dissolving varying amounts of the ion- pair and PVC in 5 mL THF. To these, solvent mediators, viz. DBP, DOS, TCP ,DOA and DOP were added to get membranes of different compositions. The mixture was stirred with a magnetic stirrer. When the solution became viscous it was poured into a 6.0 cm Petri dish. The solution was then allowed to evaporate for 24 h at room temperature. Transparent membranes of about 0.2 mm thickness were obtained. A 12 mm diameter disk was cut out from the prepared membrane and glued using PVC–THF paste to the polished end of a plastic cap attached to a glass tube. The sensor body was filled with a solution of 1×10^{-1} mol L^{-1} NaCl and 1×10^{-2} mol L^{-1} Benz. The sensor was preconditioned before use by soaking in bidistilled for 24 h. The ratio of membrane ingredients, time of contact and concentration of conditioning solution were optimized so that the potentials recorded were reproducible and stable.

2.5 Preparation of the coated-wire membrane sensors

Ion-exchanger and one of a few selected plasticizers were dissolved in about 10 mL of THF. A silver wire about 1 mm diameter and 50 mm length was first polished on a cloth pad and washed with acetone. One end of the wire was then coated by repeated dipping into the membrane solution in THF. A membrane was formed on the wire surface and was allowed to dry overnight. The prepared sensor was preconditioned by soaking for 30 min in 10^{-3} mol L^{-1} Benz solution.

2.6 Sensors calibration

The calibration of the sensors under investigation was established by immersing the working sensors in conjunction with Ag/AgCl reference sensor in 50 ml beakers containing known aliquots of 1x 10^{-7}- 1x 10^{-2} mol L^{-1} Benz standard solution. The potential reading was plotted against the negative logarithmic value of Benz concentrations. The established calibration graph was used for subsequent determination of unknown Benz concentrations.

2.7 Effect of pH

The effect of pH on the response of the investigated sensors was studied using 10^{-3} and 10^{-4} mol L^{-1} Benz solutions over the pH range of 1–12. This is done by immersing the sensors and pH was gradually increased or decreased by addition of very small volumes of diluted NaOH or HCl solutions, respectively. The potential obtained at each pH was recorded.

2.8 Effect of temperature

The effect of temperature on the performance of the potentiometric sensors was evaluated by construction of calibration curves at different temperatures (20-60°C).

2.9 Conductometric Measurements

Conductometric titrations were followed with a Jenway conductivity meter. 50 mL of 1×10^{-3} mol L^{-1} Benz solution was transferred to the 100 mL cell and the solution titrated against a 1×10^{-2} mol L^{-1} PTA, PMA or RN solution using a microburette. The conductance of the solution was measured after thorough stirring after each addition (2 min, intervals). Conductance values were corrected by multiplying by the dilution coefficient and plotted versus molar ratio. The titration plot showed a break which corresponds to the stoichiometry of the ion-pair.

2.10 Determination of Benz in pure form and pharmaceutical formulation

The proposed sensors were found to be useful in the potentiometric determination of Benz in pure solution and in pharmaceutical preparation by using the standard addition and potentiometric titration methods.

In the standard addition method, known increments of Benz standard solution were added to constant volume of samples of different concentrations. The voltage was first measured in the pure sample, then the standard was added and the solutions were mixed well; a second reading was taken. From the change in potential readings for each increment the concentration of the unknown sample was calculated using the following equation [18].

$$Cx = \{Cs[Vs)/(Vx - Vs)]\}x\{10n(\Delta E/s) - [(Vx)/(Vs - Vx)]\}^{-1} \quad (1)$$

Where Cx and Vx are the concentration and the volume of unknown, respectively. Cs and Vs are the concentration and the volume of the standard, respectively. S the slope of the calibration graph and ΔE is the change in millivolt due to the addition of the standard.

In the potentiometric titration aliquots of the drug solution containing different weights from drug mg transferred to a 100-mL beaker. A standard solution of PTA ,PMA and RN were used as a titrant and the titration is monitored using proposed sensors as indicator electrodes conjugated with Ag/AgCl as the reference electrode. The potential values were plotted against the volume of the titrant added and the end points were determined from the S- shaped curves using the first derivative plots.

2.11 Determination of Benz in spiked urine and plasma samples

Different amounts of Benz and 5 mL urine or plasma of a healthy person were transferred to 50-mL measuring flask and completed to the mark by bidistilled water. The contents of the measuring flask were transferred to a 100 mL beaker, and subjected to potentiometric determination of Benz by the standard addition method.

3 Results and discussion

3.1 Effect of membrane composition

The composition of the ion-pairs were found to be 1 : 1 in case of Benz-RN and 3:1 in case of both Benz-PTA and Benz-PMA as indicated by conductometric titrations (Fig. 2).

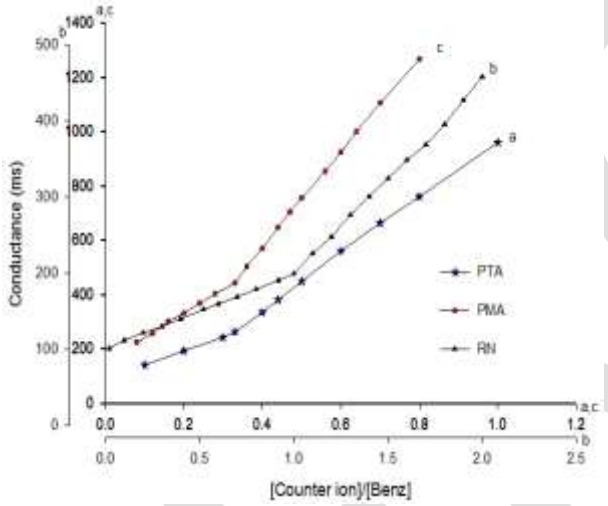


Fig. 2 Conductometric titration curve of $1x10^{-2}$ mol L^{-1} Benz against $1x10^{-2}$ mol L^{-1} PTA, RN and PMA.

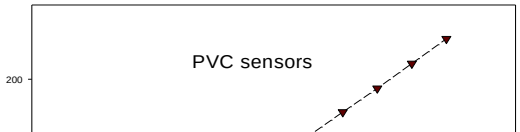
The response characteristics of ion-selective sensors depend significantly on the nature of ion-pairs and their lipophilicities, the type of plasticizers and the amount of additives used. To evaluate the incidence of membrane parameters on sensor responses we explored the influence of the ion-pairing agent nature (PTA, PMA and RN), nature of plasticizers by testing five different agents (DBP, DOP, DOS, DOA and TCP) and amount of additives, such as sodium tetraphenylborate. Several membranes of a varying nature and ratio of ion-exchanger/PVC/plasticizer/NaTPB were prepared and their response characteristics were evaluated according to the IUPAC recommendations [19, 20].The results were listed in Table 1.

Table 1 Effect of the content of ion pairing agents on the performance of the proposed sensors.

Sensor no.	Composition (%) Ion-Pair	PVC	DBP	NaTPB	Sensor Characteristics Slope (mV/decade)	L.R (mol L^{-1})	LOD (mol L^{-1})	RSD (%)	r^2
PVC sensors									
	Benz-PTA								
1.	3.0	48.5	48.5	-	52.8	1.0×10^{-5} -1.0×10^{-2}	1.0×10^{-5}	0.45	0.996
2.	5.0	47.5	47.5	-	56.8	1.0×10^{-5} -1.0×10^{-2}	7.0×10^{-6}	0.66	0.998
3.	7.0	46.5	46.5	-	56.8	8.0×10^{-6} -1.0×10^{-2}	5.0×10^{-6}	0.35	0.997
4.	9.0	45.5	45.5	-	57.5	1.0×10^{-5} -1.0×10^{-2}	5.0×10^{-6}	1.56	0.998
5.	**12.0**	**44.0**	**44.0**	**-**	**58.6**	**7.0×10^{-6} -1.0×10^{-2}**	**5.0×10^{-6}**	**0.51**	**0.999**
6.	15.0	42.5	42.5	-	57.3	7.0×10^{-6} -1.0×10^{-2}	5.0×10^{-6}	1.01	0.999
	Benz-PMA								
7.	3.0	48.5	48.5	-	50.9	1.0×10^{-5} -1.0×10^{-2}	1.0×10^{-5}	0.79	0.999
8.	**5.0**	**47.5**	**47.5**	**-**	**59.0**	**1.0×10^{-5} -1.0×10^{-2}**	**7.2×10^{-6}**	**0.74**	**0.999**
9.	7.0	46.5	46.5	-	53.3	8.0×10^{-6} -1.0×10^{-2}	5.0×10^{-6}	0.82	0.999
10.	9.0	45.5	45.5	-	52.6	8.0×10^{-6} -1.0×10^{-2}	5.0×10^{-6}	0.52	0.999
	Benz-RN			-					
11.	0.3	49.9	49.9	-	47.6	1.0×10^{-5} -1.0×10^{-2}	1.0×10^{-5}	1.42	0.998
12.	0.5	49.8	49.8	-	52.4	1.0×10^{-5} -1.0×10^{-2}	7.2×10^{-6}	0.98	0.998
13.	1.0	49.5	49.5	-	49.9	1.0×10^{-4} -1.0×10^{-2}	5.0×10^{-5}	1.6	0.997
				-					
14.	0.5	49.7	49.7	0.2	53.6	1.0×10^{-5} -1.0×10^{-2}	7.0×10^{-6}	1.2	0.998
15.	**0.5**	**49.6**	**49.6**	**0.3**	**58.7**	**$1. \times 10^{-5}$ -1.0×10^{-2}**	**5.0×10^{-6}**	**0.30**	**0.999**
16.	0.5	49.6	49.6	0.4	52.7	1.0×10^{-5} -1.0×10^{-2}	4.0×10^{-5}	0.57	0.998
Coated-wire sensors									
	Benz-PTA			-					
Effect of sensor bed using (12%)Benz-PTA									
17.	Silver			-	**58.9**	**1.0×10^{-6} -1.0×10^{-2}**	**1.0×10^{-6}**	**0.10**	**0.999**
18.	Platinum			-	52.6	1.0×10^{-5} -1.0×10^{-2}	5.4×10^{-6}	1.62	0.996
19.	Graphite			-	51.9	1.0×10^{-5} -1.0×10^{-2}	5.0×10^{-6}	0.78	0.990
20.	Copper			-	54.0	1.0×10^{-5}-1.0×10^{-2}	5.0×10^{-6}	0.67	0.995
21.	Aluminum			-	49.2	1.0×10^{-5} -1.0×10^{-2}	6.3×10^{-6}	0.77	0.991
	BENZ-PMA								
22.	**5.0**	**47.5**	**47.5**		**60.0**	**1.0×10^{-6} -1.0×10^{-2}**	**1.0×10^{-6}**	**0.84**	**0.997**
	BENZ-RN								
23.	**0.5**	**49.6**	**49.6**	**0.3**	**59.5**	**1.0×10^{-6} -1.0×10^{-2}**	**1.0×10^{-6}**	**0.68**	**0.998**

3.2 Effect of the ion-pair

The ion-pair is the key constituent of the membrane and is responsible for the sensor response and performance. It should have rapid exchange kinetics and adequate complex formation constants in the membrane. Also, it should be well soluble in the membrane matrix and have a sufficient lipophilicity to prevent leaching from the membrane into the sample solution [21]. Several membranes based on different ion pairs and different compositions were tested. The slopes, concentration range and detection limits are listed in Table 1 and the calibration curves are shown in Fig. (3). The results clearly indicate that by increasing the ion pair percentage the slope and the sensitivity of the sensor increases until the value of 12%, 5%, and 0.5% for Benz-PTA, Benz-PMA and Benz-RN, respectively .However, further increase of the ion-exchangers over this percentage resulted in a diminished response slope of the sensor, most probably due to some inhomogenities and possible saturation of the membrane [22]. The electrochemical Performance characteristics of the proposed sensors were listed in table 2.



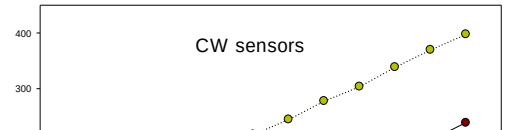


Fig. 3 Calibration graphs for PVC and CW sensors at optimum membrane composition.

3.3 Effect of additive

Additives such as lipophilic anions improve the potentiometric behavior of certain selective sensors not only by reducing the ohmic resistance and improving the response behavior and selectivity , but also, in cases where the extraction capability of the ion-pair is poor, by enhancing the sensitivity of the membrane sensor . Furthermore, additives may catalyze the exchange kinetics at the sample-membrane interface [23]. It is clear that the sensitivity and slope increased from 52.43 mV/decade to 58.7 mV/decade by adding trace amount of sodium tetraphenylborate 0.3%. However, increasing the amount of additive shows no beneficial influence on the membrane sensor response.

3.4 Effect of sensor bed

The efficiency of coated-wire sensors depends significantly on the nature of sensor bed, the optimized coating mixture was used for preparation of sensors with different conductive beds, namely silver, copper, graphite, platinum and aluminum. The results indicated that the silver wire-coated sensor has higher slope and lower detection limit compared with other tested wires (Table 1). This is attributed to low resistivity (1.62 Ω cm-1) of silver. Therefore, silver wire was used as the inner solid contact for the sensors in this study [24].

3.5 Effect of internal filling solution

The potential response of the PVC sensors for Benz cation based on Benz-RN ion-pair was studied at different concentrations of internal solution (1.0×10^{-2} to 1.0×10^{-4} mol L^{-1} Benz). It was found that the best results in terms of slope and working concentration range have been obtained with internal solution of concentration 1.0×10^{-4} mol L^{1}. Thus, 1.0×10^{-4} mol L^{-1} concentration of the reference solution was quite appropriate for the smooth functioning of the proposed sensors.

Table 2 Response characterization of the proposed sensors.

Parameters	PVC sensors			Coated-wire sensors		
	Sensor1 (PTA)	Sensor2 (PMA)	Sensor3 (RN+ 0.3%NaTPB)	Sensor4 (PTA)	Sensor5 (PMA)	Sensor6 (RN+ 0.3%NaTPB)
Slope (mV/decade)	58.6	59.0	58.70	58.9	60.0	59.5
Correlation coefficient (r^2)	0.999	0.999	0.999	0.999	0.997	0.998
Detection limit (mol L^{-1})	5.0 $x10^{-6}$	1.0$x10^{-6}$	1.0 $x10^{-5}$	1.0$x10^{-6}$	1.0$x10^{-6}$	1.0 $x10^{-6}$
Response time (s)	5	3	3	8	6	7
Working pH range	3-8	3-8	3-8	2-8	2-8	2-8
Life time (days)	63	25	31	4	4	4
SD (%)	0.3	0.44	0.18	0.06	0.51	0.4
RSD (%)	0.51	0.74	0.3	0.1	0.84	0.68

Thermal coefficient(V/^{0}C)	0.00056	0.00054	0.00071	0.0005	0.00017	0.00019

3.6 Effect of plasticizer

The plasticizer to be used in membrane should exhibit high lipophilicity, have high molecular weight, low tendency for exudation from the polymer matrix, low vapor pressure and high capacity to dissolve the substrate and other additives present in the membrane. Furthermore, it is a well established fact that the properties of plasticizer have a great influence on the sensitivity, selectivity detection limit and linearity of ISEs. Several plasticizers including DBP, DOS, DOP, DOA and DBP were tested. The best performance was achieved using DBP as membrane plasticizer and the result are summarized in Table 3.

Table 3 Effect of the plasticizers on Benz responsive sensors.

Composition % w/w			Slope	Linear range	LOD	RSD
Ion-pair	PVC	plasticizer	mV/ decade	(mol L^{-1})	(mol L^{-1})	(%)
Benz-PTA sensors						
12.0	44	DOA	54.7	1.0×10^{-5} -1.0×10^{-2}	5.0×10^{-6}	0.32
12.0	44	DBP	58.6	7.0×10^{-6} -1.0×10^{-2}	5.0×10^{-6}	0.51
12.0	44	DOP	54.1	1.0×10^{-5} -1.0×10^{-2}	4.0×10^{-6}	0.70
12.0	44	DOS	50.2	1.0×10^{-5} -1.0×10^{-2}	4.0×10^{-6}	0.40
12.0	44	TCP	54.7	1.0×10^{-6} -1.0×10^{-2}	1.0×10^{-6}	0.77
Benz-PMA sensors						
5.0	47.5	DOA	51.4	1.0×10^{-4} -1.0×10^{-2}	3.16×10^{-5}	0.68
5.0	47.5	DBP	59.0	1.0×10^{-6} -1.0×10^{-2}	1.0×10^{-6}	0.74
5.0	47.5	DOP	52.6	8×10^{-5} -1.0×10^{-2}	3.2×10^{-5}	0.29
5.0	47.5	DOS	48.5	1.0×10^{-5} -1.0×10^{-2}	1.0×10^{-5}	0.92
5.0	47.5	TCP	52.9	1.0×10^{-4} -1.0×10^{-2}	3.9×10^{-5}	0.48
Benz-RN+0.3 % NaTPB sensors						
0.5	49.6	DOA	53.4	1.0×10^{-5} -1.0×10^{-2}	5.0×10^{-6}	0.29
0.5	49.6	DBP	58.7	3.16×10^{-6} -1.0×10^{-2}	1.0×10^{-5}	0.30
0.5	49.6	DOP	51.6	1.0×10^{-5} -1.0×10^{-2}	4.0×10^{-6}	0.58
0.5	49.6	DOS	54.3	1.0×10^{-5} -1.0×10^{-2}	5.2×10^{-6}	0.61
0.5	49.6	TCP	50.0	1.0×10^{-5} -1.0×10^{-2}	5.0×10^{-6}	0.51

3.7 Effect of pH

Since pKa of Benz is 9.26 [25], therefore at pH 7.8 Benz is nearly completely ionized, i.e. Benz will be in the cationic form. The concentration distribution diagram for Benz species is constructed using SPECIES program [26] (Fig. 4). Effect of pH of the test solution on the potential response of the CW membrane sensors is shown in Fig. 5. The potential pH profile obtained indicates that the potential remains constant in the pH range 3-8 and 2-8 for PVC and CW sensors, respectively. At lower pH values the decrease in mV readings may be attributed to the interference from hydronium ion and may also be due to leaching of the ion exchangers in acidic media. On the other hand the decrease in mV at higher pH may be due to base precipitates in the test solution and consequently, the concentration of unprotonated species gradually increased .

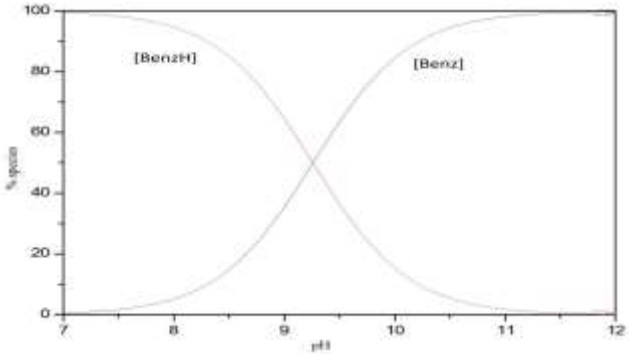


Fig. 4 Representative concentration distribution diagram for paroxetine hydrochloride species

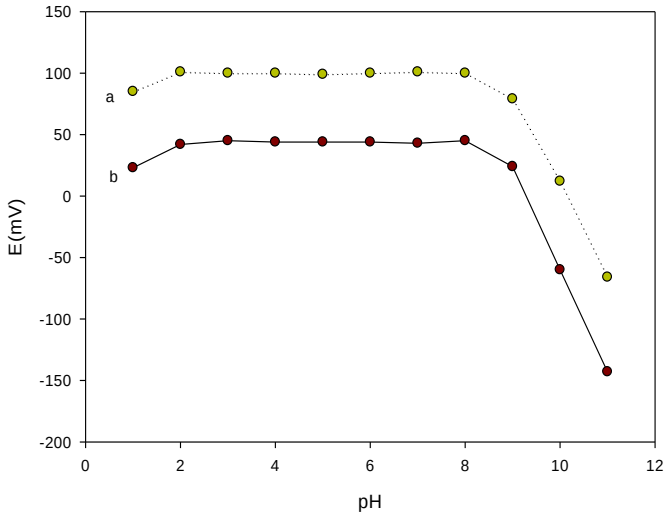


Fig. 5 Effect of pH on the performance of Benz-PMA CW sensor : (a) 1.0 x 10^{-3} mol L^{-1} Benz and (b) 1.0 x10^{-4} mol L^{-1} Benz.

3.8 Dynamic response time, reversibility and memory effect

The dynamic response time of the presented sensors was measured according to IUPAC recommendation. The practical response time was recorded by changing solution with different Benz concentrations from 1.0×10^{-6} to 1.0×10^{-2} mol L^{-1}. The actual potential versus time is shown in Fig. (6).The proposed sensors have very short response time of 3–5 s and 6–8s for PVC and CW sensors, respectively. To evaluate the reversibility of the sensor, a similar procedure in the opposite direction was adopted .The measurements were performed in the sequence of high to low sample concentrations. The results indicate that the potentiometric responses of the sensors are reversible and had no memory effect.

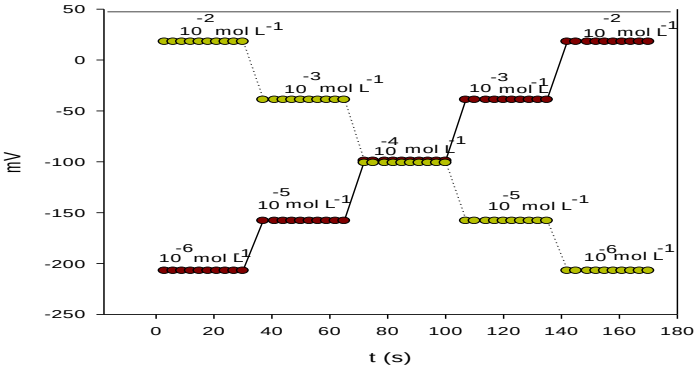


Fig. 6 Potential–time plot for the response of Benz-RN/0.3% NaTPB CW sensor.

3.9 Life time

The life time of the investigated sensors was studied by periodically constructing the calibration graphs under optimum conditions in the concentration range of 10^{-7}- 10^{-2} mol L^{-1} of Benz on different days. For sensors under investigation it was found that PVC sensors (sensors no. 1, 2 and 3) have a life time of 63, 25 and 31 days, respectively and CW sensors have 4 days. After preparation of the proposed sensors, PVC sensors were kept at 4 ^{o}C in distilled water and directly used for potentiometric measurements. Results showed that obtained slopes decreased gradually if CW sensors were conserved in 1.0 × 10^{-3} mol L^{-1} of Benz standard solution when not in use. For this reason, unused sensors were kept dry. It was established that continuous soaking had a

negative impact on the response of the sensor due, probably, to the leaching of the active ingredients (ion-exchanger and plasticizer) to the bathing solution [27]. The life spans of the CW sensors, in general, are less than those of the corresponding liquid contact sensors. This may be attributed to poor mechanical adhesion of the PVC-based sensitive layer to the conductive bed [28].

3.10 Selectivity

Potentiometric selectivity coefficient refers to the ability of the ISE to differentiate a particular (primary) ion from others (interfering ions) [29]. The selectivity coefficients were determined by the modified separate solution method using the rearranged Nicolsky equation [30,31]:

$$\log K^{pot}_{BENZ,Jz+} = ((E_1-E_2)/S) + (1 + (z_1/z_2)) \log a$$

Where, E_1 is the potential measured in 1×10^{-3} mol L^{-1} Benz, E_2 the potential measured in 1×10^{-3} mol L^{-1} of the interfering ions, z_1 and z_2 are the charges of Benz and interfering species, respectively and S is slope of the sensor calibration plot. The selectivity sequence significantly differs from the so called Hofmeister selectivity sequence [32] (i.e. selectivity solely based on lipophilicity of cation). Also, the Matched Potential Method (MPM) is used for determination of selectivity coefficients in case of neutral species (sugars, urea and amino acids).As shown in Table 4 the results obtained of the proposed sensors display high selectivity for Benz cations and lower response of the interfering species present in solutions. The results also indicate that there was no serious interference from sugars, urea and amino acids due to the differences in polarity and lipophilic nature of their molecules relative to those of Benz ions. The inorganic cations did not interfere due to the differences in their ionic size and hence their mobilities, polarities, and permeabilities as compared to those of Benz cation .The mechanism of selectivity is mainly based on the stereospecificity and electrostatic environment and depend on how much fitting is present between the locations of lipophilicity sites in the two competing species and bathing solution side and those present in the receptor of the ion-exchanger [33]. The data given in Table 4 revealed that, in most cases , the selectivity coefficients obtained for the coated silver sensors are lower than those for PVC membrane sensors, emphasizing the superiority of the former sensor in this respect as well [34-36].

Table 4 Selectivity coefficient values ($K^{pot}_{BENZ,Jz+}$) for BENZ sensors

Interferent	PVC sensors			CW sensors		
	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6
K^+	8.91×10^{-4}	2.09×10^{-3}	1.58×10^{-4}	1.21×10^{-4}	8.91×10^{-4}	1.20×10^{-4}
NH_4^+	3.80×10^{-4}	3.80×10^{-4}	8.31×10^{-5}	1.39×10^{-4}	4.57×10^{-5}	2.59×10^{-4}
Li^+	2.63×10^{-3}	4.07×10^{-4}	3.98×10^{-4}	3.55×10^{-4}	1.09×10^{-4}	1.20×10^{-4}
Co^{2+}	5.37×10^{-3}	4.47×10^{-4}	5.62×10^{-3}	3.71×10^{-3}	1.70×10^{-3}	2.24×10^{-2}
Mg^{2+}	9.77×10^{-3}	5.13×10^{-3}	4.07×10^{-3}	2.71×10^{-3}	2.14×10^{-3}	1.07×10^{-3}
Fe^{3+}	3.31×10^{-3}	9.80×10^{-3}	4.04×10^{-3}	1.70×10^{-3}	1.15×10^{-3}	2.17×10^{-3}
Cu^{2+}	9.77×10^{-3}	2.24×10^{-3}	5.62×10^{-3}	3.47×10^{-4}	9.33×10^{-4}	1.02×10^{-3}
Ca^{2+}	1.25×10^{-2}	5.13×10^{-3}	9.77×10^{-3}	1.70×10^{-3}	1.99×10^{-3}	1.15×10^{-3}
Maltose	7.94×10^{-4}	7.41×10^{-4}	1.02×10^{-3}	1.76×10^{-4}	2.161×10^{-4}	8.31×10^{-4}
Lactose	5.89×10^{-4}	9.55×10^{-4}	1.23×10^{-3}	2.47×10^{-4}	5.25×10^{-4}	8.31×10^{-4}
Fructose	8.13×10^{-4}	9.55×10^{-4}	1.05×10^{-3}	4.51×10^{-4}	3.51×10^{-4}	9.12×10^{-4}
Glucose	9.58×10^{-4}	1.07×10^{-3}	1.23×10^{-3}	1.20×10^{-4}	1.04×10^{-4}	1.15×10^{-4}

Urea	$7.94x10^{-4}$	$2.13x10^{-3}$	$1.45x10^{-3}$	$1.37x10^{-4}$	$9.12x10^{-4}$	$1.02x10^{-4}$
β-alanine	$7.32x10^{-3}$	$1.90x10^{-3}$	$1.10x10^{-3}$	$1.17x10^{-3}$	$8.13x10^{-4}$	$6.17x10^{-4}$
Glycine	$4.56x10^{-4}$	$8.51x10^{-4}$	$9.551x10^{-4}$	$1.17x10^{-4}$	$1.02x10^{-4}$	$2.23x10^{-3}$
Ascorbic Acid	$7.94x10^{-4}$	$8.13x10^{-4}$	$8.13x10^{-4}$	$2.55x10^{-4}$	$1.20x10^{-4}$	$1.29x10^{-4}$

3.11 Effect of temperature

To study the effect of temperature on the response of the purposed sensors, the potential of 1.0×10^{-7}- 1.0×10^{-2} mol L^{-1} Benz solutions were determined in different temperatures (20, 25, 30, 40, 50 and 60 °C) and calibration graphs were constructed, and the standard sensor potentials (E°elec.) (Obtained from the calibration graphs) corresponding to each temperature was calculated. For the determination of the thermal coefficient (dE°/dT) of the sensor, the standard sensor potential (E°elec.) at different temperatures was plotted vs. (t – 25), where t is the temperature of the test solution. A straight-line plot was obtained according to the following equation [37].

$$Eo = Eo\ (25) + (dEo / dT)\ (t - 25)$$

The values of the obtained thermal coefficient were found in the range 0.00054-0.00071 and 0.00019-0.0005 $V/^{0}C$ for PVC and CW sensors , respectively. This indicates that the sensors have a high thermal stability within the investigated temperature range. The investigated sensors were found to be stable up to 60 ^{o}C without noticeable deviation from the Nernstian behavior.

3.12 Analytical applications

The optimized sensors under investigation have been successfully used for the potentiometric determination of Benz (pure form and pharmaceutical form) by using the standard addition and potentiometric titration methods. Represented potentiometric titration curves for sensor 5 and differential curves for sensor 3 are shown in Figs.7 and Fig.8, respectively and the results are summarized in Tables 5 and 6. In order to estimate the quality of the results, recovery values were also determined and a represented in the same tables. Determination of Benz in spiked urine and plasma samples was also carried at three different levels of concentration using the standard addition technique (Table 7). Those results showed that the proposed sensors have good efficiency in terms of sensitivity and can be used successfully for quality control of Benz drug in pure , pharmaceutical preparations , spiked urine and plasma samples. The results obtained from the standard addition method of the drug were compared with those obtained from the potentiometric titration method by applying F-and t-tests [38]. The results (Table 8), show that the calculated F- and t-values did not exceed the theoretical values, reflecting the accuracy and precision of the applied method.

For ruggedness of the method a comparison was performed between the intra- and inter-day assay results for Benz obtained by two M. Sc. students. The RSD values for the intra- and inter-day assays of Benz in the cited formulations performed in the same laboratory by the two analysts did not exceed 1.9 %. On the other hand, the robustness was examined while the parameter values (pH of the eluent and the laboratory temperature) were being deliberately slightly changed. Benz recovery percentages were good under most conditions, not showing any significant change when the critical parameters were modified.

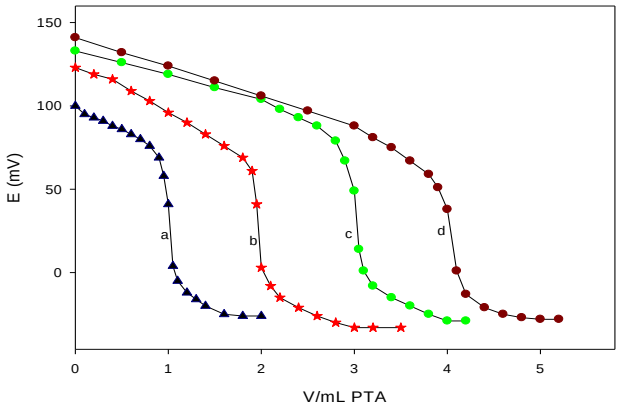


Fig. 7 Potentiometric titration curves of (a) 3, (b) 6, (c) 9 and (d) 12 mL of 10^{-2} mol L^{-1} Benz using Benz-PTA CW sensor and 10^{-2} mol L^{-1} PTA as titrant.

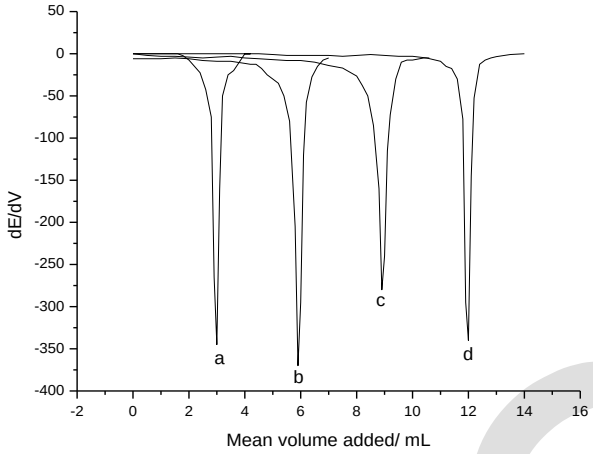


Fig. 8 Differential curves for potentiometric determination of (a) 3, (b) 6 , (c) 9 and (c) 12 mL 10^{-2} mol L^{-1} Benz using Benz-RN/0.3% NaTPB PVC sensor and 10^{-2} mol L^{-1} NaTPB as titrant.

Table 5 Determination of Benz in pure form using the proposed sensors

Sensor type	Standard addition method			Potentiometric titration method		
	Taken (mg)	Recovery □□□□SD	RSD (%)[a]	Taken (mg)	Recovery □□□□SD	RSD (%)[a]
PVC sensors						
					PTA as titrant	
Sensor 1	3.46	99.0±1.73	1.75	10.38	98.30±1.46	1.48
	10.38	97.87±0.29	0.29	20.75	100.84±0.73	0.72
	17.29	97.03±.75	0.77	31.13	100.56±0.48	0.48
	24.21	99.47±1.33	1.34	41.51	101.04±0.36	0.36
					PMA as titrant	
Sensor 2	3.46	101.73±0.46	0.45	10.38	101.65±1.43	1.40
	10.38	98.21±.95	0.96	20.75	100.42±0.73	0.72
	17.29	96.97±0.57	0.59	31.13	97.89±0.38	0.39
	24.21	99.89±1.12	1.12	41.51	100.83±0.72	0.72
					NaTPB as titrant	
Sensor 3	3.46	98.49±1.76	1.79	10.38	97.85±0.79	0.80
	10.38	97.61±1.23	1.26	20.75	98.9 ± 0.95	0.96
	17.29	102.07±0.9	0.88	31.13	99.815±0.32	0.32
	24.21	97.83±0.58	0.59	41.51	100.27±0.24	0.24
Coated-wire sensors						
					PTA as titrant	
Sensor 4	3.46	99.73±.64	0.64	10.38	100.82±1.43	1.41
	10.38	99.11±0.90	0.91	20.75	99.17 ± 0.72	0.72
	17.29	99.8±0.81	0.82	31.13	100.28±0.48	0.48

	24.21	99.93±1.01	1.01	41.51	100.62±0.62	0.62
					PMA as titrant	
Sensor 5	3.46	101.4±0.53	0.52	10.38	98.31 ± 1.64	1.49
	10.38	100.93±1.48	1.47	20.75	100.89±0.72	0.72
	17.29	99.7±0.95	0.96	31.13	98.87 ± 0.96	0.98
	24.21	100.7±0.70	0.70	41.51	100.42±0.72	0.72
					NaTPB as titrant	
Sensor 6	3.46	100.33±1.33	1.32	10.38	100.53±0.46	0.46
	10.38	98.58±0.57	0.58	20.75	98.637±0.48	0.49
	17.29	96.33±1.27	1.32	31.13	100.37±0.32	0.32
	24.21	100.6±0.52	0.52	41.51	100.55±0.24	0.24

[a] Mean of three determinations

Table 6 Determination of Benz in pharmaceutical formulation (TANTUM VERDE) using the proposed sensors

Sensor type	Standard addition method			Potentiometric titration method		
	Taken (mg)	Recovery □□□□SD	RSD (%)[a]	Taken (mg)	Recovery □□□□SD	RSD (%)[a]
PVC sensors						
					PTA as titrant	
Sensor 1	3.46	100.17±1.89	1.89	10.38	102.06±0.71	0.7
	10.38	98.03±0.29	0.29	20.75	99.61±1.43	1.44
	17.29	97.47±0.75	0.77	31.13	99.72±1.27	1.28
	24.21	99.77±1.16	1.16	41.51	100.62±0.63	0.62
					PMA as titrant	
Sensor 2	3.46	101.47±0.46	0.46	10.38	99.43±0.98	0.99
	10.38	98.75±0.95	0.96	20.75	100.84±0.73	0.72
	17.29	97.13±0.42	0.43	31.13	98.67±1.2	1.22
	24.21	100.27±0.64	0.63	41.51	100.62±0.63	0.62
					NaTPB as titrant	
Sensor 3	3.46	99.23±0.74	0.74	10.38	99.13±1.44	1.46
	10.38	97.18±1.25	1.29	20.75	99.18±0.83	0.83
	17.29	100.73±1.55	1.54	31.13	100.01±0.56	0.56
	24.21	98.17±0.58	0.59	41.51	100.41±0.41	0.41
Coated-wire sensors						
					PTA as titrant	
Sensor 4	3.46	101.07±1.67	1.66	10.38	99.43±0.98	0.99
	10.38	99.42±0.50	0.51	20.75	99.59±1.44	1.45
	17.29	99.1±1.19	1.20	31.13	100.06±.76	0.76
	24.21	99.53±0.46	0.46	41.51	101.04±0.36	0.36
					PMA as titrant	
Sensor 5	3.46	100.7±0.70	0.70	10.38	98.59±1.3	1.31
	10.38	99.97±1.15	1.16	20.75	100.42±.73	0.72
	17.29	99.7±0.95	0.96	31.13	99.63±1.16	1.16
	24.21	100.33±0.75	0.75	41.51	101.59±0.59	0.58
Sensor 6					NaTPB as titrant	
	3.46	99.53±1.36	1.36	10.38	100.53±0.46	0.46
	10.38	99.48±1.09	1.10	20.75	98.63±0.48	0.49

	17.29	97.37±0.75	0.77	31.13	100.59±0.6	0.60
	24.21	100.9±0.52	0.51	41.51	100.84±0.45	0.44

[a] Mean of three determinations

Table 7 Determination of Benz in biological fluids (plasma and urine).

Sensor type	Spiked human plasma			Spiked urine		
	Taken (mg)	Recovery □□□□SD	RSD (%)a	Taken (mg)	Recovery □□□□SD	RSD (%)a
PVC sensors						
Sensor 1	3.46	98.47±0.69	0.70	10.38	98.07±0.69	0.71
	10.4	100.87±1.61	1.60	20.75	100.53±1.24	1.23
	17.3	101.21±0.77	0.76	31.13	101.37±.68	0.67
	24.2	98.97±0.55	0.55	41.51	99.32±0.58	0.58
Sensor 2	3.46	101.25±0.78	0.78	10.38	100.92±0.2	0.20
	10.4	98.72±1.26	1.28	20.75	99.17±0.49	0.49
	17.3	98.52±0.50	0.51	31.13	98.99±0.71	0.72
	24.2	100.73±0.80	0.80	41.51	100.27±0.80	0.81
Sensor 3	3.46	96.69±0.94	0.98	10.38	97.41±1.23	1.15
	10.4	97.93±1.34	1.37	20.75	98.82±0.57	0.58
	17.3	98.8±0.52	0.53	31.13	99.87±0.81	0.81
	24.2	100.05±1.17	1.17	41.51	100.72±1.17	1.16
Coated-wire sensors						
Sensor 4	3.46	98.56±0.44	0.45	10.38	99.16±0.90	0.91
	10.4	100.13±1.53	1.53	20.75	100.58±1.33	1.32
	17.3	101.11±0.27	0.27	31.13	100.96±0.27	0.27
	24.2	99.5± 1.13	1.13	41.51	100.32±1.29	1.29
Sensor 5	3.46	101.57±0.58	0.57	10.38	101.23±0.58	0.57
	10.4	97.31±0.34	0.35	20.75	97.74±0.52	0.54
	17.3	102.17±0.46	0.45	31.13	101.83±0.90	0.89
	24.2	99.85±0.82	0.83	41.51	100.32±0.83	0.82
Sensor 6	3.46	101.92±0.21	0.21	10.38	101.43±0.64	0.63
	10.4	99.87±1.24	1.24	20.75	99.70±0.95	0.96
	17.3	100.22±0.84	0.84	31.13	99.33±0.69	0.69
	24.2	102.1± 0.67	0.68	41.51	101.37±0.58	0.57

Table 8 Statistical comparison between the results of an analysis of a pharmaceutical preparation TANTUM VERDE applying the standard addition and potentiometric titration methods

Parameter	standard addition method	potentiometric titration method
Sensor 1		
Mean recovery (%) ±SD	98.86[a]±1.31	100.50 [a] ±1.13

F-ratio		1.34 (9.28)[b]	
t-test		1.90 (2.447)[c]	
Sensor 2			
Mean recovery (%) ±SD	99.41[a] ±1.88		99.89[a] ±1.02
F-ratio		3.39 (9.28)[b]	
t-test		0.45 (2.447)[c]	
Sensor 3			
Mean recovery (%) ±SD	98.83[a] ±1.52		99.68[a] ±0.63
F-ratio		1.52 (9.28)[b]	
t-test		1.04 (2.447)[c]	
Sensor 4			
Mean recovery (%) ±SD	99.78[a] ±0.88		100.03[a] ±0.72
F-ratio		1.47 (9.28)[b]	
t-test		0.44 (2.447)[c]	
Sensor 5			
Mean recovery (%) ±SD	100.18[a] ±0.43		100.058[a] ±1.27
		8.49 (9.28)[b]	
		0.18 (2.447)[c]	
Sensor 6			
Mean recovery (%) ±SD	99.32[a] ±1.46		99.74[a] ±1.56
F-ratio		1.15 (9.28)[b]	
t-test		0.39 (2.447)[c]	

a: Average of four determinations
b: Tabulated F-value at 95% confidence level
c:Tabulated t-value at 95% confidence level and six degrees of freedom

4 Conclusion

Two kinds of potentiometric (PVC and a silver-coated wire) sensors were constructed for determination of Benz and a comparison was made between them. The sensors show favorable performance characteristics with short response times (~5 s), wide pH range between 3-8 and 2-8 for PVC membrane and coated-wire sensors respectively, low detection limits of $7.0x10^{-6}$ mol L^{-1} and $7.2x10^{-6}$ mol L^{-1} over the concentration range from $7.0x10^{-6}$ to $1.0x10^{-2}$ mol L^{-1} and $1.0x10^{-6}$–$1.0x10^{-2}$ mol L^{-1}, for PVC membrane and coated-wire sensors respectively. Clearly the coated-wire sensors show wider pH range , better selectivity and a lower detection limit. The sensors were effectively used for determination of Benz in pharmaceutical preparations.

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Methodical Approach of Determining Labour Constants Models for Building Construction Processes in Nigeria

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Abstract— Construction planners and estimators in Nigeria often guess the standards of building tradesmen. These standards are usually given as constants in the form of time necessary for the manual completion of a defined quantity of work – standard time (St), or in the form of unit output – standard output (Sop) for a specified working period. Since it is difficult to draw reliable construction programmes or make accurate cost estimates without any available baseline standards or constants, this study therefore, systematically developed statistical models for determining labour constants for building construction processes. It was a field survey where detailed work study was carried out on two major work sections (concrete work and blockwork) in six building project purposely selected across the South East, Nigeria. Time study technique and a three-time estimate technique were used to determine the most probable duration time (expected time (**t**)) to complete each operation that makes up an activity relative to the quantity of work performed. From this, the duration time ($\mathbf{t_{ka}}$), of key process was determined and subsequently, the standard time ($\mathbf{S_t}$) and standard output ($\mathbf{S_{op}}$) (labour constants) were evolved. Thereafter, these were fitted into regression models and the resultant showed that labour constant could be statistically determined. The models were further tested for adequacy, and it was found that all the generated models for various building operations considered were statistically adequate, good and fit for the purpose. The result indicated that the labour constants were realistic and appropriate for pricing, and could assist in effective project planning and control through realistic determination of optimal labour force in the execution of building projects. This is because, once a specific time is given, the labour output could be determined. The study then recommended a practical application of this model in different building construction processes across Nigeria.

Keywords— Building Processes, Construction Planning, Estimation, Labour Constants, Models, Standards, Work study

INTRODUCTION

The Nigerian building industry is strongly characterized with the desire for cheap labour ignoring the proper use of a realistic basic wage rates for tradesmen. Most of the construction workers are casual workers (Okoye, Okolie & Aderibigbe, 2014), who have not properly learnt, or stayed on the trade and/or do not belong to the unions. The level of their productivity is not known, and determining the wage rate by using the all in labour rate becomes a little difficult. Wages are determined instead by mere agreement between the employer and the workers (Udegbe, 2007), but, labour rate should be paid based on the productivity of a worker. Omange, Udegbe and Dirisu (2003) argues that the effect of labour cost on building projects though important has not been singularly treated because of scarce literature on labour dynamics. Adeyemi and Alli (2000) believe that the primary purpose of cost analysis is to optimize the client's expenditure in order to have good value for money. However, Wood (1976) argues that labour constants for establishing the cost of labour in an item of work in the Bills of Quantities need not be guessed, imagined or thought. It is then, difficult to draw reliable construction programmes or make accurate cost estimates without any available baseline standards thus, this situation in Nigeria came with many problems such as inaccurate estimation, cost overrun, claims and litigations and project abandonment. In furtherance of this, Olomolaiye and Ogunlana (1989) observe that the output of joinery and steel workers in seven public institution building projects in Oyo State of Nigeria, determined on the sites were lower than the claimed output of operatives. The differences between claimed and determined output in each task vary between 3% and 42%.

In project implementation, be it the erection of a building construction, a road or providing water scheme, the site engineer or supervisor not only needs to have a sound knowledge of the necessary skills involved but in addition should be able to determine the optimum composition of each skill in order to accomplish a task at shorter duration and reduced cost. This is of possible through the use technological standards for labour. Such standards are usually given as constants in the form of time necessary for the manual or mechanical completion of a defined quantity of work – standard time (S_t), or in the form of unit output – standard output (S_{op}) for a

specified working period. According to Okereke (2002), standard time is the quantum of time which it takes a workman or a group of workmen to produce a good quality product under an ideally organized labour force and working condition. It is measured in hr/m, hr/m^2 or hr/$m^{3.}$ While standard output is the quantum of good quality work accomplished by a workman or group of workmen in one working shift or working hour or day under an ideally organized labour and working condition. It is measured in m^2/hr or m^2/day, m^3/hr or m^3/day. Standardization in construction is primarily aimed at establishing standards in the use of labour, materials and machines. Thus these three elements in standardization are sometimes referred as technological standards or constants (Okereke, 2002). In view of the peculiarities of each construction site in terms of climatic conditions, social and cultural differences in the level of technological development, organizational, structure of contracting firms and the quality of available machines and materials, it is recommended that every construction organization should establish its own standards. The benefits to be derived among others:

i. increase in individual and collective productivity of labour;
ii. objective tendering;
iii. rational use of available resources;
iv. adaptation of more progressive management techniques.

The cumulative effect of the above benefits in having technological standards is that the contract time is correctly predetermined on the basis of available human and materials resources. In addition, Ayeni (1997) observes that most practicing firms of quantity surveyors maintain cost library within their organization. Such pool of information consists of labour wages and price of various materials and plants. They make references to them whenever they are computing the cost of a given project. Such information is of great importance to a quantity surveyor when preparing cost advice for a client on a new project. It also forms the basis of preparing final estimate for checking tenders received. Nevertheless, the productivity rate of a construction worker is measured by the quantum of good quality work he is able to perform within a unit time (hour, day, month, year). For comparison of the productivity rate of construction workers, the unit of measure usually adopted is the standard time (S_t) and standard output (S_{op}).

Work study particularly work measurement is concerned with measuring time required for specific task that is time required to perform a task so that an output standard of production for a worker or group of workers may be established (Calvert, Bailey & Coles, 1995). According to Khanna (2007), work study involves observing the worker at work. The methods used by the worker are observed and recorded in a work measurement study; the time taken by the worker to carry out an operation is recorded. It is the application of techniques designed to establish the time for a qualified worker to carry out a specified job at a defined level of performance (International Labour Organization, ILO, 1979). Such information is required for estimating, planning, setting financial incentives, as part of the data in the method study, determination of optimal labour force in the execution of building projects, and also in monitoring actual production performance against the established standard (ILO, 1979; British Standard Institute, 1992). Interestingly, Harris and McCaffer (2005) observe that this method is increasingly finding its way in the building industry thereby bringing improvements to the badly organized environment often found on construction projects. To this end, Oxley and Poskitt (2007) avow that the purpose of work study is the provision of factual data to assist management in making decisions and to enable them to utilize with the maximum of efficiency all available resources (that is labour, plant, materials, and management) by applying systematic approach to problems instead of using intuitive guess work.

Further still, the construction price book contains information mainly on prices of labour and materials in Nigeria (Oforeh, 2002). Though there are many price books in the British market today such as Spons, Architect and Builder's price books, mechanical, electrical and services books, Griffiths price book, Laxton building price book, Royal Institution of Chartered Surveyors (RICS) building maintenance price books, which contain information on standards that formed sources of cost library, none contained information on standards which is the major data for computing realistic unit rates, but the Consol's Nigerian Building Price Book (Consol Associate, 2011), which contain few information on Nigeria construction workers' average output and local daily charges. Further attempt by Alumbugu et al (2014) only yielded minimal improvement but was not able to develop labour constants that can be generalized. The dearth of labour standards and data for construction planning and cost control in Nigeria as substantiated by Olomolaiye and Ogunlana (1989) and Udegbe (2007) is the driving force behinds this study.

METHODOLOGY

This study is a field survey. Six project samples were purposely selected across the South East Nigeria based on the researchers' knowledge of the population, the nature and purpose of the study. The building processes being studied were concrete works and blockwork in superstructure. These work sections were broken into operations to facilitate subsequent synthesis. Concrete works involve batching of materials into a mixer, transportation, placing and compaction. Blockwork involves batching of materials into a mixer, transportation of mortar, placing of mortar and setting of blocks in place. Each operation involves certain number of tradesmen and unskilled labourers that form the gangs.

Activity sampling was carried out particularly field counts. Field counts were carried on concreting, carpentry, bending and fixing of reinforcement, and block laying. Field count involves a quick count at random intervals of the numbers of operatives working and those not working at a given time. An indication of performance is known as activity rating.

Thus, activity rating = $\frac{\text{No. of active observers}}{\text{Total no. observed}}$

In each case, the average activity rating from the observations was greater than 40%. Thereafter, a full scale time study was carried out using stop watch for each operation that makes up the activity for each process by observing and recording the start and finish duration of each operation per shift for different cycles. The quantity of work carried out by each gang per eight-hour working day was subsequently measured and recorded

The uniformity of gang size and mode of operation made comparative analysis possible. For each operation that make up an activity and on each project, time study was carried out randomly on chosen days (not less than three times) during the entire investigation period in order to obtain different durations and quantity of work completed. The most probable duration time (expected time (t)) to complete each operation that make up an activity relative to the quantity of work performed is given as

Expected time (**t**) = $\frac{t_e + 4t_0 + t_1}{6}$

In order to eliminate inaccuracies beyond tolerable limits, the duration of operation consists of the following components:

$\mathbf{t_e}$ = optimistic time, the probable earliest time if all goes well

$\mathbf{t_0}$ = most likely time the most probable time

$\mathbf{t_1}$ = pessimistic time, the probable longest completion time if everything goes worst

For manually executed activities the duration time of key process is determined from the formula $\mathbf{t_{ka}} = t_1 + t_2 + t_3 + \ldots\ldots\ldots\ldots + t_m$

Where $t_1 + t_2 + t_3 + \ldots\ldots\ldots\ldots + t_m$ are observed duration time of the individual operations that make up the activity relative to a unit quantity of work performed.

The standard time (S_t) is obtained by adding up the duration of the key activity ($\mathbf{t_{ka}}$), the time spent for break and workmen individual needs or rest.

Standard time (S_t) = $\frac{t}{Q}$

Where **t** = time taken to accomplish Q quantum of work in an eight-hour working day.

Standard output (S_{op}) = $\frac{Q}{t}$

To establish the nature of relationship between standard time and standard output, regression analysis was used. The developed labour constants (Standard time (S_t) and Standard output (S_{op})) were fitted into a regression model, $Y = \alpha + \beta x + e$ **.**

Where $\mathbf{S_t}$ is the independent variable (***x***) and $\mathbf{S_{op}}$ is the dependent variable (**Y**), $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ are constants, and ***e*** is the error margin. T statistic was used to test the significance of the relation at confidence interval of $\alpha = \beta_o$

Then (1- α) 100% confidence interval of β_o is given as (1 - α) 100% confidence interval $\left(\beta_0 = \hat{\beta}_o \pm t_{\frac{\alpha}{2}, n-2} \, Se\, \hat{\beta}_o \right)$

Thereafter, the model was subjected to statistical hypothesis test to confirm if the model is good. If the model is good, $\boldsymbol{\beta}$ will be statistically different from zero, otherwise.

i.e. $\mathbf{H_0}$: $\boldsymbol{\beta} = \mathbf{0}$ vs $\mathbf{H_1}$: $\boldsymbol{\beta} \neq \mathbf{0}$

Decision: Reject $\mathbf{H_0}$ if **t** is greater than $\mathbf{t}_{\alpha/2,\, n-2}$

RESULTS AND DISCUSSIONS

Table 1: Computation of Average Labour Constants for Reinforced Insitu Concrete 1:2:4 – 20mm agg

S/N	Building Process	Unit (m^3)	S_t (*x*) (h/unit)	S_{op} (*y*) (unit/m-h)	*xy*	x^2	y^2
1.	150mm thick in slab (first floor)	m^3	0.64	1.57	1.0048	0.4096	2.4649
2.	150mm thick in slab (second floor)	m^3	0.68	1.49	1.0132	0.4624	2.2201
3.	in columns (size 450 x 450 x 3000mm) (first floor)	m^3	3.11	0.33	1.0263	9.6721	0.1089
4.	in columns (size 450 x 450 x 3000mm) (second floor)	m^3	3.24	0.31	1.0044	10.4976	0.0961
	Total		**7.67**	**3.70**	**4.0487**	**21.0417**	**4.89**

Table 1 showed the developed averaged labour constants for reinforced insitu concrete 1:2:4 – 20mm agg. These were computed from the results of the work study from the six building projects considered in this study. The above values were fitted into a regression model and the result is as presented in table 2 below.

Table 2: Result of Regression Analysis for Reinforced Insitu Concrete 1:2:4 – 20mm agg.

β ^	α ^	δ^2 ^	t_{cal} H_0: ($\alpha = 0$)	MSE	SSR	SSE	t_{cal} H_0: ($\beta = 0$)	$t_{\alpha/2, v}$	Remark
-0.48	1.85	0.0017	345.177	0.0016	1.4643	0.0032	-30.246	4.303	Reject H_0 in both cases. $\hat{\alpha}$ is significantly different from zero. The model is statistically good and adequate.

From table 2, the result of regression analysis for reinforced insitu concrete 1:2:4 – 20mm agg gave the model as: $\hat{Y} = 1.85 - 0.48x$. The model relation showed that we can fit the line of best fit into the scatter diagram of *y* and *x*. This also implied that the standard output (y) is related to the standard time (*x*) and that the model can predict the values of y for a given value of *x*. The result also revealed that $\hat{\alpha}$ is significantly different from zero since t_{cal} **(345.177)** > $t_{0.05/2, n-2}$ **(4.303).** Likewise, the result confirmed that the model is good, adequate and suitable for the relationship, since t_{cal} **(-30.246)** > $t_{0.05/2, n-2}$ **(4.303)**, β is significantly different from zero and H_0 is rejected.

Table 3: Computation of Average Labour Constants for Fixing of High Yield Reinforcement Bars

S/N	Building Process	Unit (m^3)	S_t (x) (h/unit)	S_{op} (y) (unit/m-h)	xy	x^2	y^2
1.	16mmØ in columns (size 450 x 450 x 5000mm (first floor)	kg	0.025	40.09	1.00225	0.000625	1607.2081
2.	16mmØ in columns (size 450 x 450 x 5000mm (second floor)	kg	0.026	39.21	1.01946	0.000680	1537.4241
3.	10mmØ stirrups in columns	kg	0.208	4.81	1.00048	0.043264	23.1361
4.	Cut and bend 10mmØ as stirrups	kg	0.059	16.89	0.99651	0.003481	285.2721
	Total		**0.318**	**101.00**	**4.0187**	**0.04805**	**3453.0404**

Table 3 showed the developed averaged labour constants for fixing of high yield reinforcement bars. These were computed from the results of the work study from the six building projects considered in this study. The observed output in cut and bend 10mm diameter high yield bars as a stirrup is not relative and might not be comparable with other operations. However, the above values were fitted into a regression model for further analysis and statistical testing and the result is as presented in table 4 below.

Table 4: Result of Regression Analysis for Fixing of High Yield Reinforcement Bars.

β ^	α ^	δ^2 ^	t_{cal} H_0: ($\alpha = 0$)	MSE	SSR	SSE	t_{cal} H_0: ($\beta = 0$)	$t_{\alpha/2, v}$	Remark
-176.11	39.25	98.24	7.92	98.23	706.32	196.47	2.683	4.303	Reject H_0. $\hat{\alpha}$ is significantly different from zero. But the model is statistically not good and adequate enough, since $t_{cal} < t_{\alpha/2, n-2}$ ($\beta = 0$).

From table 4, the result of regression analysis for fixing of high yield reinforcement bars gave the model as: $\hat{Y} = 39.24 - 176.11x$. The model relation showed that we can fit the line of best fit into the scatter diagram of *y* and *x*. a change in *x* will cause a significant change in *y*. This also implied that the standard output (y) is related to the standard time (*x*) and that the model can predict the values of y for a given value of *x*. The result also revealed that $\hat{\alpha}$ is significantly different from zero since t_{cal} **(7.920)** > $t_{0.05/2, n-2}$ **(4.303).** But in this case, though, there would be a significant change in *y* for any change in *x*, the result revealed that the model is not good and adequate enough for the relationship. Thus, t_{cal} **(2.663)** < $t_{0.05/2, n-2}$ **(4.303)**, and since t_{cal} **(2.663)** < $t_{0.05/2, n-2}$ **(4.303)**, H_0 is accepted and conclude that β is significantly not different from zero. This is of particular significance in that the operation of fixing of reinforcement bars could not be adequately modelled into a regression fit because of handling of different sizes of reinforcement at the same time for a particular work section. This could also be due to combining different operations involved in the fixing of reinforcement bars which are not relative and comparable. Notwithstanding, the model could still predicts some changes in the amount of labour output of fixing reinforcement bars in the considered section of building construction work when there is a significant change in the time provided for the work.

Table 5: Computation of Average Labour Constants for Sawn Formwork

S/N	Building Process	Unit (m^3)	S_t (x) (h/unit)	S_{op} (y) (unit/m-h)	xy	x^2	y^2
1.	to suspended floor slab (first floor)	m^2	0.145	6.50	0.9425	0.0210	42.2500
2.	to suspended floor slab (second floor)	m^2	0.136				
3.	to sides of column (size 450 x 450 x 3000mm) (first floor)	m^2	4.08	6.19	0.8418	0.0185	38.3161
4.	to sides of column (size 450 x 450 x 3000mm) (second floor)	m^2 .	4.27	0.25	1.0200	16.6464	0.0625
				0.23	0.9821	18.2329	0.0529
	Total		**8.631**	**13.17**	**3.7864**	**34.9188**	**80.6815**

Table 5 showed the developed averaged labour constants for sawn formwork. These were computed from the results of the work study from the six building projects considered in this study. The above values were fitted into a regression model and the result is as presented in table 6 below.

Table 6: Result of Regression Analysis for Sawn Formwork in Slab and Column.

$\beta^{\wedge}$	$\alpha^{\wedge}$	$\delta^{2\wedge}$	t_{cal} H_0: ($\alpha = 0$)	MSE	SSR	SSE	t_{cal} H_0: ($\beta = 0$)	$t_{\alpha/2, v}$	Remark
-1.51	6.56	0.0442	62.348	0.0446	37.23	0.0892	-28.890	4.303	Reject H_0 in both cases. $\hat{\alpha}$ is significantly different from zero. The model is statistically good and adequate.

From table 6, the result of regression analysis for sawn formwork in slab and column gave the model as: $\hat{Y} = 6.56 - 1.51x$. The model relation showed that we can fit the line of best fit into the scatter diagram of y and x. This also implied that the standard output (y) is related to the standard time (x) and that the model can predict the values of y for a given value of x. The result also revealed that $\hat{\alpha}$ is significantly different from zero since t_{cal} **(62.348)** > $t_{0.05/2, n-2}$ **(4.303).** Likewise, the result confirmed that the model is good and adequate and suitable for the relation, since t_{cal} **(-28.890)** > $t_{0.05/2, n-2}$ **(4.303)**, β is significantly different from zero and H_0 is rejected.

Table 7: Computation of Average Labour Constants for Hollow Sandcrete Blockwork Bedded and Jointed in Cement Mortar (1:3)

S/N	Building Process	Unit (m^3)	S_t (x) (h/unit)	S_{op} (y) (unit/m-h)	xy	x^2	y^2
1.	225mm in (first floor)	m^2	0.39	2.57	1.0023	0.1521	6.6049
2.	225mm in (second floor)	m^2	0.40	2.53	1.0120	0.1600	6.4009
3.	150mm in (first floor)	m^2	0.38	2.64	1.0032	0.1444	6.9696
4.	150mm in (second floor)	m^2	0.39	2.59	1.0101	0.1521	6.7081
	Total		**1.56**	**10.33**	**4.0276**	**0.6086**	**26.6835**

Table 7 showed the developed averaged labour constants for hollow sandcrete blockwork bedded and jointed in cement mortar (1:3). These were computed from the results of the work study from the six building projects considered in this study. The above values were fitted into a regression model and the result is as presented in table 8 below.

Table 8: Result of Regression Analysis for Hollow Sandcrete Blockwork Bedded and Jointed in Cement Mortar (1:3)

$\beta^{\wedge}$	$\alpha^{\wedge}$	$\delta^{2\wedge}$	t_{cal} H_0: ($\alpha = 0$)	MSE	SSR	SSE	t_{cal} H_0: ($\beta = 0$)	$t_{\alpha/2, v}$	Remark
-5.50	4.73	0.00000125	1338.55	0.000025	0.00605	0.00005	-15.556	4.303	Reject H_0 in both cases. $\hat{\alpha}$ is significantly different from

									zero. The model is statistically good and adequate for the relationship.

From table 6, the result of regression analysis for hollow sandcrete blockwork bedded and jointed in cement mortar (1:3) gave the model as: $\mathbf{Y = 4.73 - 5.50}x$**.** The model relation showed that we can fit the line of best fit into the scatter diagram of *y* and *x*. This also implied that the standard output (y) is related to the standard time (*x*) and that the model can predict the values of y for a given value of *x*. The result also revealed that $\boldsymbol{\alpha}$ is significantly different from zero since t_{cal} **(1338.55) >** $t_{0.05/2,\ n-2}$ **(4.303).** Likewise, the result confirmed that the model is good and adequate and suitable for the relation, since t_{cal} **(-15.556) >** $t_{0.05/2,\ n-2}$ **(4.303)**, $\boldsymbol{\beta}$ is significantly different from zero and $\boldsymbol{H_0}$ is rejected.

CONCLUSION

Construction planners and estimators in Nigeria are usually faced with the challenges of making accurate cost estimate, cost plan, pricing and preparing reliable construction programme thereby pushing the contractors to run into cash flow problems due to non existence of reliable and realistic labour standards. The dearth of unreliable cost data bank impelled this current study. Thus, this study was concerned with developing the appropriate labour constant models for different building construction processes in Nigeria. It has successfully demonstrated that relationship existed between the labour constants (standard time (S_t) and standard output (S_{op})), and convincingly developed different statistical models for different building construction operations. The study has also established that labour constants could be modelled into regression fit where any change in standard time would cause a significant change in the standard output and that standard labour output could be predicted from the model for any given standard time. The adequacy or otherwise of the models was also confirmed through the test of statistical hypotheses and the models were found to be good and adequate for the purpose except for fixing of reinforcement bars.

This study therefore has found to be very significant and has contributed substantially to the insufficient body of knowledge in this research direction. With this development, the work of construction planners, estimators, work study officers and other construction practitioners have been made easier in the sense that for any observed and calculated standard time, the standard output for any of the building processes would be obtained from the model for manually executed activities and similar working ratios of the gang. The developed labour standard at the same time would serve as veritable tools for realistic and accurate pricing thereby reducing the tendencies of guess estimates and at the same time serving the purpose of optimizing the client's expenditure in order to have good value for money. The results of this study would also minimized the challenges of accurate cost estimate, construction programme, project planning and control, and pricing of bills of quantities through realistic determination of optimal labour force in the execution of building projects. The study recommended a practical application of the labour constants and models in different building construction processes, an insight and holistic study into other building processes as this would significantly improve the performance of building practice in Nigeria.

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Comparative Analysis of Low-Power CMOS&DTMOS Full Adder Circuits at 180nm And 45nm Technologies

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ABSTRACT: The full adder circuit is one of the most important components of any digital system application. This paper presents a new low power full adder that uses 8 transistors. The power dissipation, propagation delay and power delay product using 8T full adder are analyzed and Compared with existing techniques 28T,16T,14T,10T transistor full adder designs using HSPICE simulation at 180nm(1.8V) and 45nm(0.7V) technologies. All the circuits are implemented using DTMOS at 45nm (0.3V) technology. Dynamic threshold MOSFET (DTMOS) transistor utilizes dynamic body bias because in DTMOS, substrate (or body) and gate of MOSFET are tied together, therefore the input gate voltage forward biases the source substrate junction and owing to the body effect threshold voltage (V_{th}) decreases in the ON state and when the gate is turned off, V_{th} returns to its original high value in equilibrium. DTMOS is an excellent scheme to provide less delay with increased speed compared to traditional body biasing in the sub-threshold region.

Key words: CMOS, DTMOS, Full-Adder, low power

I.INTRODUCTION

The explosive growth in laptops and portable systems and in cellular networks has intensified the research efforts in low power microelectronics. In present day there is an ever-increasing number of portable applications requiring low-power and high throughput than ever before. For example note book and laptop computers, representing the fastest growing segment of the computer industry, are demanding the same computation capabilities as found in desktop machines. Therefore, circuits with low-power consumption become the major candidates **[**1] for design of systems. There are several issues related to the full adders. Some of them are power consumption, performance, area, noise immunity and regularity and good driving ability [1]. Several works have been done in order to decrease transistor count and consequently decrease power consumption and area [2]. In some designs, reducing transistor count has been resulted in threshold loss problem that causes non-full swing outputs, low speed and low noise immunity especially when they are used in cascaded fashion. Some of them has threshold loss problem that cause non-full swing outputs and low noise immunity. However, usually they have less power consumption in comparison to full adders with full swing outputs. In Integrated Circuits mainly two types of full adders (Static & dynamic) are used. Static full adders commonly are more reliable, simpler and lower power than dynamic ones. However, dynamic full adders are faster and some times more compact than static full adders. Dynamic full adders suffer from charge sharing, high power due to high switching activity, clock load and complexity.

There are several sources of power consumption in CMOS circuits:

1) Switching Power: Due to output switching during output transitions.

2) Short Circuit Power: Due to the current between VDD and GND during a transistor switching.

3) Static Power: Caused by leakage current and static current.

II. RIPPLE CARRY ADDER

2.1. Designing Ripple Carry Adder

A standard 8-bit ripple-carry adder built as a cascade from eight 1-bit full-adders. C0 for carry-in, inputs are A0..A7 and B0..B7. To demonstrate the typical behavior of the ripple-carry adder, very large gate-delays are used for the gates inside the 1-bit adders - resulting in an addition time of about 0.6 seconds per adder. Note that each stage of the adder has to wait until the previous stage has calculated and propagates its carry output signal. Therefore, the total delay of a ripple-carry adder is proportional to the number of bits. Faster adders are often required for bit widths of 16 or greater.

Each full-adder built by using a new CMOS technology which consumes less power. The PDP exhibited by the full-adder would affect the system's overall performance.

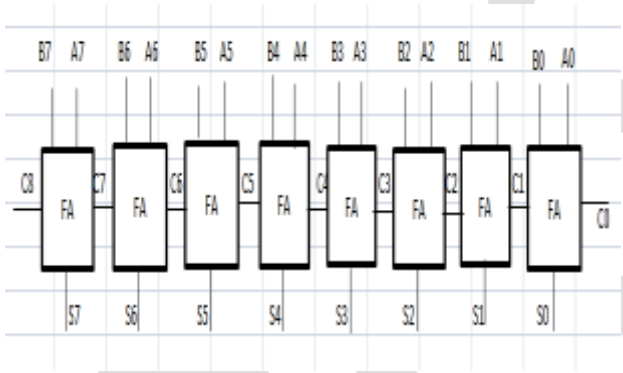

Figure.1 8-bit ripple carry adder

III. RELATED WORK

In the existing method implementation part, The performance analysis and comparison between various parameters that are power, delay, power delay product and rise time ,fall time of different 1-bit and 8-bit CMOS full adders that are 28T,16T,14T,10T are presented here.

The full-adder function can be described as follows: Given the three 1-bit inputs A, B, and C, it is desired to calculate the two 1-bit outputs SUM and COUT, where

SUM = A ⊕ B ⊕ Cin……(1)
Cout= Cin (A ⊕ B) +AB ……(2)

These outputs can be expressed in many different logic expressions. Therefore, many full adder circuits can be designed using the different expressions. There are three main components to design a full adder cell [5]. Those are XOR or XNOR, Carry generator and SUM Generator.

3.1 28T FULL ADDER:

The CMOS design style is not area efficient for complex gates with large fan-ins. Thus, care must be taken when a static logic style is selected to realize a logic function. Pseudo NMOS technique is straightforward. Pass transistor logic style is known to be a popular method for implementing some specific circuits such as multiplexers and XOR-based circuits, like adders.

The conventional CMOS [6] adder cell using 28 transistors based on standard CMOS topology is shown in Fig.2. Due to high number of transistors, its power consumption is high. Large PMOS transistor in pull up network result in high input capacitances, which cause high delay and dynamic power.

However, using inverters on the output nodes decreases the rise-time and fall-time and increases the driving ability. It functions well at low power supply voltages because it does not have threshold loss problem.

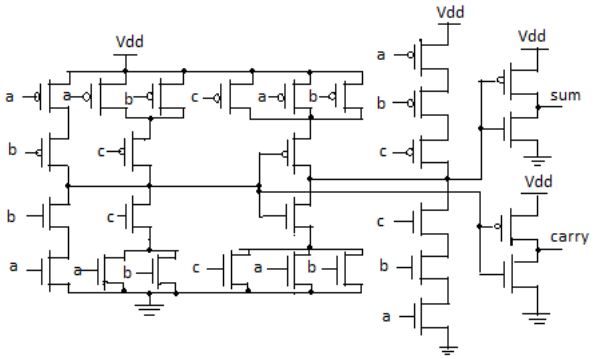

Fig. 2 28T Full Adder

3.2 16T FULL A DDER

The novel adder cell (NEW) has 16 transistor presented here, However, the XOR-XNOR module has been modified to reduce delay and power consumption. Lower power and delay has been obtained at the expense of 2 additional transistors. The novel adder cell (NEW) has 16 transistors. It is based on the 4-transistor implementations of the XOR and XNOR functions pass transistor, and transmission gates. 16T full adder is improved version from 14T, which is called 16T [8]. It has incomplete voltage swing at H when (A = 0, B = 0) and incomplete voltage swing at H' when (A = 1, B = 1) which account for less dynamic power consumption at those nodes. Also, it has less load capacitance at node H, since it is driving fewer loads than all other designs, which provides additional savings in dynamic power.

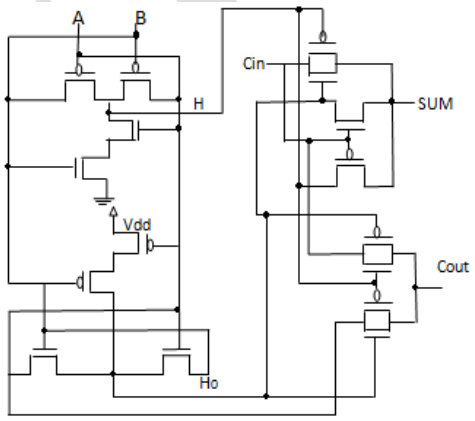

Fig.3 16T full adder

3.3 14T FULL ADDER

One of the recent enhancements is the 14-transistors adder (14T) presented in [10]. Power consumption has been reduced by using the 4-transistor XOR implementation presented in [7], which decreases the overall cell transistor count to 14 (see Fig. 4) .

14T uses only one inverter, but it has the same problem of glitches in the outputs. Also, it has the drawback of introducing a static power component at the inverter output. Due to the incomplete voltage swing of the XOR gate when A = B = 0, both the N and P transistors will be ON (N is weakly ON), which will lead to drawing current from the power supply although the circuit is in steady

state. This drawback increases the power consumed by this cell, but still it remains a good candidate for low power applications due to having only 14 transistors. This circuit has 4 transistor XOR which in the next stage is inverted to produce XNOR. These XOR and XNOR are used simultaneously to generate sum and cout. The signals cin and cin' are multiplexed which can controlled either by (a ⊗ b).

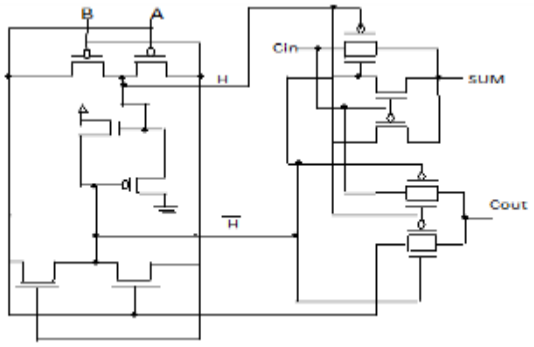

Fig.4 14T full adder

3.4 10T FULL ADDER

SERF (Static Energy Recovery Full Adder) full adder is implemented by 10 transistors, as shown in Fig. 5, uses energy recovery technique to reduce power consumption [8]. SERF use energy recovery technique to decrease the power consumption. Energy recovery logics reuse charge. Therefore, it consumes less energy than the other full adders. There are some problems in this circuit. First SUM is generated from two cascaded XNOR gates (group1) which lead to long delay. Second, it cannot work correctly in low voltage. As shown in Fig.6 in the worst case, when A=B='1' there is 2Vtn threshold loss in output voltage. Therefore, logic 1 becomes equal to VDD-2Vtn in this case.

The suitable operating supply voltage is limited to VDD> 2Vtn+|Vtp|. Second, there are five gate capacitances on node X. It causes to long delay in generating of intermediate A⊕ B signal and finally delay in generating SUM and COUT. This problem also increases the power.

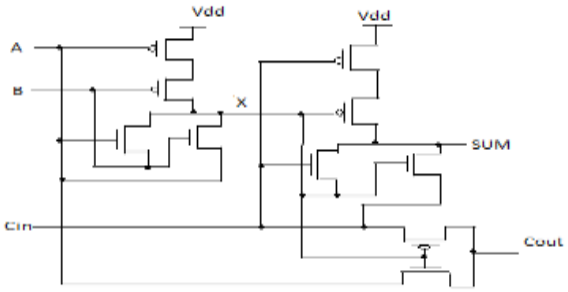

Fig.5 10T full adder

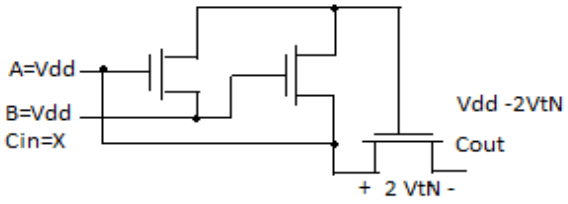

Fig.6 worst case of threshold loss problem in SERF full adder

IV. PROPOSED FULL ADDER

The full adder function can be derived as; the addition of two 1-bit inputs A and B with forestage carry C_{in} calculates the two 1-bit outputs sum and C_{out}, where

$Sum = A \oplus B \oplus C_{in}$……(1)

$Cout = C_{in} (A \oplus B) + AB$ ……..(2)

In this design, the Boolean function as

$Sum = (A \oplus C_{in}) \cdot (C_{out})' + (A \oplus C_{in})' \cdot B$……..(3)

$Cout = (A \oplus C_{in}) \cdot B + (A \oplus C_{in})' \cdot A$……..(4)

From Esq. (3) and (4), the 8T design is proposed (Fig. 7).

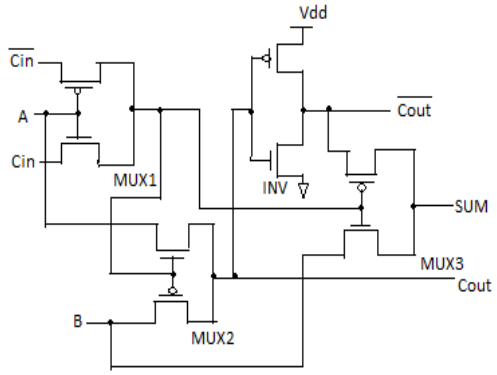

Fig.7 8-transistor full adder

The entire design process can be divided into several steps as follows:

1. $(A \oplus C_{in})'$ or $(A \oplus C_{in})$ is needed as a control signal in multiplexers MUX2 and MUX3 to generate Cout and Sum. $(A \oplus C_{in})'$ is implemented by MUX1 (Fig. 7).

2. The multiplexer circuit MUX2 is adopted in our proposed design to generate Cout followed by an inverter INV. Using inverter in the circuit; it speeds up the carry propagation as a buffer along the carry chain. Secondly, it provides complementary signals needed for the generation of Sum (Lin et al., 2007).

3. The Sum is generated by the multiplexer MUX3 passing either B or out C_{out}' according to the value of in $(A \oplus C_{in})'$.

The proposed full adder circuit, which uses three multiplexers and an inverter, requires eight transistors. Choosing appropriate width to length rates of transistors, W/L, improves the threshold drop of the circuit (Chowdhury et al., 2008). The multiplexer uses transistor sizes of (W/L)p=6/1 and (W/L)n=3/1 for PMOS and NMOS, respectively, while the inverter uses the typical sizes of (W/L)p=4/1 and (W/L)n=2/1 (Fig. 7). The 8T full adder showed better performance than other full adders due to its low power consumption and propagation delay.

V. SIMULATION RESULTS

All the 1-bit and 8-bit full adders have been simulated at 180nm technology under the voltage V_{DD}=1.8V tabulated in Table 1 and Table 2, and at 45nm technology under the voltage V_{DD}=0.7V tabulated in Table 3 and Table 4.

Table .1 Simulation Results Of All CMOS 1-Bit Full Adder At 180nm Technology

Parameter/ Full Adder	Voltage (V_{DD})	Average power (W)	Propagation delay(S)	Power delay product(J)
28T	1.8V	11.66E-06	12.35E-12	14.40E-17
16T	1.8V	10.78E-06	9.379E-12	10.11E-17
14T	1.8V	9.797E-06	11.35E-12	11.11E-17
10T	1.8V	9.664E-06	10.07E-12	9.727E-17
8T	1.8V	7.812E-06	3.432E-12	2.680E-17

Table .2 Simulation Results Of All CMOS 8-Bit Full Adder At 180nm Technology

Parameter/ Full Adder	Voltage (V_{DD})	Average power (W)	Propagation delay(S)	Power delay product(J)
28T	1.8V	5.484E-05	14.42E-12	7.907E-16
16T	1.8V	4.409E-05	10.42E-12	4.594E-16
14T	1.8V	3.793E-05	13.71E-12	5.200E-16
10T	1.8V	3.746E-05	11.73E-12	4.394E-16
8T	1.8V	3.205E-05	8.957E-12	2.860E-16

Table .3 Simulation Results Of All CMOS 1-Bit Full Adder At 45nm Technology

Parameter/ Full Adder	Voltage (V_{DD})	Average power (W)	Propagation delay(S)	Power delay product(J)
28T	0.7V	4.265E-07	0.898E-12	3.829E-19
16T	0.7V	3.669E-07	0.546E-12	2.003E-19

14T	0.7V	3.157E-07	0.616E-12	1.944E-19
10T	0.7V	2.049E-07	0.592E-12	1.213E-19
8T	0.7V	1.348E-07	0.332E-12	0.447E-19

Table .4 Simulation Results Of All CMOS 8-Bit Full Adder At 45nm Technology

Parameter/ Full Adder	Voltage (V_{DD})	Average power (W)	Propagation delay(S)	Power delay product(J)
28T	0.7V	6.565E-05	5.562E-12	3.651E-16
16T	0.7V	3.525E-05	2.619E-12	0.923E-16
14T	0.7V	3.053E-05	4.171E-12	1.456E-16
10T	0.7V	1.876E-05	3.274E-12	0.614E-16
8T	0.7V	1.571E-05	2.003E-12	0.314E-16

From Table 1, 2 and Table 3, 4, 28T full adder has more power and delay and PDP compared to 16T, 14T, 10T full adders, because more number of transistors results in high input loads, more power consumption. In 16T full adder the XOR-XNOR module has been modified to reduce delay and power consumption. Lower power and delay has been obtained at the expense of 2 additional transistors. 14T full adder has simultaneous XOR and XNOR signals. Feedback transistors provide rail-to-rail outputs in XOR-XNOR module.

However, they prompt high delay than 16T full adder. SERF use energy recovery technique to decrease the power consumption. Energy recovery logics reuse charge. Therefore, it consumes less energy than the other full adders. There are some problems in this circuit, SUM is generated from two cascaded XNOR gates which lead to long delay, compared to 16T full adder it has more delay. 8T full adder shows a much better power, delay and power delay product (PDP) compared to any other adders mentioned in Tables. Compared to 180nm technology the 45nm technology has low power, delay and power delay product.

VI. COMPARISION OF CMOS AND DTMOS FULL ADDERS

MOSFET devices are generally operated above threshold voltages but the devices can also exhibit control characteristics, even below the threshold voltages. This region of operation of these devices may be called sub threshold operation.

Dynamic threshold MOSFET (DTMOS) transistor utilizes dynamic body bias because in DTMOS, substrate (or body) and gate of MOSFET are tied together, therefore input gate voltage forward biases the source substrate junction and owing to the body

effect threshold voltage (V_{th}) decreases in the ON state and when the gate is turned off, V_{th} returns to its original high value in equilibrium. DTMOS is an excellent scheme to provide less delay with increased speed compared to traditional body biasing in the sub-threshold region.

6.1 Structure Of CMOS and DTMOS Configuration

Typical schematic structures of CMOS and DTMOS [3] are given in Figure 11.1(a), 11.1(b). In conventional NMOS circuit, Fig. 11.2(a), the substrate is normally connected to ground or lowest potential in the circuit and in PMOS circuits, the substrate is connected to supply voltage (VDD=0.3V) or the highest potential in the circuit. In DTMOS, Fig 11.2 (b), the substrate is always kept at gate potential. Also, the voltage of each transistor substrate is dynamically adjusted depending on the gate voltage, causing the threshold voltage of the device to adjust dynamically. DTMOS devices are efficient because they function as dual threshold logic gates. When a DTMOS transistor is ON, its threshold is lowered increasing the current and decreasing propagation delay. Likewise when the transistor is OFF, the threshold is raised, reducing leakage current and minimizing power and energy dissipation. DTMOS is an excellent scheme to provide less delay with increased speed compared to traditional body biasing in the sub-threshold region.

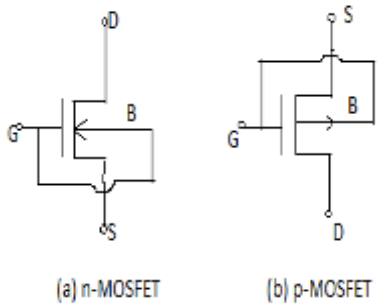

Fig 11.2 - DTMOS Structure

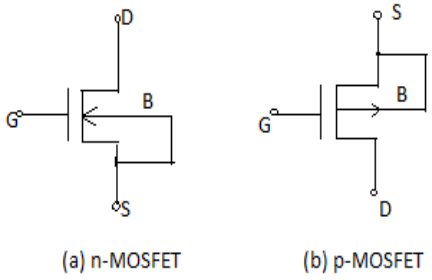

Fig 11.2 - DTMOS Structure

VII .SIMULATION RESULTS

All the 1-bit full adders have been simulated at 45nm technology under the voltage V_{DD}=0.3V and the comparison of CMOS and DTMOS of the results have been tabulated in Table 5.

Table. 5 Comparison Results Of CMOS&DTMOS Of 1-Bit Full Adder At 45nm

Technology (0.3V)

Parameters	Voltage (V_{DD})	full adders	CMOS	DTMOS
Average Power(W)	0.3V	28T	2.609E-07	2.901E-07
		16T	2.196E-07	2.483E-07
		14T	2.143E-07	2.220E-07
		10T	0.675E-07	0.780E-07
		8T	0.102E-07	0.136E-07
Propagation Delay(S)	0.3V	28T	0.704E-12	0.218E-12
		16T	0.393E-12	0.130E-12
		14T	0.635E-12	0.180E-12
		10T	0.444E-12	0.143E-12
		8T	0.207E-12	0.118E-12
Power Delay Product(J)	0.3V	28T	1.838E-19	0.635E-18
		16T	0.863E-19	0.032E-18
		14T	1.362E-19	0.039E-18
		10T	0.299E-19	0.011E-18
		8T	0.021E-19	0.001E-18

From the above Table 5 DTMOS has less delay and power delay product and more power compared to CMOS. DTMOS is an excellent scheme to provide less delay with increased speed compared to traditional body biasing in the sub-threshold region.

Compared to all CMOS and DTMOS full adders, proposed 8T full adder has less power, delay and power delay product. Power consumption less in 8T full adder. Dynamic threshold MOS (DTMOS) circuits provides low leakage and high current drive compared to CMOS circuits, operated at lower voltages. Regarding speed, DTMOS 8T is superior; it is faster than CMOS 8T by 50%.

Table .6 Comparison Results Of CMOS&DTMOS Of 8-Bit Full Adder At 45nm Technology (0.3V)

Parameters	Voltage (V_{DD})	full adders	CMOS	DT MOS
Average Power(W)	0.3V	28T	4.529E-06	4.589E-06
		16T	2.547E-06	2.603E-06
		14T	2.119E-06	2.241E-06
		10T	1.239E-06	1.922E-06
		8T	0.104E-06	0.919E-06
Propagation Delay(S)	0.3V	28T	0.934E-12	0.522E-12
		16T	0.518E-12	0.202E-12
		14T	0.724E-12	0.233E-12
		10T	0.617E-12	0.217E-12
		8T	0.248E-12	0.146E-12
Power Delay Product(J)	0.3V	28T	4.230E-18	2.396E-17
		16T	1.319E-18	0.052E-17
		14T	1.534E-18	0.068E-17
		10T	0.764E-18	0.041E-17
		8T	0.025E-18	0.013E-17

From the above Table 6 DTMOS has less delay and power delay product and more power compared to CMOS. DTMOS is an excellent scheme to provide less delay with increased speed compared to traditional body biasing in the sub-threshold region. Compared to all CMOS and DTMOS full adders, proposed 8T full adder has less power, delay and power delay product. Power consumption less in 8T full adder. Dynamic threshold MOS (DTMOS) circuits provide low leakage and high current drive compared

to CMOS circuits, operated at lower voltages. 8-bit full adder has more power and delay and PDP compared with 1-bit full adder. Regarding speed, DTMOS 8T is superior; it is faster than CMOS 8T by 50%.

CONCLISIONS

The performance of digital VLSI applications depends largely on the characteristics of the full adder circuits employed in such systems. The full adder design proposed is composed of only eight transistors forming three multiplexers and one inverter to produce complementary carry signals (*C*out and out *C*) and summation signal (Sum). Comparing The proposed design with other existing adders in respect of power consumption, delay, and power delay product, the new design embodies a good many advantages. Power, delay and power delay product (PDP) has also been improved. The comparison shows that the implementation of the full adder would be better at 45nm technology as compared to 180nm technology. DTMOS has less delay and power delay product and more power compared to CMOS. DTMOS is an excellent scheme to provide less delay with increased speed compared to traditional body biasing in the sub-threshold region. In future work, the proposed design will be embedded into multiplier to demonstrate the performance in realistic application. Research is going on to further reduce the power and delay, area of full adders.

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Performance Analysis on Web based traffic control for DDoS attacks

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***Abstract*—** Increase in the usage of internet from mailing a friend to e-learning, e-commerce, e-medicine, internet have tremendous growth as well as flaws such as raise in internet traffic leading to congestion .There are information security related active attack which cause internet traffic and make a resource unavailable to user . DoS and DDoS are an active attack that threatens the availability of a resource. In this proposed work we emphasis on how to overcome the traffic caused by DDoS attack. To mitigate the effect of DDoS we have used signature that is been generated whenever a client is logging in. Signature uses a lightweight hash algorithm which has an advantage of reduction in number of codes used with a lower development cost. Log is created for each operation on network and this file can be kept at any location. Also we have situation where traffic is completely controlled by limiting user's request/response. There is a backend Database used for holding information regarding users.

Keywords — Lightweight hash algorithm, service signature verification.

INTRODUCTION

Increase in the usage of internet

The internet is a global system of interconnected computer networks that use the standard Internet protocol suite (often called TCP/IP, although not all applications use TCP) to serve billions of users worldwide. It is a *network of networks* that consists of millions of private, public, academic, business, and government networks, of local to global scope, that are linked by a broad array of electronic, wireless and optical networking technologies. The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents of the World Wide Web (WWW) and the infrastructures support email.

Most traditional communications media including telephone, music, film, and television are reshaped or redefined by the Internet, giving birth to new services such as Voice over Internet Protocol (VoIP) and Internet Protocol Television (IPTV). Newspaper, book and other print publishing are adapting to site technology, or are reshaped into blogging and web feeds. The Internet has enabled and accelerated new forms of human interactions through instant messaging, Internet forums, and social networking. Online shopping has boomed both for major retail outlets and small artisans and traders. Business-to-business and financial services on the Internet affect supply chains across entire industries [9]. As Internet is increasingly being used in almost every aspect of our lives, it is becoming a critical resource whose disruption has serious implications. Blocking availability of an Internet service may imply large financial losses, as in the case of an attack that prevented users from having steady connectivity to major e-commerce Web sites such as Yahoo, Amazon, eBay, E*Trade, Buy.com, ZDNet and CNN [12]. Despite substantial discussion of the Internet's impact on individual activities, there is an absence of a theoretically grounded measure of Internet usage for the provisioning of information required by decision-makers [11].

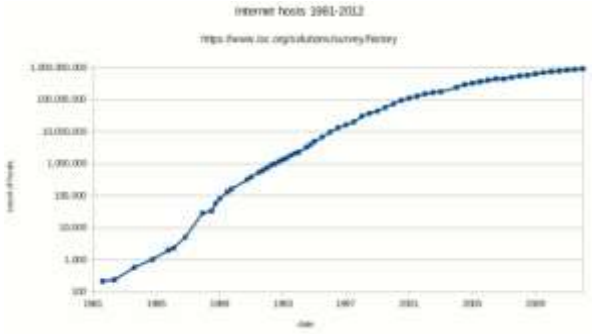

Fig. 1. Internet Usage(1981-2012)

DDoS

Distributed Denial of service (DDoS) attacks is designed to disrupt network services, by intentionally blocking or degrading the available resources used by them. One of the major problems for DDoS detection methods is the difficulty of differentiating DDoS attack packets from legitimate packets [13], since attackers mimic their attack traffic amongst legitimate traffic in order to hide their attack. This makes DDoS attacks a very serious threat to computers users [14]. A Distributed Denial of Service (DDoS) Attack is composed of four elements, as shown in *Fig. 2*.

• The real attacker.

• The handlers, which are compromised hosts with a special program running on them, capable of controlling agents.

• The attack daemon agents or zombie hosts, who are compromised hosts that are running a special program and are responsible for generating a stream of packets towards the intended victim. Those machines are commonly external to the victims own network, to avoid efficient response from the victim, and external to the network of the attacker, to avoid liability if the attack is traced back.

• A victim or target host.

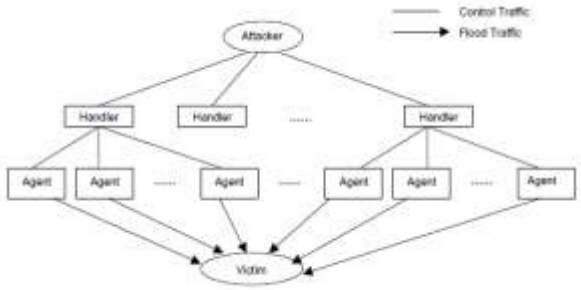

Fig. 2. Architecture of DDoS attack

The following steps take place while preparing and conducting a DDoS attack:

1. *Selection of agents*: The attacker chooses the agents that will perform the attack. These machines need to have some vulnerability that the attacker can use to gain access to them. They should also have abundant resources that will enable them to generate powerful attack streams. At the beginning this process was performed manually, but it was soon automated by scanning tools.

2. *Compromise:* The attacker exploits the security holes and vulnerabilities of the agent machines and plants the attack code. Furthermore he tries to protect the code from discovery and deactivation. Self propagating tools such as the Ramen worm and Code Red soon automated this phase. The owners and users of the agent systems typically have no knowledge that their system has been compromised and that they will be taking part in a DDoS attack. When participating in a DDoS attack, each agent program uses only a small amount of resources (both in memory and bandwidth), so that the users of computers experience minimal change in performance.

3. *Communication:* The attacker communicates with any number of handlers to identify which agents are up and running, when to schedule attacks, or when to upgrade agents. Depending on how the attacker configures the DDoS attack network, agents can be instructed to communicate with a single handler or multiple handlers. The communication between attacker and handler and between the handler and agents can be via TCP, UDP, or ICMP protocols.

4. *Attack*: At this step the attacker commands the onset of the attack. The victim, the duration of the attack as well as special features of the attack such as the type, length, TTL, port numbers etc, can be adjusted. The variety of the properties of attack packets can be beneficial for the attacker, in order to avoid detection.

DoS attacks based on protocol features take advantage of certain standard protocol features. For example several attacks exploit the fact that IP source addresses can be spoofed. Several types of DoS attacks have focused on DNS, and many of these involve attacking DNS cache on name servers. An attacker who owns a name server may coerce a victim name server into caching false records by querying the victim about the attackers own site [18].

Distributed denial-of-service (DDoS) attacks pose an immense threat to the Internet, and many defense mechanisms have been proposed to combat the problem. Attackers constantly modify their tools to bypass these security systems, and researchers in turn modify their approaches to handle new attacks. The DDoS is quickly becoming more and more complex, and has reached the point where it is difficult to see the forest for the trees. On one hand, this hinders an understanding of the DDoS phenomenon. The variety of known attacks creates the impression that the problem space is vast, and hard to explore and address. On the other hand, existing defense systems deploy various strategies to counter the problem, and it is difficult to understand their similarities and differences assess their effectiveness and cost, and to compare them to each other [10].

The Light-Weight Hash function is used to verify the digital signature of the particular clients. The lightweight instance conjecturally provides at least 64-bit security against all attacks. By using this hash function we have to perform the digital signature. The digital signature of the uploaded and downloaded file can be stored in server side. The need for lightweight (that is, compact, low-power, low-energy) cryptographic hash functions has been repeatedly expressed by professionals, notably to implement cryptographic protocols in RFID technology. At the time of writing, however, no algorithm exists that provides satisfactory security and performance. The ongoing SHA-3 Competition will not help, as it concerns general-purpose designs and focuses on software performance. Lightweight hashes are indeed necessary in all applications that need to minimize the amount of hardware and the power and energy consumption [5].

The scope of the project is to prevent the network from the attackers. In order to maintain the security and traffic control. By using this process we prevent the attack insist from the attacker. In security basis the adaptive device is not allowed. The end-to-end principle is a powerful method. This method is used to forwarding the packet. The traffic control not allows the packet rate to increase. The owner has to restrict their own packets by using traffic control method. Trace back method is used to store a back log of packet hashes. This control handover is performed at each activated adaptive device on the network path of an IP packet.

SYSTEM ANALYSIS

Existing System

In our existing system we had to check the IP-address of the particular client and server. IP-address has to be checked by giving the source and destination address of the particular clients. To overcome this process we have to insert the digital signature process. The signature has to store in server side only. The digital signature of the particular client can get by giving the port number for that particular client. The signature verification is done by using the hash algorithm. The traffic can be monitored by the network traffic control method. The traffic can be measure to introduce the traffic ownership process. The network users known source and destination IP-address of the network packet. By using this traffic method we prevent misuse and malicious interference. The inclusion of this method is the adaptive device. Adaptive device is used to re-route the packets. The adaptive device can provide contextual information about the particular client. Disadvantages that are present in existing system are packet loss on intermediate links could be measured for network debugging purposes, Collateral damage caused by misconfigurations or malicious behavior of users, Traffic control not allows the packet rate to increase.

Methodology

In our proposed system we have to introduce the trace back method. The method is based on packet marking approach to avoid storing state at routers. Instead of inserting its entire IP address into the packet, each node inserts only the part of the IP address to indicate its presence on the path.

This method supports the network forensics by sampling the traces of suspicious network activity. Before forwarding a packet the router inserts the IP address of its output interface into the packet.

In this router inserts its outer-interface IP address into the forward packet. Upon receiving an attack packet, the victim disposes whose elements are the routers that compose the attack path. To reconstruct the attack path, the following procedure is used. Initially the victim checks for the presence of all neighbor routers in the received attack packet. Then we have to introduce the k-nn classification method to indicate the status of the networks. The network statuses are attack, pre-attack and normal.

Differential attacks cover all attacks that exploit non-ideal propagation of differences in a cryptographic algorithm. A large majority of attacks on hash functions are at least partially differential. The Security requirements of hash function are collision resistance, second pre-image resistance and also the pre-image resistance. The advantages of our proposed methodology are that it can minimize memory requirements, provide security and performance. The advantage of the ciphers is their simplicity and their performance flexibility. We use real network traffic information to discover the self-similar pattern for legitimate traffic, and use this information as a benchmark for our prediction algorithm, to determine if any new traffic that enters the network is DDoS traffic or legitimate traffic.

SYSTEM DESIGN

- Always when a user needs to access the server he must have been registered to the server. The registered user is given a key which is sent to his mail.
- When a user sends request to server, the signature of sender is verified.
  - The traffic monitoring system checks for the pattern of request from sender monitors and reply with action when the request is not a attack.
  - Log is created for each operation on network and this file can be kept at any location.

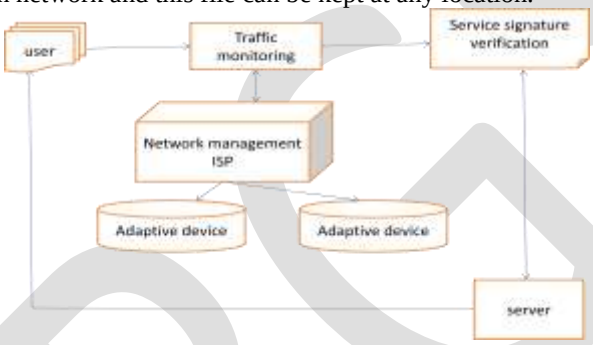

Fig. 3. System Architecture

The Light-Weight Hash function is used to verify the digital signature of the particular clients. This is mainly used to maintain the security of the system performance. Hash functions can serve many different purposes, within applications ranging from digital signatures and message authentication codes to secure passwords storage, key derivation, or forensics data identification.

The lightweight instance conjecturally provides at least 64-bit security against all attacks. The primitives used in hash functions are Message Authentication Code, Pseudorandom generator, stream cipher, random Access Stream cipher and Key Derivation Function. By using this hash function we have to perform the digital signature. The digital signature of the uploaded and downloaded file can be stored in server side.

RESULTS

The fig. 4 indicates that the traffic has not occurred with status normal, source and destination IP address

.

Fig .4. Traffic information

Fig.5 indicates that the file pgp.docx has been uploaded to server of size 64kb with time taken is zero seconds. This is server side information which shows the security of the system is high. When there is packet of same size and same pattern these information's will help us in the detection of DDoS.

Fig.5. Server information

Database contains the logged in information and list of users who have registered to the server is shown in fig.6. Database also helps us in verifying whether an intended user is logged in or not.

Fig.6. Database

CONCLUSION

This proposed work offers a new distributed traffic control system that enables ISPs to deploy new applications within the network and to safely delegate the partial network control to network users. Proposes a model to measure the effectiveness of filtering malicious traffic along with an effective trace back technique to control DDOS attacks generated. The methods based data mining are suitable for the detection. Then, the current network status is classified to determine the class to which it belongs to. Hence, our method can classify the current network status well to detect DDoS attacks early and the fault tolerance level was around 3%.

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NAVDEC DECISION SUPPORT SYSTEM TO AVOID COLLISION AND DISTRESS IN SEA NAVIGATION

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ABSTRACT- This paper proposes an advanced navigation decision support system (NAVDEC) mainly to avoid the collision among two or more vessels in sea. More commonly the faults can be occurred by the mistakes of human where it can be avoided by the decision support system. Decision can be taken by the navigator in critical situations with the help of the gathered information from different identification and tracking system. The planning of routes is more important to maintain the proper navigation in sea. The proposed system also uses the Ant Colony Optimization algorithm for planning the routes in collision time. In addition to this GDMSS of very high frequency management system can be used for the safe navigation and the data collection can also be sent to the coastal through the high frequency. Pollution in navigation can also be reduced automatically with the detection and avoidance of collision among the vessels in sea.

Keywords: Decision Support System, GDMSS, Path Detection, ARPA, GNSS.

I. INTRODUCTION

Monitoring of vessels is more essential to avoid the distress situations in sea. Various parameter values of vessels can be taken with the identification systems and thereby the human faults can be reduced. Path planning is the main factor to avoid the collision among the vessels in sea, Ant Colony Optimization algorithm can be used to detect the own ship path in the ocean. NAVDEC support system is the decision system to avoid collision and traffic between the vessels. Automatic aided RADAR is placed in the own ship to detect the nearer objects in the sea. Decision system involves with the various identification systems like AIS, ARPA, GNSS, ENC, GPS, and DGPS to handle the real time solution for collision in sea. GMDSS is the system to rescue ships in the dangerous situations in sea. To maintain the co-ordination between the multiple vessels Self Organization Time Division Multiple Access can be used, where separate timing can be given to each vessel to share their information for a safe navigation using the satellite communication.

II. METHODS AND MATERIALS

A. Expanded NAVDEC Decision System

The proposed decision system is used to acquire the information from the different controlling system and it can be displayed to the navigator to avoid the collision among the vessels in sea. In order to maintain the efficiency of the proposed system the expanded form of decision support system can be maintained. Parameter values of position, speed, path, arrival time, departure time of the own and surrounding vessels should be recorded using the expanded systems such as Path Planning Scheduling (PPS), Localizations of vessel states and its environment (LVSE), Determining Safe Trajectory Subsystem (DSTS).By avoiding the collision among vessels life of the navigator can be saved , damage in ships can be reduced ,and the goods can also be safely carried by the vessels. The block diagram representation of the decision system is shown in the below fig and each block function can be explained in the below section.

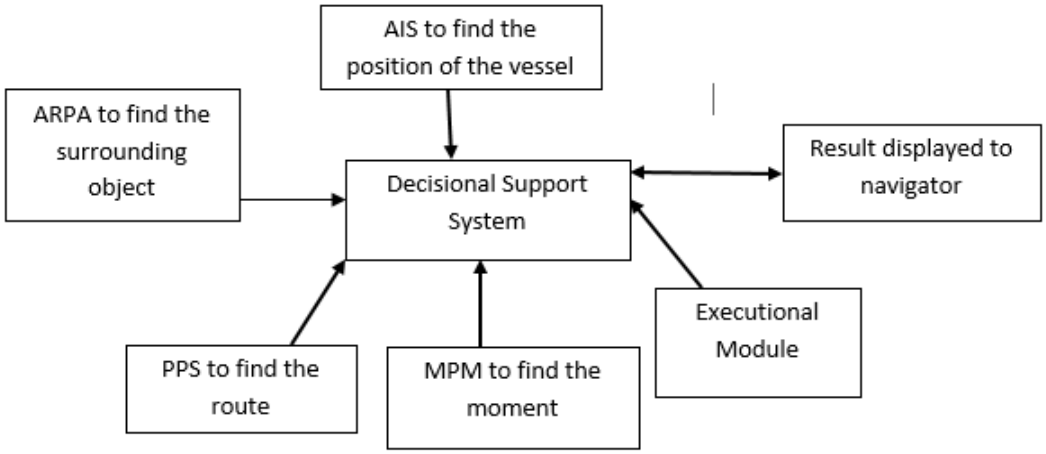

Fig 1.Block Diagram of NAVDEC

B. SOTDMA for identification system

Each vessels have their own time management to transmit their information to avoid the collision among them. Not only the monitoring of vessels is important but also the acquiring of data from the identification and controlling system is more essential and it can be done by the Self Organizing Time Division Multiple Access (SOTDMA).For the transmission of information among them separate time can be allocated with the desired frequency range. Ships equipment like rudder, engine, propeller, fuel level can be monitored continuously and if any of the fault occurred in the equipment means immediately the alarm can be generated and thereby the life of the navigator can be saved.

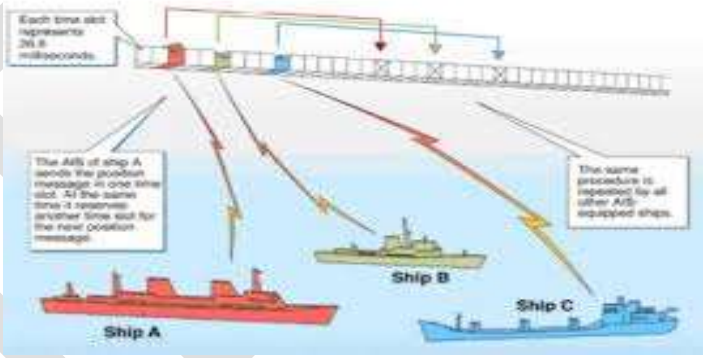

Fig 2.SOTDMA

Collision avoidance between the vessels using the SOTDMA of the simple diagrammatical representation is shown in the below figure. Automatic plotted radar can be used to find the surrounding vessels from its own ship and there by the course speed of the vessel can be maintained.

Fig 3. AIS alert system

C. GDMSS for marine safety

To save the life of the navigator GDMSS can be used in the sea navigation. Ship to ship and ship to shore communication can be done with the different transmitting wireless agents. If the ship faces difficult situations means then the message can be sent to the surrounding ships from the own ship. Immediate rescue alert and searching can be done with the SART (Search and Rescue Transponder) from the own ship distress to the nearby ship. Global detection of vessels position in sea can be found using the Emergency Position Indicating Radio beacon (EPIRB)

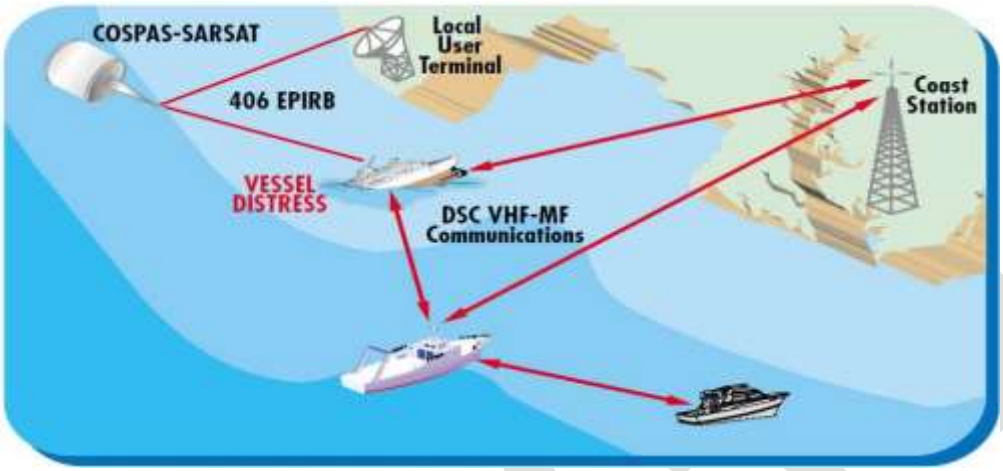

Fig 3.GDMSS

III. RESULT AND DISCUSSION

Collision avoidance among the vessels can be simulated using the MATLAB. By the avoidance of the collision among the vessels the life of the fisherman can be saved in the distress situation. Decision support system plays a major role in this proposed system. Algorithm can also be used for path scheduling. Simulation result can be shown in the below figure.

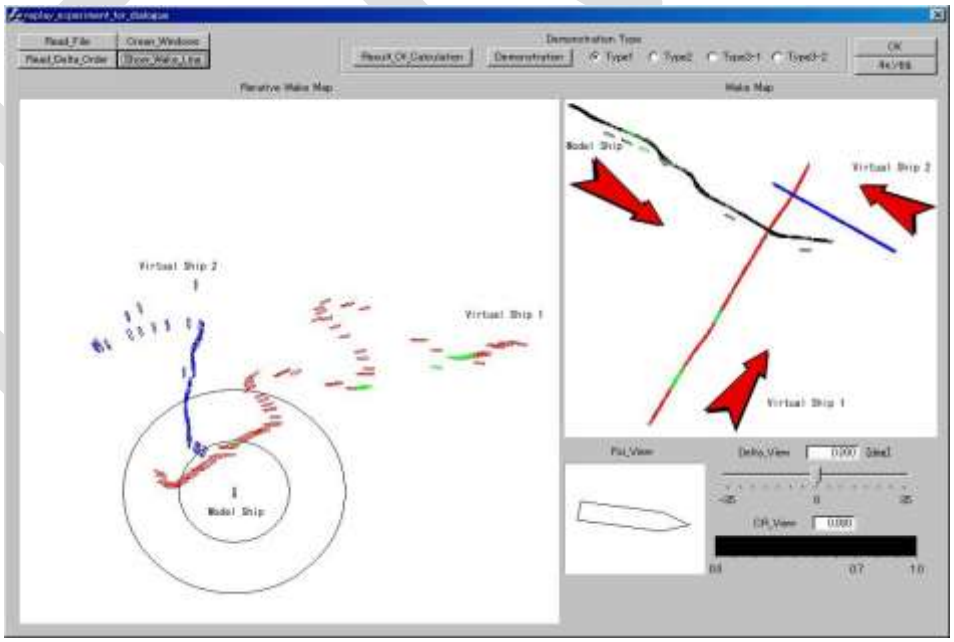

Fig 4: Simulated Result

IV. CONCLUSION

In this proposed system decision support system can be used to communicate between own vessel to other vessel to avoid the collision in the sea. Future enhancement can be done with the visualization based support system to improve the accuracy of the performances.

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NUMERICAL COMPARISON OF THE TUBE BANK PRESSURE DROP USING A CONVENTIONAL NOZZLE POSITION AND AN INLINE NOZZLE POSITION OF A SHELL AND TUBE HEAT EXCHANGER

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Abstract— The main parameters describing the efficiency and acceptance of a particular shell and tube heat exchanger in any application is its pressure drop. More the pressure drop across the tube side less is the heat transfer and hence more is the pumping power required and more is the cost. The pressure drop on the tube side can be split into three parts namely pressure drop due to Inlet nozzle, pressure drop in the tube bank, and pressure drop in the outlet nozzle. A large number of analytical expressions are available for finding the tube bank pressure drop of a Conventional SHTX i.e. as per TEMA Standards. This research provides a Numerical approach for finding the pressure drop across the tube bank for a SHTX with a nozzle position other than the TEMA Standards and also its comparison of the tube bank pressure drop with a conventional BEM types of TEMA SHTX. Firstly the Conventional Nozzle position is used for an Elliptical Inlet and Outlet headers i.e. the nozzle length being perpendicular to the direction of flow in the inlet and outlet header and secondly the nozzle length being parallel to the direction of flow in the inlet and outlet header. Since the approach is numerical the use of Ansys 14.5 was used. ICEM was used for the geometry making and meshing. The meshed file was then exported to the Fluent for the solving process. After doing the solver setup and using appropriate boundary conditions the solution was found keeping in mind that the flow was steady and isothermal. The pressure zones computed at the Inlet header were compared between the two cases. Also the pressure drop across the tube bank were calculated for each case and compared. The results obtained from the Conventional Nozzle position were validated against the theoretical pressure drop and the same model and approach was used to find the Tube Bank pressure drop for an Inline Nozzle.

Keywords — Numerical, Comparison, Tube Bank Pressure Drop, Nozzle Position.

INTRODUCTION

A heat exchanger is a device used to transfer heat from one medium to another by separating them to prevent mixing or allowing them to mix and transfer the heat. One such exchanger which prevents the mixing of the mediums is a shell and tube heat exchanger. There are various types of shell and tube heat exchangers based on their geometrical specifications. However for the present analysis a TEMA BEM [1] and its modified type of SHTX has been used. The pressure drop plays an important role in the overall efficiency of a SHTX. The total tube-side pressure drop ΔPT for a single pass comprises the pressure drop in the straight tubes (ΔPTT), pressure drop in the tube entrances, exits and reversals (ΔPTE), and pressure drop in nozzles (ΔPTN) [2]. The uniform distribution of flow in tube bundle of shell and tube heat exchangers is an assumption in conventional heat exchanger design as claimed by Bejan and Kraus [3]. Traub [4] found that increased turbulence levels lead to an improvement in the heat transfer for tube banks and at the same time increasing the pressure drop. Achenbach [5] found that rough surfaces on the tubes of in-line arrangements in cross-flow have the potential to decrease the pressure drop while simultaneously improving heat transfer.

PHYSICAL MODELLING

Physical modeling involves the creation of the actual 3-D model of a SHTX. A large number of manufacturing firms were visited inorder to obtain the 2-D drawing of a SHTX. CANAAN Engineering works located at Kandivali, Mumbai, India was generous enough to provide a 2-D AutoCAD drawing of an actual SHTX to be manufactured and used at an industry in Hazira, Surat. The fluid to be circulated was chosen as water. The geometrical specifications and the fluid properties are as shown in table no – 1.

Table -1: Geometrical Specifications and Fluid Properties

Sr No	Geometrical Parts	Specifications
1	Inlet/Outlet Header	Elliptical Ends 2: 1
2	Shell or Header I.D	304.8 mm

3	No of Tubes	77
4	Tube O.D	19.05 mm
5	Tube Thickness	1.65 mm
6	Inlet and Outlet Nozzle I.D	66.64 mm
7	Nozzle Lengths	212 mm
8	Tube Pitch	25.4 mm
9	Tube Layout	Triangular (60^0)
10	Tube Length	1518 mm
11	Overall Length	2492.94 mm
12	Fluid circulated	Water
13	Fluid Density	998.2 kg/m^3
14	Fluid Viscosity	0.001003 kgm/s^2

Based on the above geometrical specifications and the 2-D drawing ICEM was used to create the 3-D drawing of the SHTX to be used for the analysis. The thickness of the surface was not taken into consideration as the analysis was restricted to the pressure analysis. Figure number 1 shows the tube bank geometry. Figure number 2 and 3 indicate the overall geometry of the SHTX with conventional nozzle position and the modified nozzle position respectively.

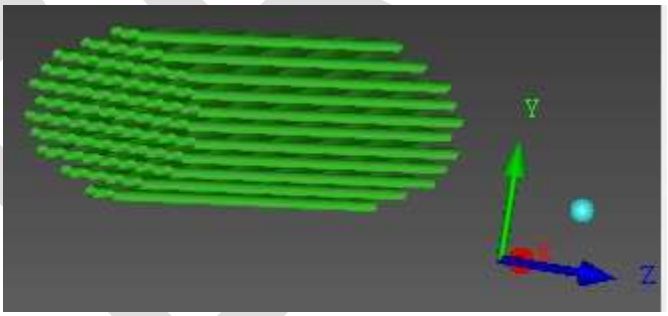

Fig -1: Tube Bank Geometry

The tube bank and the Inlet and Outlet header geometry remain same for both the conventional and inline nozzle position.

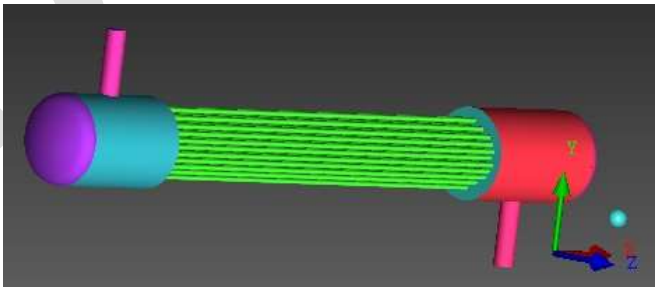

Fig -2: Full Geometry with Conventional Nozzle Position

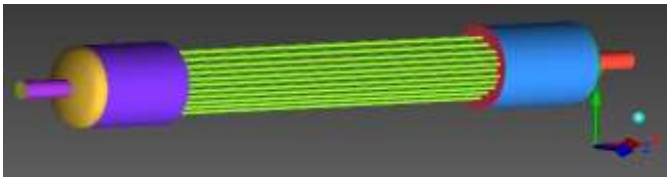

Fig -3: Full Geometry with Inline Nozzle Position

MESHING

Both geometries as shown in figure number 2 and 3 were meshed using ANSYS ICEM 14.5. Firstly the surface mesh was created by doing the global, surface and the curve mesh setup. The method specified in the setup was tetra mixed robust octree.

The surface mesh was further processed for prism mesh. Two layers were specified for prism mesh near curved surfaces inorder to capture the effects accurately for flow near boundaries. Fig 4 and 5 indicates the mesh of the two nozzle positions.

Fig -4: Mesh of Conventional Nozzle Position

Fig -5: Mesh of Inline Nozzle Position

The mesh was obtained with a very good quality with the minimum value of 0.25 in both the cases. However there were a very few nodes which had a slightly lesser quality than that indicted which was neglected as they were very small in number. The meshed file was then imported in ANSYS FLUENT for analysis.

SOLVER SETUP

The solver used for obtaining the numerical solution was ANSYS FLUENT. The governing equations used by the solver shall include the Continuity and the Navier Stokes Equation i.e. the Momentum Equations in three dimensions.

The boundary conditions used for the solver setup are as shown in table no – 2.

Table -2: Boundary Conditions

Sr No	Name of the Zone	Boundary Condition	Boundary Characteristics
1	Inlets	Velocity Inlet	3.31 (m/s)
2	Outlets	Pressure Outlets	0 Gauge Pressure
3	Inlet Wall		

4	Outlet Wall	Wall	No Slip, Surface Roughness 0.5, Stationary
5	Tubewalls		
6	Header Walls		

The solution method used was the "SIMPLE" Algorithm and the spatial discretization was based on Second Order Upwind Scheme. The turbulence model used was the standard k-ε model. The solution residuals were iterated for a precision upto 0.0001.

RESULTS AND ANALYSIS

a) Analytical Pressure Drop across the Tube Bank

The input velocity to the nozzle was chosen as 3.31 m/s. The tube side pressure drop comprises of the pressure drop due to friction losses inside the tubes (1) plus the pressure losses due to sudden expansion and contractions (2) which is accounted by four velocity heads per pass [6]. Therefore the total pressure drop for the tube side fluid flow is given by (3)

$$\Delta P_t = 4 * f * L * N_p * \rho * U^2_m / (2 * d_i) \quad (1)$$

$$\Delta P_r = 4 * Np * {}_\rho * U^2_m / 2 \quad (2)$$

$$\Delta P_{total} = (4 * f * L * N_p / d_i + 4 * N_{p)} \rho * U^2_m / 2 \quad (3)$$

Where

ΔP_t and ΔP_r are the pressure losses due to friction and sudden expansions and contraction respectively

L – Length of the tubes (1.518 m)

N_p - No of passes (One Pass)

d_i - Inner diameter of the tubes (0.01575 m)

U_m – Mean velocity of Fluid in the tubes

f – Friction factor, ρ – Density of the fluid (998.2 kg/m^3)

The friction factor f is given by Moody's chart for turbulent flow through uniform circular pipes [7] i.e. $f = 0.079Re^{-0.25}$ where Re is the Reynold no for the fluid.

As per the given conditions the pressure drop for a single pass tube side was found to be analytically = 2038 Pascal.

Another correlation for the tube side pressure drop was given by R. W Serth[2] who suggests that the total tube-side pressure drop ΔPT (4) for a single pass comprises the pressure drop in the straight tubes (ΔPTT) (5), pressure drop in the tube entrances, exits and reversals (ΔPTE) (6).

$$\Delta PT = (\Delta PTT) + (\Delta PTE) \quad (4)$$

Where

$$\Delta PTT = K_{PT1} * N_P * L * u_T^{(2 + m_f)} \quad (5)$$

$K_{PT1} = 2 * F_C ((\rho * d_1 / \mu) \wedge m_f) * \rho / d_1$

$F_C = 0.0791$, $m_f = -0.25$ for $Re \geq 3000$

$$\Delta PTE = K_{PT2} * u^2_T \quad (6)$$

$K_{PT2} = 4 * \alpha_R * \rho$

$\alpha_R = 2 N_p - 1.5$

u_T - mean velocity of the fluid through the tubes which is the same as that obtained above

It was observed that using the above correlation also the pressure drop was found to be 2038 Pascal.

b) Numerical Pressure Drop across the Tube Bank

The meshed files were imported and after doing so the Solver setup mentioned earlier, they were iterated for 1000 iterations. The solutions converged in less than 300 iteration. The origin for the geometries was at the tip of the Elliptical wall at the inlet header. The distance between the origin and the start of the tube bundle is 392 mm. Inorder to find the numerical pressure drop a number of Z-Coordinates i.e. vertical sections in the X – Y plane passing through the vertical tube arrays i.e. and passing through the center of the tubes were created. The central Z-Coordinate was named as Z-0.

Moving along the positive Z axis along the tube bank array in X-Y plane each vertical tube array is separated from each other by half the pitch i.e. 25.4/2 = 12.7 mm. At each and every such vertical tube array in X-Y plane a Z-Coordinate was created.

Therefore a total of 19 such Z- Coordinates were created for both the converged files inorder to capture the 77 tubes of which 9 were along the positive Z – axis and 9 along the negative plus the center one which can be visualized from the tube bank array shown in fig 1.

Also an X coordinate at a distance of 5 mm away from the tube start was created. Thus a combination of the various Z Coordinates and the single X Coordinate the pressure at the inlet of each and every tube was found out for both the geometries. A gap of 4 mm was left between the tube start and the X Coordinate inorder to capture the pressure changes due to entrance effect of fluid inside the tube from the header.

The fig 6 and fig 7 shows the Z – 0 coordinate of contours of total pressure variation for both the nozzle position. The X-Coordinates for the two cases are shown by fig 8 and 9. However a combination of both Z and X Coordinate used to find the tube inlet pressure for inline nozzle arrangement is shown in figure 10.

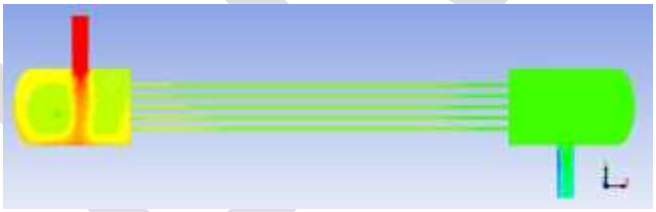

Fig -6: Z-0 Coordinate of Conventional Nozzle Position

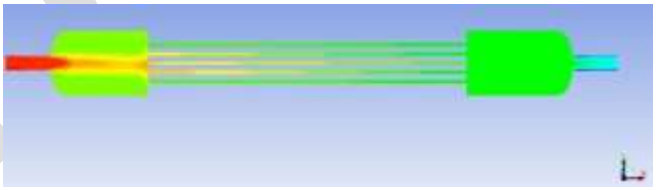

Fig-7: Z-0Coordinate of Inline Nozzle Position

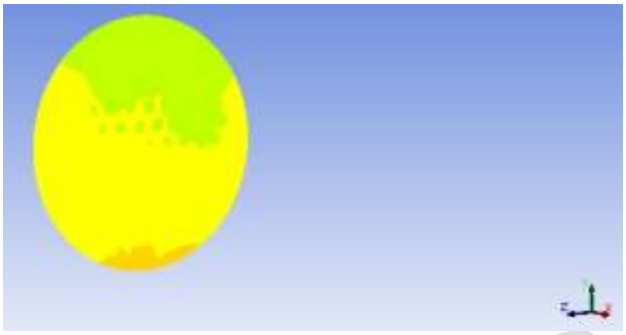

Fig – 8: X-Coordinate for Conventional Nozzle Position

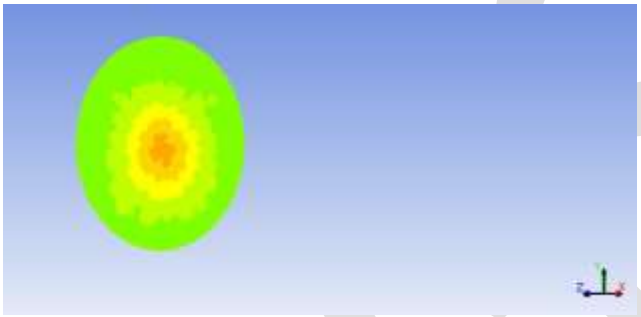

Fig -9: X-Coordinate for Inline Nozzle Position

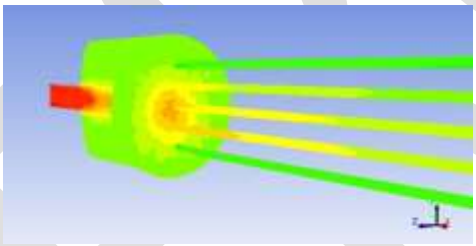

Fig -10: Z-X Coordinates for Inline Nozzle Position

c) Grid Independence Test

Before running the simulation an optimized mesh needs to be found out in terms of the accuracy of the results and the lesser number of nodes inorder to reduce the computation cost.

The conventional geometrical model was meshed for three different dimension inorder to obtain a coarse, medium and a fine mesh. The numbers of cells thus obtained are mentioned in the table no – 3.

Table -3: Name of the Table

Sr No	Mesh Type	No of Cells	Average Pressure Drop
1	Coarse Mesh	1986668	1918
2	Medium mesh	2519375	1943
3	Fine Mesh	3709885	1912

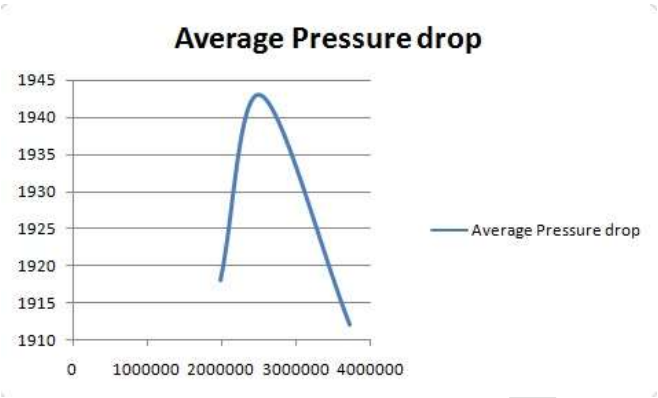

Fig -11: Grid Independence Test for Conventional Nozzle Position

The fig no - 11 indicates that the average pressure drop first increases reaches optimum and then starts decreasing as the fineness goes on increasing. Thus the optimum mesh used for further simulations was the medium mesh for the conventional and the same mesh size parameters were used for the inline nozzle position. The mesh gave a maximum accuracy with a -4.6 % deviation from the theoretical results for the conventional nozzle position. The medium mesh chosen also helps to reduce the computation cost compared to that of the fine mesh. However for the inline nozzle position there were 2540756 cells or 492881 nodes with the medium mesh.

d) Inferences

For the Conventional Nozzle Position:

- A two set of pressure values were obtained at the inlet of the tubes.
- The tubes with green color at the start of the tubes in the fig no 6 indicates a pressure value of 10506 Pa while the yellow color indicates 11285 Pa.
- All the 77 tubes were observed at the inlet side with the help of Z and X Coordinates to get the inlet pressures of the respective tubes.
- 38 tubes were having a pressure inlet of 11285 Pa while 39 tubes were having a pressure inlet of 10506 Pa.
- It can be observed from fig no 6 as that at the outlet all the tubes had a uniform pressure i.e. there is not much variation.
- The outlet pressure was observed as 8947Pa.
- Therefore the average pressure drop can be calculated as [(39 * 10506 + 38 * 11285) – 77* 8947] / 77.
- From the above calculation the average pressure drop was found to be 1943.5 Pa while the theoretical average pressure drop is 2038 Pa.
- The difference between the theoretical and the numerical analysis is less than 10% which is within the acceptable range, hence the results are validated.

For the Inline Nozzle Position:

- A five set of pressure values were observed across the 77 tubes as seen from fig no 9 in the form of rings.
- The pressure values obtained are 13536 Pa (1 Tube) at the centermost region indicated by brown color, the region surrounding it i.e. the light brown has a value 12823 Pa (9 Tubes). Then we have 12111 Pa (12 Tubes) indicated by yellow color. The yellowish green region has a value of 11399 Pa (33 Tubes) and the outermost light green color has a value of 10687 Pa (22 Tubes).
- It can be observed from fig no 6 as that at the outlet all the tubes had a uniform pressure i.e. there is not much variation.

- The outlet pressure was observed as 9262 Pa.
- Therefore the average pressure drop can be calculated as [(1*13536 + 9*12823 + 12*12111 + 33*11399 + 22*10687) – 77*9262] / 77.
- From the above calculation the average pressure drop was found to be 2238 Pa while the theoretical average pressure drop is 2038 Pa for the conventional position.
- Therefore a difference of +10.2 % was observed between the two.

e) Parametric Study

The simulations were run for different input velocities of 2m/s, 5m/s and 7 m/s at the inlet nozzle and a relationship between the theoretical and numerical pressure drops were observed. Table no – 4 indicate the parametric study.

Table -4: Parametric Study

Input Velocities	2 m/s	3.31m/s	5m/s	7m/s
ΔP_{theor} (Pa)	787.4	2038	4467	8468
ΔP_{num} (Conventional)	720	1943	4431	8421
ΔP_{num} (Inline)	818	2238	4981	9263
% Deviation Conventional	-8.5	-4.3	0.0	0.0
% Deviation Inline	4.05	10.2	12.42	10

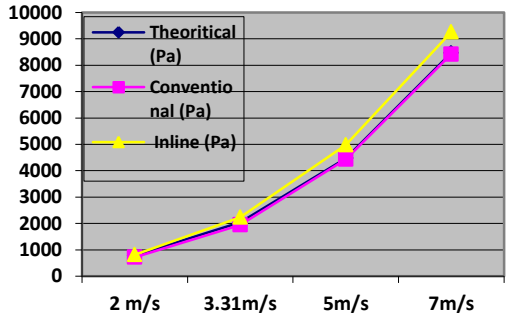

Chart -1: Parametric Study

- Chart 1 is a graph indicating the parametric study of pressure drop against different velocities for the theoretical, Conventional and Inline position.
- The dark blue colored curve is the theoretical, pink is for the Conventional Nozzle pressure drop whereas the yellow colored is for the Inline Nozzle pressure drop.
- The theoretical and the Conventional Nozzle Position pressure drop are well in conversant with each other whereas the Inline Nozzle pressure drop is higher than them for all the situations.
- The maximum deviation of Inline Nozzle position was at 5 m/s with percentage deviation of +12.42 %.

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I hereby thank Prof Kunal Bhavsar for his consistent guidance and motivation for achieving this task.

I also thank my family for their support especially my daughter Shagun Ajugia who has always been a source of inspiration.

CONCLUSION

- Two set of pressure values were obtained 10506 Pa and 11285 Pa were observed on the inlet side of the tube bank for the Conventional Nozzle position whereas five set of pressure values (13536, 12823, 12111, 10687, 11399) Pa were observed at an inlet velocity of 3.31 m/s.
- The % deviation of the pressure drop was on the negative side for the Conventional Nozzle position whereas it was on the positive side for the Inline Nozzle as shown in table no -4.

Since the pressure drop is more for the Inline Nozzle it is better to use a Conventional Nozzle position, which in turn reduces the pumping cost for the fluid on the tube side.

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Analysis of parameters for casting ductile iron pipe-A Review

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Abstract— Foundry industries in developing countries suffer from poor quality and productivity due to involvement of number of process parameter. Ductile iron pipes are casted centrifugally by using centrifugal casting machine. Various defects generated during the casting process of ductile iron pipes. Defects like thickness variations, pin holes, metal laps, thick/thin socket, over weight etc. are produced during the casting process of ductile iron pipe. These defects can be minimized by appropriate changing in parameters. Parameters that lead to the desired quality and yield, is important but difficult to achieve. In this study, the parameters like temperature and flow-rate of molten metal during the casting process are analyzed for minimization of defects and microstructure study of ductile iron pipes. In this study, at different flow-rates, variations in thickness of ductile iron pipe studied. Also the defects are observed at the same flow-rates. This paper also studied that at different temperature the microstructure of the pipe varied which greatly affect on the ductility and hence quality of the pipe. An attempt has been made to optimize the parameters for manufacturing a better quality pipe and for minimizing the casting defects.

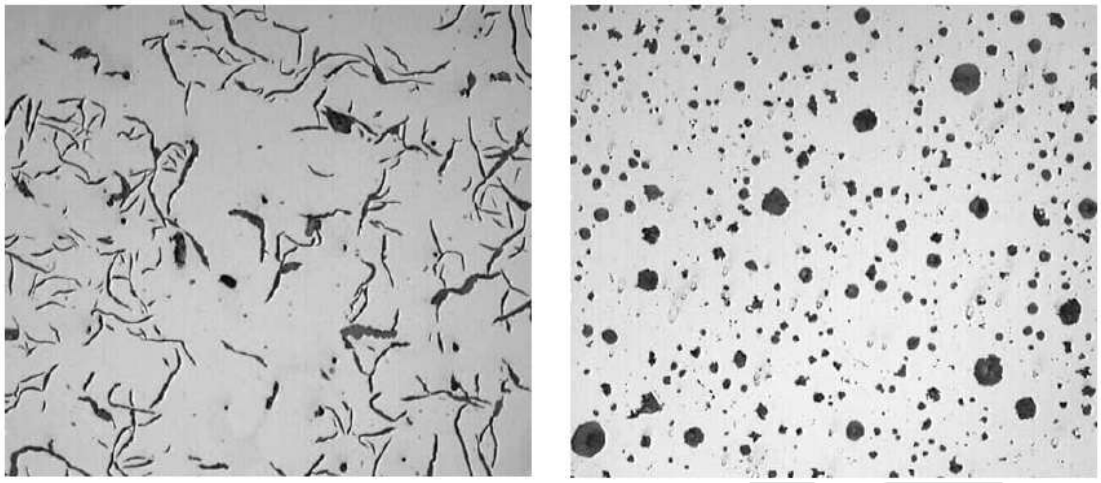
Keywords— Ductile iron pipe, Centrifugal casting, Analysis of Parameters, optimization of parameters like temperature and flow-rate of molten metal, minimization of Defects, Microstructure study, Quality of pipe

Introduction

Metal casting is a 5000 years young manufacturing process in which molten metal is poured in a mould and removed after solidification. These castings are all around us right from Simple rings to complex engine cylinders and are employed in industries varying from Aerospace, medical devices, automobiles, sanitary, electrical machineries, pipes home appliances etc. Indian casting industry with an annual production of 7.5 MT is the 2nd largest casting producers in the world after China.

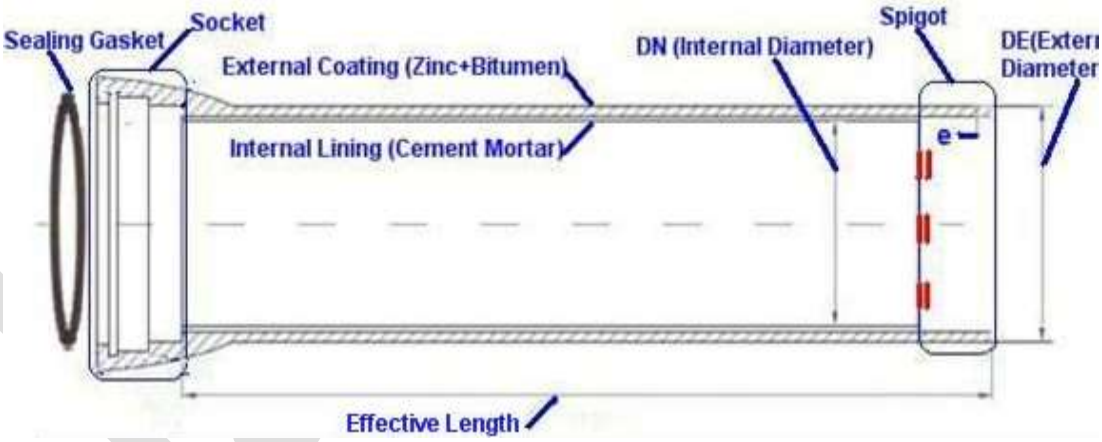
1.1 Steps in metal casting [1]

Casting can produce variety of products, which account for various metal processes which are Combination of complex geometry and varying weight. Almost all the metals or alloys which can be easily melted under controlled conditions are Castble. Water has always been a precious commodity, and its transmission has facilitated the advancement civilization enabled the comforts of our modern living standard. Around 150 years ago the supply of water was done by cast iron pipes. Cast iron pipes have been used for transport drinking water as well as industrial water. Since middle of the 19th century as the result of increasing industrialization and considerable growth in population with constant improvements in standard of living, the consumption of water has been steadily rising. With the necessity of conveying larger volumes of water to the consumer, operating pressure in supply line increases. Ductile Iron also referred to as **"Nodular Iron"** or Spheroid graphite iron was patented in 1948.After a decade of intensive development work in the 1950's, ductile iron had a Phenomenal increase in the use as an engineering material during the 1960's, and the rapid Increase in commercial application continues today. The word ductile comes from the Latin "ducere" which means pliable and that means malleable. In static calculations, pipes in ductile iron are therefore considered as having piable properties or being flexible pipes. An unusual combination of properties is obtained in ductile iron because the graphite occurs as spheroids rather than as graphite flakes as in grey iron.



1.2 Comparison of microstructure of gray cast iron pipes and ductile iron pipes

Ductile iron pipes are made of ductile iron commonly used for water transmission and distribution. Ductile iron pipes are the direct development of cast iron pipes which were used in earlier years for water transmission. The Ductile iron used to manufacture the ductile iron pipe is characterized by spheroidal or nodular nature of graphite within it. Chemically Ductile iron pipe is same as gray cast iron pipe but the main difference between both of them is in gray cast iron pipe the graphite is present in the form of graphite flakes while in ductile iron pipe the graphite is present in the form of nodules which give it the tensile strength 350 N/mm^2 to 1500 N/mm^2 rather than 150 N/mm^2 to 400 N/mm^2 of the gray cast iron pipe with good elongation and High Toughness. Also the cast iron or gray cast iron pipes are brittle because of the lack of Ductility. [2]



1.3 Cross section of ductile iron pipe [3]

Ductile iron pipe with its elements is shown in Figure 1.3. There are mainly three sections of ductile iron pipe:

1. Socket

Socket is the one of the end of ductile iron pipe. It is generally known as the front portion of the pipe. It is thicker portion of the pipe which is casted by providing sand-core. Core is made of silica. The core is arranged at the front portion of the centrifugal casting

machine and the socket is casted during the centrifugal casting. Sand Core is made as per the dimensions requirement of the socket. Generally the time for solidification of socket is more compare to other sections of pipe.

2. Barrel

It is the main body-section of the ductile iron pipe. It is comparatively thin section compare to socket and spigot. During casting process solidification of this section occur speedily. It the long section and covers majority of the portion of the ductile iron pipe. The thickness of the as well as the diameter of the pipe is described by this section of the pipe.

3. Spigot

Spigot is the second end of ductile iron pipe which is casted lastly during the casting process. It is the smaller section of the pipe which solidifies lastly during the centrifugal casting process. During the installation process of ductile iron pipe network for application each Spigot is jointed with socket section.

Ductile iron foundries usually melt their iron in cupola or blast furnace from recycled material pig iron. Coke, oil or natural gas is the fuel used here for melting the iron ore which is the solid raw material for casting process. Crystallisation of the carbon dissolved in liquid iron in the form of graphite nodules is achieved by the addition of magnesium into the molten metal. These days ductile iron pipes are manufactured exclusively by means of centrifugal casting process, where the centrifugal forces produce the pipe wall. The rapid cooling applied in ductile iron pipe production by the means of heat treatment of pipes is necessary in order to give them a ductile microstructure. Also the lining and protective coating is the part of production process. Throughout the entire production process there is defined control system of controls and tests to guarantee the specified properties of the product. [3]

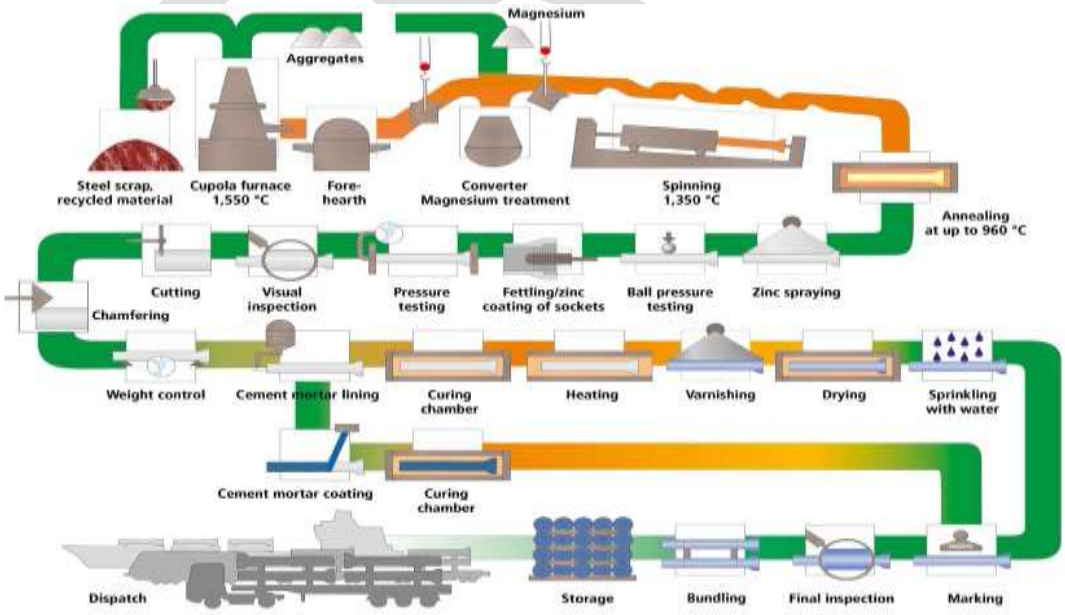


Figure 1.4: Process of manufacturing the ductile iron pipes [3]

TABLE 1.1: THICKNESS AND WEIGHT CHART OF DUCTILE IRON PIPE:[4]

DN(mm)	Thickness(mm)	DE(mm)	Weights of pipes in kg.		
			4.0	**5.0**	**6.0**
80	5.0	98	44.612	54.915	65.218
100	5.0	118	54.375	66.894	79.413
125	5.0	14	67.297	82.696	98.095
150	5.0	170	80.219	98.498	116.778
200	5.0	222	106.462	130.503	154.543
250	5.3	274	140.417	171.971	203.525
300	5.6	326	177.621	217.376	257.131
350	6.0	378	221.519	270.974	320.428
400	6.3	429	265.319	324.323	383.328
450	6.6	480	312.915	382.143	451.372
500	7.0	532	368.510	449.938	531.365
600	7.7	635	487.395	594.418	701.442
700	9.0	738	660.592	805.965	951.338
750	9.7	789	760.762	928.252	1095.743
800	10.4	842	869.117	1060.764	1252.375
900	11.2	945	1056.827	1288.559	1520.291
1000	12.0	1048	1263.130	1538.588	1814.046

Advantages of ductile iron pipes

1. High tensile strength, good elastic module and excellent ductility, making it suitable for high stress applications and where pressure surge may be experienced.
2. High corrosion resistance.
3. Excellent hydraulic flow.
4. High working pressure compared to other types of pipes.
5. Ease to installation.
6. Long lifetime.
7. Accommodate ground movement

Applications

1. Drinking and irrigation water networks.

2. Sewerage networks.

3. Fire fighting systems.

Defects analysis in ductile iron pipes

Foundry industries in developing countries suffer from poor quality and productivity due to involvement of number of process parameters in casting process. Even in a completely controlled process, defects in casting are observed and hence casting process is also known as process of uncertainty which challenges explanation about the cause of casting defects. Various defects which can generate during the process of centrifugal casting of ductile iron pipes are:

1. Thickness variation

This defect occurs due to the change in flow-rate; mould RPM of centrifugal casing machine and machine down time. Flow-rate is one of the major reasons of thickness variation as mould RPM and machine down time are set constant. Thickness of the wall in ductile iron pipe, especially in bigger diameter sizes, is very important property during the installation process. Also the uneven cement lining distribution could be occurring due to this defect. This defect reduces the proposed life of ductile iron pipe.

2. **Blowhole/pinhole**

It is a kind of cavities defect, which is also divided into pinhole and surface blowhole. Pinhole is very tiny hole which can generate during the solidification of metal inside the mould. Gases entrapped by solidifying metal on the surface of the casting, which results in a rounded or oval blowhole as cavity.

3. **Metal laps**

It is the defect in which metal laps are seen on the outer surface of the ductile iron pipe. Laps are the major reason of failure of ductile iron pipes as that portion of the pipe is observed as weak portion. Metal laps are caused during the solidification of molten metal, mostly due to the lower temperature of the liquid metal before the casting process.

4. Crack marks

It is the defect which is also seen on the surface of the ductile iron pipe after the casting process. Crack marks are shown on the outer surface of the pipe. The cause of this defect is also the lower temperature of molten metal before the casting or the improper metal composition.

5. Metal Fin

Metal fin is shown after the casting process at the socket or spigot sections of the pipe.fin is the thin metal portion which is shown at the upper side of the socket or spigot after the casting process of the pipe.

6. Sponge socket

During the casting process sometimes for easy and smooth flow of liquid metal from the runner to the mould, graphite coating is applied on the runner surface. This graphite coating is done completely manually. So the quantity of graphite should not be remains same at all time due to human errors. Sometimes due to more amount of graphite coating more quantity of graphite flows with liquid metal and sticks inside the socket portion of the pipe which cannot be removed easily. It is called the sponge socket defect.

7. Thick socket

Sometimes due to the change of speed of travelling of the centrifugal casting machine in longitudinal direction or due to change of flow rate of metal due to excess tilting of hopper, excess liquid metal at the socket side gathers than required which causes thick socket. This is also the defect which occurs during the casting process as explained.

8. Thin socket

As discussed earlier in the thick socket, in thin socket less metal gathers at socket side due to low tilting of hopper, change of speed of machine or down the machine manually before required socket filling of metal.

9. Thin barrel

In thin barrel, the main body of the pipe casted with less thickness than minimum required. It is due to the low metal quantity of metal inside the hopper or by changing the automatic down time of the casting machine.

These are the main defects which can be seen in ductile iron pipe. Among these most of the defects generated during the casting process. All these defects can be encountered by optimizing various parameters. But still it is difficult to overcome all the defects at the same time and make the defects-free pipe with better quality. In this study, two parameters, temperature and flow-rate of molten metal are considered as these are the parameters which greatly affect on most of these defects during the casting process.

LITERATURE REVIEW

Ductile iron pipes have been produced since 1951 and from that year many successive studies have been done by different researchers.

Effect of Heat treatment procedures on microstructure and Mechanical Properties of Nodular iron was studied. In this paper heat treatment affection on nodular iron was studied which shows the pearl tic, ferrite, and cemented percent of nodular iron after the heat treatment procedure. [5] Study about the defects, their causes and remedies in casting process showed the root causes of casting defects which helped to quality department of different industries for finding roots and remedies of different defects. Different research papers were studied and casting defects, causes and their remedies were listed. [6] Variation in tensile properties and fracture properties for ductile cast iron by experiments and numerical analysis was studied. By fractrographic analysis it was possible to establish a relation between elongation at fracture and size of slag defects. Relative contribution to the loss of ductility, size of slag defects, perlitic contents, nodularity and changing graphite were demonstrated by deterministic models. [7] Solidification rate greatly affect on the microstructure, quality and mechanical property. The rotational speed effect the solidification of liquid metal during the centrifugal casting process. It was found that setting 800 RPM. Of die in centrifugal casting machine the metal poured was directly lifted and rapid solidification took place and finer grain size can be achieved compare to 400 and 600 RPM of the die which improved the microstructure of casting. This helped to achieve the best quality pipe. [8] The design of easy locking and un-locking arrangement by using electromagnet lock plate to avoid the excess metal fly-out was found. The productivity also increased by using the electromagnetic plate which minimizes dwell time. [9] Investigation about the effect of electromagnetic force on the centrifugal force in centrifugal casting was done. It was found that under 0.15T electromagnetic field intensity both absolute pressure of metal flow to mould wall and metal flow velocity on same location had some differences between electromagnetic centrifugal casting and centrifugal casting. [10]

Enhancement of wear resistance on the surface of ductile cast iron by using satellite 6 Alloy was investigated. The result showed that microstructure of surface alloyed layer consisted of carbide dispersed in co-based solid solution matrix with dendrites structure. This microstructure was responsible for improvement of hardness and wear resistance coating. [11] Also the discussion about the effect of mould wall thickness on the rate of solidification of centrifugal casting was investigated. Result of this paper was as mould thickness increases, due to chilling effect solidification time decreased. Rapid solidification showed well distributed fine grains and slow solidification showed coarse grains. [12] Development in production and technology of ductile cast iron was studied in china. Also the processes parameters and properties were evaluated for better quality. Due to great development and technology, better quality pipes were produced. [13] Discussion about modes and causes of gray cast iron pipes failures was investigated. Various failure causes were found. Also the causes of remedies were predicted as per the failure modes. Also it was observed that failure was always unexpected and produces emergencies which were mostly shown in medium and large diameter pipes. [14]

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KARAN BHUVNESHBHAI THACKER

CONCLUSION

1. It is concluded from above study that by optimizing the parameters like flow-rate and temperature of molten metal during the centrifugal casting process of ductile iron pipe, various defects can be minimized.

2. The effect of temperature on the microstructure of the pipe during the casting process is also studied to increase the ductility of the pipe and for producing a better quality pipe.

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Experimental study on the effect of welding speed and tool pin profiles on AA2014-T6 friction stir welded butt joints

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Abstract— Friction stir welding (FSW) is an origin for solid state joining process. The function of FSW process are used in several industries such as aerospace, rail, automotive and marine industries for joining aluminium, magnesium and copper alloy. Porosity, solidification, liquification and cracking do not see in FSW. Friction stir tool is that the necessary tools of friction stir welding process. The welding parameters (rotational speed, welding speed, axial force and tilt angle) and tool pin profile plays a vital responsibility in deciding the weld quality. In this research work primarily examine the effect of different welding speed and tool pin profiles on the weld quality of AA2014.Taper cylindrical threaded pin and tri-fluted taper cylindrical threaded pin are used as tool pin profiles in this research. By using these tools appearance of the weld is well and no obvious defect is initiated. Mechanical properties of AA2014-T6 welded plates will be computed at the weld center of all joints. The good weldment were obtained with tri-fluted taper cylindrical threaded pin at the tool rotational speed of 900rpm and tool welding speed of 40mm/min.

Keywords— Friction stir welding, AA2014 Al alloy, tool pin profiles, tri-fluted taper cylindrical threaded pin, tool rotational speed, tool welding speed and mechanical properties.

INTRODUCTION

Aluminium and its alloys are having been used in engineering applications. The manifestations of aluminium are low density, good mechanical properties, good surface finish and relative fine corrosion resistance. AA2014 is most widely used in the air craft structure, truck body, heavy duty forgings, extrusions for aircraft fittings, wheels, major structural components, space booster tankage, truck frame and suspension components. This application needs high strength and hardness as well as good elevated temperature properties. By alloying copper, magnesium and silicon etc the mechanical properties can be improved. In fusion welding process, it is very difficult to join 2XXX and 7XXX series aluminum alloys because of solidification microstructure is very pitiable and porosity in the fusion zone (weld zone) [1].To prevent these conventional welding problems. Wayne Thomas was invented Friction Stir Welding in 1991 at The Welding Institute (TWI) in UK. FSW is solid state joining technology and it improves better mechanical properties: fewer weld defects, low residual stresses and superior dimensional stability [2]. In this FSW process, the contact of a non-consumable tool circumvolve and traversing along the joint line creates a welded joint through viscoplastic deformation and resulting heat dissipation temperatures below the melting temperature of the materials being together [3].

Sound welds are fabricated by rotation tool having high resistance than the base metal. In this process consists of a high hardness tool is designed like that; it has non consumable and a specifically designed pin profile having circular shoulder. The friction is produced between the work piece and tool shoulder and the material gets often without attaining the melting point [4].

In this exploration, an effort has been made to understand the effect of tool pin profiles and different welding speed on the weld quality of AA2014 aluminium using FSW process. In this research, taper cylindrical threaded pin and tri-fluted taper cylindrical threaded pin are used as tool pin profiles. The pin traveled longitudinally at different welding speed (mm/min) and the tool rotation speed was seized constant at 900 rpm in all of the experiments [2]. Consequently, the effect of different welding speed and pin profiles on yield strength and elongation are analyzed. The manifestation of the weld for different welding speed has been examined and the impact of the stress as a function of strain.

FRICTION STIR WELDING

FSW is a solid state joining of weld metals and ultimate goal of the process are to generate thermal energy by frictional contact of FSW non consumable tool and welding pieces, which will soften weld pieces and stir it with solid metal into weld. Due to the relative motion of third-body region, around the immersed portion of the tool produces frictional heat that creates a plasticize material. The major frictional heat is generated due to the contact of shouldered region of the tool with the work pieces and also preventing plasticized material from being expelled. The tool is stirred (relatively) along the joint line, forcing the plasticized material to coalesce behind the tool to form a solid-phase joint [5].

Table -1: Chemical composition of AA2014-T6 (in wt. %)

Element	%
Si	0.5-12
Mn	0.4-1.2
Cu	3.9-5
Fe	0.7
Mg	0.2-0.8
Cr	0.1
Zn	0.25
Ti	0.5
Al	Balance

Principle of Operation of FSW

The process involves the dipping of a pin with a cylindrical shouldered tool rotating at a constant, with a desired configuration, into the adjoining surfaces of a joint to be welded. The welding plates have to be duly clamped tightly on a backing bar to avert the abutting joint faces from being forced apart. The length of the pin is slightly less than the required weld depth. The heat generated between the contacting surfaces of the tool, in addition to the heat generated by the mechanical amalgamation process and the adiabatic heat within the material, cause the stirred materials to soften and swiftly raises the temperature of the material being joined to its plasticizing temperature.

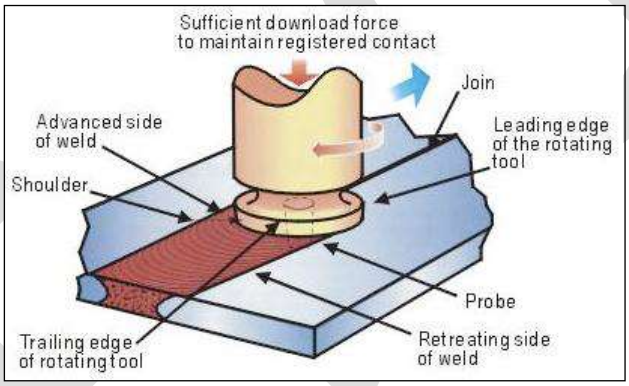

Fig 1: Schematic drawing of FSW process

The material undergoes extreme plastic deformation at elevated temperature during FSW process, resulting in production of equiaxed and fine recrystallized grains. The representation view of the operation is shown in Fig 1.Friction stir welding can be viewed as an autogenous keyhole joining method. The consolidated welds do not show fusion welding defects and solid-phase in nature. FSW is considered to be the most important development in metal joining in a decade and is a ‘‘green’’ technology due to its energy efficiency, environment friendliness, and flexibility [4]. As compared to the conventional welding methods, FSW consumes significantly less energy.

EXPERIMENTAL WORK

Aluminum alloy 2014-T6 was used as a base metal to fabricate the weld. The chemical and mechanical properties of AA 2014-T6 are shown in Table 1 and Table 2 respectively. Two aluminum plates, having the dimensions are 4 mm in thickness, 210 mm length and 60 mm in width, were placed on a flat metal plate as shown Fig.2.Before starting the FSW process, these two aluminum plates were cleaned by using ethanol to eradicate the oxides created on the surface of the plates.

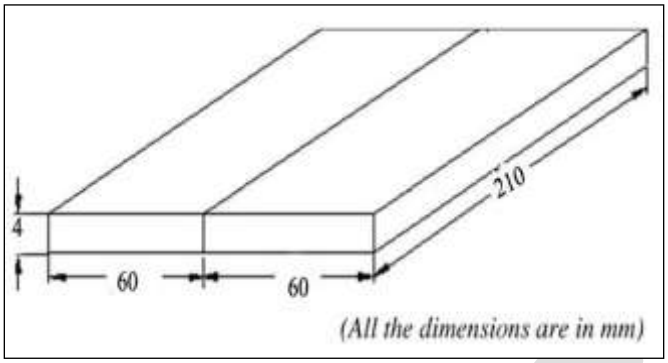

Fig. 2 Schematic diagram of aluminum alloy plates

Fig 3: Fabricated FSW tools

Fig 4: Fixture to hold work material

In this research two variant geometries of tool pin profiles (Taper cylindrical threaded pin and tri-fluted taper cylindrical threaded pin) and welding speed were used to fabricate the joints (Fig. 3). The H13 tool was made of standard tool steel and both the shoulder and the pin. The H13 tool process parameters used in this study are given in Table 3. The shoulder of the tool was the same with the diameter of 24 mm. The length of the pin was 3.8 mm as the required welding depth of the plates. The welding process was carried out rotating the tool at 900 rpm and at a feed rate of 40 mm/min and 50mm/min, with a 2^0 tilt angle. The butt weld was produced on FSW machine (Bharat Fritz Werner Ltd). The geometrical design of tool and the FSW process parameters are shown in Table 3.

Fig 5: FSW tools after welding

After welding, the specimens were slashed along the cross-sections of the traverse direction for doing mechanical tests (tensile, impact, micro hardness).

Table-3: FSW process parameters and tool dimensions

Process Parameters	Values
Tool rotation speed (rpm)	900
Welding speed (mm/min)	40, 50
Axial force (KN)	5
Pin length (mm)	3.8
Shoulder diameter(mm)	24
Pin diameter(mm)	8
Tool pin geometry	Taper cylindrical threaded pin & tri-fluted taper cylindrical threaded pin
Tool material	H13 tool steel
Triflute angle	120^0

RESULTS AND DISCUSSION

Effect of the pin geometry on the appearance of the weld

Fig 6 shows photos of appearance the weld surface made by different friction stir tools. It can be observe from the pictures that good surface appearance will be obtained by using No.1 and No.2 friction stir tools. Different pin geometries of friction stir tools are shown in Table 4. The appearance of the weld was clean and no apparent defects can be found. The superiority of the weld is defined by the material flow around the weld zone and it was deformed by the tool shoulder.

Table-4: Different pin geometry of two friction stir tools

No	Description of the pin	Big diameter of the pin	Small diameter of the pin	Pitch
1	Taper cylindrical threaded pin	8mm	6mm	0.5mm
2	Tri fluted taper cylindrical threaded pin	8mm	6mm	0.5mm

(a) (b)

(c) (d)

Fig 6: Appearance of the weld **(a)** welded by tool **1** (at welding speed 40mm/min) **(b)** welded by tool **2** (at welding speed 40mm/min) **(c)** welded by tool **1** (at welding speed 50mm/min) **(d)** welded by tool **2** (at welding speed 50mm/min)

Effect of the pin geometry and welding speed on the tensile properties

The obtained results are plotted as graphs and they are showed from Figure 10 to 16. The effect of FSW process parameters such as welding speed, tool profiles on tensile strength of friction stir welded AA2014-T6 aluminium alloy joints can be efficiently used to understand by the plotted graphs.

The transverse tensile properties such as yield strength, ultimate tensile strength, and percentage of elongation, of friction stir welded AA2014 alloy joints were evaluated with rotational speed of 900 rpm, and welding speed 40 and 50 mm/min by using different tool pin profiles. The change in the tool geometry had an imposing effect on strength and ductility. The tensile properties are summarized at the room temperature are show in the Table 5.

Table-5: Mechanical properties of AA2014 Friction stir weldments

Mechanical properties	**Tools**			
	1	2	1	2
Yield strength (N/mm^2)	382.35	381.20	184.97	110.91
Welding speed (mm/min)	40	40	50	50
UTS (N/mm^2)	398.43	415.90	210.26	182.02
% of elongation	4.3	3.72	3.4	2.6
Impact strength (Joule)	6	5	5	4
Hardness (BHN)	130	132	123	126

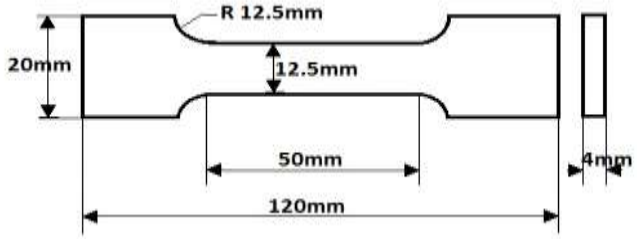

Fig 7: Tensile test specimen standard dimension

Fig 8: specimens before tensile testing

The Fig 7 shows the specimen dimensions for tensile test. Tensile strength was observed at the fusion zone of AA2014-T6 weldments at 900 rpm with a welding speed of 40 and 50 mm/min with different tool pin profiles. Fig 8 shows samples of tensile specimens before tensile testing. By changing profile of the tool there is a significant difference in the heat input through friction and material deformation and Tool no 2 exhibited better mechanical properties than other pin profiles. By using tri fluted taper cylindrical threaded pin profiled tool with the welding speed of 40mm/min and rotational speed 900rpm, obtained superior tensile properties at the FSW region of the joint due to combined effect of tool pin profile and sufficient heat. Fig 9 shows the samples of tensile specimens after

tensile testing.

Fig 9: specimens after tensile testing

At each condition specimens are tested and average of the results of specimens is presented as the outcome of this research work. Figures 10 and 11 show the engineering stress-strain relationship of the welded products for taper screw thread and tri-flute taper screw threaded pin profiles respectively.

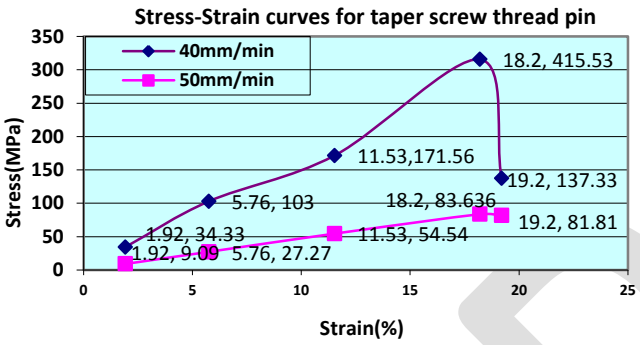

Fig 10: Stress Strain Curves for taper screw threaded pin

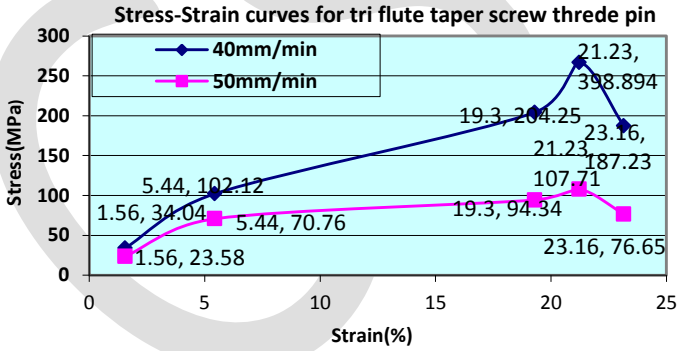

Fig 11: Stress Strain Curves for tri fluted taper cylindrical threaded pin

Figures 12 and 13 show the discrepancy of engineering stress and engineering strain for taper screw thread and tri-fluted taper cylindrical threaded pin profiles at 40 and 50mm/min respectively.

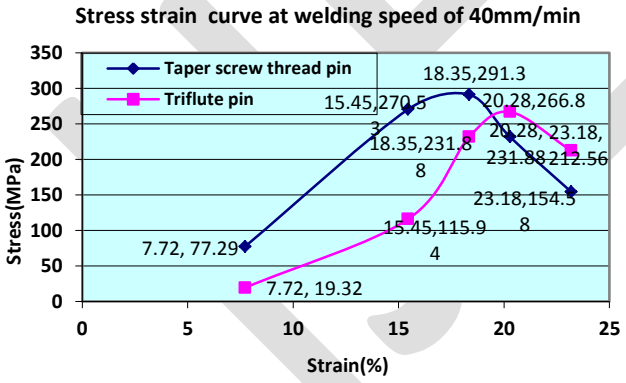

Fig 12: Stress Strain Curve at welding speed of 40mm/min

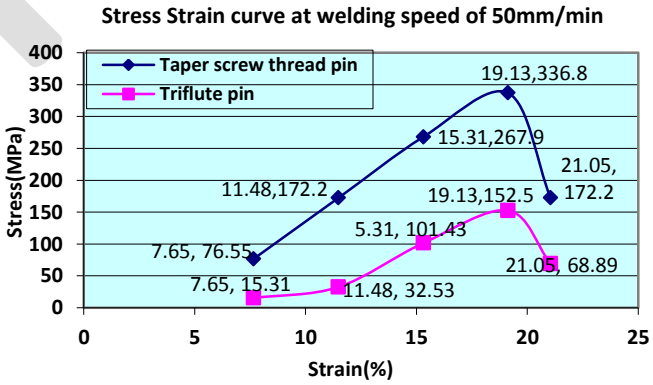

Fig 13: Stress Strain Curve at welding speed of 50mm/min

Figure 14 demonstrates the effect of tool pin profiles and welding speed on ultimate tensile strength of FSW joint. As experimental, the taper screw thread joints fabricated at the welding speed of 40mm/min have shown superior tensile strength (ultimate and yield strength) compared to the joints fabricated at a speed of 50mm/min. At a welding speed of 40mm/min joints are fabricated and it shows superior tensile strength for this pin profile. Similarly, this consequence can be seen for tri-flute joints. The tri-flute joints fabricated at the welding speed of 50mm/min have demonstrated less tensile strength in assessment with other welding speed 40mm/min.

Figure 15 shows the variation of % elongation with welding speed for these two joints. The percentage of elongation for taper screw thread pin shoots up as a result of increasing in the welding speed from 4.3% at 40mm/min to approximately 3.72% at 50mm/min. Similarly, for tri-flute pin profile the percentage of elongation decreases at welding speed of 50mm/min.

At the welding speed 40mm/min joints fabricated by tri-fluted taper cylindrical threaded pin exhibited more hardness comparison with other welding speed 50mm/min. Figure 16 presents the variation of hardness with welding speed for these two joints. Similarly, for taper cylindrical thread pin profile the hardness decreases at welding speed of 50mm/min.

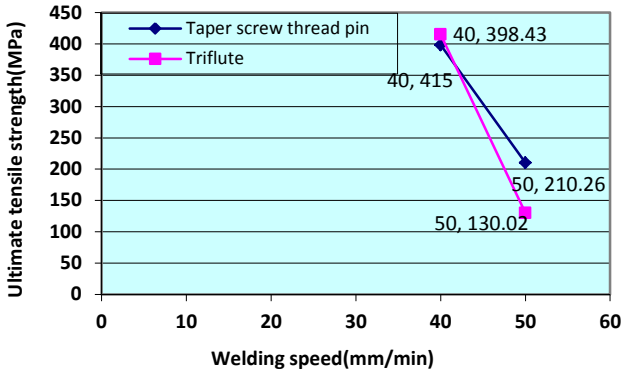

Fig 14: Effect of tool pin profile and welding speed on UTS

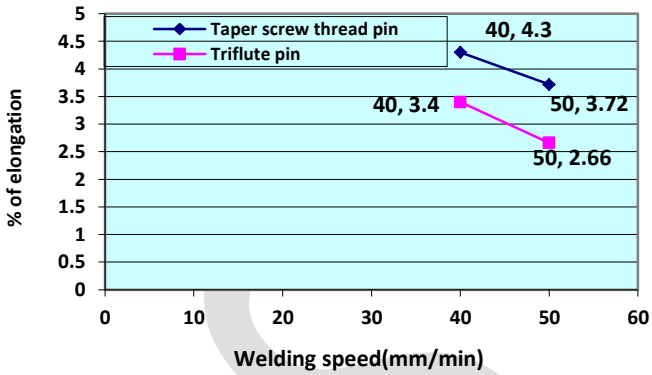

Fig 15: Effect of tool pin profile and welding speed on % of elongation

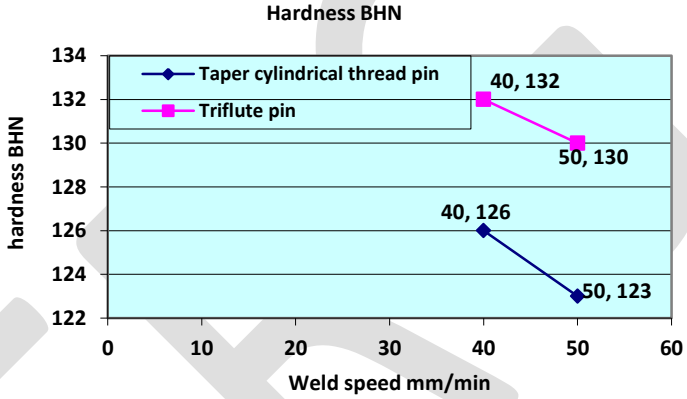

Fig 16: Effect of tool pin profile and welding speed on hardness

For improving the hardness of stir zone, there are two main causes; In general hardness mainly depends on the impulsive distribution rather than grain size. It is likely that low hardness in the stir zone can be attributed to dissolution of the precipitate during FS welding. Stir zone temperature ranges from450^{0}C to 480^{0}C. In AA2014-T6 aluminium alloy, these temperatures are adequate to dissolve all precipitates and cooling rate after welding is sufficiently rapid to retain alloying elements in saturated solid solution.

ACKNOWLEDGMENT

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CONCLUSION

In this research, FSW process was done on AA 2014-T6 alloy. To study the influence of the pin geometry on the weld shape and mechanical properties on AA2014, two different friction stir pin profiles were designed. Also, the effects of various welding speeds are investigated in this exploration. From this research, the following conclusions are derived:

- The consequence of tool pin profile and process parameters plays a vital role on the emergence of the weld is presented and no obvious defect was found. The results designate that the shape of the pin has a major effect on the joint structure and the mechanical properties.
- Four joints are fabricated in this exploration; the tri fluted taper cylindrical threaded pin profile and taper cylindrical threaded tool are used to fabricate the joints with welding speed of 40mm/min showed superior tensile properties in comparison with welding speed of 50mm/min.
- The taper cylindrical threaded pin ultimate tensile strength goes up to the 82.4% of the base metal ultimate tensile strength.

- The ultimate tensile strength of tri-fluted taper cylindrical threaded pin reaches to the 85.9% of the base metal ultimate strength.

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A Comparative Analysis of Various Actuation Performance

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Abstract--In this paper the three thermal actuated technique i.e. Simple fixed fixed beam resonator, Squeezed Film Damping, Tuned Pizeoelectric Actuator are related using COMSOL Tool .In fixed beam resonator,we will study the concept of TED which is an important issue in the development of actuators.In Squeezed film damping , when two similar-shaped surfaces are close to each other and moving closer, and there is a gas or a liquid between them, that gas or liquid has to flow out. Associated with that flow is viscosity, which means that some of the kinetic energy of the moving surfaces gets dissipated. That is basically the definition of damping; it's called "squeeze film" because in this case the damping effect is associated with the "squeezing" of the fluid layer . Tunable Piezoelectric actuator , in which change in frequency by causes displacement in amplitude .

Keywords: MEMS, NEMS, PZT, TED, Poly Si, Damping. Eigen mode

I INTRODUCTION

MEMS is Micro-Electro-Mechanical System Technology[1] is a process technology in which mechanical and electro-mechanical devices and structures are constructed using special Micro-fabrication Techniques. The three major operations in MEMS are:

- Sensing: measuring a mechanical input by converting it to an electrical signal e.g. A MEMS Accelerometer or A Pressure Sensor.
- Actuation: using an electrical signal to cause the displacement (or rotation) of a mechanical structure.
- Power Generation: generates power from a mechanical input.

II SIMPLE FIXED FIXED BEAM RESONATOR

The resonator is a beam of silicon with length 400 μm, height 12 μm, and width 20 μm as shown in Fig.1. The beam is fixed at both ends, and it vibrates in a flexural mode in the *z* direction (that is, along the smallest dimension). The model assumes that the vibration takes place in vacuum. Thus there is no transfer of heat from the free boundaries. The model also assumes that he contact boundaries are thermally insulated.

A high Q value is a key factor of a MEMS resonator. It it essential that the resonator vibrates consistently at the desired frequency and that it requires as little energy as possible to maintain its vibration. These features can be characterized by the resonator's Q value, which is a measure of the sharpness of its spectrum's peak. There are several ways to define the Q value, for example: where $W0$ is the total stored vibrational energy, ΔW is the energy lost per cycle, $\omega 0$ is the natural angular frequency, δ is the damping factor (vibration decays exponentially with δt), and $\Delta\omega$ is the half power width of the spectrum

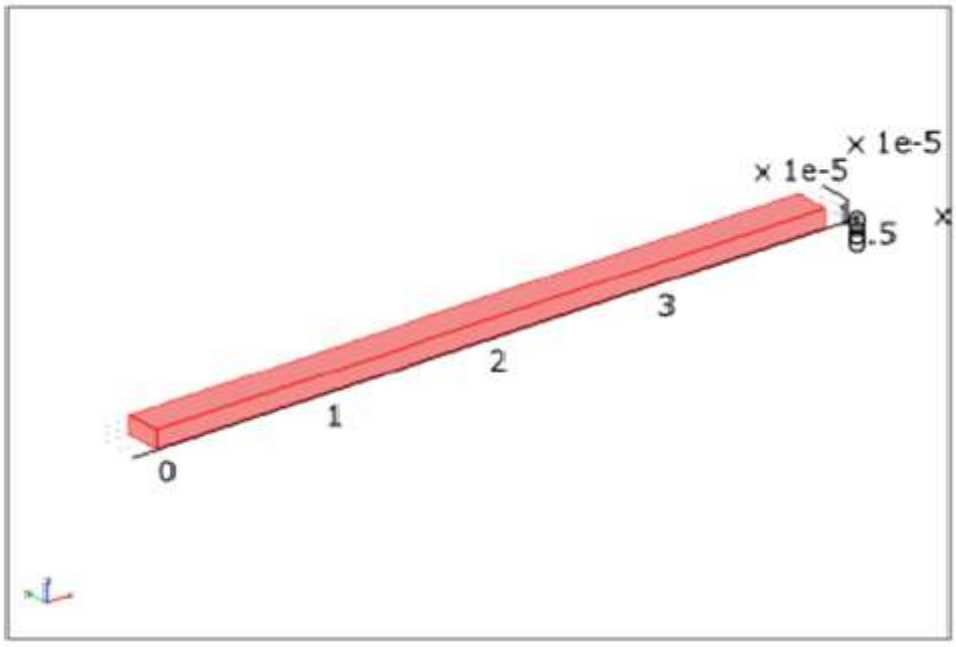

Figure 1: Geometry of a simple fixed-fixed type beam resonator.

In order to improve the resonator, the designer needs to consider all aspect that produce damping and noise to the system. For example, resonators are usually run in vacuum to minimize effects of air and squeeze-film damping. For simple structures, researchers have developed analytical expressions to estimate thermoelastic damping. According to Zener [6] and [7], you can calculate the Q value for a resonator with a single thermal mode by:

$$\frac{1}{Q} = \left(\frac{E\alpha^2 T_0}{\rho C_p}\right)\left(\frac{\omega\tau}{1+(\omega\tau)^2}\right)$$

where E is the Young's modulus, α is the thermal expansion coefficient, $T0$ is the resonator temperature at rest, ρ is the density, Cp is the heat capacity of the material, ω is the vibration angular frequency, and τ is the thermal relaxation time of the system. Thus it is easy to see that in order to have good Q value, the system needs to be designed so that ω is as far from $1/\tau$ as possible.
The natural frequency of a beam clamped at both ends can be calculated as [2]

$$\omega_0 = a_0^2 \frac{h}{L^2}\sqrt{\frac{E}{12\rho}}$$

where $a0$ equals 4.730; h and L are the thickness and length of the beam, respectively; and E and ρ are material parameters.
The thermal relaxation time of the beam is given by

$$\omega_0 = a_0^2 \frac{h}{L^2}\sqrt{\frac{E}{12\rho}}$$

where κ is the thermal conductivity and other parameters are as above.

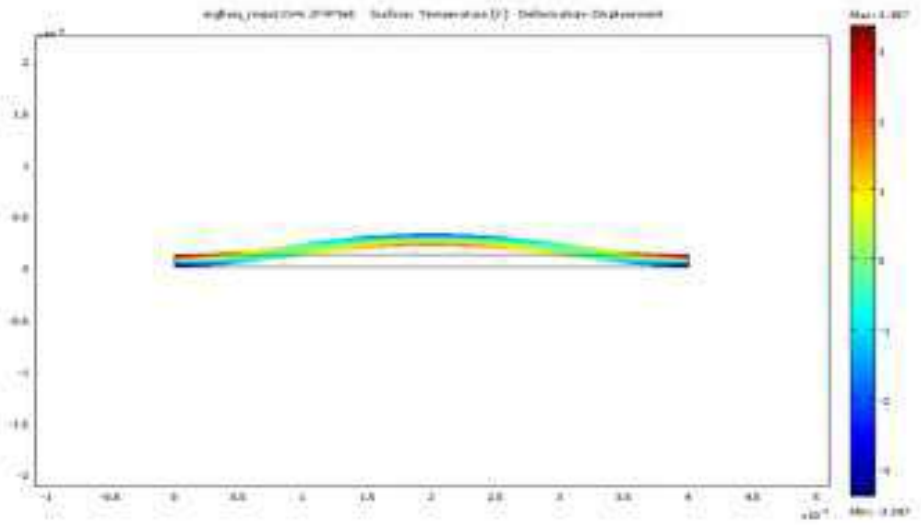

Figure 2 : First eigen mode and temperature distribution of the Poly Si.

To gain information about the quality of the resonator, it is of interest to know its natural frequency and Q value. To do this, run an eigen frequency analysis to find the eigen values for this system. For a system with damping, the eigenvalue λ contains information about the natural frequency and Q value [3]. Fig.2 shows the variation of TED factor with eigen frequency. From the analysis it is clear that at some particular frequency internal friction (TED factor) is maximum and this corresponds to the maximum dissipation of the resonator[8].

III Sqeezed Film Damping

Squeezed-film gas damping is a critical aspect of many MEMS transducers and actuators.In accelerometers, inertia produces a motion that the device detects. A typical structure connects a large proof mass, with dimensions typically in millimeters, to surrounding structures with elastic beams.

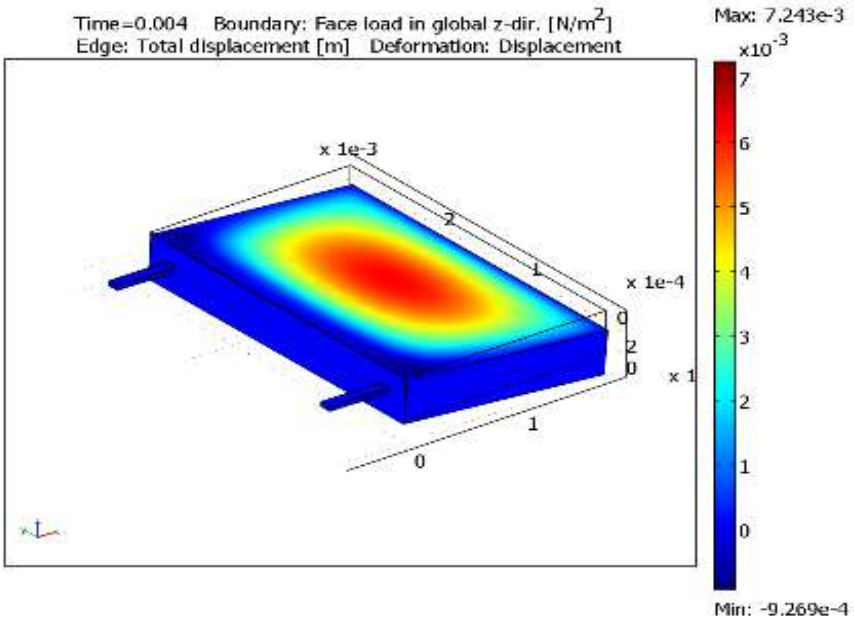

Figure 3：A load on the face of proof mass in z direction leads to deformation

This combination forms a mechanical oscillator with a specific resonance frequency. However, in accurate motion-detection applications these resonances are unwanted, and the device damps the movements to produce smooth time-step and frequency responses. Such a device can usually achieve suitable damping with a low gas pressure (100 Pa–1000 Pa) which, considering the dimensions of the device, lead to rarefied gas effect in the system [4].

A narrow gap formed by two solid horizontal plates restricts the displacement of the gas perpendicular to the surfaces. When the sensor squeezes the gap, the gas flows out from its edges. The narrow pathway restricts the flow, which causes gas pressure to increase, which decelerates the plates' movement. This model solves the squeezed-film air damping on the lower and upper surfaces using the Film Damping application mode. The model constrains the film pressure, pF, to 0 at the edges of the boundary.

The model consists of two thin silicon cantilever beams and a silicon proof mass. The cantilever beams are fixed to the surrounding structures at one end. The proof mass reacts to inertial forces and bends the cantilevers. The external acceleration, a, acts in the z direction and causes a body volume force Fz = ρsolida [5].

In this model the the pressure distribution on the surface of the proof mass after 4 ms of simulation. The ambient pressure, pA, in this case is 300 Pa, and the acceleration switches on at the beginning of the simulation. The acceleration's magnitude is half that due to gravity, g. In this figure, the maximum displacement at the tip of the proof mass is roughly 0.4 μm, or 0.1% of its thickness.

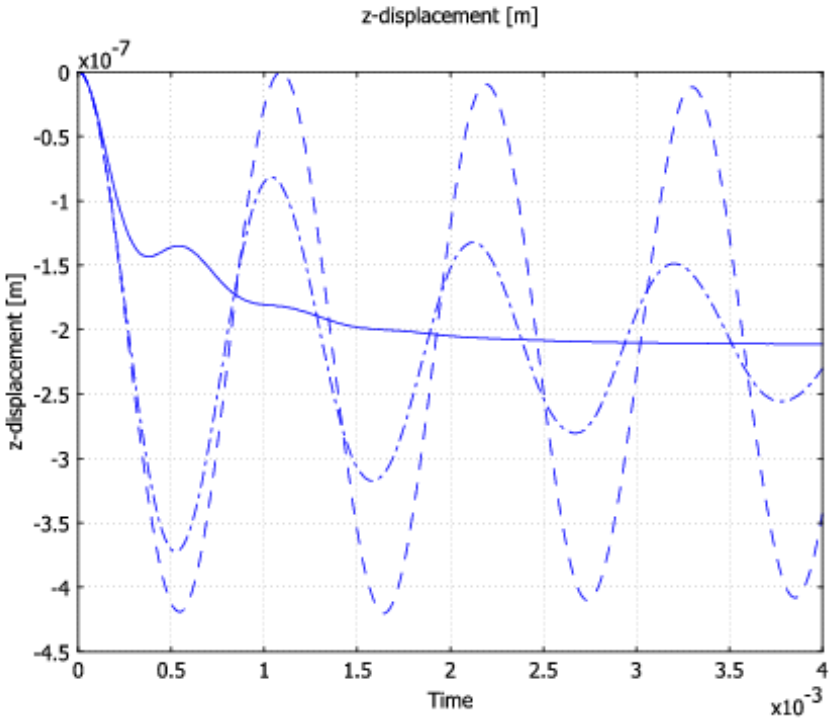

Figure 4 : Plot of Displacement the proof mass tip at ambient pressure of 3 Pa(dashed line),30 Pa (dashed-dotted line),and 300Pa(solid line).

The figure4 shows the total displacement of the proof mass tip as a function of time for ambient pressures of 3 Pa, 30 Pa, and 300 Pa. As ambient pressure increases, the film damping at the upper and lower surfaces increases through the increase in the gas' effective viscosity and density. This increased damping results in a substantial decrease in oscillation with increasing pressure. At 300 Pa, there is no apparent oscillations, and the proof mass seems asymptotically to reach the value of 0.2 μm in total displacement.

IV Tunable Piezoelectric Actuator

A piezoelectric device can actuate a cantilever beam simply by applying an AC voltage over the device. The cantilever beam itself has resonant modes that causes peaks in the vibration when the frequency of the applied voltage passes the resonance frequency of each mode. If another piezoelectric device is attached to the cantilever, it is possible to tune the resonance by connecting that device to a passive external circuit. This model investigates how the external circuit influence the resonance peaks of the cantilever beam[7].

The actuator consists of a thin bar of silicon with an active piezoelectric device below the bar, and a second passive piezoelectric device on top. These devices are located at one end of the actuator .The piezoelectric material is lead zirconate titanate (PZT), and each of the devices has two electrical connections to an external circuit, realized with the Floating potential boundary condition of the Piezo Plane Strain application mode.

Figure 5: A piezoelectric actuator with an active piezoelectric device below and a passive piezoelectric device above the silicon bar.

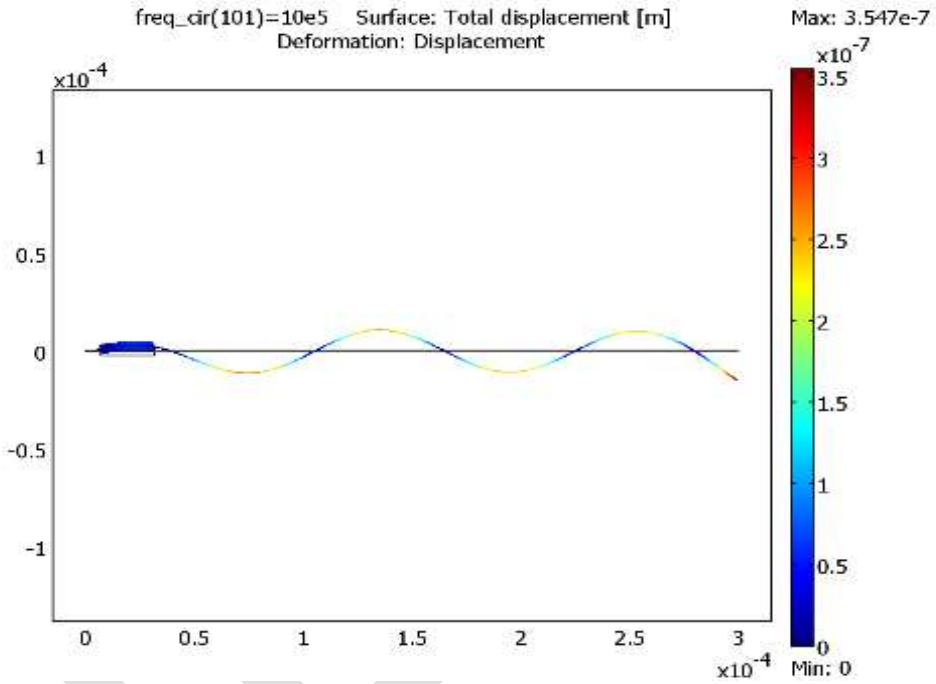

Figure 6 : First eigenmode and temperature distribution of the 3D model.

The analysis of the actuator is performed through a frequency sweep that goes from 200 kHz up to 1 MHz while logging the displacement amplitude in the y-direction. As shown , the vibration shows several resonance peaks in this range. The external inductance for this sweep was 50 mH.

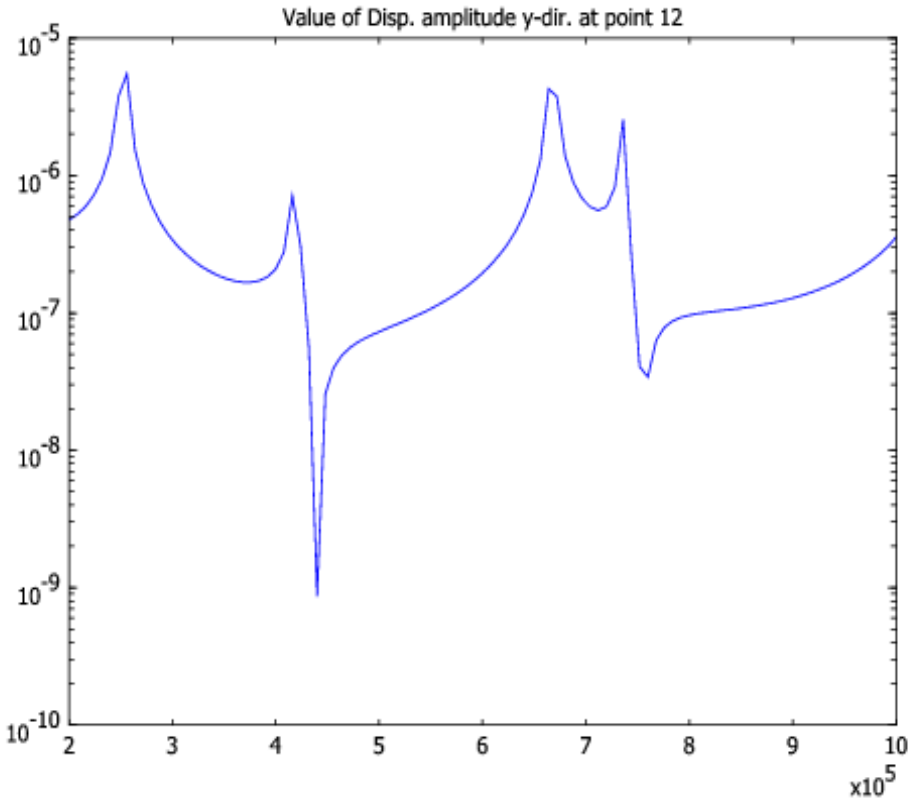

Figure 7: First eigenmode and temperature distribution of the 2D model

It is not obvious from the plot how the external circuit affects the vibration. Therefore a second sweep is performed using a higher inductance value of 60 mH. By inspecting figure it is clear that the peak around 660 kHz is affected by the change in inductance. The inductance causes a sharp spike in the spectrum that moves toward lower frequencies when the inductance increases

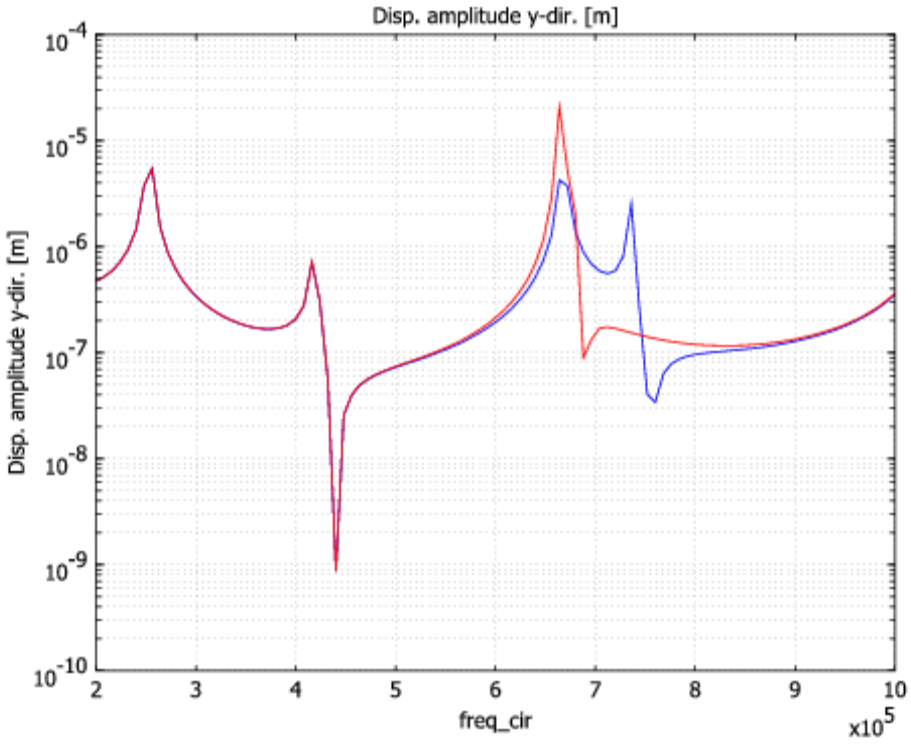

Figure 8：A comparison between the amplitude versus frequency for two inductance values in the external circuit, 50mH (blue curve) and 60 mH (red curve).

V CONCLUSION

Here we concluded that all the three devices i.e. Simple fixed fixed resonator, Sqeezed film damping, Thunable Piezoelectric actuator shows various changes when Temperature, pressure& frequency changes respectively. In simple fixed fixed resonator,as vibration increases displacement increases. In sqeezed film damping when the pressure of gas increases then it causes proof mass reacts to inertial forces and bends the cantileverist. In tunable piezoelectric actuator , peaks occur in the vibration when the frequency of the applied voltage passes the resonance frequency of each mode and varies the displacement in amplitude in y-direction.Also, we can changes displacement in amplitude by varying the inductuance value .

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Probabilistic Assessment on Flexural Strength of Steel Fiber Reinforced Concrete Members

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Abstract- This paper presents the reliability analysis of conventional reinforced concrete members and steel fiber reinforced concrete members subjected to flexural loading. First order Second Moment (FOSM) method is used to determine the reliability index. Monte Carlo simulation has been used to generate random samples of the variables in the present reliability analysis. C++ Computer programme has been written to obtain the Moment carrying capacity of a reinforced concrete beam of cross-sectional dimensions $250mm \times 500mm$ having 1% percentage of longitudinal reinforcement with 0.75% as the volume fraction of steel fibers. The cross sectional dimensions of the beam, compressive strength of the concrete, tensile strength of concrete are taken as variable parameters while keeping the other variables constant. The results revealed that there is an increase in cracking moment of approximately 17.5% after addition of steel fibres (volume fraction = 0.75 %) to the reinforced concrete beam and there is an increase of approximately 72% in the reliability index value, which suggests that steel fibre reinforced concrete beams are safer than reinforced concrete beams.

Key words: fibre reinforced concrete, reliability index, steel fibres.

1. Introduction

The evaluation of the safety of structures is a very importance task. It is one of the major concerns of engineers from a long time. The safety of a structure depends on the resistance, R of the structure and the action, S (load or load effect) on the structure. The action is a function of loads (live load, wind load etc.), which are random variables. Similarly, the resistance or response of the structure depends on the physical properties of materials, and the geometric properties of the structure which are also subjected to statistical variations, and are probabilistic in nature. Theory of probability provides a rational framework for accounting the uncertainties in loads and resistances. The uncertainty or incomplete information about the failure process is a result of complexity, imprecise measurements of the relevant physical constants and variables, and the indeterminate nature of certain future events.

The theory of structural reliability is widely used in many fields such as ship and offshore structures, architectural design, civil engineering, aerospace and mechanical engineering. In structural engineering, because of requiring long–term security commitments subject to various loads, the analysis of the reliability is particularly important. For a long time, the concept of reliability has been used to evaluate the quality of engineering structures. In the present study, the aim is to study the variations (randomness) of characteristic compressive strength, the breadth & depth of the beam, the load acting on the beam on the moment carrying capacity of reinforced concrete and fibrous reinforced concrete beam.

2. Literature review

Dmitri et al., (1997) reported that frames with longer external spans are less reliable in terms of progressive collapse resistance. The coefficient of variation of the structural resistance is approximately equal to or slightly less than that of the primary random variable, which is the steel strength in the case of the plastic failure mode and the concrete compressive strength in the case of the

brittle one. Sofia et al., (1997) concluded that the amount of confining steel has negligible effect on the column reliability with respect to the ultimate strength, whereas the concrete compressive strength, the slenderness ratio, and the amount of longitudinal steel have a significant effect on the column reliability. The reliability of an HSC column is generally lower than that of the corresponding NSC column. Nataraja et al., (1999) reported that the addition of crimped steel fibers to concrete increased the toughness considerably and the increase in toughness was directly proportional to the reinforcing index. Monti and Santini (2002) proposed a possible methodology for the calibration of partial safety factors for the design of strengthening measures of reinforced concrete members using fibre-reinforced plastic (FRP). A first-order reliability method based optimization procedure was used to seek the solution of such a problem so that the target reliability is attained with the optimal FRP quantity. Wang et al., (2010) concluded that the resistance factor applied to the reinforced concrete remains unchanged, a separate resistance factor should be applied to the nominal strength of the CFRP plate to achieve the reliability index of approximately 3.0 (that is standard for reinforced concrete and steel beams designed for flexure).

3. Objective and Scope

The strength of reinforced concrete beam may vary due to variations in the material strengths of concrete and steel reinforcement, the cross sectional dimensions of concrete and steel, percentage of steel and cover to reinforcement. The effects of basic variables concrete strength, cross-sectional dimensions and loads are identified as significant.

The present investigation is aimed at predicting the reliability index of the reinforced concrete beam with varying compressive strength of concrete, cross-sectional dimensions and loads and to determine the reliability index for fibre reinforced concrete member under flexure and to compare it with that of reinforced concrete member under flexure. In the present study, FOSM has been used to evaluate Reliability Index (β). It is assumed that loads on the structure, the cross-sectional dimensions, compressive strength of concrete, cover to the beam follow normal distribution. The variation in the span of the beam and in the reinforcement provided is ignored. Statistical data of the variable parameters is presented in Table.1.

4. Methodology

4.1 Sampling Technique

The reliability indices of a system can be calculated using two basic approaches, direct analytical techniques or stochastic simulation. The difference between the analytical and simulation approaches is the way in which the reliability indices are evaluated. Analytical techniques represent the system by a mathematical model, which is often simplified, and evaluate the reliability indices from this model using direct mathematical solutions.

Simulation techniques, on the other hand, estimate the reliability indices by simulating the actual process and random behaviour of the system. The method therefore treats the problem as a series of real experiments conducted in simulated time. It estimates probability and other indices by counting the number of times an event occurs. Monte Carlo simulation has been used to generate random samples of the variables in the present reliability analysis of the R.C beams

4.2 Reliability Study of RC Beams

4.2.1 Assumptions

In the reliability analysis and design of structures, it is important to first study the distribution pattern of the components such as loads and resistance. The strength of a structural member will vary from the calculated value or nominal strength due to variations in material strengths and in the dimensions of the members, as well as variables inherent in the equations used to calculate the strengths of the members. The compressive strength of concrete, breadth of the beam, width, Depth and cover of the beam along with the loads acting on the beam are all considered to be normally distributed.

4.2.2 Design of Beam

The beam was designed as per IS 456:2000 code provisions. The beam was checked for safety in deflection and crack width.

4.2.2.1 Control of Cracking

Cracking is a very complex phenomenon. The practical objective of calculating crack width is merely to give guidance to the designer in making appropriate structural arrangements and in avoiding gross errors in design, which might result in concentration and excessive width of flexural crack. The formula can be used provided that the strain in the tension reinforcement does not exceed $0.8\,\sigma_y/E_s$.

Design surface crack width, W_{cr}

$$W_{cr} = \frac{3a_{cr}\varepsilon_m}{1+\frac{2(a_{cr}-C_{min})}{h-x}}$$

Where, a_{cr} = distance from the point considered to the surface of the nearest longitudinal bar

C_{min} = Minimum cover to the longitudinal bar,

ε_m = Average steel strain at the level where cracking is being considered,

$$\varepsilon_m = \varepsilon_1 - \frac{b(h-x)(a-x)}{3E_sA_s(d-x)}$$

h = overall depth of the member, and

x = depth of neutral axis.

A_s = Area of tension reinforcement,

b = width of the section at centroid of the tension steel,

ε_1 = Strain at the level considered, calculated ignoring the stiffening of the concrete in the tension zone,

a = distance from the compression face to the point at which crack width is being calculated,

d = effective depth.

Crack width has been calculated at three points:

(a) Directly under a bar on tension face of concrete

(b) At a point on the tension face midway between the two bars

(c) At the bottom corner.

In general, the surface crack width should not exceed 0.3 mm. For very aggressive environment, the assessed surface width of cracks at points nearest to the main reinforcement should not exceed 0.004 times the nominal cover to the main reinforcement.

4.2.2.2 Control of Deflection

The permissible deflection is governed by the amount that can be tolerated by the interacting components of the structure. It is essential to consider both the short-term and long-term deflections. The deflection of a structure or part thereof shall not adversely affect the appearance or efficiency of the structure or finishes or partitions. The deflection shall generally be limited to the following:

(a) The final deflection due to all loads including the effects of temperature, creep and shrinkage and measured from the as-cast level of the, supports of floors, roofs and all other horizontal members, should not normally exceed span/250.

(b) The deflection including the effects of temperature, creep and shrinkage occurring after erection of partitions and the application of finishes should not normally exceed span/350 or 20 mm whichever is less.

4.3 Reliability Study of SFRC Beam

4.3.1 Assumptions

There are few assumptions which have been made in the design of steel fiber reinforced concrete beam. The aspect ratio of fiber has been assumed as 90. The volume fraction of steel fibers has been assumed as 0.75%.

The equivalent modulus of elasticity, E_{eq} is estimated using the formula used by Teng (2004)

$$E_{eq} = E_f V_f + (1 - V_f) E_m$$

Where, V_f = volume fraction of the fiber,

E_f = Modulus of Elasticity of the fiber used,

E_m = Modulus of Elasticity of the matrix (Concrete)

The residual tensile strength of fiber reinforced concrete has been calculated by the formula suggested by Naaman (2003) which is

$$f_r = \lambda_1 * \lambda_2 * \lambda_3 * \tau * F$$

Where f_r = residual tensile strength of fibrous concrete

λ_1 = Expected pullout length ratio = 0.25

λ_2 = Efficiency factor of orientation in the cracked state = 1.2

λ_3 = Group reduction factor associated with the number of fibers pulling out per unit area = 1

τ = average bond stress of a single fiber embedded in the concrete.

The above values of λ_1, λ_2 and λ_3 are applicable upto an aspect ratio of 100.

The compressive strength of steel fiber reinforced concrete has been found obtained by the formula suggested by Nataraja et al., (1999) which is

$$f_{c\prime} = f_c + (6.913 * F)$$

Where $f_{c\prime}$ = compressive strength of fiber reinforced concrete,

f_c = Compressive strength of plain concrete,

F = Fiber factor = $V_f * aspect\ ratio.$

This formula for calculating compressive strength of fiber reinforced concrete is valid for concrete strength upto 50MPa. The beam was designed considering the above assumptions and it was checked deflection and cracking criteria

5. Results and Discussion

A C++ Computer programme has been written to obtain the Moment carrying capacity of a reinforced concrete beam of cross-sectional dimensions $250mm \times 500mm$ for 1% of longitudinal reinforcement. For steel fibre reinforced concrete the volume fraction of steel fibers with 0.75% and an aspect ratio of 90 are used. The cross sectional dimensions of the beam were given as inputs to study the variation in the moment carrying capacity of the beam keeping the other variables constant.

The mean and standard deviation of the different parameters considered in this are presented in table. 1. The limiting moment has been obtained from the equation, $M_{lim} = 0.138 * f_{ck} * b * d^2$, considering f_{ck}, b, d as random variable and the result obtained for RC beam and SFRC beam respectively are presented in figure 1 a, b. The maximum bending moment carrying of the beam has been obtained by the equation, $M_u = 1.5 * 0.125 * w * L^2$, considering load acting on the beam, w as random variable. The variation in the cracking moment observed for RC beam and SFRC beam respectively is presented in figure 2 a, b.

Comparison of Frequency Distribution for Bending Moment (Action) and Limiting Moment (Resistance) of the Beam for RC beam and SFRC beam respectively is presented in figure 3 a, b. It is to be noted that the shaded portion in the plot represent the failure region.

Comparison of Results

From the analytical study of RC and SFRC beams the reliability index is calculated using the resistance and action of the beams. The comparison of the same is presented in the table 2.

6. Conclusions

The investigation tries to compare the reliability (safety) index – β for a normal reinforced concrete beam with that of steel fiber reinforced concrete beam. The following conclusions have been drawn based on the observations and the results of the study.

The cracking moment for reinforced concrete beam in obtained as 32.5kN.m whereas the same for a steel-fiber reinforced concrete beam is 38.1 kN.m. Thus, there is an increase in cracking moment of approximately 17.5% with addition of steel fibers (volume fraction = 0.75 %) to the reinforced concrete beam. The increase in cracking moment is due to the fibers distributed in the matrix which absorb a large amount of energy for crack formation as well as crack propagation. This aspect of steel fibers in concrete increases the serviceability of the structure.

The reliability index has been calculated by First Order Second Moment method and it is found to be 1.0578 for reinforced concrete beam whereas the same for a steel-fiber reinforced concrete beam is 1.75162. Hence, there is an increase of approximately 72% in the reliability index value, which suggests that steel fiber reinforced concrete beams are safer than reinforced concrete beams or for the same reliability the steel fiber reinforced concrete beam can be designed with economical dimensions.

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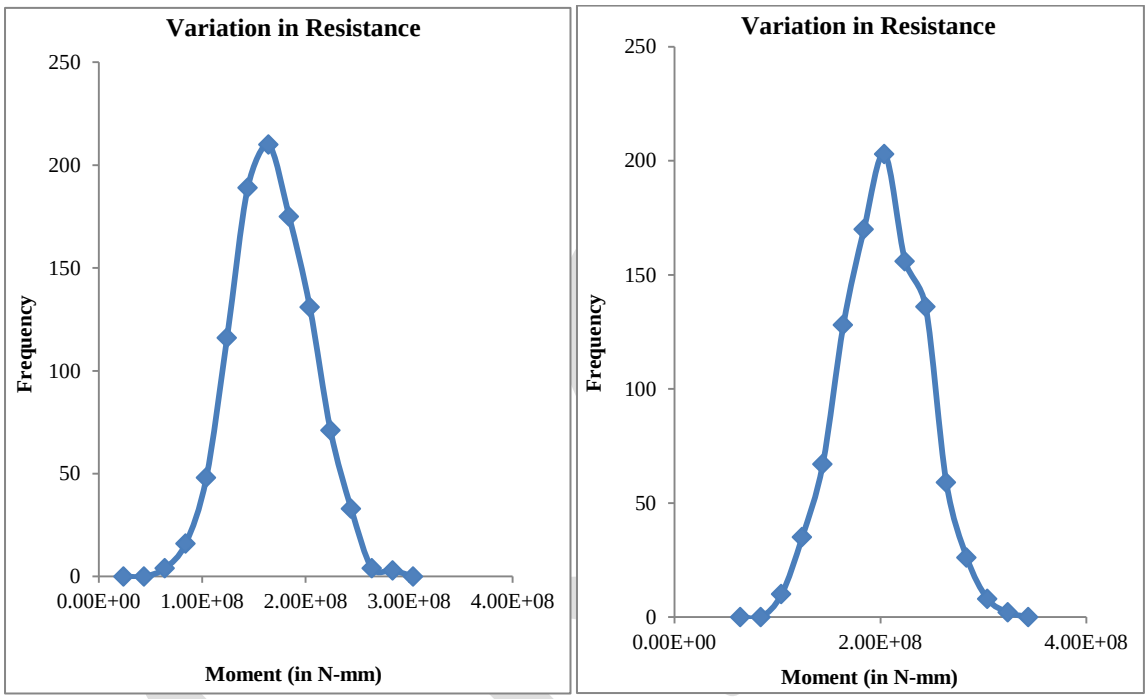
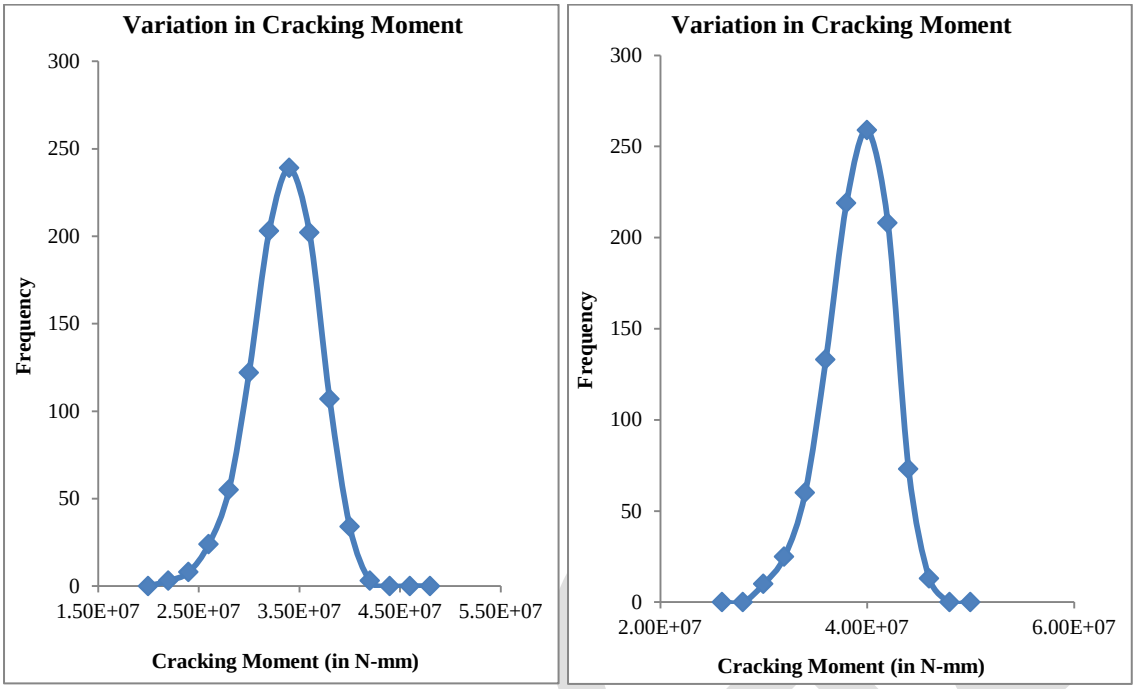


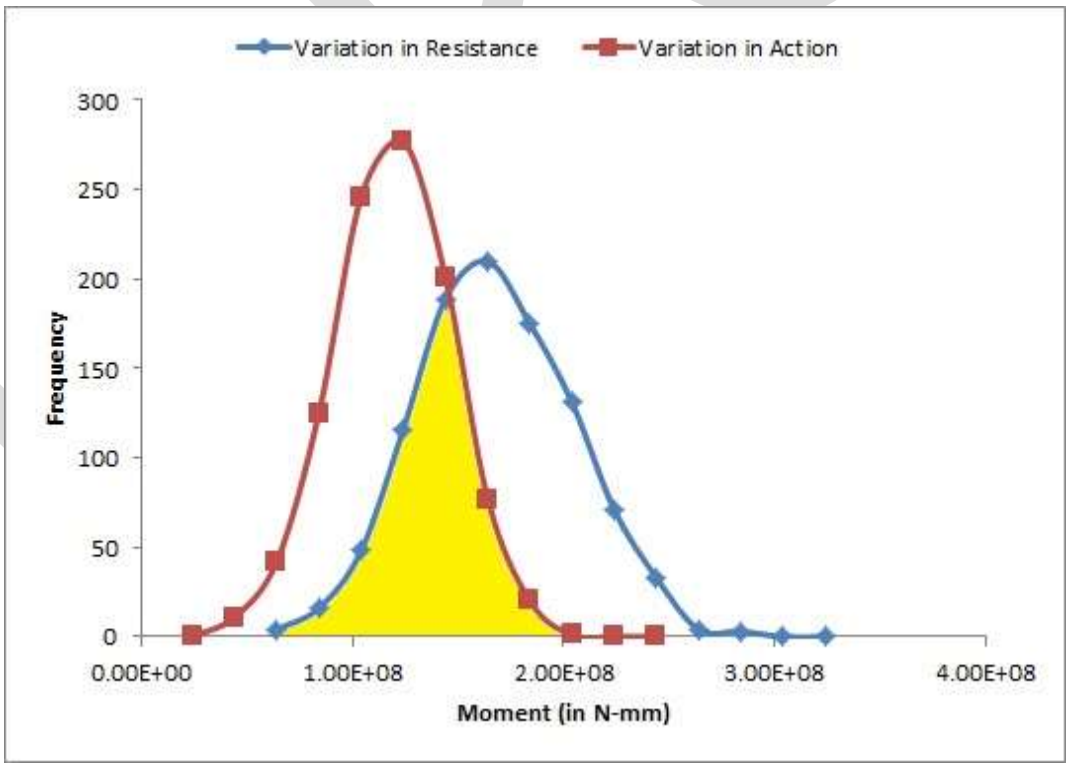
A) RCC Beam **b) SFRC Beam**

Figure 1: Normal distribution curve for limiting moment of the beam



a) RCC Beam **b) SFRC Beam**

Figure 2: Normal distribution curve for cracking moment of the beam



a) RCC Baem

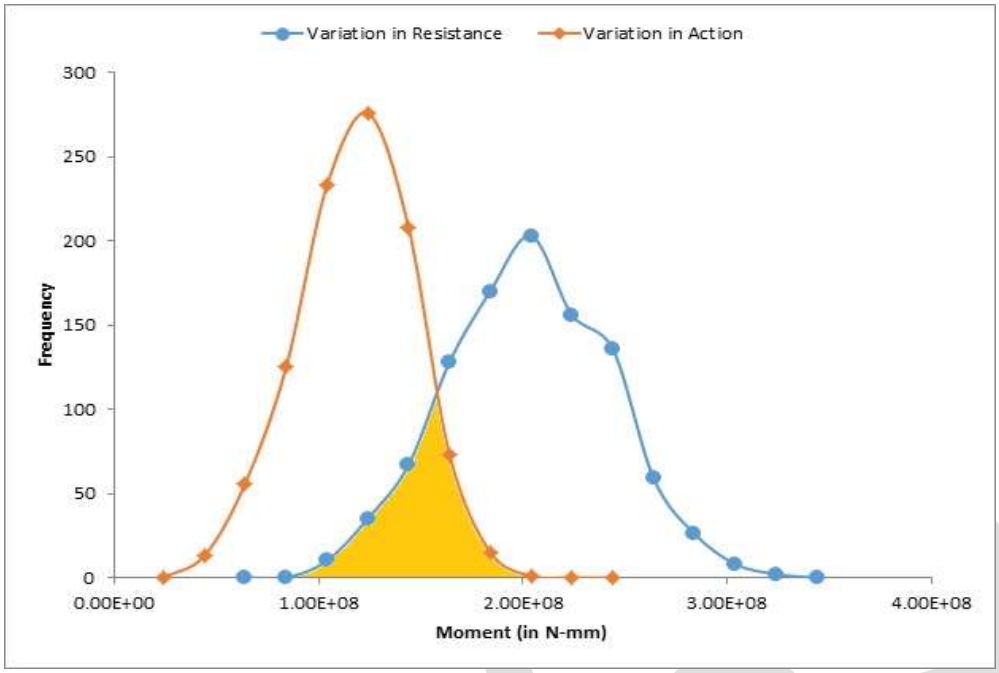


Figure 3: Normal distribution curve for Bending Moment (Action) and Limiting Moment (Resistance) of the Beam

Table.1- Statistical data of the variable parameters (ref. Ranganathan (1990)

b) SFRC Beam

Variable parameter	Mean	Standard Deviation	Probability Distribution
Depth (mm)	450	9.38	Normal
Breadth (mm)	250	9.47	Normal
Cover to longitudinal Reinforcement	25	8.41	Normal
Compressive strength of concrete (MPa)	20	4.1034	Normal
Loading (kN/m)	20	6	Normal

Table 2 - Comparison of the results of the RC and SFRC beams

	RC Beam	SFRC Beam
Average of Resistance, μ_R (N.mm)	157833230.9	192918219.9
Average of Action, μ_S (N.mm)	109037313.5	108089948.1
Average of Margin of Safety, $\mu_M = \mu_R - \mu_S$ (N.mm)	48795917.4	84828271.8
Standard Deviation of Resistance, σ_R (N.mm)	37244254.44	39537503.07
Standard Deviation of Action, σ_S (N.mm)	27219570.52	27965773.06
Standard Deviation for Margin of Safety, $\sigma_M = (\sigma_R^2 + \sigma_S^2)^{1/2}$ (N.mm)	46130678.6	48428283.18
Reliability Index, $\beta = \mu_M/\sigma_M$	1.0578	1.7516
Average of Cracking Moment (N.mm)	32518126.3	38161033.3
Standard Deviation of Cracking Moment (N.mm)	3302483.341	3059554.652

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Integrating Building Information Modeling (BIM) into Core Courses within a Curriculum: A Case Study

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Abstract: This paper discusses a case study of a teaching and learning approach for integrating Building Information Modeling (BIM) into a core course within a Construction Management (CM) curriculum. The paper presents a detailed study of the experience and lessons learned from introducing a project model into a Methods Analysis course in the curriculum of the Construction Management Department at California State University, Chico. The author illustrates how the introduction of BIM helped Faculty deliver more realistic project-based courses. In particular, the author analyzes a new model-based Methods Analysis course that allowed students to learn how to use BIM software, while applying construction concepts to real-world, project-based assignments. The paper presents evidence that integrating BIM allowed the instructor to design and implement a course that utilized more realistic assignments to simulate real-world project planning activities and helped students to improve their BIM skills.

Keywords: Building Information Modeling, BIM, Virtual Design and Construction, Construction Management, Construction Methods, Constructability, Curriculum Development, Construction Education, Information technology (IT), Three-dimensional models

INTRODUCTION

Understanding Virtual Design and Construction (VDC) technologies and processes along with BIM skills is becoming more important for CM students to participate effectively in the construction industry upon graduation. This importance stems from industry's ever increasing adoption of BIM into their construction delivery workflow (Ahn et al. 2013). Construction companies are starting to demand that CM graduates have BIM skills and an understanding of VDC processes (Souder and Gier 2006). CM educators generally agree that the knowledge of VDC and BIM is now required to adequately prepare students for work in the industry. They also recognize that there are inherent barriers to implementation (Lee and Hollar 2013; Lee and Dossick 2012). And, in fact, "Only slightly over half of all programs offer BIM courses and almost one fifth of all programs still do not have any plans to offer BIM courses" (Becerik-Gerber et al. 2012).

What is not agreed upon is how best to teach these topics and how to integrate VDC technologies, processes, and BIM tools into the CM curriculum (Glick et al. 2011). Most CM faculty agree that teaching and learning practical, real-world VDC and BIM skills in the classroom is important, but also difficult to implement. One problem is due in part because acquiring proficiency in the use of BIM tools, both for students and faculty, takes repetition and practice, which are difficult due to the time constraints in the traditional lecture-lab CM course. Another difficulty in teaching in the traditional format is that it takes so much time to cover the technical course material there is very little time remaining to apply what the student has learned to a real-world project (Glick et al. 2011). Overcoming these barriers requires a new teaching and learning approach. Integrating VDC technologies within a virtual framework of a real-world construction project contributes to student learning because the model becomes the learning environment (Richards and Clevenger 2011; Clevenger et al. 2010; Lu et al. 2013).

This exploratory case study presents the analysis and documentation of the process to integrate VDC technologies into a CM curriculum at California State University (CSU), Chico. The author selected a Methods Analysis course to analyze during this case study mainly because of past and current experience with the course and the first-hand knowledge gained during the course re-design and subsequent migration to a model-based format. The author spent the last eighteen months designing, developing, and delivering this course with an instructional team comprised of two CM faculty, as co-instructors, two industry representatives, as subject material experts, and two undergraduate students, as lab assistants. All course development work was funded by an external grant from the California Contractor's State License Board. The author served as the team leader of the instructional team and managed the design and development of this model-based Methods Analysis course, which would eventually integrate VDC technologies.

LITERATURE REVIEW

Historically, students learned practical construction methods and processes during summer internships or through simple stand alone, topic-based assignments, due to the time constraints of the typical classroom. To reach beyond these types of assignments instructors often enhanced them with "war stories" from the field, typically discussing, isolated solutions and methods found on past projects from their own experience. Listening to the instructor tell a story about the application of a certain construction method, while it may

sound interesting, does little to help the student know what to do when they are confronted with a problem on an actual project or on a course assignment based on a real project (Thomas and Mengel 2008; Weber 2003; Terenzini et al. 2001).

Pre-construction planning activities and methods analysis really depends on an understanding of the project (Thabet and Waly 2002). The transformation of project information into useable, practical planning and construction methods depends extensively on the knowledge and experience of the individual members of the project's management team (Becerik-Gerber et al. 2012). Knowing when and how to apply a specific method or processes is as much an art as it is a science. It is heavily dependent on the experiential knowledge of the Project Manager. Teaching without project specific details falls short in accounting for the degree of complexity, the diversity of situations, and sheer numbers of situations, variables, and conditions on a typical construction project. Construction project case studies and stories cannot begin to cover all the interconnected variables and factors that an experienced Project Manager brings to the understanding of a specific construction project. What is missing is the specific project context, in which decisions are made about construction methods and processes (Hunt 2005; Boud et al. 1993; Andresen 2000).

As BIM becomes an industry standard, the educational paradigm must evolve towards an interactive learning environment, where student's gain experience interacting with dynamic project models. Developing integrated project-based assignments however, has been challenging, particularly, prior to the introduction of BIM (Kunz et al. 2003). BIM can also be difficult to teach to students because of their limited construction experience, novice skills with software tools, and lack of educational materials (Lee and Dossick 2012). There have also been several other obstacles to integrating VDC technologies into undergraduate CM courses, such as, lack of course development funds, lack of experienced instructors, lack of software tools, and lack of project models. But, now that the industry has been using BIM for a number of years, models of real-world projects exist that can be used in the classroom, thus the labor-intensive task needed to create these integrated assignments has become more manageable. Students still need to learn about contract documents, specifications, quantity take-offs, productivity analysis, methods, and construction processes, however now they can learn them in the context of a real-world project. The possibility of model-based methods analysis has diminished the negative impact of many of the practical barriers that instructors have encountered in the past (Lee and Dossick 2012). The advancement of computer applications, particularly BIM, has helped to support project-based education (Fruchter 2001).

Several improvements to VDC technologies have enabled instructors to teach students with off-the-shelf software, such as, Sketch-up, Autodesk Revit, Navisworks, and Solibri in a structured and integrated manner that was previously difficult or not possible (Teicholz and Fischer 1994). First, BIM tools speed up the time it takes to do time-intensive tasks, such as, quantity take-offs. Second, a proliferation of BIM project models in industry means students do not need to take the time to build a model to study it. Third, BIM models introduce a realistic level of project complexity, but at the same time, make it easier to manage all the project-specific details. Fourth, BIM tools allow students to learn more construction concepts, such as, site layout, methods analysis, productivity analysis, cost analysis, sequencing, schedule analysis, and clash detection all in an integrated fashion within a real-world project context (Richards and Clevenger 2011).

As noted by Barham et al. (2011) improvements in student performance were observed when 3D models were used. Integrated, model-based project assignments have several features that make them naturally effective for the CM classroom. First, a building information model presents to the student project-specific information and details from a real-world project in a very comprehensive, visually enhanced, 3D manner. The student can see and manipulate this project detail in such a way that it increases their understanding of the project, while they are using the model (Glick et al. 2011; Vygotski 1978). Second, by definition, the model is a database of project-related information, easily accessible to students as they work to apply construction concepts, like methods analysis, and to solve problems on their project-based assignments. Third, the model facilitates the automation of tedious and repetitive project tasks, such as, quantity take-offs, when analyzed by model checking software, like Solibri. These aspects of BIM combine in a synergistic way to give instructors the capability to design a course that comes closer to delivering actual project-specific details, in such a way, as to give the student a more realistic learning environment.

Based on the literature review the author hypothesized that the integration of VDC technologies, processes, and BIM tools would give instructors the ability to develop and teach model-based Methods Analysis courses that:

1. Utilize real-world projects to effectively teach VDC technologies and processes.
2. Increase opportunities to use BIM tools to improve students' BIM skills.
3. Utilize a learning management system, such as, Blackboard Learn to increase course effectiveness.

RESEARCH METHODOLOGY

To find evidence for the above listed hypotheses, the author embarked on a exploratory case study analysis of the people, courses, events, activities, and resources involved in integrating VDC technologies, processes, and BIM tools in the CMGT 332 Construction Methods Analysis at CSU, Chico. In particular, this case study focuses on the evolution of a non-model based Methods Analysis course taught by the author in 2005-2006, which was re-designed as a model-based course and implemented by the author in 2013-2014. This case study provides a comparison of the two courses and an analysis of how integrating VDC technologies can enhance CM curriculum, improve course learning outcomes, and cause a paradigm shift in the learning environment (Lee and Hollar 2013).

Studying these two Methods Analysis courses allowed for observations of students and experience with students in a consistent course environment, even to the point of being taught in the same classroom. Fortunately, the author was also able to reference accreditation course records kept in the CM Department archives for the 2005-2006 Methods Analysis course, so that the syllabi, lecture notes, Power Points, assignments, quizzes, exams, keys, grades, and student evaluation comments could be compared with the new 2013-2014 model-based course materials and results. All this archival data provided a degree of consistent and historical context and allowed a detailed comparison of the courses. Using several different data sources permitted the author to cross-triangulate the data, thus increasing the reliability of the research results (Yin 2003; Miles and Huberman 1994).

Jorgensen (1989) explains that being a participant observer can provide valuable insight into unsystematic and irregular data collection. Being participant observers helped the instructional team to collect data, observe student behavior, and gain insights into the courses without adversely affecting the student learning process. From the very beginning the co-instructors, industry representatives, and student lab assistants were introduced to the students as an integral part of the course delivery method for the new model-based course format. The students did not consider any member of the instructional team to be an outsider, that is, someone who would possibly influence their natural behaviors.

An in-depth involvement in the design, development, and implementation of both courses gave the instructional team a deeper insight into the course assignments and student progress on these assignments, which was a positive outcome of being participant observers. But, this same involvement may have introduced some bias into the data analysis. To offset any potential bias, another researcher with an outsider's perspective reviewed the findings. The author hoped this outsider's perspective would counter any bias introduced into the case study.

To show evidence for the hypotheses of this case study the following sections describe the two Method Analysis courses. In these sections the author provides the background of the courses and describes the data collected.

CASE DESCRIPTION

A NON-MODEL BASED METHODS ANALYSIS COURSE

The CMGT 332 Construction Methods Analysis course has historically been taught in a traditional lecture-lab format for many years at CSU, Chico. The class has always consisted of a combination of topic-based lectures, discussions, stand-alone assignments, quizzes, and exams. The course is a pre-requisite for CMGT 450 Construction Cost Estimating. CM students usually take it in their third year of the CM Program. Typically, about half the students in this Methods Analysis course have had an internship or some construction experience. The course's primary goal has been to explain, enhance, and reinforce this recent industry experience that the student has acquired on the job by covering such topics as, site layout, methods analysis, sequencing, productivity, crew analysis.

The Fall 2005 and Spring 2006 Semesters served as the example of a traditional non-model based Methods Analysis course for this case study. This non-model based course relied heavily on published articles bundled in a course packet along with the instructor notes and handouts as the course materials. The course was not taught using a learning management system, such as, Blackboard Learn. Table 1 gives some historical comparison of the topics covered in this Methods Analysis course and some comparative context for this case study.

Table 1. Evidence of how the integration of VDC/BIM increased our ability to teach in the Methods Analysis Course

Year	Use of Real-World Projects	Type of Assignments	Methods Analysis Topics Covered	VDC/BIM Topics Covered	Project Constructability
2005-2006	None	Ten Stand-Alone	Site Layout Methods Analysis Productivity Sequencing Crew Analysis Safety	None	None
2013-2014	Three Story Steel Structure BIM Model from Contract Documents	Ten Integrated Project-Related	Site Layout Methods Analysis Productivity Sequencing Crew Analysis Safety	Site Utilities & Foundation Conflicts Schedule Analysis Architectural QTO Clash Detection Constructability Log Constructability Summary Report	Constructability Summary Report (Issues/Resolutions)

During two-hour lecture periods the author, typically presented topics related to methods analysis, such as, site layout, sequencing, and productivity to convey the concepts. Instructor experience in the form of storytelling was used to provide project context for the various topics. The instructor covered a different methods analysis topic in lecture and the students were assigned a related assignment to complete during the subsequent three-hour lab period. The students completed a total of ten stand-alone, topic-based assignments during the semester. Overall, the students' learning process followed a traditional topic-based format with little time for hands-on application of methods analysis concepts or realistic project-based context.

A MODEL-BASED METHODS ANALYSIS COURSE

The other course example in this case study analysis was the new CMGT 332 Model-Based Methods Analysis. BIM had been offered as stand-alone technical electives for over five years, but recently these electives were not well attended, so by early 2013 it had become apparent to some of the CM Faculty at CSU, Chico that they needed to embed BIM tools into the core CM curriculum to reach more CM students. Industry was already requesting that CM graduates have some basic BIM skills. It seemed logical to target CMGT 332 Construction Methods Analysis, as one of a series of three CM courses where the CM Department would take steps to integrate VDC technologies, processes, and BIM tools.

During the Spring 2013 Semester, several CM Faculty led by this author, along with an industry representative, a VP of VDC for a large construction company, met weekly to re-design Methods Analysis as a model-based course. The new design consisted of a mix of discussions, a project model, project-based team assignments, software workshops, training videos on a course YouTube Channel, related web resources, quizzes, and exams. The primary goal was to better prepare the student for their future work in the industry, by increasing their understanding of VDC technologies and processes, and improving their BIM skill set. The basic methods analysis topics, such as, site layout, methods, sequencing, productivity, crew analysis are still covered, but in addition the model-based learning environment allows the instructor to teach more advanced, model-based topics, such as, quantity take-offs, schedule analysis, model analysis, clash detection, and constructability in a more realistic project-based learning environment. Table 2 shows the software used in the Methods Analysis course.

Table 2. Software used in the Methods Analysis Courses

Year	BIM	Scope	Time	Cost and Database	Animation and Graphical	Model Analysis	Learning Management System
2005-2006	None	None	None	Excel	None	None	None
2013-2014	Revit 2014	Revit 2014	Navisworks Timeliner MS Project Primavera P6.0	Solibri Excel	Navisworks Timeliner Sketch-up Power Point	Navisworks Manager 2014	Blackboard Learn

The new course was implemented in Fall 2013 and Spring 2014. These two semesters served as the example of the model-based Methods Analysis course for this case study. Having this project model integrated into the course is a major paradigm shift in the way the instructors deliver this course. Normally one CM Faculty member and one student lab assistant are in the classroom at all times. All course materials, instructor's notes, handouts, workshop Power Points, training videos, Course YouTube Channel, related web resources, quizzes, and exams reside within the hybrid online course format on Blackboard Learn, the current learning management system at CSU, Chico. These course materials are available to the student continuously throughout the semester; anywhere the student has Internet access.

The introduction to the model-based course included the forming of teams, installing BIM software on students' laptops, downloading the project model, familiarizing students with the contract documents, the Blackboard Learn online course, and the physical classroom environment, opening the model, acquainting themselves with the model, and the BIM software tool's user interface. After the initial introduction and set-up sessions, students began working on the first team assignment, site layout, while the industry representative began teaching a seven week series of one-hour workshops, given once a week, on the various BIM software tools, i.e. Sketch-up, Autodesk Revit, Navisworks, and Solibri. The subsequent weeks were devoted to the ten integrated, project-based assignments. The ten team assignments were (1) Site Layout, (2) Site Utilities and Foundation Conflicts, (3) Structural Steel Methods Analysis, (4) Structural Steel Sequencing, (5) Structural Steel Schedule Analysis, (6) Architectural QTO, (7) Navisworks Clash Detection, (8) Model Analysis, (9) Constructability Log, and (10) Constructability Summary Report.

During a typical week throughout the semester the students meet for a two-hour session and a three-hour session. In the new course design these two sessions have been changed from a traditional lecture-lab format to primarily two activity work sessions. Within these activity work sessions the student is exposed to course materials via an instructor or industry representative led topic discussion, an industry representative led BIM software tools workshop, or they are working on their team assignments. The students work in teams of three or four to complete ten integrated, project-based assignments during the semester. The weekly classroom time averages about a third discussion/software workshops and two-thirds team time.

The students created a project notebook to document their team's work on the ten integrated, project-based assignments. They could not have completed these assignments within the course time-constraints or the required level of detail and completeness without a building information model. The model provided project-specific detail and realistic context for the learning environment. The student spent hours learning the BIM tools to prepare for the team assignments and an equal amount of time preparing the assignment reports and presentations. The student teams fairly consistently required an average of thirty to forty person-hours to complete each team assignment over a week to two-week period. Each team had a team leader, who managed the team members and maintained a three-week look-ahead schedule for the assignment tasks. Team assignments overlapped by design to simulate real-world project conditions. At any one time during the semester a team leader may have different team members working on two or three different assignments at the same time.

The students presented the results of their work on the team assignments during the semester through four presentations, various animations, and a project notebook. The instructors graded both digital and hard copy student work throughout the semester. The instructors used Blackboard Learn's Gradebook to communicate the results of their grading with the students.

The project model and the integrated, project-based assignments set the rhythm and the pace of course instruction. Individual, team, and class discussion and Q&A sessions between the instructors, industry representatives, lab assistants, and the students are both planned and spontaneously encouraged during the weekly activity sessions. Overall, the students' learning process has changed to focus more on a hands-on application of methods analysis concepts within a real-world project-based context.

CASE ANALYSIS

A Quantitative Comparison of Student Scores

Educational researchers often infer how an individual processes information by measuring or observing resulting actions or responses (Davidson-Shivers and Rasmussen 2006). This study compares the student scores of the model-based Methods Analysis course with the non-model based Methods Analysis course. Table 3 provides a historical comparison of average student scores for overlapping assignments and final grades in the non-model based and model-based Methods Analysis courses at CSU, Chico. This data illustrates the effect of integrating VDC technologies on the learning environment. It provides some insight into the changes in the learning environment caused by a change in course format. To permit a quantitative comparison of student scores this case study analyzed the average student scores for each overlapping assignment and final grades, as a percentage of the maximum attainable score.

Table 3. Historical comparison of average assignment scores in non-model based and model-based Methods Analysis Courses. Standard Deviation is shown in parentheses.

Year	Site Layout	Methods Analysis	Productivity Analysis	Sequencing	Crew Analysis	Safety	Final Grades
2005-2006	83.85% (5.68)	75.11% (11.6)	71.42% (11.06)	84.32% (6.57)	60.15% (3.26)	89.35% (5.61)	78.94% (5.14)
2013-2014	87.98% (0.17)	84.46% (2.64)	87.50% (0.11)	87.55% (2.05)	87.50% (0.11)	97.34% (2.34)	85.42% (3.84)

Upon close examination of the student scores, it became apparent that in general, the students in the model-based course, who utilized integrated VDC technologies, processes, and BIM tools to complete their project-based assignments, scored better in every overlapping assignment and eventually also in their final grade. The students' scores in the model-based course were markedly better in two areas, Productivity Analysis and Crew Analysis. The instructor attributed this finding to the ability of the students in the model-based course to have a better grasp of the scope of work on the project because of the ability to actually see what work was required via the project model. The instructor also observed in the classroom that a better understanding of scope allowed the students to apply the concepts of productivity analysis and crew analysis because they could see what had to be done for a certain work activity, what labor, equipment, and materials were required, and what the optimum crew make-up would be.

Students in the model-based course could also put information into Navisworks Timeliner to run a simulation of the work activity to check if their decisions about productivity, equipment choice, and crew size gave reasonable time durations to complete the work activity. The instructors observed that this higher level thinking, as a natural outcome of the integrated, project-based assignments ultimately engaged the students more in the course material and thus gave the students a better grasp about productivity analysis and crew analysis. The instructors also noted that the methods analysis concepts were less abstract and more real to the students because they were tied to a real-world project model.

The students' final grades in the model-based Methods Analysis course were roughly a whole letter grade higher than those students in the non-model based course. This noted improvement from an average final grade of a C+ (78.94%) to a solid B (85.42%), for this instructor seemed significant. The final grade comparison indicates that the student group that had integrated project assignments had a deeper understanding of the principles and concepts of methods analysis, not only about the concepts, but also how and when to apply them. In contrast, those students in the non-model based Methods Analysis course seem to have had a more fractured understanding of methods analysis concepts, which the instructor attributed to the stand-alone, topic-based assignments.

Another finding was the wide variation in the range of average scores for the students in the non-model based course. It was much greater than for those students in the model-based course. The main conclusion that the author drew from this observation is that the students in the model-based Methods Analysis course may have had a more consistent and cohesive learning experience. This tightening of the range of student scores may be caused by the consistency that the project model brings to the learning environment. The instructor observed that students were always coming back to the model, to get information, to visualize what an element looks like, and to test their decisions. This continual presence of the project model in the learning environment appears to make a difference in student learning.

What the author concluded from this quantitative comparison of student scores is that students exposed to VDC technologies in a series of integrated, project-based assignments showed a degree of improvement in their overall understanding of methods analysis concepts. Of course, with this type of case analysis comparison, any conclusions drawn must be taken with a certain amount of caution. The trends indicated by this quantitative comparison of student scores definitely show that student improvement in the model-based Methods Analysis course is evident. But, since there was not a control group per se, the results must be tempered with cautious optimism.

A Statistical Comparison of Student Surveys

As another means of testing the hypotheses for this case study the author developed a student survey of those students who completed the model-based Methods Analysis course in the 2013-2014 academic year. Five questions addressed descriptive demographic information, such as, gender, age, college major, construction field experience, and geographical environment. Table 4 shows the descriptive statistics of the student population for this survey. Forty-seven students completed the survey.

Table 4. Descriptive Statistics from Student Survey of CMGT 332 Model-Based Methods Analysis Classes 2013-2014

Variable	Survey Results				
Gender	Male = 83%	Female = 11%	No Reply = 6%	NA	NA
Geographical Environment	Urban = 57%	Suburban = 30%	Rural = 9%	No Reply = 4%	NA
Age (Years Old)	0-19 = 3%	20-29 = 91%	30-39 = 3%	40-49 = 3%	50 + = 0%
College Major	CM = 94%	Architecture = 0%	Business = 0%	Engineering = 3%	Other = 3%
Construction Field Experience	None = 11%	Less than 1 year = 19%	1-2.99 years = 28%	3-5 years = 30%	5 + years = 12%

Sixty-five questions asked the students to rate course-related elements, such as, the VDC and BIM components, the course content, method of course instruction, and the hybrid online course components on a five-point Likert Scale, where 1 = Strongly Disagree, 3 = Neutral, and 5 = Strongly Agree. Forty-seven of the seventy-four students completed the survey. Table 5 shows a summary of the average student survey responses. Note that overall, 80.81% of the students rated the course with neutral or positive responses. Only 17.48% of the students rated the course with negative responses.

Table 5. Summary of the average survey responses from the CMGT 332 Model-Based Methods Analysis Classes in 2013-2014. (Standard Deviation) Total Surveys = 47

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Omitted	Total
4.94% (3.64)	12.54% (5.19)	32.57% (9.34)	37.18% (11.76)	11.06% (7.89)	1.68% (3.72)	100.00%

For data analysis the author submitted the survey data to the CSU, Chico Testing Center. This statistical output became the basis for the study's statistical comparison of student surveys. The author checked variables for reliability of measurement and screened the data. All responses were found to be in range.

The author utilized the Discriminative Item Analysis output to conduct a point biserial correlation analysis. The value calculated by the student t-Test for point biserial correlation was used to determine if the point biserial correlation for each survey question was statistically significant. To make this determination the author compared the point biserial correlation values given by the t-Test with the value given for N-2 degrees of freedom in a table of t distribution values, where N = the number of students and the level of confidence was 99.95% [13]. The survey questions, whose point biserial correlation were statistically significant, are listed in Tables 6 and 7, along with the survey results for those questions.

Table 6. Statistically significant question responses from a survey of the CMGT 332 Model-Based Methods Analysis Classes in 2013-2014. Total Surveys = 47

Likert Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Omitted	Total
Question Statement: Learning the BIM Software, i.e. Autodesk Revit, Navisworks, Solibri, and Sketch-up was "helpful."							
Fall 2013	10%	0%	10%	50%	30%	0%	100.00%
Spring 2014	0%	8%	30%	43%	19%	0%	100.00%
Question Statement: Learning to Navigate the construction 3D models was "effective."							
Fall 2013	10%	0%	10%	40%	40%	0%	100.00%
Spring 2014	0%	3%	27%	59%	11%	0%	100.00%
Question Statement: Learning Virtual Design and Construction (VDC) processes, i.e. Constructability Reviews, Clash Detection, Scheduling Simulations, etc. was "effective."							

Fall 2013	10%	0%	30%	20%	40%	0%	100.00%
Spring 2014	0%	8%	32%	51%	8%	0%	100.00%
Question Statement: Learning Site Utilization, Methods Analysis, Sequencing, Schedule Analysis, and Architectural QTO was "easy to learn."							
Fall 2013	0%	30%	0%	50%	20%	0%	100.00%
Spring 2014	0%	14%	27%	49%	8%	3%	100.00%
Question Statement: This course was "effective" in improving your overall Virtual Design and Construction (VDC) and BIM Skill Set.							
Fall 2013	10%	10%	0%	30%	50%	0%	100.00%
Spring 2014	0%	3%	32%	54%	11%	0%	100.00%

The author used the point biserial correlation analysis to estimate the statistical significance of the survey questions because the sample size was small and the population, though thought to be normally distributed, had an unknown standard deviation. The results of the statistically significant survey questions suggest that the probability of the effects of integrating VDC technologies in the classroom was not due to chance alone.

Table 7. Statistically Significant Blackboard Learn-related question responses from a survey of the CMGT 332 Model-Based Methods Analysis Classes in 2013-2014.

Total Surveys = 47

Likert Scale	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Omitted**	**Total**
Question Statement: The Digital Reference Materials on Blackboard Learn were "helpful."							
Fall 2013	10%	10%	60%	10%	10%	0%	100.00%
Spring 2014	0%	14%	27%	54%	5%	0%	100.00%
Question Statement: The Announcements on Blackboard Learn were "easy to use."							
Fall 2013	10%	0%	20%	40%	30%	0%	100.00%
Spring 2014	5%	14%	27%	43%	8%	3%	100.00%
Question Statement: The Announcements on Blackboard Learn were "effective."							
Fall 2013	20%	10%	10%	40%	20%	0%	100.00%
Spring 2014	5%	11%	30%	46%	5%	3%	100.00%

Question Statement: The Content on Blackboard Learn was "easy to use."							
Fall 2013	10%	10%	30%	40%	10%	0%	100.00%
Spring 2014	0%	8%	51%	41%	0%	0%	100.00%
Question Statement: The Content on Blackboard Learn was "effective."							
Fall 2013	10%	10%	30%	30%	20%	0%	100.00%
Spring 2014	0%	11%	43%	43%	3%	0%	100.00%
Question Statement: The Exams on Blackboard Learn were "easy to use."							
Fall 2013	20%	10%	40%	10%	20%	0%	100.00%
Spring 2014	5%	16%	43%	14%	0%	22%	100.00%
Question Statement: The Exams on Blackboard Learn were "effective."							
Fall 2013	20%	30%	30%	0%	20%	0%	100.00%
Spring 2014	8%	16%	43%	11%	0%	22%	100.00%
Question Statement: The Gradebook on Blackboard Learn was "easy to use."							
Fall 2013	10%	20%	40%	20%	10%	0%	100.00%
Spring 2014	3%	19%	27%	51%	0%	0%	100.00%

CROSS COURSE ANALYSIS

A comparative analysis of the two Methods Analysis courses was one of the primary purposes of this case study. Table 1 gives some historical context for the two courses. When compared to each other, the two courses did reveal some similarities. Students in both classes completed ten course assignments. Six of the assignments were overlapping, site layout, methods analysis, productivity analysis, sequencing, crew analysis, and safety.

As for other similarities, the same instructor, i.e. the author, taught both courses and utilized the same classroom. The students were primarily CM majors, approximately 90%, in their third year of the CM program at CSU, Chico. The student populations for each course were approximately the same size, i.e. 93 students in the 2005-2006 course and 74 students in the 2013-2014 course. In both courses, approximately 10% of the students were female. Both student groups were able to learn methods analysis concepts within the same semester time constraints. Both courses had ten assignments, plus quizzes and a final exam. Both courses divided students into teams of 3 or 4 students each.

During the first semester of the new model-based course, Fall 2013, the students openly verbalized their frustration and resentment towards the change to a model-based format. But, the instructor attributed this frustration to a lack of preparation with BIM tools by this particular group of students, who had not had appropriate preparation in the two new model-based courses, CMGT 110 Construction Graphics and CMGT 210 Construction Drawings and Specifications. This student group had taken these pre-requisite courses, when they were still non-model based. In response to this frustration the instructor arranged to offer extra BIM software workshops taught by industry representatives. By the Spring 2014 semester, the instructor noted a marked change in student attitude toward the model-based Methods Analysis course. The instructor attributed this more positive attitude to students having more experience with BIM tools from the two pre-requisite courses in the new model-based series, i.e. CMGT 110 and CMGT 210. Toward the end of the spring 2014 semester several students even commented to the instructor that the model-based format was more "real-world."

In the model-based course students had the opportunity to apply several methods analysis concepts to a real-world project, with the goal being to learn not only about the concepts, but also when and how to apply them. The course format and course materials

were based on an actual model and contract documents from a recently built project. This use of real contract documents simulated closely what the students would encounter as Project Engineers in the field. The project scope and quality was presented in the form of a building information model. Thus, the students were not required to build the model for the model-based course, only manage it. There was no project model available for the non-model-based course.

The primary difference between the two Methods Analysis courses is attributed to the integration of VDC technologies in the model-based course taught in 2013-2014. Incorporating a model into the 2013-2014 Methods Analysis course lead to a significant difference in course design, the instructor was able to include an actual project model in the design of ten new, integrated project assignments, whereas the non-model based course had ten stand-alone topic-based assignments. The inclusion of a model moved the student experience beyond the traditional classroom experience to one that simulated the complexity and specific details of a real-world project environment. The project model became the framework around which the instructor was able to design the new, integrated course assignments.

Another significant difference is the number of major topics covered in each course. Refer to Table 1 for a historical comparison of topics covered in our Method Analysis course. By using BIM tools in the course the instructor was able to accelerate the time spent on basic methods analysis topics, i.e. site layout, methods analysis, productive analysis, crew analysis, sequencing, and safety, which freed time to spend on VDC related topics, such as, Site Utilities & Foundation (Conflicts), Schedule Analysis, Architectural QTOs, Clash Detection, Constructability Log (Issue Identification), and the Constructability Summary Report (Resolution Identification).

Project constructability was another area of significant difference between the two Methods Analysis courses. In the non-model based Methods Analysis course, the students never really had the opportunity to address project constructability because the ten course assignments were stand-alone assignments and topic-based, not project-based. Switching to integrated, project-based assignments allowed the instructor to introduce project constructability as a major topic of the model-based Methods Analysis course. Student Teams completed a Final Constructability Summary Report, in which they delineated project issues and resolutions. Constructability although mentioned in the non-model based course, was not a major topic or an assignment.

Another difference that the instructor noted between the two courses was that students also had four opportunities to make team presentations in the model-based course. There were no team presentations in the non-model based Methods Analysis course.

In the model-based course the instructor also required the student teams to compile a project notebook, in which they put their ten, integrated project assignments. This project notebook was graded at the mid-term with the first five assignments completed and at the end of the term with the final five assignments completed. These team assignments were completed and graded as a team. Half of a student's final grade was based on their team assignments; the other half was based on individual performance on five quizzes, a final exam, attendance, and participation. In the non-model based course the assignments were stand-alone and were submitted periodically by each student throughout the semester and individually graded. Final grades were based on individual scores for the ten assignments, five quizzes, a final exam, attendance, and participation. No project notebook was required for the non-model based course.

The level of project detail and assignment complexity was the final significant difference between the two Methods Analysis courses. The model-based format allowed the instructor to design into the integrated project assignments a level of detail and complexity that can only be gotten by integrating an actual project model in the course assignments. The non-model based format had only a fraction of the complexity and detail of the model-based course.

FINDINGS AND IMPLICATIONS

A comparison of the non-model based Methods Analysis course with the model-based Methods Analysis course clearly shows that the integration of VDC technologies, processes, and BIM tools enhances the learning environment. This integration allows for the use of more realistic course assignments and an increase in the real-world project details. It enables students to practice making decisions in a more complex model-based learning environment. This case study illustrates that a model-based Methods Analysis course permits students to learn in a more integrated, real-world manner. The findings, in particular, show that there were improvements in the average scores for all overlapping assignments and final grades in the model-based Methods Analysis course.

The case study demonstrated that integrating VDC technologies let the students gain an understanding of the project details in an integrated and structured way, while slowly revealing the complexities of a real-world project. Automating repetitive, time-consuming tasks, such as, quantity take-offs, gave the students more time to spend on the analysis of appropriate project methods and processes. Overall, the students' output in the model based Methods Analysis course was increased when compared to the non-model based Methods Analysis course, which was delivered in a more traditional lecture-lab format. It would not have been possible to teach all the topics of the model-based Methods Analysis course in a traditional manner because of the time constraints of the term.

The findings from our comparison of the two Methods Analysis courses demonstrated that the integration of VDC technologies improved the learning environment by making the class activities and assignments active learning exercises. In the model-based course, the instructor was able to integrate the assignments into a more realistic project-based learning environment. While, both classes allowed students to learn methods analysis, the model-based course allowed that to happen in a more integrated and realistic

real-world environment. Refer to Table 3 for evidence of how the integration of VDC processes and technologies increased our ability to teach in the Methods Analysis course.

This model-based learning approach created a less predictable environment, more similar to actual project conditions, and very different than the typical classroom. This approach was part of the course design that tried to simulate the practical experience of being on a real-world project. At first students were hesitant to engage because they are accustomed to passive learning environments. But, once they saw how the class worked and how real world the experience would be, most students engaged themselves in the course for the duration of the semester.

The model-based format allowed the students to formulate a more visual understanding of the level of complexity and detail on a typical project. Without a project model the relationships and interdependencies between building systems, methods, production, equipment, processes, trades, owner, contractor, architect, engineer, subcontractor, quantities, schedule, and cost, all of which contribute to the complexity of a project, are often lost on the student in the classroom. The project model helped the student gain a better understanding of the project scope, the time, the cost, and the risks that go into completing a project.

Studying methods analysis concepts in a model-based course enables students to apply concepts and make decisions within the complexities of an actual project scenario. They learn about project specific details, the complex relationship between building systems, and the interplay of the players on the project, i.e. the owner, the architect/engineer, the general contractor, and the subcontractors. BIM tools allow the student to better understand the dynamic aspect of the construction process.

To summarize our findings, this case study gives evidence that our hypothesis that the integration of VDC technologies into a Methods Analysis course, allows for a more effective means to teach VDC technologies and processes, to improve students' BIM skills, and to deliver method analysis concepts in a hybrid online course that is easy to use and effective. The study further shows that a model-based Methods Analysis course helps instructors design assignments that are more complex, yet well integrated into an active learning environment. Students learn not only the concepts of methods analysis, but when and how to apply them to a real-world project, which are valuable skills for their future careers in construction.

CASE STUDY LIMITATIONS AND THE NEED FOR ADDITIONAL RESEARCH

As with most case studies, there are always new directions that reveal themselves, not only for further qualitative study, but also for future empirical research. The author is confident that the experiences and observations documented in the case study are a realistic analysis of what happened during the efforts to develop and implement a model-based Methods Analysis course at CSU, Chico.

The underlying common goals of all accredited CM curricula affords a certain opportunity to apply these experiences and lessons learned to courses at other CM Departments. From this case study, it appears that the integration of VDC technologies will effectively allow more complexity, more project-specific details, and more realistic course assignments into the learning environment. While the experiences documented in this case study show that BIM models can serve as a new framework for the CM learning environment. Still, other institutions need to proceed cautiously, as integrating VDC technologies, processes, and BIM tools is a paradigm shift, not easily accepted by all faculty, students and administration.

The experiences and observations delineated here clearly demonstrate how integrating VDC technologies improved the overall effectiveness of the learning environment within a model-based Methods Analysis course. Since other CM Departments normally teach similar topics within a means and methods type of course, this case study's findings may act as a strong barometer of the overall applicability of the findings beyond the local environment of this study's CM Department.

In spite of the positive results documented in this case study and the author's confidence in these results there still exists inherent weaknesses in the study. A case study examining only two courses inevitably brings up discussion about how much can be deduced from the findings and applied elsewhere successfully. The main weakness, therefore, is that the effectiveness, in which the experiences and lessons learned described in this case study, can be applied to other educational institutions may be limited.

Model-based courses are based on active learning exercises, blended learning concepts, and the active commitment and engagement of faculty, students, and representatives from local industry. These variables will impact the extent to which other educational institutions can successfully implement the results described in this case study. This type of course development process takes extensive resources, time, and commitment. Not every CM Department will be willing or able to implement these measures. The particular success of others to some unknown degree will be based on the local context and the commitment of that institution (Lee and Dossick 2012).

To increase the application of this study's findings the author recommends the following additional research be explored. Conduct an empirical study to measure the extent to which BIM tools influence the learning environment. Extend the current research to a wider student population by involving other universities. Develop a standardized exam that can measure learning outcomes across a variety of educational institutions. Conduct a more extensive study in parallel with a control group, for example, a study with some

students in a non-model based course versus those students in a similar, but model-based course. Perhaps this study would involve two or more universities. This type of study would allow a timelier, direct comparison of the impacts on learning within the two courses.

In addition researchers need to develop better survey questionnaires that would facilitate more extensive statistical analysis. This additional research could provide more quantitative results to indicate a more exacting measurement of a variety of different factors potentially influencing the integration of VDC technologies in the CM classroom, for example, factors like the degree of complexity, the time spent on course assignments, the proficiency of resulting BIM skills, etc. The author also recommends that additional research efforts be focused on what influence model-based courses could have on other CM courses, such as, estimating, scheduling, and cost management.

The literature review pointed to other areas needing study, for example, barriers to integrating BIM, the need for extensive faculty training and development with VDC technologies, processes, and BIM tools, and building industry partnerships to assist in the integration of new technologies, etc. (Taylor et al. 2008).

Finally, the author suggests the need for research studies that show how effective recent graduates with course work in VDC technologies are performing at their positions in industry, i.e. not only to show the effectiveness of model-based courses in the educational setting, but evidence of their impact on the projects in the field. This type of study would try to answer the inevitable questions, do students who learn BIM skills in their undergraduate education perform better and more effectively on their projects in industry, to what extent do companies benefit by having BIM educated project engineers and project managers on their projects, and does their presence on project reduce risk.

This case study points to findings that indicate more real-world project assignments in model-based courses improve the education of future project engineers and project managers, but no long-term study of their performance in practice has been done. This case study shows that this type of long-term study is warranted.

CONCLUSIONS

Within this paper the author has presented evidence that the integration of VDC technologies, processes, and BIM tools can improve the CM faculty's ability to develop and implement a more effective course to teach construction methods analysis in a more realistic, model-based learning environment. In particular, the author has demonstrated that model-based learning activities are actually effective in teaching and learning VDC technologies. In particular, the author illuminated how the introduction of VDC technologies allowed the instructors to design course assignments that naturally included more complexity, realistic conditions, and simulate real-world project details, which helped students learn how VDC technologies integrate with the pre-planning activities for a project, in addition to improving the students' BIM skill set.

The author analyzed and compared a non-model based Methods Analysis course and a model-based Methods Analysis course. Generally, this case study showed that there are some advantages to integrating VDC technologies into CM courses. In particular, this case study demonstrated that integrating model-based courses can significantly increase the quality and effectiveness of course instruction and generally helps CM curriculum be more aligned with the current industry demands and the challenges the student will encounter in industry upon graduation. By increasing the complexity, the amount of project specific detail, and the realism in course assignments, students are better able to learn how to apply VDC technologies, processes, and BIM tools in a real-world context.

In summary, this study shows that model-based courses can be an effective framework for improving learning environments in a CM curriculum. This new model-based teaching and learning approach has proven to be a paradigm shift in the course delivery method and the learning environment for the CM Department at CSU, Chico. This case study provided an analysis of the study's hypotheses, such that the results were shown not only to be important, but also meaningful. The author believes that this case study shows the potential power that integrating VDC technologies have to make CM curriculum current and relevant and thereby, making graduates' BIM skills more valuable to their future employers.

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Estimation of Maximum Age Group of Old Age People affected by the Psychological Problems using CETD Matrix

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Abstract: Indian population is graying. An old person who can retard the aging process to some extent and reduce associated physical and psychological problems if he continues to be physically active and mentally alert. Knowing the maximum age at which they are going to suffer will help them a lot to overcome from their problems. The comprehensive study of this article is to find out the maximum age group of old age people affected by the psychological problem in Chennai using CETD matrix.

Keywords: ATD Matrix, RTD Matrix, CETD Matrix, Old age people, Old age home.

1.INTRODUCTION

In 1998, W.B.Vasantha and V.Indira developed the matrix theory to study the passenger transportation problem. To study this problem they defined four types of matrices called Initial Raw Data Matrix, Average Time Dependent Data matrix (ATD Matrix), Refined Time Dependent Data matix (RTD Matrix)and Combined Effective Time Dependent Data(CETD) matrix. This paper is organized into four sections. The application of the CETD matrix was described in section 2 . In section 3, the Psychological problems of the old age people were discussed. In section 4, the peak age group of old age people suffered by psychological problems was found out using CETD matrix. We derived the conclusion in the final section.

2.PRELIMINARIES

2.1 The method of application of CETD matrix.

We give a very simple but a very effective technique on the collected data.

2.1.1 Average Time Dependent (ATD) matrix

Raw data transform it into a raw time dependent data matrix by taking along the rows the age group and along the columns psychological problems using the raw data matrix we make it into the Average Time Dependent Data (ATD) matrix (aij) by dividing each entry of the raw data matrix by the number of years i.e., the time period. This matrix represents a data, which is totally uniform. At the third stage we find the average and Standard Deviation (S.D) of every column in the ATD matrix. Refined Time Dependent (RTD) matrix Using the average μj of each j^{th} column and σj the S.D of the each j^{th} column we chose a parameter α from the interval [0,1] and the Refined time dependent Matrix (RTD matrix), Using the formula

If $aij \leq (\mu j - \alpha * \sigma j)$ then eij = -1 else
if $aij \in (\mu j - \alpha * \sigma j, \mu j + \alpha * \sigma j)$ then eij = 0 else
if $aij \geq (\mu j + \alpha * \sigma j)$ then eij = 1

We redefine the ATD matrix into the refined time dependent fuzzy matrix for here the entries are -1, 0 or 1. Now the row sum of this matrix gives the maximum age group.

2.1.2 Combined Effective Time Dependent Data (CETD) matrix

We also combine the above RTD matrices by varying the $\alpha \epsilon [0,1]$, so that we get the Combined Effective Time Dependent Data (CETD) matrix. The row sum is obtained for CETD matrix and conclusions are derived based on the row sums. All these are represented by graphs and graphs play a vital role in exhibiting the data by the simplest means, which can be even understood by a layman.

2.1.3 Method of calculation of CETD matrix is as follows:

Step 1. Construct the raw data matrix by taking along the rows the age group and along the columns psychological problems of the old age people.

Step 2.Average Time Dependent (ATD) matrix

Transform the raw data into a raw time dependent data matrix(a_{ij}) by dividing each entry of the raw data matrix by the number of years. This matrix represents a data which is totally uniform.

Step 3. Average and Standard deviation(S.D)

Find the average(μ_j) and Standard Deviation(σ_j) of every column in the ATD matrix.

Step 4. Refined Time Dependent (RTD) matrix

Using the average μ_j of each j^{th} column and S.D σ_j of each j^{th} column, chose a parameter α from the interval [0,1] and form the Refined Time Dependent Matrix(RTD matrix), using the formula

$$e_{ij} = \begin{cases} -1, if\ a_{ij} \le (\mu_j - (\alpha \times \sigma_j)) \\ 0\ \ , if\ a_{ij} \in (\mu_j - (\alpha \times \sigma_j), (\mu_j + (\alpha \times \sigma_j)) \\ 1\ \ , if\ a_{ij} \ge (\mu_j + (\alpha \times \sigma_j)) \end{cases} a_{ij}$$

Step 5. Obtain the row sum which gives the maximum age group.

Step 6. Obtained the Combined Effective Time Dependent Data(CETD) matrix.

Combine the above RTD matrices by varying the $\alpha \in [0,1]$,to get the CETD matrix.

Step 7. Obtain the row sum of the CETD matrix. Represent everything in graphs, since graphs play a vital role in exhibiting the data by the simplest means.

3. DESCRIPTION OF THE PROBLEM:

The survey was conducted in various old age homes in Chennai (Adambakkam, Chrompet, Mylapore & Mugalivakkam). We framed a linguistic questionnaire and administered the same to 150 old age people living under different difficult circumstances. Based on our interviews, the listed are the psychological problems suffered by the old age people:

A_1 – Depression

A_2 – Isolation

A_3 – Lack of reason to Live

A_4 – Fear

A_5 – Disrespect

We analyze these problems using fuzzy matrix, where the problems are taken as the columns of the initial raw data matrix and the age group in years 61 – 63, 64 – 70, 71 – 75, 76 – 80 are the rows of the matrix.

3.1 Estimation of maximum age group of old age people affected by the psychological problems.

Table 1: Initial raw data matrix of order 4×6

	A_1	A_2	A_3	A_4	A_5
61 – 63	8	6	2	4	8
64 – 70	20	22	10	25	18
71 – 75	12	11	10	6	7
76 – 80	6	10	12	8	9

Table 2: ATD matrix of order 4×6

	A_1	A_2	A_3	A_4	A_5
61 – 63	2	1.5	0.5	1	2
64 – 70	2.86	3.14	1.43	3.57	2.57
71 – 75	2.4	2.2	2	1.2	1.4
76 – 80	1.2	2	2.4	1.6	1.8

Table 3: Average and S.D of the above given ATD matrix

Average	2.12	2.21	1.58	1.84	1.94
S.D	0.7	0.69	0.82	1.18	0.49

RTD matrix for $\alpha = 0.1$ row sum matrix

$$\begin{bmatrix} -1 & -1 & -1 & -1 & 1 \\ 1 & 1 & -1 & 1 & 1 \\ 1 & 0 & 1 & -1 & -1 \\ -1 & -1 & 1 & -1 & -1 \end{bmatrix} \qquad \begin{bmatrix} -3 \\ 3 \\ 0 \\ -3 \end{bmatrix}$$

RTD matrix for $\alpha = 0.3$ row sum matrix

$$\begin{bmatrix} 0 & -1 & -1 & -1 & 0 \\ 1 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & -1 & -1 \\ -1 & -1 & 1 & 0 & 0 \end{bmatrix} \qquad \begin{bmatrix} -3 \\ 4 \\ 0 \\ -1 \end{bmatrix}$$

RTD matrix for $\alpha = 0.5$ row sum matrix

$$\begin{bmatrix} 0 & -1 & -1 & -1 & 0 \\ 1 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & -1 & -1 \\ -1 & 0 & 1 & 0 & 0 \end{bmatrix} \qquad \begin{bmatrix} -3 \\ 4 \\ -1 \\ 0 \end{bmatrix}$$

RTD matrix for $\alpha = 0.7$

$$\begin{bmatrix} 0 & -1 & -1 & -1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & -1 \\ -1 & 0 & 0 & 0 & 0 \end{bmatrix}$$

row sum matrix

$$\begin{bmatrix} -3 \\ 2 \\ -1 \\ -1 \end{bmatrix}$$

RTD matrix for $\alpha = 0.9$

$$\begin{bmatrix} 0 & 0 & -1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & -1 \\ -1 & 0 & 1 & 0 & 0 \end{bmatrix}$$

row sum matrix

$$\begin{bmatrix} -1 \\ 4 \\ -1 \\ 0 \end{bmatrix}$$

Fig 1: Depicting maximum age group of old age people for $\alpha = 0.1$

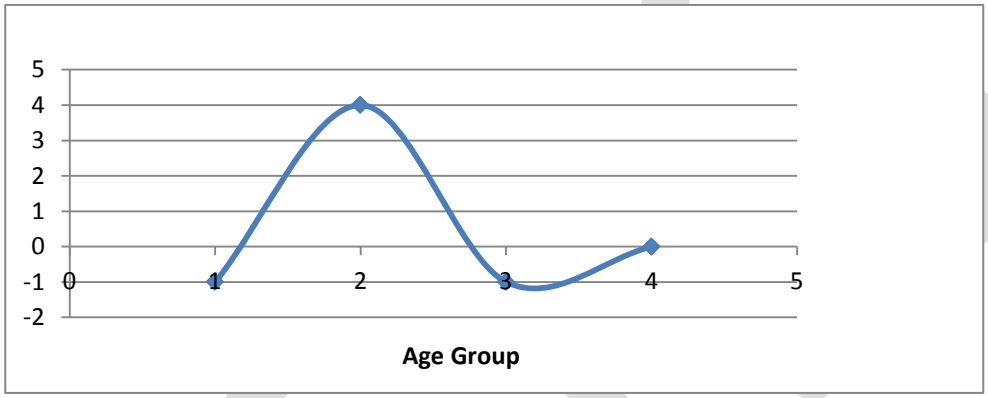


Fig 2: Depicting maximum age group of old age people for $\alpha = 0.3$

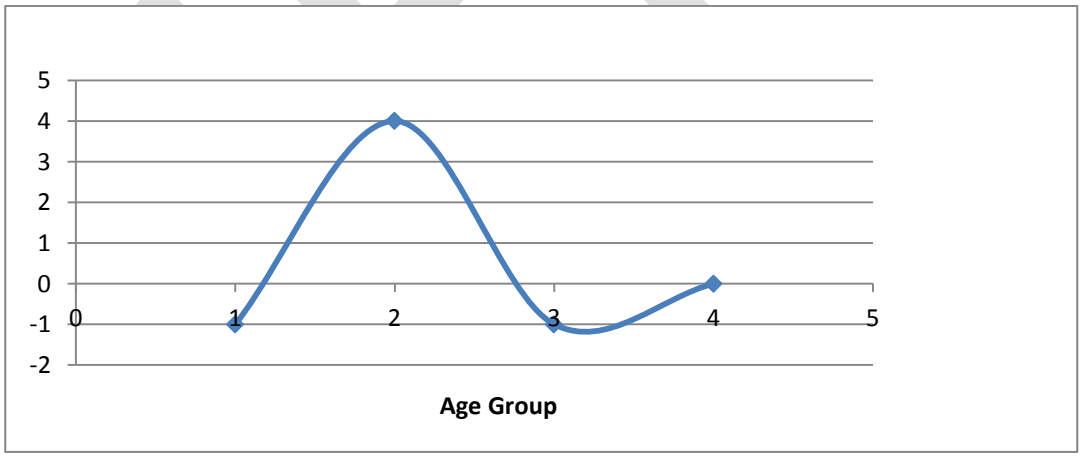


Fig 3: Depicting maximum age group of old age people for $\alpha = 0.5$

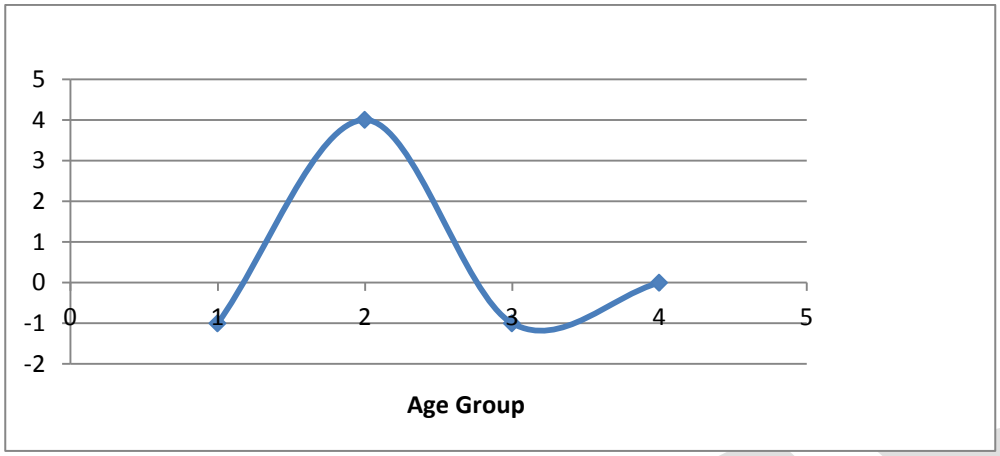


Fig 4: Depicting maximum age group of old age people for $\alpha = 0.7$

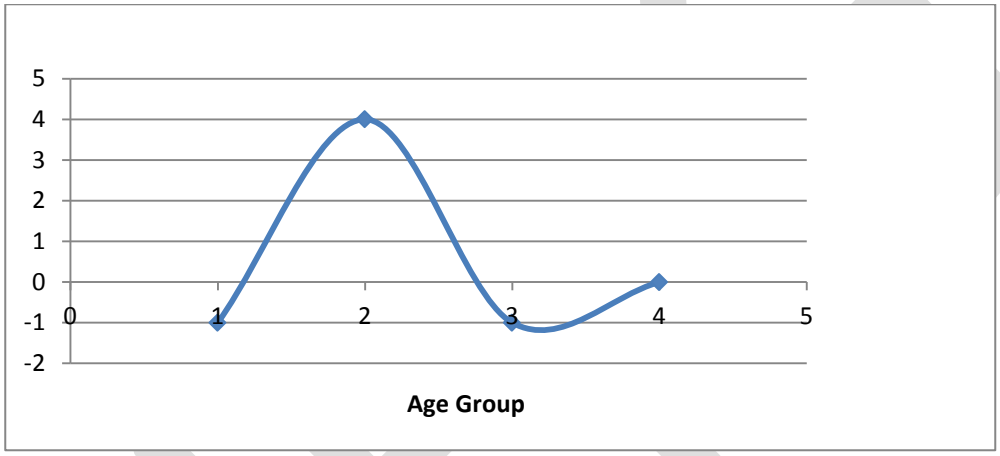
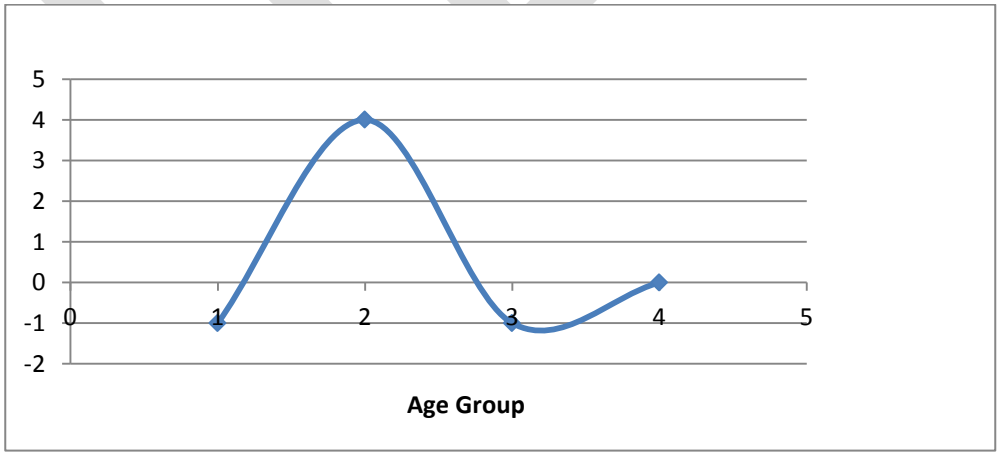


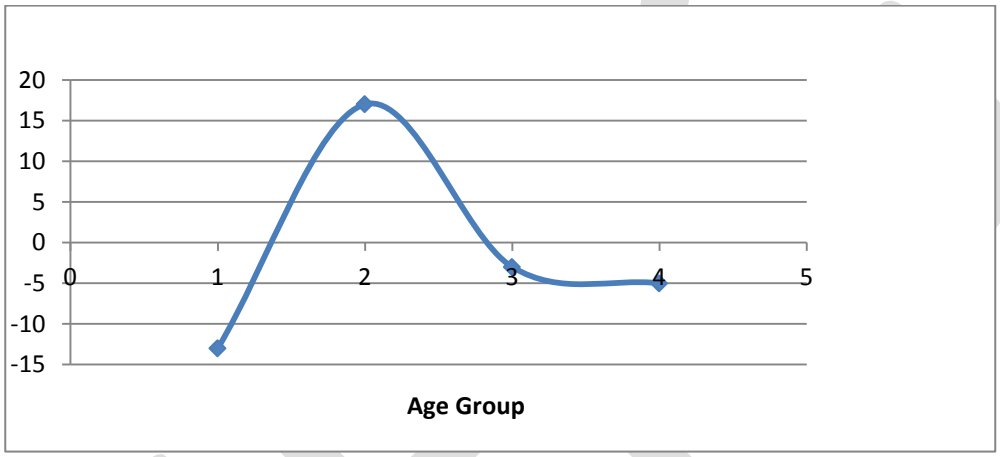
Fig 5: Depicting maximum age group of old age people for $\alpha = 0.9$



The CETD matrix

$$\begin{bmatrix} -1 & -4 & -5 & -4 & 1 \\ 4 & 4 & -1 & 5 & 5 \\ 2 & 0 & 3 & -3 & -5 \\ -5 & -2 & 4 & -1 & -1 \end{bmatrix} \qquad \begin{bmatrix} -13 \\ 17 \\ -3 \\ -5 \end{bmatrix}$$

Fig 6: Depicting maximum age group of old age people for CETD matrix



4.CONCLUSION

From the above CETD matrix analysis we found that 64 -70 is the maximum age group affected by psychological problems. Old people get angst for petty issues, they feel isolated and get depression. After retirement they will manage some years, but during 64 – 70 they suffer a lot and they were in a confused state, to decide whether to go to an old age home or stay with their children. After this period they have a clear idea to decide about their life.

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Design Of Human Powered Water Lifting System

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ABSTRACT – The objective of this paper is to design the water lifting system which is of human operated. In all over the world there are various types of water lifting systems currently in use. Some are electrically operated and some of them are mechanically operated and some are still traditional way of system. In India there are some basic types of water lifting system still in use such as Hand Pump, rope well. It can be use in everywhere but it need more manual power. Now electrically water lifting system is also in use. But drawback is electricity is costly and hence not efficient to use. Some of manual operated system is use like Traddle Pump and many other types of system using, but the design of this system is more critical and maintainance cost is high. The many water lifting system is not portable and does not reach the maximum height and also the rate of discharge is less. Other drawback is it is not easily availability of the spare parts once get damaged. Hence in this preview paper we are considering the all above points and proposed the new design concept of bicycle powered water lifting system. It is in simple in design and portable.

Keywords: Ergonomic, environment , pump , efficiency , discharge rate

INTRODUCTION

Engineering plays a major role in the human life with respect of ergonomics, social, economic development. From the past decades the human develops the engineering concepts as per the need and the depending upon their types. The human basic need is food, shelter and clothes. But the major problem is how to fulfil their needs. The researcher then found the solution of the basic problems. In ancient days engineering was not fully developed i.e. it was very difficult to work on any problem solving concept. After many study and hard work they able to use the concept properly. Now we are getting the things very easily because of their hard work. In today's day to day life the human are trying to modify the system by keeping the basic concept same. In past the many system they used were very critical in design the parts made by heavy metals. Once the any part of the system damaged, it was very difficult to repair and its cost is high. Also the maintainance cost is high. Coming to the point of important need i.e. water , the water is the main part of our life and without it the human can not survive. The water is the naturally resources available in the earth. It means the earth is the main source of the water. We get the water in its pure form i.e. without any impurity. In past decades the human stored the water by making the small pond , lake and well so that the water could store for long time because the river water continuous flows and it was very difficult to block the river water. The human uses the water to fullfil their thirst and and other water related works. Later on as the need of the water is increased, the system of providing the water to fullfil need is changed. In the world the water providing system is still continuously changing. The India also known as traditional country and is developing country. The major business of India is agricultural and many people in the country still fully depend upon farm business. Where there is farm the need of the water is also arises. Many system uses in the farm like well to lift water. Then newly introduced hand pump, traddle, electrically operated pump and many other system is using to provide water in the farm. But all that was stationary and electric are also very costly so it can not be used in small villages because of no power supply in many times and they also can not afford the electric pump. So they use the basic types i.e. well to lift the water. The hand pump is also used in the farm but it is stationary and requires more power to handle. The hand pump is also stationary system. In some areas the traddle is using but the remedies is that it is stationary and can not be portable. Also the spare part unavailability on time. Maintainance is also very important issue in the system. Once the system is installed it can not get changed as it occupies more space. In the urban areas the water is the main problem to get because as the country is developing, the many sky touching buildings are to be built. All the facility they gets but the water is major issues because in the ground level the water flow rate is high and as the the height of the building increased, it is difficult to reach water at the same rate. Hence the discharge rate of the water is very less. The top floor people unable to get the sufficient amount of water. Then they started using the electrically operated water lifting system, But the same problem came in front of them is electricity is very costly and maintainance is high and if it by-mistake handle not properly, it would be dangerous to the people living in and around the building. The main remedy is in summer season the motor gets heated soon. So it is also the main problem of water lifting. In summer season the electricity mostly shut down because of over heating. That time no use of the electric pump. Now by considering the urban and

rural positive and negative points of water lifting issues, the newly introduced water lifting system by using bicycle are to be used in this project. The human using this system is eco-friendly and simple in use. In all over eyes it is mostly suitable system for water lifting.

GENERAL PRINCIPLE OF WATER LIFTING:

Defination of Work, Power, Energy and Efficiency

By definition, the energy is required to do work; the power is defined as the rate at which it is used. To do a specific amount of work, the maximum or minimum amount of power is required depending upon type of work.

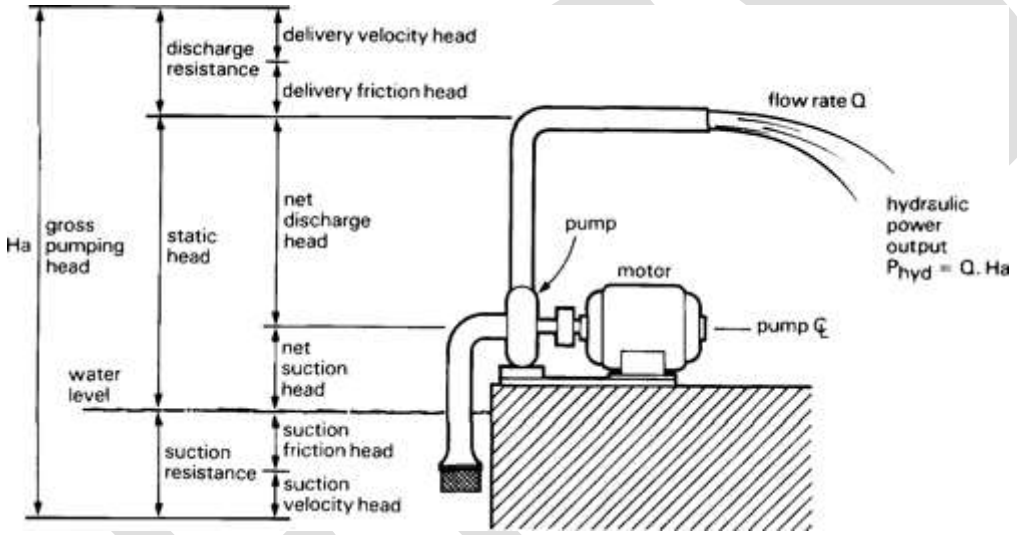

Fig: Typical pump installation

The general principle that,

$$\text{Power} = (\text{Head} \times \text{Flow rate})$$

$$\text{And Energy} = (\text{Head} \times \text{total amount of water lift})$$

This principle applies any type of water lifting system. The actual power and energy need are always greater than the hydraulic energy need because losses inevitably occur when producing and transmitting power or energy due to friction. The smaller the friction losses, the higher the quality of a system. The quality of a system in terms of minimizing losses is defined as its "efficiency":

$$\text{Where Efficiency} = \frac{(\text{Hydraulic energy output})}{(\text{Actual energy input})}$$

TYPES OF WATER LIFTING SYSTEMS:

HANDHELD PUMPS

Pneumatic (air) hand and foot pumps are commonly used today by people to inflate such things as tires, basketballs, and air mattresses. There are similar hand pumps that are used to pump water. A simple Modern lift pumps intended for village or community wells often are specially designed to support heavy, sustained use. This girl pumps water in Phai Sali, Thailand.
Example is the pump used in a toy squirt gun. A more practical example is a handheld pump for collecting small quantities of water.

BUCKET, WHEELS AND PADDLES

Long before recorded history, people used buckets and pots to lift and carry water from its source. Wheels and paddles also were employed. The devices could be powered by humans or animals, by wind, or by the water itself.

A few examples are discussed in the following paragraphs.

Human-powered devices traditionally were used to move water short distances and up low grades. This irrigation wheel in Japan was still being used in 1958 to irrigate a small plot.

THE SHADUF

An old and simple device that evolved from the hand-carried bucket, and that was used by the ancient Persians and Egyptians, was the shaduf. It consists of a pole with a bucket or pot on one end and a counterweight at the other end, and supported in between by a vertical post. A person grasps the pole and dips the bucket into a body of water such as a stream or river in order to fill it with water.

The counterweight then lifts the bucket, and the bucket is swung over and emptied into an irrigation ditch. * The shaduf is still used in rural Egypt.

WHEELS AND LOOPS

An advancement over devices that used a reciprocating cycle (i.e., filling a container with water, dumping the water, then repeating the cycle) was the development of devices that scooped and emptied water in a continuous motion. The sakkia (or saquiyah), introduced by the ancient Persians during the fifth century B.C.E. , uses animal power to turn a wheel or chain that has numerous, evenly-spaced buckets attached. At the lowest point the buckets are filled with water, which are then emptied at the highest level. Like the shaduf, sakkias are still in use today.

Human-powered water wheels probably were developed more than 2,000 years ago during China's Chin dynasty (221–207 B.C.E.). Such wheels are turned by one or more people walking on them .A variation arranged the paddles or scoops in a linear fashion on a looped device, somewhat resembling a modern escalator or conveyor belt. The series of scoops would be advanced by a human operator, perhaps by walking on foot pedals mounted on an axle connected to the paddles.

HYDRAULIC RAM PUMPS

A hydraulic ram is a self-powered device which pumps water using only water pressure. The ram pump was invented in 1773 in England, and first patented in France in 1796. Unlike human-powered and animal-powered devices, the hydraulic ram is independent of any external power source. If a ram is properly located and periodically maintained, it can pump continuously for decades.

A hydraulic ram uses a combination of water pressure, air pressure, and gravity to pump water with no external power source (e.g., without electricity). The ram in this photograph dependably delivered spring water to a household in east-central Tennessee from the 1920s through the 1970s. The ram is shown in mid-stroke, when a spurt of water is wasted through an outside valve.

PROBLEMS IN CURRENT SYSTEM:

The following points are to be considered in the current system –

- In the current design system there are some design issues such as very critical in design to understand.
- Lake of deep study of need of human and as per the design correctly.
- Material cost is high.
- Limited life of the system.
- Once it is repaired, need to repair frequently.
- Noise occurs when started.

FUTURE SCOPE:

There is very bright future of this project because it will get the opportunities to make it always better than previous in all sorts e.g. in cost, design. The water lifting system related data and research data will be available for future reference. There are mainly two types of water available on earth such as normal water which we can get from river, rain water and second is salted water. When we processed the salted water to become use for our daily purpose, some impurities still present in water and when we lift that impure water, it affect on the system and the possibilities of damage and the layer of salt is obtained after some time. So in this project we are going to design the system in which salted water after processing when lifted, and if still impurity is present, the system automatically detect the impurity and that impure water filtered by the filtration process available in the system. And the pure water will be lift.

CONCLUSION:

The main purpose of this paper is to provide a basis for comparing and choosing between all present and future option for lifting water. It is also useful in the design of water lifting system for urban and rural areas. In it the waste material is also used for making the system less costly. This system can be use for salted water also.

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PECULIARITY OF NUCLEUS IN ALTERNATIVE RINGS

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ABSTRACT: In this paper we have proved that the peculiar property of nucleus (N) in an alternative ring (R) i.e nucleus contracts to centre C when alternative ring is octonion and nucleus expands to whole algebra when the alternative ring is associative.

KEYWORDS:, commutator, c Associator entre, Nucleus, Octonion, Moufang laws, Alternative ring.

INTRODUCTION: Alternative rings arose out of the work of Ruth Moufang in 1930's When he put his attention mainly on multiplicative structure of alternative division ring .The next prime mover was E.G. Goodaire[1]He shows that alternative loop algebras does not exists. E.Kleinfled[2,3,4,5], R.H. Bruck[6],Emil Artin and Macdonold gives a beautiful characterization of alternative algebras. Armin Thedy[7,8,9] discussed about right alternative rings.Slater[10,11] gives an idea about purely alternative rings concept.Kevin Mc Crimmon [12,13]in his A taste of Jordan algebras mention peculiarities of alternative nucleus.Alternative rings derive their name from the fact that in an alternative ring the associator is an alternating function through linearization.

PRELIMINARIES: A ring R is said to alternative ring in which left and right alternative laws satisfies.

$$(p^2q) = p(pq)$$

$$(qp^2) = (qp)p$$

In nonassociative ring theory two important functions are commutator and associator defined as

$$(pq) = pq - qp$$

$(pqr) = (pq)r - p(qr)$ for all p,q,r in R.

An alternative algebra is automatically flexible which satisfies the commutation relation $(pq)p = p(qp)$ Alternatively is equivalent to the associator (p,q,r) being an alternating multilinear function of its arguments i. e in the sense that it vanishes if any two of its variables are equal

$$(p,p,q) = (q,p,p) = (p,q,p) = 0$$

The very interesting and peculiar property is that in non associative ring the centre and ,nucleus are associative defined as follows

Nucleus(N) = $\{ \alpha \in R / (\alpha,\beta,\beta) = (\beta,\alpha,\beta) = (\beta,\beta,\alpha) = 0 \}$

Centre (c) = $= \{c \in N / (C,R) = (C,R,) = 0 \}$

Nuclearity conditions can be written in terms of associators as $(n, p, q) = (p, n, q) = (p, q, n) = 0$ so alternation nuclearity $(p, q, n) = 0$ reduces to $(n, p, q) = 0$ in alternative algebra. In general these identities are quadratic in p so they automatically linearize and all scalar extensions of alternative algebras are again alternative

The fundamental and most extremely useful tool in nonassociative algebra is linearization using this concept we replace a repeated variable or an identity by the sum of two variables in order to obtain another identity like $(p, r, q) = -(r, p, q)$,

$$(p, q, r) = -(p, r, q)$$

Alternative rings automatically satisfy flexible identity known as Moufang lemma.

$$(p, q, p) = 0$$

$$\Rightarrow \quad (p, q, p) = -(p, p, q) = 0$$

The flexible identity says $pq.p = p.qp$ in other words the expression pqp is unambiguous in an alternative ring.

Kleinfield function f : $R^4 \rightarrow R$ defined as

$$f(\omega, p, q, r) = (\omega p, q, r) - p(\omega, q, r) - (p, q, r)\omega \text{ ----------(1)}$$

$$(p^2, q, p) = p(p, q, r) + (p, q, r)p \text{ ----------(2)}$$

If the characteristic is not two, the liberalized relation implies the flexible property valid in any ring known as Teichmuller identity

$$(\omega p, q, r) - (\omega, pq, r) + (\omega, p, qr) = \omega(p, q, r) + (\omega, p, q)r \text{ ----------(3)}$$

Alternative algebra satisfy the Moufang left, middle, right laws and bumping formula which plays a vital role they are

$$((pq)p)r - p(q(pr)) \text{ ----------(4)}$$

$$(pq)(rp) = p(qr)p \text{ ----------(5)}$$

$$((pq)r)q - p(q(rq)) \text{ ----------(6)}$$

$$(p, q, rp) = p(q, r, p) \text{ ----------(7)}$$

The respective proofs (3) to (7) are as follows,

$$(\omega p, q, r) - (\omega, pq, r) + (\omega, p, qr)$$
$$((\omega p)q)r - (\omega p)(qr) - ((\omega(pq))r - \omega((pq)r)) + ((\omega p)(qr) - \omega(p(qr)$$

$$((\omega p)q)r - (\omega p)(qr) - (\omega(pq))r + \omega((pq)r)) + (\omega p)(qr) - \omega(p(qr))$$

$$((\omega p)q)r - (\omega(pq))r + \omega((pq)r)) - \omega(p(qr))$$

$$((\omega p)q - \omega(pq))r + \omega((pq)r - p(qr)$$

$$(\omega, p, q)r + \omega(p, q, r)$$

Moufang laws

$$((pq)p)r - p(q(pr)) = ((pq)p)r - (pq)(pr) + (pq)(pr) - p(q(pr))$$

$$= (pq, p, r) + (p, q, pr)$$

$$= (q, p, r)p + (pr, p, q)$$

$$= (q, p, r)p + (r, p, q)p = 0$$

Similarly middle and right laws,

$$(pq)(rp) - p(qr)p = (pq)(rp) - ((pq)r)p + ((pq)r)p - p(qr)p$$

$$= -(pq, r, p) + (p, q, r)p$$

$$= (pq, p, r) + (p, q, r)p$$

$$= (q, p, r)p + (p, q, r)p = 0$$

$$((pq)r)q - p(q(rq) = ((pq)r)q - (pq)(rq) + (pq)(rq) - p(q(rq))$$

$$= (pq, r, q) + (p, q, rq)$$

$$= -q(p, q, r) - q(r, q, p) = 0$$

Bumping formula as $(p, q, rp) = -(p, q, pr) - (r, q, p^2)$

Using Jordan algebra and linearization

$$= (p, pr, q) - (p^2, r, q)$$

By alternativity and left alternativity,

$$= (p^{2^z} r)q - p((pr)q) - (p^2 r)q + p^2(rq)$$

$$= -p((pr)q) + p(p(rq))$$

$$= -p((pr)p - p(rq))$$

$$= -p(p, r, q)$$

By using alternativity

$= p(q,r,p)$ [illegible]

MAIN RESULTS:

Lemma: If R *is* an alternative with nucleus $N = Nuc(R)$ then for any element $n \in N, p,q,r \in R.$, it satisfies

(1) Nuclear slipping formula

$$n(p,q,r) = (np,q,r) = (pn,q,r)$$

(ii) The nucleus is commutator closed $(N,R) \subseteq N$

(iii) It satisfy nuclear product relations $(N,X)p \subseteq N, (p,n)(p,q,r) = 0$ for any $p,q,r \in R.$.

(iv) Nuclear commutators absorb R and annihilate associators.

$$(N,N)R \subseteq N, (N,N)(R,R,R) = 0$$

(v) If C satisfy $(C,R) \subseteq C \subseteq N$ then If $c \in (C,C)$ it has $c^{-1} \in R$ then $R = C$ is associative.

PROOFS: From the equation (3)

$$(\omega p,q,r) - (\omega, pq,r) + (\omega, p,qr) = \omega(p,q,r) + (\omega, p,q)r$$

Put $\omega = n \in N_\alpha$

$$(np,q,r) - (n, pq,r) + (n, p,qr) = n(p,q,r) + (n, p,q)r$$

$$\Rightarrow (np,q,r) = n(p,q,r)$$

$$\Rightarrow (np - pn,q,r) = n(p,q,r)$$

$$\Rightarrow (np,q,r) - (pn,q,r) = n(p,q,r)$$

$$\Rightarrow (np,q,r) = (pn,q,r) = n(p,q,r)$$

Known as nuclear slipping formula.

ii) $(N,R) \subseteq N$

since $(n,p)p \in N \Leftrightarrow ((n,p)p,R,R) = 0$

$$\Leftrightarrow (n,p)(p,q,r)$$

By using nuclear slipping formula

Hence $(n,p) \subseteq N$

$$\Rightarrow (N,R) \subseteq N$$

(iii) From equation (3) and (1)

$$f(p,q,r,n) = (pq,r,n) - q(p,r,n) - (q,r,n)p = 0$$

$$\Rightarrow f(n,p,q,r) = (np,q,r) - p(n,q,r) - (p,q,r)n = 0$$

which gives $(np,q,r) = (p,q,r)n$

Similarly $(pn,q,r) = n(p,q,r)$

$$(pn,q,r) - (p,nq,r) + (p,n,qr) - p(n,q,r) - (x,n,q)r = 0$$

$$\Rightarrow (pn,q,r) - (p,nq,r) = 0$$

So $(pn,q,r) = (p,nq,r)$,

since $(pn,q,r) = (nq,r,p) = (q,r,p)n = (p,q,r)n = (np,q,r)$

Thus we obtain $((n,p)q,r) = 0$ thus $(p,n) \in N$

Now by using equation (2)

$$((qp,n) = q(p,n) + (q,n)p$$

$$\Rightarrow ((q,p,n),p,r) = 0$$

$$\Rightarrow ((q(p,n)p,r) + ((q,n)p,p,r) = 0$$

$$\Rightarrow (p,n)(q,p,r) + (p,p,r)(q,n) = 0$$

$$\Rightarrow (p,n)(q,p,r) = 0$$

(iV) Linear zing $p \to p+m$ for $m \in N$ in result (2) gives (7)

$(N,p)p \subseteq N$, $(N,p+m)(p+m) \subseteq N$, $((N,p)+(N,m))(p+m)$

$$(N,p)p + (N,p)m + (N,m)p + (N,m)m$$

$$\Rightarrow (N,p)m + (N,m)p = 0$$

$$\Rightarrow (N,p)m = -(N,m)p \subseteq N$$

Similarly, we get

$$(n,m)(p,q,r) = -(n,p)(m,q,r)$$

$\Rightarrow (n,m)(p,q,r) = 0$ Since $(N,N)R \subseteq N$

$$\Rightarrow (n,m)(R,R,R) = 0$$

(V) If $C \supseteq cR \supseteq c(c^{-2}(cR))$

$= (cc^{-2}c)(R)$

Using left Moufang

$= IR = R$

$\Rightarrow N \supseteq C \supseteq R \supseteq N$

$\Rightarrow N = C = R.$

Thus all these properties are also true in associative algebra where $(p,q,r) = 0$ and

$N = R$ and in octonion algebra where $N = cen(R), (N,R) = 0.$

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Surveying Cloud Storage Correctness using TPA with BLS

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Abstract— In cloud computing, data is moved to a remotely located cloud server. Cloud storage in which data is stored on remote servers and is accessed by the user. Even though there is a benefit in accessing the data from the remote servers there raises security problem. After moving the data to the cloud data owner thinks that the data is secured and safe. But this hope may fail sometime because the data on the cloud may be altered, deleted o may be corrupted .For this scheme the user must download the data each time to validate it. But this scheme is very inefficient for the large data files. Thus by enabling public auditability user can resort to a third-party-auditor (TPA) to check the integrity of the outsourced data.

In this Paper we proposed a system which is based on Bi-linear pairing, which covers many recent proof of storage systems because existing system are based in HLA and HLA-based systems are not privacy preserving. Our main scheme is based on a specific BLS scheme SHA2 based solution. There we are going to present a new technique for the key generation scheme bases on bilinear pairing unlike BLS & it is assume to be proven best experimentally & to increase user experience. Also here we are using SHA2 in place of cryptography map to point hash function.

Keywords—Bi-linear pairing, BLS, Secure Hashing Algorithm-2, Public Auditing, TPA, Secure cloud authentication, Secure Data verification, IAAS & PAAS.

INTRODUCTION

You can put the page in this format as it is and do not change any of this properties. You can copy and past here and format accordingly to the default front. It will be easy and time consuming for you. This Cloud computing means store and access data and programs over the Internet instead of our computers hard drive. Cloud computing, often referred to as simply "the cloud," is the delivery of on-demand computing resources—everything from applications to data centers—over the Internet on a pay-for-use basis. Cloud resources are usually not only shared by multiple users but are also dynamically reallocated per user's demand. NIST [1] defines cloud computing by describing five essential characteristics, three cloud service models, and four cloud deployment models.

They are summarized in visual form in figure 1.Organizations use the Cloud in a variety of different service models (SaaS, PaaS, and IaaS) and deployment models (Private, Public, and Hybrid). As the user store data remotely to the cloud, it brings many benefits like user is free from the burden of storage management, hardware and software maintenance, location independency and has the ease of universal data access. But it also brings many challenges in the context of security of outsourced data.

As the data is not physically present in user's storage we cannot adopt traditional cryptography methods to encrypt the data, downloading complete file only for verification is very difficult If the outsourced data is very large in size the task of auditing is formidable and very expensive. All these problems can be solved by enabling public auditing. In public auditing user can rely on the third party for the verification of his outsourced data. Enabling public auditing leads to many rewards like:

1. Auditor checks the integrity of data periodically.
2. Save the cloud user's computational resources and reduces online burden.
3. It is easier and affordable for the user to check the data's integrity and correctness.
4. It also reduces the time consumption as we don't need to download data to check its correctness. It can be verified on the cloud.
5. Using public auditing the user not suffer from the complexity in verifying data and hence it increases efficiency.

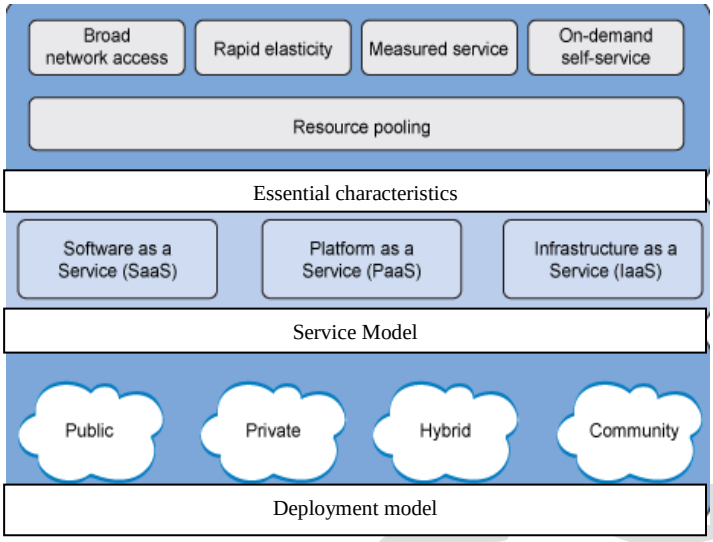

Fig.1. NIST Model of Cloud Computing

Most of the schemes described in paper [8],[9],[11],[12] had not consider the privacy of outsourced data in opposition to external auditors. Third party auditing provides cost effective method for uses. We assume that external auditor in the business of auditing is reliable but it may harm the user if it could learn the data in the audit. This severe drawback greatly affects the integrity and privacy of data. The data can be leaked and can be misused by the external auditors.

To address these problems we work on the techniques for achieving public auditing without the information leakage. Without learning the data contents the third party auditor has to perform auditing process.

PRELIMINARIES AND DEFINITION

This section contains introduction to the important terms used in our paper and their definitions. System model is also introduced in this section.

a) ***The System Model***

We consider a cloud data storage service involving three different entities, as illustrated in Fig. 2:

1. *The cloud user*, who has large amount of data to be stored in the cloud;
2. *The cloud server*, which is managed by the cloud service provider to provide data storage services & resources;
3. *The third-party auditor*, who has the capabilities to check the integrity and correctness of the data stored in cloud.

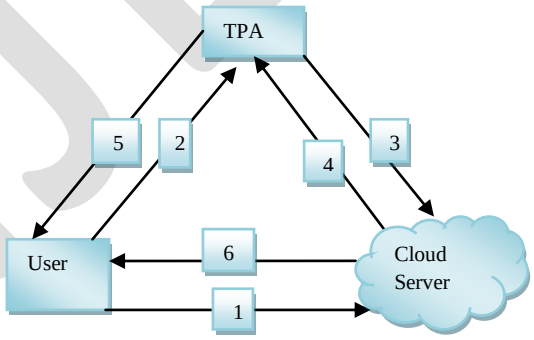

Fig 2.The architecture of cloud data storage service

Each steps mentioned above are consisting of different algorithm to perform the task. They are described as follows:

1. Data outsourcing: In this phase data to be outsourced is first encoded.

I. Key generation phase: First they generate some keys for coding and call encode function to create blocks of file and then perform the encoding the file

II. Signature generation phase: In this phase signature is generated of the coded data file.
Now user needs to send the data to the server with the verification metadata and deletes its local copy.

2. Verification: In this phase user sends the request for the verification of the outsourced data.

3. Public Verification (Challenge): In this phase TPA creates a challenge and sends the challenge to the cloud server and get back a corresponding response from the server.

4. Public Verification (Response): In this step server generate the proof of the challenge sent by TPA. And send back the proof as a response message to the TPA.

5. Verification Response: In this step TPA verify that the data block is damaged or not by calling the verification algorithm.

6. Data Extraction: If data is verified then user can extract the data from the server.

b) *Bilinear Pairing*

Pairing-based cryptography is the use of a pairing between elements of two cryptographic groups to a third group to construct cryptographic systems. Now we understand the bilinear mapping mathematically: Let G_1, G_2, and G_t be multiplicative cyclic group of order p. Let g_1 and g_2 be the generator of G_1 and G_2 respectively. Then, a bilinear map e is a map where

$$e: G_1 \times G_2 \rightarrow Gt$$

Bilinearity: For all u Є G1, v Є G2 and a, b Є Zp,

$$e(u^a, v^b) = e(u, v)^{ab}.$$

Computability: There exists efficiently computable algorithm for computing map e.

c) *Secure Hash Algorithm(SHA-2)*

SHA-2 is a set of cryptographic hash function. We are using SHA-2 in our proposed scheme. The SHA-2 family mainly consists of six hash function: SHA- 224, SHA-256, SHA-384, SHA-512, SHA-512/224, SHA-512/256.SHA-256 has the longer hash value than SHA-1 and hence it is more secure than SHA-1. The SHA-256 Algorithm works on the fallowing steps: Message is processed in 512-bit blocks sequentially, just like SHA-1. Message digest is 256 bits instead of SHA-1's 160-bits. 64 rounds instead of 80 rounds of compression

Algorithm structure same as SHA-1

- Step 1: Padding bits
- Step 2: Appending length as 64 bit unsigned
- Step 3: Buffer initiation
- Step 4: Processing of message
- Step 5: Output

We are using SHA-256 in our proposed scheme as it is more securing than other algorithm Here (in TABLE I) we have given a comparison among different hashing algorithm.

d) *BLS Signature Scheme*

There is a basic signature scheme known as the BLS scheme. It has the shortest length among signature schemes in classical cryptography. The scheme is based on Weil pairing and can be obtained from the private key extraction process of Boneh-Franklin's [11] ID-based encryption scheme. BLS short signature needs a special hash function. The signature scheme is consist of three steps:

- *Key generation,*
- *Signing and*
- *Verificatio*n

COMARISION AMONG HASHING ALGORITHMS

S. No.	*FACTORS*	*MD-5*	*SHA-0*	*SHA-1*	*(SHA-256)*
1.	**O/p size (bits)**	128	160	160	256
2.	**Internal state size (bits**	128	160	160	256
3.	**Block size (bits)**	512	512	512	512
4.	**Max message size (bits)**	$2^{64} - 1$	$2^{64} - 1$	$2^{64} - 1$	$2^{64} - 1$
5.	**Word size (bits)**	32	32	32	32
6.	**Rounds**	64	80	80	64
7.	**Operations**	+, And, Xor, Rot	+, and, or, xor, rot	+, and, or, xor, rot	+, and, or, xor, shr, rot
8.	**Collision**	Yes	Yes	Yes	Not yet

LITERATURE REVIEW

Recently, much of growing interest has been attended in the context of remotely stored data auditing [2], [6], [7], [8], [9], [10], [11], [12].

Ateniese et al. [9] are the first who considered the public auditability in their defined "provable data possession" model for ensuring possession of files on untrusted storages. In their scheme, they utilize homomorphic tags used for verification process and it is based on RSA with HLAs for auditing outsourced data, thus public auditability is achieved.
Disadvantage: In this research paper they had not considered the case of dynamic data, and the direct adoption of their scheme from static data to dynamic data suffered design as well as security problems.

In their subsequent work of "Scalable and Efficient Provable Data Possession" [10], Ateniese et al. propose a extended and dynamic version of the prior PDP scheme. They only extend their previous scheme in their next paper.
Disadvantage: However, their system is dynamic still their system demands a priori bound on the number of queries. It also does not support fully dynamic data operations, that is, it allows basic block operations with limited functionality.

In [11], authors considered the dynamic data storage with a distributed scenario. Here Wand et al. proposed a challenge-response protocol by which they can determine both the data correctness and locate possible errors.
Disadvantage: Similar to [10], they only considered partial support for dynamic data operation.

In [8] authors describe the "proof of retrievability" (PoR) model. According to the Juels et al. in "Pors: Proofs of Retrievability for Large Files" model spot-checking and error-correcting codes are used. They are used to ensure both possession and retrievability of data files on remote archive service systems. A POR is a protocol in which a server proves to a client that a target file *F* is intact or unchanged. In a native POR, a client might simply download *F* itself and check an accompanying digital signature.
Disadvantage: However, the number of audit challenges a user performs is fixed a priori. And hence public auditability is not achieved in their main scheme. And this approach only works with encrypted data.

Shacham and Waters [6] design an improved PoR scheme with full proofs of security in the security model defined in [8]. They use publicly verifiable homomorphic authenticators or HLAs built with BLS signatures [14], based on which the proofs can be aggregated into a small authenticator value, and public retrievability is achieved.

Erway et al. were the first to explore constructions for dynamic provable data possession. In their work [12] they extend the PDP model in [9] to support provable updates for stored data files using rank-based authenticated skip lists. This scheme is a fully dynamic version of the PDP solution.

In the paper "Enabling Public Auditability and Data Dynamics for Storage Security in Cloud Computing" Qian Wang et al.[7] particularly try to achieve efficient data dynamics, they improve the existing proof of storage models by manipulating the Merkle Hash Tree construction for block tag authentication.. To efficiently handle multiple auditing tasks, they explore the technique of bilinear aggregate signature to extend their main result. Here TPA can perform multiple auditing tasks simultaneously.

Boyang Wang et al. [2] proposed Oruta, a privacy-preserving public auditing technique for shared data. They use ring signatures to construct homomorphic authenticators, so that a public verifier is able to audit shared data without retrieving the entire data. They further extend their mechanism to support batch auditing.
Disadvantage: It suffers from the drawback of traceability, which means the ability for the original user to reveal the identity of the signer based on verification metadata in some special situations. As Oruta is based on ring signatures, where the identity of the signer is protected, this design does not support traceability.

PROBLEM FINDING

Before giving our main result, we study two classes of Schemes:

1. MAC based solution and
2. HLA based solution

Message Authentication Coded (MAC) based solution is also separated in two schemes:

Scheme I: In this scheme the user pre computes the MACs of each block of the data file and send both file and the MACs to the cloud server. Simultaneously it also sends the secret key to the TPA. At the time of audit TPA request for the data clocks and their corresponding MACs from the cloud server and check the correctness of the data. This simple solution for verification of data suffers from severe drawbacks. Firstly, as TPA demands for user's data it violates the privacy preserving guarantee & suffers from large communication overhead.

Scheme II: To improve the first scheme new solution is proposed. It avoid retrieving of data from the server .Before outsourcing the data the cloud user chooses *s* random MAC keys, pre compute s MACs for the complete data file, and this to verification data to the TPA. For verification, each time TPA reveals the secret key to the cloud server and ask for a fresh keyed MAC for comparison. Here auditing is limited by number of secret keys generated that to be fixed priori. And TPA has to maintain and update state of audits. And it is very difficult and error generating procedure for the TPA.

Homomorphic Linear Authenticator: Existing system based on HLA which is not preserve to privacy. HLA like MAC are verification metadata that are used for checking of the integrity of the data block. But unlike MAC, HLA can be aggregated. HLA based on homomorphic linear authentication which not privacy is preserving because in HLA linear combination of block may potentially reveal user data information to TPA.

PROPOSED WORK

In this Paper we proposed a system which is based on Bi-linear pairing. Both systems HLA & MAC are not privacy preserving. Our main scheme is based on a specific BLS scheme SHA-2 based solution.

Message authentication is a processing of message with a private key to produce a digital signature. Thereafter anyone can verify this signature by processing the signature with the signer's corresponding public key and compare that result with the message. Success confirms the message is unmodified since it was signed. And also the signer's private key has remained secret to the signer i.e. the signer, and no one else, performed the signature operation. In practice, typically only a hash or digest of the message, and not the message itself, is encrypted as the signature. A signature scheme consists of the following four algorithms:

1. ParamGen is a parameter generation algorithm.

2. KeyGen is a key generation algorithm.
3. Sign is a signature generation algorithm.
4. Ver is a signature verification algorithm.

Now, we are describing the new signature scheme as follows:

Step 1: ParamGen: The system parameters are {P, H, e, G1, G2, q} are generated here. Here, P is a generator of G1 in order to q, H is a hash function and bi-linear pairing is given by:

*e :G1*G1=G2.*

Step 2: KeyGen: A user he/she randomly chooses x which belongs to Z_q^* and compute $P_{pub} = xP$.
Where Z_q^* is a collection of large random numbers.
Then the user's public key is P_{pub}. And his secret key is x.

Step 3: Signing: given a secrete key x and a message m, then he/she computes $S = (H(m) + x) P$
Here, signature is S and H(m) is the hash of the message.
The user uses cryptographic hash function SHA-2 for generating hash function. Then, user send message or file along with the verification data i.e. digital signature S to the server and delete file/message from local storage.

Step 4: Verifying: For the verification we are using TPA. If the TPA wants to check the integrity of message he creates a challenge (*chall*) for verification. In response server sends the proof of data storage correctness, which is the hash of message. Then TPA verifies the signature in the fallowing manner: For a given public key P_{pub}, a message m and a signature S verify,

if, $\{e(H(m)P + P_{pub}, S) = e(P,P)\}$.

The verification work because of the following equation:

$e(H(m)P + P_{pub}, S) = e((H(m)+x)P,(H(m)+x)P)$

$e(H(m)P + P_{pub}, S) = e(P, P)$

EXPERIMENTAL SETUP

We have set up an experiment to justify our approach with the cloud. Our storage auditing protocol consists of two phases: Setup phase and Audit phase.

SETUP PHASE:

The first one is the setup phase. Here Cloud user register itself to the cloud, generate parameter and upload file to the cloud server. Here cloud user also generate signature and send it to the TPA.

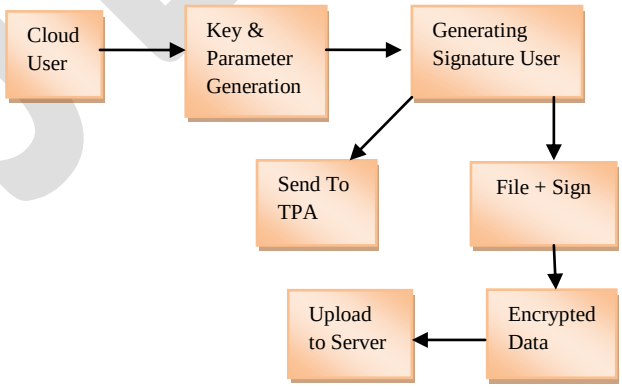

Fig. 3.Setup Phase of our Scheme

AUDIT PHASE:

Second one is the Audit phase. Here cloud user send request to TPA for the audit of outsourced data. TPA send auditing challenge to server. In response server generates a response message and send it to the TPA. Then, TPA performs the auditing of the data stored on the cloud server.

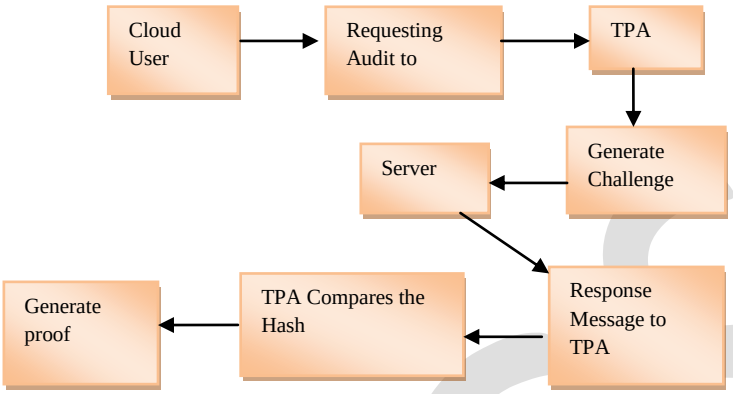

Fig.4 Audit Phase of our Scheme

IMPLEMENTATION FLOW

Before

Implementation flow describes the flow of our experimental setup i.e. how experiment is working. Here we have taken three modules for describing the flow of our implementation work. Three modules of our setup are as fallow:

1. User module
2. Cloud server module and
3. TPA Module

The entire three modules provided with login credential to maintain its own account and can run on different machine from anywhere availability of access to the cloud.

Once the experimental setup is done with the machine, here we are started to perform with the data and to upload on to the machine and started performing to generate the signature and parameters using BLS algorithm to generate encrypted data in order to upload on to the cloud and perform a safely storage on to the cloud server.

***[1] User Module**:*

It is Cloud Client Registration module. This module is used to create network which consist of Users and Server to communicate with each other. So here we create a network which consists of Data Owner/ User and the Cloud server (Fig 5). Here the cloud user registers itself to the server so that cloud user can store data on the cloud server. User can also request TPA to audit the file stored on remote server (Fig 7).

[2] Cloud Server Module:

After registering with cloud and getting login details to access the operation the user can perform fallowing operations on server like file uploading, file editing. In the mention diagram (fig 6) user get connected and can upload its required file to keep on to the server and before that user can encrypt it, and store on the cloud.

[3] TPA Module:

The Trusted Party Auditor is a module which is used to the audit the data that are uploaded by the Data Owner in the Server. So that TPA will audit data based on the Owner's request. Once it received the request from data owner, it checks the data integrity stored in cloud server.

In this phase (Fig 8) TPA is logged in and the file uploaded and requested by the user can be audited with the cloud block and perform the integrity check by generating our current scheme decryption and hashing technique. And once the data blocks are safe user can perform download operation with the data to get ensure about the data security.

Fig 5(User Registration)

Fig 6(file upload and encryption phase)

Fig 7(Send request for Auditing)

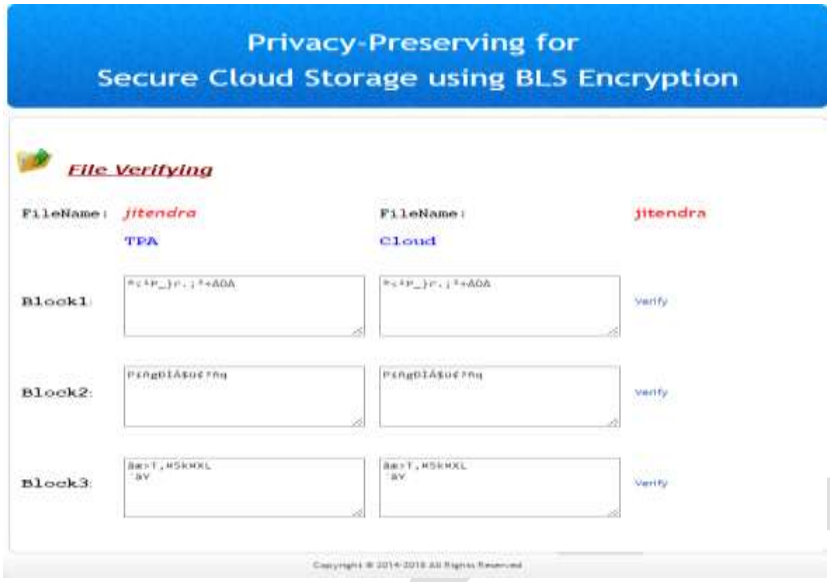

Fig 8(Auditing phase)

ANALYSIS OF OUR AUDITING PROTOCOL

Our main goal is to enable public auditing for cloud data to become a reality. Thus, the whole architectural design should not only be cryptographically strong, but, more importantly, it should be practical from a systematic point of view.

We briefly elaborate a set of suggested desirable properties below that satisfy our scheme. The in-depth analysis is discussed in this section.

- Security Analysis:

Thus the system is based on the BLS scheme where its giving the advantage over the current MAC and HLA based scheme, it is providing us a privacy preserving approach which tell the data is not being shared with the cloud or any other level.

As described above about the proposed system it is faster in process than the current system. The existing system may leak the data and give the poor performance. The direct adoption of HLA based technique is still not suitable because the linear combination of blocks, $\mu=\Sigma_i\ v_i\ m_i$. It may potentially reveal user data information to TPA, and violates the privacy guarantee. Specifically, by challenging the message block $m_1, m_2 \ldots\ldots m_n$ using different sets of random coefficients $\{v_i\}$. TPA can accumulate different linear combinations $\mu_1, \mu_2 \ldots \mu_n$. With $\{\mu_i\}$ and $\{v_i\}$, TPA can derive the user's data M by simply solving a system of linear equations.

Where as in our system, as it won't have to go throw those steps it makes our system faster and more security thus it increase our system performance.

- *Performance Evaluation:*

We now assess the performance of the proposed public auditing scheme. The experiment is conducted using Java on a Windows system with an Intel Core 2 Duo processor running at 2.00 GHz, 2 GB of RAM, and 32 bit of Operating System. All experimental results represent the mean of 30 trials.

We begin by estimating the performance of our proposed scheme in terms of the time required by the operations to execute successfully. We quantify the time taken by the privacy preserving auditing in terms of file uploading, server computation and auditor Computation. First before uploading we have taken a variable t which is being initialized by 0. Then on performing a particular task again we have calculated the time being taken by the system to execute the operation and monitored the new time on machine. Performance under different small size of data is illustrated in TABLE II

PERFORMANCE UNDER DIFFERENT SIZE OF DATA

	Data Size (Byte)	*File uploading Time (ms)*	*Server Computation time (ms)*	*TPA computation time (ms)*
Our Scheme	460	230	318	487
	300	223	217	355
Existing Scheme (15)	460	Not mention	335.17	530.60
	300	Not mention	219.27	357.53
(6)	460	Not mention	333.23	526.77
	300	Not mention	217.33	353.70

As we can see that our scheme works efficiently in comparison with the other scheme. Now to check the efficiency of our scheme we compare it with other scheme but with a large data file. We can see that our proposed scheme work accurately with large data files too. And hence, the proposed method provides an efficient and accurate solution for the auditing of the data through a third party using our proposed system. Illustrated table (TABLE III) gives the comparison of proposed scheme with the previous schemes under large sized of data files

PERFORMANCE UNDER DIFFERENT SIZED DATA

	Data Size (Byte)	*File uploading Time (ms)*	*Server Computation time (ms)*	*TPA computation time (ms)*
Our Scheme	4600	250	330	490-510
	3000	223	230	350-365
Existing Scheme (15)	4600	Not mention	361.56	547.39
	3000	Not mention	242.29	374.32
(6)	4600	Not mention	342.91	543.35
	3000	Not mention	223.64	370.29

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CONCLUSION

Cloud Computing is emerging technology and gaining remarkable popularity in the recent years for its benefits in terms of flexibility, scalability, reliability, efficiency and cost effectiveness. Despite of all these benefits, Cloud Computing has one problem: Security, we analyze the problems of data security in cloud storage, which is a distributed storage system. An effective and flexible scheme is proposed in our paper to ensure the integrity and correctness of the data stored in cloud server. By detailed security and performance analysis, we show that our scheme is very efficient for checking integrity, probity and correctness of user's data in the cloud servers by third party authenticator (TPA). The future work for our research will be in the field of enhancing the security of the data by appending two signatures on the data to be stored on cloud so that no one can harm or change the data.

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Application of Heat Integration Techniques on Extract Column Section to reduce the cold utility requirements

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Abstract: Energy is the prime mover of economic growth and is vital to the sustenance of modern economy. Future economic growth crucially depends on the long-term availability of energy from sources that are affordable, accessible and environmental friendly. Pinch Analysis is a methodology for minimizing energy consumption of chemical plant by maximizing the utilization of hot and cold utilities available within the process, thereby reducing the use of external utilities. It is also known as heat integration, process integration, energy integration or Pinch technology. Pinch technology is applied on various process flow diagrams from chemical industries using heat integration strategies or techniques. These techniques include both graphical procedure (Thermal Pinch diagram) as well as algebraic procedure (Temperature interval diagrams) in order to compare the minimum heating and cooling utility requirement of a process with the actual requirement. In the present work, the process flow diagram of Extract column section is received from a chemical industry and block diagram is prepared for simplification. The hot and cold streams are identified and heat integration techniques are applied in order to find out the minimum cooling utility requirement. With this, the utilities available within the process can be used better and thus energy can be conserved to an extent of 20%.

Keywords*:* Graphical procedure, Algebraic procedure, Heat integration, Pinch Analysis,Cascade diagram, Thermal Pinch diagram, Temperature interval diagram, cooling utility requirement.

1. INTRODUCTION

Chemical processes should be designed as part of a sustainable industrial activity that retains the capacity of ecosystems to support both life and industrial activity into the future. Sustainable industrial activity must meet the needs of the present, without compromising the needs of future generations. For chemical process design, this means that processes should use raw materials as efficiently as it is economic and practicable, both to prevent the production of waste that can be environmentally harmful and to preserve the reserves of raw materials as much as possible. Processes should use as little energy as economic and practicable, both to prevent the build-up of carbon dioxide in the atmosphere from burning fossil fuels and to preserve the reserves of fossil fuels. [5]

In a chemical process, the heating and cooling duties that cannot be satisfied by heat recovery, dictate the need for external heating and cooling utilities (furnace heating, use of steam, steam generation, cooling water, air-cooling or refrigeration). Thus, utility selection and design follows the design of the heat recovery system.

Pinch Analysis is a methodology for minimizing energy consumption of chemical processes by calculating thermodynamically feasible energy targets and achieving them by optimizing heat recovery system, energy supply methods and process operating conditions.

1.1 Objective

In the present work the process flow diagram of Extract column section was obtained from a chemical industry and Heat integration techniques were applied in order to find the minimum cooling utility requirement. The main objective is to find the energy available and saved from the process.

1.2 Similar works

Studies similar to present work have been done by several people among which a few are listed below.

-Dr.Gavin P. Towler worked on "Integrated process design for improved energy efficiency." The concept that the efficiency with which energy and raw materials are used within the process industries depends strongly on the way in which resources are distributed within a manufacturing site were described. Most sites or processes contain several sources or sinks of the resource. For example, a chemical plant will have heat sources (hot streams) and heat sinks (cold streams). By matching these sources and sinks in the appropriate manner we can transfer heat between the streams. Thus developed a more integrated process design which makes better use of the resources available internally, and therefore reduces the amount of external resource that is required. The techniques for integrated design of processes can be applied to a range of problems, for example, recovery of process waste heat, reduction of water usage (which reduces the consumption of heat in treating fresh water and waste water), reduction of chemicals use, etc. In all cases, the overall result is a considerable saving in energy. [1]

-R.M. Mathur, B.P. Thapliyal used Pinch analysis as a tool in pulp and paper industry for setting energy targets and optimizing the heat recovery systems. Using this methodology in a bleached Kraft mill, various successful cost effective process integration and design approaches have been adopted to maximize the heat recovery. In a typical case, all process heating and cooling duties were reviewed , hot effluents being included as potential sources of additional heat. Stream data is then extracted as hot and cold streams according to analysis procedure to derive composite and Grand composite curves for a typical pulp mill. [2]

-Uday V.Shenoy worked on process integration concepts and their application to energy conservation. Heat integration Strategies such as construction of composite curves and grand composite curves for minimum energy targeting were used. The targeting methodology proposed by Shenoy etal.(1998) to determine the optimum loads for multiple utilities is based on the cheapest utility principle(CUP) ,which simply states that the temperature driving forces at the utility pinches once optimized do not change even when the minimum approach temperature at the process pinch is varied. In other words, it is optimal to increase the load of the cheapest utility and maintain the loads of the relatively expensive utilities constant while increasing the total utility consumption.[3]

2. MATERIALS AND METHODS

2.1 Heat Integration Strategies

Two techniques are available for the application of Pinch Technology on process flow diagrams from chemical industries. These include:

1) Graphical procedure (Thermal Pinch diagram)
2) Algebraic procedure (Temperature interval diagram)

The above techniques are used to find the minimum cooling utility requirement of a process.

Steps involved in Graphical Procedure:

- The given hot and cold streams must be plotted on temperature-enthalpy axes
- A constant heat capacity over the operating range is assumed
- Next, both the hot and cold streams are plotted together in a single temperature versus enthalpy plot which represents the Thermal Pinch diagram
- The point where the two composite streams touch or very close to each other is called "Thermal Pinch point".
- The region of overlap between the two streams determines the amount of heat recovery possible
- The part of the cold stream that extends beyond the start of the hot stream cannot be heated by recovery and requires steam and it is the minimum hot utility or energy target
- The part of the hot stream that extends beyond the start of the cold stream cannot be cooled by heat recovery and requires cooling water and it is the minimum cold utility

Steps involved in Algebraic Procedure:

- The first step in algebraic approach is the construction of the Temperature interval diagram(TID)
- Next, the TEHLs (Table of exchangeable heat loads) for the process hot and cold streams are to be developed
- A cascade diagram is constructed
- A Revised Cascade diagram is constructed whenever there exists a thermodynamic infeasibility.
- The results obtained from the revised cascade diagram will be identical to those obtained using the graphical pinch approach

The flow pattern of Hot and cold streams for Extract column section is as shown in Fig 1.It was observed that there were two hot streams and one cold stream with the following data.

Initial cooling utility requirement= 23750 kW

Initial heating utility requirement= 10000 kW

Minimum temperature difference, $\Delta T_{min} = 10^0 C$

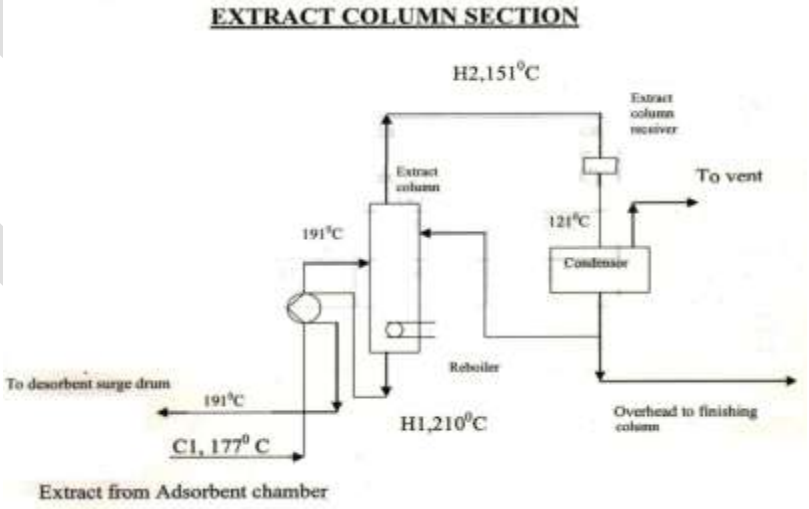

Fig.1 Block Diagram of Extract Column section

Table 1. Hot Stream Data

Sl.No	Supply Temperature (^{0} C)	Target Temperature (^{0} C)	Heat Capacity Flow Rate, m Cp (kW/^{0} C)	Heat Exchanged (kW)
H1	210	191	97.92	1860.8
H2	151	121	631.51	18945.27

Table 2. Cold Stream Data

Sl. No	Supply Temperature (^{0} C)	Target Temperature (^{0} C)	Heat Capacity Flow Rate, m Cp (kW/^{0} C)	Heat Exchanged kW
C1	177	191	132.81	1860.8

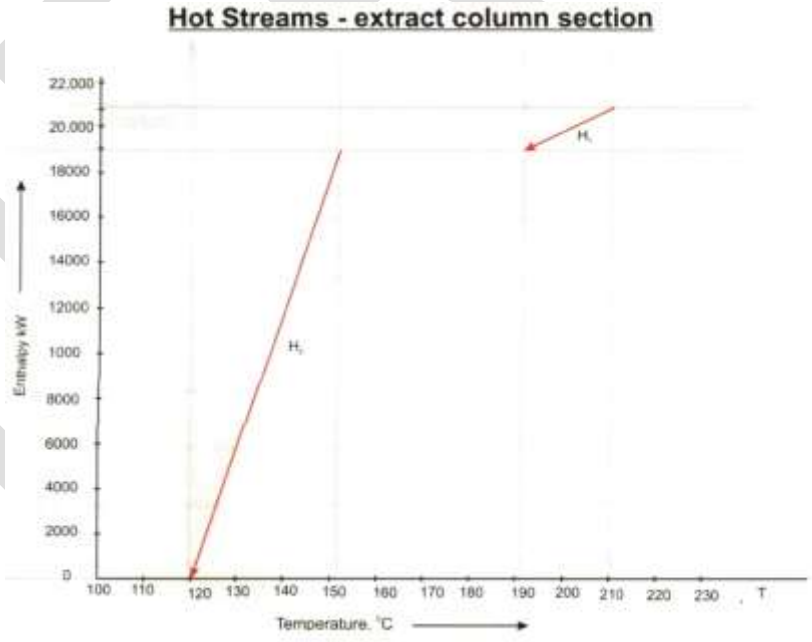

Fig 2.Representation of Hot Streams

Using the supply and target temperature data of hot streams from Table 1, they were plotted on Temperature versus Enthalpy graph as shown in Fig 2.

3. RESULTS AND DISCUSSION

Thermal Pinch diagram was constructed by plotting composite hot and cold streams on a single temperature versus enthalpy plot using graphical procedure as shown in Fig 3. From Thermal Pinch Diagram the minimum cooling utility requirement was found to be 19000 kW.

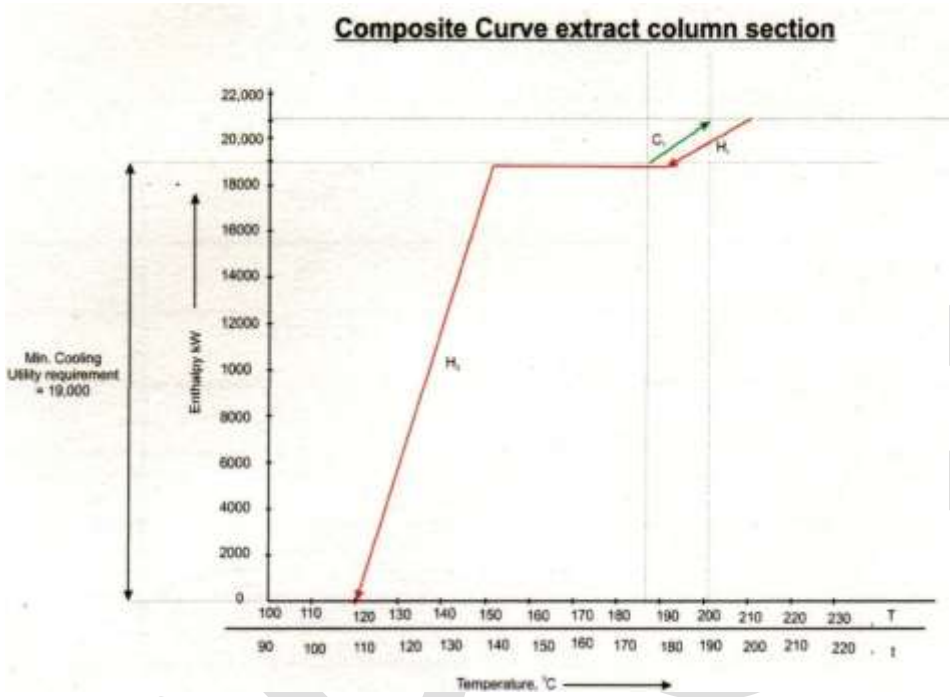

Fig3. Thermal Pinch Diagram

Temperature interval diagram (TID) was constructed using Algebraic procedure as shown in Fig 4. Considering the highest and lowest temperature of hot and cold streams the TID was constructed with seven intervals. Hot stream1,H1 was plotted from interval 1 to interval 3. H2 was plotted from interval 6 to 7 with their respective supply temperature and target temperatures as given in Table 1. Cold stream 1 was plotted from interval 4 to 2. with the supply and target temperatures as given in Table 2.

Interval	Hot Streams, T (°C)		Cold Streams, t (°C)	
1		210	200	
2	H1	201	191	
3		191	181	
4		187	177	C1
5		177	167	
6		151	141	
7	H2	121	111	

Fig4. Temperature interval diagram

Using TID, the TEHL for process hot streams and process cold streams were prepared as shown in Table 3 and Table 4. A cascade diagram was constructed as shown in the Fig. 5 by plotting total load of hot streams on the left and total capacity of cold streams on the right hand side and making a heat balance across each interval.

We observed that there were no negative residual heat loads in the cascade diagram and hence there exists thermodynamic feasibility.

Table 3. TEHL for process Hot streams

Interval	Load of H1 kW	Load of H2 kW	Total Load kW
1	-	-	-
2	881.32	-	881.32
3#	979.20	-	979.20
4	-	-	-
5	-	-	-
6	-	-	-
7	-	18945.27	18945.27

#3 -Load H1: mCpΔT=97.92 (201-191)=979.2

Table 4. TEHL for process cold streams

Interval	Capacity of C1, kW	Total Capacity of cold stream, kW
1	-	-
2	-	
3	1328.14	1328.14
4	531.258	531.258
5	-	-
6	-	-
7	-	-

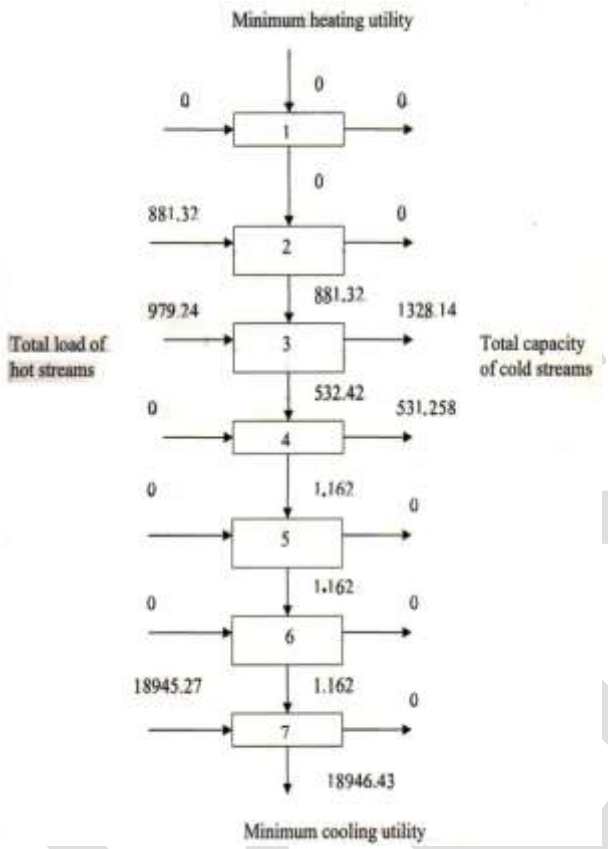

Fig 5.Cascade diagram

Table 5. Comparison of Actual and minimum cooling utility requirement

Actual cooling utility requirement, kW	Min. cooling utility requirement (Graphical procedure) kW	Min. cooling utility requirement (Algebraic procedure) kW
23750	19000	18946.43

Table 6. Percentage reduction in minimum cooling utility requirement

Actual Cooling Utility Requirement kW	% reduction from Graphical procedure kW	% reduction from Algebraic procedure kW
23750	20	20.22

4. CONCLUSION

By the application of Heat integration technique (Pinch analysis) on Extract column section the minimum cooling utility requirements were found and compared with the actual requirement which are summarized as follows:

- The minimum cooling utility requirement from graphical and algebraic procedures were found to be 19000 kW and 18946.93 kW respectively which was actually 23750 kW and hence there is a reduction in minimum cooling utility requirement by 20%
- The results obtained from graphical and algebraic procedure are identical.
- Pinch Analysis can be applied to any section in an industry.

5. ACKNOWLEDGEMENT

We thank Mr.Ravindra, Reliance Company, Jamnagar, Gujarath for his suggestions.

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Thermal Analysis Validation for Different Design Tubes in a Heat Exchanger

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Abstract- Shell and Tube Heat exchanger are the basic types of heat exchanger one of the fluids flow through a bundle of tubes enclosed by a shell. The outer fluid is forced through a shell and it flows over the outside surface of the tubes. Such an arrangement is employed where reliability and heat transfer effectiveness. In order to achieve the maximum heat transfer rate an analysis is made on single tube with two different fluids (Water and Al2O3-water based Nano fluid) in a shell and tube heat exchanger. With relate to same to have a maximum heat transfer rate this paper gives various optimal design solutions using computational techniques. To measure the performance of different designs, its model is suitably designed and fabricated so as to perform experimental tests. Thermal analysis has been carried out for different design with two fluids and on the basis of comparative results is made which one give the best heat transfer rates.

Keywords *: Heat Exchanger, Water, Al2O3-water based, Optimal Design, Thermal analysis, Computational Techniques*

1.Introduction

In a Heat Exchanger, consists of bundle of tubes. One fluid flows through the tubes while the second fluid flows space between the tubes and shell. Tubes plays an important role while exchanging heat from hot fluid to cold fluid. Although they are not specially compact, their robustness and shape make them well suited for high pressure operations. They have larger heat transfer surface area to volume ratio than the most of common types of heat exchangers, and they are manufactured easily for a large variety of sizes and flow configurations. The main design objectives here are to accommodate thermal expansion, to furnish ease of cleaning, or to provide the least expensive construction.

To get robust, least expensive and technically sound design, we will be dealing with four different designs viz. "Circular Tube", "Elliptical type(Oval)", "Twisted type" and "Coil type" Along with construction issue we too come across the difficulties in improving heat transfer rates, which means to have high effectiveness, we were in flow to compromise the design and robustness. In order to achieve the maximum heat transfer rate an analysis is made on single tube for different designs with two different fluids (Water and Al2O3-water based Nano fluid) in a shell and tube heat exchanger. This paper shows how maximum heat transfer rate has been achieved by comparing four different designs and getting optimal design solutions using computational techniques. To measure the performance of different designs, its model is suitably designed and fabricated so as to perform experimental tests. Thermal analysis has been carried out for four different designs with two fluids and on the basis of comparative results is made which one give the best heat transfer rates. After the modification of design an experimental validation is carried out to validate the results from analysis.

2. Literature Review

Ala Hasan [1] experimentally investigated five oval tubes and compared with that for a circular tube in a cross-flow way and concluded that oval tube gives higher heat transfer results. The outcome was taken for comparing results of oval and circular tubes which helped for optimized design. Abdul Kareem Abbas *et al* [2] shows heat transfer augmentation due to twisting parameter was investigated in a twisted tube of rectangular/square cross sectional area. Also swirling increases internal mixing process which enhances internal thermal equilibrium. The heat transfer coefficient also increases as Reynolds number increased as velocity components are increased. This relation shown was used as function and one of the parameter in design. Su Thet Mon Than *et al* [3] In this paper data is evaluated for heat transfer rate having spiral tubes and pressure drop and checking whether the assumed design satisfies all requirement or not by using computational techniques. Satisfied design found was used for coil type tubes for analysing the heat transfer rate. Jay J. Bhavsar *et al* [4] objective of this paper is to design and analyze of spiral tube heat exchanger. In this newly proposed design hot fluid flows in axial path while the cold fluid flows in a spiral path. The presented work was used in spiral tube design and has high heat transfer rate compared with helical coil heat exchanger and spiral plate heat exchanger. P. M. Deshpande *et al* [5] They studied horizontal spiral coil tube (HSTC) for various forces (viscous, buoyancy and centrifugal force) acting on fluid element in coil; of which the centrifugal force is predominant and results in secondary flow. This phenomenon also depends on the physical properties of fluid at a given temperature. They also concluded that as the coil diameter reduces the curvature ratio increase that increases the pressure drop. Relation was used for designing coil type tubes.

3. Design of Tubes :

3.1 Circular type tube :

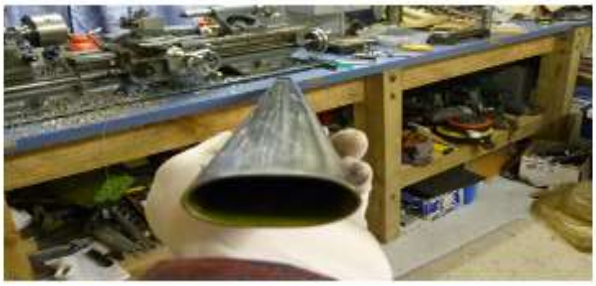
D_i=16.65mm
D_o=19.05mm
Thickness=t=18BWG
Length= 1000mm

Source:

1) Design of Heat Exchange equipment.
2) Design shell and tube heat exchanger [Rajiv Mukherjee Engineers India Ltd.]
3) Handbook of TEMA.

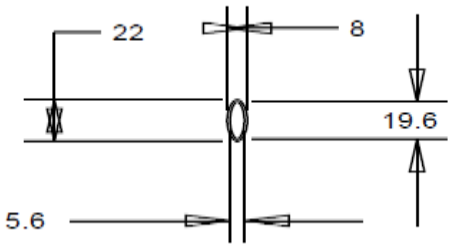
3.2 Elliptical Type Tube(Oval):

Axis Ratio = R_a=3
Major Axis = 2a=22 mm
Minor Axis =2b=8mm



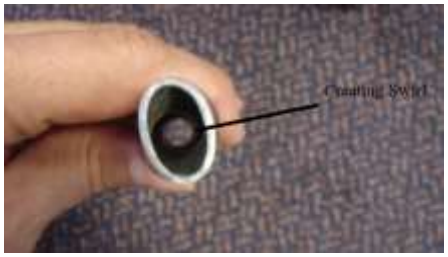
Source:

1) Thermal-Hydraulic performance of oval tubes in a cross-flow air- *ALA-HASAN*
2) Structural and Thermal Analysis of Heat Exchanger with Tubes of Elliptical Shape -Nawras H. Mostafa Qusay R. Al-Hagag



3.3 Twisted Type Tube:

Length(L)=1000mm
Thickness(t)=1.2mm
Breadth of rectangular tube(b)=22 mm
Depth of rectangular tube(d)=8mm
No. of twists(Nt)=05(Each at 200mm)



Source:

1) Twisted Tube Heat Exchanger Technology-*R. Donald Morgan*
2) Twist parameter influence on heat transfer coefficient augmentation for a square twisted tube- *A. Kareem*

3.4 Coil Type Tube:

Diameter (D_0) =3/4"=19.05mm
Length(L)=1000mm
Number of turns(n)=6
Thickness(t)=1.2mm
Effective coil diameter(D)=52mm
Pitch(p) for helical it is taken as $1.5D_0$≡30mm
To know the unknown parameter, D (Coil Diameter)

Equation is given by,

$L = N\sqrt{(2\pi R)2 + (p)2}$

$1000 = 6\sqrt{(2\pi R)2 + (1.5\text{x}19.05)2}$

$\frac{1000}{6} = \sqrt{(2\pi R)2 + (1.5\text{x}19.05)2}$

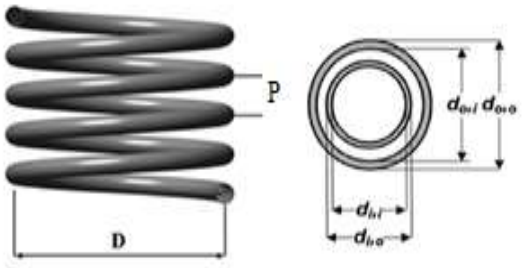
$\frac{1000}{6} = \sqrt{(2\pi R)2 + 816.53}$

$\frac{26961.24}{4\text{x}\pi^2} = R^2$

Therefore,
R = 26.13mm
D ≡ 52 mm

Source:

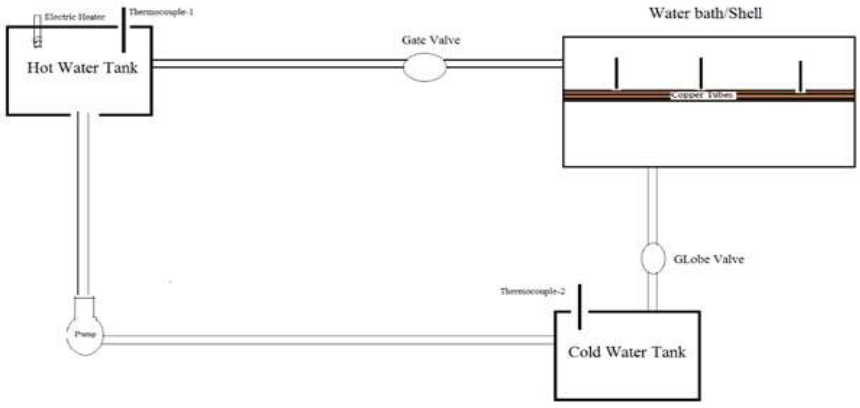
1) ASME German AD-*Merkblatt*
2) European pressure equipment directive (PED)
3) Designing a helical-coil heat exchangers- *K. Ramchandra*

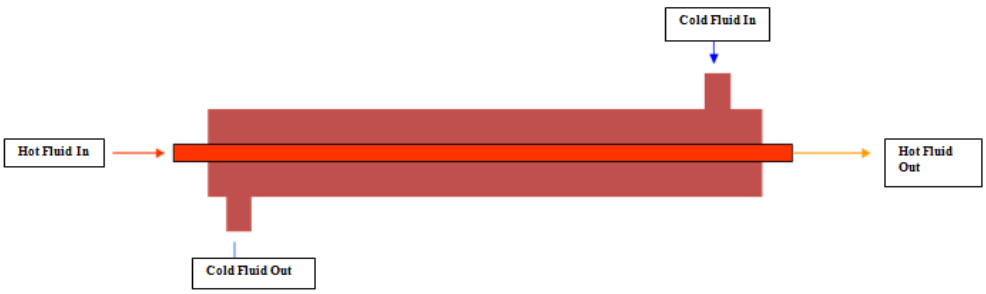


4. Experimental Work:

We achieved temperature range by placing thermocouple at 250 mm apart for four design tubes.

T_1 = Temperature at inlet of tube.
T_2= Temperature at a distance of 250mm from inlet.
T_3= Temperature at a distance of 500mm from inlet.
T_4= Temperature at a distance of 750mm from inlet.
T_5= Temperature at outlet of tube.





4.1 For (Water –Water as a fluid)

4.1.1 For circular type:

Sr. No	Mass flow rate(Kg/sec)	Temperatures at different points of tube (^{0}C)				
		T1(At start 0mm)	T2(At 250 mm)	T3(At 500mm)	T4 (At 750mm)	T5(At 1000mm)
1	0.14	67	66.5	65.5	65	64
2	0.12	67	66.5	66.5	65	64
3	0.05	66.5	66	65	64.5	63.5

4.1.2 For Elliptical type:

Sr. No	Mass flow rate(Kg/sec)	Temperatures at different points of tube (^{0}C)				
		T1(At start 0mm)	T2(At 250 mm)	T3(At 500mm)	T4 (At 750mm)	T5(At 1000mm)
1	0.14	67.5	65	64.5	64	63.5
2	0.12	63	62.5	62	61	59.5
3	0.05	63	62	62	61.5	60

4.1.3 For Twisted type:

Sr. No	Mass flow rate(Kg/sec)	Temperatures at different points of tube (^{0}C)				
		T1(At start 0mm)	T2(At 250 mm)	T3(At 500mm)	T4 (At 750mm)	T5(At 1000mm)
1	0.14	64	62	60	58.5	56.5
2	0.12	56	54	53	52	51
3	0.05	58	57	56	54	53

4.1.4 For Coil type:

Sr. No	Mass flow rate(Kg/sec)	Temperatures at different points of tube (^{0}C)				
		T1(At start 0mm)	T2(At 250 mm)	T3(At 500mm)	T4 (At 750mm)	T5(At 1000mm)
1	0.14	68	68	67	65	63
2	0.12	65.5	65	64.5	62	58
3	0.05	61	60	60.5	58	56.5

5 .Calculations for heat transfer coefficient

5.1 For case I(water-water):

Fluid properties for water are:

μ=0.467xNs/

ρ=1000 kg/

Cp=4.18xJ/kg^{0}k

k_w=0.625w/m^{0}k

For Circular type :

$A_{c/s}$ = ($\pi[d_0^2-d_i^2]$

=($\pi[0.01905^2-0.01665^2]$

=$6.73x10^{-5}m^2$

As Reynolds number for circular tube is given by,

Re=ρvd/μ …… (1)

to find V,

We know continuity equation,

Q=AxV

As density = mass/volume(ρ=m/vol.)

Therefore, m= A x ρ x V…… (1a)

For mass flow rate =m=0.14kg/sec

$0.14 = Vx1000x6.73x10^{-5}$

V= = 2.08m/s

V= 2.08 m/s

So,

Re = 74158.45

From Reynolds number, flow is turbulent.(Re>2000)

Correlation used for turbulent flow is;

$Nu = CRe^{a}Pr^{b-m}$..... (1b)

where C = 0.021 for gases,

= 0.023 for non-viscous liquids,

= 0.027 for viscous liquids

$Nu = CRe^{a}Pr^{b-m}$

$= 0.023xRe^{0.8}Pr^{(1/3)}$ x1

$= 0.023x(74158.45)^{0.8}x(Pr)^{(1/3)}$……(1c)

Pr =μCp/k ……. (Depend only on fluid properties)

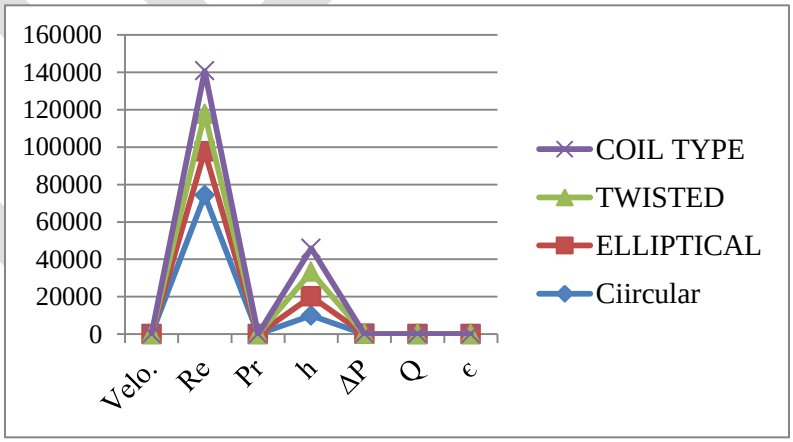
= 3.12

Equation 1c, → $= 0.023 \times (74158.45)^{0.8}x(3.12)^{(1/3)}$

$\check{h}$ = 9932.08 $w/m^{20}K$

Likewise, calculated heat transfer rate for other three tubes are:

Sr. No.	Type of Design	V	Re	Pr	h	ΔP	Q	ϵ
1	Circular	2.08	74158.4	3.12	9932.08	31.18	19.6	0.35
2	Elliptical	1.7	23516.1	3.12	10213.7	54.91	19.22	0.24
3	Twisted	2.11	19952.4	3.12	13100.6	29.3	19.83	0.53
4	Coil	2.09	23032.5	3.12	12625.1	36.72	21.91	0.34



5.2 Calculated outcome of Case-II (AL2O3-Water as a Nano fluid):

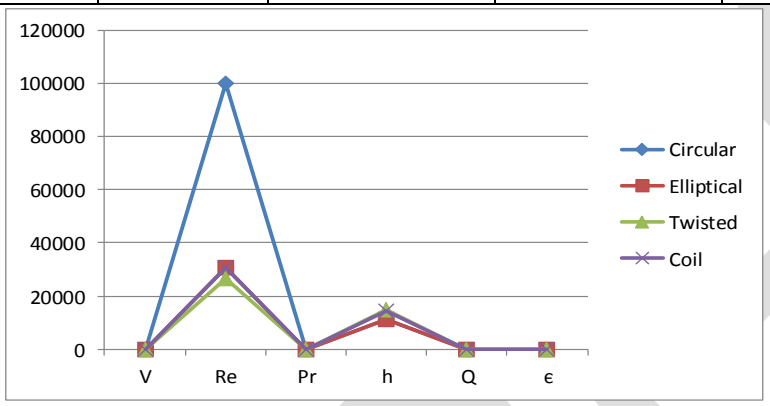
Fluid properties for Al_2O_3- water (0.1 % concentration) are:

μ=0.35 cp=3.5xNs/

ρ=1022 kg/

Cp=3.1xJ/kg^{0}k
k=0.72w/m^{0}k,
Prandtl number obtained from calculation is common for all type of deign as fluid properties are common, viz 1.5

Sr. No.	Type of Design	V	Re	h	Q	ϵ
1	Circular	2.06	100153.08	11399.20	20.63	0.38
2	Elliptical	1.63	30761.90	11427.08	20.16	0.30
3	Twisted	2.07	26563.12	14864.54	23.18	0.60
4	Coil	2.04	30617.95	14307.87	24.01	0.40

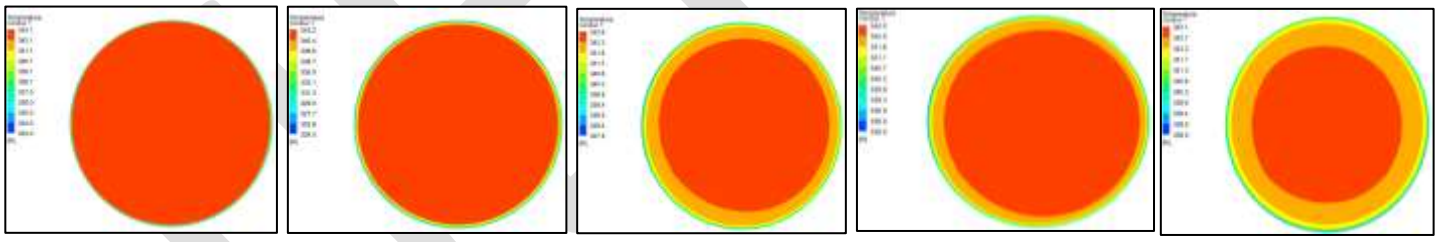


6. Thermal Analysis of Tubes with two different media:

6.1 CFD-Results of Case-I :

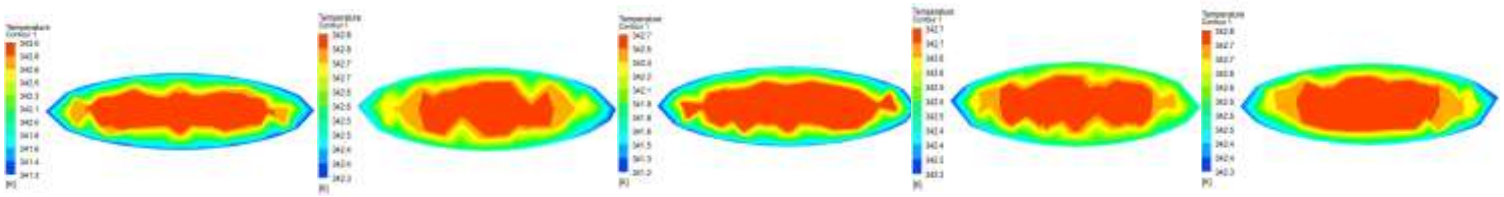
Mass flow rate : 0.14 kg/s
Temperature Contours

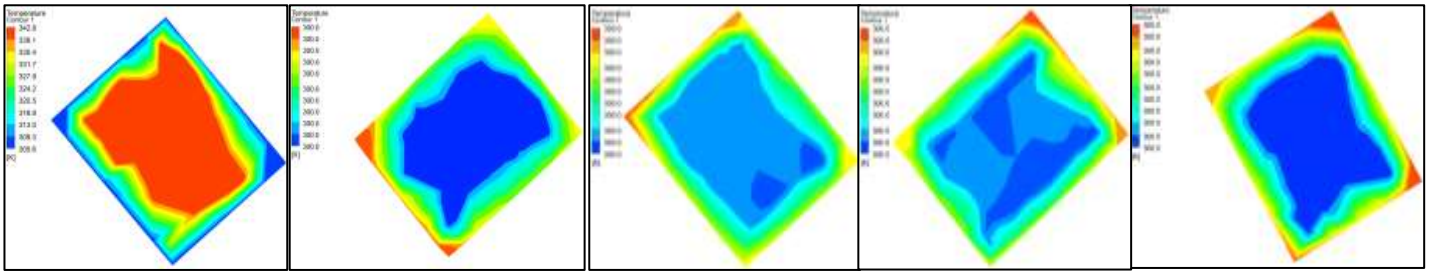
1.For Circular tube



2. Elliptical Tube :

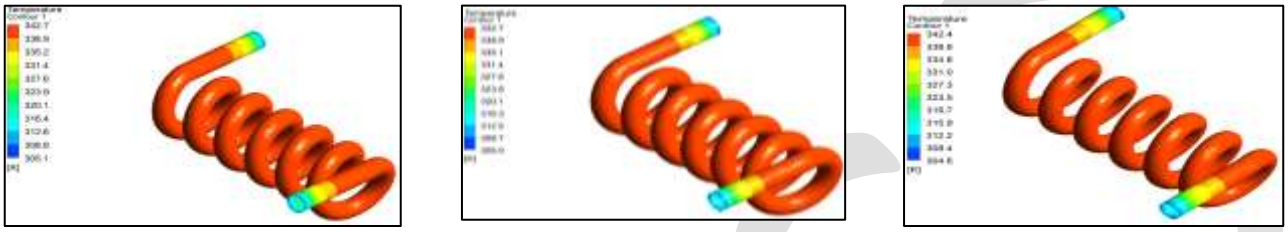
3. Twisted Tube :





4. Coil Tube: (For three planes)

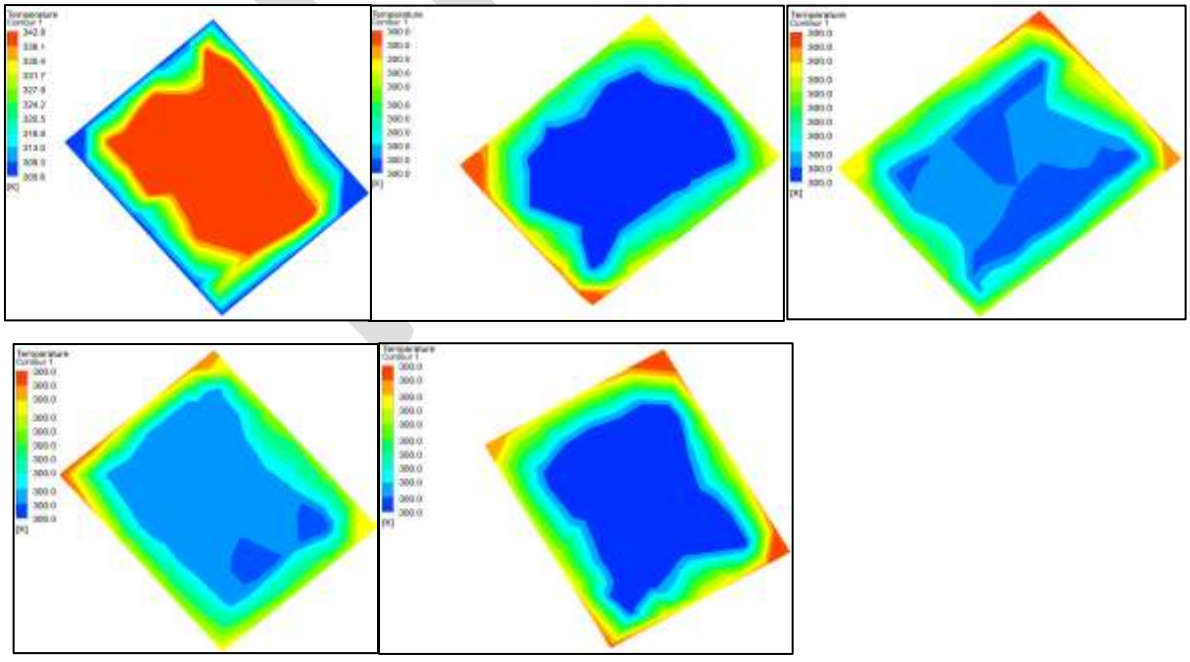
i. Temperature Contours



ii. h-Contours for inner wall

6.2. CFD-Results of Case-II (Al_2O_3 as a Nano fluid) :

We have focused only on twisted type tube as in above sequence of calculations we are getting high heat transfer rate and high effectiveness by calculation.



In above colourful diagram, if we compare d the twisted tube temperature contours with water as base fluid, an CFD analyst may observe that for 4^{th} and 5^{th} plane we are getting blue colour contours as compared to case 1, which directly shows the temperature gradient in above case is high along with effectiveness.

7. Conclusion:

This study shows the design and thermal analysis of different tubes. Experimentally, same designs are made and results are evaluated. With relate to same design tubes are thermally analysed in ANSYS software and compared both the results. After comparing the result for both water-water(Case-I) and water-Al2O3(Case-II) for four different tubes we are in conclusion that twisted type of tube is giving high heat transfer coefficient as compared to other i.e 1.14 more. Along with effectiveness, twisted tube is at higher side by 1.17.So according to my research one should go for twisted tube.

However, a good understanding of the underlying principles of exchanger design is needed to use this software effectively. The possibility to increase in these characteristics using the latest technology and various methods has raised application range of these designs. Modified design tubes are having great applications due to their large heat transfer area and high heat transfer coefficients. They are used in many industrial processes like waste water treatment, refrigeration, wine and beer making, petroleum refining

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Production and Analysis of Pyrolysis oil from waste plastic in Kolhapur city

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Abstract: The aim of this research was to study the pyrolysis oil production from municipal plastic waste of Kolhapur city. A pyrolysis experiment is done on the municipal LDPE plastic waste of 150 grams. A series of tests were carried out at a temperature range of 300- 350 ^{0}C with all other parameters being same. Under pyrolysis conditions plastic waste was decomposed into three types: producer gas, oil and solid residue. The obtained result shows that the properties of the pyrolysis oil are closely similar to that of diesel. hence it can be used as alternative fuel for compression ignition engines.

Keywords: alternative fuel, Compression ignition, LDPE, Plastic waste, Producer gas, Pyrolysis oil, solid residue.

Introduction:

Conversion of waste to energy is one of the recent trends in minimizing not only the waste disposal but also could be used as an alternate fuel for internal combustion engines. Waste plastics are non-biodegradable materials and its application in the domestic as well as industrial field is continually increasing. As the disposal of plastic will take more than 500 years in natural way. Hence, the plastic waste disposal is the biggest concern of the city. In Kolhapur city, around 165 tonnes of solid waste is generated every day, out of which nearly 11% i.e. 18 tonnes is contributed by only plastic waste. The aim of this experiment is to convert this non biodegradable plastic into useful components.

A plastic material is a wide range of synthetic or semi-synthetic organic solids that are malleable. Plastics are typically organic polymers of high molecular mass, but they often contain other substances. They are usually synthetic, most commonly derived from petrochemicals, but many are partially natural. Plastics can be converted into hydrocarbon fuels since it contains hydrogen and carbon. LDPE (Low Density Polyethylene) is defined by a density range of 0.910–0.940 g/cm^3. It is widely used for domestic as well as industrial applications.

Pyrolysis is the thermo chemical decomposition of organic substances at elevated temperatures in absence of oxygen. Plastic waste is treated in a cylindrical reactor at temperature of 300 ^{o}C – 350 ^{o}C. The gases are condensed to give a low density oil. A solid carbon residue gets generated at the bottom of the reactor.

Method:

The process flow chart:

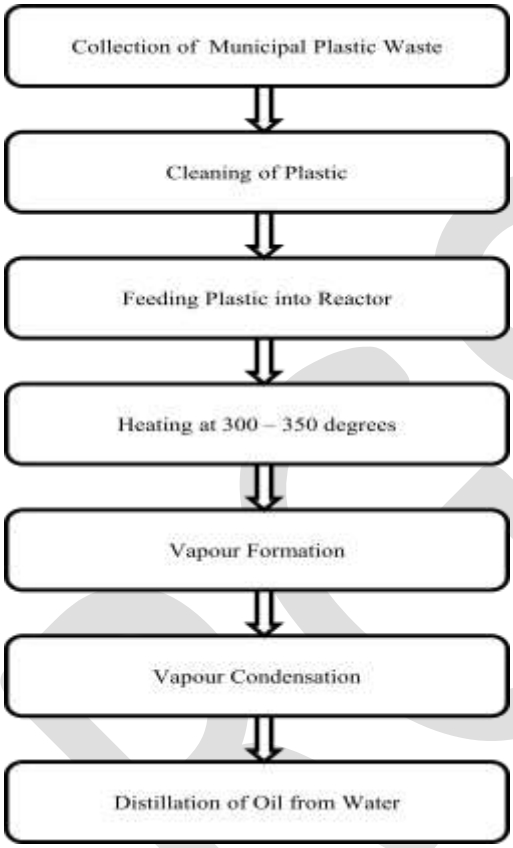


Figure 10: Flow chart

Experimental Set up:

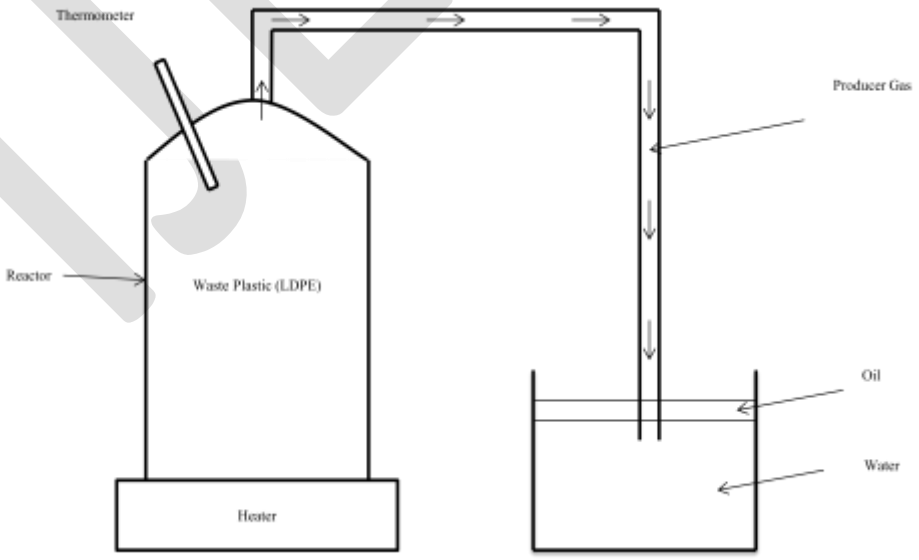


Figure 11: Experimental Set Up

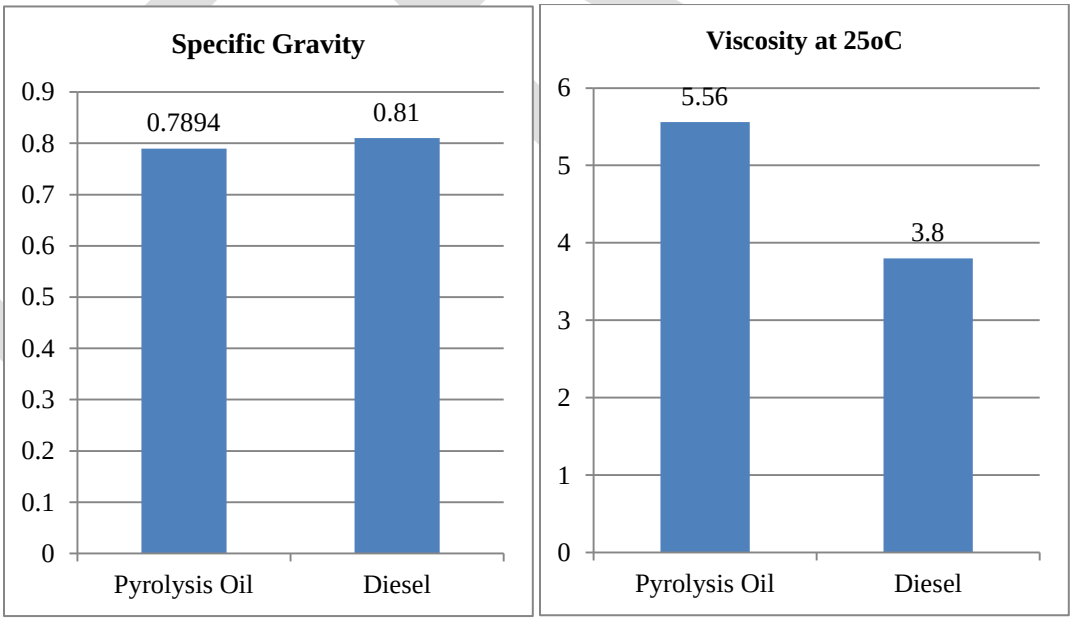
Waste plastic is collected from municipal solid waste. A sample of 150 grams of waste plastic (LDPE) is taken and cleaned. The sample is fed into the reactor and heated at a temperature of 300-350 ^{o}C for about 35 minutes using induction heater. The plastic is evaporated at this temperature and the vapours are condensed by direct mixing it with water at atmospheric temperature. The layer of oil is formed at the surface of water due the difference in their densities. This oil is separated by using distillation process. 100ml oil was formed with 150 grams of plastic waste.

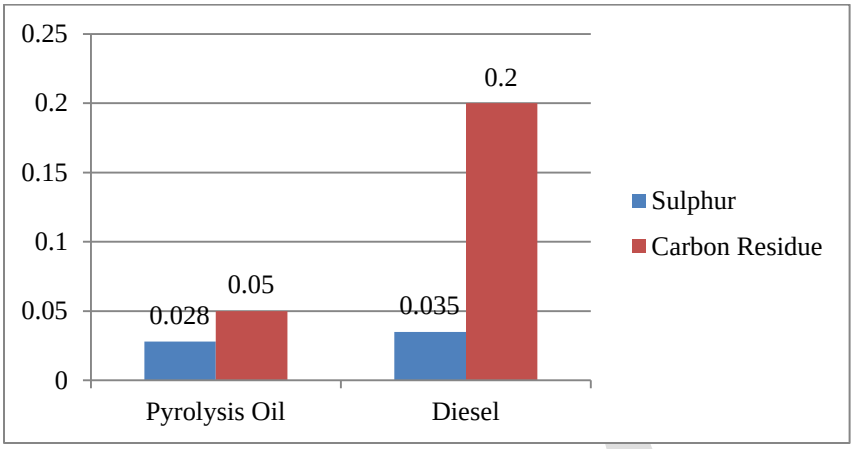
Results and Discussion:

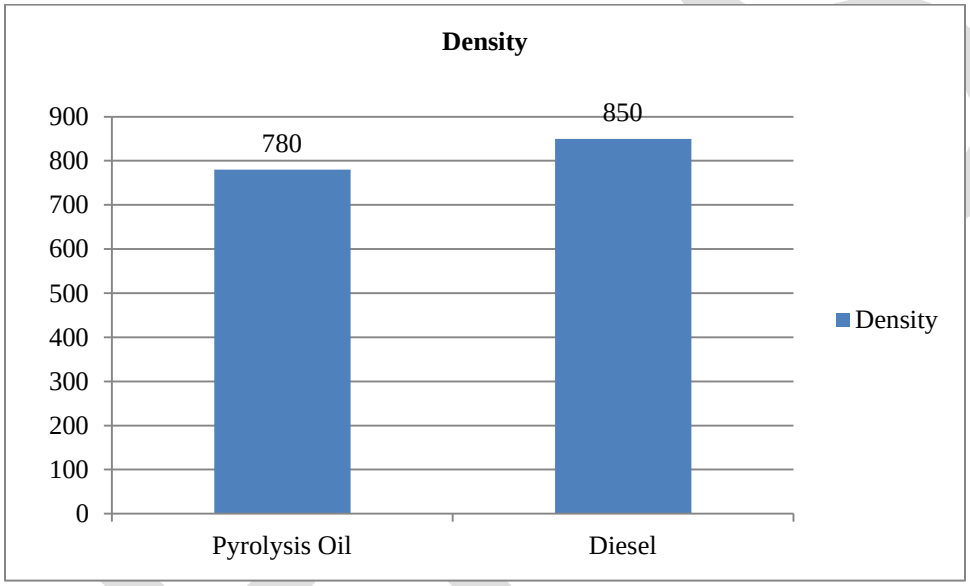
Sr. No.	Parameter	Unit	Pyrolysis Oil	Diesel
1	Specific Gravity	-	0.7894	0.81
2	Viscosity at 25^{o}C	cSt	5.56	3.80
3	Flash Point	^{o}C	41	50
4	Fire Point	^{o}C	46	56
5	Sulphur	%	0.028	<0.035
6	Carbon Residue	%	0.05	0.20
7	Calorific value	KCal/Kg	9434	10031.52
8	Cetane Number	-	49	55
9	Density	Kg/m^3	780	850

Table 3: Comparison of properties

Graphical Representation:




0.25
0.2
0.15
0.1
0.05
0
0.028
0.05
0.035
0.2
Pyrolysis Oil
Diesel
Sulphur
Carbon Residue


Density
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800
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600
500
400
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780
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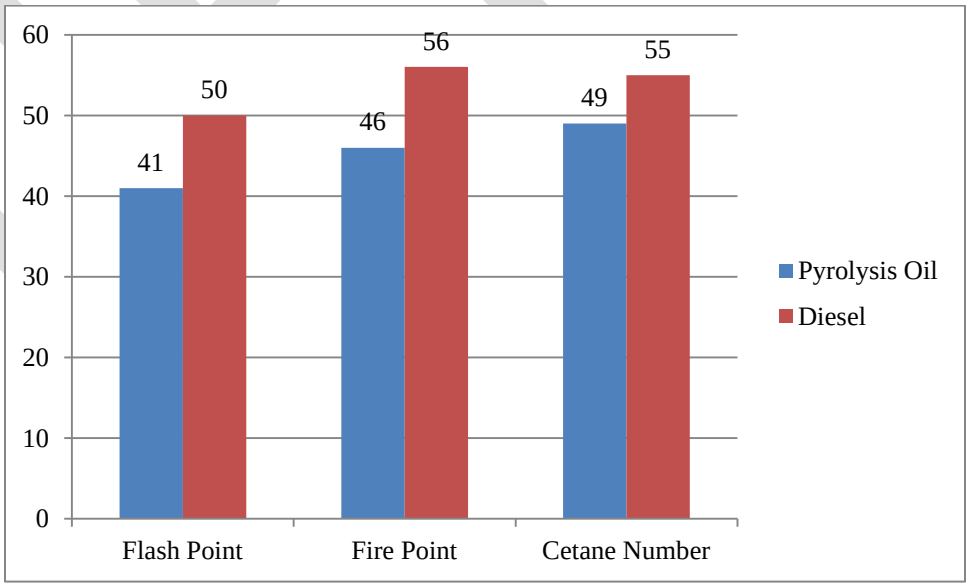
Pyrolysis Oil
Diesel
Density


60
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46
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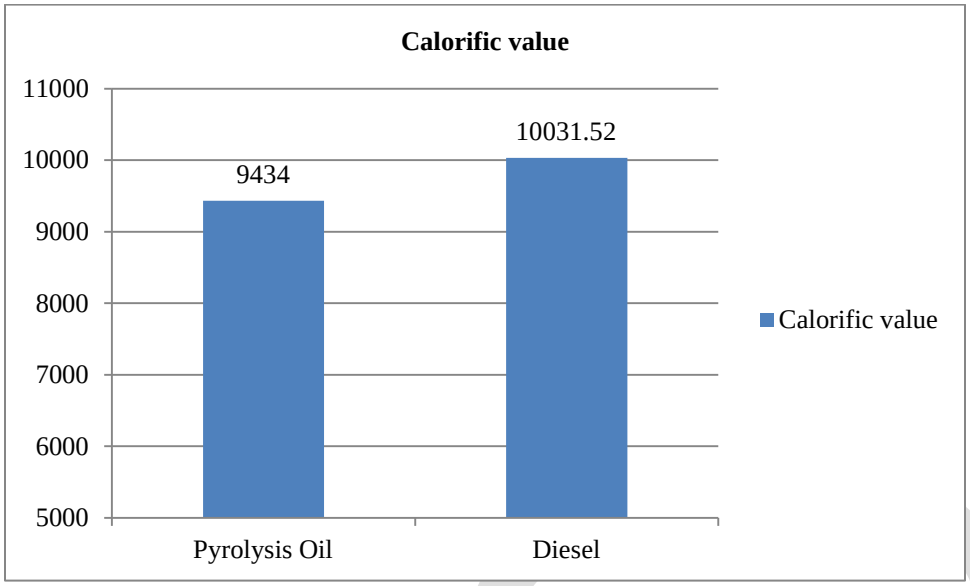
Flash Point
Fire Point
Cetane Number
Pyrolysis Oil
Diesel



The breakdown of the output from pyrolysis process is given below:

Output	% of output
Fuel Oil	80% - 90%
Producer Gas	8% - 10%
Char as Residue	2% - 13%

Table 4: Breakdown of output

From above comparative analysis, it is clear that the properties of pyrolysis oil are similar o that of diesel. Also, it is found that the carbon residue, sulphur content of plastic pyrolysis oil is much lesser than the diesel, hence its use will result in lesser air pollution. Hence plastic pyrolysis oil can be used as an alternative fuel for diesel engines and oil fired furnaces. Char is the material that is left once the pyrolysis process is complete and the fuel recovered.

The total amount of plastic waste collected from Kolhapur city is 18 tonnes/day. This can be converted into 12000 litres of pyrolysis oil per day. The running cost of pyrolysis plant ranges from Rs. 14 to Rs. 18 per litre while the market price of oil is Rs. 40 per litre.

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Integrated Solid Waste Management for Municipal Solid Waste Generated from Small-Scale Towns and Nearby Villages Located in a Developing Country

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Abstract - According to census 2011, 72% of Indian population lives in small-scale towns and villages. Municipal solid waste (MSW) generation, in terms of kg/capita/day, is showing an increasing trend. MSW management is one of the major problems faced by these local bodies. Due attention is not paid for MSWM due to small quantity of waste generated by individual towns and villages surrounding them. The MSW is collected from the source and disposed off randomly in open dumps. In this paper, we present a systematic study of MSW quantity and characteristics and existing disposal methods for small-scale towns and nearby villages. We also propose an optimization model to identify a comprehensive disposal strategy considering segregation treatment and final disposal of MSW. The model includes fixed cost like land cost, equipment cost and operating cost like transportation cost, labor cost etc. Optimization results revealed that formation of clusters for segregation and treatment of MSW and final disposal at landfill site is more economical than segregation and disposal at each source towns/villages. We have demonstrated the efficacy of the proposed method with the help of case study to identify economical strategy for segregation and disposal of MSW generated form small-scale towns and nearby villages

Keywords - MSW, Small-scale towns, village, quantity, Optimization, Segregation, Economic

INTRODUCTION

Quality and quantity Municipal solid waste depends on various activities carried out in that municipality. Quality of municipal solid waste primarily depends on economical condition, climatic condition and geographical condition. (World Bank 2003), Quantity of solid waste increases with increase in population and modernization in these areas [1]. Ludwig et al. (2003) have observed a quantum jump in quantity of MSW due to increase in consumption pattern.[2]

Studies have shown that waste generated from high economic area has higher calorific value, lower specific density and lower moisture content. This may be largely attributed to more utilization of packed food and disposal material like paper, dishes etc. Waste from lower income group has low calorific value and high moisture content due to more utilization of fresh vegetables [3,4]. Bhide and Shekdar (1998), CPCB(2004) and Garg and Prasad(2003) studied composition of MSW in metro/large cities [5,6,7]. As per these studies MSW sampled at generation source and collection points as wet basis, consists mainly of a large organic fraction (40–60%), ash and earth (30–40%), paper (3–6%) and plastic, glass and metals (each less than 1%). They have also indicated that the C/N ratio ranges between 20 and 30, and caloric value ranges from 800 to 1000 kcal/kg.

As per CPCB (2004)[7] The average waste generated for small towns, medium scale towns/cities and large cities is 0.1 kg per person per day, 0.3 to 0.4 kg per person per day and around 0.5 kg per person per day respectively. Many researchers estimated 1.3% increase in waste generation in these Indian towns (Bhide and Shekdar, 1998; Shekdar, 1992; Pappu et al., 2007).[5,8,9]

Solid waste management with respect to source segregation, storage at various stages, collection, transfer and transport, processing, and disposal has not received due attention in study areas under consideration. Current practices adapted in developing countries for collection, processing and disposing municipal solid waste, is less efficient in comparison with the developed countries. Developing countries face a major problem due to low collection coverage and irregular collection services. Crude open dumping of MSW enhances the breading of flies and vermin. Open burning of MSW without implementing suitable air and water pollution control strategies leads to increase in pollution level. MSWM also need to take care of informal waste picking or scavenging activities [10]. The improper handling and disposal of solid wastes constitutes a serious problem: it contributes to the high morbidity and mortality rates in many Third World cities [11]. Many cities do spend significant portions of their municipal revenues on waste management [12,13,14,15] However, these cities could not cover all aspects of waste management.

Climatic factors play a crucial role in the municipal waste management of the study area. Due to high moisture, content in wet season weight of refuse increases which causes difficulty in transportation of MSW. High humidity due to heat elevates decomposition of organic waste before final disposal of MSW, which makes it more difficult to handle and dispose. Decomposed organic waste also causes health effects on workers and inhabitants (Ludwig et al., (Eds.) 2003).

Hua and Wang (2001) noted that (MSWM) continues to be a major challenge for local governments in both urban and rural areas throughout the world. Poor solid waste management creates a major threat for public health and environment quality in the developing countries it reduces quality of life for poor economic section both in urban and rural area.[16]. Unscientific disposal of MSW affects environment and human health in all aspect. Studies show that there is reduction in field yield due to open dumping of MSW at field

sides or open area nearby. [17, 18, 19, 20, 21, 22, 23, 24]

Majority of population lives in rural and semi urban areas in developing countries. As per census of India 2011, with an estimated population of 1028610328, India is the world's second most populated country after the People's Republic of China. India has 593625 inhabited villages and 72.2 % of the total population resides in these rural areas and semi urban centers. Total population of 584069713 resides in 229150 villages having population range of 1000-10,000 & above. While around 26784423 people resides in towns having population less than 20000. Approximately 60% of population resides in these rural and semi urban centers. These centers provide utilizations, services to nearby rural areas, and can play an important role in development of the rural regions.

Lack of necessary data in small-scale towns and villages hampered solid waste management. Moreover, the available data is generally unreliable, scattered and unorganized [25]. Large and medium scale cities have better financial support, trained personnel, public awareness for MSWM compared to small-scale towns/villages. Along with less awareness in public, other necessary infrastructure to handle and dispose solid waste are inadequate in small-scale towns and villages. Hence, low line areas on the outskirts of towns or villages are used for open dumping of MSW. This creates nuisances of flies, mosquitoes and other insects, which can lead to major health hazards in the nearby area. It also causes ground water pollution due to leached water. Due attention is not paid to MSWM of small-scale towns and surrounding villages. As large population, lives in small-scale towns/ villages it becomes important to mange MSW to reduce overall environmental degradation.

Development of mathematical models for prediction of MSW, transportation of MSW, routing etc utilizing ANN, linear programming, life cycle assessment for developed countries attracted considerable attention of the researchers. Quality and quantity of MSW is in general different in developed and developing countries. Daskapoulous et. al. (1998) noted that these municipalities lack infrastructure, human resources and are fast growing [26]. It is necessary to develop suitable model for MSWM in suburban municipalities in developing countries.

For selection of suitable MSWM strategy Optimization models are proposed after considering economic, environmental and management factors [27]. It is necessary to explore the possibility of integrated management of MSW of small-scale towns and their surrounding villages rather than handling them individually.

RESEARCH METHODOLOGY

Selection of study area: For study purpose small-scale town and representative village of Gujarat state, India. The Urban Development and Urban Housing department of Gujarat has classified municipality in following categories based on population: Class A Municipality - Population of 100000 and above, Class B Municipality - Population of 50000 – 99999, Class C Municipality - Population of 25000 – 49999, Class D Municipality - Population of 15000 - 24999. According to census, 2001 data there are 18 class A municipalities, 33 class B municipalities, 45 class C municipalities and 63 class D municipalities exists in the state of Gujarat. Class D municipalities along with small villages around them, have very few facilities for municipal solid waste management. The rate of Infrastructural development in Class D municipalities is little slow.

Amount of solid waste generation is a strong function of population of the area under consideration. Thus, prediction of population is necessary to predict waste generation in the study area. Urban population of Gujarat has grown from 37.4 percent in 2001 to 42.6 percent in 2011. The growth rate in small-scale town has increased by approximately 27 percent 2011. Population projected in the study area for 25 yrs for the study purpose. Quantity of waste generation is estimate based on the projected population data. MSW generation estimated using 1.3% increase solid waste generation per annum per person. Approximately 1 x 106 to 2 x 106MT of MSW has be to be handled by the year 2036.

The study area consists of small towns surrounded by villages having low population. This results in an average generation of solid waste 0.05 to 0.1 Kg/person/day, which is a low per capita generation of MSW. Solid waste generated from small-scale towns and villages around them have high organic matter, as agriculture is major occupation of people. Solid waste presently is disposed in open dumps in low-lying areas at the outskirts of the towns.

Quality and quantity of solid waste: In the present study average solid MSW collected in the community bin over a period of two weeks in each season is determined experimentally. Computerized weighing machine used to weight community bins. To determine the quality of MSW in the present study samples are collected from both dumping site and main collection bins. Recyclable material like metal, paper, bottles are in general segregated at primary level. Further quantity of organic material for composting and inert material for disposal is experimentally determined.

Development of optimization model: To minimize the total disposal cost of MSW generated from small towns and their surrounding villages, within the regulatory framework we propose an optimization model in this paper. The proposed mixed integer non-linear program model solves the minimization problem. Proposed model considers the installation cost of the site, transportation cost, infrastructure cost. Commercial solver GAMS is used to solve MINLP problem. We present indices, sets, parameters, variables, tables and equations used in the program.

Sets: i – source of municipal solid waste j – segregation site

Variable: x(i,j) selection of site z total cost

Parameter: Tw(i) Total solid waste from village p(i) Population of the village Jc(j) Jantri cost Tr(i) Trips from source to segregation site Trp(i,j) cost of each trip Vmc vehicular cost Trc(i,j) total trip cost Ttw(i) total waste collected c(i,j) Cost of segg. Site ls land for composting lm land for movement ln land for shed lf land for finished goods L(j) total land require Mc man power cost d(i,j) distance between villages Sc(j) segregation cost

Scalar: Rp is rate of generation of solid waste S1 is rate of vehicular cost
t is rate of transportation S2 no of days of storage S3 density of solid waste S4 height of solid waste S5 remuneration for workers S5 rate of seggregation cost

Total waste generated at source: Total MSW generation depends on the population "P" and average rate of generation of solid waste from study area. Average rate of MSW generation Rp in the study area is experimentally determined as 0.8Kg/person/day. Total MSW generation Tw from village "i" is estimated using equation (1). Where p(i) Population of the village

$Tw(i)=Rp * P(i)$ ……. (1)

TRANSPORTATION COST

Transportation cost is, computed by considering cost of the vehicle and operating cost of vehicle to transport MSW from the source to the segregation site. Operating cost includes fuel and maintenance of vehicle and labor cost. Product of vehicle plying distance "d" and cost of transport per unit distance "Rt" gives cost per trip. In the present study, it is assumed that each vehicle can carry, 2 T of MSW per trip. Minimum cost per trip is (S1).

$Tr(i) = Tw(i)/2000$ …….. (2)

Cost per trip $Trp(i,j) = Rt * d(i,j) *Tr(i)$ …….. (3)

Vehicular cost $Vmc(i,j) =Trp(i,j) * S1$ …….. (4)

Total trip cost $Trc(i,j) = \sum_{i=1}^{j} Vmc(i,j) + \sum_{i=1}^{j} Trp(i,j)$ …….. (5)

Labor cost: We consider storage capacity of 15 days for MSW segregation and storage. Minimum labor cost "S5" is taken as Rs 120/day.

Labor cost to operate segregation plant Mc(i) = Tr(i) trip of vehicle *S2 *S5 (6)

Land Cost: Land require for segregation site depends upon total MSW collected at site "i" from all site factor of x(i,j). Land require for segregation ls(j) considers days for storage (S2), density of waste (S3) and height for which waste can be stored (S4). Total land is considered by summation of land for shed (ln), for composting, for movement (lm) and for management (lf). Land cost depends upon cost of land set by government know as Jantri cost (Jc).

Total waste collected at segregation site $Ttw(j) = \sum_{i=1}^{n} Tw(i)$…….. (7)

Land for storage ls(j) =(((Ttw(j) *S2)/S3)/S4) …….. (8)

Land for movement lm(j)= ls(j)*1 …….. (9)

Land for shed ln(j) = ls(j)*1 …….. (10)

Land for management lf(j) = ls(j)*1 …….. (11)

Total land required l(j) = Σ(ls(j),lm(j),ln(j),lf(j)) …….. (12)

Land cost lc(j) = L(j) * Jc(j) …….. (13)

Segregation cost: Segregation cost per ton of MSW (S5) is taken from the existing market price as INR 30 per ton. This includes operating and maintenance cost of the machinery. Total segregation cost is estimated using Equation (14).

$Sc(j) = \sum_{i=1}^{n} Tw(i) * S5$ …… (14)

Total cost: Segregation site "j" is selected for segregation of waste generated from each source town "i" by minimizing total cost (z). Total cost includes Transportation cost (Trc), Land Cost (L(j)) and segregation cost(Sc(j)) of waste management from collection to disposal.

In the present study, it is assumed that MSW of each source town is segregated at single segregation site. The following constraint realizes this condition. This constraint also ensures that MSW is collected from each one of the source town. However, this constraint can be relaxed depending on the requirements of the study area.

$\sum_{j=1}^{n} x(i,j)=1$ …… (15)

Segregation cost for each site "j" is taken into consideration only when the site receives MSW from at least one of the source "I", and is estimated using Equation (16)

Segregation cost (j) $= \sum_{i=1}^{n} Sc(j) * x(i,j)$ …… (16)

Transportation cost for segregation site "j" and is estimated based on the total amount of MSW received by the segregation site that is estimated using Equation (17)

Transportation cost (j) $= \sum_{i=1}^{n} Trc(i,j) * x(i,j)$ …… (17)

Land cost for segregation site "j" is estimated based on the total amount of MSW to be handled by the segregation site using Equation (18)

Land cost (j) $= \sum_{i=1}^{n} L(j) * x(i,j)$ …… (18)

Total cost of establishing segregation sites for handling MSW generated from all source towns located in the study area is estimated using Equation (19)

Total cost =z $= \sum_{i=1}^{n} \sum_{j=1}^{n} c(i,j) * x(i,j))$ …… (19)

CASE STUDY

Study area in the present work encompasses small-scale towns and their surrounding villages located in the state of Gujarat, India. We have identified Sojitra and Anklav towns located in Anand district of Gujarat state as representative towns for collection of field/primary data. Gujarat urban planning commission classified these towns as category "D" municipalities. Sojitra town is having 24 villages surrounding it, having population in the range of 1000 to 12000. Anklav town is having 18 villages surrounding it, having population in the range of 1000 to 9000. Primary objective of the study is to suggest optimal waste management strategy. Primary field data collected from these two towns and their surrounding villages. Quality and quantity of MSW generated from these towns are experimentally determined.

Present scenario of MSWM handling at study towns: Analysis of data collected reveals that 20 percentage of population comes under high-income group, 30 percentage of population are middle-income group and 50 percentage of population belongs to low-income group as shown in Table(1). Nearly 80% of population are working in agriculture sector rest are either in service sector or having small business. These towns have hot and humid climate in summer, an average rainfall is 1015 mm/year and climate is dry and cold during winter.

These small-scale towns have separate administrative department for sanitary and solid waste management. They do not have properly trained labor. Labor deficiency is more than 25%. Waste collected from the sources using small hand pulled tricycle containing six small containers. However, presently to segregate waste before transferring it to collection station these containers are not used. To collect waste Large containers are used. These containers are place at collection points. Waste collected from street sweeping s dumped in the container. Vehicles with a capacity to transport 2 tons of waste at a time are available with each town. From containers every alternative day waste is collected. Climatic conditions cause high moisture content in solid waste in the study region. In general, open dumping of solid waste observed in these towns. Open dumping practiced without any segregation or treatment. There is no facility for segregation or proper disposal of waste.

Characteristics of MSW generated from small-scale towns: We have studied composition of MSW for small-scale towns based on socio economic status, of population. Mixed group comprises of areas having residence and commercial area together. Primary segregation at residential source is done for recyclable and resalable items. Rag pickers segregate the remaining recyclable and resalable items at collection centers. MSW is collected from bins/containers to study waste characteristics before segregation. Before weighting, MSW is manually segregated. Digital weighing machine used to determine weight of various components of MSW. Alternative day composite samples are collected. Data collected for two weeks and average weight is considered. Weight of the empty and filled bins, are done to get total volume of waste generating form the area. Computerized weighing machine used for weighing of bins. Figure (I) shows Composition of waste for different economic regions for Sojitra town.

Close observation of the results reveals the followings a) the higher income group generates more inert waste compared to the other groups b) lower income group generated waste that is more organic. This may be attributed to the fact that low income, people bring daily cores of vegetables from fields and leftover of these vegetables as well as leftover of vegetable vendors generates more organic waste. Vermin composting sites are already available at each town. Organic waste can be converted useful fertilizers at these sites. Moreover, recyclable waste can be segregated and send to recycler plants. Inert waste is found more in areas having construction activities, small-scale industries etc. These inert materials are to be disposed in land filling site.

Composition of waste from villages: Four representative villages were, selected around Sojitra to study waste composition. The selected villages are Gada , Piplav, Asodhar and Navakhal. These villages are having population of 3116, 4483, 8811 and 5819 respectively. Piplav is a religious place having higher floating population. Waste composition study done for four weeks. Composite waste from bins placed at different location of village collected to get representative sample. Figure (2) shows composition of waste from villages under consideration.

From Figure (2) it can be observed that more organic waste is generated from villages compared to inert waste. More, recyclable waste collected from village with higher floating population. Figure (3) shows comparison of composition of waste from small-scale town and its surrounding village. Small-scale towns produce more recyclable and inert waste as compared to villages.

Conventionally organic generated from villages are composted along with farm waste. The manure thus generated used as fertilizer. Presence of recyclable material in the waste is less but not negligible. Proximity of these villages to small towns is one possible reason for presence of plastic waste. Incineration and land filling are widely used methods to dispose waste. However, segregation of waste is key step for effective solid waste management in these villages. Segregation of waste at the source is the best possible option. However, with existing literacy to achieve segregation of waste at source requires at least a decade. For proper and scientific method of segregation and disposal of waste, it is advisable to segregate waste at a common place. Two alternative options are a) segregation at the collection point and segregation done at a segregation site. These segregation sites either constructed at each village or constructed at center of cluster of villages.

Quantity of waste from villages: According to census, 2011 population of Sojitra at its surrounding villages are shown in Table(2). Population of Sojitra is 19720 persons. The population of surrounding villages ranges from 1000 to 12000. Quantity of MSW generated from four villages experimentally obtained. For the remaining villages MSW quantity estimated using established methods. The MSW quantity for all the villages surrounding Sojitra town is depicted in Table(2). Quantity of waste generated is less 1 Ton/Day for all the villages under consideration. However, long-term effect of the waste if unattended may cause environmental problems. We propose an economically optimal option for location of segregation site in this present work.

Identification of segregation site for Small-town (Sojitra) and its surrounding villages: The optimization model presented in the previous section used to determine the optimal MSW handling strategy. Distance among villages and small-scale town obtained from road map of Gujarat. The optimization results presented in Figure (4) and Table (3) indicate formation of three clusters. Three segregation sites suggested are located at Sojitra, Deva and Kasor. Figure (4) also shows source villages along with location of segregation site. We have identified segregation sites by minimizing total cost that includes transportation cost, segregation cost and land cost. The mathematical model proposed in the previous section used for optimization. From the results, it is evident that transportation cost is vital for selection of cluster centers.

Detailed cost analyses for two possible options presented in Table (4). The results are indicating that segregation done at collection point of source village is costlier than segregation done at cluster center. Formation of three clusters is more economical compared to formation of single cluster. On the contrary, segregation site at each source village increases total cost by 3.71times sojitra cluster. Similar trend observed for Deva (2.7 times) and Kasor (2.8 times) clusters. Hence, segregation at cluster centers more economical compared to segregation at source village.

Villages around Anklav: Population and quantity of MSW generated by Akalav town and its surrounding villages presented in Table (5). Quality and Quantity of waste obtained for this case also by following same procedure as explained in previous case. Quantity of waste generated is less 1 Ton/Day for all the villages under consideration for this cluster also.

Proposed optimization procedure used to identify optimal solid waste handing strategy. Results show formation of two clusters at Anklav and Bamangam is economical. Cluster centers and their corresponding source villages shown in Table (6) and Figure(5). Results presented in Table (7) shows that formation of two clusters is more economical compared to formation of single cluster. Segregation site at each source village increases total cost by 4 and 3.8 times respectively at Akalav Bamangam clusters.

The results presented for both cases suggest that segregation at cluster centers more economical compared to segregation at source village.

CONCLUSIONS

We found from study that composition of waste for small-scale towns and villages consists of 40 – 70% as organic waste, 20-30% as recyclable waste and 10 – 20% inert waste. The rate of generation of waste ranges from 0.5 to 1.0 Kg /person/Day. An optimization model proposed to determine optimal location of segregation sites. The proposed model suggests formation of cluster for segregation is economical. There is an increase ranging from 2.5 to 4.0 times in total cost if the segregation sites provided at each source town. Efficiency of the proposed method demonstrated with the help of two case studies considering small-scale towns and their surrounding villages located in the state of Gujarat, India.

Table (1) Income group

Sr no	Group	Income per annum (INR/year)
1	High income	> 1,00,000
2	Medium / Mixed group	50000 to 1,00,000
3	Lower income group	< 50000
Source: Gujarat urban planning commission		

Table (2) Population and MSW Generated per day of Different Villages under Sojitra Municipality

Name of village	Population 2011	MSW Quantity (Kg/day)	Name of village	Population 2011	MSW Quantity (Kg/day)
Balinta	3168	253.44	Maghrol	4323	345.84
Bantwa	1177	94.16	Malataj	4666	373.28
Bhadkad	2853	228.24	Medhalpur	1569	125.52
Dali	1078	86.24	Parol	2362	188.96
Devataj	2926	234.08	Petli	3869	309.52
Devavanta	2462	196.96	Piplav	4483	358.64
Devtalpada	6955	556.4	Run	1565	125.2
Dabhou	5570	445.6	Runaj	3182	254.56
Gada	3116	249.28	Trambovad	3891	311.28
Isnav	2774	221.92	Virol (Sojitra).	2384	190.72
Kasor, sojitra	12029	962.32	Kothavi	1155	92.4
Khansol	1008	80.64	Limbali	1508	120.64
Source: census of India 2011					

Table (3) Location of Segregation Site for Different Clusters

Sr No.	Cluster	Name of village
1	Sojitra	Sojitra,Balinta,Dali,Devataj, Gada, Khansol, Kothavi, Madhrol,Runaj, Trambovad, Virol
2	Deva	Bhadkad, Deva, Dhabou, Malataj, Petli, Run
3	Kasor	Kasor,Isnav, Piplav

Table (4) Cost Comparison for Sojitra Site

Detail	Sojitra Site		Deva Site		Kasor Site	
	cluster	Source	cluster	Source	cluster	source
Land cost	2575600	7838700	566500	3360900	663000	2019600
Segregation cost	51410	51410	27375	25437	21900	16896
Construction cost	309000	3672000	309000	1836000	306000	918000
Transportation cost	177472	-	1017484	--	44395	----
Total	3113482	11562110	1920356	5222337	1035295	2954496

Table (5) Population and MSW generated per day of different villages under Anklav municipality

Name of Village	Population 2011	MSW Quantity (Kg/day	Name of Village	Population 2011	MSW Quantity (Kg/day
Ambali	4027	322	Gambhira	7038	563
Ambav	4344	348	Haldari	2249	180
Amrol	5006	400	Hathipura	2546	204
Asarma	3863	309	Jhilod	2078	166
Asodar	8811	705	Kosindra	4006	320
Bamangam	8220	657	Mijkuva	4747	380
Bhanpura	1323	106	Navakhal	5819	469
Bhetasi(Talpad)	1218	97	Umeta	3176	254
Bilpad	2090	167	Kandvadi	5816	465
Source: census of India 2011					

Table (6): Name of villages in Anklav town and villages found

Sr No.	Cluster	Name of village
1	Anklav	Ambali,Ambav,Amrol,Asarma,Asodar,Bhanpura, Bhetasi, Haldari, Hathipura,Joshikuva, Kosindra, Mujkuva, Navakhal
2	Bamangam	Bilpad, Ghambhira,Jhilod,Chamara,Umeta

Table (7) cost comparison for segregation site

Detail	Anklavsite		Bamangam site	
	cluster	source	cluster	source
Land cost	1680000	5661000	306000	1534080
Segregation cost	61465	44117	19799	12598
Construction cost	2320329	3978000	306000	1224000
Transportation cost	307980	-	91966	--
Total	2364446	9683117	723765	2770679

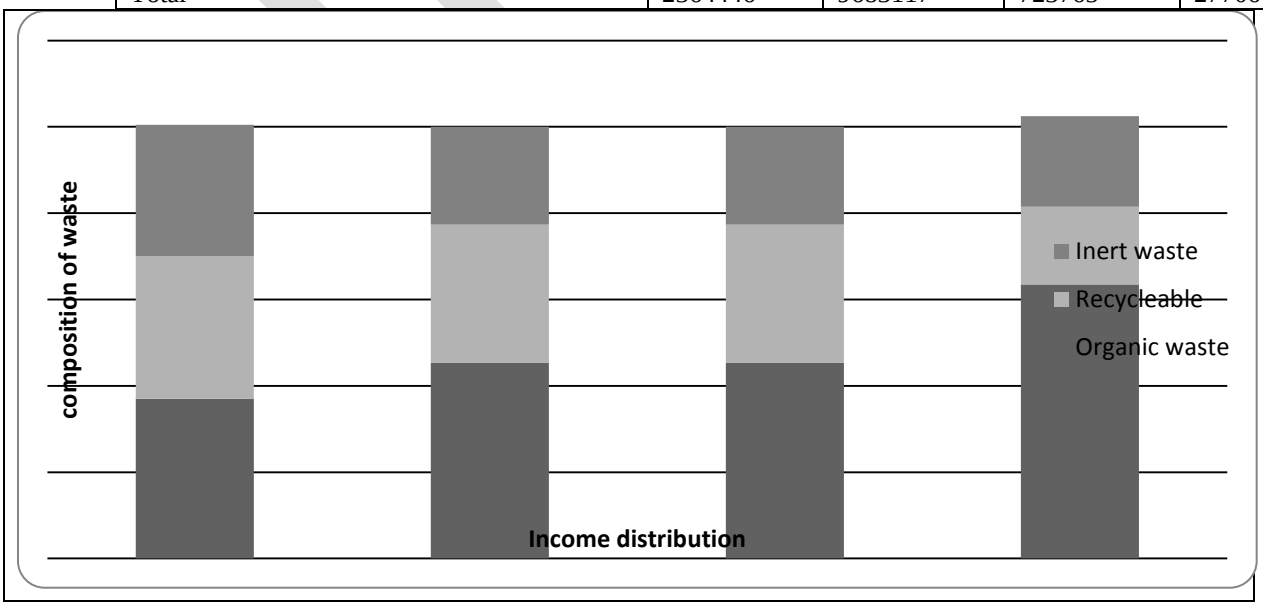

Figure (1) Waste characteristic as per economic status of Sojitra town

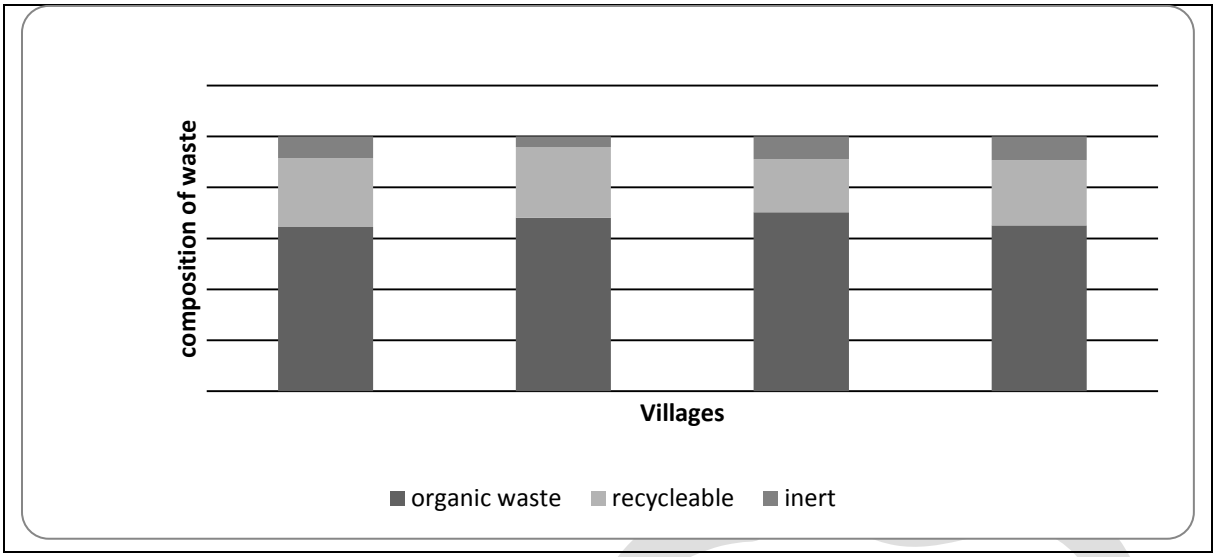

Figure (2) Comparison of MSW composition for villages near Sojitra.

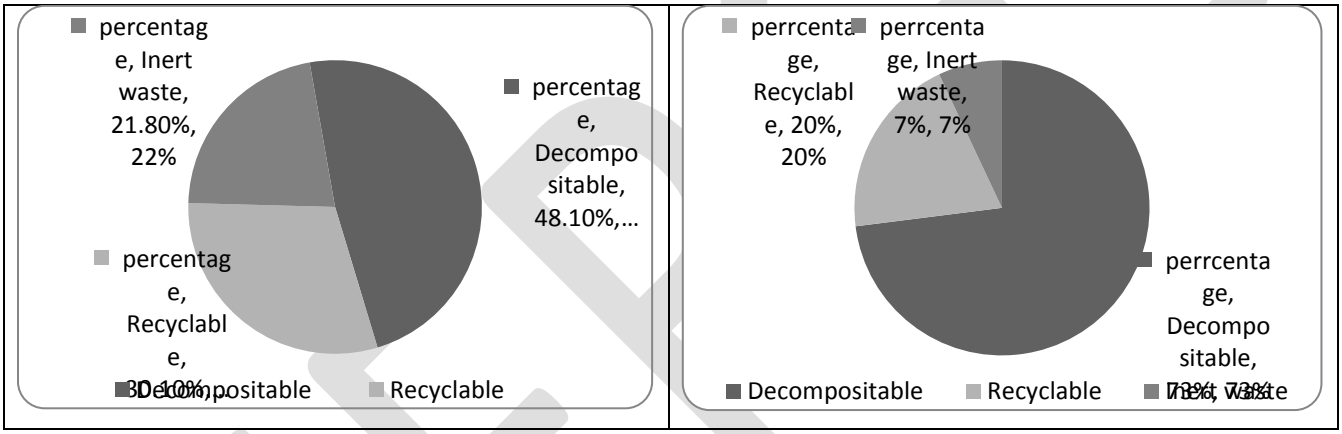

Figure (3) comparison of MSW composition for sojitra (left) and its surrounding villages (right).

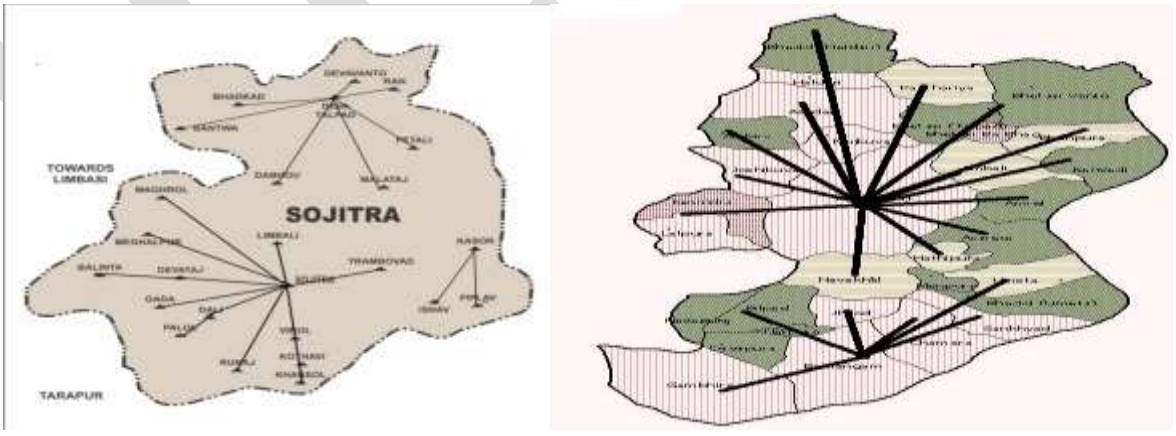

Figure (4): Map showing location of segregation site selected for Sojitra and Anklav municipality

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Stylistic Analysis of Anna Swell's "BLACK BEAUTY": A Poetic Prose

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Abstract: This article aims to find out aesthetic preference of the author of this novel by analyzing exploitation of different literary devices and style in the text. Style refers to the way in which language is used in a given context, by a given person, for a given purpose and so on (Leech & Short, 1981, p 10).Style pertains to parole: it is selection from a total linguistic repertoire that constitutes a style (ibid, p 11). Style refers to linguistic characteristics of a particular text (ibid, p 12). It may refer to some or all language habits of one person as when we talk of Shakespeare's style (or styles) or style of James Joyce (David Crystal & Derek Davy, 1969, p 9). It also focuses on aesthetic appeal which this novel has for the readers. A literary text simultaneously contains two faculties we respond to it as literary work and also as language (Spitzer, 1948). Phono Graphological features of the text will be analyzed to sort out these qualities. This novel is forerunner of pony book genre of children literature. Basically, it is autobiography of a horse called "Black Beauty". It is in first person narration. Anthropomorphism is present in this novel which adds color to the beauty of text and increases its aesthetic appeal. Anthropomorphism is the attribution of human form to God, to abstraction or even to animals and inanimate objects (Martin Gray, 200, p 26).

Keywords: Style, Pony book genre, Anthropomorphism, Phono-graphological features.

INTRODUCTION

Black Beauty" is a novel by an English author Anna Swell. It was composed in last years of her life. It is one of the bestselling books of all the times. The story is narrated is in first person and is an autobiographical memoir told by handsome horse named "Black Beauty" beginning with his care free days as a colt on an English farm with his mother to his difficult life pulling cabs and recounts many tales of cruelty and kindness. Each short episode recounts an incident in "Black Beauty's" life containing a lesson or moral typically related to kindness, sympathy and understanding treatment of horses with Swell's detailed observation and extensive distinction of horse behavior landing the novel a good deal of verisimilitude.

".....there is no religion without love, and people may talk as much as they like about their religion but if it does not teach them to be

good and kind to man, it is all a shame....." (Chapter 13, last paragraph).

THEORETICAL FRAME

Most critical discussions of literature revolve around, at some stages, to appeal linguistic evidence- that is, the evidence of words and sentences which actually occur on the printed page, in literary text the type of critical activity known as "Practical Criticism" or 'explanation de texte' relies more heavily on linguistic evidence than others. In addition, much of the basic vocabulary of literary criticism (metaphors, irony etc) cannot be explained without recourse to linguistic notions (Leech, 1969, pp. 1-2).

The ordered approach which seems more satisfactory in realizing the general aims of stylistic analysis involves taking the object of study-a particular piece of language, or text-and discussing it in terms of a number of interrelated levels of description. At each level, we are studying one aspect of the way in which language is organized: we shall be distinguishing phonetic/graphetic, phonological/ graphological, grammatical, lexical and semantic level (David Crystal & Derek Davy, 1969, p 15)

Literary text is analyzed in linguistic oriented way with the help of Halliday's Systemic Function Linguistic(SFL)(Halliday,1985).Particular method is used to analyze the text by systematically analyzing different inter-connected levels which separately analyses different features of text.

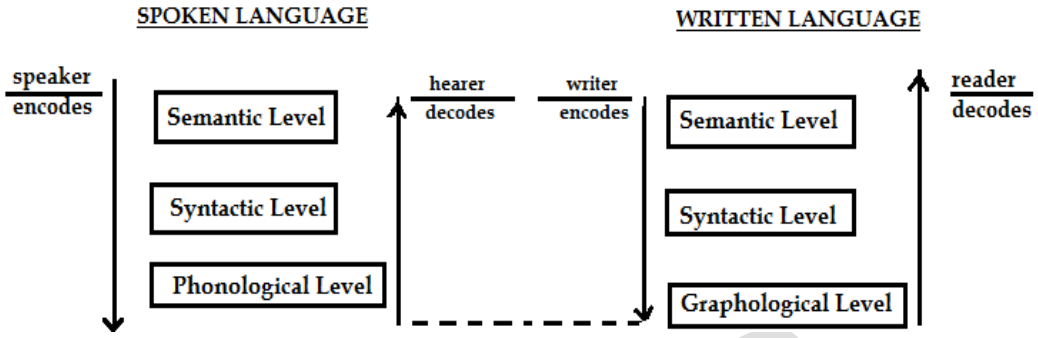
Focus is on phono-graphological features of text as subject matter is made up of phonic and graphic material of language realized by both phonology and graphology. Form is related to grammar and lexis. Subject matter relates language form to non-linguistic features (Tomori, 1997).

Text is analyzed on two levels in SFL.

1. **Formal level**
2. **Situational context level**

Meaningful patterning of text is seen as sublevels of phonology, grammar and lexico- semantics. In situational level, concentration is on contextual element SFL model is both structural and functional in nature(Martin Mathiessen,1997).In the same way, Leech and Short(1981) identified four levels for analyzing text; syntax, phonology, semantics and graphology. Syntax and phonology make the frame work of expression and work together to sort out meanings which is main interest of semantics. Graphology is a substitute of phonology according to them. Phonological features may be considered remote but they are not irrelevant. Spellings can be exploited or sounds can be elongated to make text prominent, it will be more prominent when text is read aloud.

Level of organization in speech and writing is described in leech and Short.

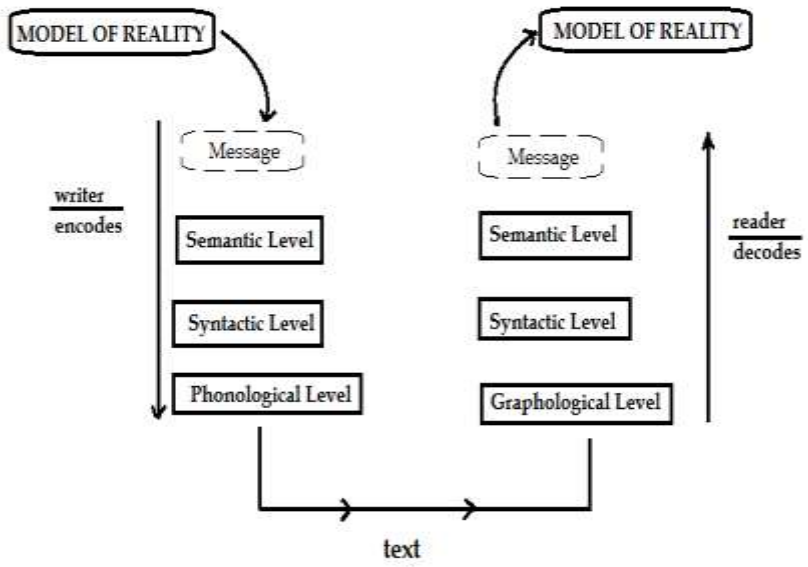


(Leech and Short, 1981, p 121)

Encoding is a top down process in speech and writing. Speaker and writer has to convey meaning for this purpose, he puts them in a particular and specific frame work which can be identified by sounds or letters.

Decoding is a down top approach because it starts from sounds and letters arranged in a typical format to the level of meaning.

Leech and Short (1981, p 126) defined the level of language organization in fiction with regards to its analysis:



With the help of Leech and Short's "Model of reality" we have tried to interpret it keeping in mind the context of situation and culture.

For encoding the text with the help of "model of reality", writer thinks that message is expressible in shape of meanings realizable by syntax and graphology. The process is turned round in case of text decoding.

Systemic grammar is a model for analyzing linguistic STRUCTURES as interrelated system of choices of formal categories (classes) for the expression of meanings in social context, developed by a British Linguist MAK Halliday and his associates JFG is descended from systemic grammar (Johnson & Johnson, 1998, p 313)

The systemic functional grammar (SLG) due to its stress on meanings is relevant. Language is a system of meaning according to Halliday and when people use language then it is manifestation of meanings (Bloor & Bloor 1995, p 1). Halliday for finding out meanings charts a triadic boundary between subject matter (Phono or Graphic), text (Grammatical and lexical organization)and context(linking the text to the textual environment culture and situation of the event itself (Philip,2007).Pluralist's approach which is favored by SLF is necessary to find out meaning. Pluralist says that language performs different functions, and any piece of language is likely to be the result of choices made on different functional level. A pluralist is not satisfied with the dualist's division between "expression" and "context", he wants to distinguish various strands of meanings according to various functions (Leech & Short 1981,p 30).

Many functional classification of language have been proposed but only three had the same impact in literary studies. The oldest of three is that of I.A Richards, who in practical criticism (1929) distinguishes four types of functions and four kinds of meanings sense, feelings, tones and intention. Jacobson's (1961) scheme is based on more systemic theory of language and distinguishes six functions (referential, emotive, conative, phatic, poetic, meta-linguistic) each corresponding to one basic dimension of the discourse situation.

Halliday's (1967) model of language tells us about three major functions which he calls "ideational", "interpersonal" and "textual" (Leech & Short, 1981, p 30). Fairclough (1995, p 4) observes the written texts are "increasingly becoming multi semiotic ", exploiting photographs, diagrams, sound effects and other forms of graphic design.

Analysis of Phono-Graphological Features

Analysis of Phonological Features:

Anna Swell has exploited different literary devices to create a particular aesthetic appeal in her anthropomorphic and autobiographical memoir of horse "Black Beauty".

- **Sound Repetition:**

It is one of the outstanding features of "Black Beauty". Almost on every page, there is more than one example of sound repetition. This is in-form of alliteration and assonance. At least one example from every page will be put forward.

- The repetition of sounds in different names in the novel creates a very unique impact on the mind of the readers. On the other hand, sound repetition creates a musical effect in this text and makes text of the novel just like poetic prose.

- "Rob Roy" (p9)
- "Black Beauty"(p16)

- "Gray Grant or Governor Grant"

These are different names in the novel.

Examples:

- "grow up gentle and good"(p5)
- "bad boy"! He said bad boy"(p6)
- "no noise now"(p9)
- "my master would not sell me"(p10)
- "stiff strap"(p11)
- "stood snorting"(p12)
- "sight or sound of steam engine"(p9)
- "common stall good stall"(p13)
- "man brought me put me here"(p14)
- "three times together"(p17)
- "tender places, ticklish places"(p17)
- "see such big stick"(p220)
- "Beauty do your best"(p21)
- "Stood by me and stroke my neck"(P22)
- "my legs ached, my lion ached"(p23)
- "silent and sad"(p24)
- "another and another and another"(p25)
- "tolling tolling"(p25)
- "ho, ho"(p16)
- "yo! yo,o,o! yo,o,o,o!"(p7)

Expression such as on page 25, 16 and 7 serve as an effective onomatopoeia which adds color to the beauty of text and Swell's style.

- "snappish and suspicious" (p26)
- "will do very well with"(p27)

- "day by day, whole by whole"(p28)
- "still strained on the saddle"(p29)
- "lord w-was much put out when he learned what had happened"(p30)
- "mouth more or less"(p31)
- "my masters were friends"(p31)
- "no more pleasure no more hope"(p32)
- "great grey coat with great gray caps and great white cotton gray hat"(p32)

Such expression makes Swell's style just like poetic prose.

- "sad sights"(p33)
- "comfortable, clean smelling"(p34)
- "dark hairs, dark eyes"(p35)
- "when I was well"(p35)
- "Quite well by the way in which"(p37)
- "streets were slippery with frost or snow"(P38)
- "no, no"(p39)
- "what do you want with"(p40)
- "knees knuckled"(p41)
- "saw a white streak"(p42)
- "oh! if man were more merciful"

It is an innocent prayer of the horse and shows the cruelty of human nature.

- "some lame, some broken winded, some old and some that I am sure"(p43)

Such expression also heightens the pathos.

- "bless the boy"(p45)
- "handsome is that handsome does"(p46)
- "well, well"(p46)

With such an artistic usage of alliteration and assonance, Swell attains effective and bright description along with aesthetic pleasure which such repetition often bestows.

- **Sound Elision:**

In this process writer often omits a unit of sound or even syllable to create certain literary effect which satisfies aesthetic sense of readers. Swell has exploited this sound device to achieve her aesthetic goals.

- "I don't know" (p35,7)
- "I don't believe" (p21,26)
- "but 'twas all for me"
- "I don't think"(p14)
- "that's well"(P16)
- "here's money"(p21)
- "I can't bear"(p2,28)
- "there's monstrous"(P37)
- "Tis a speculation"(p44)

Such expressions make text of novel poetic in nature. Their main purpose is to appeal to aesthetic sense of readers.

- **Elongation of sounds:**

This device has also been used for emphasis such as at page 7;

- "yo!yo,o,o!yo,o,o!"

Graphological Features

Multiple punctuation marks in a sentence, capitalization, hyphenation, dashes, use of brackets, unusual spellings and quotation marks are unique graphological features of the text.

The use of such features has particular semantic and stylistic effects on texts.

These features are also found in native and non native English literature e.g. in novels of Achebe and Qurat-Ul-Ain Haider.

- **Use of Multiple Punctuation Marks:**

Use of particular punctuation marks in a sentence creates certain effects in the text. Often such fragmented language makes text difficult to comprehend but here case is reverse. Sentences narrated by Black Beauty are fragmented but are not difficult to comprehend. It also helps the author to narrate the events in detail which is an evidence of her extensive and deep observation of animal life. Two or three examples are being presented here.

Example:

- "Over the hedge, on one side we looked into the plowed fields and on the other we looked over a gate at our master's house we stood by the road side."(p4)
- "My mother seemed much troubled; she said that she had known that horse for years, and his name was Rob Roy; he was a good horse, and there was no vice in him."(p 8-9)

- **Capitalization**

Every chapter and its title is capitalized and serves the purpose of foregrounding and attracts the readers and brings colors to aesthetic beauty of novel. The title of all chapters is in noun phrases just like news report's heading.

Examples:

- "MY EARLY HOME"(p4)
- "CHAPTER 2"
- "THE HUNT"(P7)

- **Unusual Spellings**

- "Hallo"(p33),"Thank Ye"(p33) and "Plowed" are the words with unusual spellings. There purpose looks to create certain effects because in the whole novel "Ye" is not used for "you" except in this sentence. Hello and ploughed are actual words for "Hallo" and "Plowed".

- **Use of Brackets**

Use of bracket is also a graphological feature of this text. It has been used to provide extra information related to particular event or

being.

Example:

- Dorothy (Dolly they called her) p35
- (I was on the side next the house and could see all that went on) p25
- Unique Quotation Marks:

'"Handsome is that handsome does"'

It aims to foreground the statement by deviating from norm.

- **Hyphenation**

Hyphenation has been used to create new vocabulary item in the text which adds colors to literary expressions in the novel and also has the aesthetic appeal for the readers.

Examples:

- Cart-horse cart (p5)
- Well-born (p5)
- Box-stall (p13)
- Water-mill (p15)
- Good-tempered (p18, 20)
- High-mettled (p26)
- Night-cap (p22)
- Check-rein (p27)
- Bearing-rein (p28)
- Colt-broker (p24)

Hyphenation is present at almost all pages of novel.

- **Use of Dash**

Dash has been used to depict the urgency of situation in novel and it also heightens emotional effect of statements. This

graphological feature makes text look beautiful.

Examples:

- There-----take your money and go (p6)
- They were now riding on all directions----------to doctor's (p9)
- I hated the crupper--------to have long by tale (p11)
- Putting out of smoke---------a long black (p12)
- Intelligent eye----------what do you say----------
- Black Beauty---------why, yes
- Ride for your life----------that's
- I over----------Joe used to see as this----------that John (p23)
- He said----------never (p25)
- Where the Earl of W----------lived (p26)
- But my lady---------that's another (p27)
- Drive the duchess of B----------'s (p29)
- Another six pence----------yes (p33)
- After the old one----------shall we (p35)
- When they suffer----------they paid (p42)

➢ **Pictures**

Pictures of horse on each page serve the purpose of attention seeking device. They don't let the readers get bored and hence maintain the interest in text and it puts the soothing effect on eyes of the readers.

Conclusion

The meanings are present in all levels of stylistics. This paper shows how Swell has exploited Phonic and Graphic devices of language in the text to acquire the particular effect of theme and style. By analyzing these devices in the text, we come to know that a text with multi-layered meanings can be evaluated in a better way within the matter of formal functional dimension of language representation.

The amalgam of phono-graphic features in the text appeals to readers' aesthetic sense, it also soothes the sense of seeing and hearing as Eagleton (1983, p 128) noted that:

.....meaning is scattered or dispersed along the whole chain of signifiers. It cannot be easily nailed down: it is never fully present in any one sign alone.

Eminent linguistic-critic Leo Spitzer (1948) observes: "I would maintain that to formulate observation by means of words is not to cause the artistic beauty to evaporate in vain intellectualities; rather, it makes for widening and deepening of the aesthetic taste. It is only frivolous love that cannot survive intellectual definition, great love prospers with understanding" (p. 2). Spitzer (ibid) emphasizes that the minutest information of language can open the "soul" of literary work. All these features inculcate poetic quality to Swell's prose in novel.

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EFFECT OF FLUID DENSITY ON SHIP HULL RESISTANCE AND POWERING

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ABSTRACT- Vessels move through waters by overcoming the resisting force from the water and air. This force, known as the total resistance is overcome by the provision of effective power from the propulsion system so that the ship can sail at a given speed. In this work the effect of water density on the ships hull resistance and powering was analyzed. Densities of water were taken at different sources, tides, temperature and at different hours of the day and simulated against various types of resistances encountered by the ship when moving in still water (sea or fresh) and air. The ITTC 1957, 1963 line, ATTC 1947, 1957 line and the Froude's ship resistance models were employed for the simulation and results have shown a positive correlation between water density and ship hull resistance and ultimately the effective power of a vessel. Standard charts and existing equations were used to estimate the total resistance and power for situations of varying water and atmospheric temperatures resulting in varying fluid (Water) and air densities. A computer program using c++ was developed to carry out the necessary computations and from the excel plot, it was discovered that the R_T and P_E varied in a similar trend with the density of the fluid fresh or sea water.

Keywords: Density, Hull Resistance, Effective Power, Tide, Sea and Fresh Water Displacement, draft

NOMENCLATURE

A_T	=	*Transverse project area of ship*
C_B	=	*block coefficient*
C_f	=	*coefficient frictional*
C_A	=	*coefficient of air resistance*
C_T	=	*coefficient of total resistance*
D	=	*displacement*
L_{pp}	=	*length of the ship between perpendicular (ft)*
R_T	=	*total resistance*
R_F	=	*frictional resistance*
T	=	*draft*

1. INTRODUCTION

The development of building different types of ships to serve for whatever purpose it is built for, led to the calculation of the ship resistance on the water surface and studying of densities and effective power of ships. This enables the naval architect or builder to know the necessary component to be installed in the vessel.

One of the most important considerations for a naval architect is the powering requirements for a ship. Once the hull form has been decided upon, it is necessary to determine the amount of the engine power that will enable the ship to meet her operational demands or requirements. Knowing the power required to propel a ship also enables the naval architect to select a propulsion plant, determine the amount of storage required, and define the ships center of gravity.

However, resistance in a ship is of various types or components. These include frictional resistance, residuary resistance, wave-making resistance, eddy-making resistance, air resistance and appendage, resistance; and finally the total bare hull resistance.

In this project we will be limited to the total resistance of a vessel and its effective power. In the design of the hull, certain requirements must be met i.e. the hull vessels must suit the hull resistance and densities of the water. To be more explicit in our research goals and scope, densities of three or more creek were calculated at low and high tide and different temperatures. The results and data collected were used to determine resistance and effective power of a ship and different densities at specified temperatures [6], [13].

1.1 Components of Ship Resistance.

The force opposing motion of a ship in a fluid is referred to as ship resistance. A ship moving through water at speed experiences a force or resistance exerted by the water on the ship. The ship must therefore exert an equal thrust to overcome the resistance and travel at that speed. There are various components of resistance on ship include Frictional resistance, Wave - making resistance, Eddy-Making resistance and the Air - resistance
The above four main components make up the total resistance (R_T) of Ships; and both the wave and Eddy resistance are commonly taken together under a name called Residuary resistance." [7], [11]. Hence;

$R_T = R_f + R_R$ 1

And the effective power can be determine
$P_E = R_T$ x V x (0.514) KW 2

Where V = m/s and by transposition

$$\frac{P_E}{0.514} = R_T \ x V \ (KW) \quad 3$$

1.2 Frictional Resistance (R_F)

Frictional resistance R_f is developed only by the shearing action in a very thin wetted surface lying among the projected roughness, not withstanding that this action may be frequently governed by what is happening in those portion of the boundary layer not touching the hull. In other words frictional resistance is the largest single component of the total resistance of the ship. Experiments have shown even smooth new ships account for 80% to 85% of the tot resistance R in slow-speed ships and as much as 50% in high speed ships [3], [9].

The frictional resistance of a ship depends on the following;

- The speed of the ship
- Density of water of operation
- Length of ship
- The wetted surface area
- The nature of the surface i.e. roughness of hull.

Froude in the nineteen (19th) Centuries undertook a basic investigation on frictional resistance of smooth planks in this tank at Torgugy (England). And he gave an empirical formula for the resistance in the form [1].

$R_f = F.S.V^n$ 4
Where,
R_f = Resistance
S = Total surface are (wetted surface) (ft^2)
V = Speed (knots)
F = Coefficient which depends upon the length
n = an index of about 1.825

1.3 Modern Frictional Resistance Formulations

Reynolds, after performing series of experiment came up with a suggestion that there are two different flow regimes possible, each consisting of different law of resistance. At low value of Reynolds number, $\mathrm{Re} = \frac{V_L}{V}$, the flow is called laminar and was associated with a relatively low resistance. When Reynolds number increases, the laminar flow broke down and the fluid mixes transversely in eddying motion and the resistance increased. This flow is called turbulent flow.

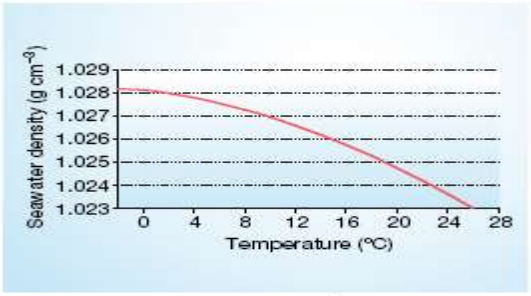
In modern frictional resistance formulations the specific frictional resistance coefficients C_f has been introduced and is assumed to be a function of the Reynolds number.

In 1904, Blasin's achieved a success in calculating the total resistance of the plank in laminar flow and gave the following formula.

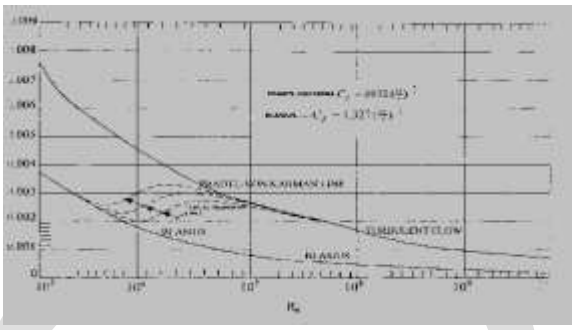
$$Cf = \frac{R_f}{0.5\ell SV^2} = 1.327 \left(\frac{V_L}{\mu}\right)^{-½} \quad 5$$

In 1921 Prandle and Von Karman published the equation for turbulent flow as

$$Cf = \frac{R_f}{0.5\ell SV^2} = 0.072 \left(\frac{V_L}{\mu}\right)^{-½} \quad 6$$



(a) Density and Temperature variations [4]



(b) Skin Friction lines for Laminar and turbulent flow [6] [10].

Fig 1: Skin Friction Lines turbulent and laminar flow
[Source: Koumako (1999)]

In 1935, the international Conference of ship tank superintendents (ICSTS) proposed the formulation.

$$R_f = \left[0.00871 + \frac{0.053}{8.8 + L}\right] SV^{1.825} \quad 7$$

Other formulae have been proposed and used in practice. They are the ITTC line and ATTC line methods. [2], [5]
ITTC (1963) has

$$C_f = \frac{0.075}{Log_{10}(R_n - 2)^2} \quad 8$$

And ATTC (1957) line has,

$$\frac{0.075}{\sqrt{C_f}} = Log_{10}\ (R_n\ x\ C_t) \quad 9$$

Also Hughs has it that

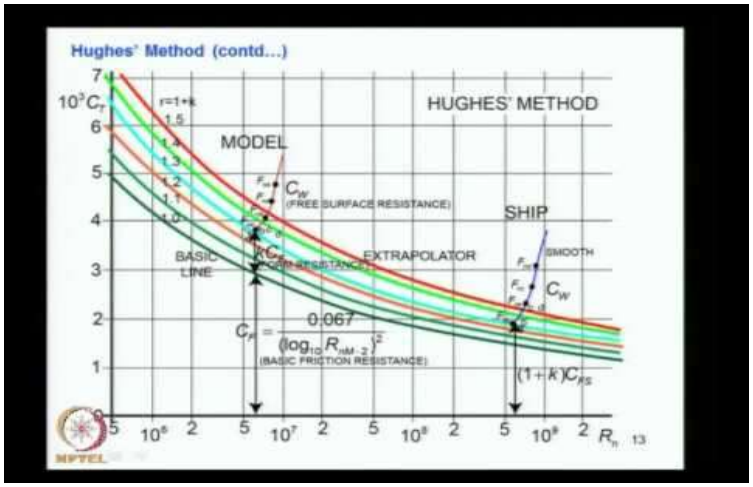
$$C_f = \frac{0.066}{Log_{10}(R_n - 203)^2} \quad 10$$

The wetted surface area S maybe estimated using some empirical formula such as

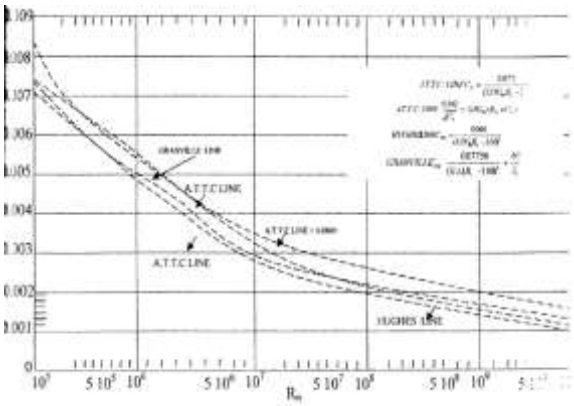
Munford formula $S = 1.7Lpp\ x\ d + \frac{\nabla}{d}\ (m^2)$

Bruckhoffe's formula $S = \frac{(4d + B)\ x\ L/2}{1.625 - C_B}$

Where;
L_{pp} = length of the ship between perpendicular (m)
d = draught of the ship (m)
∇ = Volume displacement (m^3)
C_B = block coefficient



a. Hughes Method [4]



b. ATTC, ITTC and other lines [6], [10]

Fig: 2 Comparison of method of Hughes, ATTC, ITTC and others

1.4 Residuary Resistance (R_R)

Residuary resistance R_R, comprise of Wave-making resistance and eddy resistance. Wave resistance refers to the energy loss caused by waves created by the vessel during its propulsion through the water while eddy resistance refers to the loss caused by flow separation which creates eddies, particularly at the aft end of the ship. The residual resistance normally represents 8 - 25% of the total resistance for low speed ship, and up to 40- 60% for high speed ships.

1.5 Air Resistance

A ship moving on a smooth sea and still air encounters a resistance due to the movement of the above water hull through the air. From experiment Admiral Taylor suggested the following empirical formula for the determination of ship's air resistance

$$R_A = 0.004 \times \frac{1}{2B^2} \times (V_R)^2 \qquad 11$$

Where;

B = beam of the ship
V_R = relative velocity of the wind
V = speed of the ship in still air

For ship moving in still air

$$R_A = CA \times \frac{1}{2} \times \rho \times A_T \times V^2$$

Where;

C_A = Resistance coefficient
ρ = Mass density of air
A_T = Transverses projected area of above water hull
V = Ship speed.

1.6 Eddy - Making Resistance (R_E)

This is the resistance due to the eddy formulation or disturbed streamline flow caused. It occurs as a result of abrupt or sudden changes in form of projecting part such as bossing and bilge keel.

1.7 Wave- Making Resistances (R_w)

The wave- making resistance is due to the wave system created on the surface of the water as the ship passes through it. This wave generation is dependent on the air - water free surface and gravity.

The net fore and aft forces upon the ship due to fluid pressure acting normal to all parts of the hull are the wave making resistance. There are three types of wave form as a ship moves through still water.

1. Diverging wave
2. Diagonal wave
3. Transverse wave

1.8 Appendage Resistance

In some certain ships, the appendage resistance is due to the rudder and bilge keels in the case of a single screw ship, while in multi screw ships, there are also resistance components due to open shaft and struts. All these items give rise to additional resistance, which is best determined by model experiments. Many model experiments have been carried out over the years but the expansion of such estimates to the ship is a very difficult question which is yet to be satisfactorily solved as a means of making approximate estimates of appendage resistance for design purposes. Appendage resistance is expressed as % of bare hull resistance

1.9 Relationship between Density and Resistance

The formula for totals resistance $R_{T\,is}$ given by

$$R_T = C_T \frac{1}{2} \rho V^2 . S \qquad 12$$

From the formula above, it is clear that as the density of the fluid in which the ship hull is submerged increases the resistance also increases and verse versa.

Type of ship	Value of $\frac{V}{\sqrt{L}}$	
	0.7	1.00
Large fast and 4 screws	10-16	1.0 – 16
Small fast 2 screws	20-30	10-23
Small medium speed 2 screw	12-30	2-4
Large medium speed 2 screw	8-14	8-14
All screw ship (single)	2-5	2-5

Table 1: Types of Ships and their values of V/√L
[Source: Koumako, (1999)]

2.0 Methodology

The Froude Reynolds ITTC and ATTC adopted in 1993 were used to show the variations of resistance resulting from densities of fresh and salt water taken at different temperature and investigate the densities of creeks in different time, and at low and high tides. These densities were used to verify the density previously stated by ITTC and ATTC methods in values of C_f in 1957. Due to the in availability of materials used for determination of density of water as experimented in the physical sense using chemical balance and its volume and graduated density bottle for determining mass and volume of the liquid, the formula for density equal to mass over volume was used [8].

Samples of water were collected from different creeks in Rivers State of Nigeria such as Rumumasi and Choba Creeks are Fresh Water, while Iwofe and Abonnema Wharf creeks are Salt Waters. The mass of water from each creek was measured per liter and ten liters. The unit of the measuring apparatus is in grams and conversions where made to kilograms. Calculation of density in its standard international unit of kg/m^3 was also achieved [12].

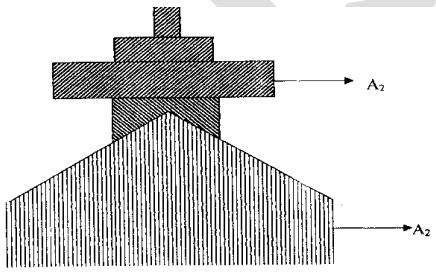


Fig. 2.2: Transverse Project Area

Fig 3 Transverse Projection Area

Simulation Model

Length of water line (m) L_{wl} 131

Length between perpendicular (m) Lpp	134
Beam (m) (B)	18
Draft (m) T	8
Displacement (Tonnes)	6680
Block coefficient C_B	0.90
Wetted surface sq m	2403
Speed knots v	12
Super …….m	499
Main hull area m^2	273

Harbor Tug Principal Dimensions

Length overall (m)	32
Length of water line (m) L_{wl}	30.4
Length between perpendicular (m) L_{pp}	30.4
Beam (m) (B)	8
Draft m (T)	4
Block coefficient C_B	0.58
Wetted surface sq m	292
Speed knots v	9
Displacement (Ton)	433

Data Collection And Processing For Low Tide

1 litre of Empty container weighs 55.96grm = $\frac{(55.96)}{1000}kg = 0.05596kg$

1 Litre of Empty container weighs 55.96grm = $\frac{(55.96)}{1000}kg = 0.05596kg$

Note:

$1000cm^3 = 1dm^3 = 1$ litre

$1000\ dm^3 = 1m^3$

1000 liters $= 1m^3$

1litre $= 0.001m^3$

Abonenema wharf creek (salt water)

Mass of container + mass of 1 litre of water = 1051.73grm =

$$\frac{1051.73}{1000} = 1.05173kg$$

Mass of water = mass of container with water – mass of empty container

= 1.05173 – 0.05596 = 0.99577kg

$$density = \frac{mass}{vol} = \frac{0.99577kg}{0.001m^3} = 995.773kg/m^3$$

Measurement for 10 liters of water + container Mass of container + mass of 10 liters of water = 10,013.66grm = $\frac{10013.66}{1000} = 10.01366kg$

Mass of 10 liters of water = mass of container with water - mass of empty container = (10.01366 – 0.05596) kg = 9.9577kg

Density for 10 liters of water = $\frac{9.9577}{0.001} = 9957.7 kg/\mathrm{m3}$

For Iwofe Creek (Salt Water)

Mass of container with 1 liter of water = 1053.84g = 1.05384kg, Mass of water = 1.05384 – 0.05596 = 0.99788kg

$$density = \frac{0.997884 kg}{0.001 m^3} = 997.88 kg/m^3$$

Measurement For 10Litres

Mass of container with water (10 lit) = 10034.76grm = 10.03476kg

Mass of 10 Liters of water = 10.03476kg – 0.05596kg = 9.9788kg

$$density = \frac{9.9788 kg}{0.001 m^3} = 9978.8 kg/m^3$$

Choba Creek (Fresh Water)

Measurement of 1 litre of container + water.

Mass of container + water = 1046.54g = 1.04654kg

Mass of water = mass of container with water - mass of empty container

= 1.04654 – 0.05596 = 0.99058kg

$$density = \frac{0.99058 kg}{0.001 m^3} = 990.58 kg/m^3$$

Measurement For 10Litres

Mass of container with 10 liters of water = 9961.76grm = 9.96176kg

Mass of 10 Liters of water = 9.96176kg – 0.05596kg = 9.9058kg

$$density = \frac{9.9058 kg}{0.001 m^3} = 9905.8 kg/m^3$$

Rumumasi Creek Fresh Water (low Tide)

Mass of container with 1 liter of water = 1050.3grm = 1.05030kg

Mass of water = mass of container with water – mass of empty container =

1.05030 - 0.05596 = 0.99434kg

$$density = \frac{0.99434 kg}{0.001 m^3} = 994.34 kg/m^3$$

Measurement For 10Liters of water.

Mass of container with 10 Liters of water = 9999.36grm = 9.99936kg

Mass of 10 liters of water = 9.99936 -0.5596 = 9.9434kg

$$density = \frac{9.9434 kg}{0.001 m^3} = \frac{9943.4 kg/m^3}{}$$

Data Collection and Processing for High Tide

Abonnema Wharf

Mass of container with 1 liter of water = 1059.73grm = 1.05973kg

Mass of 1 liter of water = 1.05973 – 0.05596kg = 1.00377kg

$$density = \frac{1.00377}{0.001} = 1003.77 kg/m^3$$

For 10 liters of water.

Mass of container + water = 10.09366kg

Mass of 10 liters of water = 10.09366 – 0.05596 = 10.0377

$$density = \frac{mass}{vol} = \frac{10.0377 kg}{0.001} = 10037.7 kg/m^3$$

For Iwofe Creek

Mass of container with 1 liter of water = 1057.3grm = 1.0573kg

Mass of 1 liter of water = 1.0573 – 0.05596 = 1.00134kg

$$density = \frac{mass}{vol} = \frac{1.00134}{0.001} = 1001.34 kg/m^3$$

For 10 liters of water.

Mass of container with 10 liters of water = 10069.36grm = 10.06936kg

Mass of 10 liters of water = 10.06936 – 0.05596 = 10.0134kg

$$density = \frac{mass}{vol} = \frac{10.0134 kg}{0.001} = 10013.4 kg/m^3$$

Rumuomasi

Mass of container + 1 liter of water = 1028.464grm = 1.028464kg

Mass of 1 liter of water = 1.028464 – 0.05596 = 0.972504kg

$$density = \frac{0.972504}{0.001} = 972.504 kg/m^3$$

For 10 liters of water.

Mass of container + 10 liters of water = 9781.0grm = 9.781kg

Mass of 10 liters of water = 9.781 – 0.5596 = 9.72504kg

$$density = \frac{9.72504}{0.001} = 9725.04 kg/m^3$$

Choba Creek

Mass of container + 1 liter of water =1043.73grm = 1.04373kg, Mass of 1 liter of water = 1.04373 – 0.05596 = 0.98777kg

$$density = \frac{mass}{vol} = \frac{0.98777}{0.001} = 987.77 kg/m^3$$

For 10 liters of water.

Mass of container + 10 liters of water = 9.93366kg

Mass of 10 liters of water = 9.93366 – 0.5596 = 9.8777kg

$$density = \frac{9.8777}{0.001} = 9877.7 kg/m^3$$

3.0 Results and Discussions

ATTC and ITTC methods was used to determine the effect of temperature to the density and resistance in the Ship to the Water. And also to know it's effect in effective power. However, the calculation results for resistance at various creeks are shown in Table 3.

3.1 Data Collection and Processing for Different Temperature Procedure

The collection of dates was made at different consecutive time and temperature. And the process for collection of data was made as follows.

i) The temperatures of the creeks were taken and the volumes of water collect in one's and 10 liters,
ii) The temperature of the water collected was measure and recorded.
iii) The temperature of the laboratory at which the mass will be measured was be measured was recorded.
iv) Masses were measured in grams and recorded for a conversion to kilograms.
v) The density of the different volume of water was also calculated.
vi) The measurement when made in time 6: 30- 700am, 12- 1pm, 6pm - 7pm, morning, afternoon and evening respectively.

The measurements procedure for the masses were made as described in chapter three below the mass and density calculation made.

3.2 Comparison between Total Resistance and Effective Power.

In the initial simulation which results is tabulated in Table 1 the calculation of the ship hull resistance and affective power. The results of increase in coefficient of friction of ITTC line table. The data of density collected shows that the densities of high tide creeks are more than low tide creeks. Densities increase more from low to high tide fresh water creeks than the salt water creeks. Consequently, the increase in density increases in the hull resistance and effective power of ship.

In the second simulation which results is tabulated in Table 3 same result of initial simulation is achieved by using the harbor tug but different figures [12].

In the table 5 there is a decrease in density as result of increase in temperature but in this case the result in slightly abnormal. Table 5 compares the results of ITTC and ATTC, the results of ITTC method is better due to the reasons stated in Table 4 [2], [4]. Figures 5 to 8 shows the graph representation of relationship of Resistance and Power with respect to the density of the salt water considering the ATTC and ITTC models which agrees with the theoretical explanation. Similarly Figures 9 to 12 shows the graph representation of relationship of Resistance and Power with respect to the density of the fresh water considering the ATTC and ITTC models which also agrees with the theoretical explanation.

4.0 CONCLUSION

In comparing the densities of salt and fresh water, low or high tide and at different temperatures, it was noted, that these densities differ. They were used to calculate the hull resistance and effective power of a ship and harbor tug using ATTC and ITTC methods. The methods employed in making the calculation shows that the hull resistance and effective power of the both vessel increases with increase in density.

However, it is noted that the densities of water at high tide is more than low tide. And temperature increase result to density decrease. Here, the matter rest for the present but it is clear that the subject is far from it final solution. Researches should be carried out to fits the recent improvement or requirement on this topic. By king recent conferences held by the ATTC and ITTC committee respectively.

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Appendix

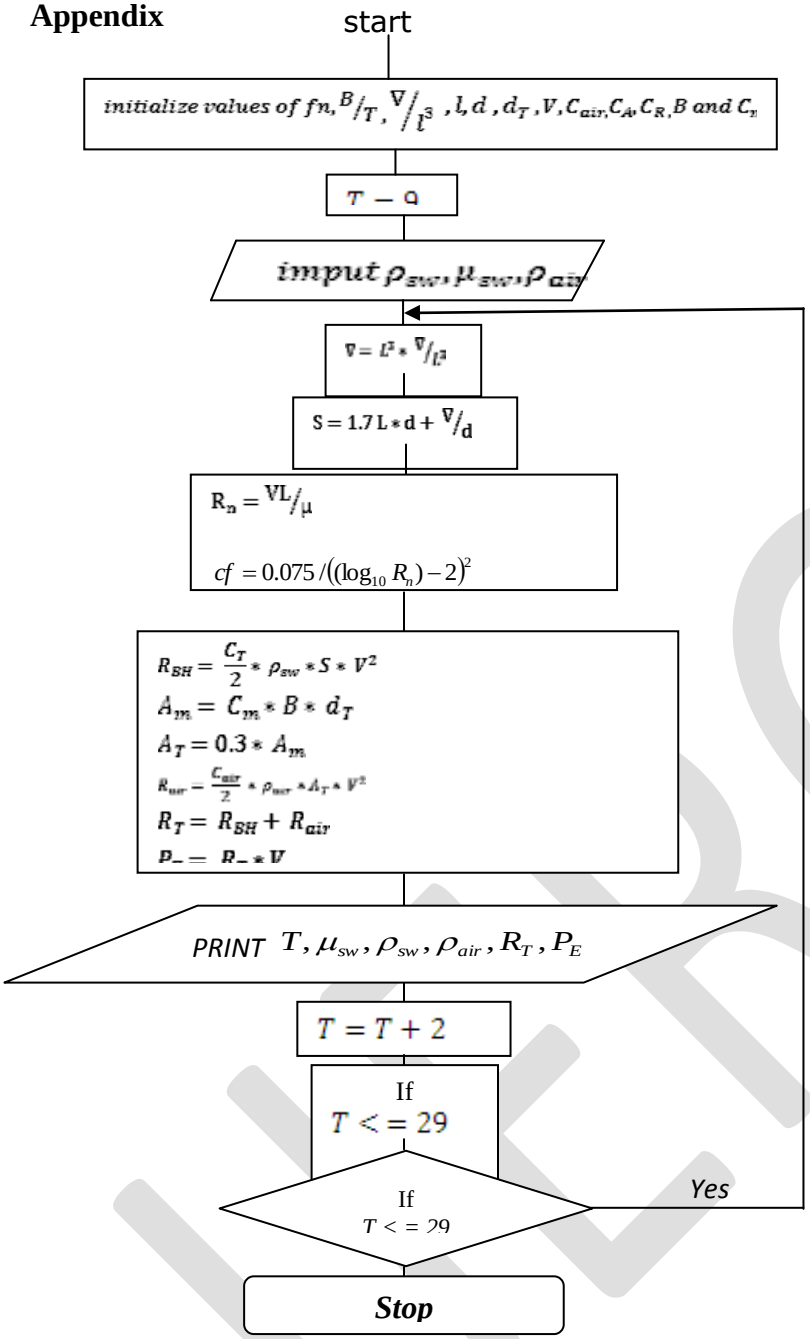

Fig : 4 Flowchart

Table 2: Data Collection and Processing for High and Low Tide

Creeks	Low Fresh water p (kg/m^3)	Low Tide Salt water p (kg/m^3)	High Fresh water p (kg/m^3)	High Tide Salt water p (kg/m^3)
Abonnima (SW)	-	995.773	-	1003.77
Iwofe (SW)	-	997.88	-	1001.34
Rumumasi (FW)	994.34	-	972.504	-
Choba (FW)	990.58	-	987.77	-

Table 3a: Tabulation of Results for High Tide

TABLE 3: TABULATION OF RESULTS FOR THE SHIP					
TABLE 3a: TABULATION OF RESULTS FOR HIGH TIDE					
SALT WATER					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
ABONNEMA (SW)	1003.77	289.5491701	1786.51838	289.7799234	1787.942127
IWOFE(SW)	1001.34	288.8482083	1782.193445	289.0784029	1783.613746
FRESH WATER					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
RUMUOMASI (FW)	972.504	280.5301275	1730.870887	280.7536932	1732.250287
CHOBA(FW)	987.77	284.9337834	1758.041444	285.1608585	1759.442497

Table 3b: Tabulation of Results for Low Tide (for Standard Density)

TABLE 3b: TABULATION OF RESULTS FOR STANDARD DENSITY					
STANDARD DENSITY(SALT WATER)					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
STANDARD VALUE	1025	295.6732114	1824.303714	295.9088451	1825.757574
STANDARD DENSITY (FRESH WATER)					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
STANDARD VALUE	1000	288.4616696	1779.808502	288.6915562	1781.226902

Table 3c: Tabulation of Results for Low Tide

TABLE 3c: TABULATION OF RESULTS FOR LOW TIDE					
SALT WATER					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
ABONNEMA (SW)	995.773	287.2423421	1772.285251	287.471257	1773.697656
IWOFE(SW)	997.88	287.8501309	1776.035307	288.0795301	1777.450701
FRESH WATER					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
RUMUMASI (FW)	994.34	286.8289766	1769.734785	287.057562	1771.145157
CHOBA(FW)	990.58	285.7443607	1763.042705	285.9720817	1764.447744

Table 4: Tabulation of Results for Habour Tug.

TABLE 4: TABULATON OF RESULTS FOR HABOUR TUG					
STANDARD DENSITY (SALT WATER)					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
STANDARD VALUE	1025	24.87225289	115.0590419	25.09748674	116.1009737
STANDARD DENSITY (FRESH WATER)					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
STANDARD VALUE	1000	24.26561257	112.2527238	24.48535292	113.2692426
LOW TIDE SALT WATER					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
ABONNEMA (SW)	995.773	24.16304183	111.7782315	24.38185333	112.7904535
IWOFE(SW)	997.88	24.21416948	112.014748	24.43344397	113.0291118
LOW TIDE FOR FRESH WATER					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
RUMUOMASI (FW)	994.34	24.12826921	111.6173734	24.34676582	112.6281387
CHOBA(FW)	990.58	24.0370305	111.1953031	24.2547009	112.2022463
HIGH TIDE SALT WATER					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
ABONNEMA (SW)	1003.77	24.35709393	112.6759165	24.5776627	113.6962677
IWOFE(SW)	1001.34	24.2981285	112.4031424	24.51816329	113.4210234
HIGH TIDE FRESH WATER					
CREEKS	DENSITY Kg/m^3	**ATTC**		**ITTC**	
		R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
RUMUOMASI (FW)	972.504	23.59840529	109.1662229	23.81210366	110.1547915
CHOBA(FW)	987.77	23.96884413	110.879873	24.18589706	111.8839598

Table 5: Data Collection and processing for different Temperature

	Time: 6-7am			Time: 12-1pm			Time: 6-7pm		
CREEKS	T (^{0}C)	FW DENSITY Kg/m^3	SW DENSITY Kg/m^3	T (^{0}C)	FW DENSITY Kg/m^3	SW DENSITY Kg/m^3	T (^{0}C)	FW DENSITY Kg/m^3	SW DENSITY Kg/m^3
Abonima	29.2	-	991.33	35	-	990.6	30	-	998.2
IWOFE	30	-	994.93	34	-	994.23	33.2	-	994.59
Rumuomasi	28.9	990.48	-	34.7	990.27	-	32.9	990.6	-
CHOBA	29.5	994.22	-	33.5	995.59	-	31.2	994.39	-

Table 6: Results of ATTC and ITTC methods for Ship Densities at Different Temperatures

TABLE 6: RESULTS OF ATTC AND ITTC METHODS FOR SHIP DENSITIES AT DDIFFERENT TEMPERATURES.						
STANDARD DENSITY FOR SALT WATER						
CREEKS		DENSITY Kg/m^3	**ATTC**		**ITTC**	
			R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
STANDARD VALUE		1025	295.6732114	1824.303714	295.9088451	1825.757574
STANDARD DENSITY FOR FRESH WATER						
CREEKS		DENSITY Kg/m^3	**ATTC**		**ITTC**	
			R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
STANDARD VALUE		1000	288.4616696	1779.808502	288.6915562	1781.226902
STANDARD DENSITY FOR SALT WATER						
CREEKS	TEMP ^{0} C	DENSITY Kg/m^3	**ATTC**		**ITTC**	
			R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
ABONNEMA (SW)	29.2	991.33	285.9607069	1764.377562	286.1886004	1765.783664
IWOFE(SW)	30	994.93	286.9991689	1770.784872	287.22789	1772.196081
STANDARD DENSITY FOR FRESH WATER						
CREEKS	TEMP ^{0} C	DENSITY Kg/m^3	**ATTC**		**ITTC**	
			R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
RUMUOMASI (FW)	28.9	990.48	285.7155145	1762.864725	285.9432126	1764.269622
CHOBA(FW)	29.5	994.22	286.7943612	1769.521208	287.022919	1770.93141
12-1PM (STANDARD DENSITY FOR SALT WATER) TEMPERATURE OF ENVIRONMENT= 32^0 C						
CREEKS	TEMP ^{0} C	DENSITY Kg/m^3	**ATTC**		**ITTC**	
			R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
ABONNEMA (SW)	35	990.6	285.7501299	1763.078302	285.9778556	1764.483369
IWOFE(SW)	34	994.23	286.7972458	1769.539006	287.0258059	1770.949222
12-1PM (STANDARD DENSITY FOR FRESH WATER) TEMPERATURE OF ENVIRONMENT= 32^0 C						
CREEKS	TEMP ^{0} C	DENSITY	**ATTC**		**ITTC**	

		Kg/m^3	R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
RUMUOMASI (FW)	34.7	990.27	285.6549376	1762.490965	285.8825873	1763.895564
CHOBA(FW)	33.5	995.59	287.1895537	1771.959546	287.4184264	1773.371691
6-7PM (STANDARD DENSITY FOR SALT WATER) TEMPERATURE OF ENVIRONMENT= 30^0 C						
CREEKS	TEMP ^{0} C	DENSITY Kg/m^3	**ATTC**		**ITTC**	
			R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
ABONNEMA (SW)	30	998.2	287.9424386	1776.604846	288.1719114	1778.020693
IWOFE(SW)	33.2	994.59	286.901092	1770.179738	287.1297349	1771.590464
6-7PM (STANDARD DENSITY FOR FRESH WATER) TEMPERATURE OF ENVIRONMENT= 30^0 C						
CREEKS	TEMP ^{0} C	DENSITY Kg/m^3	**ATTC**		**ITTC**	
			R_H (KN)	P_{EF} (KW)	R_H (KN)	P_{EF} (KW)
RUMUOMASI (FW)	32.9	990.6	285.7501299	1763.078302	285.9778556	1764.483369
CHOBA(FW)	31.2	994.39	286.8433996	1769.823776	287.0719966	1771.234219

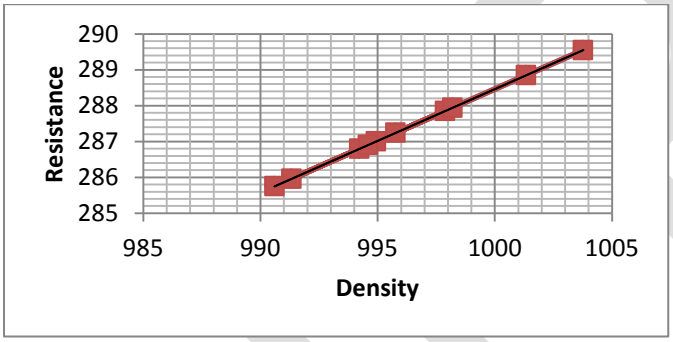

Figure 5 : Resistance Versus Density for ATTC Salt Water

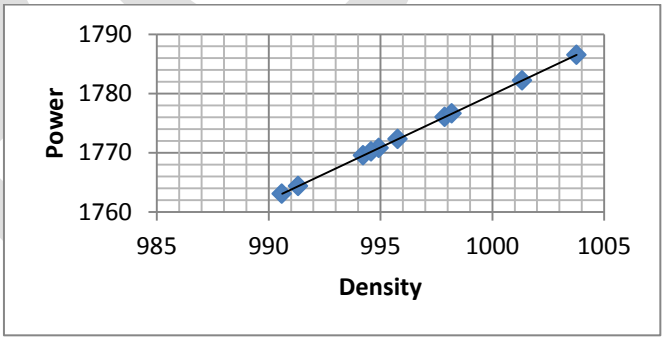

Figure 6 : Power Versus Density for ATTC Salt Water

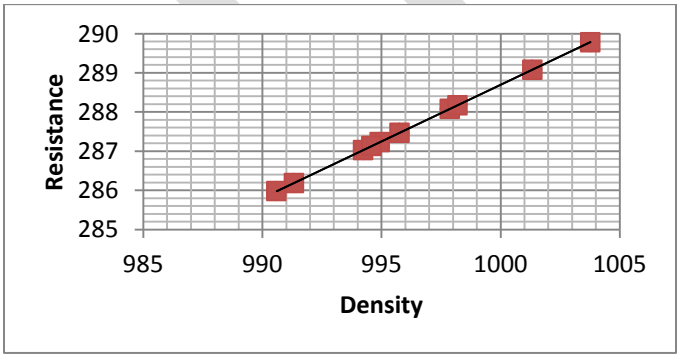

Figure 7: Resistance versus Density for ITTC Salt Water

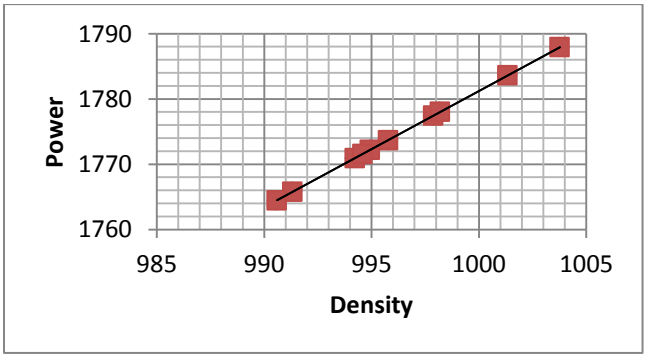

Figure 8: Power versus Density for ITTC Salt Water

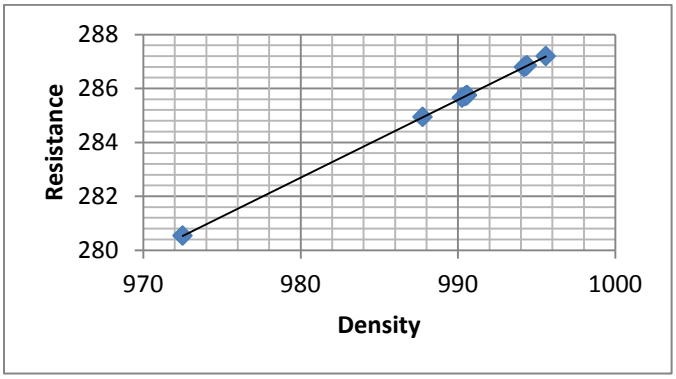

Figure 9: Resistance versus Density for ATTC Fresh Water

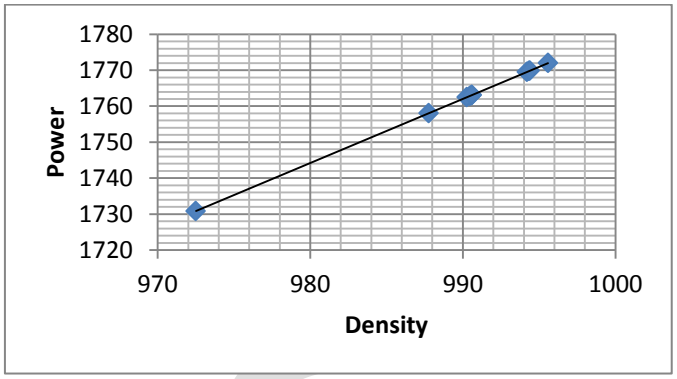

Figure 10: Power versus Density for ATTC Fresh Water

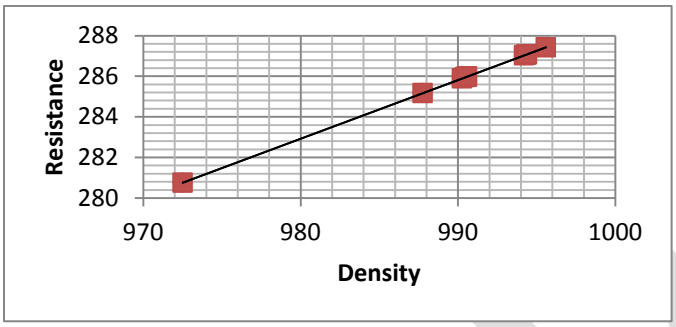

Figure 11: Resistance versus Density for ITTC Fresh Water

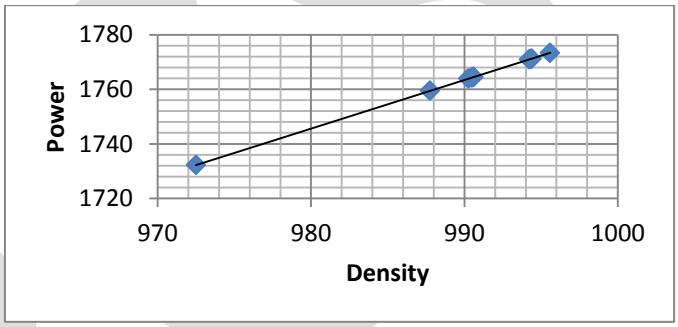

Figure 12: Power versus Density for ITTC Fresh Water

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Stylistic Study of Legal Language

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Abstract: The present paper is aimed at stylistic study of legal language. Analysis is done by identifying stylistic devices, their impact on text and communicative function, these markers carry. Rudimentary introduction of stylistics and legal register is given in the very beginning and then legal language is analyzed on three basic stylistic levels; graphological, lexical and syntactic level. A legal document is selected as sample. Examples are provided from given sample to explain each and every feature. Keeping in mind the pedagogical implications, analysis is done minutely and explained properly. It is effective and beneficial treatise for present and also for further future researches.

Keywords: style, stylistics, register, legal language, graphological, lexical, syntactic level.

INTRODUCTION

Legal English or language of law is the style of English used by lawyers and other legal professionals in pleadings, legal writing and the drafting of written material. Different dimensions of legal language are

- *Legal documents; like contracts, licenses, etc.*
- *In court pleadings; such as summonses, briefs, judgments, etc.*
- *Laws; for examples Acts of Parliament and subordinate legislation, case reports, etc.*
- *And legal correspondence.*

Traditionally, Legal English was property of lawyers from English-speaking countries such as U.S., the UK, Canada, Australia, New Zealand, Kenya, and South Africa, which have shared common law traditions. But legal English is now a global phenomenon used throughout the world that's why it is referred, now a day, as lawspeak or legalese.

THEORETICAL FRAME

I. Style

It is widely defined term but not a single couple of definitions stand similar. Its definition varies scholar to scholar. The core definition of style is: "*Style is appearance; as things appear. It is the way in which things are presented, ideas are expressed, words are uttered or texts are written".* Leech and Short (1981) defined it as *"Style refers to the way in which language is used in a given context, by a*

given person, for a given purpose, and so on (p 10). Its person's distinctive language habits or the set of individual characteristics of language use e.g.

- *Hemingway's style,*
- *Shakespearean style,*
- *T.S Eliot's style*

Also its language habits shared by a group of people at one time, or over a period of time

- *Classical style,*
- *Style of legal document, or*
- *Style of advertisement.*

Concisely speaking, style is a particular manner of language, utilizing particular and prominent linguistic features, devices or patterns, most (or least) frequently occur in a particular text of a particular variety of language

II. Stylistics

It is simply the study of style: a discipline that studies the ways in which language is used; it is a discipline that studies the styles of language in use**.** Leech and Short (1981) defined it as *"Stylistics is the study of style, is rarely undertaken for its own sake, simply as an exercise in describing what use is made of language" (p 13). Broadly speaking, it's of two kinds:*

- ***Literary stylistics****: concentrating on the unique features of various literary works, such as drama, novel, poem, prose, etc.*
- ***General stylistics:*** *concentrating on the general features of various types of language use, including literary discourses and other practical styles*

III. Levels of stylistic analysis

Stylistics is the study of style, so the analysis of the text in the domain of stylistics covers variant levels. These levels include graphology, grammatical, lexical, syntactic, discourse, prosodic, semantic, and pragmatic and phonology. Analysis of the sample of a text is done according to the features of these linguistic levels.

- Lexical level: it studies the choice of specific lexical items in a text, their distribution in relation to one another, and their meanings.
- Syntax level: it refers to sentence structures and rules for ordering and connecting words into sentences
- Semantic level: it's related to the overall meaning of a text.

- Graphological level: this levels is about writing system; the appearance of the text. Its general umbrella term including grammar, punctuation, derivation, foregrounding etc

IV. **Legal Register**

Register is situational based variety of language. It is "according to use" variation" because it is situation and condition of use of language not user that defines a register. In a given situation of a register all users will speak similarly and all documents will be written likewise. David Crystal (2004) has an authoritative stylistic influence upon English legal language. During the Medieval period lawyers used a mixture of Latin, French and English. To avoid ambiguity, lawyers often offered pairs of words from different languages. Sometimes there was little ambiguity to resolve and the pairs merely gave greater emphasis, becoming a stylistic habit. This is a feature of legal style that continues to the present day. Examples of mixed language doublets are: "breaking and entering" (English/French), "fit and proper" (English/French), "lands and tenements" (English/French), and "will and testament" (English/Latin). Examples of English-only doublets are "let and hindrance" and "have and hold".

Modern English vocabulary draws significantly from Germanic languages, French, and Latin, the lattermost often by way of French. These vocabularies are used preferentially in different registers, with words of French origin being more formal than those of Germanic origin, and words of Latin origin being more formal than those of French origin. Thus, the extensive use of French and Latin words in Legal English results in a relatively formal style.

Furthermore, legal English is useful for its dramatic effect: for example, a subpoena compelling a witness to appear in court often ends with the archaic threat "Fail not, at your peril"; the "peril" isn't described (being arrested and held in contempt of court) but the formality of the language tends to have a stronger effect on the recipient of the subpoena than a simple statement like "We can arrest you if you don't show up".

HISTORICAL BACKGROUND

Modern legal English is based on Standard English. However, it contains a number of unusual features. These largely relate to terminology, linguistic structure, linguistic conventions, and punctuation, and have their roots in the history of the development of English as a legal language. In prehistoric Britain, traditional common law was discussed in the vernacular since time immemorial. The legal language and legal tradition changed with waves of conquerors over the following centuries. Roman Britain followed Roman legal tradition, and its legal language was Latin. Following the Roman departure from Britain circa 410 and the Anglo-Saxon invasion of Britain, the dominant tradition was instead Anglo-Saxon law, which was discussed in the Germanic vernacular (Anglo-Saxon, Old English), and written in Old English since circa 600, beginning with the Law of Ethelbert. Following the Norman invasion of England in 1066, Anglo-Norman French became the official language of legal proceedings in England for a period of nearly 300

years (and continued in minor use for another 300 years), while Latin was used for written records for over 650 years. Some English technical terms were retained, however. In legal pleadings, Anglo-Norman developed into Law French, from which many words in modern legal English are derived. These include property, estate, chattel, lease, executor, and tenant. The use of Law French during this period has an enduring influence on the general linguistic register of modern legal English. It also accounts for some of the complex linguistic structures employed in legal writing. In 1363, the Statute of Pleading was enacted, which stated that all legal proceedings be conducted in English .This marked the beginning of formal Legal English; Law French continued to be used in some forms into the 17th century, though it became increasingly degenerate.

From 1066, Latin was the language of formal records and statutes, being replaced by English in the Proceedings in Courts of Justice Act 1730. However, since only the learned were fluent in Latin, it never became the language of legal pleading or debate. The influence of Latin can be seen in a number of words and phrases such as ad hoc, de facto, bona fide, inter alia, and ultra vires, which remain in current use in legal writing .

METHODOLOGY

Stylistic analysis features the court pleading that is a judgment of the case against the parliamentarians holding dual nationality. The sample incorporates the detailed verdict that was declared on 18th September 2012. The case was filed against parliamentarians having dual nationality under CONSTITUTION PETITION NO.05/2012 AND CMA NOS.2382, 2487, 2492, 2876 & 3446/2012.

Dates of Hearing:

08th, 10th, 16th, 25th & 30th May,

04th 13th, 21st & 25th June, 02nd

03rd, 04th & 23rd July, 09th, 12th,

17th, and 18th September 2012.

STYLISTIC ANALYSIS

I. Graphological level

a) Layout: Layout refers to the sketch or plan of the text's physical appearance. This includes paragraphing, indentation, and graphitic choices, Viz., capitalizing, italicizing, underlining and bold-typing. Crystal & Davy called the general

layout of legal texts as "solid block". Solid block is characterized by long lines that are from margin to margin and without any use of spacing or indentation to indicate the limits of the paragraphs or the relation between them. So, it was common to compose an entire document in the form of one single sentence. Apart from it, there are certain layout norms to adopt during drafting such as paragraph division, indentation, punctuation, capitalization, bold-typing, and italicization etc. Each of which has a function within legal texts; their use renders these texts more cohesive and coherent.

b) Use of Italicization and Bold text:

It is very important graphological feature of any legal document that words, phrases and even sentences are italicized and boldfaced to show emphasis.

- Learned Attorney General for Pakistan appeared and raised the question as to whether under Article 63(1) (c) of the Constitution *"a person shall be disqualified from being elected or chosen as, and from being, a member of Majlis-e-Shoora (Parliament), if he ceases to be a citizen of Pakistan, or acquires the citizenship of a foreign state.*
- In "*The Interpretation and Application of Statutes'*, Reed Dickerson, at page 135 discussed the subject while dealing with the importance of context of the statute.
- On behalf of the respondent No.5 Punjab Government, objections were taken about the maintainability of the petition, however, relied upon the principles laid down in the **case of Umar Ahmad Ghumman versus Government of Pakistan and others**.
- **In the Words and Phrases Permanent Edition 7A,** the word *'comma' has been defined as under:- "A 'comma' is a point used to mark the smallest structural divisions of sentence, or a rhetorical punctuation mark indicating the slightest possible separation in ideas or construction."*

c) **Capitalization:**

One of the characteristic features of legal documents is capitalization of words and especially initial letters. It is done either by writing the words in larger font size than the remainder of the text, or by writing it in all caps. Capitalization of initial letters is in the texts used widely. Capital letters can be seen in the following places:

- Names of the participators*: Devisee, Creditor, Client, Grantor, Grantee,*
- Occupations*: Lawyer, Police Officer, the League President, Head of Institution*

- Organizations and institutions: *Players Association, Crime Agency, Trade Union*
- Instruments/documents*: Agreement, Basic Agreement, Will.*
- *Main sections: Schedule 8, Article IV. Section 4.*
- Sums of money when they are set in words: *four hundred dollar, thirty thousand rupees.*

d) **Missing lines and use of dots:**

The common feature to all the documents to be mentioned is the presence of lines on which the missing but relating data need to be filled in.

- **…….** *The essence of the language is to reflect, express, and perhaps even affect the conceptual matrix of established ideas.*

- He is, in the case of the National Assembly, not less than twenty-five years of age and is enrolled as a voter in any electoral roll in **…….**

e) Punctuation

Another prominent characteristic of English legal texts is the absence of punctuation. As it is normally known punctuation helps reading a piece of writing loudly. The reason is to avoid forgery. Punctuation is easy to put and erase from documents so it may create grave change in legal meanings. So, punctuation is, normally, avoided in legal texts. Thinness of punctuation and presence of long uninterrupted sentences also effective for higher level of formality in legal language. Despite the fact that legal writings lack proper and extensive use of punctuation, there are some ways of using punctuation where it is needed. For example

1. **Use of brackets:** Some examples from the document are following.

- *Through this petition, filed under Article 184(3) of the Constitution of Islamic Republic of Pakistan, 1973* ***[hereinafter referred to as 'the Constitution'],***
- *In support of his contentions, he relied upon the case of Al-Jehad Trust versus Federation of Pakistan,* ***(1999 SCMR 1379).***

2. **Comma, colon, semi colon, hyphen, slash etc.** Generally, commas, semi-colons and full stops appear where there is the necessity to emphasize the beginning or end of a phrase, clause or sentence, or new and highly important or contrastive information that has an essential effect. Commas and semicolons are also used for the

separation of individual items where needful, usually when an enumeration is done; commas and dashes are employed in cases where additional information is inserted.

- *Mr. Imtiaz Rashid Siddiqui**,** ASC representing Mr. Jameel Malik**,** MNA while questioning the maintainability of the petition**,** contended that his client was adopted as son by his real uncle in the year 1970.*
- *Here-in-below relevant parts of Articles 62 & 63 (1) (c) of the Constitution as well as Section 14 of Pakistan Citizenship Act, 1951**:***
- *A person shall not be qualified to be elected or chosen as a member of Majlis-e-Shoora (Parliament) unless**:-***
- *A person shall be, if— He ceases to be a citizen of Pakistan, or acquires the citizenship of a foreign State.*
- *We have no doubt in our mind that a person holding dual citizenship is disqualified from being elected or chosen as member of the Majlis-e-Shoora (Parliament).*

3. Use of inverted commas. Some examples are**,**

- ***"**An here is a man who being constitutionally and legally debarred from being its member, managed to sneak into it by making a false statement on oath and by using bogus, fake and forged documents polluting the piety of this pious body.**"***
- ***"**As a Bench of 7 Hon'ble Judges vide judgment dated 26.04.2012 followed by the detailed reasons released on 08.05.2012 has found Syed Yousaf Raza Gillani guilty of contempt of Court under Article 204(2) of the Constitution of the Islamic Republic of Pakistan**"***

4. Abbreviations: It is an important graphological feature that gives stress on some long terms by making them short for the economy of space. In the text at certain places abbreviations are used instead of whole phrases or names of different things or related material.

- ***MNA**: Member of National Assembly*
- ***PPP**: Pakistan Peoples Party*
- *When **P.W.1** was suggested that he was admittedly not holder of the **B.A**. degree from the University of the Punjab whereas in his written statement.*
- *The Additional Registrar of this Court was directed to lodge a criminal complaint against the **DG, FIA**, the Deputy Director who signed and furnished the incorrect information/documents and*
- *Immigration and other services, Civil Aviation Authority **(CAA)** and the Overseas Pakistanis Foundation **(OPF)**, when they return to Pakistan after months or even years away from home.*

II. Lexical features

a. Archaism

Archaic expressions are in frequent use in legal documents. These are old or antique words, rarely used in common and everyday conversation, such as

- *Hereinafter: in the following or coming part of the document*
- *Aforesaid: discussed or mentioned before or previously*
- *Hereto: to this document or file*
- *Herein: in or within this document*
- *Subsequent: coming or following*
- *Pursuant: in according with*
- *Anterior to: before to*
- *Abutting to: next to*

Basically, these expressions were employed as abbreviations and sometimes to avoid ambiguity. These are often used to refer, exactly and precisely, a particular document or some part of document or to some party. But, there is a school that dismisses the use of archaic expressions and blames that archaic expressions are only meant for formality and uniqueness of style without any important semantic function. They argue that these old expressions are outdated and consequently obscure to understand for common users so these should be replaced by new and frequently used expressions e.g. aforesaid by previously mentioned, anterior to by before to, hereto by to this document etc.

There are plenty of archaic expressions in selected sample. For example

- *Constitution of Islamic Republic of Pakistan, 1973 [**hereinafter** referred to as 'the Constitution'].*
- *Every candidate has to file certain declaration on oath; one such declaration is reproduced **herein-below**:*
- *He traveled **thereafter** on Pakistani passport and subsequent thereto contested fresh election of Senate*
- *We would like to reproduce **here-in-below** relevant parts of relevant parts of Articles 62 & 63 (1) (c)*

b. Technical terms:

Technical terms are the specific, chosen or particular word or vocabulary items from a particular discipline or domain. Every discipline has plenty of its terms and so is the case with legal English. For example

- *Petition: a formal written request for judicial action*
- *Patent: an official document granting a right*

- *Suo Motu: action taken without external demand*
- *Testimony: a solemn statement made under oath*
- *Devisee: To whom property is devised by will*
- *Legislator: someone who makes or enacts laws*
- *Grantor: who makes a grant in legal form*
- *Impleading: take proceedings against*
- *Decree: judicial order*

Examples:

- *He can only be removed by filing an Election **Petition.***
- ***Notices** were issued to the **respondents** as well as the learned Attorney General for Pakistan*
- *The intention of the **Legislator** is primarily to be gathered from the language used.*

Along with these technical terms lawyers use less formal words, phrases and even idioms, called jargon. They use these jargon expressions for easy communication but these are difficult to grasp for common person. Mellinkoff (1963) is a step ahead by saying that legal English contains argot. Argot words are just like slang words produced by lawyer themselves for their own convenient. Technical terminology adds in formality of legal English and imparts specific semantic preciseness.

c. Common words with uncommon meaning:

Word	***Common meanings***	***Legal meanings***
Party	*a social group*	*group involve in* *Legal processing*
Assignment	*duty assigned*	*Transformation of property from*

		one party to other
Action	*deed*	*lawsuit*
Of course	*yes*	*as the matter of fact or right*

In legal register, we also find many common words with uncommon meanings. These common and familiar words give unfamiliar meaning when employed in a legal context.

d. Formality:

There are many expressions in legal English having sole function of increasing its formality. For example "shall" has preference over "will". Another thing concerning formality is capitalization of names, organizations even documents.

Examples:

- *"A person **shall** be disqualified from being elected or chosen as, and from being, a member of Majlis-e-Shoora (Parliament), if he ceases to be a citizen of Pakistan,*
- *He **shall**, unless he makes a declaration according to the laws of that other country renouncing his status.*
- *The **A**dditional **R**egistrar of this **C**ourt was directed to lodge a criminal complaint against the **DG, FIA**, and the **D**eputy **D**irector, **P**resident, **C**hief of **A**rmey **S**taff, **G**overnors, **C**hief **J**ustices and **J**udges of the superior **C**ourts, **A**uditor **G**eneral from holding dual citizenship.*
- *The **E**lection **C**ommission of **P**akistan also through its parawise comments stated that there is nothing on record*
- *The petitioner alleged that in terms of **A**rticle 63(1)(c) of the **C**onstitution read with **S**ection 14 of **P**akistan **C**itizenship **A**ct, 1951, any person holding dual citizenship is disqualified from being elected or chosen as, and from being, a **M**ember of **M**ajlise- **S**hoora (Parliament).*

e. Excessive use of "any":

"Any" is in frequent use in legal register and it is considered as redundant. It makes the thing as inclusive as possible.

Examples:

- *In response to our order that **any** Member of the Parliament may appear on his own by filing a reply, only some of the Parliamentarians came*
- ***Any** person holding dual citizenship is disqualified from being elected or chosen as, and from being, a Member of Majlise Shoora (Parliament).*
- *Whether **any** of the Parliamentarians is holding citizenship of a foreign State*
- *I am not subject to **any** of the disqualification specified in Article 63 of the Constitution*
- *If for **any** reason for the sake of arguments it is accepted that he was not qualified to contest election*
- *Further contended that if **any** untrue statement is given at the time of submitting the nomination papers*
- *He is, in the case of the National Assembly, not less than twenty-five years of age and is enrolled as a voter in **any** electoral roll in—*
- *Subject to the provisions of this section if **any** person is a citizen of Pakistan under the provisions of this Act*
- *The Parliament of **any** country is one of its noblest, honourable and important institutions making not only the policies*

.

f. Enumeration:

It means listing two or more elements that are semantically same or are similar somehow. Its primary function is clarity and preciseness. E.g.

- *case and matter*
- *rules and regulation*
- *order and decree*
- *promote and advance*
- *protect and defend*
- *Primary and foremost*
- *noblest, honorable and important*
- *sovereignty, integrity, solidarity, well-being and prosperity*

Examples

*The essence of the language is to **reflect, express, and perhaps even affect** the conceptual matrix of established ideas*

- ***Primary and foremost** task of a Court to interpret the statute is to ascertain intention of the legislators **actual or imputed**. Having ascertained the intention, the Court must then strive to interpret the statute as to **promote/advance** the **object and purpose** of the enactment*
- *Keeping in view these basic principles of interpretation of **Statue/Constitution**, we will now examine Articles 62.*
- *The Parliament of any country is one of its **noblest, honorable and important** institutions making not only the policies and the laws for the nation but in fact shaping and carving its very destiny."*
- *It has been conceived in a manner so as to apply to **situations and conditions** which might arise in future. **The words and expressions** used in the Constitution, in that sense, have no fixed meaning*
- *"I hereby declare, on oath, that I **absolutely and entirely renounce and abjure all allegiance and fidelity** to any **foreign prince, potentate, state, or sovereignty**, of whom or which I have heretofore been a **subject or citizen**; that I will **support and defend** the **Constitution and laws** of the United States of America against all **enemies, foreign and domestic**; that I will bear true **faith and allegiance** to the same;*
- *They will perform their functions honestly always in the interest of the **sovereignty, integrity, solidarity, well-being and prosperity** of Pakistan and will preserve, protect and defend the Constitution,*

III. Syntactic features

Syntactic features are probably more distinctive of legal English than are lexical ones, and certainly account for more of the difficulties of lay persons in comprehending it. (Danet, 1985:281)

a. **Nominalization:**

Nominalization is a process of deriving nouns from verbs. In legal English nominalization occurs extravagantly. Lawyers and Judges prefer to use noun instead of verbs. It is condemn by many because it makes sentences long and disjoints the parts of sentences. On the other hand, some lawyers and expertise acknowledge its importance and argue that these nouns are having definite meanings in legal English so accordingly can't be replaced by verbs. Some of its examples are following,

- *Provision from provide*
- *To be in opposition instead of to oppose*
- *For the implementation in place of implement*

Material selected provides a full supply of nominalization. Some of extracts in this regard are:

- ***Objections were taken** about the maintainability of the petition.*

- *We have **taken into consideration** respective arguments advanced by the learned Counsel*
- *Subject to the **provisions** of this section if any person is a citizen of Pakistan under the provisions of this Act.*
- *We in view of the **acceptance** of the apology by the learned counsel/respondents.*
- *I am **in agreement** with his conclusions but am adding this concurring opinion giving my additional reasons.*
- ***To understand** the spirit behind Article 63(1)(c), the first point that needs to be considered is the fiduciary role envisaged for members of Parliament in our Constitution.*
- ***To appreciate** respective contentions raised by the Learned ASC*

b. Impersonality:

Impersonality or objectivity is an object of high concern in Legal English. Many strategies and tools assess in achieving objectivity in legal documents. Firstly, there is no use of 1st and 2nd pronoun; only 3rd person is employed in all types of legal documents. Secondly, persons are not addressed by their personal names, but by their position in legal process suah as Grantor, agent etc. Thirdly, there found, in legal documents, a continuous use of passive voice sentences. This objectivity performs two primary functions. On first place, in is strategy to obscure the actor, mostly through the use of passive voice sentences. On the other hand, it projects the impression that Law is impartial and objective in its dealings.

Examples:

- ***The petitioner** alleged that in terms of Article 63(1)(c) of the Constitution*
- ***Notices were issued** to the respondents as well as the learned Attorney General for Pakistan.*
- ***"A person shall be disqualified** from being elected or chosen.*
- *Malik Waheed Anjum learned ASC **submitted an application** to DG, FIA for the provision of travel history*
- *On behalf of the respondent No.5 Punjab Government, **objections were taken a**bout the maintainability of the petition.*
- ***It is contended** by him that his client was a born citizen of USA*
- *It **is contended** that word "or" should be read as "and"*

c. Long and complex sentences:

One of the most striking features of legal English is use of long and complex sentences. One sentence may spread to a whole paragraph and contains many independent and dependant clauses. In past, there used to be only one sentence for each part of a document with lesser use of sentence and phrase markers. Movement of simplicity of legal language demanded short and simple sentences but lawyers defend it by arguing that for clarity and accuracy, long sentences are fruitful.

Examples

- *We have also noted that Members of the National Assembly have taken oath under Article 65 of the Constitution, whereby they have undertaken that they will perform their functions honestly always in the interest of the sovereignty, integrity, solidarity, well-being and prosperity of Pakistan and will preserve, protect and defend the Constitution, whereas on the other hand, at the time of acquiring citizenship of United States of America they have taken oath that they will bear true faith and allegiance to the US Constitution and will bear arms on behalf of the United States when required by the law, etc.*
- *The above declaration is applicable to the candidates of membership of Parliament and Provincial Assemblies, therefore, whoever signs such a declaration is meant to be fully aware of the constitutional provisions and after signing the said declaration if the same turns out to be false, he makes himself liable to be disqualified from being elected or chosen as Member of the Majlis-e-Shoora (Parliament) or a Provincial Assembly for making misstatement or concealment of fact, and also exposes himself to criminal proceedings contemplated under sections 193, 196, 197, 198 and 199 PPC.*

- *He further contended that Mr. A. Rehman Malik has resigned from the membership of the Senate on 9th July 2012, and subsequent thereto contested fresh election of Senate as his request for renunciation of citizenship of U.K. has been conveyed to him by the UK Border Agency on 29.05.2012 and if for any reason for the sake of arguments it is accepted that he was not qualified to contest election as Senator in the year 2008, he was qualified to be elected after the acceptance of his request for renunciation of his citizenship of UK in the year 2012 as Member of Parliament and as such he was rightly elected as a Senator.*

d. Negatives:

Negatives are abundantly used in legal documents. Multiple negatives are not only expressed by "not" but other expression are also employed to get the very result such as unless, except, not only, never etc.

Examples:

- *I am **not** subject to any of the disqualification specified in Article 63.*
- *The candidate has **not** possess the citizenship of any foreign State*
- *There is **no** bar for a dual citizen to contest the election as a Parliamentarian. It is stated by her learned counsel, that she will **not** contest the election*

- *A person shall **not** be qualified to be elected or chosen as a member of Majlis-e-Shoora (Parliament) unless:-*
- *That literal construction **not** to be denied only because the same may lead to penalty.*
- *But you do **not** do it unless you are obliged because 'or' **does not** generally mean 'and' and 'and' **does not** generally mean 'or'.*
- ***No** CMA has been filed denying the allegation that he **is not** holder of citizenship of any foreign State*
- *Pakistan also did **not** allow for holding dual citizenship. It is for this reason the Constitutions of 1956 and 1962 **did not** contain any express disqualification for dual citizens becoming parliamentarians because there were **no** dual citizens permitted under law.*

e. Conditional sentences:

Legal documents display handful use of conditional sentences. Examples from given material are:

- ***If** it is so whether disqualification has been got removed or whatever the position may be, and that if they desire, they can also appear at their own.*
- *"A person shall be disqualified from being elected or chosen as, and from being, a member of Majlis-e-Shoora, **if** he ceases to be a citizen of Pakistan.*
- ***If** any untrue statement is given at the time of submitting the nomination papers, is nothing more than a mistake on the part of the candidate.*
- ***If** any person is a citizen of Pakistan and is at the same time a citizen of any other country, cease to be a citizen of Pakistan."*
- *Member of the Majlis-e-Shoora shall be disqualified **if** any one of the disqualifications mentioned in the said Article applicable upon him*

f. Prepositional phrases

This is another recurrent feature in Legal English. Documents are full of preposition phrases that come one after another frequently. Danet (1985:282) said,

> "Prepositional phrases are often misplaced".

Examples

- ***Through this petition**, filed under Article 184(3) **of the Constitution** of Islamic Republic of Pakistan, 1973], the petitioner alleged that **in terms of** Article 63(1)(c) **of the Constitution** read with Section 14 of Pakistan Citizenship Act, 1951, any*

*person holding dual citizenship is disqualified **from being elected** or chosen as, and from being, a Member of Majlise-Shoora (Parliament).*

- ***Although the question** of maintainability of the petition under the Article 184(3) of the Constitution has not seriously been argued **by the learned counsel for the respondents**, the issue **in the petition** about the disqualification of a person to be a Member of Parliament, the State has to exercise its powers and authority **through the chosen representatives**.*

g. Unique determiners

"Such" and "said" are unique and specific determiner of nouns in legal documents that gives meanings of "this", "that", "the particular" or "one that is under consideration".

Examples

- *He had acquired citizenship of the **said** country.*
- *If one of the disqualifications mentioned in the **said** Article applicable upon him.*
- *The **said** Tariq Mehmood holder of American Passport No. 211267712 again entered in Pakistan on 19.07.2008*

h. Passive sentences

Passive sentences are preferred to active in Legal English. At some points, it is impossible to use active sentences but most of the time it is strived to employs passives for intense formality.

Examples

- *The declaration, that the candidate has not possess the citizenship of any foreign State or County, **has been taken** by election commission*
- *His request for renunciation of citizenship of U.K. **has been conveyed** to him by the UK Border Agency on 29.05.2012*
- *The Constitution **was framed** by its makers keeping in view the situations.*

I. Pre and post modification:

Modifiers are words, phrases, or clauses that modify a noun. Modifiers add or further explain the noun. If modifier comes prior to the noun it is called pre modifier and if comes after the noun it is called post modifier.

Examples:

- *Through this petition**, filed under Article 184(3)** of the constitution of Islamic Republic of Pakistan, 1973*
- *In response to our order **that any Member of the Parliament** may appear on his own by filing a reply, only some of the Parliamentarians came forward by appearing in person or through counsel.*
- *Malik Waheed Anjum**, learned ASC**, has filed CMANo.2382 of 2012 for impleading the following fourteen Parliamentarians who according to him are holders of dual nationality*
- *Mr. Wasim Sajjad, **learned Sr. ASC** for Ms. Farah Naz Isfahani, **MNA** argued that the Constitution must be interpreted as a living document to meet the requirements of all times to come*

CONCLUSION

In present analysis we tried our best to discuss minutely the distinctive features of legal language. Furthermore, all features are explained by applying examples from selected legal document. Analysis shows that legal language is distinct and peculiar variation of language. It has its specific graphological, lexical, syntactical and phonological features. . Such analysis helps the ESP practitioners to select specific contents for courses related to language of law. Stylistic analysis also creates gap for creativity which is a part of language learning. It also increases language learning capability in the learners. If we outlined the analysis of legal document in class room settings it give much information about the language of legal English and help in understanding of terms specific to legal English.

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METAL SENSING USING SCADA

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Abstract— This paper presents an overview of metal sensing using SCADA. The main aim of the paper is to explain the fundamental functioning and working of the metal sensing and its need. Sensors are being used to detect the metal piece and the correct metal pieces are collected and used further as per requirement, whereas the defected metal pieces are rejected. Nowadays metal sensing is used in various industries like in automobile industries, hardware industries. The software which is used to achieve this is SCADA.

Keywords— metal sensing, sensors, ejector, designing of the system, SCADA

INTRODUCTION

With the rise of technology, automation has become an integral part of the industries. The word automation means automatic control of system and information technologies to increase the productivity in the generation of goods and delivery of the services. It helps to achieve the goals which are not possible with human involvement. The main advantages of automated manufacturing are higher quality and consistency, simplified construction, reduced handling, reduced lead time and improved work flow.

Metal sensing is the process which involves sensing of a metal with a set of parameters that need to be processed. Metal pieces are sensed using inductive sensors. If the metal piece turns out to be defected then it is removed from the conveyor belt through ejector. The verified metal pieces are collected and stored. Further, these corrected metal pieces are counted with the help of a sensor and a counter. The counter in the PLC is responsible for storing the number of verified metal pieces. This whole process is automatically controlled. The software used to design this model is SCADA.

SCADA

Supervisory Control and Data Acquisition (SCADA) system is defined as an industrial measurement and control system which is used to monitor the parameters of the system. It is flexible and open architecture.[1]It provides an interface between software and hardware. SCADA systems have made a tremendous improvement over the recent years in terms of scalability, functionality and performance. Data acquisition is very important aspect in industries as a person can supervise, control and monitor various parameters of the system located far away from the plant. Data can be acquired either through wired connection or wireless.[2] SCADA is actually a graphical and visual representation of the system through which the person can visualize the process taking place at any instant of time and can take the desired step as per the requirement. Whenever any fault occurs it will be depicted on the SCADA screen and the operator will send the message to the concerned person to rectify the fault, hence eliminating the need to visit the site on regular basis to verify the system.

DESIGNING OF MODEL

Now on the designing stage of the model we are using the components namely 3 inductive sensors, switches, ejector, conveyer belt and metal pieces.

First of all, a new file is created in the SCADA software where all the equipments will be placed from the symbol factory. One can also design these equipments manually with the help of tool box. Once all the equipments are placed as per the desired location, scripting is done to control the process to control the process. In scripting all the conditions and parameters like positioning 1of the objects and timing is set as per requirement. The model is actually a representation of the hardware model. The user can use his creativity to change the outlook of the project. Since the whole system cannot be depicted on a single screen so multiple screens are used which are later interlinked through scripting.

WORKING

The design model consists of 3 inductive proximity sensors placed above the conveyor belt.

Sensor 1- It detects the metal piece. As soon as it senses the metal, it sends the signal to the motor which start the conveyor belt therefore moving the metal piece further.

Sensor 2- This sensor senses the circular cut on the top face of the metal piece. If there is a circular hollow cut as per the required parameters in the metal piece then it will not send any signal to the ejector and the metal piece will be moved further. If the metal piece doesn't have the appropriate circular hollow cut as per the requirement then it will send the signal to the ejector.

Ejector - An ejector is placed just after the sensor 2. It will throw the metal piece out of the conveyor belt as soon as it receives the signal from sensor 2. This helps in separating the defective metal pieces from corrected pieces.

Sensor 3-All the verified metal pieces are counted with the help of counter and the numbers of pieces are displayed on the SCADA screen.

Conveyor Belt- The movement of conveyor belt is through single phase dc motor. It moves according to the scripting or programming of the SCADA.

EXPERIMENTAL DETAILS

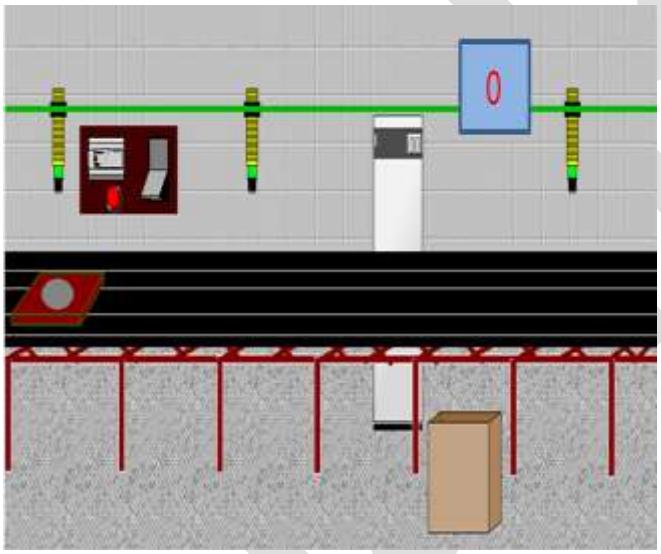

Fig.1 Layout of the proposed mode

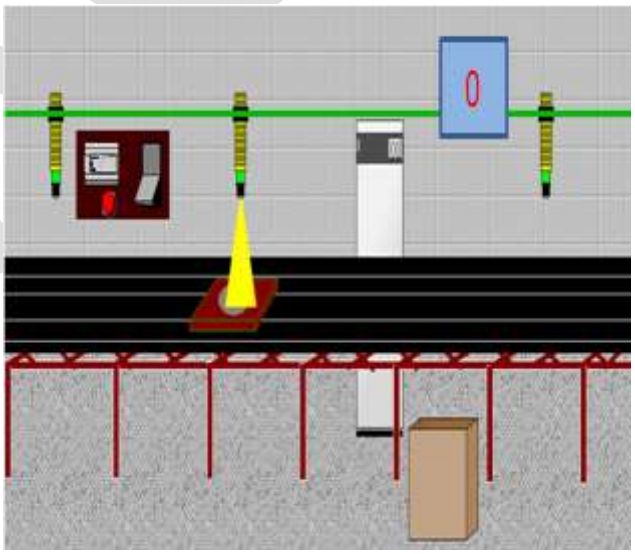

Fig.2 Runtime (circular cut sensed by sensor 2)

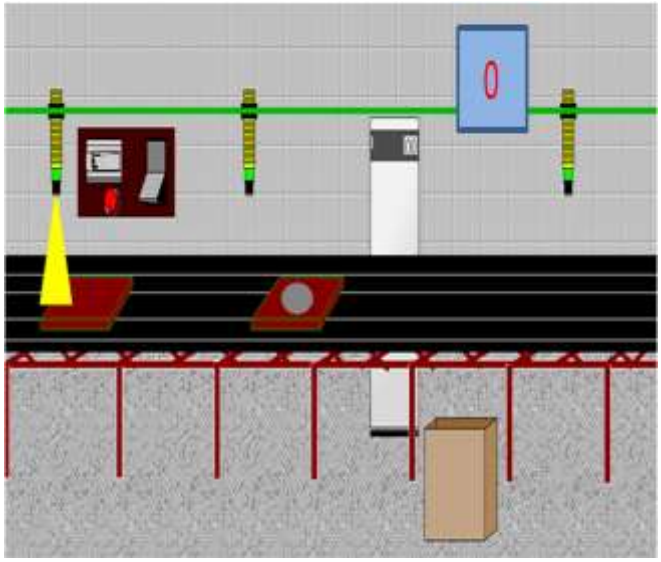

Fig.3 Runtime (defective metal at sensor 1)

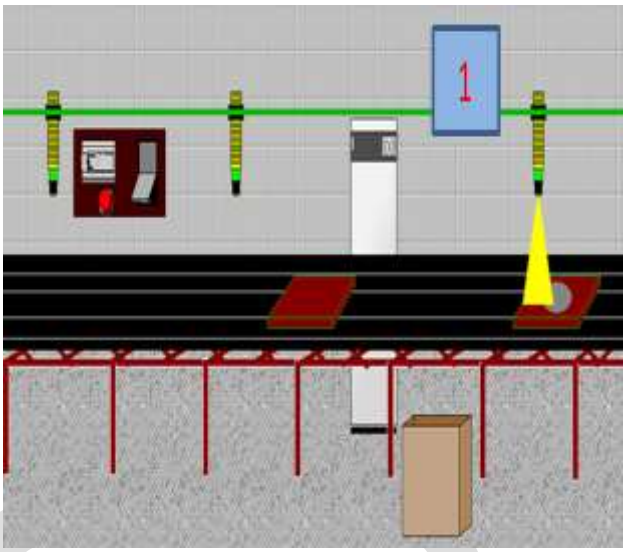

Fig.4 counting the number of metal pieces

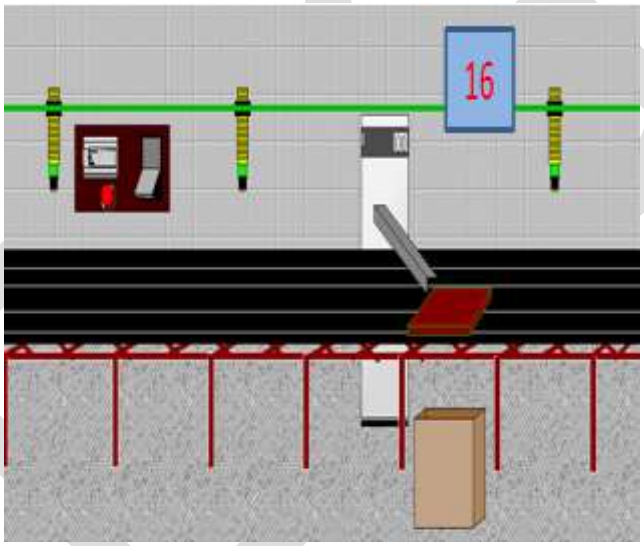

Fig.5 Ejecting the metal piece out of the conveyor

CONCLUSION

The proposed model is actually a small part of industrial automation. The model is quite useful as it can be successfully communicated with PLC (programmable logic control). The whole hardware process is represented on the computer screen which facilitates the operator to control the functioning as well as acquire the data without actually monitoring the site.

The model can be modified as per the requirement of the industry. Similar SCADA models can be designed keeping in view the hardware model designed on PLC.

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Application of ANN model for the prediction of Water Quality Index

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Abstract - Water is the prime requirement for the existence of life. The unbridled exploitation of water for irrigation, drinking and industrial purposes has caused a drastic decline of the quality and availability of water. The over-exploitation of limited resources has not only caused a perceptible decline in the water table, but also resulted in the enormous increase of pollutants concentration. The ever growing population exerts a great pressure on this resource. The never ending growth of population and ill-planned exploitation of the water resource created a situation, where the very survival of man has become endangered. Assembling the various parameters of the water quality data into one single number leads an easy interpretation of data, thus providing an important tool for management and decision making purposes. The purpose of an index is to transform the large quantity of data into information that is easily understandable by the general public. Water quality index exhibits the overall water quality at a specific location and specific time based on several water quality parameters. WQI is a set of standards used to measure changes in water quality in a particular river reach over time and make comparisons from different reaches of a river. A WQI also allows for comparisons to be made between different rivers.

The present study is concentrated on the prediction of WQI using ANN model. Pavna river originates south of Lonavala from western ghatts and flows a total of nearly 60Km to meet the Mula river in Pune, Maharashtra, India. Pavna river flows through Pune city covering Pimpri Chinchwad Area. Pimpri –Chinchwad area is developing area and due to industrialization and high population growth the river is getting polluted. The data for the prediction of water quality index were collected from the water treatment Plant, Nigdi – sector 21.The collected data were for the point Ravet Intake.(2001-2014)(monthly).In the present study it is found that the recurrent neural network give better results as compared to the radial multilayer neural network. R value for the multilayer neural net work is 0.960 .

Keywords— Water Quality Index (WQI), Artificial neural network, recurrent neural network, multilayer neural network , Pavna River ,conjugate function

1. INTRODUCTION

Water is the prime requirement for the existence of life and thus it has been man's endeavour for the immemorial to utilize the available resources. The growing population exerts a great pressure on this resource. The increased population growth and ill planned exploitation of the water resources created a situation, where the very survival of man has become endangered[1].

Interpretation of complex water quality data is difficult to understand. Also it is difficult to communicate during decision making process. Assembling the various parameters of the water quality data into one single number is essential for decision making purpose. The purpose of an index is to transform the large quantity of data into information that is easily understandable by the general public. Water quality index exhibits the overall water quality at a specific location and specific time based on several water quality parameters. The index result represents the level of water quality in a given water basin, such as lake, river or stream.[2] WQI is a set of standards used to measure changes in water quality in a particular river reach over time and make comparisons from different reaches of a river. A WQI also allows for comparisons to be made between different rivers. This index allows for a general analysis of water quality. It also helps for the analysis of water many levels that affect a stream's ability to host life and to check whether the overall quality of water bodies poses any potential threat to various uses of water. A computer programming using MATLab had been used for training and testing of the ANN .Once the a number of training trials are completed ,the best neural network model was generated. The maximum number of epochs was chosen by a trial and error approach. Trial and error method was used to find the most suitable network model for the WQI analysis using the different ten parameters. The result of WQI was valid in respect of experimental and ANN model.

In recent years the trend has been to use statistical method instead of traditional and domestic methods to forecasting WQI. Lee Yoot Khan et al conclude that the modular neural network was found to be the most suitable model for the

termination of the WQI[2].A A Mansur et al predicted the dissolved oxygen in Surma river using fed forward neural network and radial basis function neural network[3]. Both the methods provided better results. Sundarambal et al concluded that the ANN model can be used even for sea water quality forecasting[4]. In this study the modular neural network and radial basis function models of ANN are used to forecast the WQI of pavna river at ravet intake.

2. STUDY AREA

The Pavna river in Pune, Maharashtra, India is selected as the study area for the ANN application. Pavna river originates south of Lonavala from western ghatts and flows a total of nearly 60Km to meet the Mula river in Pune. Pavna river flows through Pune city covering Pimpri Chinchwad Area. Pimpri –Chinchwad area is developing area and due to industrialization and high population growth in thease area the river is getting polluted. The study area is Ravet intake from where water is collected and treated in water treatment plant in Nigidi.

3. METHODOLOGY

There are different methods for the determination of water quality Index. In this particular study the methods used are given below:

1. Weightage Rating method
2. Prediction of WQI by using ANN

Weigtage Rating Method:

Factors which have higher permissible limits are less harmful because they can harm quality of river water when they are present in very high quantity. So weightage of factor has an inverse relationship with its permissible limits.

Therefore Wi α(1/ Sn)Or (1)
Wi = K/Sn
Where, K = constant of proportionality
Wi = unit weight of all chemical factor
Vs or Sn = Standard alue of i^{th} parameter
Values of K were calculated as: $K = \frac{1}{\sum_1^{71}/_{Vs}}$

$$\sum_1^7 \frac{1}{Si} = \left(\frac{1}{SiPH}\right)+\left(\frac{1}{Si(EC)}\right)+\left(\frac{1}{Si(TDS)}\right)+\left(\frac{1}{Si(DO)}\right)+\left(\frac{1}{Si(nitrates)}\right)+\left(\frac{1}{Si(Alkalinity)}\right)+\left(\frac{1}{Si(Total\ Hardness)}\right)+\cdots\ldots\ldots\ldots\ldots+\left(\frac{1}{Si(Calcium)}\right)+\left(\frac{1}{Si(calcium)}\right) \quad (2)$$

The weightage of all the factors were calculated on the basis of the above equation.

WQI =∑ Wi x Qi/∑Wi (3)

Wi x Qi = Wi(pH) x Qi(pH) + Wi(EC) + Qi(EC)+ Wi(TDS) xQi(TDS) + Wi(DO) x Qi(DO) + ...+ Wi(Calcium) x Qi (Calcium) (4)
Qi = 100[(Va-Vi)/(Vs-Vi)] (5)

= Rating scale

Va =average measured values of water sample at study area.
Vi =standard value of i^{th} parameter
Vs =ideal value for pure water (0 for all parameters except pH and DO)
∑Wi - total unit weight of all chemical factors. Using the water quality index, all the samples were categorized into the following five classes: excellent (0 - 25), good (26 - 50), moderately polluted (51 - 75), severely polluted (76-100) and unfit for human consumption(above 100) based on their suitability.[5]

TABLE 1 The permissible values of various pollutants for drinking water(expressed in mg/l except ph and ec recommended by Indian Standards and CPCB Standard[2]

Sl No	Parameters	CPCB/IS	IS (10500)
1	PH	6.5-8.5	6.5-8.5
2	EC	<300**	---
3	Turbidity	-	5
4	TDS	<500	<500
5	Total Alkalinity	200	200
6	Total hardness	300	300
7	DO	6	-
8	Chloride	250	250
9	Nitrate	20	45
10	Calcium	75	75

Pre-processing of data

At the initial stages of the project, real environmental data (fortnight)on the condition of Pavna river over a period of time 10 years beginning from 2001 to 2014 were acquired from water treatment plant sector 21 Nigidi, Pune. These make a total of 97. Out of these data 70 datas are set for training and remaining 27 data are set for testing. Trial and error method is tried for the different combinations of the data.

Training of data

The network architecture for WQI consists of input nodes and output node. In the present study it consists of ten input nodes and one output node. The parameters of choices as input must have an influence on the desired output. For the current project the ten water pollution parameters are selected to be as input nodes. These input and output nodes are used to produce ANN model. The input variables are DO concentration, concentration of Nitrates, concentration of Calcium, Total Suspended Solids concentration, concentration of Total hardness, concentration of Alkalinity, concentration of Chlorides, Total Hardness concentration. All the eight parameters are measured in milligram per litre. The remaining three parameters are pH, turbidity and conductivity.

Artificial neural network

Artificial Neural networks are non-linear mapping structure which is inspired by the observed process of natural networks of biological neurons in brain. It consists of simple computational units called neurons. These are highly inter connected. ANNs become very popular nowadays because of their wide range of applicability and the ease with which it can treat complicated problems.[6]

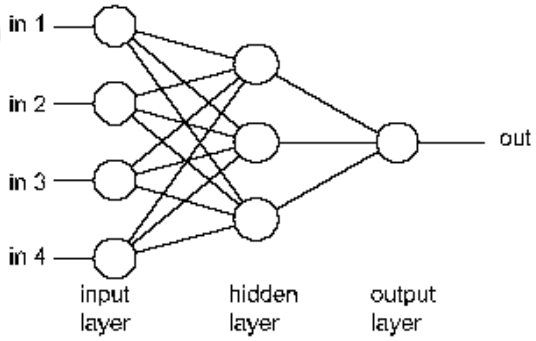

Fig 1 The schematic representation of a artificial neural network

3.1 Development of ANN Model

ANNs are constructed with layers of units, and hence it is termed as multilayer ANNs. The first layer of multilayer ANN is known as input units. In statistical nomenclature input units are known as independent variables. Last layer is called output units. In statistical nomenclature these are known as dependent variables or response variables. All the other units in the model is known as hidden units and it includes hidden layers. There are two function to achieve the behaviour of a unit in a particular layer, which normally are the same for all units within the whole ANN.Fig 2 shows the mathematical representation of Neural Network.

Input function and Output function

Input into a node is a weigted sum of outputs from nodes connected to it. The input function is given by the equation:

$Net_i = \Sigma W_{ij} X_j + \mu_i$ (6)

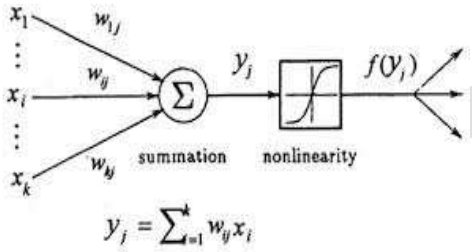

fig 2 Mathematical representation of neural network

Where Neti describes the result of the net inputs x_i (weigted by the weights w_{ij})impacting on unit i.Also wij are weights connecting j to neuron i ,x j is output from unit j and μ_i is the threshold for neuron i, Threshold term is baseline input into to a node in absence of any other input. If a weight w_{ij} is negative it is termed inhibitory because it decreases net input ,otherwise it is called excitatory. Each unit takes its net input and applies an activation function to it. A number of nonlinear functions have been used in the literature as activation function. The threshold function is useful in situation where the input and outputs are binary encoded.most common choice in activation function is sigmoid function[6] ,such as

$g(netinput) = [1+ e^{-netinput}]^{-1}$ (7)

$g(netinput) = \tanh(netinput)$ (8)

3.2 Multilayer perceprton

The network was constructed by interconnecting several neural objects called as components. Multilayer perceptrons (MLPs) are layered feedforward networks typically trained with static backpropagation. These networks have found their way into countless applications requiring static pattern classification. Their main advantage is that they are easy to use, and that they can approximate any input/output map. The key disadvantages are that they train slowly, and require lots of training data (typically three times more training samples than network weights).Fig 3 shows the schematic diagram of Multilayer perceptron Network

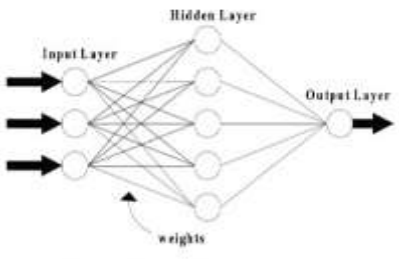

Fig 3 Schematic diagram of Multilayer perceptron Network

3.3 Recurrent Neural Network

A feed forward neural network contains one or more hidden layers and at least one feed back loop is known as recurrent network. In recurrent neural network the out put network will fed back may be a self feedback. The output of neutron is fed back to its own input. Schematic diagram of the recurrent network is given in fig 4 shows the schematic diagram of Recurrent Neural Network.

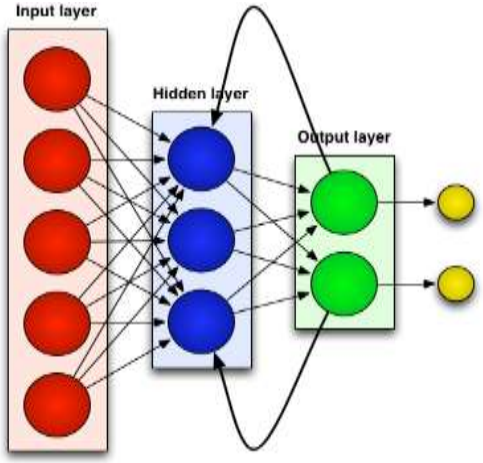

Fig 4Schematic diagram of recurrent neural network

4. RESULT AND DISCUSSION

The ANN models were trained using number of neurons in the hidden layers and for training and testing. After number of trials by changing the length of data set for training ,testing and also changing the number of neurons in the hidden layer the maximum value of R was obtained. The Multilayer perceptron consists of sigmoid as transfer function and conjugate as learning rule. In case of recurrent neural network TanAxon as transfer function and LevenbergMarqua is used as a learning rule. The number of epochs was set to 1000 to 5000 throughout the trial and error process. The number of ANN models were developed using Multilayer Neural Network and Recurrent Neural Network. The hidden layer is taken to be between 1-2.The training and testing data set an epochs were varied as shown in table 2 in order to achieve better accuracy.

Among the selected two ANN models the developed ANN model with Recurrent Neural Network model stimulated the WQI of pavna river with great accuracy when compared with Multilayer neural network architecture. The maximum value of R was 0.960, MSE=62.763and MAE=5.030 as shown in table 2 . In this case the value of R obtained is quite high (0.960) and reliable for short term prediction. The observed and modelled WQI values in whole array using Multilayer neural network and Recurrent Neural Network is illustrated in fig 5a and 5b and fig.6a and fig 6b which indicates that the modelling has been quite successful.

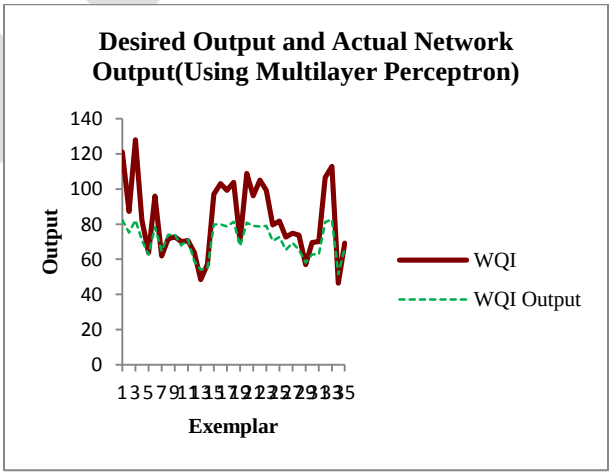

Fig5.a The observed and modelled WQI values for Multilayer Neural Network

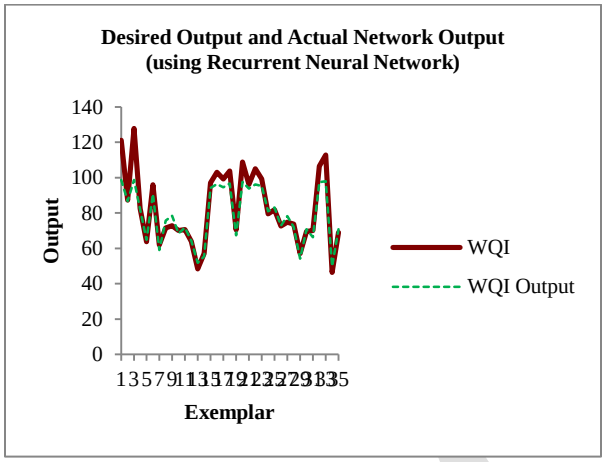

Fig5.b The observed and modelled WQI values in recurrent neural Network

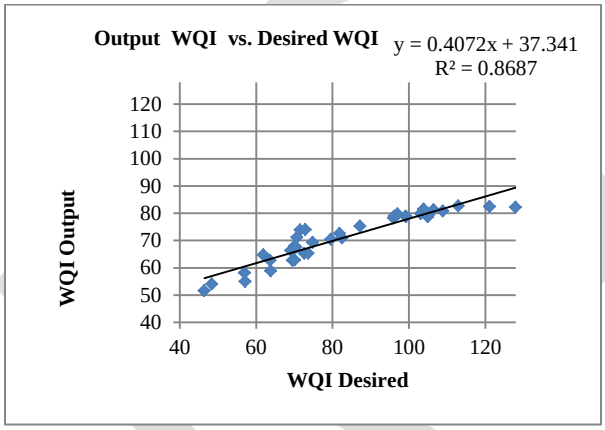

Fig 6a Scatter plot of observed verses modelled WQI for Multilayer Neural Network

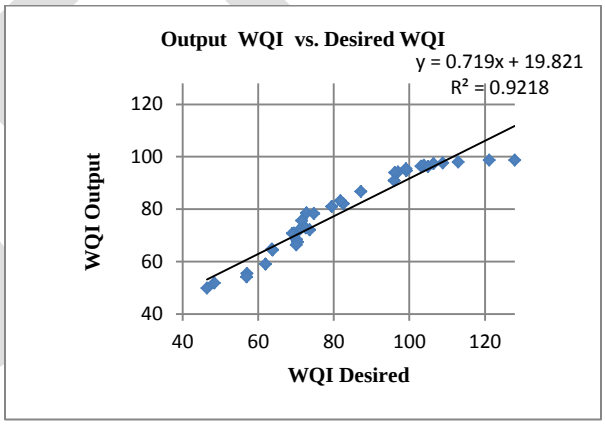

Fig 6.b Scatter plot of observed verses modelled WQI for recurrent neural Network

TABLE 2 SUMMARY OF ANN MODEL

Model	Training data%	Testing data%	Epoch	R	MSE	MAE
r perceptron	70	30	2000	0.761	247.562	12.019
	70	30	1000	0.891	237.959	12.219

	50	50	5000	0.891	148.960	10.452
	60	40	1000	0.932	292.604	12.716
	60	40	5000	0.896	154.784	9.794
Recurrent neural Network	70	30	5000	0.700	392.234	15.994
	70	30	1000	0.917	107.103	7.799
	70	30	1000	0.934	79.610	6.737
	50	50	5000	0.920	78.623	7.013
	60	40	1000	0.944	167.329	10.744
	60	40	5000	**0.960**	62.763	5.030

The Recurrent Neural Network with all input parameters are found to be the most appropriate model for WQI prediction with high correlation co-efficient of 0.960 and a mean square error (MSE) value of 62.763.

5. CONCLUSION

In this model ANN models were developed to predict the WQI in Pavna river at Ravet intake. The proposed model shows efficiency in forecasting the WQI in water bodies. The result showed that the modular network model prepared by different ten water quality parameter provided high R(0.960) value. It has been observed that the WQI of Pavna river can be predicted using both with acceptable accuracy using Recurrent Neural Network .

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Improving Efficiency in Keyword Search Using Exact and Fuzzy Methods

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Abstract— In today's emerging world, there is a great need to balance and lessen the gap between non-technical and technical ones. Most applications are being developed in order to make people life easier. Search is one of the most basic and important tool utilized by humans in everyday life. Search as-you-type feature allows you to get answers on the fly as a user fires a query character by character. So, we are going to simulate this type of search in our paper with the help of *exact* and *fuzzy* search methods. We will study how search as-you-type works on data lying in the backend database. But there are many challenges in the implementation of these methods, which include security issues, application compatibility in all platforms and the most important is the response time of application. We also study how to use indexes in tables that will increase overall performance of searching. We also make declarative solutions and techniques using exact and fuzzy search. Lastly we have tested our application on large and real time data with millions of records that shows far better good results.

Keywords— Exact Search, Fuzzy Search, Like and UDF methods, Gram based method, Incremental Computation method, Neighborhood Generation method, Inverted table method

INTRODUCTION

There are many information systems nowadays which provide autocomplete search by providing instant results as soon as possible. Many search engines and websites support autocomplete search, which provide multiple answers to the queries provided by the user. This feature is also known as answers "on the fly". For example, shopping sites helps user search different types of commodities with a single keyword search of user. If a user types in "*Refrigerators*", then the server may show multiple results with a title matching this keyword as a prefix. This type of search is popularly known as *type ahead search*.

Many databases, say, Oracle and SQL server support *type ahead* search. But there are many challenges which are to be considered and moreover all databases do not support this feature. Generally autocomplete search methods use three approaches which can be summarized as follows:

1) Constructing indexes on databases using separate application layer can be used to maintain indexes. However this feature has a benefit that it can be used to achieve performance, on the contrary it has a major problem of duplication of data and indexes that may result in additional hardware costs
2) Database extenders, say, Informix DataBlades, MS SQL Server CLR integration allow developers to provide some additional features, but the point of concern is non-availability of extender feature in databases such as SQL.
3) To use standard SQL techniques which are also portable to other databases. Gravano et al. [1] and Jestes et al.[2] made similar observations.

SEARCH CATEGORIES

In particular, there are two types of search which is mostly observed, namely *multikeyword search and fuzzy search.* In multikeyword search techniques, a user types in query containing multiple keywords, and find tuples that are similar to these keywords irrespective of the location of keywords. For example, if a user types in "Operating Machines" to find out a book by "R.K.Mishran" with a title including "Operating" and "Machines" irrespective of the locations. In fuzzy search, minor discrepancies may be present between entered query and actual results. For example, if a user types in "Mishrn" despite the word "Mishran", then also this type of search techniques can prove useful. Depending on these search techniques, multiple methods have been discussed later in the paper.

PREPARATORY MEASURE

We will first plan the problem of search-as-you-type in database management system and then we will discuss different ways to support search-as-you-type.

PROBLEM FORMULATION

Let us take *T* as a relational table with attributes A_1, A_2, A_3,……, A_l. Let $R = \{r_1, r_2, r_3, ….., r_n\}$ be the collection of records in *T*, and $r_i[A_j]$ denote the content of record r_i in attribute A_j. Let *W* be the set of tokenized keywords in *R*.

SEARCH-AS-YOU-TYPE FOR SINGLE-KEYWORD QUERIES

Exact search: When a user types in a single partial keyword *w*, search-as-you-type immediately finds records that contain keyword with a prefix as *w*. This type of search is known as prefix search or exact search. Consider the table *T* with given set of data. If any user types in a query "sig", it returns records r_3, r_6, r_9. In particular, r_3 contain a keyword "sigmod" with a prefix "sig".

TABLE 1
Table dblp: A Sample Publication Table (about "Privacy")

ID	Title	Authors	Booktitle	Year
r_1	K-Automorphism: A General Framework for Privacy Preserving Network Publication	Lei Zou, Lei Chen, M. Tamer Özsu	PVLDB	2009
r_2	Privacy-Preserving Singular Value Decomposition	Shuguo Han, Wee Keong Ng, Philip S. Yu	ICDE	2009
r_3	Privacy Preservation of Aggregates in Hidden Databases: Why and How?	Arjun Dasgupta, Nan Zhang, Gautam Das, Surajit Chaudhuri	SIGMOD	2009
r_4	Privacy-preserving Indexing of Documents on the Network	Mayank Bawa, Roberto J. Bayardo, Rakesh Agrawal, Jaideep Vaidya	VLDBJ	2009
r_5	On Anti-Corruption Privacy Preserving Publication	Yufei Tao, Xiaokui Xiao, Jiexing Li, Donghui Zhang	ICDE	2008
r_6	Preservation of Proximity Privacy in Publishing Numerical Sensitive Data	Jiexing Li, Yufei Tao, Xiaokui Xiao	SIGMOD	2008
r_7	Hiding in the Crowd: Privacy Preservation on Evolving Streams through Correlation Tracking	Feifei Li, Jimeng Sun, Spiros Papadimitriou, George A. Mihaila, Ioana Stanoi	ICDE	2007
r_8	The Boundary Between Privacy and Utility in Data Publishing	Vibhor Rastogi, Sungho Hong, Dan Suciu	VLDB	2007
r_9	Privacy Protection in Personalized Search	Xuehua Shen, Bin Tan, ChengXiang Zhai	SIGIR	2007
r_{10}	Privacy in Database Publishing	Alin Deutsch, Yannis Papakonstantinou	ICDT	2005

Fuzzy search: When a user types in a single partial keyword *w* which is basically prefix character by character, fuzzy search immediately finds the record with keyword similar to the query keyword. For example, if a user types in a query "correl", record r_7 is a relevant answer since it contain a keyword "correlation" with a prefix "correl" which is similar to the query keyword "corel". In fuzzy search we use edit distance to measure similarity between strings. The edit distance between two strings, say, *s1* & *s2*, denoted by *ed(s1,s2)*, is the minimum number of single-character edit operation needed to transform *s1* to *s2*. For example, ed(corelation, correlation) =1 and ed(coralation, correlation) =2. A prefix *p* of a keyword is similar to the partial keyword *w* if ed(p, w) ≤ edit distance threshold.

SEARCH-AS-YOU-TYPE FOR MULTI KEYWORD QUERIES

Exact search: Given a multi keyword query *Q* with *k* keywords w_1, w_2, w_3,…., w_k, as a user completed the last keyword w_k as a partial keyword and other keyword as a complete keywords. If a user type in a query "privacysig", search-as-you-type returns record r_3, r_6 and r_9.

Fuzzy search: Fuzzy search finds the record with keyword similar to the complete keyword and a keyword similar to the partial keyword w_m. Suppose edit distance is equal to one. Assuming that a user types in a query "privicycorel", fuzzy type ahead search

return record r_7 since it contains a keyword "privacy" similar to the complete keyword "privicy" and a keyword "correlation" with a prefix "correl" which is similar to the partial keyword "corel".

EXACT SEARCH FOR SINGLE KEYWORD

In this section we proposed two types of methods to use SQL to support Search-as-You-Type for single keyword Queries.

No-Index Method

A simple and straight forward way to support search-as-You-Type is to issue an SQL query that scans record and verifies whether the record is an answer to the query which can be implemented by two methods:

1) *Calling User-Defined Functions (UDFs):* We can add functions into database to verify whether a record contains the query keyword.
2) *Using the LIKE predicates:* Databases provide LIKE predicates to allow user to perform string matching. But this method may introduce false positive which can be removed by introducing UDF's.

Index-Based Method

In index-Based method we proposed building auxiliary tables as index structure to facilitate prefix search.

Inverted-index table: In table, we assign unique ids to the keyword in the table *T*, following their alphabetical order. We create an inverted-index table I_T with record in form <*kid, rid*>, where *kid* is the id of record that contain the keyword.

TABLE 2
The Inverted-Index Table and Prefix Table

(a) Keywords

kid	keyword
k_1	icde
k_2	icdt
k_3	preserving
k_4	privacy
k_5	publishing
k_6	pvldb
k_7	sigir
k_8	sigmod
k_9	vldb
k_{10}	vldbj
...	...

(b) Inverted-index Table

kid	*rid*
k_2	r_{10}
k_5	r_6
k_5	r_8
k_5	r_{10}
k_6	r_1
k_7	r_9
k_8	r_3
k_8	r_6
k_9	r_8
k_{10}	r_4
...	...

(c) Prefix Table

prefix	*lkid*	*ukid*
ic	k_1	k_2
p	k_3	k_6
pr	k_3	k_4
pri	k_4	k_4
pu	k_5	k_5
pv	k_6	k_6
pvl	k_6	k_6
sig	k_7	k_8
v	k_9	k_{10}
vl	k_9	k_{10}
...	...	...

Prefix table: For all prefixes of keywords in the table, we build a prefix table P_T with record in the form <*p, lkid, ukid*>, where *p* is a prefix of keyword, *lkid* is the smallest id of those keyword in table *T* having *p* as prefix and *ukid* is the largest id of those keyword in table *T* having *p* as prefix. So, given a prefix keyword *w*, we can use the prefix table to find the range of keyword with the prefix. For example Table 2 illustrate the inverted-index table and the prefix table for the record in Table 1.

Suppose given a partial keyword *w*, we first get its keyword range *[lkid,ukid]* using prefix table P_T, and then find records that have keywords in the range through the inverted-index table I_T. For example, if a user enters the keyword "sig", then the SQL query first finds out keyword range [k_7,k_8] based on P_T. Next, it finds the records containing a keyword with ID in [k_7, k_8] using I_T. We can use SQL to answer the prefix search query w:

SELECT T* FROM P_T, I_T, T WHERE P_T.prefix = "w" AND P_T.ukid ≥ I_T.kid AND P_T.lkid ≤ I_T.kid AND I_T.rid = T.rid.

FUZZY SEARCH FOR SINGLE KEYWORD

No-Index Methods

In fuzzy search LIKE predicate is not supported, so we take UDF to implement no-index methods. We use PED(w,s) that takes keyword w and string s as two parameters and returns minimal edit distance between w and the prefixes of the keywords in s. For example, in Table 1,

PED(‘‘pvb’’, r_{10}[title])=PED(‘‘pvb’’; ‘‘privacy in database publishing ’’)=1.

Here the edit distance is 1 to the query where r_{10} bears a prefix “pub”. PED(w,s) returns true when keyword in string s has prefixes with edit distance within τ(edit distance threshold).

INDEX-BASED METHODS

In this method I_T and P_T are utilized to support fuzzy search. In the first stage, from prefix table P_T, we calculate its similar prefixes and range of the keywords is obtained from these similar prefixes. Then with the help of I_T, we calculate the answer depending upon these ranges.

USING UDF

UDF can be used to find similar prefixes from the prefix table P_T when a keyword w is given. The underlying SQL query helps to scan each prefix in P_T and a call is made to the UDF to notice whether prefix is similar to w:

SELECT $T.*$ FROM P_T, I_T, T WHERE PEDTH(ω, P_T , $prefix$, τ) AND $P_T.ukid \geq I_T.kid$ AND $P_T.lkid \leq I_T.kid$ AND $I_T.rid = T.rid$.

Performance can be improved by utilization of length filtering which can be done by adding the following clause to the where clause:

“LENGTH($P_T.prefix$) ≤ LENGTH(ω) +τ AND

LENGTH($P_T.prefix$) ≥LENGTH(ω) – τ”.

GRAM-BASED METHOD

Approximate string search is supported by many q-gram-based methods. String s is been given as input then its q-grams are its substrings with length q. We assume that $G^q(s)$ represents set of its q-grams and the size of $G^q(s)$ is been represented by $|G^q(s)|$. For instance, for “pvldb” and “vldb”, have G^2(pvldb)={ pv,vl,ld,db} and G^2(vldb)={vl,ld,db}. From the above example we say that strings s_1 and s_2 pose edit distance within threshold τ if

$|G^q(s_1) \cap G^q(s_2)| \geq \max(|s1|, |s2|) + 1 - q - \tau * q,$

This implementation is named as count filtering. But creating I_T and P_T is not enough, we even need to create a q-gram table G_T with records in the manner (p,$q$gram) when there is a necessity to find similar prefixes of the query keyword w, where p is referred as prefix in the prefix table and $q$gram referred as q-gram of p. When a partial keyword w is given as input, the initial step is to search the prefixes in $G_T$with no smaller than $|\omega| + 1 - q - \tau * q$grams in $G^q(\omega)$.

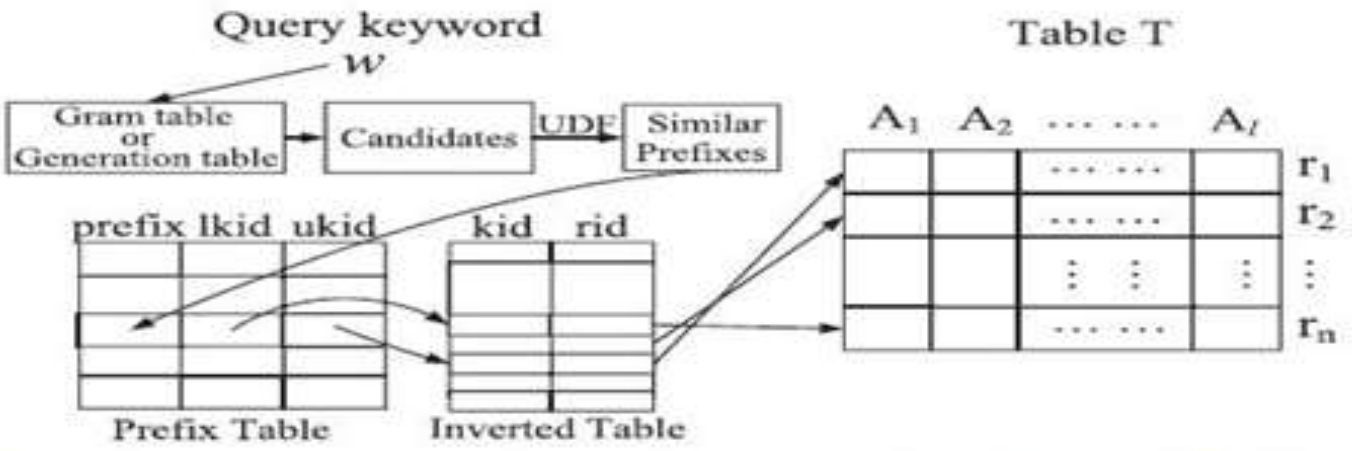


Fig. 1 . Using the q-gram table and the neighborhood generation table to support fuzzy search.

To obtain the candidates of w's similar prefixes, the following SQL with "GROUP BY" command is mentioned:

SELECT $P_T.prefix$ FROM G_T, WHERE $G_T.prefix = P_T.prefix$ AND $G_T.q$gram IN $G^q(\omega)$ GROUP BY $G_T.prefix$ HAVING COUNT($G_T.q$gram)= $|\omega| + 1 - q - \tau * q$.

False positives may be introduced in this method hence we make use of UDFs to check the candidates to obtain similar prefixes. It could be inefficient to use q-gram based method, and utilization of "GROUP BY" could be expensive in database for mostly large q-gram tables. This method is even inefficient for short query keyword [3] it has low pruning power as short keywords have less number of q-grams. Length filtering may be added to improve performance [1].

NEIGHBORHOOD-GENERATION-BASED METHOD

TABLE 3
Neighborhood-Generation Table ($\tau = 1$)

prefix	*i-deletion*	*i*
vldb	vldb	0
vldb	ldb	1
vldb	vdb	1
vldb	vlb	1
vldb	vld	1
...	...	...

This method was proposed by Ukkonen to support approximate string searching [4]. If a keyword w is given, the substring of w by eliminating or deleting i characters called as "i-deletion neighborhoods" of w. Set of i-deletion neighborhoods of ω is given by $D_i(\omega)$ and $\widehat{D\tau}(\omega) = \bigcup_{i=0}^{r} D_i(\omega)$. For instance, for a string "pvldb", D_0(pvldb) = {pvldb}, and D_1(pvldb) = {vldb, pldb, pvdb, pvlb, pvld}. Assume τ=1, $\widehat{D}\tau$(pvldb) = {pvldb, vldb, pldb, pvdb, pvlb, pvld}. If a user enters an input keyword "pvldb", its prefixes are calculated in D_τ that have i-deletion neighborhoods in {pvldb, vldb, pldb, pvdb, pvlb, pvld}. From this, we come to know that "vldb" is similar to "plvdb" and their edit distance is 1. So we can say that this method is efficient for short strings but for long strings this method is inefficient and especially when the edit distance threshold is even large. To store neighborhoods large space is been required. All these three methods of fuzzy search have some or the other disadvantages. So to overcome these disadvantages an incremental algorithm is proposed which makes use of previously calculated result to answer subsequent queries.

INCREMENTALLY COMPUTING SIMILAR PREFIXES

Chaudhari and Kaushik [5] and Ji et al. [6] proposed to compute similar prefix incrementally. If a user types in a keyword $w = c_1\ c_2\ \ldots\ c_x$ character by character, then for each prefix $p = c_1\ c_2\ \ldots\ c_i\ (i<=x)$, we maintain a similar-prefix table $S^p{}_T$ with records in the form *(prefix, ed(p,prefix))*, which has all the prefixes similar to p and corresponding edit distances. Due to small similar prefix tables, in-memory tables can be used to store them. This similar prefix table may be shared by different queries. To avoid table from getting too big, periodically some of its entries may be removed. So, the incremental-computation algorithm does not maintain session information for different queries. Suppose the user types one more character c_{x+1} and enters a new query $w' = c_1\ c_2\ \ldots\ c_x c_{x+1}$, then we use table $S^w{}_T$ to calculate $S^{w'}{}_T$ and find the range of keywords of similar prefixes in $S^{w'}{}_T$, by joining the similar-prefix table $S^{w'}{}_T$ and the prefix table P_T, and compute the answer of w' using I_T. The following SQL query can be used to answer single keyword query w':

SELECT T.* FROM $S^{w'}{}_T, P_T, I_T, T$ WHERE $S^{w'}{}_T.prefix=P_T$.prefix AND $P_T.ukid \leq I_T.kid$ AND $P_T.lkid \leq I_T.kid$ AND $I_T.rid = T.rid$.

SIMPLE TECHNIQUES FOR FINDING MULTIQUERIES

In this section, we have used techniques to support multi-keyword queries.

COMPUTING ANSWER FROM SCRATCH

Let us assume a multi keyword query Q with m keywords. It can be done in two ways:

1) *By Using Intersect Operator:* In this we first find the records & then by using INTERSECT Operator join these records for multi keywords to compute the answer
2) *By Using Command text:* In this we first find the record by using CONTAINS command to find records which match the first *m-1* complete keywords & then use our methods to match the last prefix keyword .

Due to lack of precomputed results, these two methods may lead to low performance and thus, to overcome these problems we propose an incremental computation method.

INCREMENTAL COMPUTATION BY USING WORD BY WORD

In this method, suppose a user types a query Q with key word as $x_1, x_2, \ldots, x_n$, a temporary table C_Q is created to reserve the record ids of query Q. At that instance, if a user types in a new keyword w_{m+1} and submits a new query Q' with $x_1, x_2 \ldots\ldots x_n, x_{n+1}$ then a temporary table C_Q is utilized to increment the answer.

Exact Search: We check whether the tuples in C_Q contain keywords with prefix w_{m+1} of new query Q'. The SQL query for the same is:

SELECT T.* FROM C_Q, P_T, I_T, T WHERE P_T.prefix=" w_{m+1} " AND $P_T.ukid \geq I_T.kid$ AND $P_T.lkid \leq I_T.kid$ AND $I_T.rid = C_Q.rid$ AND $T.rid = C_Q.rid$.

For example, if a user types in query Q = "privacysigmod" and there is a temporary table $C_Q = \{r_3, r_6\}$. At the same instance if the user types in a new keyword "pub" and issues a new query Q' = "privacysigmodpub", in that case it is checked whether records r_3, r_6 contain a keyword with prefix "pub". With the help of C_Q, we observe that only r_6 contains a keyword "publishing" with prefix "pub".

Fuzzy Search: Firstly $S^{wm+1}{}_T$ is calculated using character level incremental method and then use $S^{wm+1}{}_T$ to answer the query. With the help of temporary table C_Q, the SQL query is:

SELECT T.* FROM $S^{wm+1}{}_T, P_T$, I_T, T WHERE P_T.prefix= $S^{wm+1}{}_T$ .prefix AND $P_T.ukid \geq I_T.kid$ AND $P_T.lkid \leq I_T.kid$ AND $I_T.rid = C_Q.rid$ AND $T.rid = C_Q.rid$.

PROVIDE UPDATES EFFECTIVE

To make updates effective, we have also to consider insertion and deletion of records.

1) *Insertion:* When a record is entered, we first assign the record with a record ID. For each keyword, we add the keyword in P_T. For each new prefix, we insert it into the prefix table. In this way we reserve the space for the prefix keywords.

2) *Deletion:* If a record is deleted, there should be an indication that the prefix is deleted from the prefix table for which we use a bit. If the bit is marked, then the record is deleted. But updating of table is only done when index has to be rebuilt. So, we have to better update the table until we need to restore the indexes.

EXPERIMENTAL SURVEY

After implementing the proposed method in two real data sets (DBLP & MEDLINE), we summarize the data sets and index size into Table 4. From Table 4, we can say that size of I_T and P_T is acceptable as compared to the data size. In a keyword, substring has many overlapped q-grams, so the size of q-grams table is larger. As similar prefix table stores similar prefix of a keyword, so its size is very small. From the log of our deployed system we used 1000 real queries for each data set and assume characters are typed one by one. We work on a Windows 7 OS with a Intel Core 2 Quad processor (X5450 3.00 GHz and 4 GB memory) and three data bases, MYSQL, SQL Server 2005 and Oracle 11g.

TABLE 4
Data Sets and Index Costs

Data Set	MEDLINE	DBLP
# of Records (millions)	5	1.2
Database size	1.5 GB	450 MB
Avg. # of words per record	7.7	17.1
Max. # of words per record	62	172
Min. # of words per record	2	2
# of distinct keywords (millions)	0.7	0.4
Index-construction CPU Time	46 secs	9 secs
Index-construction IO Time	102 secs	18 secs
Size of the inverted-index table	604 MB	126 MB
Size of the prefix table	70 MB	30 MB
Size of the prefix-deletion table ($\tau = 2$)	4.2 GB	1.3 GB
Size of the q-gram table ($\|q\| = 2$)	902 MB	329 MB
Avg. size of the similar-prefix table	3 KB	2 KB

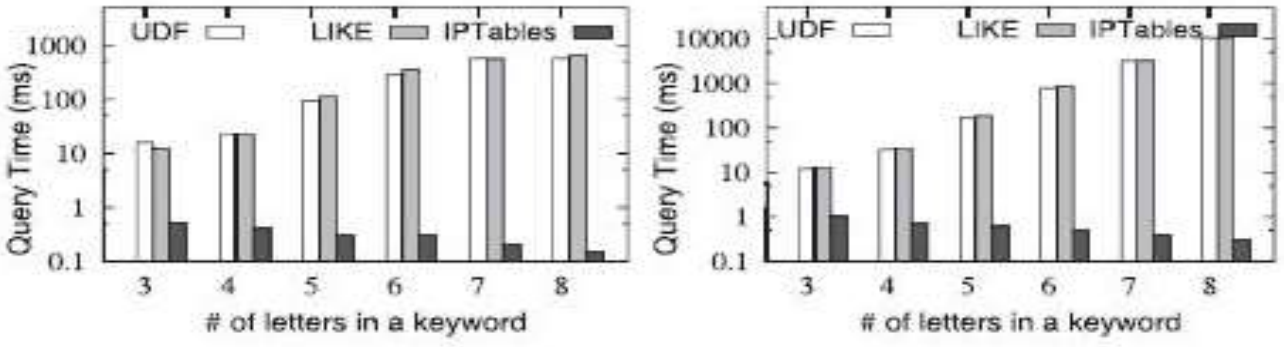
EXACT SEARCH

Single Keyword Queries: In our system for single-keyword queries, we implemented three methods: 1) using UDF, 2) using LIKE predicate and 3) using the IP tables (inverted index and prefix table). Fig. 2 shows the results.

UDF based method and LIKE based method had a low search performance as compared to the IP table as in UDF & LIKE based method, they need to scan records where as in IP table they uses indexes. As the length of keyword increases, the performance of UDF and LIKE based method decreases as they need to scan more records in order to find the same number (*N*) of answers whereas IP tables had a higher performance as there are fewer complete keywords & fewer join operations for the query.

Multi-Keyword queries: We used 6 methods to implement multi keyword queries:

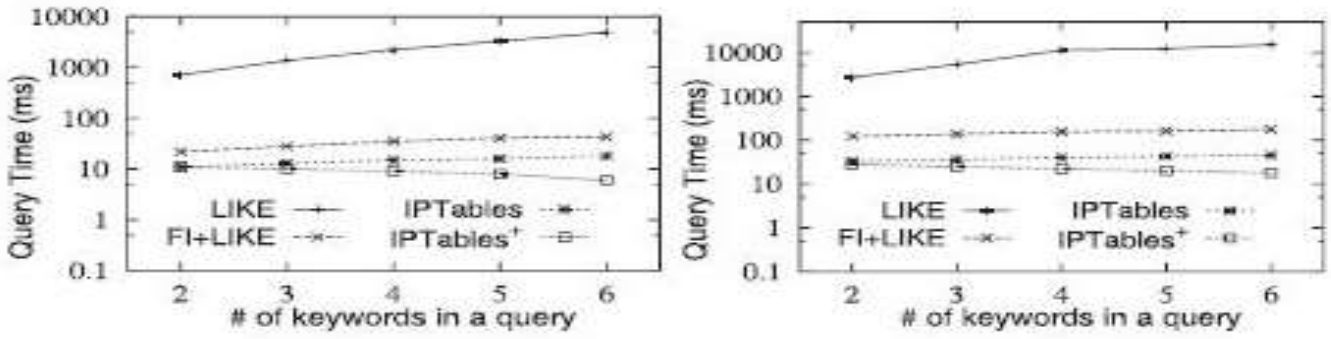
1. Using UDF.
2. Using the LIKE predicate.
3. Using full-text indexes and UDF (called "FI+UDF").
4. Using full-text indexes and the LIKE predicate (called "FI+LIKE").
5. Using the IPT tables (inverted- index table prefix table).
6. Using the IPT tables+ (called word- level incremental method).



(a) Find N answers(DBLP) (b) Find N answers(MEDLINE)

Fig. 2. Exact-search performance for answering single-keyword queries (varying keyword length).

From figure 3, we see that LIKE based method has low performance. Full-text indexes gives better performance. For example, on the MEDLINE data set, LIKE based method took higher time and later on method took less time and IPT table+ achieved the highest performance.



(a) Find N answers(DBLP) (b) Find N answers(MEDLINE)

Fig. 3. Exact-search performance of answering multikeyword queries (varying keyword numbers).

Varying the number of answers N: We compared the performance of methods to compute first *N* answers by varying the results which is shown in Fig 4. From the figure, we observe that IP table had highest performance for the single keyword whereas IP table+ outperformed other methods for the multi-keyword for different values of N.

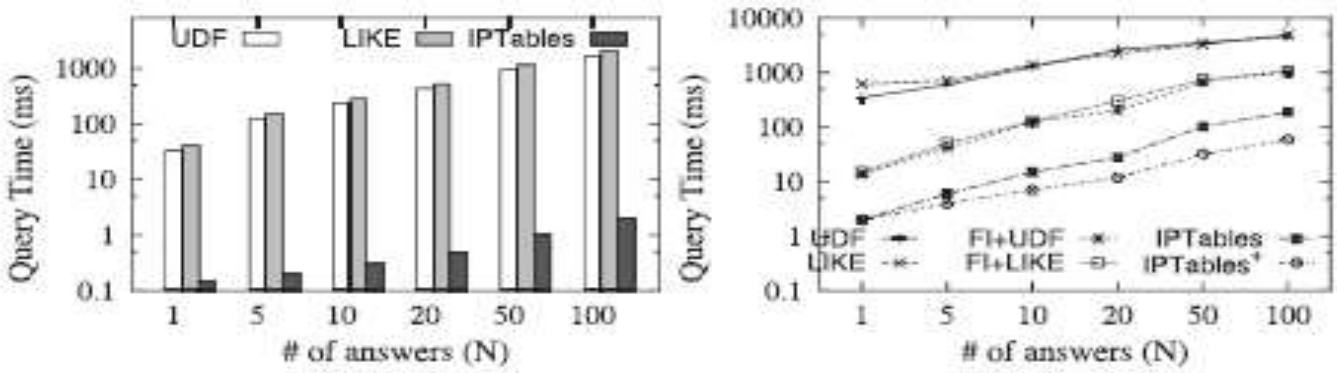


Fig. 4. Exact-search performance of computing first-N answers by varying different N values. (a) Single keywords—DBLP. (b) Multi-keywords—MEDLINE.

FUZZY SEARCH

Single-keyword queries: These queries have been implemented by these four methods:

1. Using UDF.
2. Using Gram based method.
3. Using NGB method (called neighborhood-generation-based method).
4. Using INCRE method (called character-level incremental method).

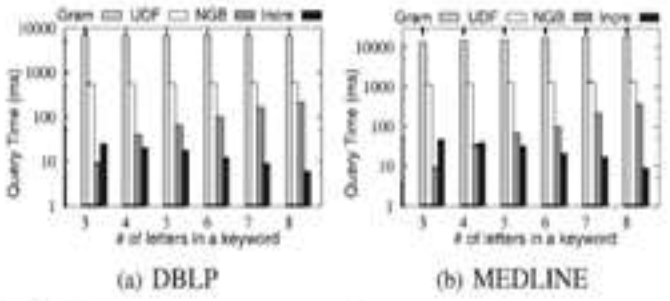
From Fig 5, we conclude that the running time of Gram, NGB & UDF increases while running time of INCRE method decreases. This is due to the fact that UDF took more time for computing long strings, NGB took more time for i-deletion of longer strings and more time was required for large number of grams.

Multi-keyword queries: For multi-keyword queries, we did not use UDF & Gram as they were too slow. We implemented two methods INCRE & NGB to find similar keywords. For multi-keyword queries, we also implemented their word level incremental called NGB+ & INCRE+. From Fig 6. it is clear that INCRE+ had highest performance . We also evaluated the running time in 2 steps:

1. Finding similar keywords (called NGB-SP & INCRE-SP).
2. Computing first *N* answers (called NGB-R & INCRE-R).

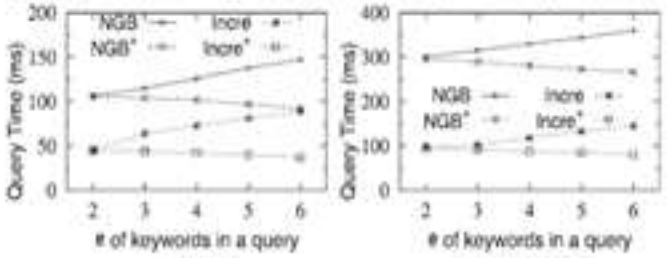
From Fig 7, we can say that NGB & INCRE nearly took the same amount of time.

Varying the number of returned results (N): Fig 8 shows the result for the first –*N* answering by varying *N* from which we can conclude that INCRE+ & NGB+ can efficiently compute.



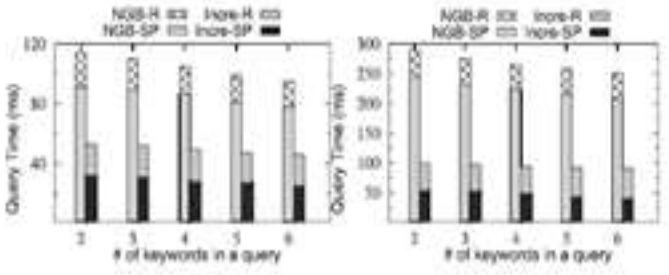
(a) DBLP (b) MEDLINE

Fig. 5. Fuzzy-search performance of computing similar keywords for single-keyword queries by varying the query keyword length ($\tau = 2$).



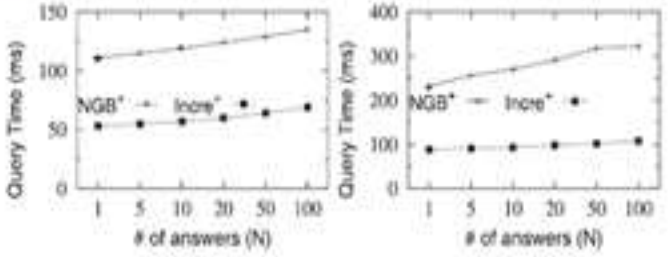
(a) DBLP (b) MEDLINE

Fig. 6 Fuzzy-search performance (overall) of computing first-N answers for multikeyword queries by varying the keyword number in a query ($\tau = 2$).



(a) DBLP (b) MEDLINE

Fig. 7. Fuzzy-search performance (2 steps) of computing first-N answers for multiple-keyword queries by varying keyword numbers in a query ($\tau = 2$).



(a) DBLP (b) MEDLINE

Fig. 8. Fuzzy-search performance of computing first-N answers by varying different N values.

RELATED WORK

The function of auto completion feature is to predict answers to query on the basis of previous parial word typed by the user [7]. This feature was studied in detail by Nandi and Jagadish, also known as phrase prediction. Many other researchers like Bast et al. proposed HYB indexing techniques [8] [9] to support autocomplete searching. Nowadays keyword search has become very important in databases. Recently many techniques have been studied on keyword search [10] [11] [12]. There have been recent developments to support approximate string searching like gram based methods but these are not as better as tri structure in fuzzy search techniques. Our study on search as you type feature includes these earlier studies by thorough investigation of different related methods.

ACKNOWLEDGEMENT

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The completion of any inter-disciplinary project depends upon cooperation, coordination and combined efforts of several sources of knowledge. We are grateful to **Prof. Pranali Lokhande, Department of Computer Engineering** for her even willingness to give us valuable advice and direction; whenever we approached her with a problem. We are thankful to her for providing immense guidance for this project. Our thanks and appreciations also go to our colleagues in developing the project and people who have willingly helped me out with their abilities.

CONCLUSION

In this paper, we work on the problem of using SQL to support search as you type in databases. We discuss on the challenge of how to meet high performance in existing databases. We use prefix matching via auxiliary tables as index structures & SQL queries to support search as you type. We use fuzzy search to improve performances. We use incremental –computation method to answer multikeyword queries and study about incremental updates. Our result on large, real data sets showed that our method can enable DBMS system to support search as you type on large tables.

However, there are several problems to support search as you type using SQL. For example, one is how to support queries efficiently and other is how to support multiple tables.

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Parametric Modeling of 'C' Class Boiler- A case study

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Abstract—In order to reduce the pressures of reading drawings and dimensional analysis on engineering staffs, the use of CATIA to build 3D models by 2D drawings with the given information is suggested. Through the application of 3D modelling, the overall situation of the time consuming design can be avoided. The research focuses on the case of the 'C' Class boiler owned by renowned company. 3D model is constructed by using information of 2D drawings to calculate the design parameters of boilers concerned with the project. It managed to shorten the design time, reduce the construction difficulties and ensure that the requirements on equipment, human resource and materials are all satisfied.

Keywords— Parametric modelling , CATIA, 3D Model, boiler, 'C' class boiler, 2D drawing, KBE, Design parameters, Design time.

INTRODUCTION

C Class boilers mainly used in Marine ships for the purpose of hot water supply, cooking and other basic purpose. These boilers need to be designed frequently as per change in dimensions for different types of marine ships. In the phase of multidisciplinary design optimization of boilers, according to the changes of the design parameters, structure and the shape need to be continuously adjusted. The parametric modeling can avoid the disadvantages of 3D modeling, such as long time consuming, low efficient, and poor interaction, and it will be the important method of multidisciplinary design optimization.

A model of a Boiler by using the parametric modeling in CATIA software which will be the base of design and analysis using a Knowledge Based Engineering (KBE) as a parametric tool.

1.2 .Introduction to Boilers

Steam boilers: It is a closed vessel made of steel. Its function is to transfer heat produced by combustion of fuel (solid, liquid or gaseous) to water and ultimately to generate steam. For producing hot water which can be used for heating installation at much lower pressure.

1.2.1 Classification of Pressure Vessels

The pressure vessels may be classified as follows:

1. According to the dimensions.

If the wall thickness of the shell (t) is less than 1/10 of the diameter of the shell (d), then it is called a **thin shell.**

Ex: boilers, tanks and pipes.

If the wall thickness of the shell is greater than 1/10 of the diameter of the shell, then it is said to be a **thick shell.**

Ex: high pressure cylinders, tanks, gun barrels etc.

2. According to the end construction.

A simple cylinder with a piston, such as cylinder of a press is an example of an open end vessel,

In case of vessels having open ends, the circumferential or hoop stresses are induced by the fluid pressure, whereas a tank is an example of a closed end vessel. In case of closed ends, longitudinal stresses in addition to circumferential stresses are induced.

1.3 Problem Identification

Boilers which were designed are produced as standard assembly and designed using traditional design methodology. According to this methodology the boilers design were tedious and time consuming Class boilers mainly used in Marine ships for the purpose of hot water supply, cooking and other basic purpose. These boilers need to be designed frequently as per change in dimensions for different types of marine ships.

1.4 Aim

Design of C-Class Boiler by using a parametric modelling technique (A case study approach)

1.5 Objective

To use parametric modelling technique to minimize the efforts of design engineer for designing similar objects with varying capacity.

To reduce design time for repetitive jobs.

1.6 Challenges in typical design

Due to change in dimensions redesign of boiler was tedious.

Analysis was time consuming and end results were not satisfactory.

1.7 Concept used

Basic concept of Knowledge Base Engineering (KBE) has been the approach for case study. The use of CATIA to build 3D models by 2D drawings with the given information is suggested. Through the application of 3D modelling, the overall situation of the time consuming design can be avoided. The research focuses on the case of the 'C' Class boiler .3D model is constructed by using information of 2D drawings to calculate the design parameters of boilers concerned with the project.

1.8 Why CATIA for parametric modelling?

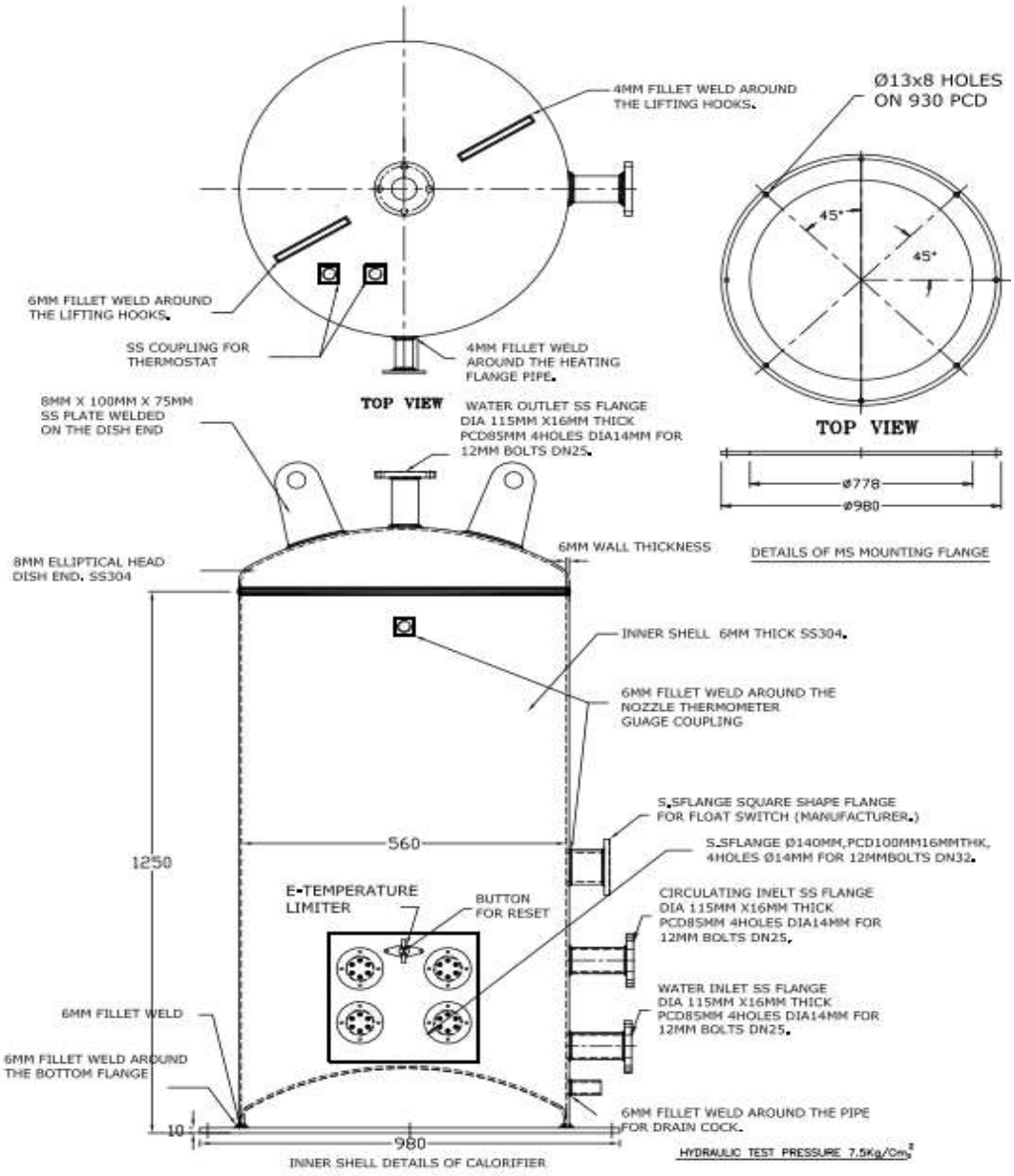
The parametric modelling approach has elevated computer-aided design technology to the level of a very powerful design tool. Parametric modelling automates the design and revision procedures by the use of parametric features. Parametric features control the model geometry by the use of design variables. The word parametric means that the geometric definitions of the design, such as dimensions, can be varied at any time in the design process.

Parametric Modelling is an approach to CAD that leaves the traditional 2 dimensional approach. Parametric modelling represents a different approach to CAD compared to 2D drafting. It is often called Feature Based modeling. Parts are composed of features of positive or negative space. A positive space can be an extruded boss, a negative space can be a hole or segment that is cut away. Often the feature is sketched 2 dimensionally and extruded, revolved or swept into a 3 dimensional object.

2. WORK DONE

2.1 Input data.

ADCC Infocad ltd. Nagpur has been source for obtaining a 2D diagram of a boiler which has become a base for the start of case study. A knowledge based engineering approach is followed. From this figure we studied total number of parts, material of boiler, specification, dimensions and other dimensional attributes.



2.2 Design Formulae

2.2.1 Boiler Tubes up to and including 5 inches O.D. (125 mm):

a) The minimum required thickness, according to ASME paragraph PG-27.2.1, use equation below:

$$t = \frac{PD}{2S + P} + 0.005D + e \qquad 1.1$$

b) To calculate the Maximum Allowable Working Pressure (MAWP):

$$P = S\left[\frac{2t - 0.01D - 2e}{D - (t - 0.005D - e)}\right] \qquad 1.2$$

Where:

t = Minimum Design Wall Thickness (in)

P = Design Pressure (psi)

D = Tube Outside Diameter (in)

e = Thickness Factor (0.04 for expanded tubes; 0 = for strength welded tubes)

S = Maximum Allowable Stress According to ASME Section II, Table 1A

2.2.2 Piping, Drums, and Headers

a) Using the outside diameter

$$t = \frac{PD}{2SE + 2yP} + C \qquad 2.1$$

$$P = \frac{2SE(t - C)}{D - (2y)(t - C)} \qquad 2.2$$

b) Using the inside radius

$$t = \frac{PR}{SE - (1 - y)P} + C \qquad 2.3$$

$$P = \frac{SE(t - C)}{R + (1 - y)(t - C)} \qquad 2.4$$

Where:

t = Minimum Design Wall Thickness (in)

P = Design Pressure (psi)

D = Tube Outside Diameter (in)

R = Tube Radius (in)

E = Tube Welding Factor (1.0 for seamless pipe; 0.85 = for welded pipe)

y = Wall Thickness Welding Factor (0.4 for 900°F & lower; 0.7 for 950°F & up)

C = Corrosion Allowance (0 for no corrosion; 0.0625 in. commonly used; 0.125 in. maximum)

S = Maximum Allowable Stress According to ASME Section II, Table 1A

2.2.3 - Thin Cylindrical Shells:

The formulae in ASME Section VIII, Division 1, paragraph UG-27, used for calculating the wall thickness and design pressure of pressure vessels, are:

a) Circumferential Stress (longitudinal welds):

When, P < 0.385SE:

$$t = \frac{PR}{(SE - 0.6P)} \quad 1.3$$

Or

$$P = \frac{SEt}{(R + 0.6t)} \quad 1.4$$

(R = Internal Radius)

b) Longitudinal Stress (circumferential welds):

When, P < 1.25SE

$$t = \frac{PR}{(2SE + 0.4P)} \quad 1.5$$

Or

$$P = \frac{2SEt}{(R - 0.4t)} \quad 1.6$$

2.2.4 Thick Cylindrical Shells:

For internal pressures higher than 3,000 psi, special considerations as specified in paragraph U-1 (d).

As the ratio of t/R increases beyond 0.5, an accurate equation is required to determine the thickness. The formulae in ASME Appendix 1, Supplementary Design Formulas used for calculating thick wall and design pressure, are:

a) For longitudinal welds:

When, P > 0.385SE:

$$t = R\left(Z^{\frac{1}{2}} - 1\right) \quad \text{Where} \quad Z = \frac{(SE + P)}{(SE - P)} \quad 1.7$$

And

$$P = SE\left[\frac{(Z - 1)}{(Z + 1)}\right] \quad \text{Where} \quad Z = \left[\frac{(R + t)}{R}\right]^2 \quad 1.8$$

b) For circumferential welds:

When, P > 1.25SE:

$$t = R\left(Z^{\frac{1}{2}} - 1\right) \quad \text{Where} \quad Z = \left(\frac{P}{SE}\right) + 1 \quad 1.9$$

And

$$P = SE(Z - 1) \quad \text{Where} \quad Z = \left[\frac{(R + t)}{R}\right]^2 \quad 1.10$$

Where:

R = Design Radius (in.)

Z = Dimensionless Factor

2.2.5 Pressure Piping - Minimum Wall Thickness:

$$t = \frac{PD}{2SE + 2yP} + C \qquad 1.12$$

Where:

t(min)= Minimum wall thickness required (in)

P = Design pressure (psig)

D = Outside diameter of pipe (in)

S = Allowable stress in pipe material (psi)

E = Longitudinal joint factor - E = 1.0 for seamless pipe, E = 0.85 for ERW pipe

C = Corrosion allowance, typically 0.05 in.

y = Wall thickness coefficient in ASME Table 304.1.1 for ferritic steels, is:

y = 0.4 for T<= 900 ºF

y = 0.5 for 900< T <= 950 ºF

y = 0.7 for 950 < T <= 1000 ºF

2.2.6 Reinforcement Wall Thickness Plate:

The standard design method uses an increased wall thickness plate at the equator line of the vessel to support the additional stresses caused by the attachment of the legs. The formula for calculation the wall thickness of a segmented plate of to be welded in a vessel or spherical shell is:

t = (P x L) / (2xSxE – 0.2xP) + C

Where L = Di/2

Where:

t = Minimum Design Wall Thickness (in)

P = Design Pressure (psi)

Di = Inside Diameter of Sphere (in)

L = Sphere Radius (in)

E = Tube Welding Factor (1.0 for seamless pipe; 0.85 = for welded pipe)

C = Corrosion Allowance (0 for no corrosion; 0.0625 in. commonly used; 0.125 in. maximum)

S = Maximum Allowable Stress According to ASME Section II, Table 1A

2.2.7 Dished Heads Formulae

a) Blank, Unstayed Dished Heads:

$$t = \frac{5PL}{4.8S} \qquad 1.11$$

Where:

t = Minimum thickness of head (in)

P = maximum allowable working pressure (psi)

L = Concave side radius (in)

S = Maximum Allowable Working Stress (psi)

b) Seamless or Full-Hemispherical Head

$$t = \frac{PL}{2S - 0.2P} \qquad 1.13$$

t = Minimum thickness of head (in)

P = Maximum Allowable Working Pressure (psi)

L = Radius to which the head was formed (in)

S = Maximum Allowable Working Stress (psi)

Note: The above formula shall not be used when the required thickness of the head given by the formula exceeds 35.6% of the inside radius. Instead, use the following formula:

$$t = L\left(Y^{\frac{1}{3}} - 1\right) \quad \text{where} \quad Y = \frac{2(S + P)}{2S - P} \qquad 1.14$$

c) Spherical or Hemispherical Heads:

i) When t < 0.356R or P < 0.665SE - (Thin Spherical or Hemispherical Heads):

$$t = \frac{PR}{2SE - 0.2P} \qquad 2.1$$

and

$$P = \frac{2SEt}{R + 0.2t} \qquad 2.2$$

ii)When t > 0.356R or P > 0.665SE – (Thick Spherical or Hemispherical Heads):

$$t = R\left(Y^{\frac{1}{3}} - 1\right) \quad where \quad Y = \frac{2(SE+P)}{2SE-P} \qquad 2.3$$

$$P = 2SE\left(\frac{Y-1}{Y+2}\right) \quad \text{where} \quad Y = \left(\frac{R+t}{R}\right)^3 \qquad 2.4$$

d) Elliptical or Ellipsoidal Heads - Semi-Elliptical or Semi-Ellipsoidal Heads – 2:1:

$$t = \frac{PD}{2SE - 0.2P} \qquad 2.5$$

or

$$P = \frac{2SEt}{D + 0.2t} \qquad 2.6$$

e)Torispherical Heads:

i)Flanged & Dished Head (F&D heads):

$$t = \frac{0.885PL}{SE - 0.1P} \qquad 2.7 \qquad P = \frac{SEt}{0.885L + 0.1t} \qquad 2.8$$

Where:

P = Pressure on the concave side of the head

S = Allowable stress

t = Thickness of the head

L = Inside spherical radius

E = Joint efficiency factor

2.4 Preparing input database.

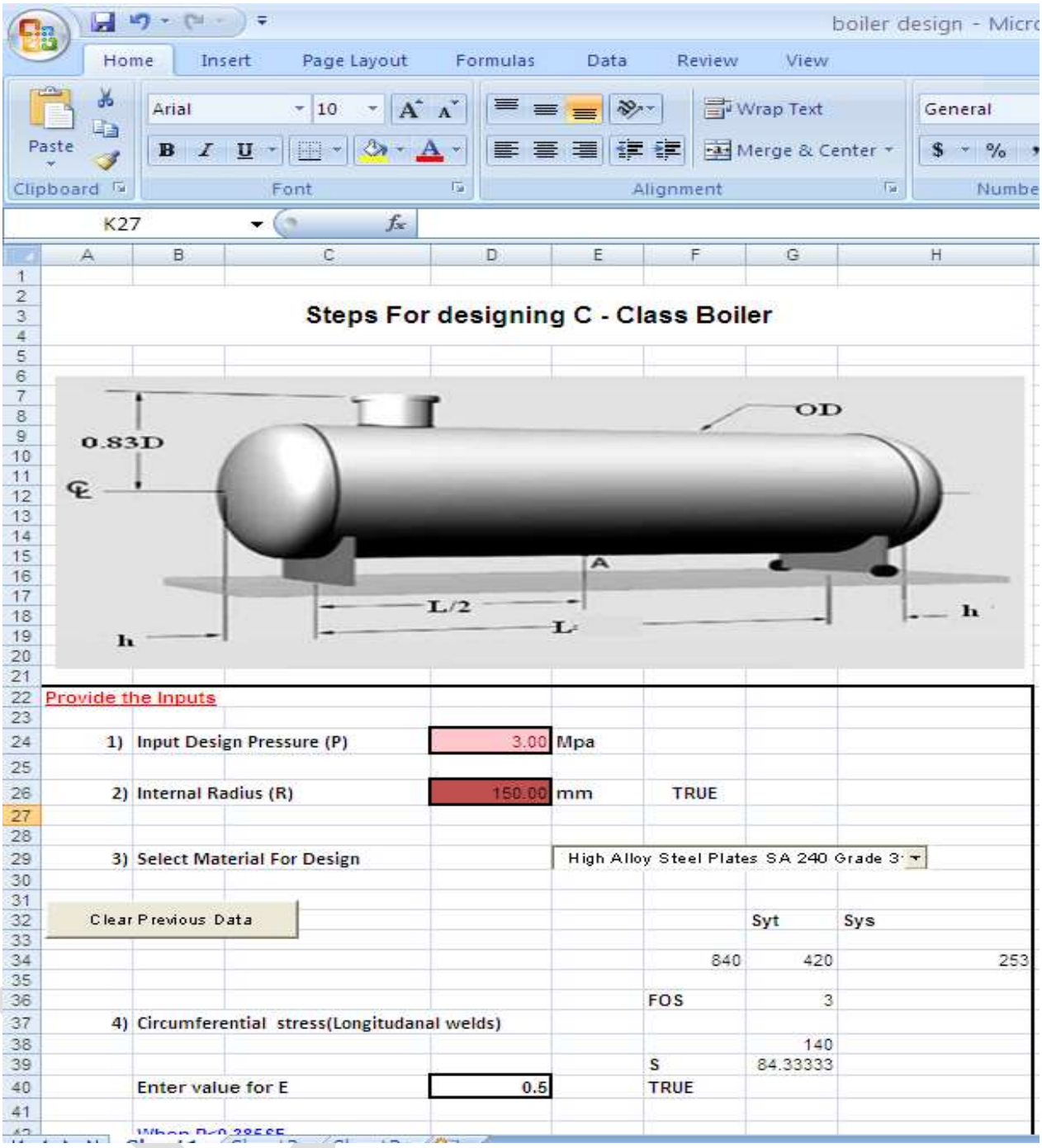
An input data base is prepared in MS excel sheet, incorporating all the design parameters. Based on the above boiler design formulae integrated tool in VB is prepared with in the form of design software which gives design of each part of boiler. Steps for using this software.

1. Input the working pressure required in MPA.

2. Select the internal radius of boiler in mm.

3. Select the appropriate material as per the table of material from ASME handbook.

These following parameters are to be entered before going to the calculation step.


boiler design - Micro
Home
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Page Layout
Formulas
Data
Review
View
Paste
Arial
10
Wrap Text
General
Merge & Center
Clipboard
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Alignment
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K27
Steps For designing C - Class Boiler
0.83D
OD
L/2
L
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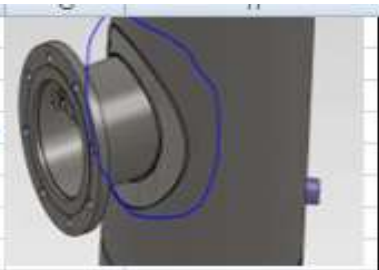
h
Provide the Inputs
1) Input Design Pressure (P)
3.00
Mpa
2) Internal Radius (R)
150.00
mm
TRUE
3) Select Material For Design
High Alloy Steel Plates SA 240 Grade 3
Clear Previous Data
Syt
Sys
840
420
253
FOS
3
4) Circumferential stress(Longitudanal welds)
140
S
84.33333
Enter value for E
0.5
TRUE

62				
63	a) t=(PxL/(2xSxE-0.2xP))+C	C=Corrosion Allowance(0.0625)		
64		L = Sphere Radius(mm) = Di/2		
65		Di = Inside Diameter of Sphere(mm)		
66				
67	Calculate Thickness			
68				
69				
70				
71	Thickness of reinfornce plate	8.932408016	mm	
72				
73	7) Elliptical or Ellipsoidal Heads - Semi-Elliptical or			
74	Semi-Ellipsoidal Heads			
75	t=PxD/(2xSxE-0.2xP)			
76				
77				
78	Calculate Thickness			
79				
80				
81	Thickness of Elliptical dish end	17.73981603	mm	
82				
83	8) L= 5D		L = Boiler length mm	
84	h=0.5D		h= Elleptical Dish head hight	
85				
86	Value for L			
87				
88				
89	Calculate Values			
90				
91				
92				
93	Length of Boiler	1500	mm	
94				
95	Height of Elliptical dish	150	mm	
96	head			
97				



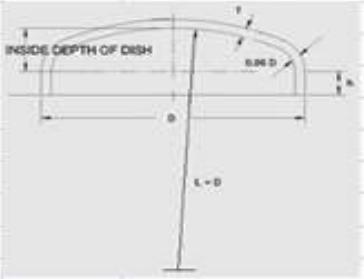


Fig 2 Database in MS Excel

2.5 3D Model in CATIA

After the calculation of the above data a 3D model is generated based on the calculation from the design.

All the parameters are linked with the CATIA software to incorporate frequent the design changes. A 3D model is generated as shown in figure based upon the sample calculation for 400 mm internal radius.

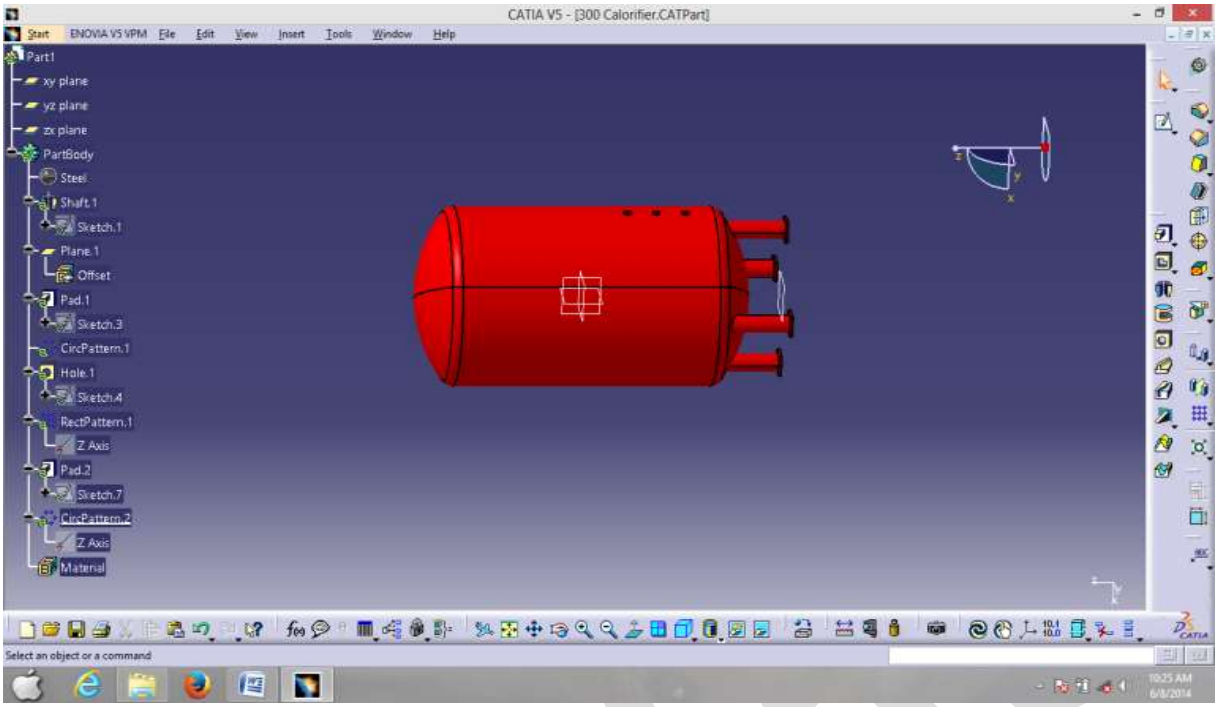


Fig. 3 3D Modelling in CATIA

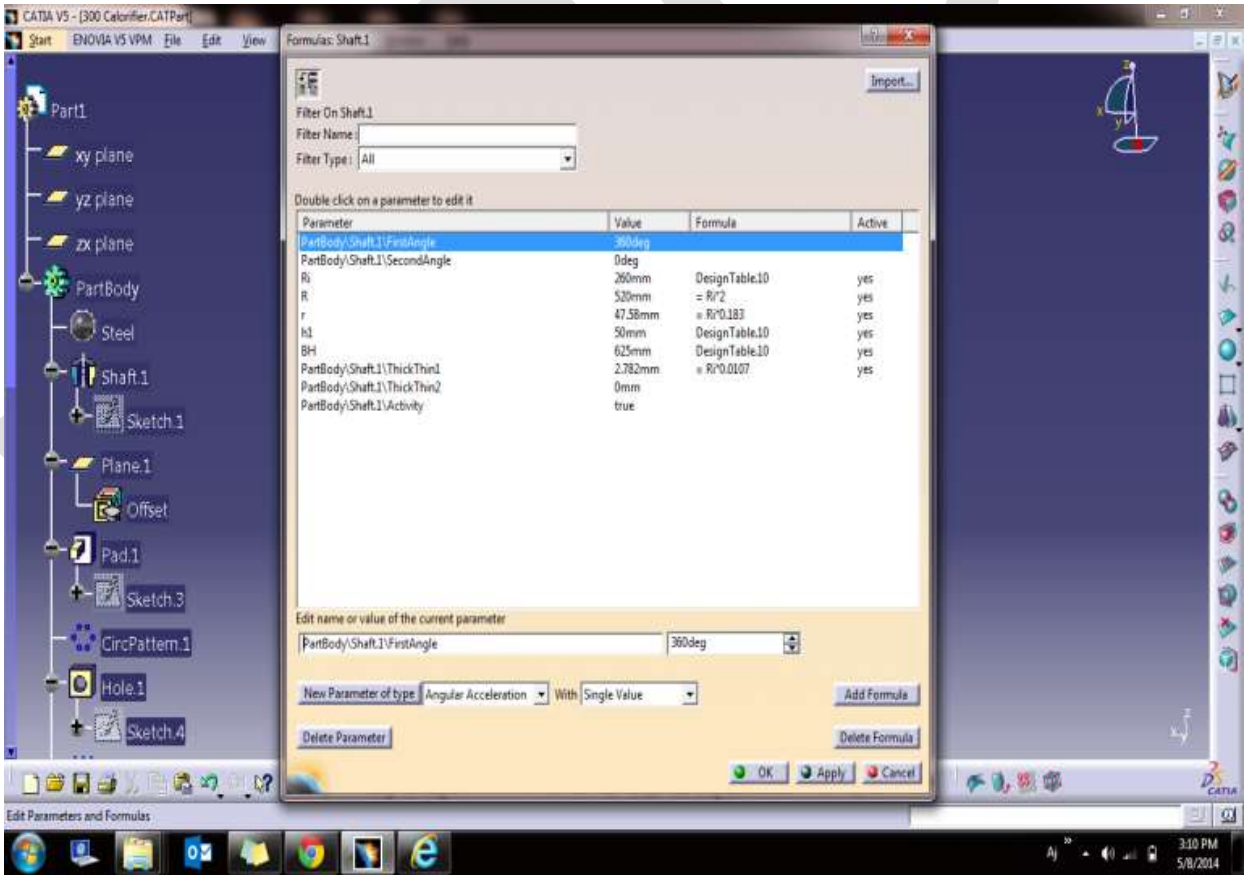


FIG 4. FORMULA FOR PART

3. ANALYSIS

Based on the calculation and 3D model an analysis report is generated with the help of analysis tool in CATIA. Each part is analysed based on the input parameters and results are formulated in a report. This report is generated by analysis tool in CATIA which gives details about stresses, deformation and other factors which affect the design because of the change in parameters or dimensions.

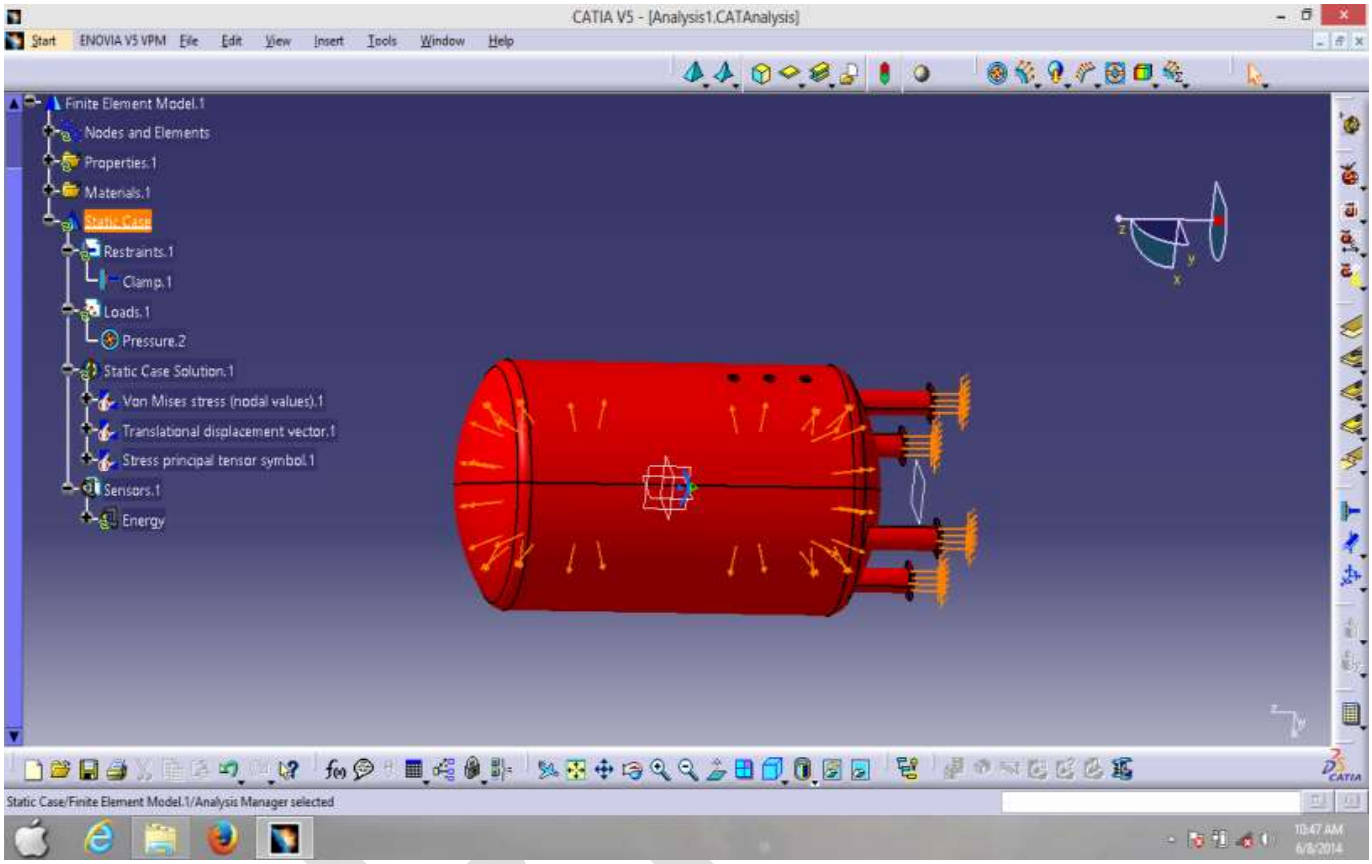


Fig 5. Analysis Model

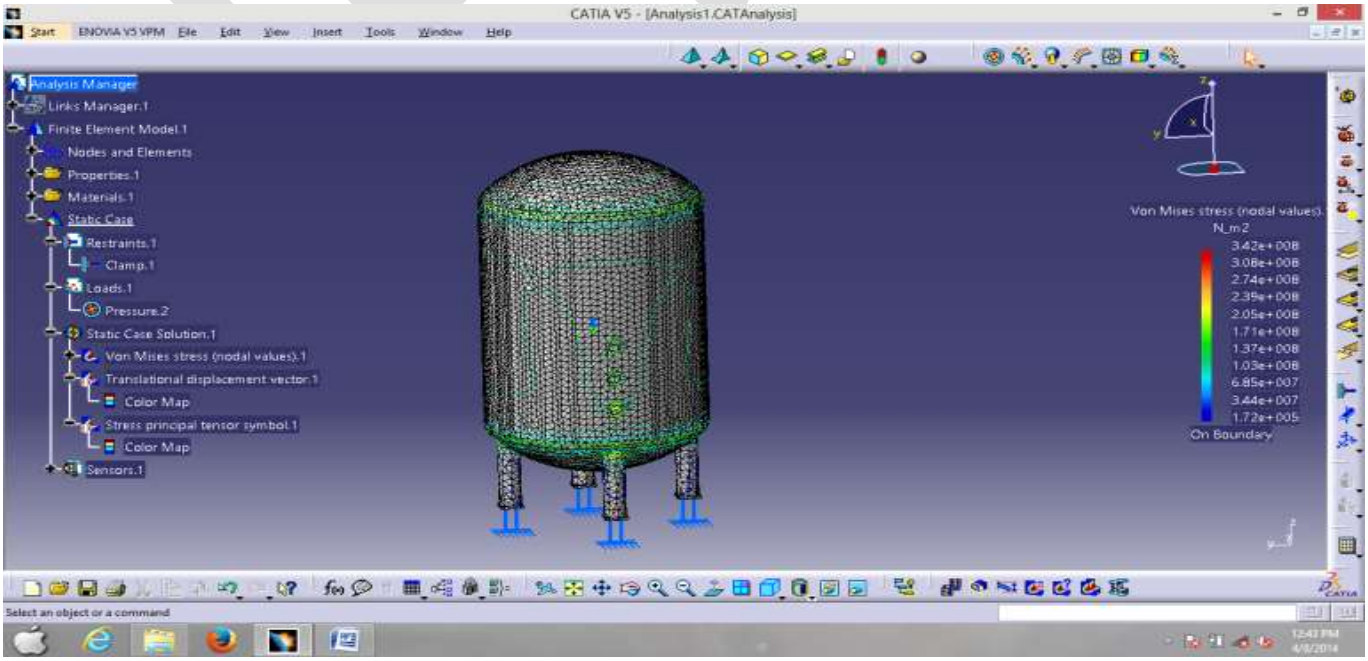


Fig6.Static Case Solution.1 - Von Mises stress

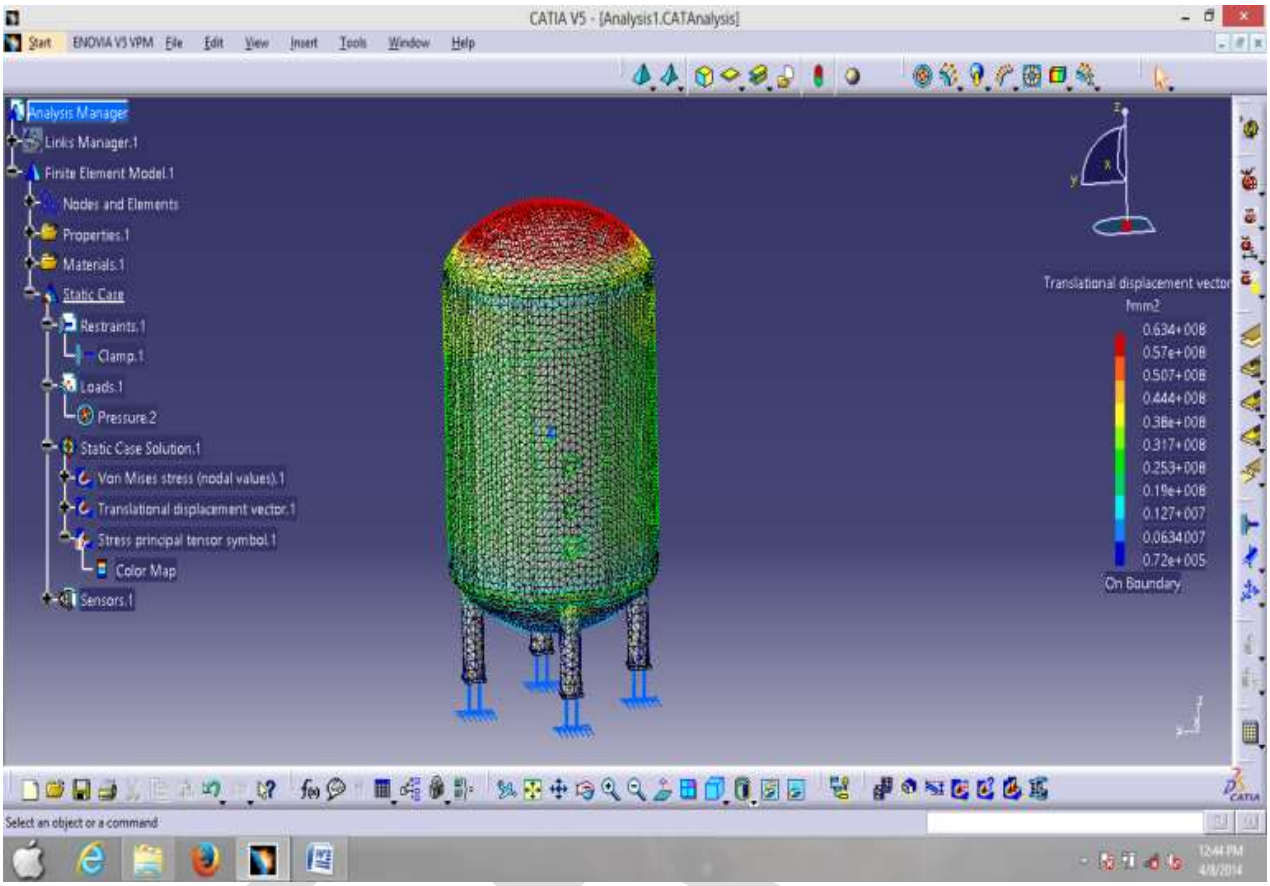


FIG7. **STATIC CASE SOLUTION.1 - TRANSLATIONAL DISPLACEMENT VECTOR**

4. RESULT

KBE is the key technology at the base of any design development. In the current design approach, too much time is wasted in lengthy and repetitive activities; not enough time remains available for investigating more product configurations and exploiting designers' skills and creativity. In this case study, it is demonstrated how KBE can be a suitable technology to help designers reducing time and cost for engineering applications by automating repetitive design tasks and supporting the systematic application of design best practices with the use of parametric modelling as a tool.

3D modelling is tool which help to save time in regards the capturing the design intent of particular equipment. The process is known as Knowledge base engineering. In this process all design intent of object is captured & save in term of relational formulas & on this basis the 3D object is prepared. Once the design requirement is change some parameters will require modifying. All other parameters are depended on the driving parameters. One driving parameter get updated, all relevant parameters will update automatically & relevant production drawings will update automatically. This helps to reduce time, which is the prime motive of this case study.

It managed to shorten the project preparation time, reduce the construction difficulties and ensure that the requirements on equipment, human recourse and materials are all satisfied

5. ACKNOWLEDGMENT

I would like to thank to my project guide Dr. V.H. Tatwawadi under whose necessary guidance I have completed my project successfully. Without his unending help, encouragement and motivation this would not have been possible.

Dedication and perseverance when supported by inspiration and guidance leads to success. For me the inspiration and guidance was given by my guide Dr.V.H. Tatwawadi who was accessible for me to obviate the darkness of my problem with light of his knowledge of the relevant subject enriched by his hands on experienced in the field of Design and analysis.

I also thank Prof.G.M.Dhote for helping me in understanding the Modeling and Analysis regarding my project.

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6 CONCLUSION.

In this study, in particular it is shown how, using KBE, it is possible to win one of the greatest design challenges at date: automate the generation and modification of boiler models, from geometry definition to the launch final design. Entire models of boiler & components can be generated in software and independently from the specific topology of the parameters.

7. FUTURE SCOPE

Future developments will include the creation of a tooling module to be linked to the movable modeland a cost module, which will provide a smooth link to a cost calculation program.

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Experimental Investigation to Improve Flame Intensity in 250MW Tangentially Firing Furnace

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Abstract—: The objective of this study is experimental investigation of 250 MW coal based thermal power plant to predict the performance of tangential fired (TF) boiler and to determine the flow patterns of the gas and coal particles, with an emphasis on increasing the flame stability in combustion zone at low load conditions at which thermal plants are forced to operates owing to number of practical limitations in this region. The effects of four parameters that are experimentally investigated are Coal air velocity through burner, Burner outlet temperature, Burner tilt & Furnace draft. The experimental results show considerable increase in flame stability at low load conditions while operating at Coal air velocity of 19.19 m/sec, Burner outlet temperature of 70°C, furnace draft of -10mmwc and burner tilt of +20°. The work has been validated with the help of CFD code Fluent. The results obtained from the present work are directly relevant to coal-fired Utilities for not only demonstrating the effectiveness of computational fluid dynamics (CFD) based tools in combating operational issues but also provides an alternative to conventional remediation strategies.

Keywords— Tangential firing furnace, CFD Fluent, Coal fire power plant, Coal combustion, Flame intensity

1.Introduction:

Efficient use of pulverised coal in boilers with tangential firing system is crucial to the power generation in most countries, which was the main motivation for undertaking this research. Due to number of practical limitations most of the coal based power plant in the region runs on part load conditions, which ultimately puts them in danger of tripping due to low flame intensity due to decreased rate of coal flow. Increasing flame stability at low load conditions is the prime objective of this research.

Tangentially fired boiler is the most commonly used industrial coal combustion system and thus gains much attention. With the development of comprehensive combustion models and their successful applications in industrial coal-fired boilers, as surveyed in the literature the complex phenomena in tangentially fired boilers, including gas–solid flow, combustion, heat transfer and NOx reduction, are widely studied using simulations. The gas temperature deviation is commonly considered to result from the after swirl in furnace exit. However, this aspect has not been well demonstrated because it is difficult to study the gas temperature deviation by experiments and theoretical ways. Along with the development of numerical techniques and their applications in coal combustion, it has become possible to investigate the gas temperature in a tangential coal-fired boiler. In some cases it replaces physical experiments with equivalent 'numerical' experiments.

The paper presents the experimental results of the Parli power station boiler equipped with tangential firing of the burners. The Computational Fluid Dynamics (CFD) approach is utilized for the creation of a three-dimensional model of the boiler furnace, including platen super-heater sections in the upper part of the furnace. Standard k–e model is employed for the description of turbulent flow. Coal combustion is modeled by the mixture fraction/probability density function approach for the reaction chemistry, with equilibrium assumption applied for description of the system chemistry. Radiative heat transfer is computed using P1 radiation model. The described case and other experiences with CFD prescribe the advantages Of combining numerical modelling and simulation over purely field data study, such as the ability to quickly analyse a variety of design options without modifying the object and the availability of significantly more data to interpret the results.

In the present study, parameters which were investigated include Coal air velocity through burner, Burner outlet temperature, Burner tilt & Furnace draft. The boiler geometry and operating conditions are described in the next section. This is followed by the description of the mathematical model. Then the results are presented and discussed following the validation of model with plant trials. Finally, the paper ends with a summary of the main conclusions and recommendations for future work and acknowledgment.

2. Literature review:

Ahmed F Ghoniem et al 2011 found that When operating under elevated pressure, the gas phase flow field and coal particle residence time may change significantly. The effect of pressure on the characteristics of mass and heat transfer, char and gas phase combustion kinetics and dynamics, etc, are also still relatively unknown. Research on the characteristics of oxy-combustion at elevated pressures is needed. S Belosevic et al 2006 presented selected results of numerical simulations of processes in utility boiler

pulverized coal tangentially fired dry-bottom furnace. The simulations of the processes are based on a comprehensive 3D differential mathematical model, specially developed for the purpose. The model offers such a composition of sub models and modelling approaches so as to balance sub model sophistication with computational practicality. A 3D geometry, Eulerian– Lagrangian approach, k–e gas turbulence model, particles-to-turbulence interaction, diffusion model of particle dispersion, six-flux method for radiation modelling and pulverized coal particle combustion model based on the global particle kinetics and experimentally obtained coal kinetic parameters are the main features of the model. Zadiraka et al (1996) proposed a method to control the emissions of SOx and NOx content in the flue gases. If coal was to be used as the fuel, the new power plants need to be very clean, with higher efficiency and economical. Sensors and control techniques are being developed to permit the accurate measurement and control of the individual burner air and fuel flows as they are introduced to the time-temperature-turbulence combustion processing the furnace.

M Habermehi et al 2012 investigated the effect of burner on flame stabilization. Starting from an existing burner design for a bench scale burner, a new burner concept based on aerodynamic stabilization of an oxy-fuel swirl flame was developed. For this development process, CFD was intensively used as a design tool. Adapted models for homogeneous and heterogeneous reactions were integrated into the CFD code to take the different conditions for oxy-fuel combustion into account. As a result a burner able to operate in air and oxy-fuel conditions was developed and its functionality was demonstrated in experiments. By these experiments, it was proven that applying the measures for oxy-coal swirl flame stabilization an oxy-coal flame can be stabilized aero-dynamically at an oxygen concentration down to 18 vol.-% for wet and dry recirculation. In UK boilers the video camera probes are mounted on the rear wall to observe the oil gun flames during the start up for safety purpose. When the boiler is on load the large flames are close to the rear wall and there will be dust and ash deposits near the rear wall. This causes variation in the colour of the fire ball which is utilised to observe the combustion conditions. A video monitoring system was developed to monitor the combustion activities. A Euclidean distance classifier was used for identifying the combustion conditions along with the CO emissions. Principal Value Decomposition (PVD) and Euclidean classifier were used for classification of flame images based on their combustion status by Abdul Rahman et al (2006).

Donglin Chen et al concluded that the deflected angle of a torsion-spring incorporated damper and the air-jet at BWD exit is approximately a linear function of air velocity inside burner nozzle and simultaneously affected by the damper's length, installation distance and the spring's mechanical constant. With a proper combination of the spring's mechanical constant k, the damper's length l and installation distances, satisfied deflecting characteristics for the jet of BWD can be obtained. Flame Doctor, a burner flame monitoring system was developed by Timothy et al (2004) to reduce NOx emissions and to improve the overall performance. The signals from an optical flame scanner diagnose the operation of the burners. Continuous monitoring by flame doctor makes it possible to analyze the flame colour thereby optimizing the overall performance of the furnace load changes, fuel quality variations, and equipment modifications. This article describes the status of an ongoing EPRI Beta Test Program and the results from combustion tuning service work which offers specific challenges encountered during Flame Doctor Installation and start up. Demonstrated performance improvements include reductions of 20% in NOx, 70% in CO, and 70% in LOI. These improvements are sustainable and translate directly into significant cost savings in the expenditure of the power plants.

The thermal characteristics of propane air diffusion flames using high temperature combustion air are presented in this work by Ashwani Gupta et al (2000). Global flame characteristics are presented using several different gaseous fuels. A specially designed regenerative combustion test furnace facility, built by Nippon Furnace Kogyo, Japan, has been used to preheat the combustion air to elevated temperatures. Stable flames were obtained at remarkably low equivalence ratios, which would not be possible with normal temperature air. The global flame features showed flame color to change from yellow to blue, bluish-green and green over the range of conditions examined using propane as the fuel. In some cases hybrid color flame was also observed. Under certain conditions flameless or colourless oxidation of the fuel has also been observed for some fuels. Some fuels provide purple colour flame under similar operational conditions. Information on the flame spectral emission characteristics, spatial distribution of OH, CH and C2 species and emission of pollutants has been obtained. Low levels of NOx along with negligible amounts of CO and HC were obtained with high temperature combustion air. Experimental results have been complemented with numerical simulations. The thermal and chemical behavior of high temperature combustion flames depends on the fuel property, preheat temperature and oxygen. The challenges and opportunities with high temperature-air combustion technology are also described.

3. Experimental setup:

The furnace geometry of the simulated boiler can be seen in Fig. 1 for which the dimensions are given in Table 1. As evident from Table 1, the tangentially fired furnace is 52 m high,15.240 m wide and 11.506 m deep and with an installed capacity of 250 MW. The boiler considered for the modeling studies is a subcritical one comprising of concentric firing system with tangential firing burners. Twenty four burners are arranged in an array of six burners positioned at different levels on four corners of the furnace walls. The specifications of the furnace geometry and original drawing are given in Table 1 and Fig. 1.

Table 1
Specifications of furnace geometry.

Sr no	Parameters	Value (m)
1	Furnace width	11.506
2	Furnace length	15.240
3	Furnace height	52

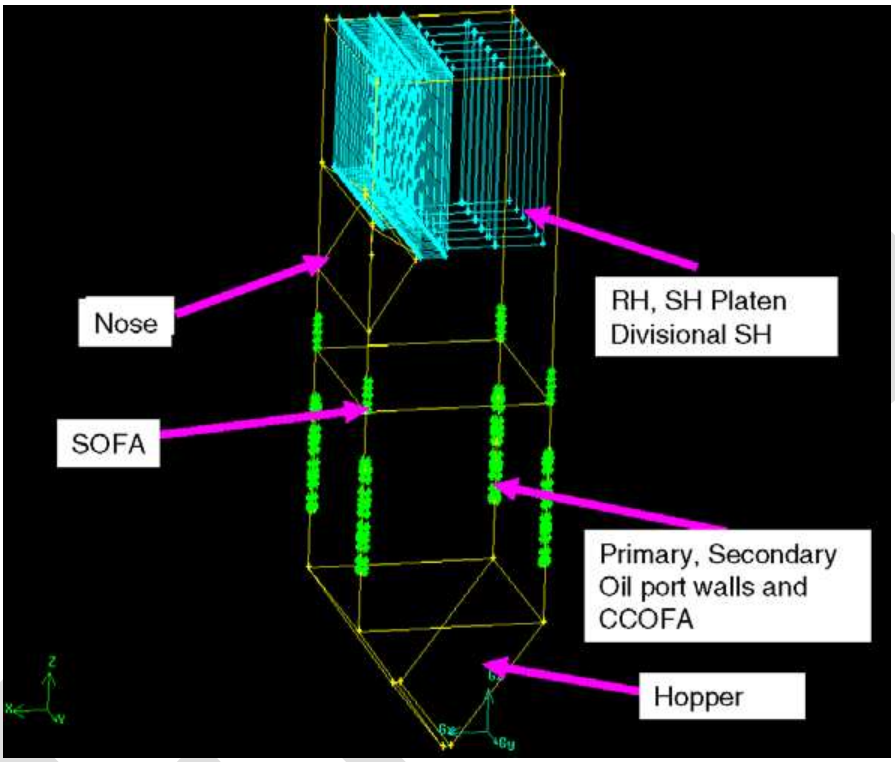


Fig. 1. Furnace geometry

4. Model description:

The three-dimensional geometry was created using GAMBIT – a FLUENT pre-processor. An isotropic view of the geometry and grid system is shown in Fig. 1. The meshed-geometry contained 402,852 nodes with hexahedral cells in one zone and the remaining zones with quadrilateral cells. In our study, the results are observed to be grid independent as three different sizes indicated no significant change in the flow patterns or trajectories.The furnace geometry has been constructed using the specifications provided by the utility. Fig 1 also presents information on super-heater and re-heater sections of the boiler. The burner arrangement, orientation, windbox elevation designations,details relevant to SOFA/CCOFA, burner tip, fuel air tip and auxiliary air nozzle tip are shown in Fig. 2. The figure is mainly used to construct the correct geometry of furnace to represent the orientation of nose, hopper and furnace wall sections as per the desighn of furnace.As indicated in Fig 2 it is used for constructing the various burner ports in four corners (1–4) along with Separated Overfire Air Register (SOFA) at different levels A–D from the bottom of the furnace as well as Close Coupled Overfire Air Compartment (CCOFA) ports at levels A and B with specified tilt angles from the plant operators. Following these SOFA/CCOFA ports, additionally Fig. 2 also refers to auxiliary air ports at A–A, B–C, D–E, F–F, Coal elevation ports at A–F and oil elevation ports at A–B, C–D,E–F which helped to represent the whole furnace ports in the geometry as per the specifications.

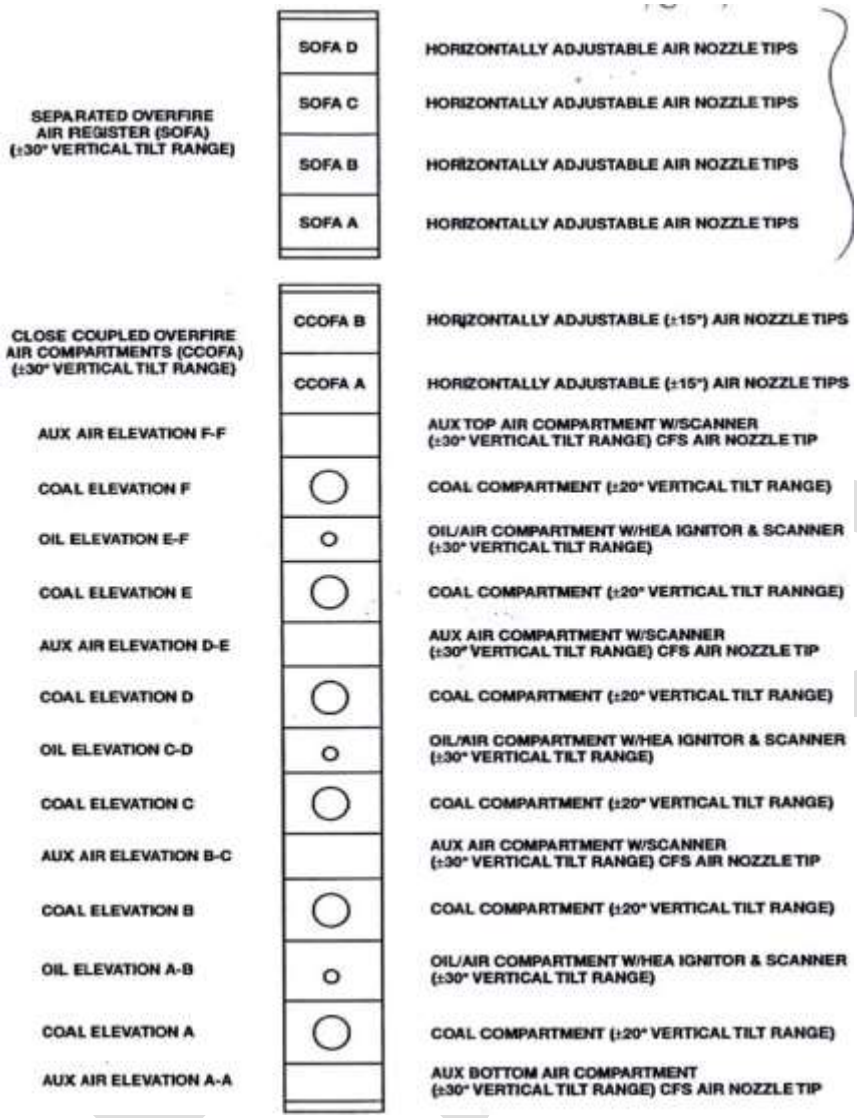


Fig. 2. Burner specifications; Windbox elevation designations.

5. Experimental Results and discussion

The computational model has been applied to the furnace of 250 MW boiler fired bituminous coal. The input data for simulations (including boiler operational conditions) have been selected in accordance with data related to the experimental tests done for the boiler considered.

5.1 Coal air velocity:

Experimentation results are as shown in the Table 2.experimentation is performed on the furnace by keeping the load below technical minimum.Coal air velocity is measured in coal pipes as shown in the Fig 3.results obtained show that we are getting maximum flame intensity at 19.19 m/sec.

Fig 3: Velocity measurement in coal pipe.

Table 2

Pipe no	Velocity (m/sec)	Load (MW)	Flame intensity (Lumens)
Corner-1	16.46	160	384
Corner-2	16.46	160	672
Corner-3	19.19	160	960
Corner-4	17.50	160	384

5.2 Burner tilt:

The position of the burner is as shown in the fig 2.All the dampers are connected with a single link so whenever we are giving command to burner for tilting all the four corners are simultaneously operated. Experimentation results show that while operating below technical minimum load at +20° of burner tilt we are getting maximum flame intensity as shown in the table 3.

Table 3

Burner tilt (Degree)	Load (MW)	Flame intensity (Lumens)
-30	160	264
-25	160	345
-20	160	194
-15	160	225
-10	160	361
-5	160	159

0	160	357
5	160	441
10	160	451
15	160	657
20	160	684
25	160	397
30	160	279

5.3 Furnace Draft:

Furnace draft is the pressure inside furnace. It must be kept below atmospheric in order to maintain fire ball and flue gases flow to second pass. We have operated in between -5 mmwc to -10 mmwc of furnace pressure and at technical minimum load as shown in the table 4.Experimentation results show that when we operate the furnace at -10 mmwc pressure we get maximum flame intensity.

Table 4

Pressure (mmwc)	Load (MW)	Flame intensity (Lumens)
-5	160	259
-6	160	364
-7	160	471
-8	160	521
-9	160	754
-10	160	789

5.4 Burner outlet temperature:

Burner outlet temperature is same that of coal mill outlet temperature in coal based thermal power plant. As shown in table 5 experimentation results show that when we vary the burner outlet temperature in range of 65°C to 85°C we obtain maximum flame intensity while operating at 70°C of burner outlet temperature while we keep load on the boiler below technical minimum.

Table 5

Temperature °C	Load (MW)	Flame intensity (Lumens)
65	160	495
70	160	859
75	160	426
80	160	528
85	160	624

6. Results validation:

A three dimensional model has been developed for the simulation of flow, temperature and concentration fields in the coal based tangentially fired furnace. The model takes into account the turbulence chemistry interactions. The simulation was performed using the ANSYS FLUENT considering non premixed combustion as fuel and oxidizer enter in a distinct stream. The convergence for this simulation was decided based on the following factors. The drop in residuals for the governing equations was the primary while the mass flow conservation between the inlet and the outlet was another. Also, the Pressure and Temperature at the outlet was monitored to reach steady values.

ANSYS Fluent is a Finite Volume based Reynolds Averaged Navier-Stokes (RANS) solver. It has the capability to solve both structured and un-structured meshes. Also, the advanced features like combustion modeling, radiation modeling, multi-phase modeling as well as specie transport modeling are available. ANSYS Fluent supports the various file formats for efficient multi-disciplinary functions. For the low speed flows, the Pressure based solver provides the SIMPLE, SIMPLEC and PISO algorithm for the Pressure-Velocity coupling while the Density based solver for the high speed compressible flows provides accurate results.ICEM CFD provide the option to generate block-structured or un-structured meshes for the geometry. The mesh quality as well flow filed aligned meshes can be generated from the block-structured mesh though addition time and expertise required. In order to resolve the boundary layers, the ‘o’ grid options can be utilized to generate the mesh layers near the wall. In the Un-structured mesh generation, prism layers provide the ability to capture the near-wall flow physics. The unstructured mesh typically contains tetra-hedra elements in 3-Dimensional domain while triangle elements in 2-Dimensional domain.

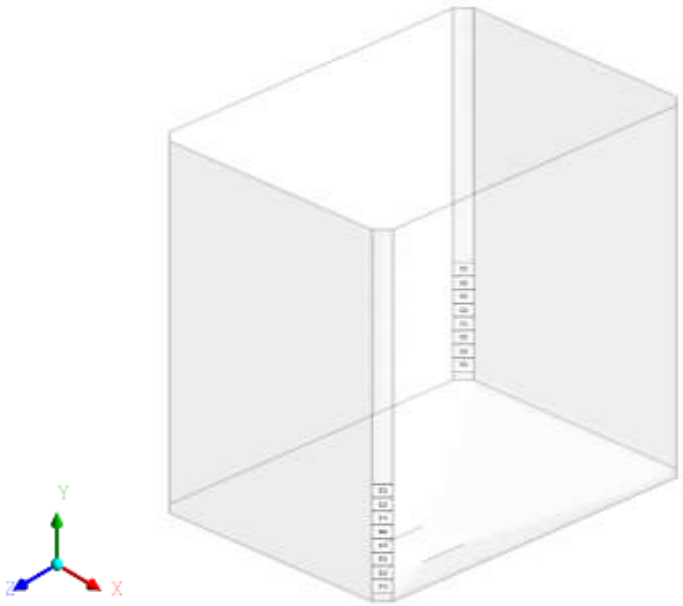
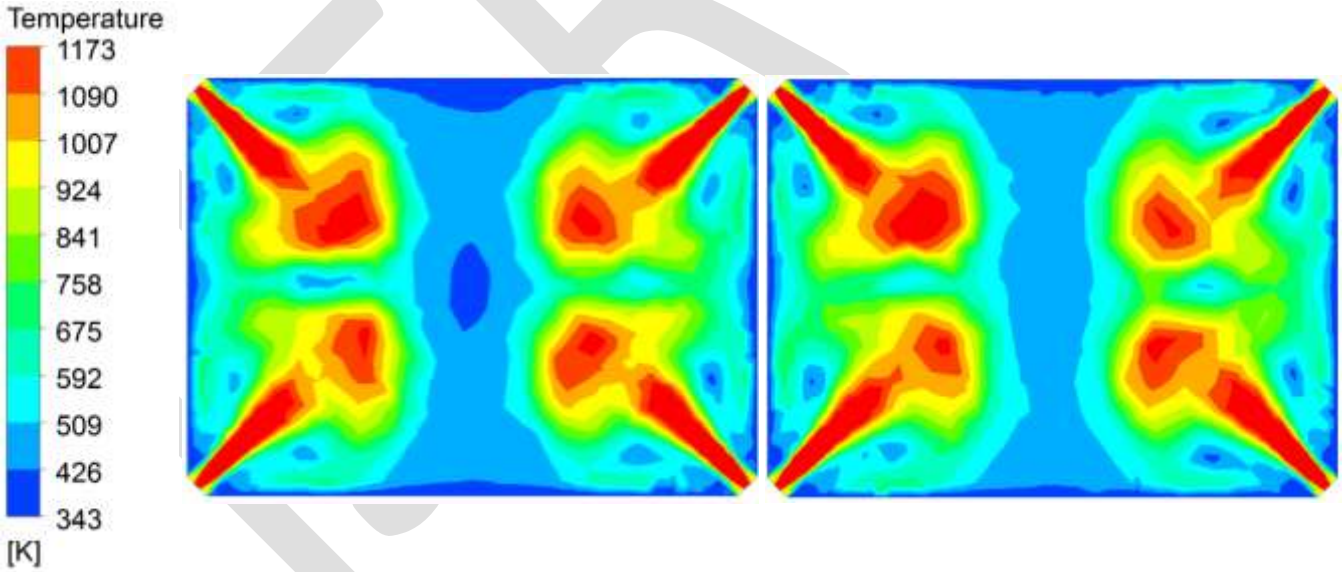


Fig 4 Furnace geometry made in ICEM

As shown in the Fig 4 furnace geometry is made in ICEM code. and for simulation purpose Fluent code is used.Pulverized coal tangentially firing furnace post processing is done by taking sections in Y plane section planes had been defined at the mid of each burner inlet. The temperature contour plots at these planes had been provided in fig 6.



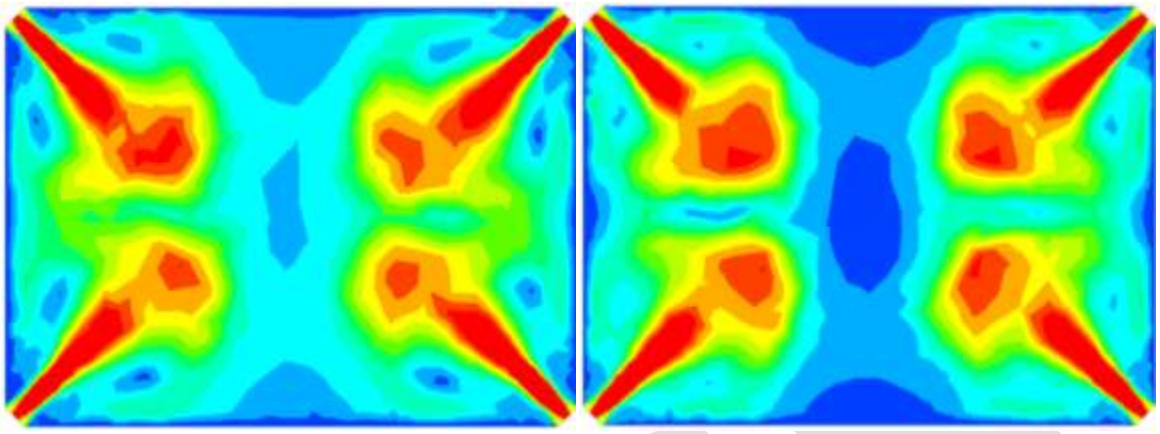


Fig 6: Temperature contours at different Y sections

The turbulence created by the jet effect at the coal and air inlet ensures flow distribution for most part of the furnace however there are certain zones with minimal flow distribution. Based on readings obtained from simulations for flame intensity vs. Coal air velocity a data table has been made which compares the readings of experimental data with that of data obtained from simulation. It can be seen in Table 6 that percentage error lies between 3.52-11.60 %.

Table 6

Sr No	Velocity m/sec (Experimental)	Velocity m/sec (Software)	Error	% Error
1	12.2	11	1.2	9.83
2	14	12.8	1.2	9.375
3	12.9	12.4	0.5	4.03
4	10.5	10.1	0.4	3.80
5	8.5	8.8	0.3	3.52
6	6.8	7.2	0.4	5.88
7	4.8	5.2	0.4	8.33
8	4	4.4	0.5	12.5

9	2.2	2	0.2	9.09
10	1.8	1.6	0.2	11.11
11	0.9	1	0.1	11.11
12	3	3.2	0.4	6.6
13	4.2	3.9	0.3	7.14
14	6.2	5.5	0.7	11.29
15	7	7.8	0.8	11.42
16	10	9.8	0.2	8
17	11.5	10.5	1	8.92
18	12.2	11	1.2	9.83
19	12	13.5	1.5	12.5
20	9	10	1	11.11
21	11.2	12.5	1.3	11.60
22	11.8	11	0.8	6.77

ACKNOWLEDGMENT

The authors wish to acknowledge M.S.P.G.C.L for giving us an opportunity to conduct the experimentation work in their 250 MW pulverized coal, tangentially firing thermal power plant.

CONCLUSION

If the thermal power plant of 250 MW is operated at recommended parameters it will give following monetary benefits.

1. Plant Availability factor in the observed period of 3 months is 96.29% .Remaining unavailability is solely due to plant tripping due to flame intensity failure. If the said parameters are maintained at low load conditions flame intensity will be high resulting in lower rate of plant tripping thereby increase in plant availability factor up to 100%.

2. Oil consumption while plant light up can be saved. It is observed that for every tripping it takes close to 20 KL of Light diesel Oil (LDO) which amounts to 1080000 Rs.If recommended parameters are maintained at technical minimum load it will decrease the chances of trappings' because of flame intensity failure.

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REFRACTORY FAILURE INVESTIGATION IN CFBC BOILER

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Abstract--- Heavy industrialization & modernization of society demands in increasing of power cause to research & develop new technology & efficient utilization of existing power units. Variety of sources are available for power generation such as conventional sources like thermal, hydro, nuclear and renewable sources like wind, tidal, biomass, geothermal & solar. Out of these most common & economical way for producing the power, is by thermal power stations. Various industrial boilers plays an important role to complete the power generation cycle such as CFBC (Circulating Fluidized Bed Combustion), FBC (Fluidized Bed Combustion), AFBC (Atmospheric Fluidized Bed Combustion Boiler), CO Boiler, RG & WHR Boiler (Waster heat recovery Boiler).
This paper is intended to comprehensively give an account of knowledge related to refractory & its failure in CFBC boiler with due effect of flue gas flow during operation on refractory by using latest technology of CAD (Computer aided Design) & CAE (Computer aided Engineering). By conceptual application of these technology the full scale model is able to analyze in regards the flow of flue gas & bed material flow inside the CFBC boiler via CFD (Computational Fluid Dynamics) software. The results obtained are helpful to understand the flow of flue gas & particles in different areas of boiler. Results also helped to check the velocity values in particular failure area and suggest suitable refractory material to withstand under such velocity .

Keywords-- CFD Simulation, Cyclone Separator, CFBC loop, Refractory for CFBC Boiler, CFBC Boiler, Refractory failure in CFBC, CAD & CFD Technology.

INTRODUCTION

On December 16, 1921 a new chapter opened in the history of the energy and power industries. Fritz Winkler of Germany introduced gaseous products of combustion into the bottom of a crucible containing coke particles, creating the first demonstration of gasification of coal in a fluidized bed. Winkler saw the mass of particles lifted by the drag of the gas to look like a boiling liquid (Squires,1983). This experiment initiated a new process called fluidization, the art of making granular solids behave like a liquid. Though some would argue that many others observed the phenomenon of fluidized beds in the past, the credit for the invention of the bubbling fluidized bed (BFB) process, which we use for scores of processes including combustion and gasification, should go to Winkler. [6]

Heavy industrialization & modernization of society demands in increasing of power cause to research & develop new technology & efficient utilization of existing power units. Fluidized bed boilers have acquired sufficient operating experience to be called a matured technology.

LITERATURE SURVEY

The circulating fluidized bed (CFB) boiler is a member of the fluidized bed boiler family. It has gained popularity, especially in the electric power-generation market, for its several practical advantages, such as efficient operation and minimum effect on the environment. Lots of research is going on in this field to addressed different issues related to boiler operation, boiler performance, increase efficiency, and utilization of most advance tools like CFD simulation & assistance of CAD/CAE tools to addressed the combustion & flow.
Thenmozhi Ganesan, Dr. Sivakumar Lingappan [1] focused on survey on the growing energy demands in the power sector. Fluidized bed combustion (FBC) technology is continuously gaining importance due to its ability to burn different low grade coals and the absence of NO_x production.[1]
The main advantages of the fluidized bed combustion boilers are: reduced NOx, SOx due to relatively low combustion temperature, better efficiency and reduction in boiler size and design. It has the ability to burn low grade coal and it is less corrosive as the combustion temperature is less when compared to that of an utility boiler. In addition to all of these, the startup and shut down operation of FBC boilers are much easier. [1]
Nan Zhanga, Bona Lua, Wei Wanga, Jinghai Li [2] focoused on 3D CFD Simulation on Hydrodynamics of 150MW circulating fluidized bed boiler because of owing to the advantages of low emission and fuel flexibility, circulating fluidized bed (CFB) boilers for utility power generation have been increasing in the past decades in both capacity and quantity. Proper design and scale-up of a CFB boiler rely heavily on its hydrodynamic understanding. To this end, experimentation is certainly an approach, while numerical simulation is another, receiving growing interest with the rapid development of computational technologies, especially computational fluid dynamics (CFD).
Berend van Wachem, Xiao Yu and Tian-Jian Hsu [3] worked to understand the 3D Eulerian-Lagrangian Numerical Model for Sediment Transport. The motion of the sediment phase is elucidated by a Lagrangian or Discrete Element Method (DEM), implying that the individual trajectory of each particle is determined by approximating Newtons second law of motion.

Ning Yang, Wei Wang, Wei Ge, Jinghai Li[4] studied the CFD simulation to understand the two phase flow. Apart from experimental investigation, recent years have seen a rapid growth of computer simulation of gas–solid two-phase flow. Most of these simulations are based on the two-fluid approach in which gas and solid are assumed to be continuous and fully interpenetrating in each control volume, so the conservative equations of mass and momentum originally derived from single-phase flow can be extended to describe the hydrodynamics of gas–solid two-phase flow.

CFBC TECHNOLOGY

CFBC(Figure1) i.e. Circulating Fluidized Bed Combustion is the most used & economical technology adopted by the industries. Deterioration of coal quality and pollutant gases (NOx) arising out of burning coal in conventional utility boilers lead to the development of fluidized bed combustion boilers. The main advantages of the fluidized bed combustion boilers are: reduced NOx, SOx due to relatively low combustion temperature, better efficiency and reduction in boiler size and design. It has the ability to burn low grade coal and it is less corrosive as the combustion temperature is less when compared to that of an utility boiler. In addition to all of these, the start up and shut down operation of CFBC boilers are much easier. Fluidization is the process by which the solid particles are brought to a suspended state through gas or liquid. When air or gas is passed upward through the solid particles at low velocity, they remain undisturbed. As the velocity is increased, the particles reach the state of "Fluidization".[1]

A CFBC boiler may be divided into two sections: the CFB loop and the convective or back-pass section of the boiler. The CFB loop consists of the following items making up the external solid recirculation system. (Figure 2)

1. Furnace or CFB riser
2. Gas–solid separation (cyclone)
3. Solid recycle system (loop-seal)
4. External heat exchanger (optional)

The air system is very important for the CFB boiler, as it consumes the greatest amount of power. A typical utility CFB boiler would use three types of fan/blowers:

1. Primary air fan
2. Secondary air fan
3. Loop-seal air fan or blower

The primary air fan delivers air at high pressure (10 to 20 kPa). This air is preheated in the air preheater of the boiler and then enters the furnace through the air distributor grate at the bottom of the furnace.

The secondary air fan delivers air, also preheated in the air preheater, at a relatively low pressure (5 to 15 kPa). It is then injected into the bed through a series of ports located around the periphery of the furnace and at a height above the lower tapered section of the bed. In some boilers, the secondary air provides air to the start-up burner as well as to the tertiary air at a still higher level, if needed. The secondary air fan may also provide air to the fuel feeder to facilitate the smooth flow of fuel into the furnace.

Loop-seal blowers deliver the smallest quantity of air but at the highest pressure. This air directly enters the loop-seals through air distribution grids. Unlike primary and secondary air, the loop-seal air is not heated. [6]

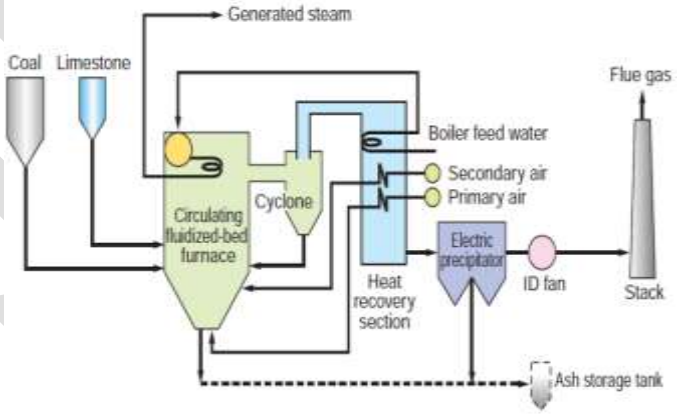

Figure 1.CFBC Boiler General Arrangement

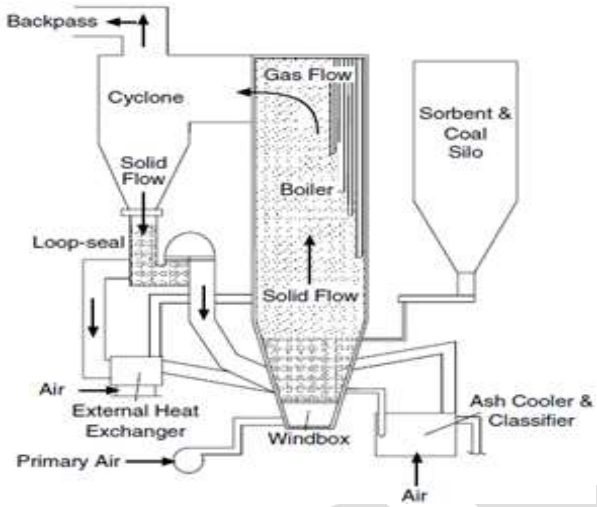

Figure 2.CFBC Boiler Component

REFRACTORY

Refractories are heat-resistant materials that constitute the linings for high-temperature furnaces and reactors and other processing units. In addition to being resistant to thermal stress and other physical phenomena induced by heat, refractories must also withstand physical wear and corrosion by chemical agents. Refractories are more heat resistant than metals and are required for heating applications above 1000°F (538°C).

The term refractory refers to a substance that is hard to fuse, while insulation refers to a substance with a high thermal resistance. Both are used as inner linings of gasifiers, furnaces, combustors, or hot ducts. These two play a critical role in modern FBC because they protect the internals from hot abrasive particles and gases moving at high velocities. The reliability of the refractory and insulation linings is dependent upon the successful combination of materials, proper design, and installation of the refractory. [6]

Importance of refractory

The inner lining of a furnace or hot duct serves two purposes: protection against erosion and protection against high temperatures. Refractory serves the first purpose and insulation serves the second.

- Erosion Resistance

Erosion resistance is a critical criterion for refractory selection. Potential for severe erosion in the cyclones and transfer lines requires that special erosion-resistant materials be used in these areas. ASTM test C-704 is a commonly-used procedure for evaluating the relative erosion resistance of refractory materials.

- Insulating Surfaces

Another important feature of the lining is to insulate against heat loss in areas where heat cannot be transferred to the water wall tubes. [6]

Properties of refractory

Principal qualities required in a refractory material are (BEI, 1992a, 1992b):

- Resistance to the temperatures to which it is likely to be exposed
- Resistance to any stress likely to be imposed by adjacent material
- Resistance to any vibrations and mechanical blows that may occur
- Resistance to the slagging action of the fuel
- Uniform expansion and contraction properties
- Resistance to environmental attack associated with oxidizing or reducing conditions

Important physical properties of the materials selected for the lining include erosion resistance, thermal conductivity, volume stability, and thermal expansion/shrinkage.

PROBLEM IDENTIFICATION

Fluidized bed boilers have acquired sufficient operating experience to be called a matured technology. Innovative modifications of different components of the boilers largely addressed the problems affecting materials and performance. Still, some problems remain, forcing occasional shutdowns. Most forced outages or shutdowns of a boiler are related to materials, operation, or design issues. Some

fluidized bed boilers of older design have experienced availability as low as 70% due to failures of their refractory parts or erosion of pressure and non pressure parts. Failure of a critical component results in shutdown of the entire power plant and requires immediate attention, making material issues the most immediate concern for the plant operators. Thus, a good selection of materials and the understanding of their behavior in a fluidized bed environment are critical to the operators.

Erosion resistance is a critical criterion for refractory selection. Potential for severe erosion in the cyclones and transfer lines requires that special erosion-resistant materials be used in these areas.

The most common areas of refractory erosion & failure are Cyclone, Cyclone inlet Duct & Loop Seal. The combustor roof and cyclone inlet are subjected to impact by high-velocity flue gases containing large particle clusters at high temperatures (800 to 900°C). Both gas and bed materials change direction here, and thereby cause greater impact on the wall. The thickness of the total lining varies from 300 to 400 mm. In the cyclone inlet, a dense-phase castable is used on the hot face along with one or two layers of insulating material.

The cyclone wall of a CFB boiler experiences the most severe conditions. Thermal cycling is rather common as the temperature varies between 850 and 950°C with little change in operating parameters. For this region, a dense-phase refractory along with an insulating back-up of 400 to 500 mm is used. Generally, a multilayer brick lining with a calcium silicate block next to the shell, followed by insulating firebrick and a hot face of dense, abrasion-resistant, superduty or mullite brick is used to resist the erosion of the refractory lining.(Figure 3.)[6]

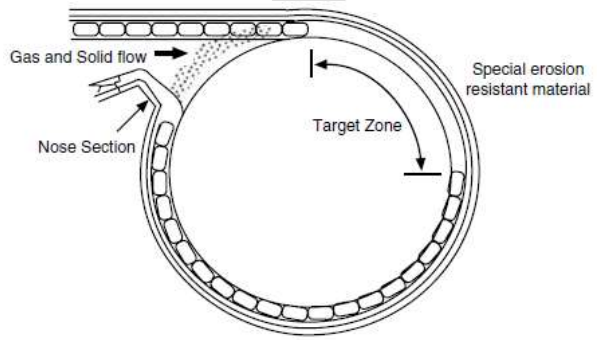

Figure 3.Cyclone Target Area

Actual photographs for the target zone, cyclone cylinder, & bottom cone shows the erosion & failure of refractory. (Figure 4 to Figure 6)

Figure 4.Photograph of Erosion in Cyclone Target Area

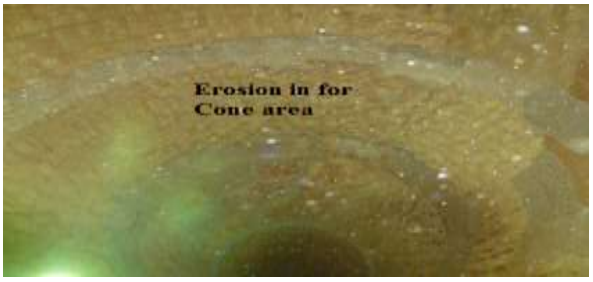

Figure 5.Photograph of Erosion for Cyclone Cone

Figure 6.Photograph of Refractory Failure in Cyclone Cone

AIM AND OBJECTIVE

Most uncertain & unplanned activity due to failure of refractory is the shutdown of boiler operation. To bring back boiler into operation is cumbersome activity. So it is always advisable to avoid the unplanned shutdowns. Aim & objective is to understand the cause of failure & serve the solution with technical aspects. This can be only achieved by using advance CAD/CAE/CFD tools available to demonstrate the actual boiler operation phenomenon virtually in to computers. Steps followed to achieve the simulation are

- Prepare individual equipments into CAD software
- Prepare the general arrangement of equipments of CFBC boiler
- To simulate the flow of flue gas inside the loop of CFBC boiler by using CFD software to understand & address the failures

A. INPUT FOR MODELING & SIMULATION

The process parameters for the CFBC operation are listed here taken as a reference from 1X120 T/H, 64 kg/cm^2 (g), 485± 5º C to conduct CFD study. The flue gas of 1.3128 Kg/Nm^{3}density flows with rate of 113350 Nm^3/hr along with maximum size of coal is 6mm. The weather condition where the operation conducted is as ambient temperature 30^0 C with 80% relative humidity. The operating data is as given in following Tables (Table 1 to 5).

Table 1: Atmospheric condition

Sr. No	*Atmospheric Conditions*		
	Description	*Design*	*Range*
1	Ambient temperature (C)	30	24 - 40
2	Relative humidity (%)	80	40 - 100
3	Elevation above MLS (m)	31	
4	Seismic zone as per IS 1894	Zone IV	
5	Max. wind velocity (m/s)	40	

Table 2: Fluidized Bed Area

Sr. No	*Operating Conditions*		
	Description	*Unit*	*Values*
1	Operating temperature	°C	850±50
2	Operating Pressure	mbar	200
3	Excess air Coeff.	-	0.49 to 1
4	Gas Velocity Max.	m/s	6.0
5	Particle Loading	Kg/nm^3	Dense fluidized bed (1000 to 1500)

Table 3: Cyclone inlet & roof

Sr. No	*Operating Conditions*		
	Description	*Unit*	*Values*
1	Operating temperature	°C	850±50
2	Operating Pressure	mbar	0 to 100
3	Excess air Coeff.	-	0.73 to 1.2
4	Gas Velocity Max.	m/s	7.0
5	Particle Loading	Kg/nm^3	20

Table 4: Ducting System

Sr. No	*Operating Conditions*		
	Description	*Unit*	*Values*
1	Operating temperature	°C	900±50
2	Operating Pressure	mbar	-10 to 20
3	Excess air Coeff.	-	1.2
4	Gas Velocity Max.	m/s	28
5	Particle Loading	Kg/nm^3	15

Table 5: Cyclone

Sr. No	*Operating Conditions*		
	Description	*Unit*	*Values*
1	Operating temperature	°C	950±50
2	Operating Pressure	mbar	-25 to +40
3	Excess air Coeff.	-	1.2
4	Gas Velocity Max.	m/s	6.0 - 28
5	Particle Loading	Kg/nm^3	1 - 15

With above input along with the dimensional inputs 3D models were prepared into CAD system (Figure 7). In later stage this model is used for meshing purpose. The method used for the meshing is the block structure meshing in ICEM CFD software (Figure 8 & Figure 9). Various meshing techniques are available so depending upon the complexity of equipment the meshing method needs to be change. While simple ducts can be modelled using a single block, majority of the geometries encountered in real life have to be modelled using multi-block strategies if at all it is possible.

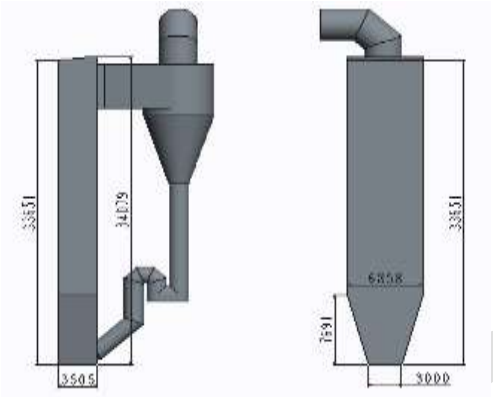

Figure 7. 3D model with actual dimensions

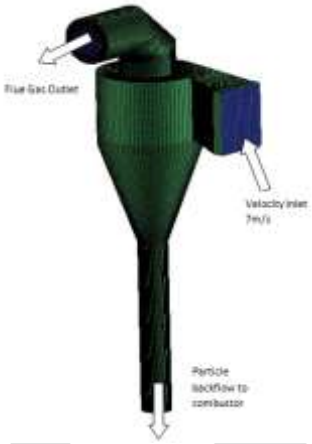

Figure 8. Meshed model with O-Grid Method

No. of Nodes - 715023
No. of Elements - 697832

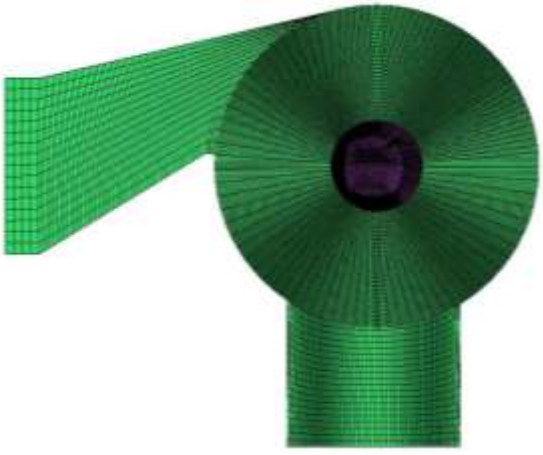

Figure 9. Meshed model-View from top

CFD SIMULATION

Ron Zevenhoven, Mika Järvinen studied the versatility and power of commercial CFD software codes that are readily available on the open market has resulted in their widespread and straightforward use in industrial equipment design. R&D institutes and academia, however, typically operate outside the range of possibilities offered by these products and are often involved in improving or developing certain sub-models. This certainly holds for CFB reactors involving a complex situation of multi-phase flow and chemistry. For CFB combustion or gasification reactors homogeneous (gas phase) as well as heterogeneous (gas/solid) turbulence/chemistry interactions must be considered. Aiming at CFD-based modelling of CFB reactors a round-robin was made over several commercial CFD codes considering their use in multi-phase flow system calculations.[5]

Based on various research papers available on the CFD study for reactor & processing equipments & available help manuals from ANSYS, Menter SST K-Omega model is selected to ensure resolving the flow gradients that are expected in the Cyclone Separator. The shear-stress transport (SST) k-ω model was developed by Menter to effectively blend the robust and accurate formulation of the k-ω model in the near-wall region with the free-stream independence of the k-ε model in the far field. To achieve this, the k-ε model is converted into a k-ω formulation. The SST k-ω model is similar to the standard k-ω model, but includes the following refinements:

- The standard k-ω model and the transformed k-ε model are both multiplied by a blending function and both models are added together. The blending function is designed to be one in the near-wall region, which activates the standard k-ω model, and zero away from the surface, which activates the transformed k-ε model.
- The SST model incorporates a damped cross-diffusion derivative term in the ω equation.
- The definition of the turbulent viscosity is modified to account for the transport of the turbulent shear stress.
- The modeling constants are different.

These features make the SST k-ω model more accurate and reliable for a wider class of flows (e.g., adverse pressure gradient flows, airfoils, transonic shock waves) than the standard k-ω model. Other modifications include the addition of a cross-diffusion term in the ω equation and a blending function to ensure that the model equations behave appropriately in both the near-wall and far-field zones.

Acknowledgment

The author would like to thanks to Dept. General Manager of CALDERYS INDIA REFRACTORY LTD. India, for continuous support & assistance related to the work.

RESULT & CONCLUSION

CFD simulation study has been conducted on full scale model to understand the behaviour & flow of flue gases inside the CFBC boiler equipments like cyclone, return leg & cyclone outlet duct. The model is setup & solved using ICEM CFD (ANSYS) software. The model was converged (Fig 10) & results for Velocity & Vorticity were (Fig 11 &12) obtained. The results from CFD were compared with given data from the processing equipment supplier & found within acceptable limits.

From Velocity plot it is observed that the velocity goes in Cyclone up to 30m/s for some area. Installed refractory for this area was as per the technical requirement from end user which do not commit the expected life for the boiler hence needs to be replaced. The results also help to understand the flow of flue gases in the cyclone seperator & actual target velocities which is practically difficult to get from the operating boiler. From vorticity plot (Fig 12-Section 3) it is observed that the vortex is focused in one direction which can be one prominent cause of refractory failure in cyclone cone (Fig 6).

Research is going in the direction of preparation of mathematical model for predicting wear phenomenon which may compare the results from the CFD along with the mathematical model. Results can be more furnished by applying different CFD codes to the model which helps to compare the outcomes.

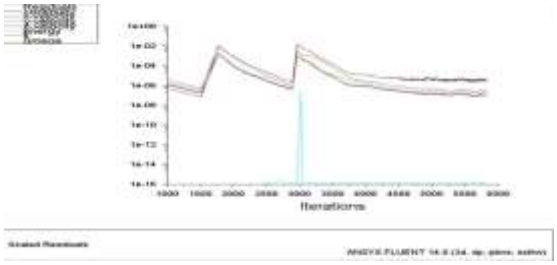

Figure 10. Convergence Graph

Figure 11. Velocity magnitude for Cyclone Separator

Figure 12. Vorticity magnitude for Cyclone Separator

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Radix-2 Non-Restoring Asynchronous divider using Shannon based 14 Transistor Full-Adder

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Abstract— This paper deals with design of non-restoring divider using Shannon based adder with pass transistor logic the proposed adder using only 14 transistors for full adder implementation it is verified and implemented on Microwind 3.1 & DSCH 2 CAD tool using BSIM 4 model. The analysis is done on the basis of power consumption, delay and area occupied and theses are compared with previous papers and we are good to enhance these parameters.

Keywords—CAS , Shannon Theorem ,Non Restoring Division,

INTRODUCTION

Now days, many small-sized multiplier (or) divider circuits are designing for efficient response in terms of power, delay, area and operational range. The high speed and reduced area size can be implemented with different logic style in VLSI design [1]. There are many types of logic designs; each has its own limitations in terms of speed, chip size (area) and power dissipation [3]. This trend must be ceased to obviate extortionate packaging and thermal management cost at system level. Eventually as more switching is done in a particular period of time; it would cause the circuit to perform much more gradual. However this quantity can be lowered if not solved by reducing the number of transistor that is being utilized. Many transistors in a circuit might be redundant and abstracting this redundancy can avail to lower the delay and hence incrementing the speed. This non-restoring divider circuit is designed utilizing by controlled add/subtract (CAS) cells techniques. This CAS cell is designed by gathering of full adder and 2 input XOR. The Shannon theorem predicated adder circuit can be reduced the number of transistor utilizing by redundancy reduction method.

The Shannon theorem adder circuit used only the NMOS, which would increase the switching speed .The proposed circuit factors analyzed by BSIM4 analyzer. We have compared our results with other adder cell predicated divider circuits in terms of better speed, area and power dissipation.

RADIX-2 NON-RESTORING DIVISION

Division is the most involutes and arduous operation in the computer arithmetic. But the division algorithm is divided into two fundamental approach first one is multiplication and another is subjective approach. The multiplication approach is involutes as compared to subjective approach. Our focus is on subtractive approach to get quotient and remnant we subtract the divisor from partial remnant recursively to find the quotient and remnant.

Suppose that there are two n-digit numbers, X and D, which represent the dividend and divisor respectively. By the division operation we can find a n-digit quotient and a n-digit remainder denoted as Q and R respectively. The mathematical representations of X, D, Q, and R are as following (Koren, 1993),

$$R^{(j+1)} = r \times R^{(j)} - q_{j+1} \times D \qquad (1)$$

Where j = 0, 1, 2, …, n-1 is the iteration number.

R_j is the partial remainder at iteration j.

r is the radix number.

q_{j+1} is the j+1th digit of the quotient.

The final quotient is represented as

Q=$q_1, q_2, q_3 - - - - q_n$

Due to the complexity and the hardware cost, we use radix-2, i.e., r=2, for our design. Therefore, equation (1) can be rewritten and represented in equation (2)

$$R^{(j+1)} = 2 \times R^{(j)} - q_{j+1} \times D \qquad (2)$$

In the hardware design we have to check the subtraction at each step to decide the quotient in that digit. There are two ways to find the quotient of the current digit. One is the recuperating method, and the other is the non-renovating method. Without loss of generality let us discuss the two methods in the radix-2 number system. In the renovating approach, when the current partial remnant,$R^{(j+1)}$ is positive, the current quotient bit is equal to 1.

On the other hand, if the current partial remnant is less than 0, then the current quotient bit is set to 0, and then the partial remnant should be integrated with the divisor and instaurate back to the antecedent partial remnant, R^((j)), and it is soi-disant the "restoring" method. In the non-recuperating method, if the current partial remnant, R^((j+1)), is positive, the current quotient bit is equipollent to 1. On the other hand, if the current partial remnant is less than 0, then the current quotient bit is set to -1, and at the next step we have to integrate the divisor to the current partial remnant, R^((j+1)), to compose the next partial remnant, R^((j+2)).The quotient map is shown in Fig. 1. By this method, there is no desideratum to integrate divisor to renovate the antecedent partial remnant. However, the quotient in the non-renovating scheme is represented in the signed bit (digit) format. Therefore, after we culminate the division process, the non-recuperating method needs a supplemental step to convert the signed bit format to the binary number representation. Since we do not require to check the polarity of the partial remnant to do the renovating of the partial remnant. Therefore, the speed of the non-renovating division algorithm is more expeditious than the speed of the renovating division algorithm.

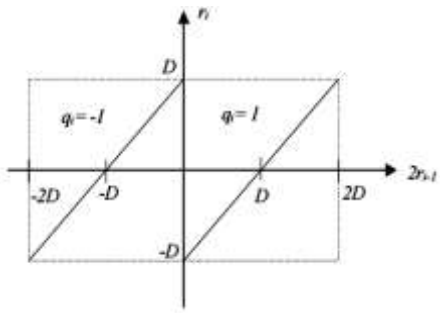

Fig 1. The Quotient map of Non restoring division

In the radix-2 division, dividend and divisor are usually represented in the normalized format. A normalized binary number can be represented in the following format.

A=$(0.1a_1a_2a_3a_4a_5 \ldots\ldots a_n)$

By the non-renovating division approach, we find the -1 of the quotient bit can be simply set to 0, and the quotient is the genuine quotient that we opted to find. We utilize a simple example to describe the normalized radix-2 non-recuperating division algorithm.

Suppose that we have two numbers, 011011111 and 01001, where the decimal points are abbreviated and the first bits of the dividend and divisor represent the denotement bits. The division is executing as the following procedures.

Example:

011010000 / 01001 => Q = 010111 &R = 0001

011010000		
-) 01001	(+10111)	
001000000		$q_1 = 1$
-) 01001	(+10111)	
11111000		$q_2 = 0$
+) 01001		
0011100		$q_3 = 1$
-) 01001	(+10111)	
001010		$q_4 = 1$
-) 01001	(+10111)	
R = 0001 <= 00001		q_5

=1 => Q = 010111

That signifies in the radix-2 non-recuperating division approach; we do not require to convert the signed digit quotient to the binary representation and the calculated quotient is the number that we opted in the hardware design. For the benefit of the speed and hardware cost, we utilize radix-2 non-recuperating division algorithm to build our divider. Pass transistor logic:

In electronics, pass transistor logic (PTL) describes several logic families utilized in the design of integrated circuits. It reduces the count of transistors used to make different logic gates, by eliminating redundant transistors. Transistors are utilized as switches to pass logic levels between nodes of a circuit, in lieu of as switches connected directly to supply voltages. This reduces the number of active contrivances, but has the disadvantage that the difference of the voltage between high and low logic levels decreases at each stage. Each transistor in series is less saturated at its output than at its input. If several contrivances are chained in series in a logic path, a conventionally constructed gate may be required to unsaturated the signal voltage to the full value. By contrast, conventional CMOS logic switches transistors so the output connects to one of the potency supply rails, so logic voltage levels in a sequential chain do not decrement. Since there is less isolation between input signals and outputs, designers must take care to assess the effects of unintentional paths within the circuit. For felicitous operation, design rules restrict the arrangement of circuits, so that sneak paths, charge sharing, and slow switching can be eschewed. Simulation of circuits may be required to ascertain adequate performance.

In digital circuits, an adder–subtractor is a circuit that is capable of integrating or subtracting numbers (in particular, binary). Below is a circuit fig 2 that does integrating or subtracting depending on a control signal. It is additionally possible to construct a circuit that performs both integration and subtraction concurrently.

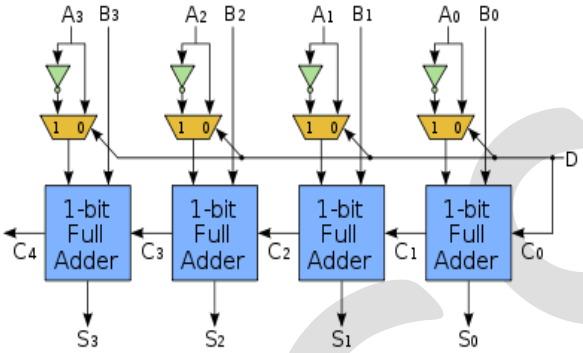

Fig 2. CAS cell using full adder and XOR gate

That has control input D and the initial carry connect is also connected to D then:

- When D=0 the modified adder performs addition
- When D=1 the modified adder performs subtraction

Having an *n*-bit adder for A and B, then S=A+B. Then, assume the numbers are in one's complement. Then to perform A-B, one's complement theory says to invert each bit with a NOT gate. This yields S=A+B'+1, which is easy to do with a slightly modified adder.

SHANNON THEOREM

According to this theorem any logic expression is divided into two terms. One with a particular variable set to 1and multiplying it by a variable and then set the variable to 0 and multiplying it by the inverse. The fullest reduction can be obtained by continuously repeating the Shannon theorem.

This method is useful especially to multiplier and pass transistor circuit design. The Shannon's theorem in a generalized way can be stated as a function of many variables, f (b0, b1, b2, y, bi, y, bn) can be written as the sum of two terms, say one with a particular variable ai , set to 0, and one with it set to 1.

f (b0, b1, b2, ..., bi,.....y, bn) = bi'f (b0, b1, b2, ..., 0,.....y, bn) + bi f (b0, b1, b2, ..., 1,.....y, bn)
(3)

Shannon's theorem is applied to the logical function using n-1 variables as control inputs and three data lines set to a logical '1'. These source inputs are then connected to the VDD lines (logical '0'), which are connected to the ground. The remaining nth variable is connected from the data input to the source input. The data signals flow horizontally and the

control signals flows vertically. Remove pairs of transistors when they cancel each other. The Shannon expression output depends upon the pass logic '1' or logic '0'. If it has logic'0' then the connection input is given by 0 and by '1' for the connection input '1'[5].

Using Shannon expansion theorem we get, sum=$(AxorB)\bar{C} + (\overline{AxorB})$C (4) and

carry=$(\overline{AxorB})B + (A\ xor\ B)C$ (5)

Below fig.3 shows the controlled full adder/subtractor design with Shannon based using pass transistor logic. Fig 4 shows CAS cell implementation.

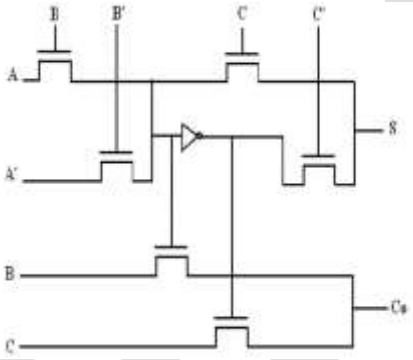

Fig 3. Full adder implementation using pass transistor logic using 14-T

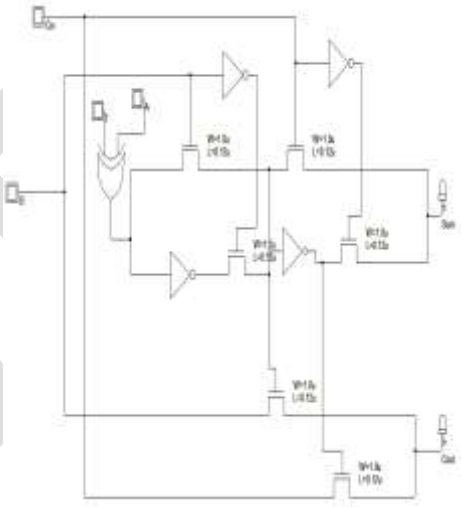

Fig 4. CAS cell using Shannon 14-T model

NON-RESTORING DIVIDER

The proposed divider is designed for 7bit dividend and 4bit divisor with MSB assigned to zero as a sign bit .Proposed divider designed by using controlled add/subtract (CAS) cell as a main structure. The CAS cell is designed by utilizing XOR gate and full adder and figure 3 shows the modified full adder by pass transistor logic. Figure 4 shows the CAS cell introducing xor gate with full adder. The CAS cell have A, as A as dividend, B as divisor ,Cin as carry, and T as control bit .The A, B and Cin are inputs of the full adder circuit [4]. Division is done row by row, on each row; the reminder of

the operation will be fed into the cells in following row below. These reminders will become the inputs to full adders for bottom rows. Computation is carried out until it reaches the last rows, where the final reminder value can be calculated and the output for it is given out. For the quotient calculation, it is taken from the first till fourth columns of final cell. These cells are responsible to give out the correct quotient [5]. When quotient is 1, subtraction is done by integrating the complement of the divisor to next cell together with carry from the lower paramount-bit position. Since the initial subtraction must always be carried out, Q = 1. It is verbally expressed to be non-restoring for the reason that it has realized the CAS mentioned above. For an n x n array divider [6],[2]. Schematic design of Divider with DSCH 2 Tool is shown in figure 5 .Here the dividend(7bit) and divisor(4 bit) are not fixed excluding the sign bit; it may be in any combination of bit .

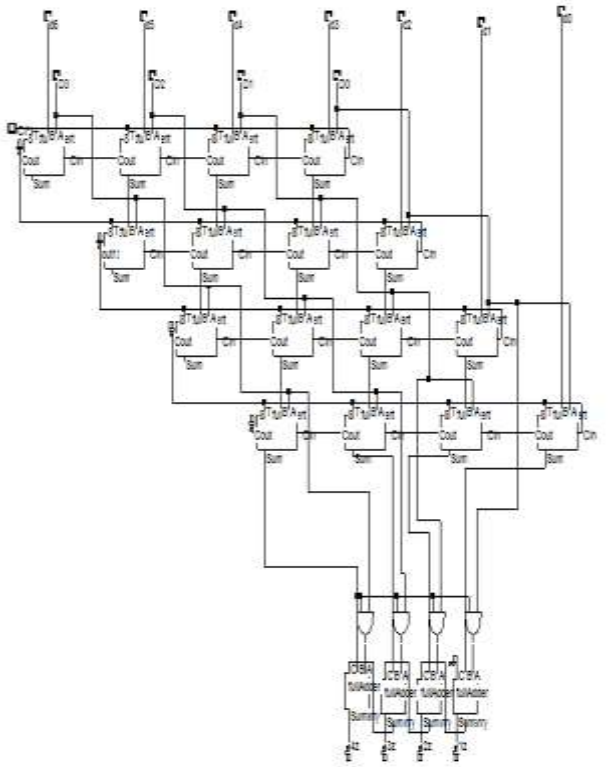

Fig 5. Radix-2 Non-Restoring Asynchronous divider using Shannon based 14 transistor full-Adder

RESULTS AND DISCUSSION

The simulation of the proposed divider circuit is carried out using Microwind tool and DSCH tool with different bit configuration, as shown in fig. 6 to fig.9.The proposed Shannon adder circuits are designed using Microwind and DSCH VLSI CAD Tools. Here MCIT Adder, basic Shannon adder, CPL, CMOS based adder are used for comparison with our proposed modified Shannon adder circuit. The basic reason of designing this is to make an efficient adder that gives us a better performing divider when it is implemented into the cells. Our proposed Shannon adder and divider are implemented on 45nm and 65nm voltage supply is respectively 0.4V and 0.7V.

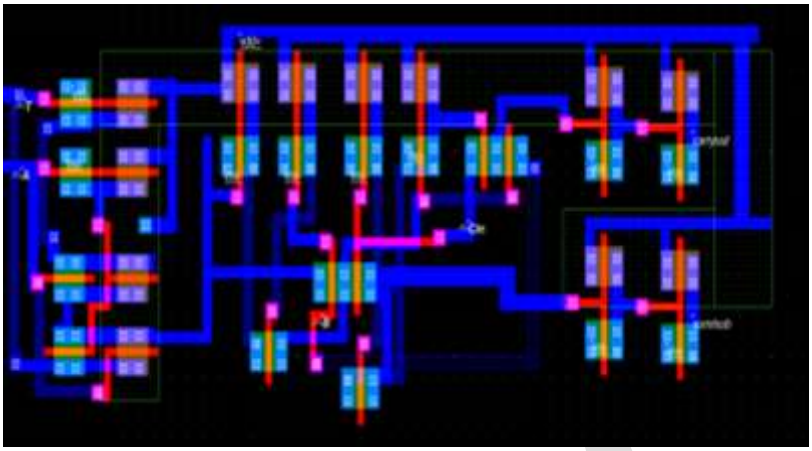

Fig.6 1-bit CAS Layout using Pass-transistor Logic in Microwind

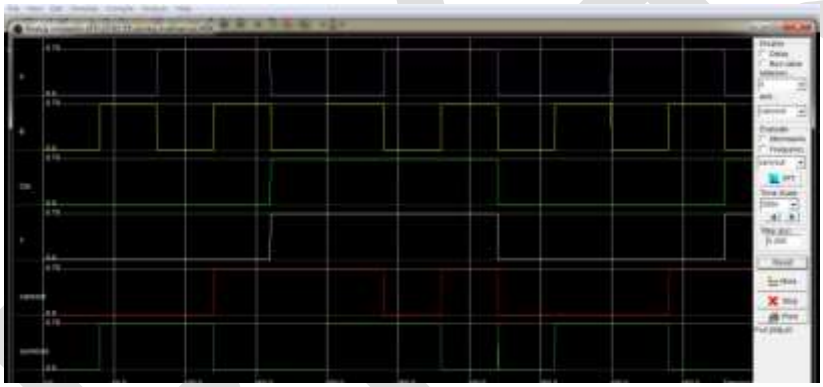

Fig.7 1-bit CAS Layout simulation using Pass-transistor Logic in Microwind

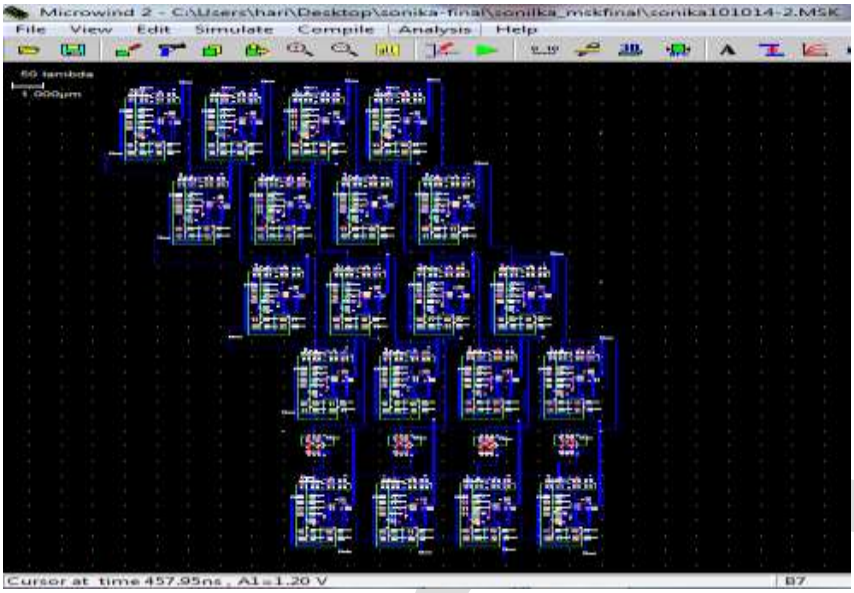

Fig 8 7÷4 bit Non-resorting divider Layout using Pass-transistor Logic in Microwind

Fig 9 7bit ÷ 4 bit Non-resorting divider Layout simulation using Pass-transistor Logic in Microwind

Our proposed Shannon adder cell based divider and other adder based dividers are checked validate for dividend varied from 0111111-0000000 and divider from 0111-0000. For the analysis of various parameters such as area, propagation delay, dissipated power, are calculated and given below in table II, III. Comparison of our proposed design with previous papers is shown in table II at 45nm technology for full range of dividend and divisor. In TABLE III power dissipation at 65nm is calculated for only fixed dividend 0111111 and variable divisor from 0000-0111 because of the proper comparison.[2]

TABLE 1 Comparison of proposed Shannon Based Full Adder

		45nm			65nm		
Adder Type on 65nm (0.7V)	No of Transistors	Power µW	Delay (ps)	Area (µm²)	Power µW	Delay (ps)	Area (µm²)
PROPOSED	14	0.036	2	8	0.208	3	18
MCIT ADDER [1]	16	0.042	2	15*7	0.371	4	220
SHANNON BASED [2]	18	0.19	10	120	0.28	12	224
CPL [1]	18	0.817	14	43*8	2.247	23	190
CMOS [1]	28	1.49	654	25*7	3.76	854	530
CMOS 10T [2]	10	18	19	180	25	26	348

TABLE II Comparison of Proposed Divider Circuit at 45nm (0.4V)

Type of Adder used	Power (mW)	Delay (ps)	Area (µm²)
PROPOSED	0.0047	40	36*12
MCIT ADDER [1]	0.617	260	1512x76
Mixed Shannon [1]	1.231	295	1562*89
CPL [1]	1.977	2264	1818x105
CMOS [1]	2.793	522	1858x141

TABLE III Comparison of Proposed Divider Circuit at 65nm (0.7V)

Type of Adder used	Power µW	Delay (ps)	Area (µm²)
PROPOSED	0.98	44	51*17
Shannon Based Adder [2]	1.1	50	NA
CMOS [2]	5.472	1460	NA

CONCLUSION

The proposed adder circuit is designed by utilizing modified Shannon theorem and this adder implemented into the design of proposed divider. Predicated divider circuit gives more preponderant performance than subsisting author's design if compared its delay and area efficiency. Furthermore, the divider circuit is utilizing less number of transistors than other divider circuits due to the utilization of Shannon predicated adder design approach. The customary arrangement transistors tree structure is reducing critical path in the circuit, which yields lower area, and less propagation delay, lower power dissipation. The proposed adder predicated divider circuit may utilized in Digital Signal Processing circuits, like DFT ,FFT etc ,due to the lower area, and less propagation delay ,lower power dissipation.

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Uses of Educational Enterprise Resource planning

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Abstract- The present study focused on ERP that is software using for information system and it also manage the resources of business and education .In this paper, I emphasize to explain the educational ERP with its objectives and modules .Generally all the educational institution availing its benefit .in present scenario the quick and secure documentation is must with lessening hours. It enabled us with biometric attendance, transparency in business, cemented the customer-owner relationship .It also facilitate the proper channel of communication to **Teacher-Parent-Child** .In accounting and auditing the help of ERP is marvelous .Not only in business and education it has other perspectives too. The educational ERP gives benefits to faculty, students, parents and management at certain levels .ERP modules in managing timetable, transportation, library and attendance proved the importance or significance of ERP in this technical era.

Keywords: ERP**,** Objectives, Modules, Biometric Attendance, Comm. Channel , information System ,Management.

Introduction

Enterprise Resource Planning is an information system or a solution to manage ,plan all the functions or resources of business efficiently .Most frequently the term ERP used as an ERP software ,an application of information technology to integrate the whole organization into a single system .ERP system is based on real time and client-server architecture .The ERP architecture is three tier architecture ,allowing multiple users to work simultaneously from multiple locations on a single database , where an application server provides data for clients at an interface between client and database server .It deals with centralized database to create a distributed environment , bridges the information gap across the organization.

Definition

"Computer- based systems design to process an organization's transactions and facilitate integrated and real-time planning, productions, and customer response**-(" O' Leary 2000)**

"ERP systems are configurable information systems packages that integrated information and information based processes within and across functional areas in an organization**- ("kumar and VanHillsgersberg.2000")**

Objectives of ERP

1. The ERP system simplifies the flow of data between different partners and stake holders in an institute and makes it accessible.
2. ERP system helps in minimizing the man power.
3. Reduces the paper invoices or manual work and create an automotive, accurate and consistence environment.
4. This can shorten the time to complete the process and make a fast feedback a process.
5. Provides a real time, faster or effective operations, consequently improve decision making speed.
6. Provides transparency between owner and customer.
7. ERP Solution reduces the cost and increase the productivity.

Educational ERP

Introduction: ERP (Enterprise resource planning) is widely adoptable technology by the organizations. The success of ERP systems depends on various factors since it embraces all business operations of an organizations, This system was not only meant

for manufacturing organizations ,now it is adopted by all type of organizations and higher education and universities are one of them.

Educational ERP is a concept or an information technology solution that integrates and automates all the academic and non-academic services/resources of the institute .Typical academic services may include registration ,admission ,recruitment ,students records etc .Non-academic or administrative functions include accounting ,payroll ,HR ,billing etc.ERP helps to track all the students records like admission ,performance ,their usage of library to hostels .With the help of centralized database all the data reflected to all the concerned departments on a touch of a button and within a fraction of seconds.

Features

1. School ERP makes it easy for quick and correct allocation or maintenance of information.
2. Demand of internal and external data in large volume.
3. Easy Maintenance of student's data and tracking students' progress helps making faster and effective decisions.
4. Monitor the regular operations which take a lot of time.
5. Shrinks the gap between parents, teachers and children.
6. Negligible paper work and build a digital campus, numerous transactions take place online, significantly saves time and resources.

Benefits

1. Faculty: Faculty/Staff members can make a better use of ERP software by managing the records of attendance, exams/test, marks etc. and greater focus on teaching and less on time consuming administrative functions. Staff members can also manage and check the time table, student's assignments, leaves and other HR activities. They can also make a efficient collaboration with students and parents.

2. Students: ERP software acts like a virtual platform for students. Students can get all the information regarding college activities and exams right through the software .They can upload their assignments and check their attendance, test records etc. They can also participate in online exams and projects .This software can also be used to access digital library and online notice board.

3.Parents: It has never been easier to handle the regular activities of their children .With the help of ERP software, they can be in touch of the teachers, anywhere, anytime on the internet .It plays a vital role in strengthen the relationship among them. Teachers can address each individual parent regarding to their children. They can look out for exams report, daily schedule, holidays, meetings, fee status etc. They would get informed about every activity via sms or online website.

4. Management: ERP helps in increasing the accuracy and consistency of the administrative work. It minimizes the paper work and create an automated environment .It allows the centralized reporting across the departments, consequently save the hours and money too .It is the better way for communication and managing the information .It minimizes the redundancy ,repeated data entry and sources of wastage. It facilitates in recruiting the staff, admission, enrollments, fee status, performance, profile management .As a result, it improves the productivity, outcomes and flexibility of deployment. It is used to preserve the digital records as an asset.

Modules

There are various modules in ERP software. These systems or modules are designed to help you drive higher performance in your higher education institute.

Admission: Admission is a hectic process which can be simplified with ERP. It is a process with a large amount of data required to be managed. ERP reduces the overhead of maintaining the physical documents by scanning the documents and attached with the concerns as a soft copy .It facilitates the information of the admission process and automates the process around the applicant database .It provides information about courses available ,selection criteria ,fees and registration process ,give students greater control to reach their goals.

Transportation: This module is designed to manage the transport infrastructure of educational institutes. It ensures the maintenance and assigning the charges of buses to the drivers. This module keeps the database update like routes, students transport details, who is using the conveyance, their fees status, timings of the buses, vehicle database etc.

Time Table: The teaching staff usually spends a lot of time in timetable generation and management .ERP provides an automated timetable generation tool which depending on the availability of teacher, students, classroom, capacity, time etc, generates and manages the time table as per the defined rules and constraints .This system also allows to do manual changes.

Library: Library is an integral part of an educational infrastructure, which caters number of books .When persons need of a book, they access the library anywhere, anytime by students and faculty members. It also enables a person to search for books ,issue a book ,accessing the periodical newspaper and magazines .Accessing the book details, rules of the library science .The responsibilities of a librarian has also become simpler, since they don't need to maintain the records ,related to cataloging and circulation of books, late penalties .It can also be used for labeling ,checking for the availability ,permit to authenticated users only.

Attendance: The tedious and stressful task for any teacher ,especially manually filling the attendance register and at the end of the session ,compiling or calculations can be simplified by integrate with the biometric system .The attendance auto calculates by the software and can easily be shared across the departments and with parents .The attendance can be displayed beautifully with help of graphs for maintaining its efficiency .It keeps the track of the daily students attendance including' time-in and time-out'. You can also generate a hardcopy of that record which can be required by academic institute.

Fee Management: This module is automated fee calculation module. Through this module the fees of students will be managed with their various installments and documents, As it generates a complete summary of payable fees. With this module, daily fee collection reports can be made available to the concerned authorities' .This portal allows to students and parents to view their own fee. The fee management module also handles all type of problems included late or advanced payments, previous balances. This module also provides the information about fees to be charged from different students' depending upon their quota.

Exam management: this module can be effectively used to reduce or minimize the stressful task of manually creation of examination schedules and their related activities .These types of activities gets repeated every 3-4 times in a session .This exam management module allows you to create and maintain marks entry, automatic result generation process, OMR integration, various reports related to results available to administration, students, parents at different levels. The database also allows you to upload old question papers for the aid of students.

Enquiry management: With this architecture, services are provided to students with respect to his/her enquiry .The enquiries can be serviced from multiple locations .Under a central database, we can search and analysis the required data, changes\updating to records. With a single click on mouse, users or administration can retrieve the required information and make a effective decision.

Hostel Management: The hostel management module is designed to manage residential and mess facility .This module is used for bed/rooms allocation .It also used to keep all the records update ,daily attendance ,check-in/check-out timing. maintain details about hostel names ,floors ,warden, inventory, fee status, updating of virtual notice board for new announcements.

Inventory: The inventory module maintains all the concerning issues and transactions such as budget ,orders ,stock ,quantities ,accounts payable etc providing a powerful control in education institutes .As it tracks the owner ,assignments ,fund accounting .It is also used to create ,manage the records of supplier and their types.

SMS: The SMS module made communication process easier .This module is used to send all/selective students/parents the message they want to convey .As it is used for bulk messages for the intimation of fess overdue ,attendance ,birthday wishes ,group messages to students/parents/teachers ,other complaints to parents. Send SMS while receiving fees as an acknowledgement, alerts for pending fees and attendance.

Conclusion: The benefits and impacts provided by Educational ERP software have brought a revolutionary change in education sector. The evaluation of the benefits of it, determine the need of this highly desirable software in order to achieve the higher performance in higher educational institutes. There are various institutes which are investing in ERP's to improve the productivity , performance and it became helping hand in providing quality education which keep us up to date with least time consumption.

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EFFECT OF INTERFERENCE DUE TO WI-FI CO-EXISTENCE IN BLUETOOTH TRANSMISSION

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ABSTRACT – The advancements in the wireless networks provide realistic distant communication of different areas of the world. New generations of wireless communication will rely on intergraded networks consisting of multiple wireless technologies. Hybrid networks based, for instance, on cellular system such as Bluetooth and Wi-Fi technologies can combine their respective advantages on coverage and data rates. Both Wi-Fi and Bluetooth operate on ISM (Industrial, Scientific and Medical) unlicensed radio frequency (RF) spread spectrum from 2.4GHz to 2.4835GHz. Early Bluetooth devices interfered with 802.11b because both techniques use same channel for an extended period of time which causes interference, data lost, and eventually loss of services of both technologies. But this interference greatly effects SCO voice link which is main issue of interference due to collision. This paper presents the effect of interference due to Wi-Fi co-existence in Bluetooth transmission and how much Bluetooth transmission is effected during Wi-Fi interference. In addition, this paper presents a new Bluetooth voice packet Synchronous Connection Oriented with Repeated Transmission scheme to minimizing the interference between Bluetooth and 802.11 wireless networks. For the sake of experimental verifications, we provide a comprehensive simulation results using MATLAB Simulink.

KEY WORDS – WPAN, Bluetooth, Wi-Fi, interference, SCO etc.

1. INTRODUCTION

The proliferation of mobile computing devices such as PDA (Personal Digital Assistants), laptops are used as WPANs and the most popular application in Bluetooth or IEEE802.15, wireless personal area network (WPAN) is currently used for voice transmissions. It allows closely located devices to share data. In modern era, Radio technologies are considered by WPAN and WLAN. Both technologies operated on popular and unlicensed 2.4 GHz ISM (Industrial, Scientific and Medical) frequency band. WLAN devices operating in proximity to WPAN devices have significant impact of the interference on the performance of WPAN and vice versa. As in band adjacent WLAN networks can almost make the voice quality of a Bluetooth SCO link unacceptable to users.

As the changes occurred in wireless world, voice transmission becomes most popular like music, voice files etc. Due to the co-existence of various technologies on same frequency band, the interference increases in the performance of the system and degrades the value of SNR. But there is one point should be noted that as Bluetooth and Wi-Fi both operated on same frequency band 2.4 GHz but they adopt different operating methods. Such as Bluetooth uses FHSS (Frequency Hopping Spread Spectrum) scheme while Wi-Fi adopts DSSS (Direct Sequence Spread Spectrum) technique as shown in figure 1.

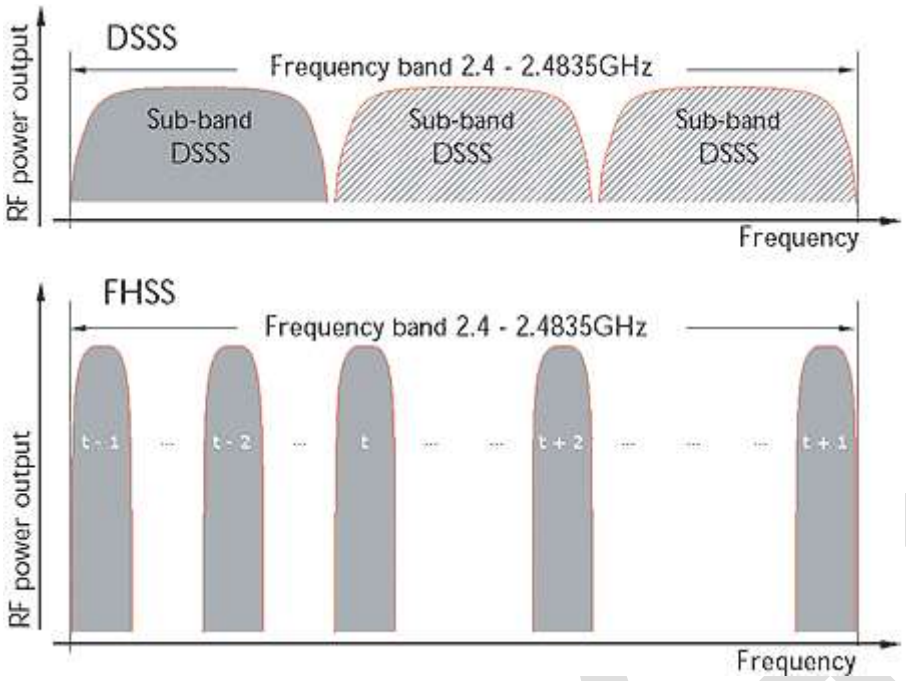

Fig:1 FHSS and DSSS operated on 2.4 GHz frequency band

As a reminder about radio transmission, a carrier frequency is modulated either in amplitude, phase and/or frequency shift (or a combination) to impress the data information onto the carrier wave. If one can transmit the data over many carrier waves in parallel, it becomes possible increase the data throughput. This hallmarks the advantage of the spread spectrum technologies. The data signals are diffused over many carriers instead of impressing the data within the sidebands of a single carrier wave. Such DSSS (Direct Signal Spread Spectrum) technologies use relatively wide bandwidths.

In contrast frequency-hopping technologies use narrower bandwidths and 'hop' (or 'jump') from one discrete frequency to another. These are the FHSS technologies (Frequency Hopping Spread Spectrum). DSSS and FHSS appeared many years ago for military applications where FHSS signals showed themselves to be more difficult to intercept or jam than DSSS ones. DSSS technologies (Direct Signal Spread Spectrum) work in 22MHz- wide bands (IEEE 802.11b).This provides three non-overlapping 22MHz channels over the band 2.400 to 2.483 GHz.
FHSS technologies (Frequency Hopping Spread Spectrum) use narrow bands (less than 1 MHz), and hop successively from one to the other at regular time intervals (...t-2, t-1, t, t+1, t+2...) in pseudo-random sequences synchronized at both ends of the link.

The transmission range of Bluetooth is 10 meters and 802.11b have 100 meters. The wider ranges of WLAN also cover up the Bluetooth range and interfere with Bluetooth transmission. If two or more WLAN devices using different channels exist in same area then the 2.4 GHz ISM band is fully occupied , making the Bluetooth FHSS system infeasible and increases BER in data output.

The main objective of this paper is to show the effect of interference on BER due to presence and absence of Wi-Fi. We also use HV1 voice packet for voice transmission using SCORT technique to reduce BER including Wi-Fi and without Wi-Fi which is purposed by IEEE working group on co-existence.

This paper differentiates into following parts: Section II presents overview of Bluetooth technology with ARQ and frame format. Section III describes the Bluetooth simulation model including Wi-Fi interfere model and without Wi-Fi. Section IV explains the purposed mechanism Synchronized Connection Oriented Repeated Transmission. Simulation results are represented in Section V and at last Section VI describes the conclusion of the purposed work.

II. OVERVIEW OF BLUETOOTH TECHNOLOGY

The Bluetooth system provides a point-to point connection (only two Bluetooth units involved), or a point-to-multipoint connection. In the point-to-multipoint connection, the channel is shared among several Bluetooth units. Two or more units sharing the same channel form a piconet.

One Bluetooth unit acts as the master of the piconet, whereas the other unit acts as slave. Bluetooth is a frequency-hopped spread-spectrum technology aimed at cable replacement and personal networking. It operates in the 2.4 GHz ISM band which may be used unlicensed in most countries. This band is divided into 79 distinct frequencies of 1 MHz bandwidth each. Bluetooth specifies two basic link types. Synchronous Connection Oriented (SCO) links (typically used for voice) are handled by reserving predetermined slots. Asynchronous Connectionless links (ACL), which are typically used for elastic data traffic, access the medium by a time division duplex scheme.

A. PACKET FORMAT

The Bluetooth packets have a fixed format as shows in figure 2. A 72-bit access code comes first in the packet that are coded with a so-called 1/3 rate FEC (forward error correction) which essentially means that every bit is transmitted three times. The access code is based on the master's identity and the master's system clock; for example, it provides the means for synchronization. These general form of the packet format of Bluetooth baseband packets which consist of a header of 126 bits and a payload section that may be 0 to 2745 bits in length.

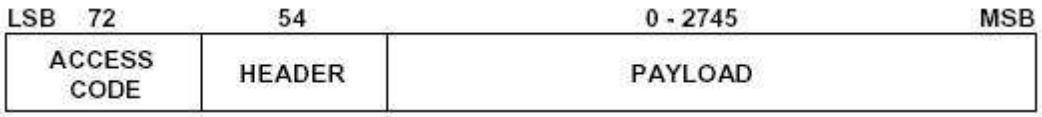

Fig: 2 Bluetooth packet format with LSB and MSB

Packets are assigned a 1 bit sequence number (SeqN) and are protected by a so-called fast automatic repeat request (FARQ), which essentially is an alternating bit protocol and explained in upcoming sub section. Positive or negative acknowledgments are piggy-backed in regular data packets (or NULL packets) in the ArqN_eld. The header_elds are protected by an 8 bit checksum.

AUTOMATIC REPEAT REQUEST

The co-existence of Bluetooth and Wi-Fi technologies is the main reason of interference due to which the packet loss and connection loss happens many times and degrade the performance of the systems and increases the BER. To complete the transmission of packets the ARQ (Automatic Repeat Request) is used. Bluetooth uni-cast packets are protected by an automatic repeat request mechanism (ARQ) on baseband level.

The so-called fast ARQ scheme retransmits each packet until it has been received and acknowledged successfully by the receiver. Packet header and payload are protected by separate checksums and thus the validity of the header may be con_rmed even if the payload of the packet has to be rejected.

If the header or the payload is corrupted, the payload will be rejected and the ArqN _eld in the packet header will be set to negative acknowledgment (NAK) in the next return packet sent by the receiver. In case the packet (header and data) is OK, its sequence number (SeqN) will be saved and the packet is accepted. The next return packet will carry a (piggy-backed) ACK. Note however that between the check for the header and the check for the payload the old sequence number is compared to the current one. Thus, if the packet has been successfully received before, the payload is ignored and an ACK is sent in the next return packet regardless of the status of the payload. Interestingly, this ACK acknowledges data received in a previous frame.

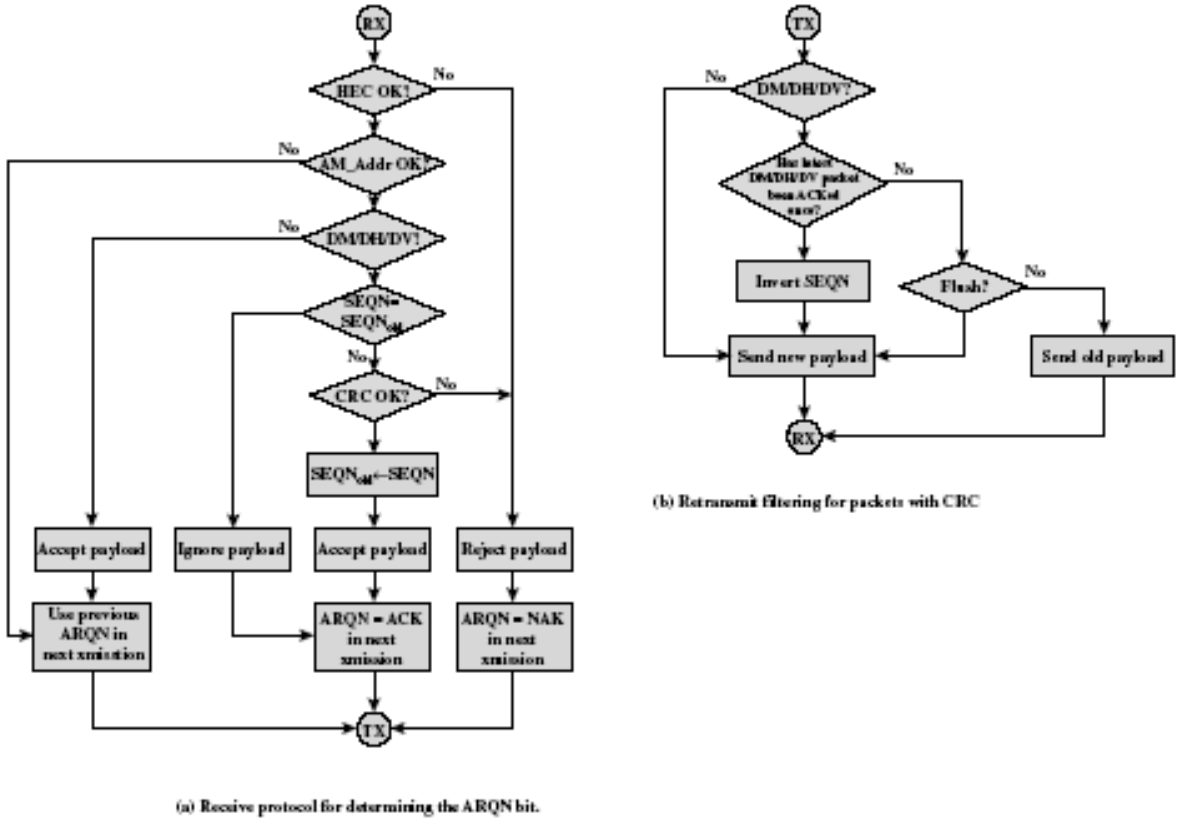

Fig: 3 Automatic Repeat Request Procedure

Furthermore, a master that sends a data packet to one of its slaves and does not receive a response in the slot following the packet just assumes a negative acknowledgment from the slave (*implicit NAK*). Slaves only send a NAK to their master in case they have data to send. If there is no data ready to send, they leave it to the implicit NAK mechanism to trigger retransmission. This feature is meant to save power and reduce interference.

C. BLUETOOTH LINK TYPES FOR COMMUNICATION

The Bluetooth specification defines two link types, Asynchronous Connectionless (ACL) and Synchronous Connection Oriented (SCO). Different master-slave pairs in the same piconet can use different link types. The link type may be changed during a session. The SCO links are primarily used for voice traffic and their data rate is 64 kbps. ACL links are used mainly for data traffic and support broadcast messages (i.e. from the master to all slaves to the piconet). Multiport packets use the ACL link type and can reach the maximum data rate of 721 kbps in one direction and 57.6 kbps in the other direction if no error correction is used.

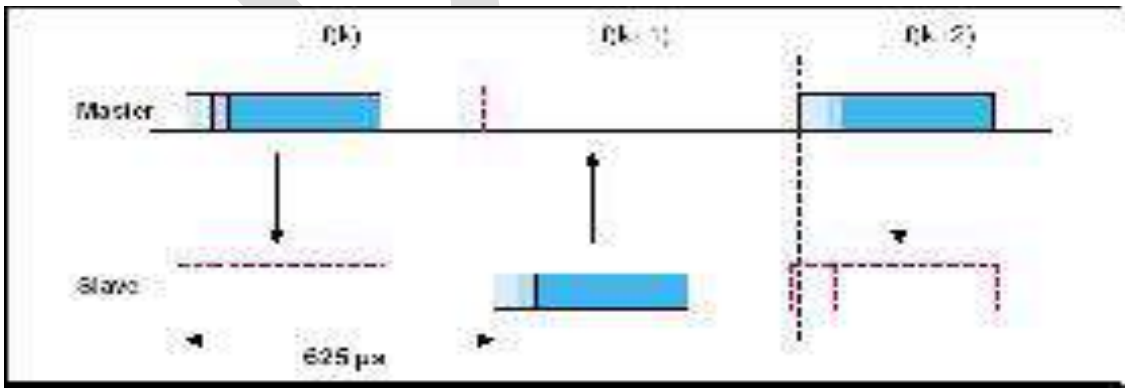

Fig: 4 Single slot packet and TDD and timing of slots

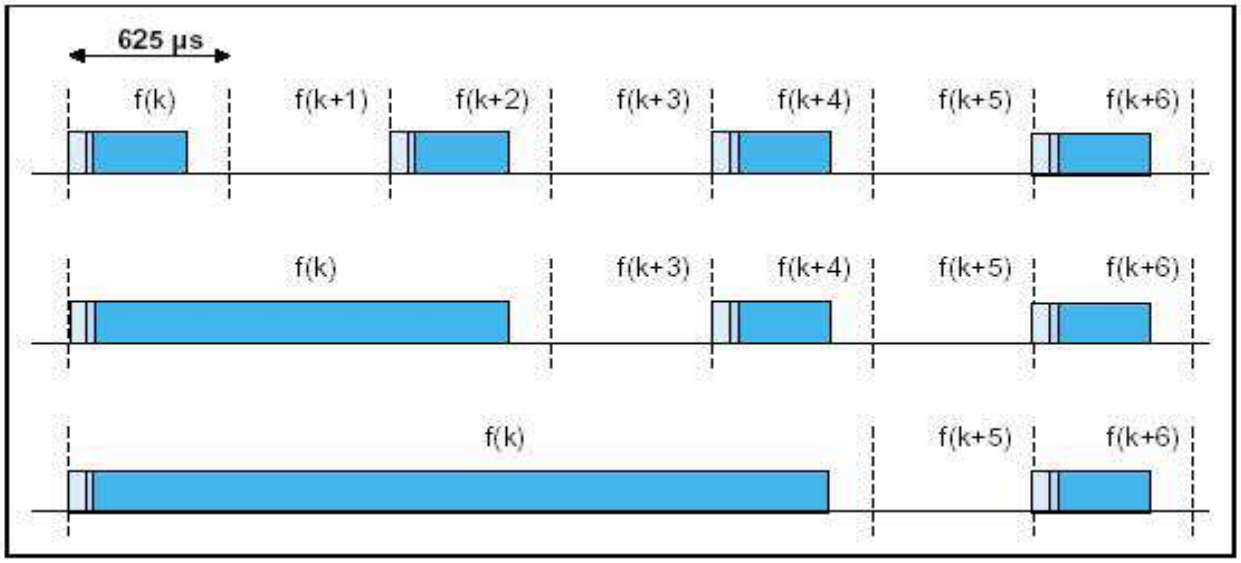

Fig: 5 Multi slot packets and TDD framing

D. PREVIOUS INTERFERENCE REDUCTION TECHNIQUES

Firstly, Frequency hopping and adaptive frequency hopping techniques are used to reduce the interference in the Bluetooth transmission for it link state state (LSH) using a counter. The counter continues count the connection state and on the bases of that the transmission of data happens.

There are two new coexistence mechanisms for Bluetooth SCO links, namely the Bluetooth SCO link Interference Mitigation (BSIM) scheme and Enhanced BSIM (E-BSIM). Both mechanisms are non-collaborative, meaning that they do not have to exchange information between two different wireless devices while the mechanism is in operation. The most famous collaborative coexistence mechanisms are alternating wireless medium access (AWMA) and packet traffic arbitration (PTA). Several other schemes, including overlap avoidance (OLA) , Bluetooth interference aware scheduling (BIAS) , Bluetooth carrier sense (BCS) and interference source oriented AFH (ISO AFH), have also been presented to reduce the impact of interference.

Moreover, many other techniques are used to minimize the interference due to co-existence of Bluetooth and Wi-Fi. But in this paper new mechanism Synchronized Connection Oriented RT is purposed. This mechanism reduces the BER (Bit Error Rate) in the received signal by passing through AWGN channel.

SECTION III BLUETOOTH SIMULATION MODEL WITHOUT WI-FI AND INCLUDING WI-FI

Figure 6 presents a Bluetooth simulation model made up in Matlab simulink. It consists of a Bluetooth transmitter, AWGN channel and a Bluetooth receiver. There is one important thing that the Wi-Fi interfere model is only used to verify the effect of interference on the Bluetooth transmissions.

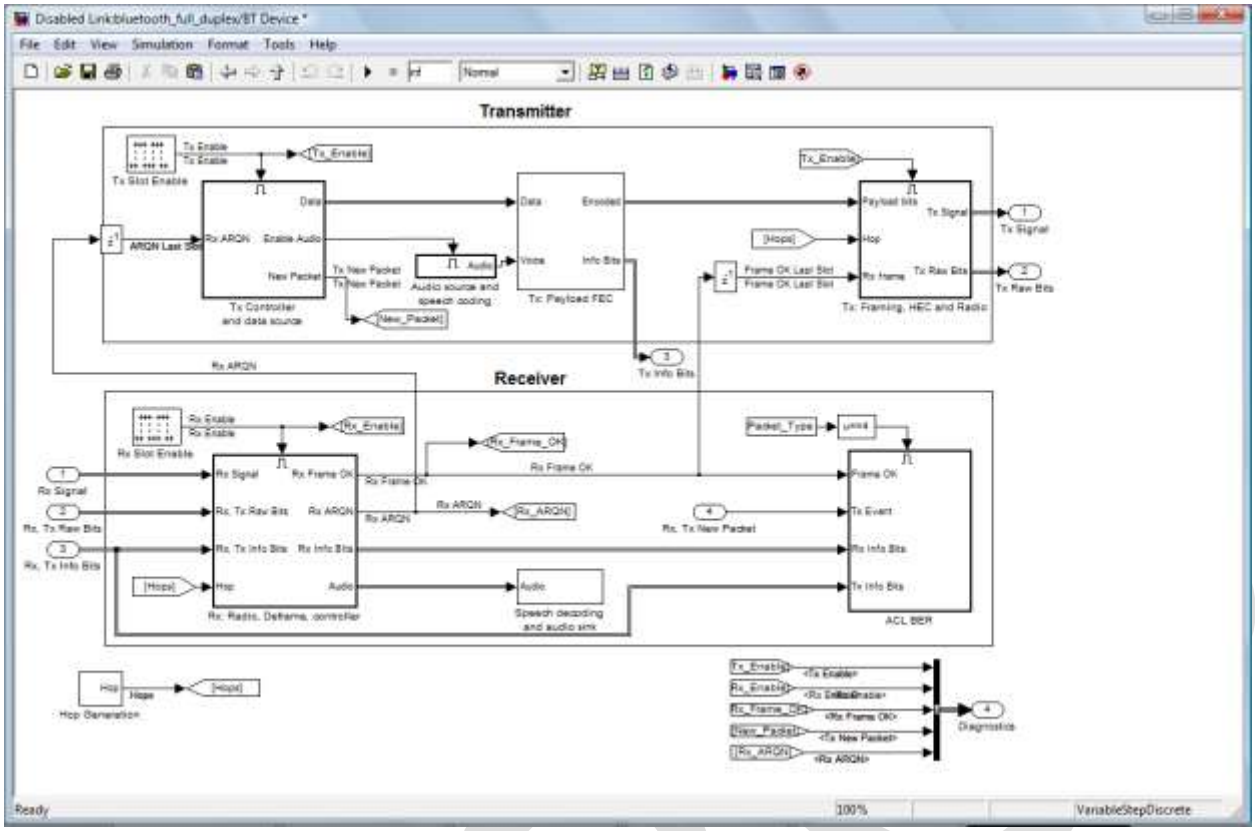

Fig: 6 Bluetooth simulation model

The various parts of Bluetooth simulation model are explained in detail following**:**

A. SIMULATION PARAMETERS

The simulation parameters which are mainly used to design the Bluetooth simulink model are given as below in table 1.

Table no.1 Simulation Parameters

S. No.	Simulation parameters	Range used in simulink model
1.	Speech signal	Input audio signal
2.	Length of speech signal	366bits
3.	Packet type	HV1,DM5
4.	Sampling time	8KHz
5.	Bluetooth clock	28 bits
6.	Bluetooth clock sampling time	(1/1600)/2
7.	FEC repetition count	3
8.	M-ary	2
9.	Integer routing mode	Floor
10.	Modulation index	0.32

B. BLUETOOTH TRANMITTER DESIGING

The Bluetooth transmitter is shown in figure 6. The transmitter block processes both the voice and data transmission. For voice transmission the HV1 packet is used for SCO link and the DM5 packet is used for data transmission for ACL link. The Bluetooth transmitter consists of transmitter controller, source, encoder, frequency hopping and GFSK modulation etc. Frequency hopping sequence generator is used to generate a frequency number from 0-79 channels. FEC repetition code is three used for HV1 packet. The security key is used for authentication process contains password or PIN number of slave to which the transmission have been done. The transmitter controller is responsible for the new packet as per it receives the acknowledgement from the receiver. If it

receives negative acknowledgement then the repeated transmission is happens and if positive acknowledgement then the new packet transmission is done. The buffering is done at the transmitter side to control the congestion in the network. Sampling of a voice signal is done at standard rate 8 KHz.

C. AWGN CHANNEL AND WI-FI INTERFER MODEL DESIGNING

The AWGN channel is used because of its importance that it contains all the colored frequencies. The free path loss of 40db is considered all the loss in the signal strength due refraction, diffraction and reflection etc. The 802.11b interfere is configured so that it can adjust in the 2.4GHz ISM band having mean packet rate, packet power and length of the transmitted signal. But only to show the internal and environmental interference without Wi-Fi transmission, the Wi-Fi interfere block does not included. This paper shows the effect and comparison between BER rate and SNR values.

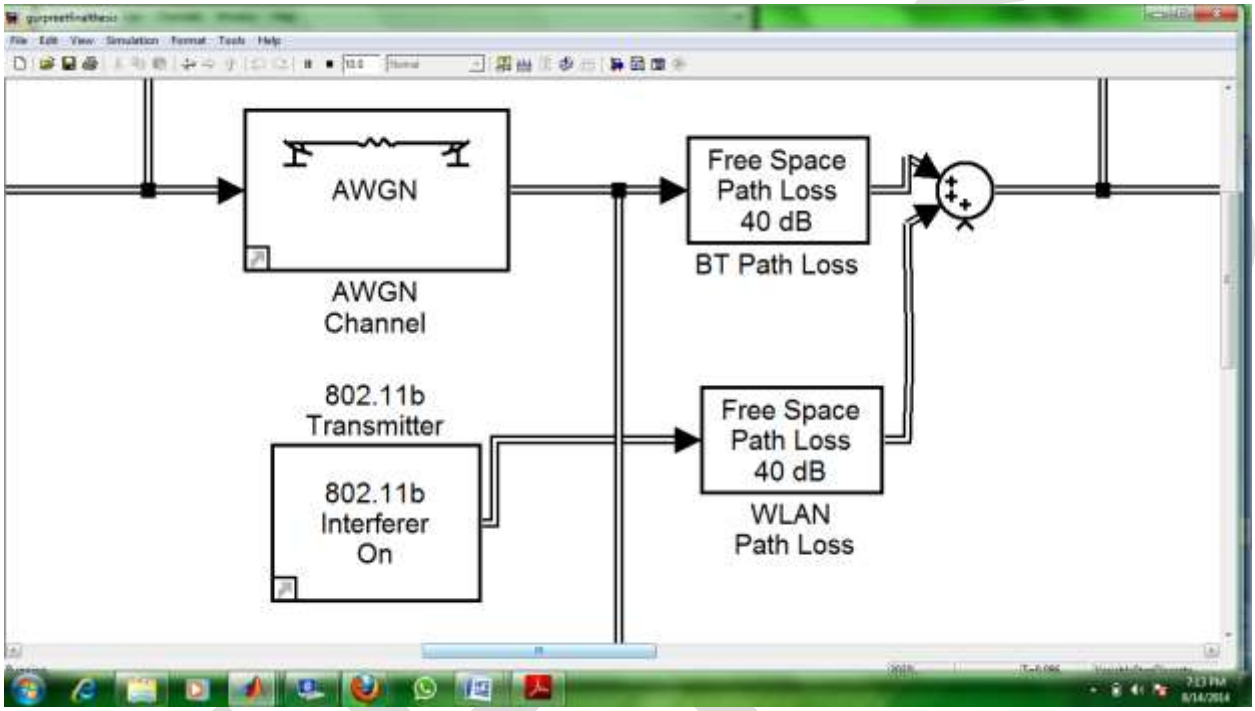

Fig: 7 AWGN channel and Wi-Fi interfere model including free path loss

D. BLUETOOTH RECEIVER DESIGNING

The Bluetooth receiver has a big responsibility for a better reception of the signal. It contains all the opposite parameters to the transmitter like decoder, down sampler, demodulation etc. There is a threshold value exists in the receiver side that evaluate that the received signal is correct or not. It also checks the HEC (Header Error Check) and CRC. If both are ok and the signal is above the threshold value then the signal is assumed to be correct and accepted and a positive acknowledgement is transmitter for new packet transmission. But if both are not ok and the signal value is less than threshold value the signal is rejected and negative acknowledgement is transmitted to transmitter and requested to the repeated transmission.

SECTION IV THE PERPOSED MECHANISM FOR CO-EXISTENCE INTERFERENCE

The Synchronized Connection Oriented Repeated Transmission algorithm is given by the co-existence working group. The synchronous connection-oriented with Repeated Transmission packet achieves more robust transmission by replacing bit-level redundancy with packet-level redundancy. The state flow diagram of Synchronized Connection Oriented Repeated Transmission is presented in Figure 8.

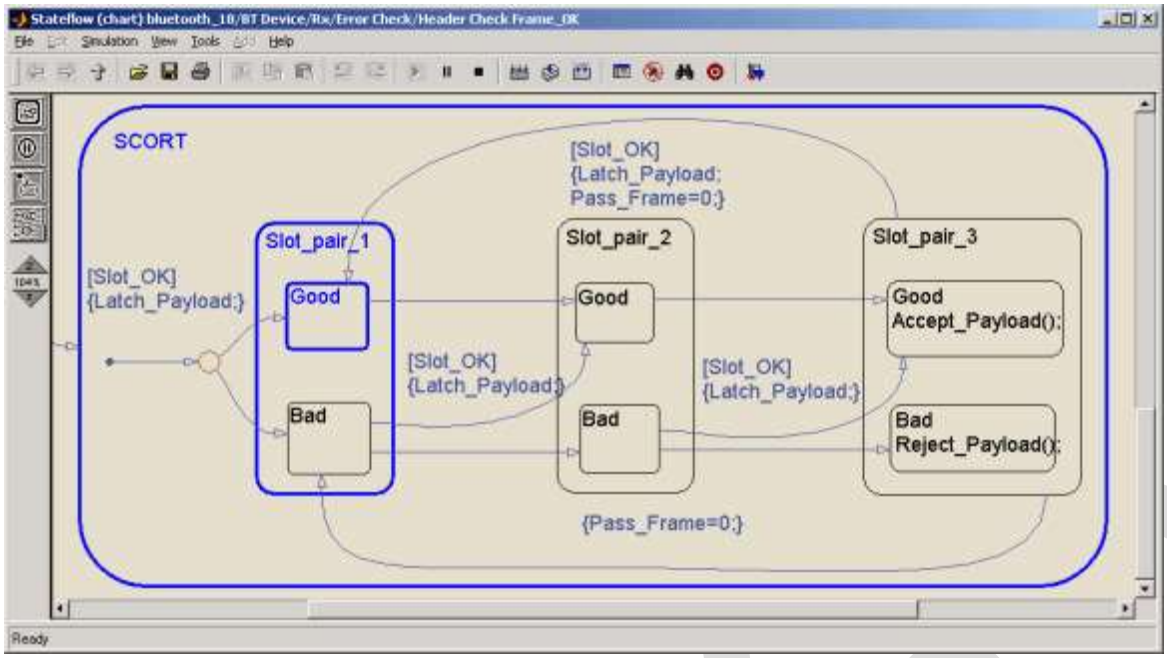

Fig : 8 Synchronized Connection Oriented Repeated Transmission for voice transmission state flow diagram

As the figure 8 depicts that the same packet is repeated three times in one SCO link interval.

There is no algorithm used for error correction in Synchronized Connection Oriented Repeated Transmission technique. In full duplex mode, the voice signal is repeated three times in a row. If the first packet is received correctly then the other two packets are rejected but if first row packet is lost and another packet is successfully received. In case of interference due to same packet transmission only one packet is received and another packet assumed as duplicate copies and are rejected by the receiver. It does not affect the BER of the payload. And it provides an improvement for frame error rate (FER).

SECTION V SIMULATION RESULTS

The Bluetooth simulation model creates two scenarios for testing the model. The first is only the Bluetooth transmission happens including its own and environmental interference without undertaking Wi-Fi interfere model. This first scenario is used to see the BER (Bit Error Rate) and SNR (Signal to Noise Ratio). The second scenario is created as that the Wi-Fi interference also worked i.e., the Wi-Fi transmission also carried on within the Bluetooth transmission and shows a great impact of interference on the Bluetooth transmission. In the whole Bluetooth transmission model, we have used the HV1 packet for voice transmission and DM5 for data transmission. The new voice packet Synchronized Connection Oriented Repeated Transmission (SCORT) is used to degrade the BER in the signal output for better performance and better communication.

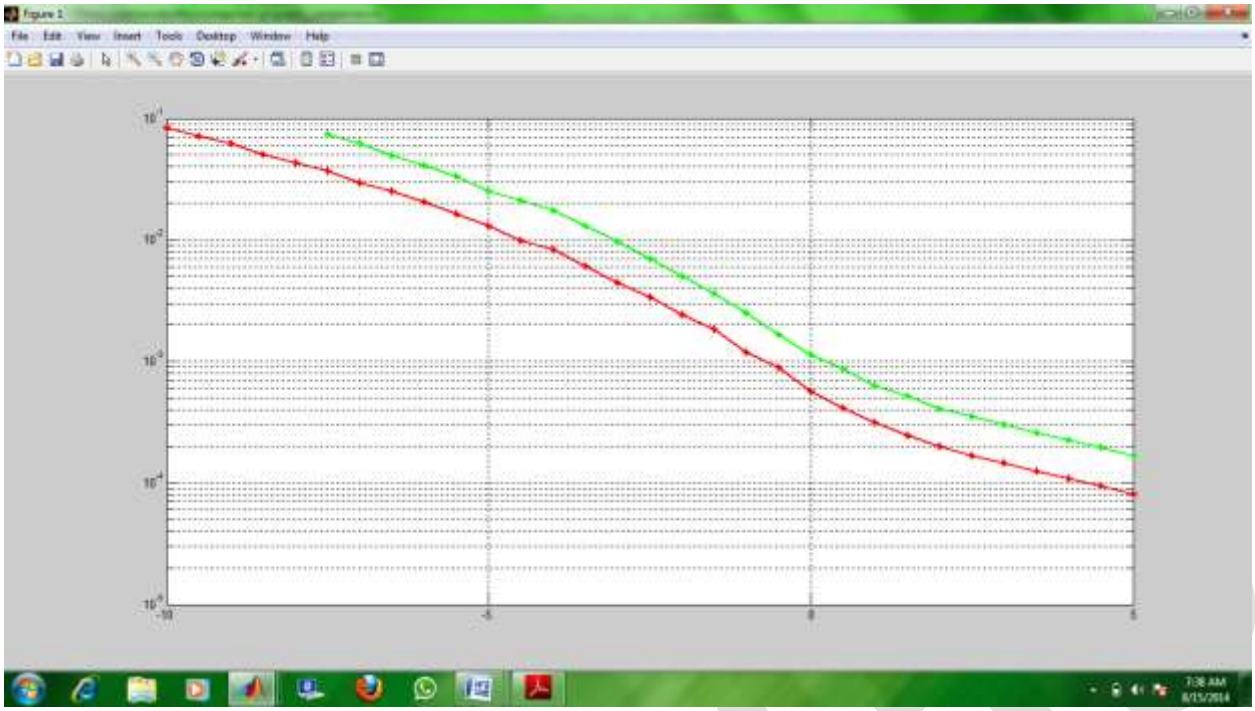

Fig: 9 BER Vs Es/No using HV1 and DM5 packets with and without Wi-Fi interfere

It is predicted from fig 9 that the BER without Wi-Fi is in above green coated line and the Bluetooth model including Wi-Fi's BER is shown in below red colored line. The BER vs. SNR graph have its own specification that the BER decreases as the SNR increases as in figure 9 shown. And there is a great difference between the BER with and without Wi-Fi interference. There is a rapid reduction in BER using SCORT algorithm.

SECTION VI CONCLUSION OF THE WORK

The advancements in the wireless world provide comfort and relaxation to human being. This wireless world have reached our daily life at that level that we cannot imagine our daily life without Wi-Fi and Bluetooth devices. They both are unbreakable part of technical world. Our experiments show that the situation gets more and more the worse as the more devices come into play and try to communicate with each other and creates congestion in the 2.4 GHz frequency band. The SCORT (Synchronized Connection Oriented Repeated Transmission) are a big leap in the future for such networks and make the network congestion less and degrade the BER in the signal output. Hopefully, in future these techniques provide an error free performance to the users for better use. Finally, we can say that it is a great solution for devices to operate co-existence in the wireless world.

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REQUIREMENTS ELICITATION FRAMEWORK FOR CLOUD APPLICATIONS

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Abstract— Requirements elicitation helps in identifying the customers and stakeholders requirements in constructing software or a system. In this paper, literature survey is performed for the challenges and issues in different elicitation methods. From literature survey it is clear that there is no relevant Elicitation Topic Map [1] for specific system and application domains. No standardized elicitation methods for cloud providers [2]. Large scale distributed software projects [3] suffer information overload, inadequate stakeholder input prioritization of requirements. The paper presents a Requirements elicitation framework for cloud applications. The framework uses Social networks for identifying and analysing stakeholders. The framework also combines storytelling method and audio technologies for eliciting requirements. Finally Elicitation Topic Map (ETM) is developed for cloud applications.

Keywords— ETM, requirements, elicitation, storytelling, stakeholder, social networks, cloud applications

INTRODUCTION

Requirements elicitation is the product building action in which stakeholder needs are comprehended [1]. It plans to distinguish the reason for which the product framework is planned [3]. It includes distinguishing stakeholders and prioritizing them focused around their impact in the task. It likewise includes distinguishing prerequisites from these stakeholders furthermore prioritizing their requirements.

Requirements stage is considered as a standout amongst the most noteworthy periods of the product advancement lifecycle. It incorporates the assignments of Elicitation, Analysis, Documentation, Acceptance and Management. The wide goal of this stage is to gather requirements of the framework to be manufacture. More particularly, RE is a methodology to dissect the stakeholders and their needs, reason and noteworthiness of framework advancement [1].

It has been observed that numerous requirements related slips are skipped to the later periods of the advancement life cycle what's more determining these blunders amid or after the usage of programming unnecessarily expands the expense and endeavors. This is the point, which reinforces the way that the more consideration should be paid towards requirements elicitation on the grounds that accepting obscure requirements from clients may prompt off base planning and in addition coding, which could be insufferable to resolve later on.

The achievement or disappointment of a framework improvement relies on upon the nature of the requirements [2]. The nature of the requirements is astonishingly impacted by strategy dynamic amid requirements elicitation in light of the fact that elicitation is the procedure of gathering the needs of clients, and imparting those needs to framework masters [3]. Requirements elicitation is a genuine period of the RE process, generally emulated by investigation further more detail, coordination and approval of the requirements. The principle reason for this procedure is to group the framework restrictions and determine the productive and open properties of a framework. The accomplishment of this procedure bases on perceiving the suitable stakeholders from diverse foundation and deciding their needs. It is an exceptional key to incorporate the all stakeholders in data assembling overall certain perspectives are never uncovered. There are number of inconveniences in accomplishing the requirements elicitation objectives [3].

Data over-burden is certain in enormous ventures. These activities have a tendency to have numerous stakeholders and requirements. Existing strategies for requirements elicitation require escalated cooperation with the stakeholders, for instance, through face to face gatherings, meetings, conceptualizing sessions, and Centre gatherings [1]. These techniques fail to offer intends to deal with the data evoked from stakeholders. All things considered, the systems neglect to scale to huge activities with hundreds, thousands, or even many thousands of stakeholders [4]. Experts battle to utilize these techniques in vast tasks. Definitely, stakeholders are precluded and their requirements ignored. Clients get to be baffled when the product neglects to address their needs. Clients who pay for the task pay for the missteps [5].

Deficient stakeholder information is brought about by insufficient stakeholder determination. Precluding stakeholders is one of the most basic slip-ups in programming designing [6]. Existing stakeholder investigation systems are prone to ignore stakeholders [7]. Likewise, stakeholders are regularly inspected amid requirements elicitation [8]. As requirements are evoked from stakeholders, precluding stakeholders brings about missing requirements, which thus prompts the wrong item being fabricated.

The rest of the paper is organized as follows. Section 2 reviews requirements elicitation procedure. Section 3 describes literature work. Section 4 describes proposed framework. Section 5 concludes.

REQUIREMENT ELICITATION PROCEDURE

A. Knowing the Application Area

It is paramount when starting the procedure of requirements elicitation to investigate the circumstances profoundly in which the framework will occur. The current foundation requirements to be completely investigated including the authoritative, structural, what's more aggregate viewpoints identified with the framework, Existing work procedures and the related issues to be unravelled by the framework need to be depicted as for the key business objectives and issues. This stage gives data about: Stakeholders 'capacities and space information, Limitations of machine assets and usefulness, and openness of other assets [5].

B. Classifications of Requirements

Requirements may be degree crosswise over different sources and exist in a mixture of configurations. In all product advancement ventures various conceivable hotspots for requirements may be recognized. Stakeholders speak to the clearest wellspring of requirements for the framework. Clients and topic masters are utilized to supply itemized data about the issues and client requirements. Existing frameworks and procedures speak to an alternate hotspot for inspiring requirements, for the most part when the task includes substituting a current or inheritance framework. Existing documentation about the business forms and current frameworks including structures, manuals and reports can give valuable data about the association and environment, and also necessities for the new framework and their supporting method of reasoning and criticalness [6][7].

C. Stakeholder - Analysis, Identification and Documentation

A standout amongst the most steps in requirements elicitation is to investigate and recognize all the applicable stakeholders. Stakeholders, who have a mindfulness in the framework or are influenced somehow by the development and execution of the framework and counselled mid requirements elicitation, In by and large the client is the most evident stakeholder of the framework and different gatherings whose has a circle of investment can be identify with some piece of the framework capacity, for example, work process and accomplices, and can likewise be viewed as stakeholders.

D. Gathering Information

Amid this stage it is critical to situate up the level of extension for the framework and look at in detail the needs and needs of the stakeholders. This stage addresses a few issues about stakeholder's capacities and area learning, impediments of machine assets and usefulness and accessibility of other assets. Every stakeholder concerned will compose a report of his/her requirements for the arranged framework and of the definite thought of the framework as the stakeholder comprehends it. Sensible prospect at this stage will likewise diminish unconventionality; since desires are less inclined to change as the substances of the change Process gets to be clearer [7].

E. Meetings with Stakeholders

The meetings may be organized or unstructured at this arrange and will be focused around the portrayals gathered from clients. The principle point of the meetings is to itemized and refines the needs and open door communicated in portrayal of clients also to perceive decisive words utilized by the clients [7].

F. Deciding elicitation Techniques

It is by and large acknowledged that an individual requirements elicitation procedure or methodology can't presumably be fitting for all undertakings. The choice of methods to be captivated is reliant on the specific environment of the extend and is regularly a genuine perspective in the achievement of the elicitation process. The choice of systems is focused around expert 'decision or endorsed by a particular approach.

G. Selecting Domain specific requirements

Creating space particular necessities has dependably been a significant assignment and this relies on upon information specialists and space masters. This stage tackled the issue of issue space which may thwart whatever is left of improvement. These difficulties can be tackled just by utilizing space masters also information masters [7].

H. Analyzing the requirements

At the last phase of this procedure master check entire set of framework requirements to verify all done so far is exact. From this stage, engineers really begin create the framework with cautious perception at each one phase of its improvement process [7].

LITERATURE SURVEY

Paper [1] is about the topic importance in requirement elicitation. The point of this paper is to discover the verifiable and unequivocal data imparted by the stakeholders amid meetings utilizing the proposed Elicitation Topic Map. ETM is a graph demonstrating subjects that may be examined amid elicitation questions and demonstrates how likely stakeholders examine each of these points spontaneously. ETM was delivered through 2 stages. In first stage topics were distinguished through meeting with requirement engineers and business investigator. In second stage the relative imperativeness of these topics was evaluated by a situated of stakeholders and the stakeholders were inquired as to whether they would impart data on it spontaneously or just if asked. In light of this the requirements specialist may choose the points and inquiries to be arranged for the meeting.

Paper [2] deals with requirement elicitation for cloud applications. In usual setting, customers ordinarily run the frameworks at their own premises. In cloud, customers don't claim arrangements any all the more, yet subscribe to administrations which they can use on interest in this way. Cloud administrations are offered by cloud suppliers. The study investigations three Questions. what systems do cloud suppliers utilization to inspire buyer necessities? . How do cloud suppliers requirements for elicitation routines contrast from customary suppliers? And to what degree can the current elicitation procedures fulfill cloud supplier's necessities? .Results demonstrate that interviews, examination of existing documentation and prototyping are the generally utilized procedures.

Stakerear in [3] uses Social Networks for requirements elicitation. It expects to address three issues that influenced expansive scale necessities elicitation: data over-burden, lacking stakeholder information and prioritization of requirements by utilizing Stakerear which recognizes stakeholders and requests them to the propose different stakeholders and stakeholder parts, assembles an informal community with stakeholders as hubs and their suggestions as connection. It then asks the stakeholders to rate a starting rundown of requirements, prescribes other significant requirements.

Paper [4] is about story telling for recording requirements. In this paper they have researched the use of the narrating system in evoking necessities and its adequacy contrasted with a customary conceptualizing method. Meeting based and poll based routines don't concentrate on making the client tell what he feels. The viability is measured as far as time required versus coming about prerequisites, fulfilment of the stakeholders, level of point of interest of the requirements, and conclusion of the requirements. The consequence of the examination directed with twenty-five space specialists, demonstrates that narrating created very nearly three times more necessities and more particular points of interest were uncovered than the conceptualizing technique.

Audio and collaboration technologies for distributed systems in [5] introduces a technique "Disire-X (Distributed web based Requirements Engineering – Extension) " which utilizes advances (a wiki framework) and audio recordings to permit various stakeholders together partake in elicitation and documentation of the requirements in globally circulated software development settings. A wiki is a site that permits anybody going to it to change or add to the material in it. The audio recording method is utilized to catch the data of the meetings. Here the wiki empowers the making of an initial project page. At that point a group page can be made with stakeholders. The Disire tool joins the audio track in the wiki.

The paper [6] manages an exact study that surveys the utilization of three distinctive correspondence modes, in particular: Text based correspondence, Face to Face, and rich media for requirement elicitation". A test was led with 6 gatherings of understudies and surveys were circulated instantly upon finishing of the session, so as to survey understudy's fulfillment in regards to the utilization of the assigned correspondence mode. Face to Face had the most elevated mean rank in correlation to the content based and rich media modes.

Paper [7] highlights on significant Issues and Challenges that may emerge amid requirements elicitation. Underlying driver of each one test is the most extreme human mediation all the while. Incorporation of most recent Artificial Intelligence (AI) strategies may reduce intervention up to some degree.

PROPOSED FRAMEWORK

From literature survey it is clear that there is no relevant Elicitation Topic Map [1] for specific system and application domains. No standardized elicitation methods for cloud providers [2]. Large scale distributed software projects [3] suffer information overload, inadequate stakeholder input prioritization of requirements.

The paper presents a Requirements elicitation framework for cloud applications. The framework uses Social networks for identifying and analyzing stakeholders. The framework also combines storytelling method and audio technologies for eliciting requirements. Finally Elicitation Topic Map (ETM) is developed for cloud applications.

Stakeholders in the Cloud

In a conventional setting, customers normally run the frameworks at their own premises, either owning and keeping up the product themselves or owning licenses to run the product or parts thereof. Suppliers, then again, offer or permit, introduce the frameworks and possibly give upkeep and consulting.

In the cloud connection, purchasers don't possess arrangements any all the more, yet subscribe to administrations which they can use on request accordingly. Cloud administrations are offered by cloud suppliers. A cloud supplier is an association, occasionally an individual, in charge of making an administration accessible to interested parties. As per the US National Institute of Standards Technology (NIST), a cloud supplier "gets and deals with the figuring framework needed for giving the administrations, runs the cloud programming that gives the administrations, furthermore makes course of action to convey the cloud administrations to the cloud shoppers through system access" [15]. In this way, the supplier is the genuine holder of the arrangement [11].

A cloud (administration) shopper is the stakeholder that uses the cloud administrations, and is spoken to by "an individual or association that keeps up a business association with, and utilizes the administration from, a cloud supplier" [15]. Thus, both Business-to-Business (B2b) and Business-to-Consumer (B2C) models are backed.

A cloud framework is a framework where processing assets are given on interest, as administrations, through system access, and the principle stakeholders are the cloud purchasers and suppliers, with the attributes portrayed previously. The administration can regularly be Software as a Service (Saas), Platform as a Service (Paas) or Infrastructure as a Service (Iaas) [11]. Customers use administrations conveyed by a supplier focused around a trust understanding (Service Level Agreement).

Story telling

Evoking clear, finish, and right requirements is still a test and a troublesome undertaking in requirements building [1]. Pivotal data identified with the requirements is regularly disregarded, and part of the way or not recorded at all amid requirements elicitation. As of late, a couple imaginative methodologies have developed to address some of these issues, including interactive media and feature based systems. [3] Investigates Story telling as a Requirements Elicitation Method for Medicinal Devices.

In the business, the regular procedure of evoking requirements includes requirements workshops, centre gatherings, for example, JAD, meetings to generate new ideas, and meetings with one or numerous stakeholders [12]. The recorded notes, issues, inquiries, pinpoints, and stakeholders' requirements are interpreted into requirements. The diverse stakeholders, counting end clients, customers, venture directors, fashioners, subcontractors, suppliers, and financing bodies have diverse levels and sorts of speculations and investments [13]. They might not in any case impart a typical dialect or venture learning [1]. Thusly, and specifically in the early periods of the tasks, stakeholders may have distinctive understandings, diverse translations, and impart little venture information. Nonetheless, as activities advancement, the level of imparted information develops, yet it is still difficult to gone to an interesting, imparted and general big picture of the task between all stakeholders. Specialists recording the necessities may misconstrue, halfway report, or discard imperative articulations. Driving stakeholders to keep to particular documentations may disturb the stakeholders and twist the necessities. In this manner, the delivered requirements might be deficient, conflicting, or inaccurate.

Obviously needing capacities to help gathering finish and point by point requirements in a common stream. This is since these methodologies basically don't concentrate on making the client tell what he feels like telling, rather stipulations the client with a specific stream, for example, in meeting based and poll based techniques. Methodologies, for example, unstructured meetings give a superior level of flexibility for the client agents as affirmed in [14]. It is vital to say that by "unstructured meetings" for this situation implies any sort of unstructured association between the designers and the client delegates [14]. Instead of having a centered set of inquiries picked ahead of time, the questioner brings general inquiries to help the client discuss the issue area.

CONCLUSION AND FUTURE WORK

The ambiguity in requirements elicitation will be reduced using the proposed framework. In future video recordings can be used for gathering requirements.

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SOFTWARE TESTERS PERSONALITY AND KNOWLEDGE IN SOFTWARE TESTING

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Abstract— we show a field contemplates on how tester uses learning while performing testing in modern settings. We investigated how the subjects performed tests and what kind of learning they used. We talk about how tester focused around their individual learning without point by point experiment depictions. The information is grouped under the classifications of area learning, framework information, and general programming building knowledge. we reason that the way exploratory testers apply their insight for test outline and disappointment distinguishment varies unmistakably from the experiment based ideal model and is one of the logical components of the viability of the exploratory testing methodology.

Keywords — framework, building knowledge, exploratory testers, methodology, disappointment, logical.

INTRODUCTION

The idea of programming testing alludes to the employment of finding issues, checking the wellness and fittingness, and guaranteeing the craved level of unwavering quality of programming frameworks before their arrangement. In this process, the analyzer hunt down occasions where the product does not perform as per its detail - that is, programming "bugs" - and tries to distinguish as numerous as could be allowed inside the points of confinement of the assets accessible to them.

In today's product trying practice, effective testing regularly depends on the tester's aptitudes, instinct, and experience. An accomplished tester who knows the item furthermore has been through a discharge cycle or two is ready to test with endlessly enhanced viability is along these lines one of the lessons adapted in programming testing.

In recognizing "bugs", programming testers ordinarily begin with a test arrangement and afterward outline suitable tests as per the plan. They execute the tests and rundown the bugs discovered, including where conceivable area, attributes and here and there potential reason. These bugs additionally need to be accounted for to the group of engineers so as to be altered. Programming testers then re-test the reported bugs after they are accounted for to be altered. This summed up cycle of programming testing may incorporate a lot of people more unit assignments. In any case, a far reaching rundown of such unit assignments is, as far as anyone is concerned, occupied.

RELATED WORK

The target of paper [1] is to discover the distinctive variable which helps in surveying the execution of the tester. The dependability of the conveyed programming totally relies on upon the individual in charge of it. Taking into account the individual presumption of the tester a study is carried out in this paper. Here the quantity of issue recognized by the tester is thought to be a paramount metric to evaluate the tester execution. The six elements considered for surveying are number of bugs discovered, nature of the bug report, seriousness of the bug, capacity of bug support and meticulousness of the test arranging and execution.104 members were there in this overview in that 72% are male testers. In that 28% of them are Indians and 24% of the testers are from Us.60% of the testers are from huge IT organizations and 20% are from little IT company.31% of the respondent noted different components like inventiveness, breaking down ability, usage of arrangement and comprehension are additionally essential in there open finished inquiry. The aftereffect of this study demonstrates that the component number of bug found is slightest essential and the element nature of bug report to be the most paramount variable for evaluating the tester's execution.

The principle goal of paper [2] is to distinguish the critical element that focus the execution of the product testing group where the creator have likewise the diverse sorts of group diversities have additionally been concentrated on. The seven variables considered for this study are the execution of the individual analyzer, interpersonal aptitudes, group playing capacity, involvement in testing, confirmation in testing, information of particular issue space and the similarity with other colleagues. The overview additionally had 6 shut inquiries where the members were approached to rank the components for 1 to 7. The result demonstrates that 89% of the

members concurred that assorted qualities helps in enhancing the execution. Members suspected that tester ought to be a decent group player.4% of the respondent felt sexual orientation assorted qualities and social diversities are to be considered. Group execution will be better when they have an experience filling in as a group.

In paper [3] creator imparts his experience while leading a review in testing industry. Four online mechanical study is finished with custom site. There was no vis-à-vis collaboration in this totally overview. The four reviews are components impacting programming tester's execution, work log accumulation of programming tester, testing administrator notion on another execution evaluation structure for programming tester and identity of the product tester. Members were enlisted from LinkedIn and Yahoo aggregates through email. Members were asked to sign in the CIS before taking part in the study. Number of member's welcome sent to the quantity of reaction got is less. So the reaction rate is less. Creator felt the way of welcome additionally assumed a paramount part in the review. In review one and four the quantities of members were high when contrasted with the second and third study.

The objective of paper [4] is to focus the relationship between the execution in programming testing and the particular identity qualities. This study was carried out by programming specialists and understudies. Singular testers differ in their impact yet the creator believed that this variety has not been concentrated on. This study attempted to explore the individual tester's tendency. The five models of identity variables being considered are extraversion, pleasantness, scruples, neuroticism and openness to investigate. These variables are tried with the assistance of measurements like bug area rate, weighted flaw thickness and bug report quality. The aftereffect of this study demonstrates that the tester who is exceptionally dynamic are great in finding and the testers who are watchful are great in discovering shortcomings.

The objective of paper [5] is to see how division of works ought to be performed and test whether by including extra testers will there be any increment in the quantity of defect.120 understudies took part in this trial and performed manual testing. Time limitation and weight are the two conditions forced on them. Two hours settled time opening for one gathering and an alternate gathering can take as much as they required for testing. Group of five time confined testers utilized ten hours and caught 75% more surrender than single non time limited testers utilizing ten hours. The result demonstrates that numerous times forced individual conveys high desert identification impact when contrasted with the non-time compelled single person. As time weight expands productivity additionally increment yet adequacy diminish. F score is the mean of viability and legitimacy. Adequacy is the measure of offer of special deformity found by an tester bunch. Legitimacy is the offer of substantial novel discoveries among all discoveries. The quantity of remarkable imperfection increment as the quantity of tester's increment. Time weight has a positive impact on deformity.

In paper [6] the two exploration inquiries are what are the social and specialized elements which impact the testing action and the other the in what capacity can the picture of tester and testing can be enhanced in scholastic exercises. The result demonstrates that there is a low inclination for understudies to take testing as future profession.

STUDY FOCUS

Testing exercises can be concentrated on two viewpoints. One is the social part of the testing exercises and is connected on how testers are composed and what is the inspiration behind a testing vocation. An alternate point to take a gander at the testing is from the specialized one, which in correlation to the social angle is widely secured in the current writing. These two points of view impact one another so the result at last relies on upon the interpersonal cooperation of the individuals creating the product.

The examination study depicted here was therefore intended to survey and change a while ago created halfway arrangements of the unit work obligations of programming testers. Such a rundown will be helpful for approach producers and spotters to outline new sets of expectations for programming testers. It will likewise help adolescent graduates to have a thought of programming testing calling and will help them in choosing profession goals. It will permit us to further research distinctive testing parts and obligations furthermore potential effects of tester identity, authoritative society, group atmosphere, and different elements.

Few observational studies exist that concentrate on how programming testing is directed in practice. The significance of such studies has been over and again stressed, as they give understanding in necessities and restricting elements of the application of programming testing in practice furthermore, in this way, make a premise for selecting examination issues in which specialists and professionals offer shared interest.

Programming testing is an action intended to assessing a trait or capacity of a framework and establishing that it meets the necessity. Albeit basic to programming quality and generally sent by developers and analyzers, programming testing remains a craftsmanship, because of incomplete understanding of the morals of programming. The entanglement in programming testing is a direct result of the intricacy of programming: we cannot by any stretch of the imagination test a project with a sensible intricacy. The test is more than simply debugging. The point of testing can be quality confirmation, check and verification, or surveying unwavering quality. The test can be utilized moreover as an expansive metric. There are two noteworthy regions of testing will be trying for accuracy and

dependability testing. Testing a framework or its segments is currently discovering lapses. We execute a framework to amend any crevices, lapses then again missing necessities.

RESEARCH QUESTIONS BEING PROPOSED

1. What sorts of information do testers use for inciting and perceiving disappointments when performing exploratory testing?
2. How do testers apply their insight when performing exploratory testing?
3. What sorts of disappointments do testers perceive utilizing information in exploratory testing?

The part of the onlooker was passer-by. The eyewitness sat close to the subject for the whole testing session and did not partake in the real testing exercises. Verbal correspondence happened between the onlookers furthermore subject as the subject was verbally processing, furthermore the eyewitness asked incidental elucidations. The viewpoint of the eyewitness was untouchable overwhelming. The onlooker was not piece of the association nor included in the item improvement. The onlooker was acquainted with the association and the tried programming items through existing long research participation.

CONCLUSION

In this paper, we reported the consequences of perception investigation of the part of tester' learning in inciting and perceiving disappointments in the setting of exploratory programming testing in industry. Tester applies learning of the framework under test and its application space, counting clients' requirements and objectives. Individual learning is sought trying in a particularly diverse style than how the experiment based ideal model comprehends the product testing movement. Our results show that the methods for applying information in exploratory testing include assessing the general conduct of the framework, contrasting the gimmicks and different peculiarities, and applying information of prior forms. Learning is now and again requested test configuration to outline focused on assaults to known dangers or client issues.

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Bandwidth Allocation In Cloud Environment

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Abstract—Cloud Computing is nothing but a use of computing properties that is distributed as a service over a network. Distribution of the data in the cloud depends on the network structure of the data centers. Allocation of bandwidth shows a important role in sharing the resources on the way to the data centers. Performance of the server is the major issue in cloud computing. When lots of users send a request for the same server at a same time then the performance of the server is significantly decreased. So we are defining a new method of rearranging the bandwidth from inactive users to active users using bandwidth delay technique using delay allocation.

Keywords—OpenStack,Devstack,Cloud Computing,Performance analysis,Bandwidth delay technique,IaaS,Delay Allocation.

I. INTRODUCTION

Cloud computing denotes the various differing types of services and applications being transported within the cloud. The Devices accustomed access these facilities and application don't need any special application. It shows a brand new thanks to increase this consumption and delivery model for IT services supported the web by providing for dynamically accessible and infrequently virtualized resources as a service over the web. The main options of cloud computing is dynamic provisioning. Dynamic provisioning permits the supply of services supported existing demand wants. This is done mechanically victimization software package automation, allowing the enlargement and contraction of service ability as needed. This dynamic scaling has to be done whereas continued high levels of dependable and security. Cloud computing encompasses a service headed design during which services are principally divided in to a few classes. In IaaS [2] cloud suppliers offer the resources on demand from their giant pools put in in information centers. For WAN association customers will use net. In PaaS model, cloud suppliers deliver a computing platform generally together with software package, programming language execution atmosphere, information and net server. In SaaS model cloud suppliers install and operate application software package within the cloud and cloud users access the software package from cloud shoppers.

Cloud computing consists of many computation type such as Hybrid cloud, public cloud and Private cloud. Public cloud - The public services are free or offered on a Pay-per-use form . Private cloud -private cloud shares communications between several organization from a specific community by common concerns whether manage internally otherwise by a third-party and hosted internally or externally. Hybrid cloud - Hybrid cloud is a composition of two or more clouds (private, community or public) that remain unique entity but are bound mutually, offering the benefits of multiple deployment models.

A.The main problems in cloud computing

The main problems in cloud computing[6] are:-

1)Security and privacy:- maybe two of the additional hot button problems encompassing cloud computing relate to storing and securing information and watching the utilization of the cloud by the service suppliers.

2) Lack of standards:- Clouds have documented interfaces. However, no standards square measure related to these,

and so it's unlikely that the majority clouds are going to be practical.

3) Continuously evolving:- User necessities area unit continuously evolving, as area unit the necessities for interfaces, networking, and storage. This implies that a "cloud" particularly a public one, doesn't stay static and is also incessantly evolving.

4)Compliance concerns:-The Sarbanes-Oxley Act within the US and information protection directives within the EU are simply 2 among several compliance problems touching cloud computing, supported the sort of knowledge and application for which the cloud is getting used.

5) Static bandwidth allocation:-There is wastage of information measure. So the server performance is weakened and hence maintenance is difficult.

B.OpenStack cloud

OpenStack[3][4] lets users deploy virtual machines and different instances that handle totally different tasks for managing a cloud setting on the fly. It makes horizontal scaling simple, which suggests that tasks that take pleasure in running at the same time will simply serve a lot of or less users on the fly by simply spinning up a lot of instances. as an example, a mobile application that must communicate with an overseas server may be able to divide the work of human action with every user across many alternative instances, all human action with each other however scaling quickly and simply because the application gains a lot of users.

And most significantly, OpenStack is open source software package, which implies that anyone WHO chooses to will access the ASCII text file, build any changes or modifications they have, and freely share these changes back dead set the community at giant. It additionally means OpenStack has the advantage of thousands of developers everywhere the planet operating in tandem to develop the strongest, most sturdy, and most secure product that they'll.

C.How is OpenStack used in a cloud:

The cloud is all concerning providing computing for finish users during a remote setting, wherever the particular software package runs as a service on reliable and climbable servers instead of on every finish users pc. Cloud computing will visit lots of various things, however usually the trade talks concerning running completely different things "as a service" which are software, platforms, and infrastructure. OpenStack falls into the latter class and is taken into account Infrastructure as a Service (IaaS)[2]. Providing infrastructure means OpenStack[4] makes it straightforward for users to quickly add new instance, upon that different cloud elements will run. Typically, the infrastructure then runs a "platform" upon that a developer will produce software package applications that are delivered to the tip users.

D.Components of OpenStack:

Followings are the components of OpenStack[7]:

1] Nova is that the primary computing engine behind OpenStack[3][4]. It is a "fabric controller," that is employed for deploying and managing giant numbers of virtual machines and different instances to handle computing tasks.

2] Swift may be a storage system for objects and files. instead of the standard plan of a bearing on files by their location on a disc drive, developers will instead visit a singular symbol bearing on the file or piece of knowledge and let OpenStack decide wherever to store this information.

3] Cinder could be a block storage element, that is additional analogous to the standard notion of a pc having the ability to access specific locations on a hard drive

4] Neutron provides the networking capability for OpenStack[3][4]. It helps to make sure that every of the elements of associate OpenStack readying will communicate with each other quickly and expeditiously.

5] Horizon is that the dashboard behind OpenStack. it's the sole graphical interface to OpenStack. Developers will access all of the parts of OpenStack separately through an application programming interface, however the dashboard provides system directors a glance at what's occurring within the cloud, and to manage it PRN.

II. EXISTING SYSTEM

In existing method it's targeted on increasing the performance of the server by resolution it to get correct estimation of the whole chance distribution of the request latent period and alternative necessary performance indicators which has been represented in novel approximate analytical model for performance evolution of cloud server farms. The model permits cloud operators to work out the relationship between the amount of servers and input buffer size, on one aspect, and therefore the performance indicators like mean variety of tasks within the system, interference chance, and chance that a task can get immediate service, on the opposite services. it\'s important to isolate the network performance between the purchasers for guaranteeing honest usage of the affected and shared network resources of the physical machine. sadly, the prevailing network performance isolation techniques aren't effective for cloud computing systems as a result of they are troublesome to adopted in a very giant scale and need non-trivial modification to the network stack of a guest OS.

III.PROBLEM STATEMENT

1) Wastage of bandwidth:- The amount server is relatively tiny, typically below ten, that makes them unsuitable for performance analysis of cloud computing knowledge centers. Then user could submit several task at a time due to this bags-of-task can seem. A cloud center will have an outsized number of facility nodes (servers).Typically of the order of hundreds or thousands; ancient queuing analysis seldom considers systems of this size. Because of the character of the cloud environments, diversity of user’s requests and time dependency of load, cloud centers should offer expected quality of service at wide loads. They not even mention the priority in static bandwidth allocation. So the passive user lost their cost.

2) Performance:- A performance drawback is also identified by slow or unresponsive systems. This sometimes occurs as a result of

high system loading, affecting some a part of the system to succeed in a limit in its ability to reply.

IV.PROPOSED SYSTEM

In this project, we will create a base application of file storage and access system in cloud server. Using this application user can access or download the files from the server. So basically a site will be created where admin will be responsible to update the content and post the videos and images in the site. Whatever data admin host under the site gets visible to the user using the system. Only registered user can access the system with help of their credentials. Once they login they can download the file from the site as per their interest. Based on their download size and number of users present in the the difference between the users. According the activity and their file access or download behavior system will categorize the user as an active user and a passive user. Active user will then automatically get a good bandwidth[5] as compared to bandwidth because now system thinks that active users is in need of bandwidth based on their behavior and activity an active user is performing.

To perform the actual working, the entire implementation is split into five modules and those modules are as follows.

- User Registration and Login
- Admin Uploads
- User access
- User Tracking
- Bandwidth Allocation

1] User Registration and Login: In this module user has an option to get register in the site filling up their normal basic details. User can only login into the system with the credentials they used during registration. If user details are entered wrong then system doesn't permits that user to login into the application.

2] Admin Uploads: Admin is the main key holder of the system as he has the complete rights to work or edit on the front end, once he logins he can upload the files which gets visible at the User interface. So a category and then the content under it is been updated or uploaded by Admin.

3] User access : In this module user once logged into the application will have an option to browse through the complete site and access the videos and other files. User is free to point and data and download without any restrictions.

4] User Tracking: Based on the activity and the usage download pattern, system will automatically detect the active and passive users in the system. This depends upon how frequently they are downloading the file and the size of the file they are interested in.

5] Bandwidth Allocation[5]: Based on the final verdict then the application distribute the system bandwidth to the valid active users.

CONCLUSION

In today's world as the usage of internet is increasing.We proposed innovative approach for increasing the

performance of the server in cloud computing environment by adding some time duration in the downloading speed of passive user.Because of this, active user will complete its downloading first and there will be delay in the downloading of passive user because of some time duration added in downloading.

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Simulation and Performance Analysis of Free Space Optical Systems using Multiple TX/RX and Polarized CO-OFDM techniques under Atmospheric Disturbances

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Abstract— Free Space Optical (FSO) communication is an optical communication technology in which optical data transmitted wirelessly from one place to another. High security, faster installation, licence free spectrum are its main advantages. The atmospheric conditions like haze, fog, snow etc affects the performance of FSO system. Using some techniques like Spatial Diversity, Coherent Optical Orthogonal Frequency Division Multiplexing (CO-OFDM) with dual polarization, it is possible to reduce the effects of atmospheric disturbances. This paper analyzed the performance of Multiple TX/RX FSO system and CO-OFDM FSO system under clear, haze and fog conditions using Q factor, Bit Error Rate (BER) etc. The simulations are done using a commercial optical system simulator named OptiSystem 12.0 by Optiwave.

Keywords— FSO, Spatial Diversity, MIMO, OFDM, CO-OFDM, Dual Polarization, OptiSystem 12.0

INTRODUCTION

Free-space optics (FSO) is one of the new optical communication technology which makes it possible to obtain the wireless optical communication with high data rate. This technology reduces the difficulty while laying optical fibers [10]. Wide license free spectrum, easy installation, secure transmission are its key advantages. Lasers and LEDs (Light Emitting Diodes) are used as sources. For long distance and short distance communication lasers and LEDs respectively are widely used. Terrestrial and outer space communications are its practical applications [8]. This technology finds application where a temporary link is needed, be it for a conference or ad-hoc connectivity in the event of a collapse of an existing communication network [12].The energy beams are collimated and sent through clear air or space from the source to the destination, rather than guided through an optical fiber. If the energy source does not produce a sufficiently parallel beam to travel the required distance, collimation can be done with lenses. At the source, the visible or IR energy is modulated with the data to be transmitted. At the destination, the beam is intercepted by a photodetector, the data is extracted from the visible or IR beam (demodulated), and the resulting signal is amplified and sent to the hardware. FSO systems can function over distances of several kilometers. As long as there is a clear line of sight between the source and the destination, communication is theoretically possible. Even if there is no direct line of sight, strategically positioned mirrors can be used to reflect the energy. The beams can pass through glass windows with little or no attenuation. Although FSO systems can be a good solution for some broadband networking needs, there are limitations. Most significant is the fact that rain, dust, snow, fog, or smog can block the transmission path and shut down the network [9]. Diversity is one of the methods to provide high quality services by sending several copies of the same signal. It gives reliability to the transmission. CO-OFDM have provided high data rate and high capacity in the optical communications.These two techniques can be used to mitigate the effects of atmospheric disturbances on FSO systems.

SPATIAL DIVERSITY AND CO-OFDM TECHNIQUES

Spatial Diversity

Spatial diversity is one of the possibilities of including diversity based on the availability of multiple antennas at the transmitter or the receiver shown in Fig.1. It is possible to linearly increase the throughput of the channel with every pair of antennas added to the system. The use of multiple antennas allows to exploit the spatial dimension of the wireless channel and to provide reliability by simultaneously transmitting the same signal through the new degrees of freedom provided by this spatial dimension. The transmitter section and receiver sections of this system contains multiple lenses which provide the diversity. Multiple beams from the transmitters are send to different paths using lenses. Beams after propagation through the channels get attenuated due to the atmospheric disturbances. The attenuation faced by each path will be different and all the multiple copies of the transmitted signals are then received at the receiver section using lenses [7].

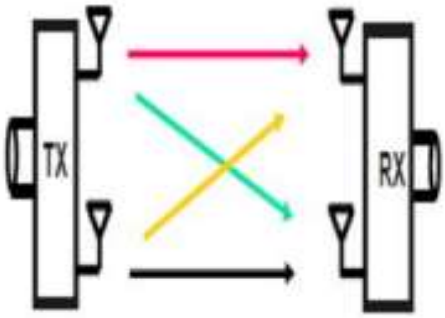


Fig.1 Spatial Diversity

CO – OFDM (Coherent Optical Orthogonal Frequency Division Multiplexing)

Coherent Optical OFDM (CO-OFDM) means OFDM data which is modulated to light frequency and then detected in coherent manner.Though OFDM has been standardized in wireless communication (e.g. IEEE 802.11) for a long time, the CO-OFDM was proposed around 2008 and is a relatively new concept for optical fiber transmission. Such a novel modulation format combines two powerful techniques in optical communications, coherent detection and OFDM. This modulation format holds the promise of delivering high electrical and optical spectral efficiency, receiver sensitivity, and optical dispersion resilience. A direct up coversion CO-OFDM architecture is shown in Fig.2. In this, transmitter and receiver uses two optical modulators and two optical detectors for modulating and demodulating both in phase and quadrature components of a signal [11].

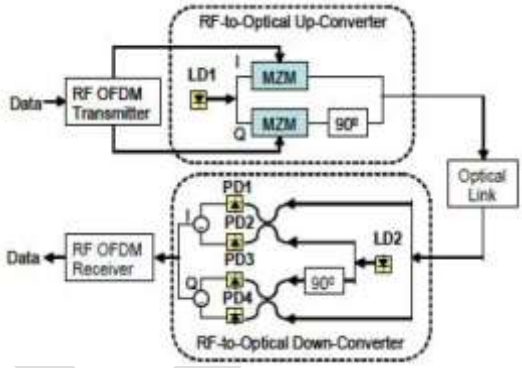


Fig.2 CO-OFDM direct up conversion architecture

DESIGN AND SIMULATIONS

FSO System using Multiple TX/RX technique

The fundamental elements that form a FSO system are the FSO transmitter, a FSO channel and the FSO receiver. Here TX and RX represents transmitter and receiver respectively. Transmitter includes the PRBS (Pseudo Random Bit Sequence) generator, NRZ pulse generator, a laser source and MZM (Mach Zehnder Modulator) [1]. In the simulation shown in Fig.4, data generated by the PRBS generator at a data rate of 20 Gbps is encoded and light modulated using MZM where laser source acts as the carrier source with wavelength 1550 nm and power 20 dBm. This modulated light is amplified using optical amplifiers before transmission to a range of 40 Km. The gain of the amplifier is set as 20 dB. Amplified signal is then directly send to the receiver through free space optical channel

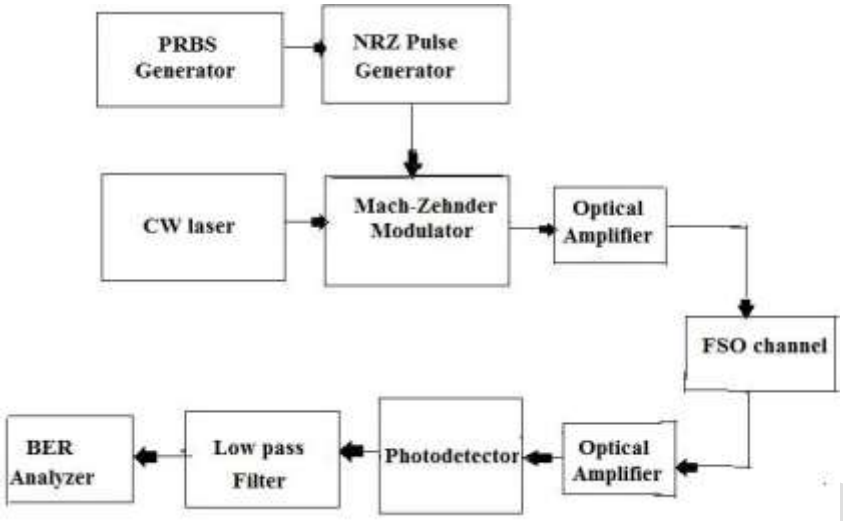


Fig.3 Block diagram of 1 TX/1 RX FSO system

Actually free space optical channel is a subsystem of two telescopes with FSO channel between them. The apertures of transmitter and receiver are set to 5 cm and 20 cm. The beam divergence is 2 mrad. In practical cases there is attenuation in the received signal due to atmospheric conditions of the channel. It is possible to set the attenuation losses in the FSO. Typical attenuation values of three conditions clear, haze and fog are 0.43 dB/Km, 4.3 dB/Km and 43 dB/Km respectively [15]. Initially, the attenuation value is set as 0.43 dB/Km (clear). The optical signals from the FSO channel are received by photodetector APD.

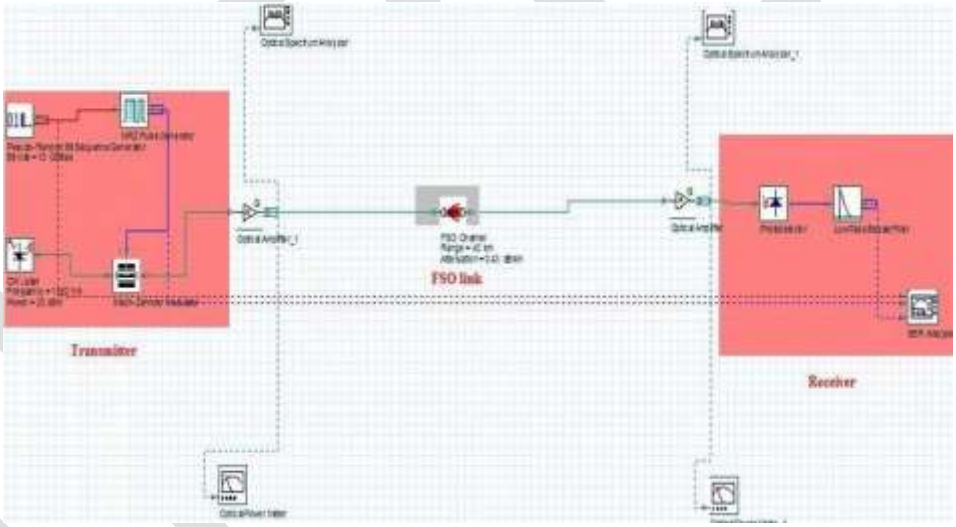


Fig.4 Simulation layout of 1 TX/1 RX FSO system.

A low pass Bessel filter is used to filter the signal from noise [5]. This simulations uses three visualizers namely optical power meter, optical spectrum analyser and BER analyser. Optical spectrum analysers provide the facility to analyse the optical spectrum. Optical power meters gives the power received in both dBm and Watts. BER analyzer automatically calculates the BER value, Q factor and display eye diagram. In the simulation shown in Fig.5, instead of one FSO channel, four channels are used. Fork is used for duplicating the input beam to all the channels.

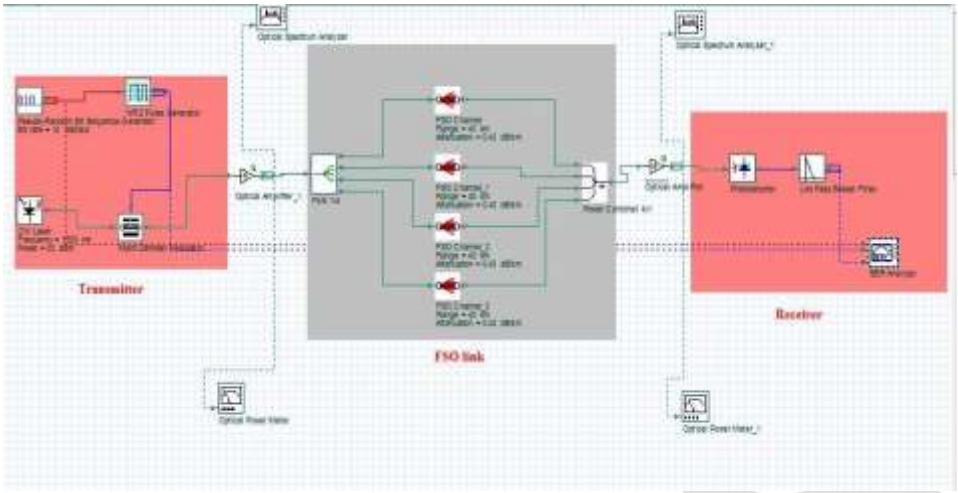


Fig.5 Simulation layout of 4TX/4 RX FSO system.

FSO System using Polarized CO-OFDM technique

A basic CO-OFDM FSO system can be divided into five parts respectively Radio Frequency (RF) OFDM transmitter, electro-optical (RF to Optical) up converter, optical free space link, optical electrical (Optical to RF) down converter, and RF-OFDM receiver. RF-OFDM transmitter consists of constellation mapper, OFDM modulator converts the signal to OFDM modulated RF. This OFDM modulated signals are then converted to light signals using Mach Zehnder modulators [2]. Light signals from modulators are then transmitted through free space channels. The transmitted light signals are then received at the optical to RF down converters and undergoes coherent detection. Data signals at several Gigabits/s are generated using 4 QAM sequence generator having 2 bit per symbol. QAM data signals are then OFDM modulated by means of OFDM modulator using 104 sub-carriers and FFT size of 128 to generate high speed OFDM analog data signals. These OFDM analog signals at this data rate are modulated with light carrier generated by a continuous wave laser having wavelength of 1550 nm and power of 20 dBm.

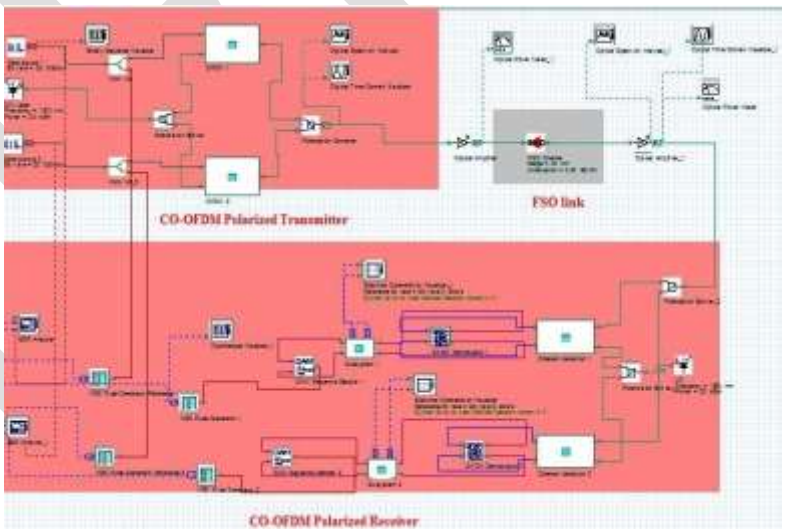


Fig.6 Simulation layout of polarized CO-OFDM FSO system.

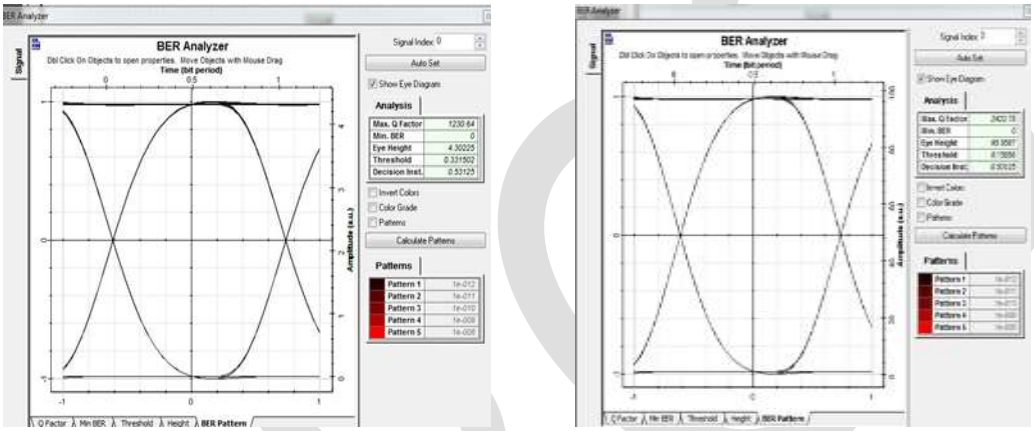
Polarization spiltters are used at the transmitter section inorder to spilt the light to horizontally and vertically polarized light. These two orthogonally polarized lights are used for the light modulation of OFDM signals. Then both lights are combined with polarization combiner before transmission into the atmospheric channel. This method is used to cancel the effects of attenuation ie, when horizontally polarized and vertically polarized light passed through the same channel, it will be counteracted by each other.Continuous wave laser light is splits into two orthogonal polarization using polarization splitter and is used to modulate two groups of OFDM

analog signals by means of two MZM modulators(for each group) [4]. This QAM-OFDM treated analog data signals are directly transmitted over an optical span. At the receiver base station, the signal is retrieved successfully using four PIN photo-detectors which are derived by local oscillator having same wavelength ie, 1550 nm as that of transmitter to realize coherent detection. Simulation layout of polarized CO-OFDM FSO system is shown in Fig.6.

RESULTS AND DISCUSSIONS

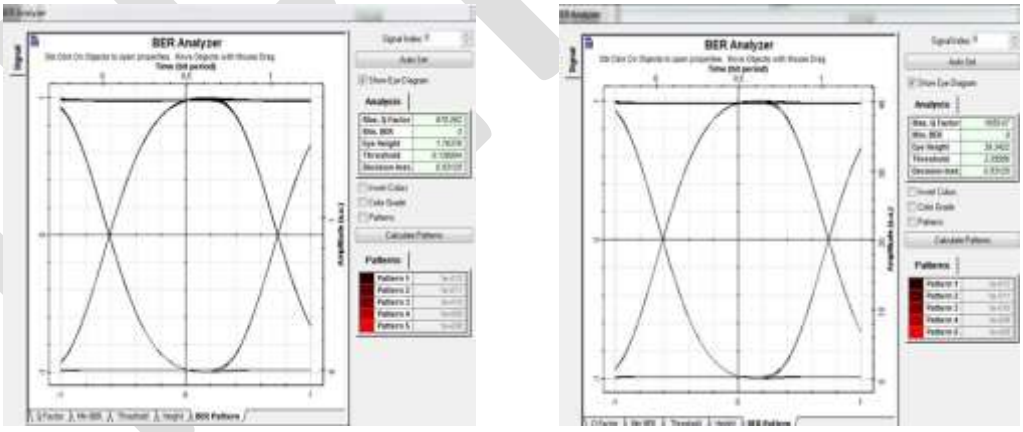
Multiple TX/RX FSO system

Simulations of both 1 TX/1 RX and 4 TX/4 RX FSO systems with a power of 10 dBm, range of 1 km and bit rate of 10 Gbps are analysed under three conditions clear, haze and fog. Fig.7 represents the FSO system under clear condition. 4 TX/4 RX show a better performance with high Q factor and low BER.



(a) **(b)**

Fig.7 Eye diagram of (a) Single TX/RX and (b) Multiple TX/RX FSO system under clear condition.



(a) **(b)**

Fig.8 Eye diagram of (a) Single TX/RX and (b) Multiple TX/RX FSO system under haze condition.

Eye diagrams of both FSO systems under haze and fog are shown in Fig.8 and Fig.9. It is seen that in this case also the 4 TX/4 RX FSO system performed better. The most important challenge faced by FSO system is fog [14]. Its attenuation is taken as 43 dB/km. In FSO system under fog with same other conditions, it is seen that Q factor of 1 TX/1 RX FSO system is only 8.29 while that of 4 TX/4 RX is 29.37.

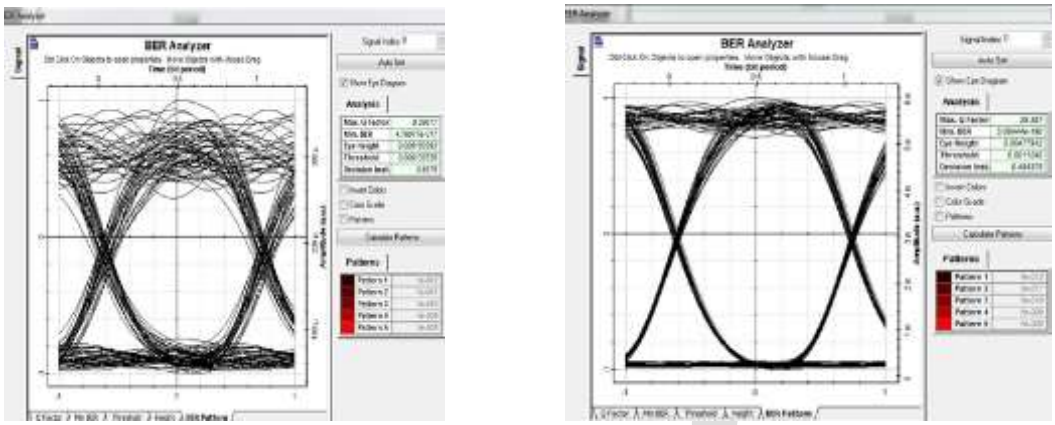
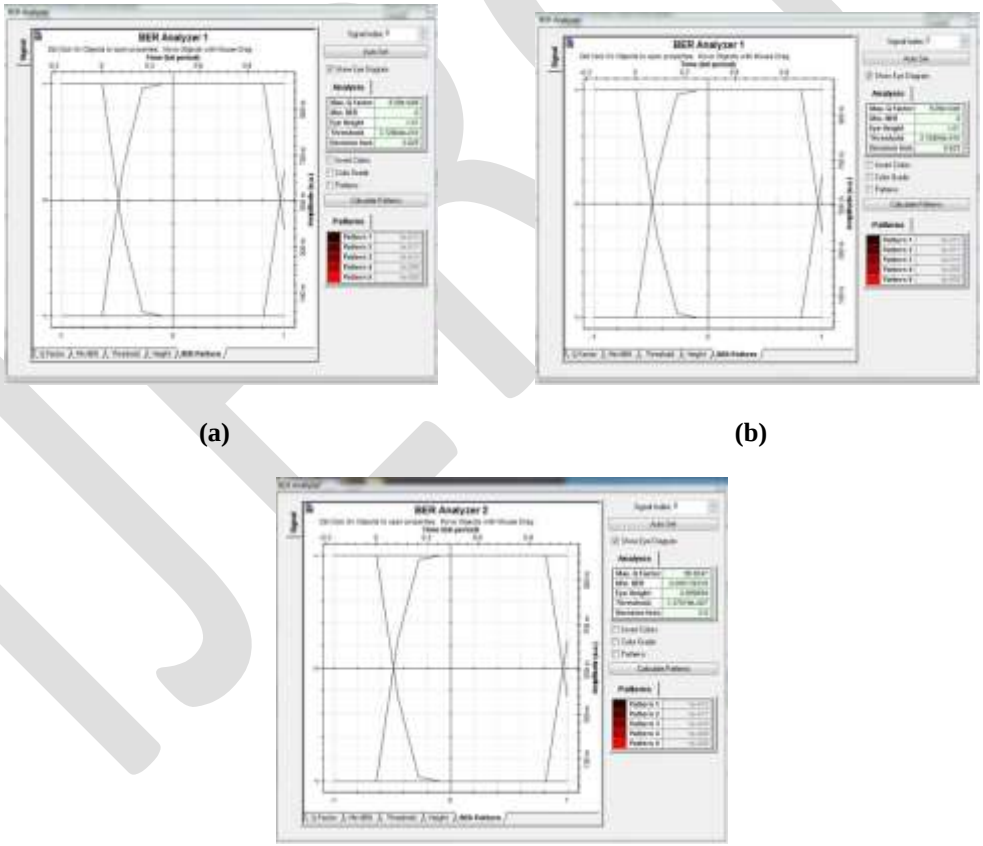


Fig.9 Eye diagram of (a) Single TX/RX and (b) Multiple TX/RX FSO system under fog condition.

Polarized CO-OFDM FSO system

The system is analysed under clear, haze and fog with a input power of 10 dBm, bit rate of 10 Gbps, and at a range of 1 Km. The eye diagrams of this system under clear, haze and fog conditions are shown in Fig.10. This system exhibits a better Q factor and low BER under these atmospheric conditions. The attenuation effects from these disturbances are minimized by the CO-OFDM modulation with polarization.



(a) **(b)**

(c)

Fig.10 Eye diagram analysis of a polarized CO-OFDM FSO system under (a) clear (b) haze and (c) fog condition.

CONCLUSION

Free Space Optics is a promising communication technology in the near future. Due to the atmospheric disturbances, there is distortion of signals at the receiver. But by using new techniques it is possible to reduce the atmospheric effects on the optical signal. Use of spatial diversity and CO-OFDM with dual polarization in the FSO system increased the efficiency of systems under different disturbances. Eventhough Q factor of FSO system decreases on increasing attenuation, the 4 TX/4 RX shows a higher Q factor so better performances. Similarly CO-OFDM system with dual polarization reduces the attenuation effects on the optical signals propagating through the atmosphere.

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Emotion Based Music Player

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Abstract— The human face is an important organ of an individual's body and it especially plays an important role in extraction of an individual's behavior and emotional state. Manually segregating the list of songs and generating an appropriate playlist based on an individual's emotional features is a very tedious, time consuming, labor intensive and upheld task. Various algorithms have been proposed and developed for automating the playlist generation process. However the proposed existing algorithms in use are computationally slow, less accurate and sometimes even require use of additional hardware like EEG or sensors. This proposed system based on facial expression extracted will generate a playlist automatically thereby reducing the effort and time involved in rendering the process manually. Thus the proposed system tends to reduce the computational time involved in obtaining the results and the overall cost of the designed system, thereby increasing the overall accuracy of the system. Testing of the system is done on both user dependent (dynamic) and user independent (static) dataset. Facial expressions are captured using an inbuilt camera. The accuracy of the emotion detection algorithm used in the system for real time images is around 85-90%, while for static images it is around 98-100%.The proposed algorithm on an average calculated estimation takes around 0.95-1.05 sec to generate an emotion based music playlist. Thus, it yields better accuracy in terms of performance and computational time and reduces the designing cost, compared to the algorithms used in the literature survey.

Keywords— Audio Emotion Recognition, Music Information Retrieval, Emotion Extraction Module, Audio Feature Extraction Module, Artificial Neural Networks, Confusion Matrix, Viola and Jones Face Detection.

I. INTRODUCTION

Music plays a very important role in enhancing an individual's life as it is an important medium of entertainment for music lovers and listeners and sometimes even imparts a therapeutic approach. In today's world, with ever increasing advancements in the field of multimedia and technology, various music players have been developed with features like fast forward, reverse, variable playback speed (seek & time compression),local playback, streaming playback with multicast streams. Although these features satisfy the user's basic requirements, yet the user has to face the task of manually browsing through the playlist of songs and select songs based on his current mood and behaviour. The introduction of Audio Emotion Recognition (AER) and Music Information Retrieval (MIR) in the traditional music players provided automatically parsing the playlist based on various classes of emotions and moods.

AER is a technique which deals with classifying a received audio signal, by considering its various audio features into various classes of emotions and moods, whereas MIR is a field that extracts some critical information from an audio signal by exploring some audio features like pitch ,energy,MFCC, flux etc.Though both AER and MIR included the capabilities of avoiding manual segregation of songs and generation of playlist, yet it is unable to incorporate fully a human emotion controlled music player. Although human speech and gesture are a common way of expressing emotions, but facial expression is the most ancient and natural way of expressing feelings, emotions and mood.

The main objective of this paper is to design an efficient and accurate algorithm that would generate a playlist based on current emotional state and behaviour of the user. The algorithm designed requires less memory overheads, less computational and processing time, reducing the cost of any additional hardware like EEG or sensors. The facial expression would categorize into 5 different types

of facial expressions like anger, joy, surprise, sad, and excitement. A high accurate audio extraction technique is proposed that extracts significant, critical and relevant information from an audio signal based on certain audio features in a much lesser time. An emotion model is proposed that classifies a song based on any of the 7 classes of emotions viz sad, joy-anger, joy-surprise, joy-excitement, joy, anger, and sad-anger. The emotion extraction module and audio feature extraction module is combined using an Emotion-Audio integration module. The proposed mechanism achieves a better efficiency and real time performance than the existing methodologies.

This paper is organized into: Section 2 gives the brief study of literature survey. Section 3 explains the methodology; Section 4 provides the experimental analysis and results. Section 5 gives the conclusion of the paper and future work.

II.LITERATURE SURVEY

I .Various techniques and approaches have been proposed and developed to classify human emotional state of behavior. The proposed approaches have focused only on the some of the basic emotions. For the purpose of feature recognition, facial features have been categorized into two major categories such as Appearance-based feature extraction and Geometric based feature extraction by zheng et. al [17]. Geometric based feature extraction technique considered only the shape or major prominent points of some important facial features such as mouth and eyes. In the system proposed by Changbo et. al [2], around a total of 58 major landmark points was considered in crafting an ASM..The appearance based extraction feature like texture, have also been considered in different areas of work and development. An efficient method for coding and implementing extracted facial features together with multi-orientation and multi-resolution set of Gabor filters was proposed by Michael Lyons [10] et. al.

II. An accurate and efficient statistical based approach for analyzing extracted facial expression features was proposed by Renuka R. Londhe et al. [13]. The paper was majorly focused on the study of the changes in curvatures on the face and intensities of corresponding pixels of images. Artificial Neural Networks (ANN) was used in the classification extracted features into 6 major universal emotions like anger, disgust, fear, happy, sad, and surprise. A Scaled Conjugate Gradient back-propagation algorithm in correlation with two-layered feed forward neural network was used and was successful in obtaining a 92.2 % recognition rate. In order to reduce the human effort and time needed for manual segregation of songs from a playlist, in correlation with different classes of emotions and moods, various approaches have been proposed.

III. Thayer [16] proposed a very useful 2-dimenesional (Stress v/s energy) model plotted on two axes with emotions depicted by a 2-dimensional co-ordinate system, lying on either 2 axes or the 4 quadrants formed by the 2-dimensional plot. The music mood tags and A-V values from a total 20 subjects were tested and analyzed in Jung Hyun Kim's[7] work, and based on the results obtained from the analysis, the A-V plane was classified into 8 regions(clusters), depicting mood by data mining efficient k-means clustering algorithm.

IV. Numerous approaches have been designed to extract facial features and audio features from an audio signal and very few of the systems designed have the capability to generate an emotion based music playlist using human emotions and the existing designs of the systems are capable to generate an automated playlist using an additional hardware like Sensors or EEG systems thereby increasing the cost of the design proposed. Some of the drawbacks of the existing system are as follows

i. Existing systems are very complex in terms of time and memory requirements for extracting facial features in real time.
ii. Based on the current emotional state and behavior of a user, existing systems possess a lesser accuracy in generation of a playlist.
iii. Some existing systems tend to employ the use of human speech or sometimes even the use of additional hardware for generation of an automated playlist, thereby increasing the total cost incurred.

This paper primarily aims and focuses on resolving the drawbacks involved in the existing system by designing an automated emotion based music player for the generation of customized playlist based on user extracted facial features and thus avoiding the employment of any additional hardware. It also includes a mood randomized and appetizer function that shifts the mood generated playlist to another same level of randomized mood generated playlist after some duration.

III. METHODOLOGY

The proposed algorithm in this involves an emotion music recommendation system that provides the generation of a customized playlist in accordance to the user's emotional state. The proposed system involves three major modules: Emotion extraction module, Audio feature extraction module and an Emotion-Audio recognition module. Emotion extraction module and Audio feature extraction module are two separate modules and Emotion-Audio recognition module performs the mapping of modules by querying the audio meta-data file. Fig 1 illustrates block diagram of proposed system.

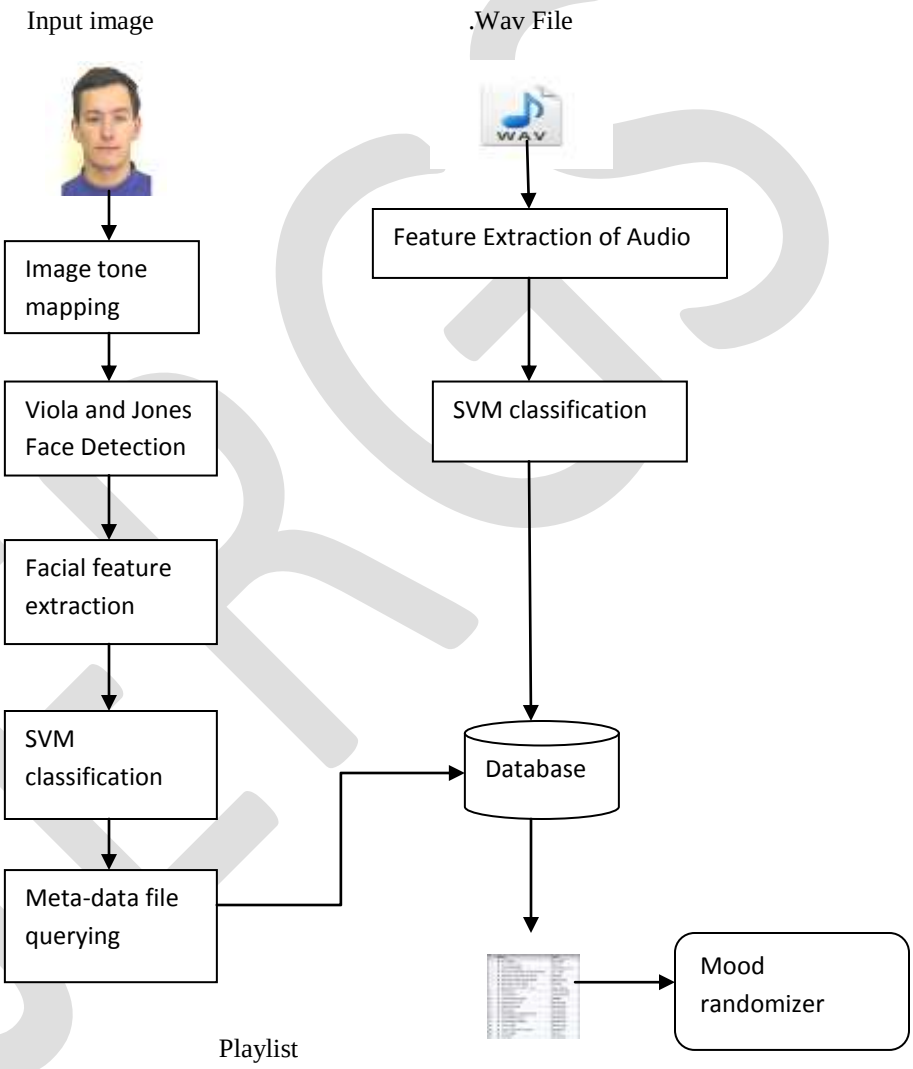

Fig 1 Block Diagram of Proposed Algorithm

A.EMOTION EXTRACTION MODULE:

Image of a user is captured using a webcam or it can be accessed from the stored image in the hard disk. This acquired image undergoes image enhancement in the form of tone mapping in order to restore the original contrast of the image.After image enhancement all images are converted into binary image format and the face is detected using Viola and Jones algorithm where the 'Frontal Cart property' of the algorithm is used that only detects upright and face forwarding features with a maximum threshold value set in the range of 16-20. The output of Viola and Jones Face detection block forms an input to the facial feature extraction block.

To increase the accuracy and an aim to obtain real time performance only features of eyes and mouth are appropriate enough to depict the emotions accurately. For extracting the features of mouth and eyes certain calculations and measurements are taken into consideration. Equations (1), (2), (3) and (4) illustrate the bounding box calculations for extracting features of a mouth.

X (start pt of mouth) =X (mid pt of nose) – (X (end pt of nose) – (Xstart pt of nose)) (1)

X (end pt of mouth) =X (mid pt of nose) + ((Xend pt of nose) – (Xstart pt of nose)) (2)

Y (start pt of mouth) =Y (mid pt of nose) +15 (3)

Y (end pt of mouth) =Y (start pt of mouth) +103 (4)

Where (X (start pt of mouth), Y (start pt of mouth)) and (X (end pt of mouth), Y (end pt of mouth)) illustrates start and end points of the bounding box for mouth respectively, (X (mid pt of nose), Y (mid pt of nose)) illustrates midpoint of noise and ((Xend pt of nose), (Xstart pt of nose)) illustrates end and start point of noise. Classification is performed using Support Vector Machine (SVM) which classifies it into 7 classes of emotions.

B.AUDIO FEATURE EXTRACTION MODULE:

In this module a list of songs forms the input. As songs are audio files, they require a certain amount of preprocessing Stereo signals obtained from the Internet are converted to 16 bit PCM mono signal around a variable sampling rate of 48.6 kHz. The conversion process is done using Audacity technique.

The pre-processed signal obtained undergoes an audio feature extraction, where features like rhythm toning is extracted using MIR 1.5 Toolbox, pitch is extracted using Chroma Toolbox and other features like centroid, spectral flux, spectral roll off, kurtosis,15 MFCC coefficients are extracted using Auditory Toolbox.

Audio signals are categorized into 8 types viz. sad, joy-anger, joy-surprise, joy-excitement, joy, anger, sad-anger and others.

1. Songs that resemble cheerfulness, energetic and playfulness are classified under joy.
2. Songs that resemble very depressing are classified under the sad.
3. Songs that reflect mere attitude, revenge are classified under anger.
4. Songs with anger in playful is classified under Joy-anger category.
5. Songs with very depress mode and anger mood are classified under Sad-Anger category.
6. Songs which reflect excitement of joy is classified under Joy-Excitement category.
7. Songs which reflect surprise of joy is classified under Joy-surprise category.
8. All other songs fall under ‘others’ category.

C.EMOTION-AUDIO INTEGRATION MODULE:

Emotions extracted for the songs are stored as a meta-data in the database. Mapping is performed by querying the meta-data database. The emotion extraction module and audio feature extraction module is finally mapped and combined using an Emotion-Audio integration module. Fig 2 illustrates mapping of Facial features and Audio features. For example, if an input facial image is categorized under joy, the system will display songs under joy, joy-anger, Joy-Excitement, Joy-surprise category.

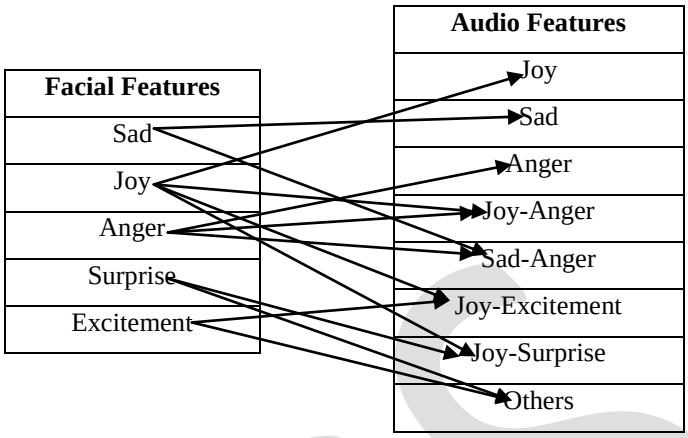

Fig 2 Modules mapping

IV.RESULTS AND EXPERIMENTS:

Testing and implementation is performed using either MATLAB R2013a or latest 2014 version of MATLAB on Windows7/8, 32 bit operating system and Intel i3 core processor. Facial expression extraction is done on both user independent and dependent dataset. A dataset consisting of facial image of 25 individuals was selected for user independent experiment and dataset of 10 individuals was selected for user dependent experimentation. An image of size 4000X3000 was used for static and dynamic dataset experiment.

A.EMOTION EXTRACTION:

A user independent dataset of 30 images and user dependent dataset of 5 images is selected for extraction of emotions. Estimated time for various modules of Emotion Extraction Module is illustrated in Table 1.

Table 1 Time Estimation of Various modules of Emotion Extraction Module

Module	Time Taken(sec)
Face Detection	0.8126
Facial Feature Extraction	0.9216
Classification using SVM	0.1956
Emotions	0.9994

B.AUDIO FEATURE EXTRACTION:

A dataset of around 200 songs was considered for experimentation and testing of audio feature extraction module and the songs were collected from various Bollywood music sites like Djmaza.in, Songs.pk etc. Estimated accuracy for various categories of emotions is depicted in Table 2.

Table 2 Estimated Accuracy for different categories of Audio Feature

Emotions	Accuracy
Joy	89%
Sad	99%
Anger	99.8%
Surprise	88%
Excitement	95%
Joy- Excitement	96.4%
Joy-Surprise	100%

C.EMOTION BASED MUSIC PLAYER:

The Proposed system is tested and experimented against an in-built camera, thus the total cost involved in implementation is almost negligible. Average estimated time for various modules of propped system is illustrated in Table 3.

Table 3 Average Time Estimation of Various modules of Proposed System

Module	Time Taken(sec)
Emotion Extraction Module	0.9994
Emotion-Audio Integration Module	0.0006
Proposed System	1.0000

IV. CONCLUSION AND FUTURE SCOPE:

Experimental results have shown that the time required for audio feature extraction is negligible (around 0.0006 sec) and songs are stored pre-handed the total estimation time of the proposed system is proportional to the time required for extraction of facial features (around 0.9994 sec).Also the various classes of emotion yield a better accuracy rate as compared to previous existing systems. The computational time taken is 1.000sec which is very less thus helping in achieving a better real time performance and efficiency.

The system thus aims at providing the Windows operating system users with a cheaper, additional hardware free and accurate emotion based music system. The Emotion Based Music System will be of great advantage to users looking for music based on their mood and emotional behavior. It will help reduce the searching time for music thereby reducing the unnecessary computational time and thereby increasing the overall accuracy and efficiency of the system. The system will not only reduce physical stress but will also act as a boon for the music therapy systems and may also assist the music therapist to therapize a patient. Also with its additional features mentioned above, it will be a complete system for music lovers and listeners.

The future scope in the system would to design a mechanism that would be helpful in music therapy treatment and provide the music therapist the help needed to treat the patients suffering from disorders like mental stress, anxiety, acute depression and trauma.
The proposed system also tends to avoid in future the unpredictable results produced in extreme bad light conditions and very poor camera resolution.

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MPEG-7 MULTIMEDIA TECHNIQUE

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Abstract- MPEG-7, formally known as the Multimedia Content Description Interface, includes standardized tools (descriptors, description schemes, and language) enabling structural, detailed descriptions of audio-visual information at different granularity levels (region, image, video segment, collection) and in different areas (content description, management, organization, navigation, and user interaction). It aims to support and facilitate a wide range of applications, such as media portals, content broadcasting, and ubiquitous multimedia. We present a high-level overview of the MPEG-7 standard. We first discuss the scope, basic terminology, and potential applications. Next, we discuss the constituent components. Then, we compare the relationship with other standards to highlight its capabilities.

Keywords— MPEG-7, multimedia asset management, audiovisual indexing, content-based image retrieval, speech Recognition, signal segmentation

Introduction

How many times have you seen science fiction movies such as 2001: A Space Odyssey and thought, "Wow, we're so far away from having any of the fancy gadgets depicted in these movies!" In 2001, Hal, the talking computer intelligently navigates and retrieves information or runs complex operations instigated by spoken input. Or how about using an image-based query, say an image of the motorbike used by Arnold Schwartzenegger in the movie T2, to find images of similarly looking motorbikes. Dreams or reality?

As more and more audiovisual information becomes available from many sources around the world, many people would like to use this information for various purposes. This challenging situation led to the need for a solution that quickly and efficiently searches for and/or filters various types of multimedia material that's interesting to the user.

For example, finding information by rich-spoken queries, hand-drawn images, and humming improves the user-friendliness of computer systems and finally addresses what most people have been expecting from computers. For professionals, a new generation of applications will enable high-quality information search and retrieval. For example, TV program producers can search with "laser-like precision" for occurrences of famous events or references to certain people, stored in thousands of hours of audiovisual records, in order to collect material for a program. This will reduce program production time and increase the quality of its content.

MPEG-7 is a multimedia content description standard, (to be defined by September 2001), that addresses how humans expect to interact with computer systems, since it develops rich descriptions that reflect those expectations.

1.1 What Are the MPEG Standards?

The Moving Picture Coding Experts Group (MPEG) is a working group of the Geneva-based ISO/IEC standards organization, (International Standards Organization/International Electro-technical Committee) in charge of the development of international standards for compression, decompression, processing, and coded representation of moving pictures, audio, and a combination of the two. MPEG-7 then is an ISO/IEC standard being developed by MPEG, the committee that also developed the Emmy Award-winning standards known as MPEG-1 and MPEG-2, and the 1999 MPEG-4 standard.

- ***MPEG-1:*** For the storage and retrieval of moving pictures and audio on storage media.
- ***MPEG-2:*** For digital television, it's the timely response for the satellite broadcasting and cable television industries in their transition from analog to digital formats.
- ***MPEG-4:*** Codes content as objects and enables those objects to be manipulated individually or collectively on an audiovisual scene.

MPEG-1, -2, and -4 make content available. MPEG-7 lets you to find the content you need.

Besides these standards, MPEG is currently also working in MPEG-21 a Technical Report about Multimedia Framework.

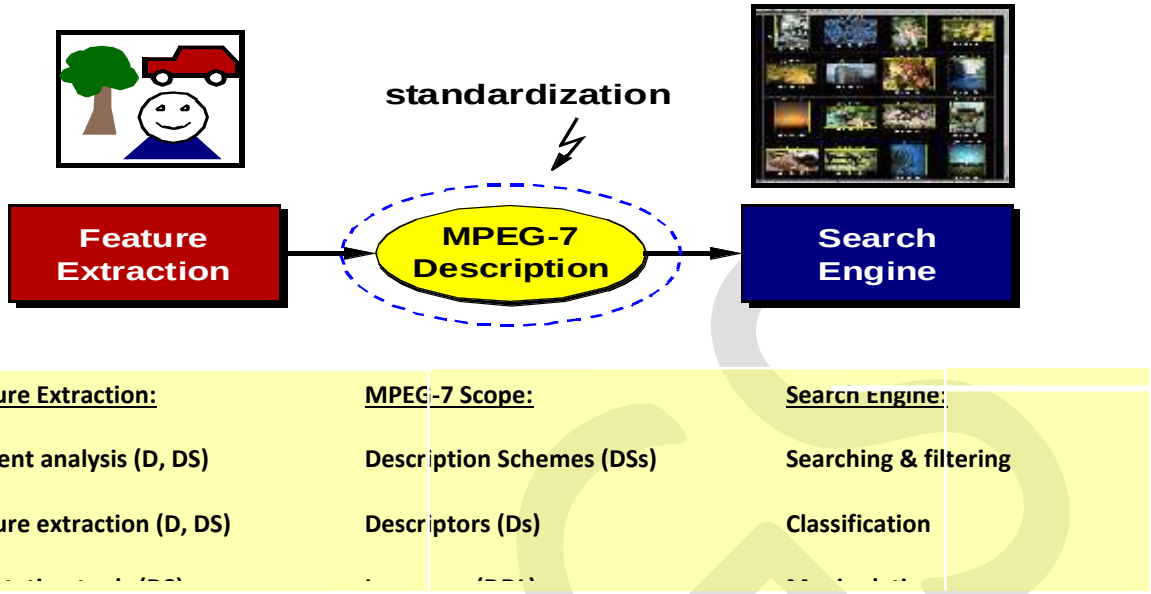

Figure 1: The Scope of MPEG-7

1.2 Defining MPEG-7

MPEG-7 is a standard for describing features of multimedia content.

1.2.1 Qualifying MPEG-7

MPEG-7 provides the world's richest set of audio-visual descriptions.

These descriptions are based on catalogue (e.g., title, creator, rights), semantic (e.g., the who, what, when, where information about objects and events) and structural (e.g., the colour histogram - measurement of the amount of colour associated with an image or the timbre of an recorded instrument) features of the AV content and leverages on AV data representation defined by MPEG-1, 2 and 4.

Comprehensive Scope of Data Interoperability.

MPEG-7 uses XML Schema as the language of choice for content description MPEG-7 will be interoperable with other leading standards such as, SMPTE Metadata Dictionary, Dublin Core, EBU P/Meta, and TV Anytime.

1.3 The Key Role of MPEG-7

MPEG-7, formally named "Multimedia Content Description Inter-face," is the standard that describes multimedia content so users can search, browse, and retrieve that content more efficiently and effectively than they could using today's mainly text-based search engines. It's a standard for describing the features of multimedia content.

However MPEG-7 will not standardize the (automatic) extraction of AV descriptions/features. Nor will it specify the search engine (or any other program) that can make use of the description.

2.1 Organization of MPEG-7 Description Tools

Over 100 MPEG-7 Description Tools are currently being developed and refined. The relationships between the MPEG-7 Description Tools are outlined in Figure 2.

The basic elements, at the lower level, deal with basic data types, mathematical structures, schema tools, linking and media localization tools, as well as basic DSs, which are elementary components of more complex DSs. The Schema tools section specifies elements for creating valid MPEG-7 schema instance documents and description fragments.

The first three elements primarily address information that's related to the management of the content (content management), whereas the last two are mainly devoted to the description of perceivable information (content description).

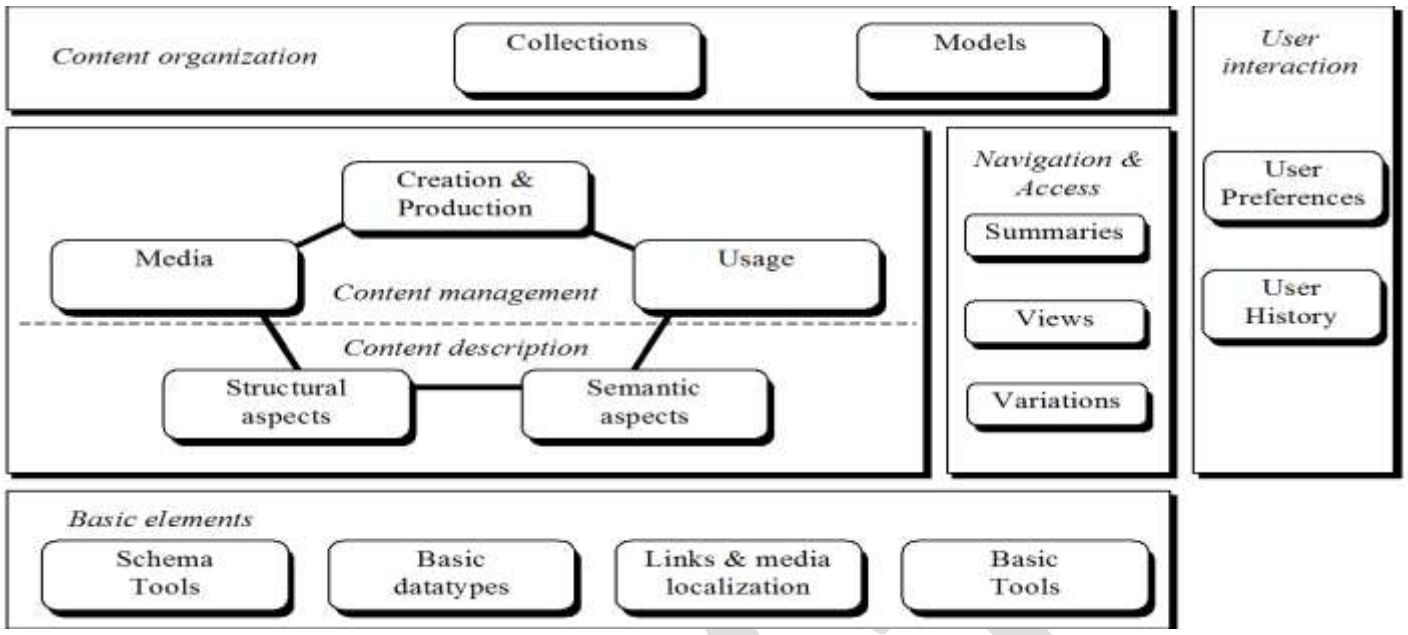

Figure 2: Overview of MPEG-7 Multimedia Description Schemes (DSs)

• ***Creation and Production:*** Contains meta information that describes the creation and production of the content; typical features include title, creator, classification, and purpose of the creation. Most of the time this information is author-generated since it can't be extracted from the content.

• ***Usage:*** Contains meta information that's related to the usage of the content; typical features involve rights holders, access rights, publication, and financial information. This information may be subject to change during the lifetime of the AV content.

• ***Media:*** Contains the description of the storage media; typical features include the storage format, the encoding of the AV content, and elements for the identification of the media. *Note:* Several instances of storage media for the same AV content can be described.

• ***Structural aspects:*** Contains the description of the AV content from the viewpoint of its structure. The description is structured around segments that represent physical, spatial, temporal, or spatio-temporal components of the AV content. Each segment may be described by signal-based features (color, texture, shape, motion, audio) and some elementary semantic information.

• ***Conceptual Aspects:*** Contains a description of the AV content from the viewpoint of its conceptual notions.

The five sets of Description Tools are presented here as separate entities, however, they are interrelated and may be partially included in each other. For example, Media, Usage or Creation & Production elements can be attached to individual segments involved in the structural description of the content. Tools are also defined for *navigation and access* and there is another set of tools for *Content organization* which addresses the organization of content by classification, by the definition of collections and by modeling. Finally, the last set of tools is *User Interaction* which describes user's preferences for the consumption of multimedia content and usage history.

2.2 MPEG-7 Working Groups

Currently MPEG-7 concentrates on the specification of description tools (Descriptors and Description Schemes), together with the development of the MPEG-7 reference software, known as XM (eXperimentation Model). The XML Schema Language was chosen as the base for the Description Definition Language (DDL).

The **MPEG-7 Audio group** develops a range of Description Tools, from generic audio descriptors (e.g., waveform and spectrum envelopes, fundamental frequency) to more sophisticated description tools like Spoken Content and Timbre. Generic Audio Description tools will allow the search for similar voices, by searching similar envelopes and fundamental frequencies of a voice sample against a database of voices. The Spoken Content Description Scheme (DS) is designed to represent the output of a great number of state of the art Automatic Speech Recognition systems, containing both words and phonemes representations and most likely transitions. This alleviates the problem of out-of-vocabulary words, allowing retrieval even when the original word was wrongly decoded. The Timbre descriptors (Ds) describe the perceptual features of instrument sound, that make two sounds having the same pitch and loudness appear different to the human ear. These descriptors allow searching for melodies independently of the instruments.

The **MPEG-7 Visual group** is developing four groups of description tools: Color, Texture, Shape and Motion. Color and Texture Description Tools will allow the search and filtering of visual content (images, graphics, video) by dominant color or textures in some (arbitrarily shaped) regions or the whole image. Shape Description Tools will facilitate "query by sketch" or by contour similarity in image databases, or, for example, searching trademarks in registration databases. Motion Description Tools will allow searching of videos with similar motion patterns that can be applicable to news (e.g. similar movements in a soccer or football game) or to surveillance applications (e.g., detect intrusion as a movement towards the safe zone).

The **MPEG-7 Multimedia Description Schemes group** is developing the description tools dealing with generic and audiovisual and archival features. Its central tools deal with content management and content description as outlined in section 2.1.

The **MPEG-7 Implementation Studies group** is designing and implementing the MPEG-7 Reference Software known as XM.

The **MPEG-7 Systems group** is developing the DDL and the binary format (known as BiM), besides working in the definition of the terminal architecture and access units.

3. MPEG-7 Application Domains

The elements that MPEG-7 standardizes will support a broad a range of applications (for example, multimedia digital libraries, broadcast media selection, multimedia editing, home entertainment devices, etc.). MPEG-7 will also make the web as searchable for multimedia content as it is searchable for text today. This would apply especially to large content archives, which are being made accessible to the public, as well as to multimedia catalogues enabling people to identify content for purchase. The information used for content retrieval may also be used by *agents*, for the selection and filtering of broadcasted "push" material or for personalized advertising. Additionally, MPEG-7 descriptions will allow fast and cost-effective usage of the underlying data, by enabling semi-automatic multimedia presentation and editing. All domains making use of multimedia will benefit from MPEG-7 including,

- Digital libraries, Education (image catalogue, musical dictionary, Bio-medical imaging catalogues…)
- Multimedia editing (personalised electronic news service, media authoring)
- Cultural services (history museums, art galleries, etc.),
- Multimedia directory services (e.g. yellow pages, Tourist information, Geographical information systems)
- Broadcast media selection (radio channel, TV channel,…)
- Journalism (e.g. searching speeches of a certain politician using his name, his voice or his face),
- E-Commerce (personalised advertising, on-line catalogues, directories of e-shops,…)
- Surveillance (traffic control, surface transportation, non-destructive testing in hostile environments, etc.),
- Investigation services (human characteristics recognition, forensics),
- Home Entertainment (systems for the management of personal multimedia collections, including manipulation of content, e.g. home video editing, searching a game, karaoke,…)
- Social (e.g. dating services),

3.1 Typical applications enabled by MPEG-7 technology include:

• ***Audio:*** I want to search for songs by humming or whistling a tune or, using an excerpt of Pavarotti's voice, get a list of Pavarotti's records and video clips in which Pavarotti sings or simply makes an appearance. Or, play a few notes on a keyboard and retrieve a list of musical pieces similar to the required tune, or images matching the notes in a certain way, e.g. in terms of emotions.

• ***Graphic*s:** Sketch a few lines on a screen and get a set of images containing similar graphics, logos, and ideograms.

• ***Image****:* Define objects, including color patches or textures, and get examples from which you select items to compose your image. Or check if your company logo was advertised on a TV channel as contracted.

• ***Visual:*** Allow mobile phone access to video clips of goals scored in a soccer game, or automatically search and retrieve any unusual movements from surveillance videos.

• ***Multimedia:*** On a given set of multimedia objects, describe movements and relations between objects and so search for animations fulfilling the described temporal and spatial relations. Or, describe actions and get a list of scenarios containing such actions.

3.2 Examples of MPEG-7 Applications

The following applications are examples of the type of solutions that MPEG-7 can solve. These application examples represent development work in progress. There are many more applications being developed around the world,

3.2.1 Content Retrieval using Image as the Query

Figure 3 shows possible ways to search for visual content using the inherent structural features of an image. In this example there are four image features detailed. The color histogram feature (1) of an image allows me to search for images that have the same color. Note, the position of the colors is not important but rather the amount of similar color in the image is important. The next feature, spatial color distribution (2) allows me to search for images where the location of the same color is important. You can see that the added object in the right-bottom flag does not affect this type of search. You can additionally search for images that have a similar edge or contour profile as in the spatial edge distribution (3) search technique. Note, color does not make a difference to this type of search. Finally, you can see an example of searching by object shape (4). Here, the color and edge profiles are not important.

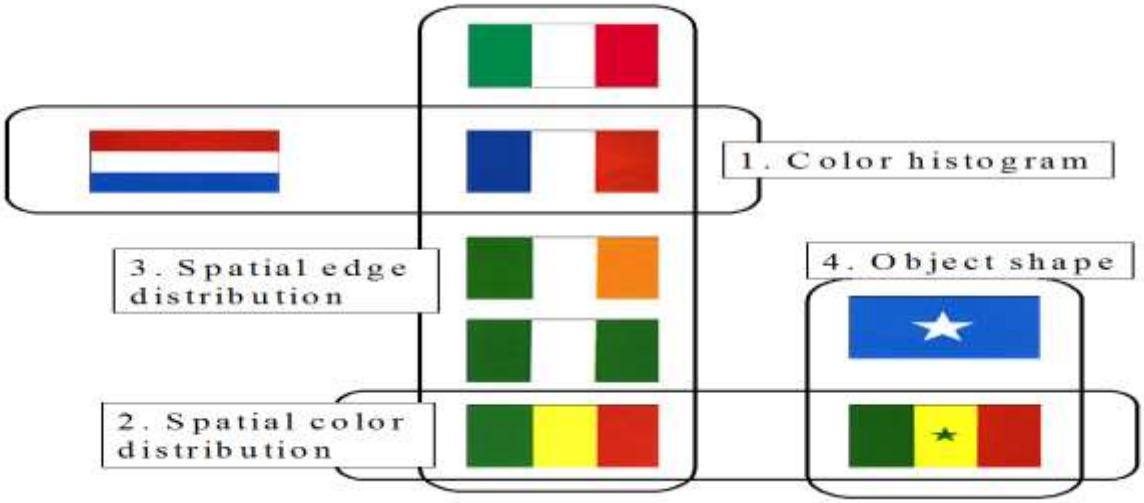

Figure 3: Search using image features

3.2.2 Movie Tool

This is an MPEG-7 description tool for video with easy-to-use visual interface (see figure 5). It is possible to compose a logical structure of the target content, and to also edit and output an MPEG-7 instance file using this tool. Automatic segmentation of video content is done by detecting scene changes. Manual annotation is also possible to allow users provide additional information about the content. The content is arranged in a hierarchy based on topic and sub-topics where visual clips are summarized using thumbnails. In the ideal world, automatic description and organization of content is most desirable but the variety of possible meanings associated with semantic content make it a difficult task. This Movie Tool, though, helps speed up the manual annotation process because of its friendly visual interface environment. Currently, this tool operates on MPEG-1 input content. Since the logical structure of the content is mapped directly to its MPEG-7 instance in the editor, users can easily see the relationships between content and its related MPEG-7

description. This feature provides is very useful when trying to understand the usage of MPEG-7 description tools and their relationship to content.

4. ADVANTAGES:-

- MPEG Standards have been Successful in the Marketplace.
- The contributors to MPEG-7 include experts in every portion of the content value chain: production, post-production, delivery, and consumption.
- Interoperability: rapid uptake of MPEG-7, as it is built on enabling technologies and standards.
- Data Exchange between Subsidiaries.
-

5. APPLICATION:-

- MPEG-7 will enable a New Generation of Multimedia Applications
- MPEG-7 uniquely provides comprehensive standardised multimedia description tools for content.
- Search Engines, Digital Libraries, Broadcast Networks, Entertainment and News Distributors, Streaming Businesses
- Dynamic start-up companies, searching for cutting edge technologies.
- MPEG-7 Intellectual Property and Management Protection
- MPEG-7 Makes Content More Valuable
- MPEG-7 provides a seamless path towards increasingly intelligent content management systems

ACKNOWLEDGMENT

The goal of this paper is to design the advanced multimedia and communication techniques using methods of **"MPEG-7 Multimedia technique"** which can be used easily in day to day life. The function has been realized successfully.

I want to give my whole sincere to my supervisor and grateful appreciation to my colleagues. They tried their best to help me. Without their help and guidance I cannot bring the theories into practice.

On the other hand, I want to thank all my family members and friends for their always support and spiritual motivation.

Thank you very much!

CONCLUSION

Since, we had studied the **MPEG-7 Multimedia technique.** We live in the age of convergence, from the level of production through to distribution and consumption. The technical hardware and communication infrastructure is evolving and will soon reach the point where computing and communications will become embedded in everyday objects and environments. Media will also then become ubiquitous. Ubiquitous media will create a huge demand for new content, and meeting this demand must involve fundamental changes to all stages of media production, management and delivery.

Media archives will become vast and interconnected pools of content, too large to be managed manually. Customization of content within programs, e.g. substitution of structural elements (characters, music, voices) according to viewer desires, content scaling for PDA, cell phones, will be not only possible, but easy and pleasant. MPEG-7 will enable the creation of tools, (through its structured combination of low level features and high-level meta-data), for coping with this "outbreak" of generic content.

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Development of a reliable and valid questionnaire considering Indian hospital's perspective of globalization of health in context to India

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Abstract— New opportunities and challenges has been created by liberalization of trade in healthcare sector specially in low and middle income group countries to provide effective and efficient healthcare services. Objective of this study was to develop a self administered questionnaire to address hospital's perspective of globalization of health in context to India. Attributes of Indian hospital's perspective in terms of globalization of health were derived from intensive interviews of managers of international wings of Indian hospitals, doctors treating international patients and through literature reviews to arrive at an item questionnaire. Each item was evaluated on a five point Likert scale so that higher scores indicated a more favorable response. 50 subjects were enrolled for this study. Their baseline scores were analyzed on the questionnaire and subjected to item analysis, validity and reliability testing. Based on the information meaningful items were retained and interpreted based on their statistical properties. Reliability of the questionnaire was calculated through cronbach's alpha using spss software version 20. Results shows that during item analysis sixteen items were discarded resulting in a valid and reliable questionnaire. Internal consistency of all the sections of the questionnaire together was 0.920 measured by cronbach's alpha with the help of spss software. Reliability coefficient of individual sections of questionnaire (different subscales) were also calculated and were 0.794 0.817, 0.651, 0.766 and 0.888 respectively. Guttman splithalf reliability coefficient was indicating that the two halves of the questionnaire provided consistent information. The Questionnaire underwent rigorous development, had reliable and valid properties. This questionnaire is intended to help in considering and measuring perspective of Indian hospitals catering to medical tourists about globalization of health.

Keywords— Reliability, validity, globalization, item analysis, internal consistency, questionnaire Guttman split half reliability coefficient.

1. INTRODUCTION

Healthcare industry is among one of the most rapidly growing industries in the world economy and is continuously faced by new issues and challenges. Healthcare systems have to respond to different challenges caused by cross border trade in delivery of health services through movement of healthcare service seekers, healthcare service providers and different collaborations and joint ventures [1,2]. Now a days cross border trade is considered to be one of the best ways to create and finance the additional resources for healthcare industry in the developing nations of the world [1].

New opportunities and challenges has been created by liberalization of trade in healthcare sector specially in low and middle income group countries to provide effective and efficient healthcare services [1].

The term Globalization is defined as the means of international interaction coming from the exchange of goods, products, people, views , and other aspects of culture [3,4]. Because of advancements in communication and transportation as well as internet facilities interdependence of different nations has increased manifold. It is defined as the system of interaction among the nations of the world so as to develop the global economy. Globalization refers to the interaction and integration of societies and economics all over the world [3]. Initially effects of globalization of health are generally not the primary focus of attention of economists [3]. But now globalization of health has led to a new area –Medical Tourism. Health and medical tourism has become a distinguished worldwide multibillion-dollar industry and India has emerged as a hub and hottest destination for medical tourism as Indian treatment and medical standards are comparable to those of international standards as in developed countries [4].

Globalization of health is defined as practice of travelling of people across the international boundaries in order to obtain healthcare services. It is also described as movement of people to different countries for getting medical services including important, elective or urgent medical procedures [2,3]. Patients from different parts of world like Bangladesh, Saudi Arabia, Pakistan, Canada, United States etc. are frequently coming to India for medical procedures [5]. Patients from United Kingdom who can't wait for medical procedures by National Health Service or can't afford private medical facilities owing to high costs choose to opt developing countries like India for treatment procedures. On other side becoming a medical tourist provides a chance to combine a good vacation with

elective medical procedures. Also patients from poorer countries where good treatment facilities are not available come to India for medical treatment [6,7]. But the hospitals in India where medical tourists come for different medical procedures need to be investigated.

This article reports the development of a self administered questionnaire whose items are customized to cover every aspect of hospital's perspective serving international patients in lieu of globalization of health in context to India. In order to identify & explore the attributes of Indian hospitals catering to medical tourists we undertook an item analysis on baseline responses of a questionnaire. Such an analysis may serve as good contributing factor for subsequent research in assessment of Indian hospitals perspective in lieu of globalization of health. Further the reliability of the questionnaire was checked through cronbach's alpha using spss software.

1.1 Aim **-**To develop a valid and reliable self administered questionnaire to address Indian hospitals perspective of globalization of health in context to India.

1.2 Objectives

The following objectives were formulated to realize the particular aim:

- To construct a conceptual framework for a self administered questionnaire in order to explore the relevant concepts addressing key issues which Indian hospitals encounter while catering to international patients.
- To elaborate and develop a pool of important potential questions based on information provided by experts in the area and through extensive survey of available literature.
- To formulate a preliminary questionnaire from the item pool of questions.
- To ensure proper reliability and validity of the questionnaire in order to further refine the questionnaire.
- To establish and construct a final valid and reliable questionnaire addressing key issues related to Indian Hospitals while treating international patients.

2. RESEARCH METHODS

A pilot study was done on five hospitals in NCR region in India and their perspective of globalization of health in context to India was calculated. The resulting questionnaire – Indian hospital's perspective of globalization of health in context to India consisted of 60 questions and responses to each item were based on Likert scale ranging from strongly agree to strongly disagree.

Responses of fifty subjects including managers of hospitals in NCR region serving medical tourists and doctors treating these patients were analyzed so that a higher item score indicated a more favorable attitude. Each of 60 items received equal weight when summed to arrive at a total score. The total score can therefore be as low as 60(least favorable) and as high as 300 (most favorable).

2.1 Questionnaire development

The questionnaire development process consisted of four steps

1. Preparation of scope and structure of questionnaire items
2. To elaborate the items of questionnaire
3. Development of a preliminary questionnaire
4. Pilot study for further evolution of preliminary questionnaire
5. Item analysis to refine the questionnaire
6. Reliability of the questionnaire

Step 1- Preparation of scope and structure of questionnaire items

Data was collected through extensive thorough and in depth interviews of managers of international wings and doctors of different hospitals in Delhi and NCR region as well as through intensive review of literature in order to have an in depth information about the different aspects a questionnaire. Data was also collected through interviews of the hospital staff dealing with international patients who had a deep understanding of different attributes of medical tourism industry.

Step 2 – To elaborate the items of questionnaire

Based on the information collected, content and items considering Indian hospital's perspective of globalization of health in context to India were identified on Likert scale which is a five point response scale ranging from strongly agree to strongly disagree and an item pool of 120 questions was generated. The initial item pool was further reduced to 80 items and only clear, specific, important and non redundant items were retained. Unambiguous and simple wording of responses and items were given importance and such items were included. Questionnaire items were developed in such a way that reliability and validity of questionnaire is established [8].

Content validity is described as systematic evaluation and examination of the test content to ensure if it covers a representative sample of behavior domain to be measured [9,10]. It refers to how well an instrument or a test measures what it is supposed to measure. The items of the questionnaire should cover essential and important aspects of strengths, weaknesses, opportunities and challenges of Indian medical tourism as per Indian hospital's perspective [9].

Face validity is defined as the relevance or transparency of a measuring instrument as they appear to test participants [9, 10]. In other words a measuring instrument or a test is said to have face validity if it looks like it will measure what it is supposed to measure [8]. People who are expert in the relevant area and with the target group are usually the best judges of face validity [9].

In order to ensure face validity and content validity of the questionnaire, the item pool was evaluated by four doctors and two managers of international wings of Artemis and Medanta Hospital Gurgaon having relevant experience in target field. They were requested to examine the questionnaire with item pool of 80 questions for accuracy, parsimony, appropriateness and relevance measuring the strengths, weaknesses, opportunities and challenges of globalization of health as per their perspective in reference to India. The experts selected 70 items from the item pool and these items became the first questionnaire draft and all questions were constructed on Likert scale. These 70 items were then evaluated again as a second evaluation by expert panel to further select the items of questionnaire for adequate coverage of all aspects of Indian medical tourism as per their perspective. After the second review by the expert panel some changes were made in some items and second draft of questionnaire consisted of 60 questions. Changes in the questionnaire included editing of some questions, removing and adding new questions.

Step 3 – Development of preliminary questionnaire

A self administered questionnaire was established comprising of 60 questions. The first page of the questionnaire included instructions for the completion of questionnaire and demographic details of respondents including name of doctor/manager, name of the hospital catering such patients. The 60 questions were put in random order within their respective sections in the questionnaire so as to avoid any biasness in numbering and positioning of items in the questionnaire.

Step 4 - Pilot study for further evolution of preliminary questionnaire

A pilot study was carried out to examine whether the questionnaire was compatible and appropriate in the target group i.e .the doctors, managers of international wing of hospitals, nurses and other hospital staff. 50 such subjects were selected from Apollo hospital New Delhi, Asian Hospital Faridabad, Medanta Medicity Gurgaon and Artemis Hospital Gurgaon to respond to different items of the questionnaire. The results were analyzed for internal consistency using spss software version 20 quantitatively and qualitatively by examining the respondent's comments on compatibility and interpretability of items, lack of important items and time used for completing the questionnaire.

Step 5 – Item analysis to refine the questionnaire

The aim of this step was to test the appropriateness of each item to be included in the questionnaire statistically known as item analysis. Item analysis includes-

Item difficulty index assessment – Kline suggests that the items are not considered to be useful if they are answered correctly by less than 20% or more than 80% of respondents [11,12] In this research 6 items were answered correctly by more than 80% of the respondents and 4 items by fewer than 30% of the respondents. So these ten items were removed from the questionnaire.

Item discrimination – It is the ability of each individual item to discriminate between the people having different knowledge levels and was measured by correlating the score on each item with overall test score using spss version 20. An item to total score correlation of 0.2 is said to be the cutoff point and the items less than 0.2 should be discarded [8,12,13]. Based on this criteria of item discrimination further five items were excluded from the questionnaire.

Step 6 - Reliability and of questionnaire

After fulfilling the validity part and performing item analysis, the questionnaire was evaluated to assess its reliability which is described as the ability of a questionnaire to measure the consistency of an item/attribute and how well the items correlate with each other and fit together, conceptually [9,14]

Internal consistency refers to the homogeneity of all the items of the questionnaire. This was measured by cronbach's alpha using spss software version 20. Cronbach α values range from 0 to 1and a score of 0.7 or higher is acceptable [10,13]. Cronbach alpha was calculated for the whole questionnaire i.e. entire scale and for the different sections of the questionnaire i.e. subscales.

SplitHalf reliability is measured by dividing the scale into two halves which may be first half of the questionnaire versus last half or odd items of the questionnaire versus even items of the questionnaire. Correlation is then carried out between the two halves of the questionnaire. A high correlation score shows that the two sets of the questionnaire have consistent information which means that if a subject scores high on one set of items he will also score high on second set of item[9,15]. This indicates that all the items of the questionnaire measure the same concept. This was measured using spss software version 20 for the questionnaire.

3. RESULTS

3.1 Content validity

A score of four or three on CV index indicates that the content is valid and is appropriate with the conceptual framework (Lynn 1996). For example, if three of five experts rate an item as relevant (4 or 5) the CVI would be 3/5=0.6, but the level required is 0.8 (4/5), and indicates that the item should be dropped [10]. Therefore, twelve items in the questionnaire were invalid because they yielded CVIs of 3/5=0.6 to 2/5=0.4 and were discarded from the questionnaire. Rest of the items were valid with CVIs ranging from 0.8 (4/5) to 1.00 (5/5) and were retained in the questionnaire.

3.2 Face validity

All the subjects rated each item at four or five on a Likert scale of 1-5. Ninety percent said they have understood all the questions thoroughly and found the questions easy to answer, and 95% indicated that the appearance and layout of the questionnaire would be appropriate with the intended target population thus assuring good face validity of the questionnaire.

3.3 Item analysis

In this process of development of questionnaire, 2 items were answered correctly by more than 80% of the respondents and 3 items by fewer than 30% of the respondents. So these five items were discarded from the questionnaire.

Item discrimination – It was measured by correlating the score on each item with overall test score using spss version 20. An item to total score correlation of 0.2 is said to be the cutoff point below which items should be discarded [12]. Based on this criteria further ten items were discarded and hence a questionnaire with 44 items was developed. (**Table 1,2** {1.1, 1.2, 1.3,2.1,2.2,2.3})

Table 1

Table 1.1 Case Processing Summary

Cases	Valid	49	98.0
	Excluded[a]	1	2.0
	Total	50	100.0

Table 1.2 Reliability Statistics

Cronbach's Alpha	N of Items
.871	60

Table 1.3 Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
admission process	190.20408	415.499	.457	.866
Infrastructure	190.55102	405.628	.654	.863
Coordination	190.38776	407.117	.615	.864
HR	189.91837	419.785	.335	.868
Confidentiality	189.83673	416.223	.478	.866
Counseling	189.67347	419.849	.423	.867
pickup facility	191.91837	416.410	.369	.867

Staff	189.87755	428.818	**.133**	.871
online diagnosis	191.04082	421.915	.215	.870
proper attn.	191.16327	437.598	**-.113**	.875
lack of hospitality	191.81633	423.986	.216	.870
daycare staff	190.16327	429.598	**.066**	.872
sensitive staff	189.89796	415.427	.425	.867
information sharing	190.51020	411.547	.443	.866
handle complications	190.32653	412.641	.422	.867
pharma sector	190.63265	419.279	.286	.869
communication skills	190.81633	413.195	.504	.866
skilled clinicians	190.38776	430.367	**.072**	.871
Availability	191.32653	427.849	**.087**	.872
knowledgeful staff	191.04082	429.415	**.058**	.873
Interpreter	190.20408	415.499	.457	.866
Linguistic	190.55102	405.628	.654	.863
selectronic transfer	190.38776	407.117	.615	.864
Revenue	189.91837	419.785	.335	.868
Accommodation	189.83673	416.223	.478	.866
dietary services	189.67347	419.849	.423	.867
palatable food	191.91837	416.410	.369	.867
exclusive wing	189.87755	428.818	**.133**	.871
Quality	191.04082	421.915	.215	.870
online counseling	191.16327	437.598	**-.113**	.875
healthcare policies	191.81633	423.986	.216	.870
medical treatment	190.16327	429.598	**.066**	.872
Cost	189.89796	415.427	.425	.867
trained staff	190.51020	411.547	.443	.866
Technology	190.32653	412.641	.422	.867
services at par	190.81633	413.195	.504	.866
gold seal	190.38776	430.367	**.072**	.871
technocentric approach	191.32653	427.849	**.087**	.872
provision of wings	191.04082	429.415	**.058**	.873
sudden boom	190.32653	412.641	.422	.867
superior medical care	190.63265	419.279	.286	.869
national health policy	190.81633	413.195	.504	.866
security hassles	190.38776	430.367	**.072**	.871
business strategies	191.32653	427.849	**.087**	.872
brain drain	192.32653	424.391	.250	.869
Competition	191.34694	458.231	**-.519**	.882
economic recession	191.40816	422.622	.294	.869
Obama	191.53061	415.421	.466	.866
overseas govt	191.71429	417.583	.308	.868
medico legal security	191.24490	410.314	.513	.865
political stability	191.79592	412.541	.463	.866
Africa	191.00000	434.833	**-.053**	.875
Insurance	191.73469	418.616	.384	.867
medical visa	191.81633	411.736	.529	.865
Government	191.00000	427.667	.164	.870
tourist destinations	191.77551	414.136	.513	.866
travel agencies	191.53061	415.421	.466	.866
training program	191.71429	417.583	.308	.868
CME	191.24490	410.314	.513	.865
disease spread	191.79592	412.541	.463	.866

Spss output for item analysis for 60 item questionnaire (corrected interitem correlation values). Values less than 0.2 were discarded

Table 2

Table 2.1 Case processing summary

		N	%
Cases	Valid	50	100.0
	Excluded[a]	0	.0
	Total	50	100.0

Table 2.2 Reliability Statistics

Cronbach's Alpha	N of Items
.919	44

Table 2.3 Item-Total Statistics

	scale mean if item deleted	scale variance if item deleted	corrected item-total correlation	cronbach's alpha if item deleted
admission process	136.72000	412.900	.496	.916
Infrastructure	137.06000	404.792	.647	.915
Coordination	136.90000	404.704	.649	.915
HR	136.44000	414.823	.435	.917
Confidentiality	136.36000	412.153	.564	.916
Counseling	136.20000	419.673	.387	.917
pickup facility	138.40000	414.816	.367	.918
online diagnosis	137.56000	418.374	.264	.919
lack of hospitality	138.32000	423.528	.195	.919
sensitive staff	136.44000	416.415	.365	.918
information sharing	137.02000	409.122	.471	.916
handle complications	136.84000	412.300	.405	.917
pharma sector	137.16000	422.056	.197	.920
communication skills	137.34000	413.413	.468	.917
Interpreter	136.72000	412.900	.496	.916
Linguistic	137.06000	404.792	.647	.915
selectronic transfer	136.90000	404.704	.649	.915
Revenue	136.44000	414.823	.435	.917
Accommodation	136.36000	412.153	.564	.916
dietary services	136.20000	419.673	.387	.917
palatable food	138.40000	414.816	.367	.918
Quality	137.56000	418.374	.264	.919
healthcare policies	138.32000	423.528	.195	.919
Cost	136.44000	416.415	.365	.918
trained staff	137.02000	409.122	.471	.916
Technology	136.84000	412.300	.405	.917
services at par	137.34000	413.413	.468	.917
sudden boom	136.84000	412.300	.405	.917
superior medical care	137.16000	422.056	.197	.920
national health policy	137.34000	413.413	.468	.917
brain drain	138.84000	422.831	.258	.918
economic recession	137.96000	416.856	.409	.917
Obama	138.06000	410.711	.563	.916
overseas govt	138.26000	413.788	.359	.918
medico legal security	137.78000	404.379	.625	.915

political stability	138.34000	409.576	.499	.916
Insurance	138.26000	416.564	.407	.917
medical visa	138.36000	407.011	.613	.915
Government	137.50000	424.255	.227	.919
tourist destinations	138.30000	410.214	.592	.915
travel agencies	138.06000	410.711	.563	.916
training program	138.26000	413.788	.359	.918
CME	137.78000	404.379	.625	.915
disease spread	138.34000	409.576	.499	.916

3.4 Internal Reliability of questionnaire

After item analysis reliability coefficient was calculated for the questionnaire through cronbach's alpha with spss version 20 and was 0.919 which indicates a high correlation between different items of the questionnaire and is reliable consistently. Now the questionnaire consisted of 44 items (Table 2,). Further two items were removed from the questionnaire on the basis of spss results cronbach's alpha if item deleted. This further increased the reliability coefficient to 0.920 which is considered to be a very good and ideal alpha value for the questionnaire in terms of reliability and a questionnaire with 42 items was developed (Table 3 {3.1, 3.2}). Reliability coefficient of different subscales or individual sections of questionnaire were also calculated. For section with nine items i.e Professionalism in management of hospital alpha was 0.794. For second section i.e Competence of Doctors and staff alpha was 0.817, for third section i.e Facilitation and care alpha calculated was 0.651. Similarly for fourth and fifth Cost and quality of treatment and Political and legal factors cronbach's alpha values were 0.766 and 0.888 **(**Table 4).

TABLE 3

Table 3.1

Cronbach's alpha	No. of items
0.920	42

Table 3.2 **Item-Total Statistics**

	scale mean if item deleted	scale variance if item deleted	corrected item-total correlation	cronbach's alpha if item deleted
admission process	130.18000	394.885	.507	.917
Infrastructure	130.52000	386.785	.662	.915
Coordination	130.36000	386.439	.670	.915
Hr	129.90000	396.908	.442	.918
Confidentiality	129.82000	394.232	.573	.917
Counseling	129.66000	401.413	.404	.918
pickup facility	131.86000	396.531	.381	.919
online diagnosis	131.02000	400.673	.263	.920
lack of hospitality	131.78000	405.440	.201	.920
sensitive staff	129.90000	399.357	.348	.919
information sharing	130.48000	392.500	.450	.918
handle complications	130.30000	395.276	.391	.919
pharma sector	130.62000	406.649	.142	.921
communication skills	130.80000	396.041	.460	.918
Interpreter	130.18000	394.885	.507	.917
Linguistic	130.52000	386.785	.662	.915
selectronic transfer	130.36000	386.439	.670	.915
Revenue	129.90000	396.908	.442	.918
Accommodation	129.82000	394.232	.573	.917

dietary services	129.66000	401.413	.404	.918
Quality	131.02000	400.673	.263	.920
healthcare policies	131.78000	405.440	.201	.920
Cost	129.90000	399.357	.348	.919
trained staff	130.48000	392.500	.450	.918
Technology	130.30000	395.276	.391	.919
services at par	130.80000	396.041	.460	.918
sudden boom	130.30000	395.276	.391	.919
national health policy	130.80000	396.041	.460	.918
brain drain	132.30000	404.827	.264	.919
economic recession	131.42000	399.024	.413	.918
Obama	131.52000	393.479	.553	.917
overseas govt	131.72000	395.879	.364	.919
medico legal security	131.24000	386.839	.628	.916
political stability	131.80000	391.633	.509	.917
Insurance	131.72000	398.777	.410	.918
medical visa	131.82000	389.375	.617	.916
tourist destinations	131.76000	392.594	.593	.916
travel agencies	131.52000	393.479	.553	.917
training program	131.72000	395.879	.364	.919
CME	131.24000	386.839	.628	.916
disease spread	131.80000	391.633	.509	.917
palatable food	131.86000	396.531	.381	.919

Table 4. Reliability Statistics for subscales of questionnaire measuring Indian hospital's perspective of globalization of health

	SUBSCALES	**NO. OF ITEMS IN SUBSCALE**	**CRONBACH'S ALPHA**
	Professionalism in management of hospital	9	0.794
	Competence of doctors and staff	5	0.817
	Facilitation and care	7	0.651
	Cost and quality of treatment	8	0.766
	Political, economic & legal factors	13	0.888

3.5 Split half reliability of the questionnaire:

Correlation between two halves for the questionnaire measuring Indian hospitals perspective of globalization of health was 0.657 which indicates high degree of correlation between two halves of the questionnaire. Spearman-Brown coefficient calculated was 0.793 and Guttman Split half coefficient was 0.790 indicating that the two halves of the questionnaire provided consistent information (Table 5).

Table 5. Split half reliability of the questionnaire measuring Indian hospitals perspective of globalization of health

Reliability Statistics

Cronbach's Alpha	Part 1	Value	.864
		N of Items	21[a]
	Part 2	Value	.809
		N of Items	21[b]
	Total N of Items		42
Correlation Between Forms			.657
Spearman-Brown Coefficient	Equal Length		.793
	Unequal Length		.793
Guttman Split-Half Coefficient			.790

4. DISCUSSION

In this study, specific and careful attention was paid to the development of questionnaire addressing Indian hospital's perspective of globalization of health in context to India. Main emphasis and priority during the whole study was to ensure reliability and validity of the questionnaire. Every draft of the questionnaire was thoroughly reviewed by panel of experts in order to ensure content and face validity of the questionnaire and to select best items in terms of clarity, accuracy and representativeness of items. Certain items were removed and some new items were added to the questionnaire depending upon the opinions and recommendations of the experts. In this study proper and adequate emphasis was laid to ensure face validity of questionnaire which was done by including and analyzing the discussion of all items and answers with experts and the respondents so that they can comment thoroughly on design and impact of questionnaire. Face validity helped in providing important concepts about operationalization of the questionnaire by experts from Indian hospitals catering to medical tourists. Content validity indicated the information that content of the questionnaire was relevant to the concept of globalization in context to India. The questionnaire was divided into five sections which provide the opportunity to assess both the general and more specific information regarding globalization of health in Indian context. Internal consistency for the questionnaire was calculated in two ways: Cronbach's alpha and split half reliability.5Cronbach's alpha was calculated for the questionnaire and it was 0.920 which indicates that there exists a high correlation between different items of the questionnaire and the questionnaire is considered to be consistently reliable. There are different views about ideal Cronbach's alpha value. One opinion is that for the instruments which are used in clinical settings cronbach's alpha should be at least 0.90 [14] Other opinion is that an alpha of 0.70 is acceptable for the new instrument [15]. In this study, alpha calculated for the entire questionnaire was 0.920 which is pretty good for new measuring instrument. If a measuring instrument consists of two or more than two subscales alpha should be calculated for the entire scale as well as for the subscales [14]. Since the questionnaire possesses five subscales and therefore Cronbach's alpha was calculated for the five subscales. Alpha calculated for four subscales were more than 0.7 but for subscale three i.e Facilitation and care alpha was found to be 0.651 which did not meet the score of 0.7 but was close to specified value and was retained for the sake of content validity after consultation with experts. Internal consistency was highest for fifth section i.e 0.888 and also for overall scale (0.920). Retaining questions that did not meet the internal consistency criteria for the sake of content validity can influence consistency of the questionnaire and statistical result but expert panel was of the opinion that it is important to retain these items in order to test the essentials components of the questionnaire. Guttman split half coefficient with spss software was used to calculate split half reliability of the questionnaire which was 0.790 indicating that the two halves of the questionnaire provided consistent & stable information. Correlation score between the two halves of the questionnaire was calculated to be 0.657 which was a good correlation score indicating that there existed a moderate degree of correlation between the two halves of the questionnaire [9].

5. CONCLUSION AND IMPLICATIONS

This questionnaire has been designed to assess the attitude of Indian hospital's catering to medical tourists addressing their perspective towards globalization of health in context to India. It was designed to find out the reasons why hospitals in India are favorable choice for international patients as a destination for various medical procedures, what are the strengths of Indian medical tourism sector, what are the opportunities available in India as far as medical tourism is concerned, what are the weaknesses of Indian medical tourism and what can be the challenges India is facing in this sector. This questionnaire possesses good content and face validities, excellent reliability and therefore it should provide an important and useful tool for measuring Indian hospitals perspective towards globalization of health. In order to add more strength to the rigor of the questionnaire for future research, it is recommended

that convergent and discriminant validity can be calculated to evaluate the similarities and differences of questionnaire with other available tools measuring identical concepts. Confirmatory factor analysis can be done to add to the generalizability of the questionnaire. However we believe that this questionnaire is a valid and reliable tool to measure the perspective of Indian hospitals catering to medical tourists coming to India for medical procedures.

QUESTIONNAIRE

GLOBALIZATION OF HEALTH

(Hospital Perspective)

Consultant's / Manager's name-

Hospital name-

Address-

Phone no.-

Section -1

Professionalism in management of hospital

1. Admission process for international patients coming to India for treatment is swift & easy in hospitals.

Strongly Disagree Disagree Undecided Agree Strongly Agree

2. Proper attention is paid to needs of international patients in hospitals in India.

Strongly Disagree Disagree Undecided Agree Strongly Agree

3. There is good coordination between different wards & departments treating the international patients.

Strongly Disagree Disagree Undecided Agree Strongly Agree

4. Human resources in India is biggest strength and growth driver for MT.

Strongly Disagree Disagree Undecided Agree Strongly Agree

5. Good counseling facility is provided to international patients on arrival to hospitals in India.

Strongly Disagree Disagree Undecided Agree Strongly Agree

6. Proper pick up facility is provided to the international patients from airport to the concerned hospital.

Strongly Disagree Disagree Undecided Agree Strongly Agree

7. Assurance of confidentiality is provided to the international patients in Indian hospitals.

Strongly Disagree Disagree Undecided Agree Strongly Agree

8. Indian hospitals provide facilities of online diagnosis especially for post care and future consultation.

Strongly Disagree Disagree Undecided Agree Strongly Agree

Section-2

Competence of Doctors and staff

1. Staff recruited for international patients in hospitals is sensitive to patients needs and is quick & responsive.

Strongly Disagree Disagree Undecided Agree Strongly Agree

2. Knowledgeable and skillful nursing staff is present in Indian hospitals for international patients.

Strongly Disagree Disagree Undecided Agree Strongly Agree

3. Indian doctors and clinical staff possess ability to handle serious medical complications.

Strongly Disagree Disagree Undecided Agree Strongly Agree

4. Hospitals in India have strong Pharma sector with worldwide recognition.

Strongly Disagree Disagree Undecided Agree Strongly Agree

5. Doctors in Indian hospitals are willing to share information as and when required by international patients.

Strongly Disagree Disagree Undecided Agree Strongly Agree

Section-3

Facilitation and care

1. Translator/interpreter facility is readily available in hospitals in India.

Strongly Disagree Disagree Undecided Agree Strongly Agree

2. Linguistic abilities of doctors and other clinical staff is compatible with international patients.

Strongly Disagree Disagree Undecided Agree Strongly Agree

3. Indian hospitals provide good accommodation facilities for international patients and their companions.

Strongly Disagree Disagree Undecided Agree Strongly Agree

4. Provision of special dietary services is there in hospitals in India for medical tourists.

Strongly Disagree Disagree Undecided Agree Strongly Agree

5. Hospitals in India provide the facility of electronic transfer of Medical records to & from the perspective medical tourist.

Strongly Disagree Disagree Undecided Agree Strongly Agree

Section-4

Cost and quality of treatment

1. Globalization has an impact on heath care policies and revenue in hospitals in India.

Strongly Disagree Disagree Undecided Agree Strongly Agree

2. Cost for various medical procedures is lower in India than those of developed countries.

. Strongly Disagree Disagree Undecided Agree Strongly Agree

3. Best quality medical treatment is available in India compatible to those of developed countries.

Strongly Disagree Disagree Undecided Agree Strongly Agree

4. Best technology and quality equipment is available in Indian hospitals which is compatible to those of developed countries.

Strongly Disagree Disagree Undecided Agree Strongly Agree

5. Infrastructure of Indian hospitals is at par with that of developed countries.

Strongly Disagree Disagree Undecided Agree Strongly Agree

6. Indian hospitals are adapting techno-centric approach to healthcare.

Strongly Disagree Disagree Undecided Agree Strongly Agree

7. Superior quality reasonable priced medical care with abundant human resources and tourist destinations is major key drive for medical tourist industry.

Strongly Disagree Disagree Undecided Agree Strongly Agree

Section-5

Political and legal factors

1. Medico legal security is provided to medical tourists in India if a post operative complication develops upon to departure to patients of India.

Strongly Disagree Disagree Undecided Agree Strongly Agree

2. Hospitals in India have agreement in India with medical insurance companies and government over seas

Strongly Disagree Disagree Undecided Agree Strongly Agree

3. Due to public sector inequality there is a brain drain of medical tourist from public to private hospitals.

Strongly Disagree Disagree Undecided Agree Strongly Agree

4. Indian government is taking adequate steps to promote MT.

Strongly Disagree Disagree Undecided Agree Strongly Agree

5. Recent economic recession is a boon for Medical tourism industry.

Strongly Disagree Disagree Undecided Agree Strongly Agree

6. Recent economic recession is a bane for Medical tourism industry.

Strongly Disagree Disagree Undecided Agree Strongly Agree

7. Security hassles from countries like Pakistan are faced by Medical tourists.

Strongly Disagree Disagree Undecided Agree Strongly Agree

8. Political stability in India is a key growth driver for medical tourists.

Strongly Disagree Disagree Undecided Agree Strongly Agree

9. Tourist from Africa and Middle East are maximum in number visiting India for Medical tourism.

Strongly Disagree Disagree Undecided Agree Strongly Agree

10. Severe competitions among hospitals in India is biggest challenge for medical tourists.

Strongly Disagree Disagree Undecided Agree Strongly Agree

11. Good tourist destinations for recreation in India is a boon for medical tourist industry.

Strongly Disagree Disagree Undecided Agree Strongly Agree

12. Hospitals have tie ups with travel agencies for interests of international patients.

Strongly Disagree Disagree Undecided Agree Strongly Agree

13. A structured training program is required in medical tourism sector to better handle international patients & their issues.

Strongly Disagree Disagree Undecided Agree Strongly Agree

14. CMEs, conferences on globalization of health help in booming Medical tourist industry.

Strongly Disagree Disagree Undecided Agree Strongly Agree

15. There are increased chances of spread of non communicable diseases as a result of globalization of health.

Strongly Disagree Disagree Undecided Agree Strongly Agree

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TARGET MOTION ANALYSIS AND TRACKING TECHNIQUE FOR AN AUTONOMOUS MOBILE ROBOT

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Abstract— This paper reviews and deals with the various methods for tracking a single manuevering ground based target using data collected by the sensors on a wheeled mobile robot. Navigation towards a moving goal, tracking, and interception of moving targets using wheeled mobile robots is an important field in robotics. It is a real-time problem combining different aspects such as how accurately the robot can estimate its own motion, the predictability of the object's motion, the accuracy of the sensors being used. There exist mainly two families of methods used to solve this problem; namely feature-based methods and model-based methods. Model-based methods require building a model of the tracked object. Feature-based methods track features such as color, shape, etc. These applications require efficient and low computational cost path planning algorithms**.** Different methods are discussed in this paper for: Estimation and Prediction of the target's position from noisy sensory measurements, motion control of the tracker to track the moving object. The Kalman filter is used to provide the mathematical basis for this process.

Keywords— Line of sight guidance law, Pursuit tracking mode, Intercept tracking mode, Kalman filter (KF), Line of sight angle (LOSA), Manuevering, Range

INTRODUCTION

One of the major challenges in the field of mobile robotics is the detection and tracking of moving objects from a moving observer. Difficulty is especially when the trajectory and speed of the moving target are unknown and dynamically changing. The target-tracking is progressively gaining importance for security, surveillance and defence applications in forms of 'following' or 'intercepting' the target. In dynamic and highly populated environments, the tracking process presents a complex and computationally difficult task. It emphasizes with subproblems such as robot's relative motion compensation and target's state vector estimation. So as to robustly track the moving object around a robot, in general, it is necessary to address four issues: the estimation of the variables of interest of the tracked target (position, velocity,...), the data association problem, the estimation of the motion of the robot platform and the detection of moving features from the observations provided by the sensors. The solution to the above estimation problem can be based on the use of a Kalman filter to predict the next state of target object.

LITERATURE SURVEY

I Ullah et al (2012) presented an algorithm to maintain a distance between the robot and the object[12]. It keeps the autonomous mobile robot at a safe distance from the object. The surrounding information is obtained through the range sensors that are mounted at the front side of the robot. The central sensor provides instructions for the forward and backward motion, and the other sensors (two ultrasonic sensors) help for the left and right motion.

K Rameshbabu et al (2012) discussed the use of kalman filter for target tracking[13]. Though the KF can be used to predict the path of a moving target, the applications of the filter can also be useful in calculating the path of interception. To do so it requires:

a) Calculating the position and velocity of the target.

b) Projecting its path, and then

c) Computing the angle of interception for the designated course.

JL Crowley (1995) described techniques for autonomous navigation[1]. Odometry is the process of estimating one's current position based upon a previously determined position, or fix, and advancing that position based upon known or estimated speeds over elapsed time, and course. Perception is defined as the process of maintaining of an internal description of the external environment. Perception serves two fundamentally important roles for navigation: Detection of the limits to free space, and Position estimation. The theoretical foundations for perception is provided by estimation theory. This approach leads to a framework for perception based on a cycle of predict-match-update. The basis for this cycle is provided by the Kalman Filter.

L Sung-On et al (2000) discussed about a model based approach, where Lyapunov theory is used to derive a stable control law to accomplish the task of tracking a moving target using a unicycle mobile robot[3]. A new global asymptotic stable controller for this problem is designed using backstepping method. The goal is to design a controller that makes the mobile robot follow the target object

smoothly keeping a certain distance from the target with its front part toward the target. By applying control laws into the control inputs (v,ω) of lyapunov function, we can conclude that variable r and ϕ asymptotically converge to zero practically. Construction of Lyapunov functions is difficult in Lyapunov theory-based tracking method.

F Capparellaet al (2005) presented a vision-based scheme for driving a nonholonomic mobile robot to intercept a moving target[6]. The robot is equipped with an on-board camera mounted on a pan-tilt platform. The Method relies on a two-level approach: The pan-tilt platform which carries the on-board camera is controlled so as to keep the target at the centre of the image plane. The robot operates under the assumption that the camera system achieves perfect tracking. In particular, the relative position of the ball is retrieved from the pan/tilt angles through simple geometry, and used to compute a control law driving the robot to the target.

TM Chenet al (2000) discussed the target tracking based on fuzzy logic[4]. Presents a hierarchical grey-fuzzy motion decision-making (HGFMD) algorithm, which is capable of integrating multiple sequential data for decision making and for the design of the control kernel of the target tracking system. GFMD algorithm works by combining an adaptive grey-theory-based position predictor and a look-ahead fuzzy logic controller. The HGFMD algorithm: Combines multiple grey prediction modules. Each of the modules can on-line estimate the suitable model from sequential sensory information. Hence can approximate the observed dynamic system model for future-trend prediction, and for decision making through a multilayered fuzzy logic inference engine.

L Huang (2009) discussed a potential field method used for velocity and path planning for a mobile robot to track a moving target[10]. The robot's planned velocity is determined by relative velocities as well as relative positions among robot and target.

Ian R Manchester et al (2008) presented a vision-based wheeled-robot navigation technique, for the interception of a moving target from a specific approach angle (σ), relative to the target's heading angle[8]. The proposed technique is termed as circular navigation guidance (CNG) which is reflexive in nature. The guidance law is not split into path-planning and path-following stages, but is continuously updated based on immediately available information, making it useful against a maneuvering target. Some of the advantages is that, navigation law is reflexive in nature, hence responds to immediately available information and the robustness of the guidance law to the numerous measurements and actuation errors.

Q Zhu et al (2013) presented a new moving target interception algorithm in which the robot can intercept such a target by following many short straight line trajectories[15].

In the algorithm: An intercept point is first forecasted assuming that the robot and the target both move along straight line trajectories. The robot rapidly plans a navigation path to this projected intercept point by using the new ant algorithm. The robot walks along the planned path while continuously monitoring the target. When the robot detects that the target has moved to a new grid it will re-forecast the intercept point and re-plan the navigation path. This process will be repeated until the robot has intercepted the moving target

F Belkhouche et al (2006) discussed about the tracking and interception of an object moving with unknown maneuvers by a wheeled mobile robot based on line-of-sight navigation technique[7]. He provided a method consisting of the proportional navigation law, which is a closed loop control law. The strategy combines geometrical rules with the kinematics equations. The principle of guidance strategy is to make the robot heading towards the moving target at any time. Thus robot's angular velocity is made equal to the rate of turn of the line of sight angle. In the algorithm, the control strategy is divided into two phases, namely: Heading regulation and Tracking. Heading regulation is performed in order to put the linear velocity of robot on the line of sight joining the robot reference point and the moving target. The aim of tracking control is to null the line of sight angle. The interception of the moving target is accomplished when the robot is faster than the moving target.

PROBLEM FORMULATION

Navigation towards a moving goal, tracking, and interception of moving objects using wheeled mobile robots is an important field in robotics. Various types of applications may benefit from this field such as autonomous surveillance, where the robot aims to track a moving object and keep it in a surveillance zone. This problem is a real-time problem combining different aspects.

The proposed target-tracking is realized with two mobile robots and sensors, where one robot acts as a moving target and the other plays the role of a tracker. The target robot is controlled remotely, while the autonomous tracker robot has to predict the motion of the target and plan its trajectory to track the target path. Thus objective is to perform:-

a) Estimation and Prediction of the target's position from noisy sensory measurements
b) Motion control of the tracker robot to track the moving target.

Model-based strategy used for this purpose consists of the proportional navigation law. Control strategy is adapted from the line of sight guidance law. This strategy belongs to the family of classical guidance laws, which are based on the integration of the kinematics equations with geometric rules. This method is computationally efficient and robust

The use of a Kalman filter as the basis for a virtual vehicle controller makes it possible to correct errors in odometric position using external perception. Thus, tracker robot carry out real time target position measurements using multisensors and autonomously maneuver its motion towards the predicted location of the moving target.

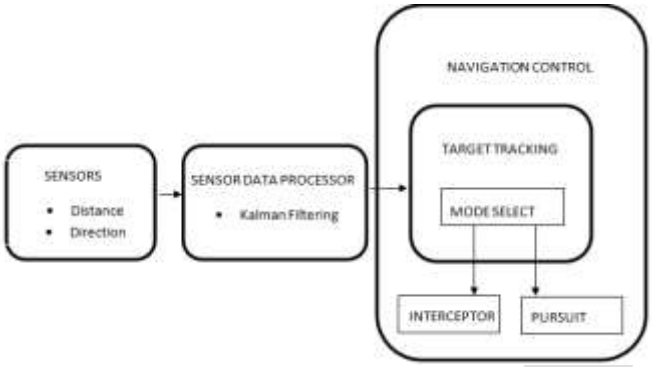

Figure 1: Target Tracking Block Diagram

TRACKING NAVIGATION OF A MOVING TARGET

The robot and the moving goal move in the horizontal plane. The goal maneuvers are not a priori known to the robot. The aim is to design a closed-loop control law for the robot steering angle, which ensures the selected target tracking mode. In the pursuit mode, the robot follows the target imitating its path by maintaining a constant range. In the intercept mode, the robot is made to reach the moving target and thus intercepting its movement.

For tracking, it is assumed that the following conditions are satisfied.

a) There are no obstacles considered in the operating region.
b) The goal moves in a smooth path.
c) The minimum turning radius of the robot is smaller than the minimum turning radius of the moving goal.
d) The robot has a sensory system, which provides the control system with the necessary information about the target and the environment.

In addition to these four assumptions there is a velocity constraint followed for each mode.

For pursuit mode:

e) The robot is having the same velocity as that of the moving goal, once the constant range is attained between target and robot.

For intercept mode:

e) The robot is faster than the moving goal, for reaching the moving target.

The target's speed, orientation, and position are not exactly known, but can be measured and estimated using a Kalman filter.

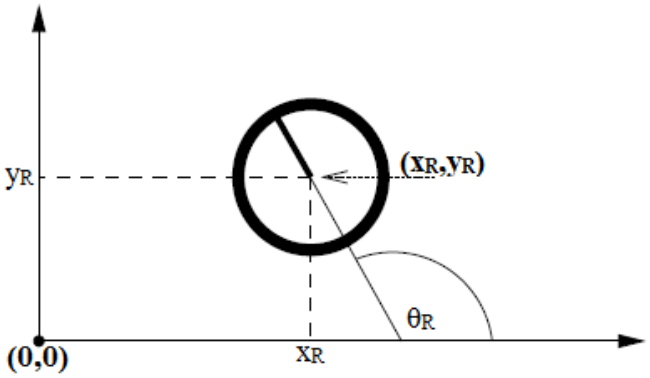

Figure 2: State space diagram for an odometric system

Point O (0,0) is the origin of an inertial reference frame of coordinates. The robot is a wheeled mobile robot with the following kinematics.

$$X_R = V_R \cos\theta_R \quad (1)$$
$$Y_R = V_R \sin\theta_R \quad (2)$$
$$\theta_R = \omega_R \quad (3)$$

where (x_R, y_R) represent the position of the robot's reference point in the inertial frame of reference, θ_R is the robot's orientation angle. v_R and ω_R represent the linear and angular velocities of the robot, respectively. The state of the robot is characterized by $s_R = [x_R, y_R, \theta_R]^T$. The state has a Gaussian distribution with mean value $\hat{S}_G = [\hat{x}_G, \hat{y}_G, \hat{\theta}_G]^T$ and covariance matrix C_R. The goal moves according to the following kinematics equations

$$X_G = V_G \cos\theta_G \quad (4)$$
$$Y_G = V_G \sin\theta_G \quad (5)$$
$$\theta_G = \omega_G \quad (6)$$

where (x_G, y_G) represent the position of the goal in the inertial frame of reference, θ_G is the goal's orientation angle. v_G is the goal's linear velocity. The state of the goal is characterized by $S_G = [x_G, y_G, \theta_G]^T$. A Gaussian distribution is assumed for the state, with mean value $\hat{S}_G = [\hat{x}_G, \hat{y}_G, \hat{\theta}_G]^T$ and covariance matrix C_G.

The geometrical representation of the target and robot coordinates is shown above. The orientation angle of the robot is relative to that of the target and it is represented by Ψ. The line of sight angle, Ψ is the angle between the normal and the line of sight. Line of sight is the line joining target and the robot. Range is the distance between robot and target, r_{GR}. The following equations show the implementation of the linear navigation law that depicts motion of robot with respect to a moving target. The relative velocity between the target and the robot is given by :

$$\dot{X_{GR}} = V_G \cos\theta_G - V_R \cos\theta_R \quad (7)$$
$$\dot{Y_{GR}} = V_G \sin\theta_G - V_R \sin\theta_R \quad (8)$$

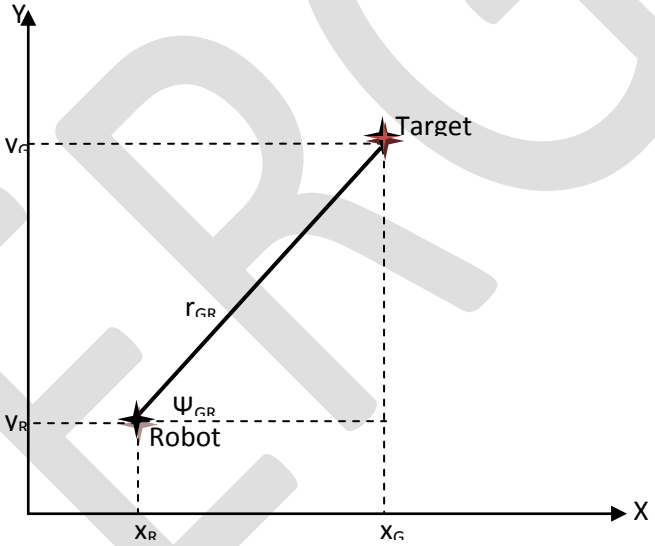

Figure 3: Geometrical representation of robot/target positions

The orientation angle between the robot and the target is given by:

$$\tan\psi_{GR} = \frac{Y_G - Y_R}{X_G - X_R} \quad (9)$$

The distance between the tracker robot and the target is given by range:

$$r_{GR} = \sqrt{(Y_G - Y_R)^2 + (X_G - X_R)^2} \quad (10)$$

The onboard sensory system returns value for Ψ_{GR} and r_{GR}. These observation or measurement values are corrupted by noise which is Gaussian with zero mean. Thus, if v1 and v2 are both measurement noise components the equations for Ψ_{GR} and r_{GR} can be written as follows:

$$\psi_{GR} = a\tan 2\left(\frac{Y_G - Y_R}{X_G - X_R}\right) + V_1 \quad (11)$$
$$r_{GR} = \sqrt{(Y_G - Y_R)^2 + (X_G - X_R)^2} + V_2 \quad (12)$$

To perform the simulation, following equations are evaluated:

$$x_{GR} = r_{GR} \cos \psi_{GR} \quad (13)$$
$$y_{GR} = r_{GR} \sin \psi_{GR} \quad (14)$$

The other contribution of this paper consists of suggesting a solution to the navigation-tracking problem using the linear navigation law. In this formulation, the navigation law is defined in terms of the orientation angle or the angular velocity, which is more suitable for robotics applications. This formulation allows an easy integration between the navigation--tracking modes. The integration is accomplished by tuning the control variables of the proportional navigation law. The aim of the navigation law is to make the robot angular velocity proportional to the rate of turn of the angle of the line of sight robot-goal.

Thus by controlling the steering angle of robot, target tracking can be achieved. For pursuit mode, the robot heading is set to the target steering at each time step. Error free values of target heading is required for stable tracking. For intercept mode, the robot heading at each time step is set to the predicted line of sight angle . This requires the prediction of future target states along with error free sensor measurement data.

SIMULATION RESULTS

Simulation experiments were performed using Matlab tool. Experiments were conducted for both cases of tracking considering different initial robot and target positions. Robot and target path for each case is shown in green and red colors.

For the target tracking in pursuit mode, the robot heading is set to the target heading at each time step. The robot position at each time step is obtained from kinematic equations by using the new robot heading and velocity values.

For simulation, the target heading is varied by adding a random number generated to the initial heading at each time step. Robot heading is set to this target heading for following target's path. The velocity of the robot, Vr is also varied to attain the pursuit range which is set to a constant value.

The figures below shows the simulated outputs for pursuit mode tracking operation with different initial positions of target and robot.

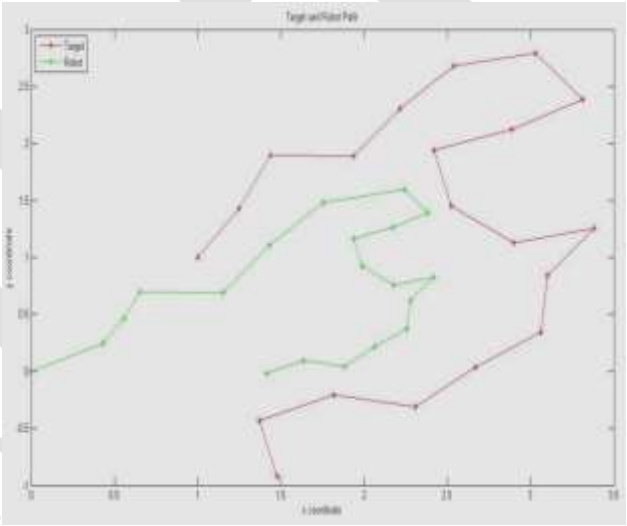

Figure 4:Pursuit tracking simulation1

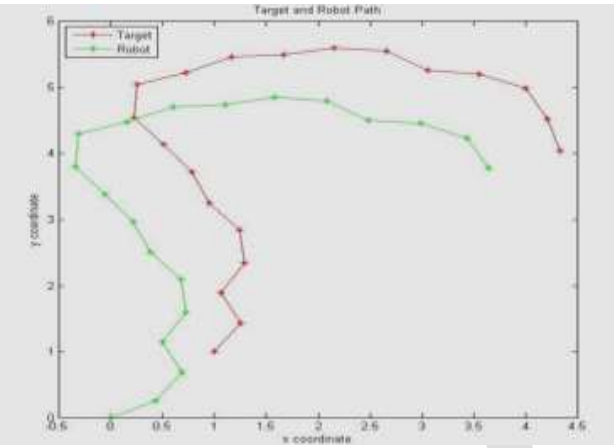

Figure 5:Pursuit tracking simulation2

For the target tracking in intercept mode, the robot heading is set to the line of sight angle at each time step. This line of sight angle is the angle made by the normal and line joining robot current position and target future position. The robot position at each time step is obtained from kinematic equations by using this new robot heading and velocity values. It is found that for interception to occur the robot should move faster than the target.

For simulation, the target heading is made to move linearly, by setting a velocity and heading value. The target path is formulated by using kinematic equations. Line of sight angle (LOSA) and range is calculated at each time step. Robot heading is set to this calculated LOSA for reaching the target's path. For establishing the target interception, two conditions are checked:-

a) whether the intercept range is attained?

b) whether the robot is in front of target?

The intercept range is selected to be zero or close to zero value. Interception operation was simulated for various cases of robot and target positions.

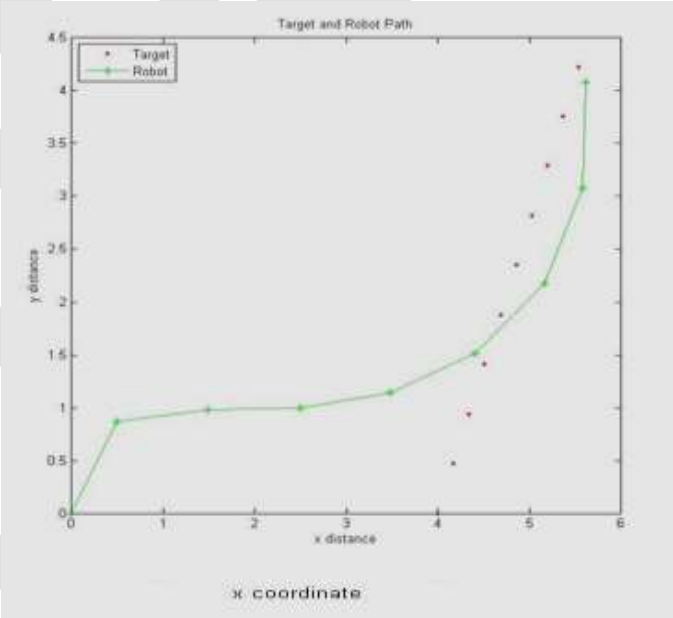

Figure 6:Intercept tracking simulation1

In Interception case1 simulation, initial conditions were:- Vr=2,Vt=1, initial robot position (xr,yr) =(0,0), initial robot heading or(1)=30˚, initial target position (xtar,ytar)=(4,0), target heading ot(t)=20˚. Simulation result shows that Interception occurs at 9th time step with range 0.40 meters.

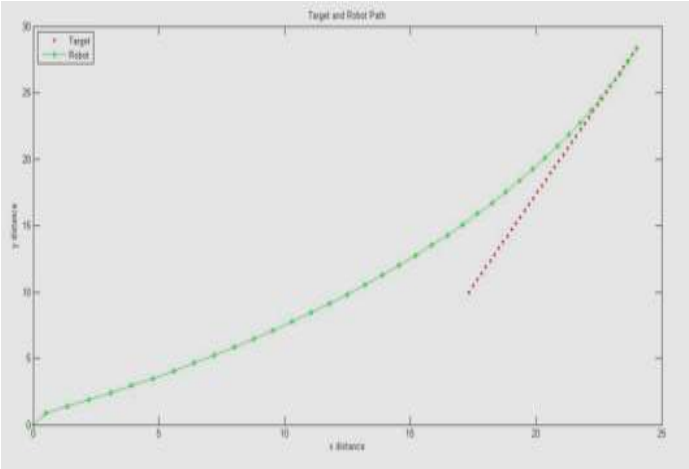

Figure 7:Intercept tracking simulation2

In Interception case2 simulation initial conditions were:- Vr = 2m/s, Vt = 1m/s, initial robot position (xr,yr) =(0,0), initial robot heading or(1)= 30˚, initial target position (xtar,ytar) = (1.732,10), target heading ot(t) = 20˚, initial range=20 meters. Simulation Result shows that Interception occurs at 39th time step with range 0.49 meters and robot position (xr,yr) = (23.9,28.3), target position (xtar,ytar) = (23.8,27.8)

CONCLUSION

This paper is concerned with the application of one of the most important techniques from estimation theory to the problem of navigation and tracking for a mobile robot. Probabilistic estimation is done to predict the next step of the robot that follows a moving target under uncertainty. Translation as well as orientation of the moving target with respect to the global axis work as the reference for estimation of robot position. Estimation of the position of the vehicle with respect to the external world is fundamental to navigation. Modeling the contents of the immediate environment is equally fundamental. In particular, a predict-match-update cycle is used as a framework for perception. In particular, technique is presented for correction of estimated position using angle and distance to the moving target. Thus the two target tracking modes namely, pursuit and intercept was studied and simulated ideally.

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Real Time Intelligent Driver Assistance System

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Abstract— Real Time Intelligent Driver Assistance System is an in-vehicle embedded system, which assist the driver and generate a vehicle health report. It predicts the errors so that the driver can have an uninterrupted journey and can avoid accidents. Thus, it alerts the driver about future errors and assists for a safe drive especially through Indian roads.The main objective is to monitor various vehicle parameters such as temperature, battery voltage, CO level in the exhaust, fire detection, fuel status and road surface nature. It detects and reports the surface conditions of the roads. This system uses ARM 7 microcontrollers at the Engine/Environment Data Processing Unit as well as Driver Assistant Status Unit and Controller Area Network (CAN) protocol for the communication between the two units. CAN bus is a vehicle bus that is designed to communicate microcontrollers and other electronic devices without a host computer. The program is compiled in Keil μVision3 using Embedded C.

Keywords—Controller Area Network (CAN) protocol, CO level, fire detection, Battery voltage, fuel status, road surface, Keil

INTRODUCTION

Based on statistics, it reveals that road accidents on an average cause 2 million deaths and 100 million injuries around the world each year. As a first step, an intelligent driver assistance system is being developed. Vehicles in Indian roads faces damaged pavements or roads, human interference, random vehicle movements which lead to sudden and unexpected stops. This calls for the monitoring of vehicle condition as well as surroundings.

The proposed Real Time Intelligent Driver Assistance System is an in-vehicle embedded system, which assist the driver and generate a vehicle health report. It predicts the future errors so that the driver can have an uninterrupted journey and can avoid accidents. Thus, it alerts the driver about future errors and assists for a safe drive especially through Indian roads.The main objective is to monitor various vehicle parameters such as temperature, presence of CO level in exhaust, battery voltage, fire detection, fuel status and road surface nature. It detects and reports the surface conditions of the roads. It also acts as an efficient eco-friendly system by regulating the environmental pollution.

LITERATURE SURVEY

Ray F et al (2002) Describes the substrate technologies for harsh environment automotive electronics applications [9]. Along with the environmental concerns come the challenges of meeting overall size constraints required of increasinglycomplex controllers by utilizing finer features and the geometries. Electronic substrate technologists have been responding to this challenge effectively in an effort to meet the performance, size and cost requirements. The key to successful automotive electronics is the recognition that the automobile is an electronic system fully integrated with its moving parts as opposed to a mechanical device replete with electronic monitors and controls. The environments for automotive electronics products differ from location to location within the vehicle. In general, these environments are harsher than the consumer electronics products that are used in more benign home or office environments. The high-density organic substrate technology will be a leading choice for many automotive electronics applications.

Knoll P. M.et.al (2002) Describes the liquid crystal display unit for reconfigurable instrument for automotive applications [11]. Electro-optical displays and flat screens incorporating liquid crystal technology will be used to an increasing extent in future vehicles. Their use will expand from the instrument cluster through the centre console to the rear passenger compartment area. The classic instrument cluster will be enhanced with graphics capable display modules displaying information relevant to the driver from the vehicle. The centre console is the obvious choice for display of information relevant to driver and passenger from various information components. Owing to the availability of appropriate transmission methods to the moving vehicle, smaller monitors for entertainment and multimedia purposes will be found in the future in the rear passenger compartment area. Flat PC monitors, integrated in the passenger seat's backrest, will, in the future, make possible the mobile office with all usual components of the office workstation, in

conjunction with the familiar mobile services. Various LCD technologies, from the simple TN-LCD to the actively addressed flat screen, will allow effective adaptation of the display performance to the relevant application.

Axelsson J.et.al (2003) Presents the correlating business needs and network architectures in automotive applications [8]. The main challenge is cost efficient development of the system with respect to business, standards, functionality, architecture, and quality for the automotive industry. There are three different architectures – used in passenger cars, trucks, and construction equipments. Communication networks in automotive vehicles replace the numerous cables and harnesses, thereby reduce the number of connection points, cost and weight. Networking enables the demand for increasingly efficient diagnostic, service and production functionality. The diagnostic system provides status of the vehicle.

Johnson R. W.et.al (2004) Describes about the changing automotive environment [10]. The underhood automotive environment is harsh and current trends in the automotive electronics industry will be pushing the temperature envelope for electronic components. The desire to keep engine control units on the engine and transmission control units either on or in the transmission will push the ambient temperature above 125 C. The number of sensors in vehicles is increasing as many electrically controlled systems are added. Many of the sensors must work in high-temperature environments. The applications are exhaust gas sensors and combustion sensors or cylinder pressure. High temperature electronics use in automotive systems is growing, but it will be gradual as cost and reliability issues are addressed.

Johansson. K. H (2005) Describes about the vehicle application of Controller Area Network [6]. In the automotive industry, embedded control has grown from stand-alone systems to networked and highly integrated control systems. By networking electromechanical systems, it becomes possible to modularize functionalities and hardware, which facilitates add-on and reuse capabilities. The Electronic Control Unit handles the control of engine, fan, turbo etc. but also the CAN communication. Combining mechatronic and networks modules makes it possible to reduce both the cabling and the number of connectors, which increases reliability and facilitates production. Introducing networks in vehicles also makes it possible to more efficiently carry out diagnostics and to coordinate the operation of the separate subsystems.

Li R.et.al (2008) Describes about the design for automotive CAN bus monitoring system [7]. This system is designed to test automotive CAN (Controller Area Network) controlled devices or entire network. This system not only display CAN frames (CAN 2.0A/B) received from or sent onto a CAN bus, but also can record data on log files for off-line evaluation. Users can configure CAN channel features and several monitoring modes of the system with PC application. The USB technology adopted in the system make it a more practical and convenient CAN bus testing system.

Gupta S. D.et.al (2012) Describes about the design and implementation of water depth measurement and object detection model using ultrasonic signal system [5]. There are several ways to measure water depth without physical contact. Some devices use infrared light transmitters and receivers to determine water depth. There are devices that have laser-based systems which have improved accuracy and precision. The detection techniques of laser, infrared, radar, and ultrasonic have been widely applied at the aspect of water depth measurement. The research of the water depth measurement system backing up with high ratio of capability to low price has ended at Ultrasonic Range Finder. This technique has provided a useful tool to more accurately to identify the water depth and object. Presented the noble methodology for measuring water depth and object detection using Ultrasonic sounds to provide efficient and effective way.

Sakhardande J.et.al (2013) Describes about Arduino Based Mobility Cane [3]. The cane a mechanical device which is dedicated to detect static obstacles on ground, uneven surfaces, holes, steps and other hazards via simple tactile force feedback. The light weightiness and the capability to be folded into a small piece can be advantageous to carry around when not required. This designed canes are only capable of detecting below waistline obstacles like street curves, steps and stair- cases etc. These canes are capable of detecting obstacles but receiving feed- back is low. Therefore visually impaired individuals still find it difficult to navigate especially in unknown milieu. It is low cost, robust and user friendly. The designed mobility stick can be easily operated uses ultrasound sensors for detecting the obstructions before direct contact. It provides haptic feedback to the user in accordance with the position of the obstacle.

Reddy. B. N. K.et.al (2013) Present about efficient online mileage indicator by using sensors for automobiles [4]. Motor vehicles displays the amount of fuel in the fuel tank by means of some indication like bars running through the Empty and Full indicators. The manufacturer provides specification that each bar maps to the corresponding litres of fuel approximately. Usually drivers experience the problem with improper estimations of the current fuel level in the tank with existing representation system. Aims at overcoming the drawbacks of this existing system by providing clear information to the user about the exact indication of fuel level digitally in litres and further distance to travel with the available fuel with respect to the different conditions of travelling such as in Highways and heavy traffic roads there by removing the ambiguity to the user.

Vijayalakshmi S (2013) Discuss about the vehicle control system implementation using CAN protocol [2]. Generally a vehicle was built with an analog driver-vehicle interface for indicating various vehicle status like speed, engine temperature, fuel level etc. this explains about the development and implementation of a digital driving system for a semi-autonomous vehicle for improving the driver-vehicle interface. It uses ARM based data acquisition system that uses ADC to bring all control data from analog to digital format and visualize via LCD. The communication module used is embedded networking by CAN which has efficient data transfer. Also it takes feedback of vehicle conditions like Vehicle speed, temperature etc., and controlled by main controller. Additionally this unit is equipped with GSM which communicates to the owner during emergency situations.

Presi. T. P (2013) Describes the design and development of PIC Microcontroller based vehicle monitoring system using Controller Area Network (CAN) protocol [1]. Controller Area Network (CAN) is an attractive alternative in the automotive and automation industries due to low cost, ease in use and provided reduction in wiring complexity. It was developed for communication between various digital devices inside an automobile where heavy electrical interferences and mechanical vibrations are present. Presence an idea of implementation of CAN protocol using PIC for monitoring vehicle. The main feature of the system includes monitoring of various vehicle parameters such as Temperature, Battery Voltage and Light due to spark or fire and presence of CO level in the exhaust.

PROPOSED METHODOLOGY

With rapidly changing computer and information technology and much of the technology finding way into vehicles. Technologies are undergoing dramatic changes in their capabilities and how they interact with the drivers. Although some vehicles have provisions for deciding to either generate warnings for the human driver or controlling the vehicle autonomously, they must make these decisions in real time with only incomplete information. So, it is important that drivers still have some control over the vehicle. Advanced vehicle information systems provide vehicles with different types and levels of intelligent to assist the driver.

The driver should be aware of certain parameters of vehicle such as engine temperature, battery voltage, gas emission and light due to spark or fire for the safeguard of both the driver and the vehicle, also fuel availability, and road surface nature for safe and well-planned journey. Some modules of the network will be high speed and other modules will be low speed. Therefore, in-vehicle network need to integrate many modules that interact with environment and process low and high speed information. i.e., testing is more challenging. Real time intelligent driver assistance system uses ARM processor and CAN protocol as shown in Figure. 1 which works on real time basis. This provide an efficient monitoring system that aids the driver.

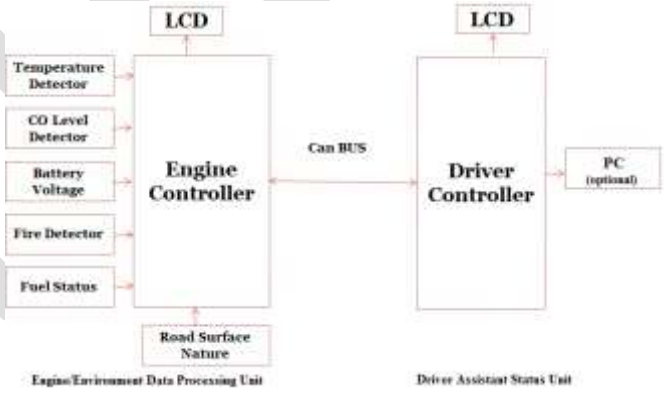


Figure 1: Block Diagram

SIMULATION RESULTS

The following figures show the simulation output in Keil µVision.

Figure 2: Analog and Digital input ports

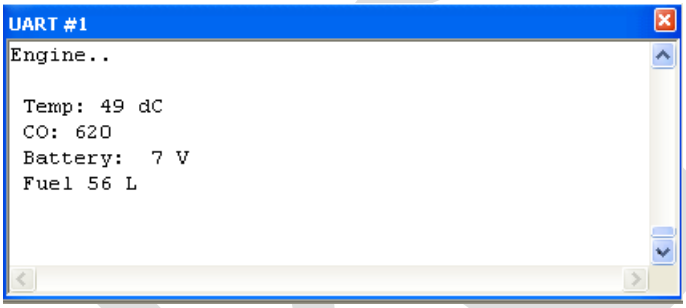


Figure 3: Display at Engine/Environment Data Processing Unit

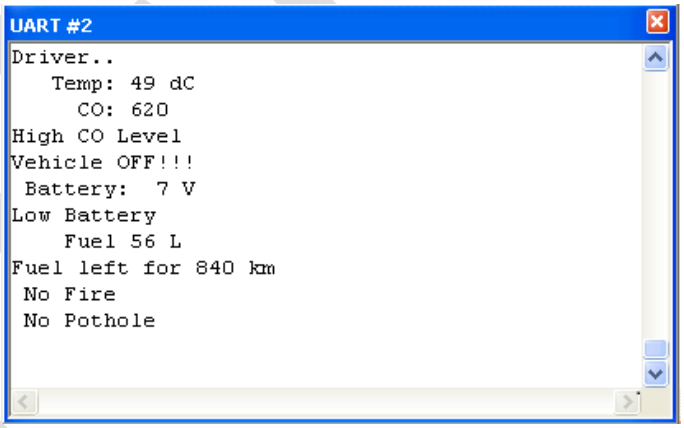
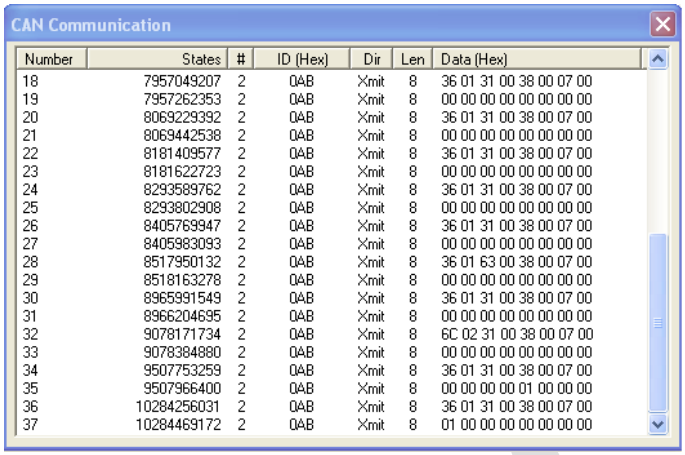


Figure 4: Display at Driver Assistant Status Unit



Number	States	#	ID (Hex)	Dir	Len	Data (Hex)
18	7957049207	2	0AB	Xmit	8	36 01 31 00 38 00 07 00
19	7957262353	2	0AB	Xmit	8	00 00 00 00 00 00 00 00
20	8069229392	2	0AB	Xmit	8	36 01 31 00 38 00 07 00
21	8069442538	2	0AB	Xmit	8	00 00 00 00 00 00 00 00
22	8181409577	2	0AB	Xmit	8	36 01 31 00 38 00 07 00
23	8181622723	2	0AB	Xmit	8	00 00 00 00 00 00 00 00
24	8293589762	2	0AB	Xmit	8	36 01 31 00 38 00 07 00
25	8293802908	2	0AB	Xmit	8	00 00 00 00 00 00 00 00
26	8405769947	2	0AB	Xmit	8	36 01 31 00 38 00 07 00
27	8405983093	2	0AB	Xmit	8	00 00 00 00 00 00 00 00
28	8517950132	2	0AB	Xmit	8	36 01 63 00 38 00 07 00
29	8518163278	2	0AB	Xmit	8	00 00 00 00 00 00 00 00
30	8965991549	2	0AB	Xmit	8	36 01 31 00 38 00 07 00
31	8966204695	2	0AB	Xmit	8	00 00 00 00 00 00 00 00
32	9078171734	2	0AB	Xmit	8	6C 02 31 00 38 00 07 00
33	9078384880	2	0AB	Xmit	8	00 00 00 00 00 00 00 00
34	9507753259	2	0AB	Xmit	8	36 01 31 00 38 00 07 00
35	9507966400	2	0AB	Xmit	8	00 00 00 00 01 00 00 00
36	10284256031	2	0AB	Xmit	8	36 01 31 00 38 00 07 00
37	10284469172	2	0AB	Xmit	8	01 00 00 00 00 00 00 00

Figure 5: CAN Communication

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I am grateful to God Almighty, for making me able to do this work. I deeply thank the Management of Toc H Institute of Science and Technology, for all the help during the course of this work.

CONCLUSION

Based on the literature survey, the real time intelligent driver assistance system is simulated using Keil µVision. The simulation was completed successfully. In this system, six critical parameters of vehicle were included for monitoring. ARM processor is used as controllers at both engine and driver side and CAN bus for communication between engine and driver side for real time application. This system was simulated and generated a vehicle health report that enables to know about the current condition of vehicle so as to provide a safe drive. It monitors engine temperature, CO level, battery voltage, presence of fire, fuel status and road surface nature and also provides necessary alarms whenever abnormal conditions occur.

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Verification IP for an AMBA-AXI Protocol using System Verilog

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Abstract— In this paper, a coverage driven verification methodology to verify the AMBA AXI Bus protocol with its verification environment is proposed. The whole verification process is carried out using the system verilog based modeling approach. The AXI verification scenario includes the Read and Write transaction phases, which are getting verified with their values of valid count, busy count and bus utilization factor. The functional verification of the AXI is carried out using Mentor Graphics Questa- sim in code coverage enabled mode.

Keywords— Verification IP development, AMBA-AXI protocol, Code coverage, Coverage driven verification, Transactions, System verilog, QUESTA-SIM.

INTRODUCTION

Today's System on Chip (SOC) has many intellectual property cores inbuilt in them and the proper synchronization between the individual cores during the data communication is a crucial task [1]. This modern SOC's majorly use the common bus protocols like advanced peripheral bus (APB), advanced high performance bus (AHB) and advanced extensible interface (AXI) for their synchronized communication[2]. Hence during the development of these kind SOC's the verification of this technologies is very important and a crucial task as it covers 70% time as compared to the design stage which requires only 30% of the time [3]. Due to this large time span for verifying an on chip many engineers are involved in verifying the functional properties and synchronization between them using an inbuilt verification environment called as Verification IP [4]. The bus protocols used in the modern SOC's are classified based on their performance and power consumption. Among the three protocols APB bus structure consumes less power when compared with AHB bus structure but lacks in performance as compared with AHB. The only thing in AHB bus structure based SOC's will have slightly higher percentage of power consumption as compared with APB bus structure. Similarly the AXI bus consumes moderate power and gives a better performance as compared with AHB and APB bus structures [6]. So the AXI bus structure can be selected as an alternative bus standard for the modern SOC design. In this paper a system verilog based Verification IP has been designed for verifying the best of AMBA protocols (i.e. AMBA AXI) using a coverage driven verification methodology [7].

AMBA AXI BUS ARCHITECTURE

This section explains the bus architecture of the AMBA AXI protocol for the data communication and synchronization operation with respect to READ Transaction phase and WRITE Transaction phase in their buses.

READ TRANSACTION PHASE

Generally the read transaction phase is divided into two modes namely channels of read address (AR) and read data plus read response(R). The transaction verification usually happens between the master and salve interface which is initiated by the signal in the read address channel and read data channels. The architecture for the AXI read transaction with read address and read data between the master and slave interface is shown in the Fig-1(a).

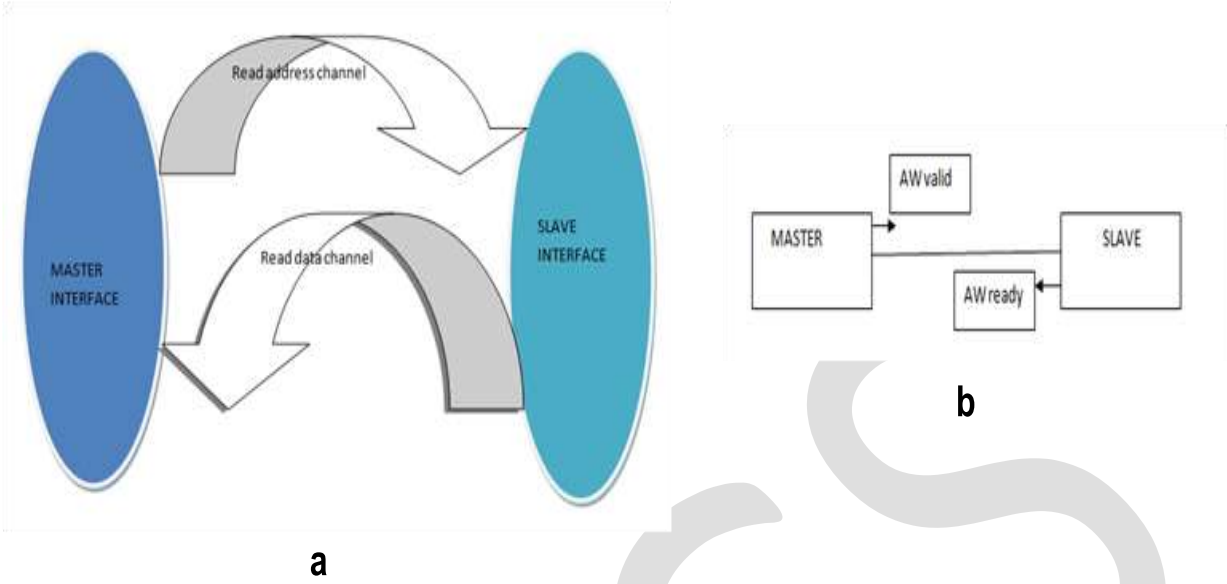

Fig-1 a) AXI read Transactions with address read and data read. b) AXI read Transactions with Address ready and Address Valid Signal.

Here each channel has dedicated valid and ready signals, based on their responses the data communication usually happens between the master and slave interface. The master slave communication with address valid (AW) and address ready (AR) is clearly illustrated in the Fig-1(b). During the read operation the read phase .master will give the read address request with address and control information based on which slave will respond accordingly.

WRITE TRANSACTION PHASE

In the write transaction phase initially the master gives the request for write address with its address and its control information. These two actions address request and control information passing will be happening one after one between the master and slave in write phase mode. Similar to the read phase the write phase will involve the three modes as writing the channel address in write address phase(AR), writing data to the channel in write data phase(W) and finally giving back the response for write operation in write response phase(B). The master slave communication with their write data channel, write response and control information along with their address is clearly illustrated in the Fig-2(a).

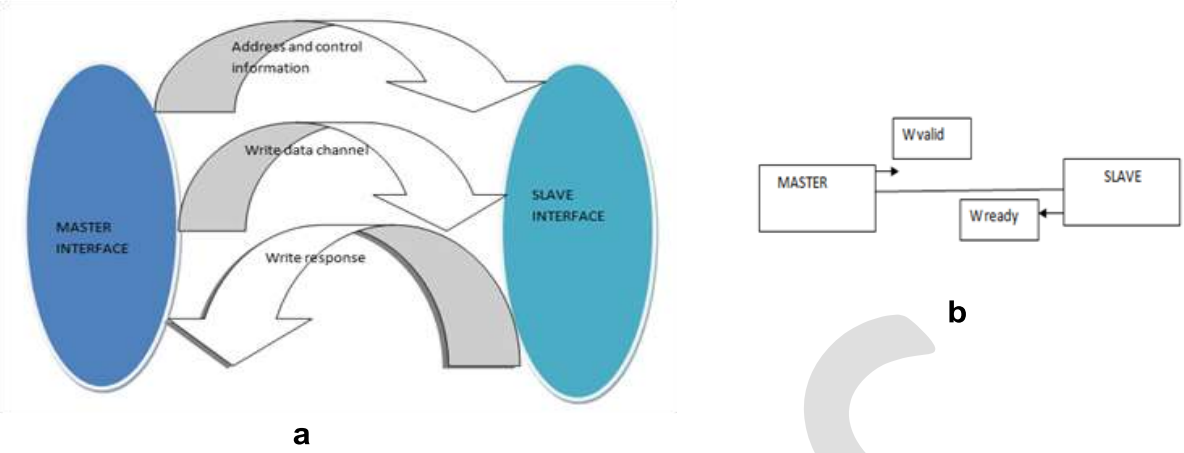

Fig-2 a) AXI write Transactions with address write and data write. b) AXI write Transactions with Address ready and Address Valid Signal.

In the whole operation of the write phase master initiates the request for write operation with write data request and with write data correspondingly the slave writes the response to the master. The entire master slave write data transaction with the data valid and data ready signal are shown in the Fig-2(b).

VERIFICATION IP ENVIRONMENT

The methodology to verify the system components in SOC using the intellectual verification IP concepts is more and more beneficial, as it saves the time for verifying the chip and reduces the time to manufacture without any faults. This type of verification environment allows us to reuse it for any type of component verification (i.e. we can tune to verify the functionality of any devices).Because of this possibilities it is easy to develop so many test cases to verify the DUV under verification. Nowadays the verification process is initiated by means of code coverage and functional coverage to verify the functionalities of the entire design under different test scenario.

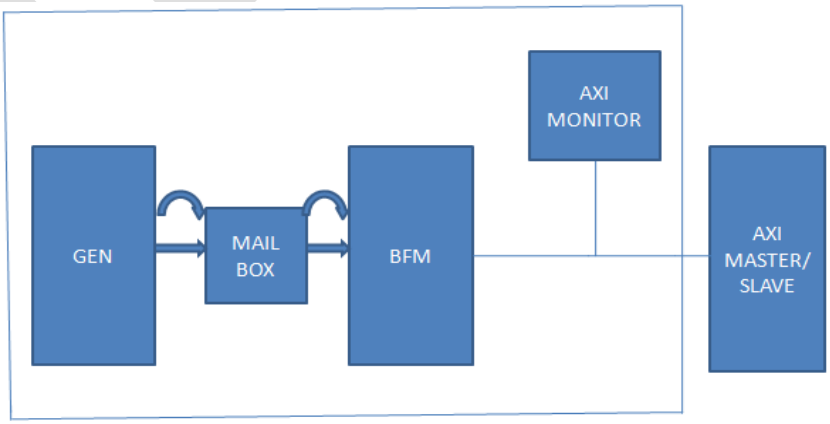

Fig-3 AXI Verification Environment.

The verification IP environment consists of a Generator, Bus functional Model (BFM), Mailbox, Monitor, AXI Interface and AXI Master/Slave. The entire verification environment for verifying the AXI Master/Slave is pictorially given in the Fig-3. The generator in the verification environment will be involved in generating different test cases according to the verification criteria. In the same manner the bus functional model will collect the transactions from the generator via mailbox. Here the mail box is an intermediate agent to convert the signal from one form to another form which is acceptable by BFM. The BFM collects all the transaction on drives into the AXI interface. The duty of the AXI interface is to connect the AXI monitor, BFM and AXI Master/Slave. Here the monitor keeps tracking the data transfers inside the test environment and gives an alert message for each transaction.

VERIFICATION PLAN

The verification plan tells the details about the properties going to be verified in the Design under verification (DUV) with respect to the corresponding test strategies. The properties which are being verified in the DUV are listed below as follows

- Verifying the system connectivity during read and write cycles
- Transaction routing.
- Data integrity

For the effective verification of these properties, the coverage driven verification methodology is followed. By using this type verification plan able to achieve 100% effectiveness in the verification process.

RESULTS AND DISCUSSION

In the verification process of the AXI Master/Slave bus protocol system verilog is used for modeling the AXI Master/Slave with their verification environments. The verification environment consists of generator, mailbox, BFM and AXI Interface all of these are modeled in system verilog and used for the verification process of this bus protocol. Mentor graphics Questa-Sim tool is used to verify the functionally of this design in the code coverage enabled mode to do the entire verification of this bus protocol. During the verification of this bus protocol first the read architecture and write architecture with all the channels are verified and then checked using verification IP environment in code coverage enable report mode.

VERIFICATION OF WRITE ARCHITECTURE

In this verification stage all three write signals named write address, write data and write response are verified for each transaction. The write address includes AWID, AWADDR, AWLEN, AWSIZE, AWVALID AND AWREADY signals toggles for every positive high edge of the global clock and finally writes the address in the channel. AWID is a write address ID which represents a particular tag for each write address; it should match with the write data WID. During the toggling action of the clock at positive edges with the high enable logic value in WVALID and WREADY, the write data channel acknowledgement will takes place. Similarly the write response will happen at the high state of BVALID and BREADY signals. Here the signal AWLEN is of four bit size [0:3] which generates different transactions from one to sixteen. During that generation process if AWLEN is 0100 then it will have 0101 transactions which mean it will increments the transactions by one. This is clearly illustrated in the waveform clearly at Fig-4. From the waveform it is observed that AWSIZE indicates the size of each transaction. The entire write architecture is simulated and verified for all the signal toggle counts which is clearly show in the waveform in Fig-4.

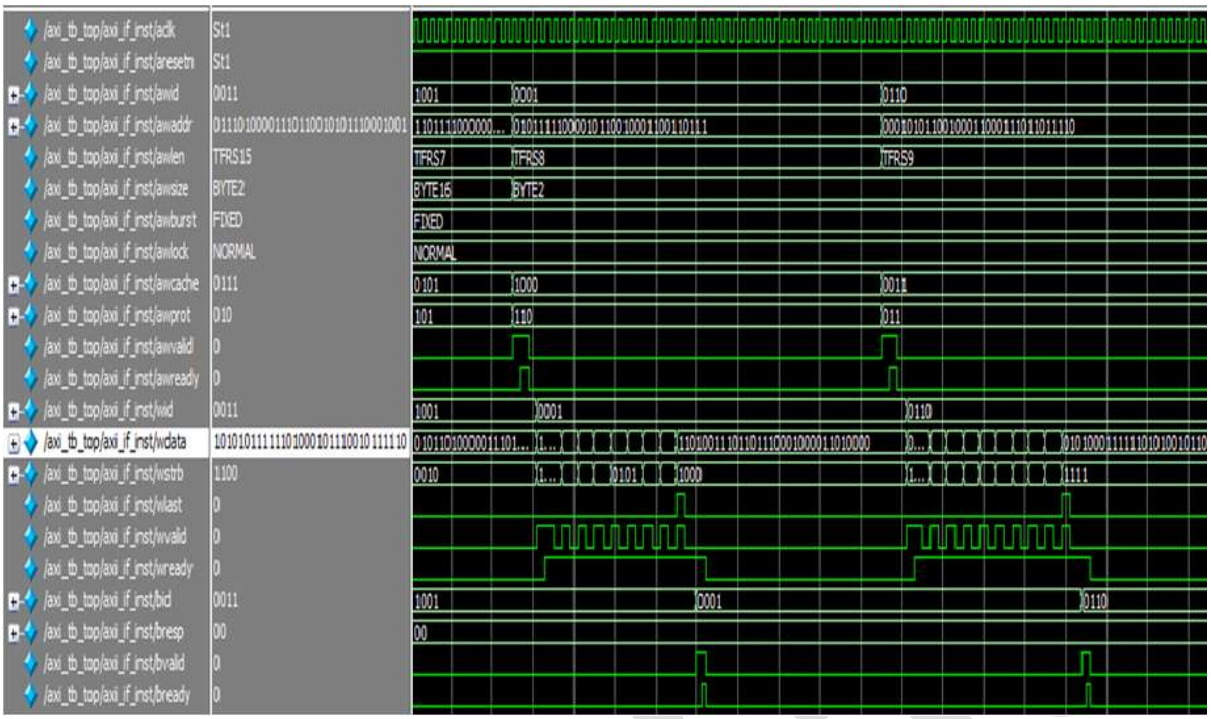

Fig-4 AXI Write Cycle Response.

The signals verified in this test case are AWADDR, AWVALID, AWREADY, and WDATA along with their write address, write data's signals. Also the signals WLAST, WVALID, WREADY, BRESP, BVALID and BREADY are also verified for every transactions. The parameters VALID COUNT, BUSY COUNT, BUS UTILIZATION are calculated practically with this test case and the bus utilization is shown in percentage numbers.

Write phase is divided into three channels response. The necessity to verify write phase is whether hand shaking of signals is happening perfectly or not in all the three channels.

VALID COUNT for read phase = 13.

BUSY COUNT for read phase = 16.

BUS UTILIZATION = (13/16)*100 = 81.25 percent.

VERIFICATION OF READ ARCHITECTURE

In this read cycle verififcation, all the read architecture signals ARVALID, ARREADY, RVALID, RREADY, RLAST, RDATA and ARSIZE are verfified for each transcations. The read architecture includes two channels i.e. read address and read response channels. The read address channel will intialize its address fetching at the high state of ARVALID and ARREADY signals for every positive edge of global clock. Similarly after a gap period of delay read response will instantiated to high mode for every positive edge of RVALID and RREADY signals. RLAST indicates the last transaction in the RDATA signal. Similarly ARSIZE and ARLEN are same as compared to that of write architecture. The entire waveform for the verififcation satge of the read architure is given Fig-5.

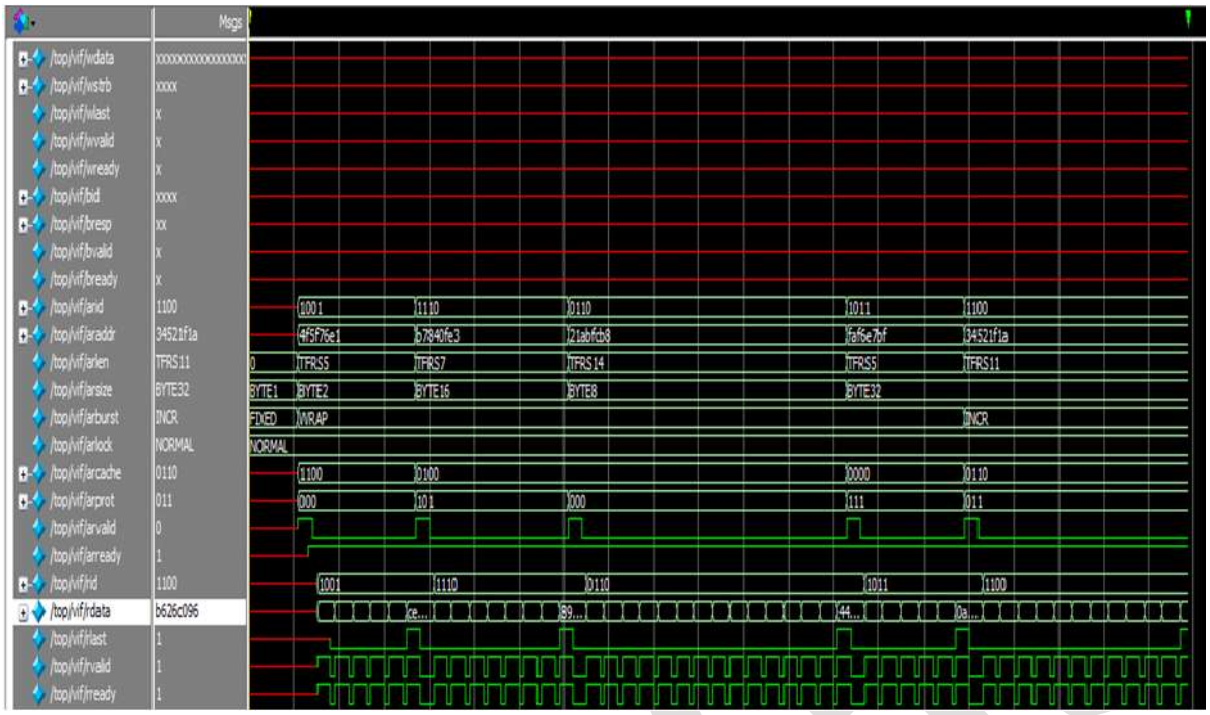

Fig-5 AXI Read Cycle Response

Verifying only the read phase is the main criteria of this test case. Neglecting the write phase signal values and focussing only on the read operation related signals and calculate the parameters are taken into consideration. The working of the read phase which includes two channels is same as explained above, the main focus is on verifying the parameters which leads to succesful measurment of bus utilization practically.The signals that are verified in this test case are ARADDR, ARVALID, ARREADY, ARID, RID, RDATA, RLAST, RRESP, RVALID, RREADY. Read phase is divided into two channels read address and read data plus read response. The necessity to verify the read phase is to cross check the hand shaking of signals for each channel then only a proper read phase will happen.

VALID COUNT for read phase = 10.

BUSY COUNT for read phase = 13.

BUS UTILIZATION = (10/13)*100 = 76.92 percent.

The same read and write phase is verified using the code coverage mode analysis and the coverage driven report is given in the Fig-5. The code coverage mode analysis is covering about the 80% of verification IP using the random test bench based verification methodology.

The sample coverage report for the AXI Slave/Master for the various analyses like state machine, branches, transitions and toggle counts etc., is given below as follows

Enabled Coverage	Active	Hits	Misses	% Covered
Statements	62	32	30	51.6
Branches	30	16	14	53.3
FEC Condition Terms	0	0	0	100.0
FEC Expression Terms	0	0	0	100.0
States	0	0	0	100.0
Transitions	0	0	0	100.0
Toggle Bins	576	284	292	49.3

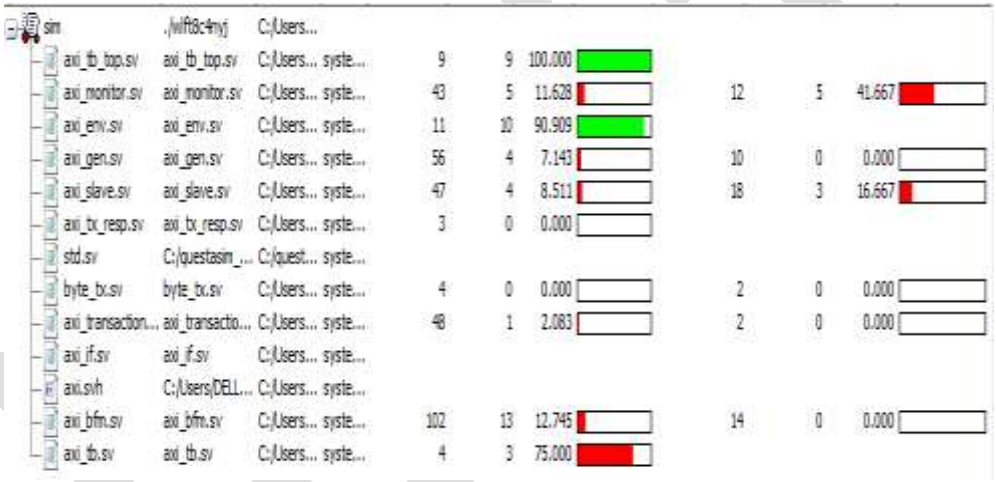

Fig-6 Coverage Mode Analysis of Read & Write Response.

CONCLUSION

The AXI protocol verification, and the signals used in each channel are verified and analyzed using the code coverage mode analysis. The main advantage of this kind of verification is using the pseudo random coverage driven verification, where the time to market is less and applicable for complex designs using system verilog verification. In future we develop a test case to verify both the write and read phase simultaneously from the same location and different locations of read and write.

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OBJECT RECOGNITION USING PARAMETRIC GEONs

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Abstract— In human, vision processing takes place within and between the retina and visual cortex. This involves various stages of vision processing where object recognition is an important phase. The object recognition in human means matching visual input with the structural representations of objects in brain. One of the efficient means of doing this is by using parametric GEONs, which is a subclass of basic GEONs a contribution of RBC (Recognition By Components) theory to the world of object recognition. Several neural network solutions are available to implement the concept like Kohonen's SOM (Self Organization Map), SONG etc. A combination of basic shapes together with their relational details as a vector has to be given to a neural network which will generate different patterns for different objects, using which the objects can be recognized.

Keywords— BMU (Best Matching Unit),GEONs (GEometric iONs), Object recognition, Parametric GEONs, SOM (Self Organisation Map), learning, vector creation.

INTRODUCTION

We human beings are blessed with a wonderful gift of god that is our vision. The vision helps us to see this beautiful world, our mother, father etc. Human vision starts right from the eye and ends in brain, that pathway is known as human visual pathway. There are a large number of processes taking place in this pathway. One of the primary functions of the human visual system is object recognition, an ability that allows relating the visual stimuli falling on retina to the knowledge of world where the prototypical knowledge of an object is used to recognize an object. Building a machine vision system to perform a given visual recognition task requires careful attention because the ultimate measuring stick for analyzing the system will be human itself. Human uses many cues to recognize an object like shape, texture, smell, colour etc. The most important and attractive cue used is the shape because the amount of noise coming with shape details is very less compared to other cues. The paper describes an attempt to emulate the human object recognition process**.** The process make use of Kohonen self organizing map (SOM), a well studied algorithm in the field of machine vision and artificial neural network. The Kohonen neural network algorithm was divided into two: learning and recognition. The input to the SOM was the position and shape details of the object to be recognized. The same are simulated using MATLAB.

BACKGROUND

The visual pathway starts from retina and ends in the brain. There is ciliary muscles and zonule to help in focusing of eye. The image is first projected onto a flattened sheet of photoreceptor cells, rods and cons that lie on the inner surface of the eye which is called the Retina. Retina contains an area called fovea which is only 2 to 5 degree in area. Fovea contribute towards the actual vision. These cells encode different aspects of the visual stimulus, and thus carry streams of information to the visual thalamus. The optic nerve ends in the lateral geniculate nucleus of thalamus which gives stimulus to visual cortex. In the visual cortex there is an area called striate cortex which is divided into two: preattentive and attentive area. The attentive area focus on the object recognition part of vision processing. Visual acuity is the ability of human to detect and recognize small objects. Near half of the cerebral cortex is busy with visual information processing. First step of visual activity is the feature extraction which will detect the edges, corners etc of the object. Human vision processing has interplay of two inversely directed processes: one is a bottom up process which deals with information pieces discovery and the other a top down process which will guide the binding or linking of these information pieces. The top down process is the object recognition process. The main motivation for the recognition by using the cue shape is that the amount of noise is less when we use shape as the cue.

METHODOLOGY

GEONs

Since the cue used was shape a model for representing the shapes are needed. In 1985, Biederman introduced to the vision community a theory of human object recognition known as Recognition By Components (RBC)[1][2]. The basic idea of this theory was that the best way for identifying objects was by using their components details and relation among the components[5]. The volumetric geometrical components introduced by Biederman were called GEONs (GEometric iONs). GEON theory assumes that objects are represented as an arrangement of simple, view-point invariant, volumetric primitives, GEONs, such as cylinders, cones etc[3].

Viewpoint invariance was derived from a class of edges corresponding to the orientation and depth discontinuities of the object's surfaces which were called viewpoint invariant contrasts (VICs).The VICs were differences in nonaccidental properties, i.e., properties of edges that are unaffected (or largely unaffected) by rotation in depth. The nonaccidental properties are symmetry, colinearity, co-termination, parallelism. There are mainly 36 GEONs using which any object under the sun can be modeled. In RBC one thing to be noted is that the object is not only specified by theses GEONs but also with the relational details among them.

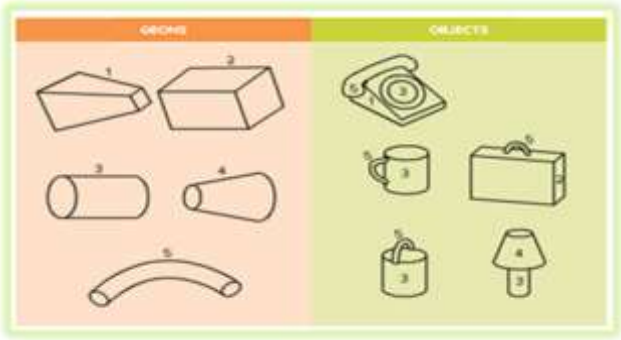

Figure.1 -GEONS and objects

The advantages of GEONs are: easily distinguishable, viewpoint invariant, explicit inter-relations, only small number are required for creating any object models.

PARAMETRIC GEONs

Parametric GEONs are finite set of volumetric primitives used to describe shapes of object parts[6]. They are basically seven volumetric shapes. They are ellipsoid, cylinder, cuboids, tapered cuboids, tapered cylinder, bended cuboids and bended cylinder. These seven shapes are derived from super ellipsoid equations. The major distinction between parametric GEONs and Biederman's GEONs are: GEONs are defined in terms of certain attributes of volumetric shapes which do not provide global shape constraints where as Parametric GEONs are defined using several analytical equations which provides global shapes constraints. GEONs will provide only qualitative characteristics of objects where as Parametric GEONs will provide both qualitative and quantitative characteristics. The geometric difference between the two can be listed as follows:

Table I - GEONs and Parametric GEONs

ATTRIBUTES	**GEON**	**PARAMETRIC GEON**
Cross sectional shape	Symmetrical, Asymmetrical	Symmetrical
Cross sectional size	Constant Expanding Expanding & Contracting	Constant or Expanding
Combination of properties	Both tapering & bending	Either tapering or Bending

SOM

In 1982, TuevoKohonen, a professor emeritus of the Academy of Finland, abstracted the Von der Malsburg and Willshaw self-organizing learning principle and functionand he gave rise to SOM[11][14]. It was known as the kohonen's model of self-organization map. Among the various neural network architectures and learning algorithms kohonen's self organising map is the important one. "Self-organisation" because no supervision is needed. "Map" is because they attempt to map their weights to conform to the given input data. It is developed on the motivation of retina to cortex mapping. Retaining principle "features" of the input data is a fundamental principle of SOMs, and one of the things that make them valuable, specifically, the topological relationships between inputs are preserved when mapped to a SOM network. Self-organisation in general is a fundamental pattern recognition process which inter and intra pattern relationships among the stimuli and response are learnt without the presence of external influence.

Structure of SOM

The structure of SOM is fairly simple. Each map node is connected to each input node. The map nodes are not connected to each other which will form a 2-D grid. Each map node has a unique (i,j) oordinate which make it easy to reference a node.It alsohelp to calculate the distance between the nodes. The weight vector should be the same for map node and input vector otherwise the algorithm will not work.

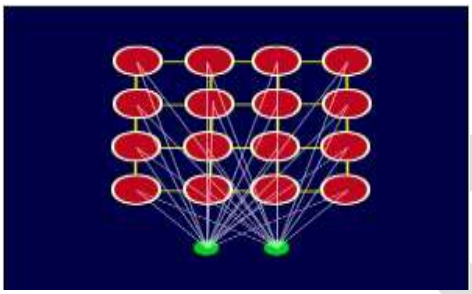

Figure.2-SOM structure

Algorithm for SOM

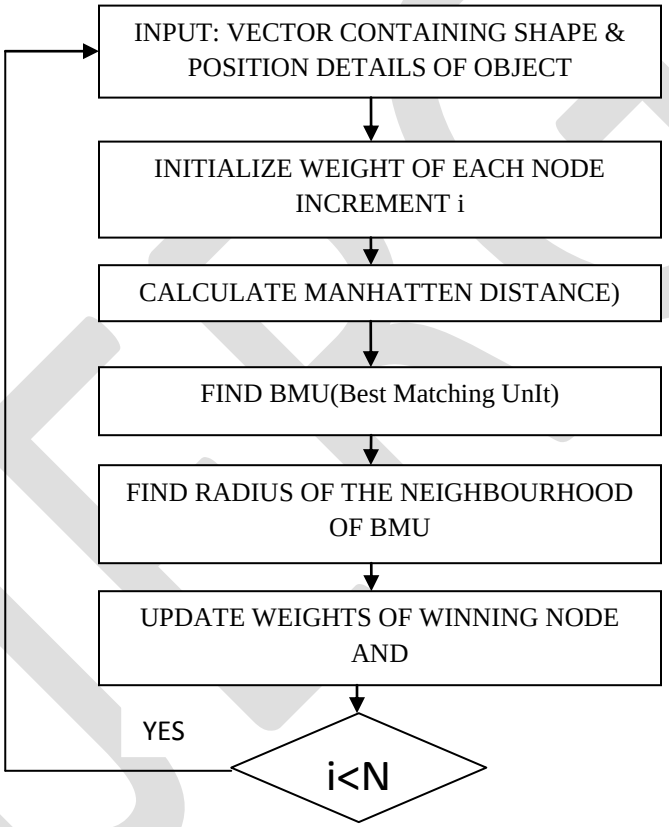

Figure.3-SOM algorithm

Advantages:

SOM provide an elegant solution to many problems with large or difficult to interpret data sets.

Through their intrinsic properties they allow the visualisation of complex data.

Powerful enough to perform extremely computationally expensive operations.

Simple enough to code in a relatively few number f lines.

SOM can be as primitive and complex as the user desires or requires.

OBJECT PERCEPTION

Object perception is a process in which from the edge details of the object the nonaccidental properties like symmetry, co-termination, collinearity, parallelism etc are extracted out[4]. Using these information the object is parsed at the regions of deep concavities and thus splitted into information pieces. The same will also provide the positional information. These two informations are togetherly used to identify the object for the first time and also recognize the same afterwards.

FLOW CHART

There were several methods for doing recognition using SOM like using pure SOM algorithm itself, using SONG(Self organizing neural graph), using som and geometric hash function etc[7][9][10][11][16]. The best method that can be used in this project was using the SOM algorithm as such because input should be the shapes, all others uses different inputs.

INPUT

Object recognition block should have a memory location where the already detected object details are stored, which will act as the database of the same. The database values as to be checked every time when an input comes for recognition inorder to find whether that is a new one or not. The main input for Object recognition was the shape, positional and attributes details required for the recognition of the object.

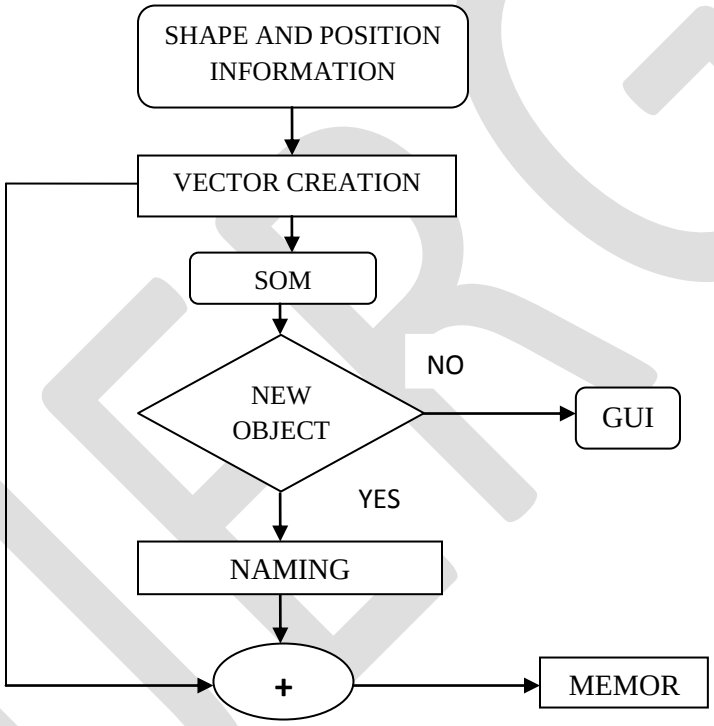

Figure.4-Flow chart

OUTPUT

There are two output processes to do:

If the object is already recognized one, the name has to be outed with the help of a display

If the object is a new one, the details of object together with the name has to be stored in the memory. At the same time the name has to be outed. The whole simulation procedure was divided into three parts:

Vector creation, training of SOM, detection and naming of object.

VECTOR CREATION

Using the input details getting a vector for each object was created. The vector contained two parts: first the position and then the shape.

POSITIONS	SHAPES

Figure.5-Input vector

The size of the vector would be the maximum of sum of the position information and shapes of the objects recognised.

TRAINING SOM

The entire process of recognition wass divided into two: Initial Learning and Recognition.

Initial Learning: during this the SOM get learned with all the basic shapes. The basic shapes currently used in this project were horizontal line, vertical line, inclined line, arc, circle, and ellipse, since now only 2D shapes were concentrated.

Recognition: during this a combination of basic shapes forming particular object together with the position information was given to SOM. SOM will generate different pattern for different object. The vectors corresponding to already recognised objects were stored in a database. When an object came for recognition this database content together with the new object was given to the SOM. SOM will generate the pattern for new object.

DETECTION

The detection step will take the patterns of already recognized objects and compare the new pattern generated with the same to find out whether the object was a new one or already detected one.

NAMING

When a new object was detected the system will ask for the name. Using GUI name was given. The name together with the vector of the object gets stored in the database (memory) for further use.

SIMULATION RESULT

The tool used was the neural network tool of MATLAB. Now only 2D shapes were used. Let us examine two experimental results first. When the given object was rectangle and squares the SOM neighbour weight distance plot was as respectively. The plot clearly differentiates between the two.

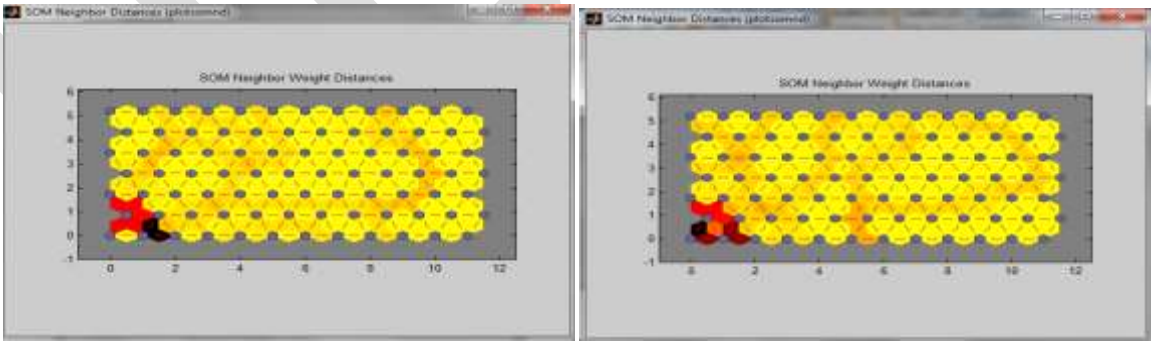

Figure.6-Experimental Result

The darkest nodes were the BMU. The next lighter ones are the nodes coming within the radius value. Thus likely ones were clustered together. That cluster was different for square and rectangle. Likely the same will vary from object to object.

The simulation results are:

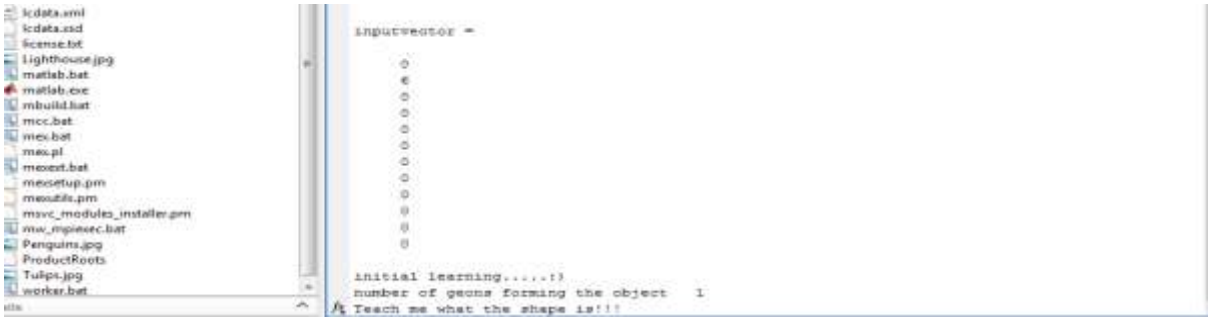

Figure.7-Initial learning

Figure.8-.New object

Figure.9-Already detected ones

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CONCLUSION

After studying human vision in detail came to know human vision processing is a huge process and object recognition is the last step in that. Human uses many cues to recognize an object. One of the most important and attractive one is the shape of the object. Human brain wills divide the object into parts. This part information together with the positional details help in the recognition of object once identified. Introduction of GEONs to the world of vision emulation helped system development a lot. Since GEONs has inability to provide global shape constraint, so went for search of parametric GEONs which will satisfy the needs. In order to implement the concept the best solution is SOM, a neural network algorithm with unsupervised learning because it is the exact replica of how retina to cortex object recognition is taking place and the input to it is the shapes.

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Geon Based Shape Approximation from the Edge Detected Image

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Abstract— In human mind the object models are composed of parts and that the first stage of spatial reasoning is primarily concerned with extraction of such parts from an image. Shape is an important visual feature of an image. The identification of shapes from the edge detected images is one of the promising stages in the object perception. Extraction of shapes from the edge detected images mainly using its pixel coordinates in an unsupervised manner is the challenging one. Geons are a finite set of distinct volumetric shapes, which are used to describe the shapes of, objects parts. Shape Approximation emulates the process involved in human brain, which is the approximation of geons in an unsupervised manner by performing edge gradient and positional analysis, to synthesize input information into primitive shapes along with its positional details.

Keywords— Geons (geometrical ions), Gradient, JIM (John and Irv's) model, pixel coordinates, RBC (recognition by component), SOM (Self Organizing Maps), Striated cortex

INTRODUCTION

Human visual system is a powerful, complex and highly efficient processing system which gives the humans the ability to see physical environment. The human visual system can be regarded as two important sections. Retina mediates only the initial steps in processing visual information. Most of the visual processing occurs in the cortex of the human brain. Among many functions of human vision, object recognition is arguably one of the most crucial. Human object recognition is invariant with viewpoint. Human recognition performance reflects the activation of a viewpoint invariant structural description specifying both the visual attributes of an object and the relations among them. In the striated cortex, the objects are mainly processed as components and the visual representation of these basic components are matched with the structural description in the memory. Humans can use many ways to recognize an object. Shape is an important visual feature and it is one of the basic features used to describe the image content. The idea behind shape approximation is to extract the various shapes forming an object from the edge detected image preserving the salient characteristics of the input image. The basic shapes can be estimated mainly in two ways such as supervised manner and unsupervised manner. In supervised shape approximation, the shapes are approximated by comparing shapes with some registered shape templates. In unsupervised shape approximation, shapes are approximated based on the shape similarity. Objects are mainly identified by their edges. These edges of an image could be straight lines, curved lines or other basic geometric shapes. The main problem in the shape approximation is the fitting of basic shapes in the edge detected binary image. The idea behind shape approximation is to extract the various shapes forming an object from the edge detected image preserving the salient characteristics of the input image. By Biederman's recognition-by-component (RBC) theory shapes can be represented using geons. The fundamental assumption of the theory is that a set of generalized-cone components, called geons, can be obtained from contrasts of five readily detectable properties of edges in a two-dimensional image: curvature, co-linearity, symmetry, parallelism and co-termination. The detection of this property is generally invariant over viewing position and image quality and consequently allows robust object perception. If an arrangement of two or three geons can be detected from an input, object can be quickly recognized even when they are occluded, novel, rotated in depth, or degraded. These geons are viewpoint invariant in nature. Biederman's introduction of geons to the vision community has spawned considerable interest in building geon based vision systems which will approximate the shapes of object parts, by a set of primitive volumetric models[1]. The project aims at identification of primitive parametric geons and their relative positional details from the feature extracted information for the identification of the object in an unsupervised manner. Based on the objective some of the relevant papers went through for shape approximations are explained below:

LITERATURE SURVEY

Hummel J et al (1992) presented a neural network implementation of the Biedermann's RBC theory that reflects the activation of a viewpoint-invariant structural description specifying the object's parts and the relations among them [2]. A neural net architecture that is JIM model is shown below which a 7 layer network. The JIM model layers one by one are discussed in detail. The 1st to 5th layer of the model will do the feature extraction, both structural and relational. The 6th layer of JIM model will give the details of various

shapes involved in the object formation and their relational description. This can be further used for recognition process. The 7th layer will combine these cells and recognize the object.

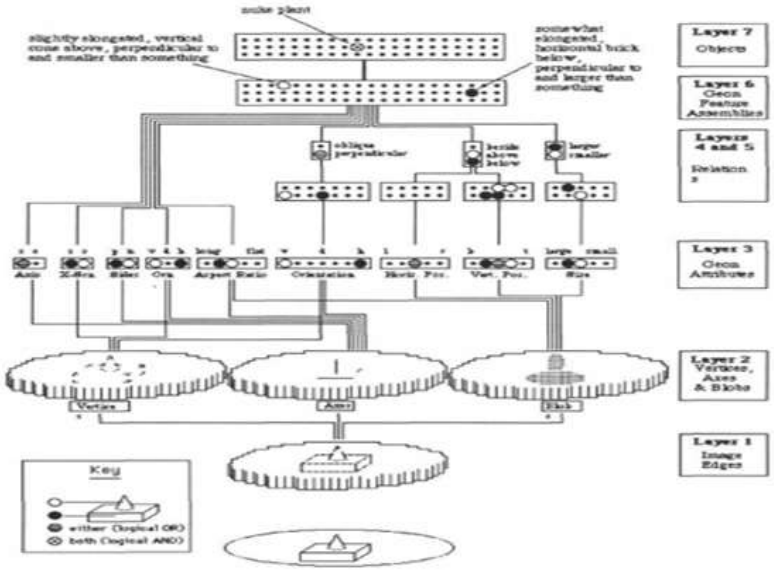

Figure1- Neural net model for object recognition. [From Hummel & Biederman (1992)]

A shape based object recognition using artificial neural network was developed by Vries J (2005), which talks about the human object recognition, recognition by components and the neural network methods [6]. The system mainly consists of two parts: - combination creation and object classification network. The neural network used is the SOM. The paper also shows various tests done on this system and their results.

Bilodeau G et al (2007) proposed a qualitative, volumetric part-based model to improve the categorical invariance and viewpoint invariance in content-based image retrieval, and also a novel two-step part-categorization method is presented to build it [8]. The method consists first in transforming parts extracted from a segmented contour primitive map and then categorizing the transformed parts using interpretation rules.

Zhang D et al (2004) introduced Review of shape representation and description techniques and generally classified these techniques into two classes of methods: contour-based methods and region-based methods [5]. They also beautifully explained the advantages and disadvantages of both methods

Bilodeau G et al (2001) proposed a method to hypothesize the volumetric primitives from object parts [4]. A combination of the concepts from the two existing approaches, a model fitting and a rule based approach is presented. Certain rules have been created for 18 volumetric primitives differentiated by axis type, sweeping rule type and section type. The steps are explained below:

- Part contours are simplified to one of a finite number of spatial constant curvature primitives
- Fuzzy classifer studies the contour of simplified parts and generates multiple hypotheses of volumetric primitives for each part.

Based on this primitive shapes can be identified.

Yu X et al (2011) extended their work on a novel approach for extracting 2D geons from 2D images and also define a finite 2D geon set based on the parametric representation of 3D geons [10]. The process is composed of three major parts:

- image pre-processing which includes image background removal and segmentation
- arc-geon detection
- Polygon-geon detection.

And also proposed a general procedure for matching the extracted 2D geons to given models for object recognition.

Xing W et al (2012) presented part based structural description of 3D objects, which combines the geometric features of individual parts with topological connections among them [12]. They described and extracted the geometric features of individual parts and topological connections among them. They classified geons according to four qualitative geometrical attributes: axis shape, cross-section edge shape, cross-section size sweeping function, and cross-section symmetry. These attributes provide distinct shape characteristics useful for symbolic object recognition.

Daghameen K et al (2007) presented an efficient algorithm for line recognition using integer arithmetic [7]. An algorithm to find the properties of a line using the properties of those actual straight line segments that form a line is presented. The main advantage of the algorithm is its simplicity and robustness. The algorithm can detect any line that is continuous in the plane.

Chen W et al (2010) presented a fast geometry figure recognition algorithm based on edge pixel point Eigen values [9]. A proposed new algorithm, which can recognize the closed geometry figures such as polygon, circle and ellipse has been explained. The problem they pointed out with this algorithm is that the figure other than polygon, circle or ellipse will not suit the algorithm best.

Rotaru F et al (2011) proposed a 2D polygon recognition method [11]. First, adaptive convex polygonal vertex detection is applied and then a polygonal fitting algorithm using as input the two vertices and the object contour provides a precise object identification and description. The algorithm is suitable for robot vision, quality control or photogrammetric applications when the image objects to be processed have polygonal shapes. A software environment was designed to test and use the proposed method, to evaluate its speed and accuracy. This technique is a synthesis of a general method to recognize any kind of polygonal shape on any kind of images.

Literature study showed that, if there are any discontinuities in the edge detected image it will be difficult to fit the geons into the image that is RBC theory does not attempt to provide mechanism to reduce the complexities of real scenes to simple geon shapes. And also around 36 geons along with its combinations should be stored in the memory. The other method of which is Eigen value analysis was found to more or less satisfy the project objective, but the limitation of this method is that it is apt only for some primitive shapes. So by modifying this approach and after carrying out simulation edge gradient analysis is found to be more suitable for shape approximation. The concept of SOM obtained from literature survey has also helped in obtaining the primitive shape codes.

METHODOLOGY

The input taken is the contour and high curvature point information of an edge detected image, which is in the form of pixel coordinates. On this information a gradient and positional analysis is performed. Based on the rules corresponding to primitive shapes a neural network gets trained. The trained output is compared with the analyzed output and the compared output gives the approximated geons which can be represented in the form of codes. The proposed block diagram is shown below:

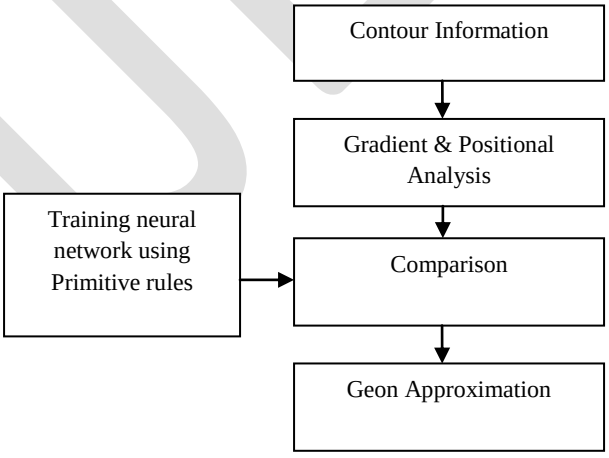

Figure 2 – Block Diagram of Shape Approximation

Contour information

The input is the contour information of an object which is in the form of pixel coordinates. The pixel coordinates of the 2D shapes are considered as the input.

Gradient & Positional Analysis

From the contour and the high curvature point information, an edge gradient analysis is performed.

The steps for an Edge Gradient analysis are as follows:

$$M(i,1)=A3X(i+1,1)-A3X(i,1) \quad (1)$$

$$n1(i,1)=A3Y(i+1,1)-A3Y(i,1) \quad (2)$$

$$Gradient\ (k,1)=n1(k)/M(k) \quad (3)$$

$$Angle= \tan^{-1}\left(\frac{n1(k)}{M(k)}\right) \quad (4)$$

From the first equation we get the gradient for x pixel coordinates, in the second equation the gradient for y pixel coordinate is calculated. A total gradient or slope is obtained from the third equation. And an angle is calculated from the pixel coordinates which provides the direction of the pixel values. This analysis provides all necessary information for synthesis of primitive shapes.

For the identification of an object, shapes as well as its relative position are critical. From the input which is the contour and high curvature point information, a positional analysis is also performed for finding the relative positions of the primitive shapes. This generates the positional parameters of the primitive analyzed, based on centre, its extend, etc.

Neural network

The neural network which finds best apt for comparing in an unsupervised manner is found to be SOM.

Self Organizing Maps (SOM) is a type of neural network [3]. The network is called "Self Organizing" because it does not require supervision or human intervention. The network learns its own through unsupervised competitive learning. During training the neural networks receives a number of different input patterns, study the significant features in these patterns and learns how to classify input data into appropriate categories. Unsupervised learning algorithms aim to learn rapidly and can be used in real-time. SOM attempt to map their weights to conform to the given input data. A SOM does not need a target output to be specified unlike many other types of network. The important characteristics of the SOM are:

- There is competitive learning among the neurons of the output layer (i.e. on the presentation of an input pattern only one neuron wins the competition – this is called a winner);
- The neurons are placed in a *lattice structure.*
- The neurons are tuned to various input patterns;
- The network is user friendly

The structure of SOM is shown below:

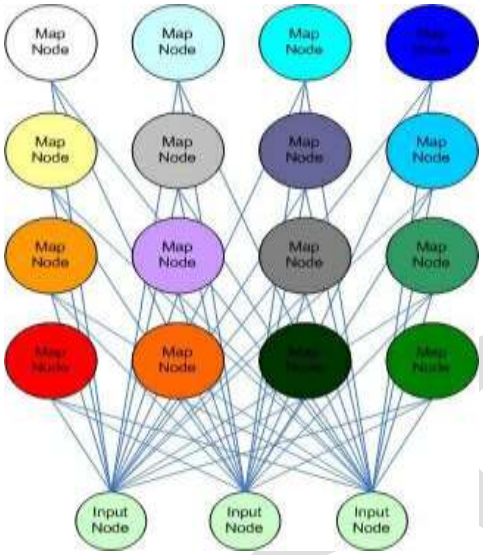

Figure 3- Structure of SOM

The figure shown above is a 4×4 SOM network. Here each map node is connected to each input node. For this node network there are possibly 48 connections. The map nodes are not connected to each other. In this configuration, each map node has a unique (i, j) coordinate. This configuration makes it easy to reference a node in the network, and to calculate the distances between nodes. A map node will only update its' weights based on what the input vector tells it.

The architecture of SOM is shown below:

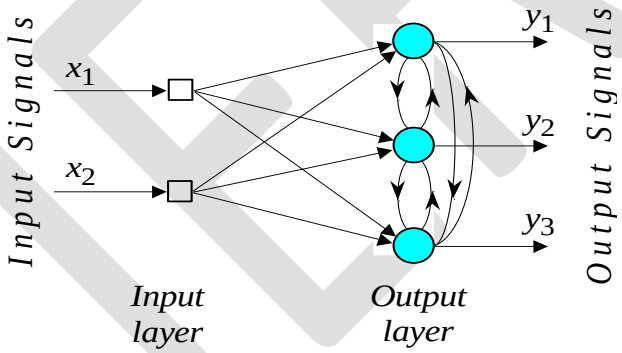

Figure 4 – Architecture of SOM

The lateral connections are used to create a competition between neurons. The neuron with the highest activation level among all neurons in the output layer becomes the winner. This winning neuron is the only one that produces an output signal and all other neurons are suppressed in the competition. Depending on the distance from the winning neuron, the lateral feedback connections can produce both excitatory or inhibitory effects, This is achieved by the use of a Mexican hat function which describes synaptic weights between neurons in the Kohonen layer.

By analysis of the characteristics of the basic shapes, certain rules have been arrived for identifying shapes. Based on these rules the SOM get trained.

Comparison

The trained output based on the primitive rules is compared with the gradient analyzed output that results to shape approximation which is mainly represented as codes for shape and its relative positional details.

SIMULATION RESULTS

Simulations were done in Matlab. For example based on the pixel coordinates of rectangle, two horizontal and two vertical lines along with its relative positional details such as top right, bottom, bottom left, up information is obtained. And certain codes have been assigned to this information. The edge detected image of rectangle is shown in Fig 5 and its corresponding pixel coordinates is shown in Fig 6.

Figure 5- Edge detected image of rectangle

A204

	A	B
1	68	199
2	68	198
3	68	197
4	68	196
5	68	195
6	68	194
7	68	193
8	68	192
9	68	191
10	68	190
11	68	189
12	68	188
13	68	187
14	68	186
15	67	185
16	67	184
17	67	183
18	67	182
19	67	181
20	67	180

G7

A
64
288
392
512

Figure 6- Pixel coordinates and corner breakpoints

The output codes corresponding to rectangle is shown below:

Command Window

```
shape_out =

     1
     2
     1
     2
     0
```

Command Window

```
position =

    11
     8
    14
     7
     0
```

Figure 7- Shape & Position Codes for rectangle

Similarly based on the pixel coordinates, output for other shapes such as square, circle, ellipse etc were also obtained. Differentiation between similar looking shapes like circle and ellipse were carried out by analyzing the values of certain characteristic parameters.

ACKNOWLEDGEMENT

First of all, I am grateful to God Almighty, for showering His blessings upon me for making me capable of doing this project work on time. I am deeply indebted to the Management of TIST, for all the help during the course of study.

CONCLUSION

According to the prime requirement, one of the suitable approaches which provide better approximation is to perform a Gradient Analysis. Shape approximation, from the edge detected contour information is successfully obtained by performing edge gradient analysis. It has the advantages as no templates are required and easy realization

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Modeling and Performance Analysis of a Permanent Magnet Brushless DC motor using Instrumentation Technique

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Abstract – This paper deals with the controlling of a permanent magnet brushless DC motor which can be done using a sensor control and a sensor less control technique. The characteristics of a brushless DC motor involve high efficiency and reliability as compared to the other motors of the same rating. The duty cycle of the motor is calculated using a PWM technique for both the methods used in controlling of a PMBLDC motor. A PID controller is also used for the speed control of the motor for sensor control and sensor less control method.

Keywords - Permanent Magnet Brushless DC Motor (PMBLDC), Pulse Width Modulation (PWM) Technique, Proportional-Integral-Derivative (PID) Controller, Hall Position Sensors, Robust Sensor less Commutation Control.

I. INTRODUCTION

A Permanent Magnet Brushless DC motor uses electronic commutators which are replaced in place of brushes that are used in other motors. The principle of a PMBLDC motor is similar to that of a conventional DC motor but has better characteristics and performance as compared to the other motors. For a BLDC motor the graph between current-torque and voltage-rpm is a straight line which shows a linear relationship. A BLDC motor has wide industrial applications since industries require medium and high speed motors. Using a PMBLDC is more advantageous as it reduces mechanical losses, has high efficiency, noiseless operation and improved speed-torque characteristics. A PMBLDC motor can be controlled using a sensor control or sensor less control technique depending upon the type used. A PID controller is used for speed control which can be closed loop or open loop control method, which also amplifies the speed of the PMBLDC motor. A PWM technique is used to vary the duty cycle which hence controls the speed of the motor. For a sensor control technique knowledge of exact position of rotor is required whereas sensor less control is used to overcome the disadvantages of a sensor control technique.

II. MATHEMATICAL MODELLING FOR A PMBLDC MOTOR

Typically, mathematical model of a PMBLDC motor is similar to that of a conventional DC motor that are having same rating. The review of the modeling of a PMBLDC motor is done using some equations involved in the process

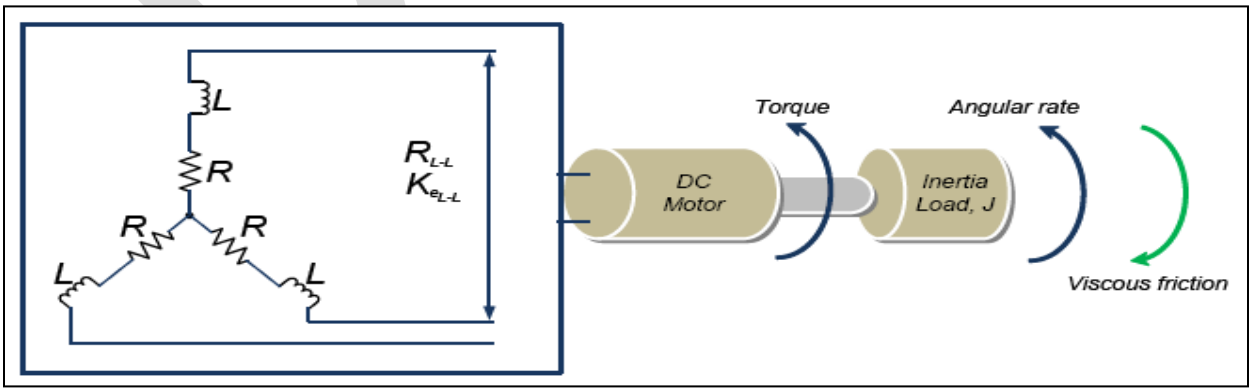


Fig. 1: Brushless DC motor schematic diagram

The phase voltage equations for a PMBLDC motor can be as follows:

$$V_a = R_a I_a + L(\frac{dI_a}{dt}) + E_a$$

$$V_b = R_b I_b + L(\frac{dI_b}{dt}) + E_b$$

$$V_c = R_c I_c + L(\frac{dI_c}{dt}) + E_c$$

Where, V_a,V_b,V_c are the phase voltages

I_a, I_b, I_c are the phase currents

E_a, E_b, E_c are the back EMF's

The back EMF's can be expressed as:

$$E_a = K_e \omega_m F(\theta_e)$$

$$E_a = K_e \omega_m F(\theta_e - \frac{2\pi}{3})$$

$$E_a = K_e \omega_m F(\theta_e + \frac{2\pi}{3})$$

Where, ω_m is the angular speed

θ_e is electrical angle of the rotor

$F(\theta_e)$ is the back EMF reference function of rotor position

III. CONTROL STRATEGY OF A BLDC MOTOR

A BLDC motor is referred to a bipolar drive where "bipolar" means that a winding is energized alternatively by both north and south poles. A bipolar drive strategy includes both sensor control technique and sensor less control technique for the smooth functioning of the motor. In a sensor based technique hall sensors and position sensors are used whereas in a sensor less control technique position encoders and back emf's are used.

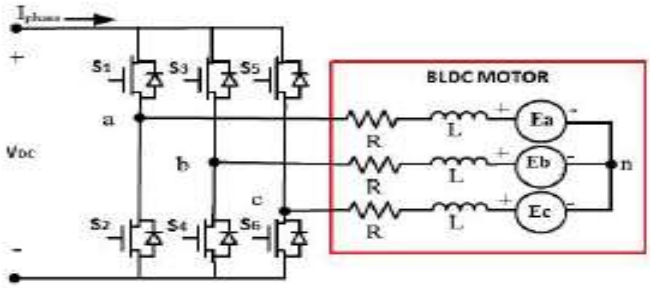


Fig. 2: A PMBLDC motor connected to inverter drive system

For a three phase PMBLDC motor application, a typical inverter drive operation is used which is divided into six modes according to the current conduction states and current sequence. The switches in an inverter drive system are operated for the phase currents of 120° when the back emf is constant and the commutation sequence is changed for the angle of every 60° electrical.

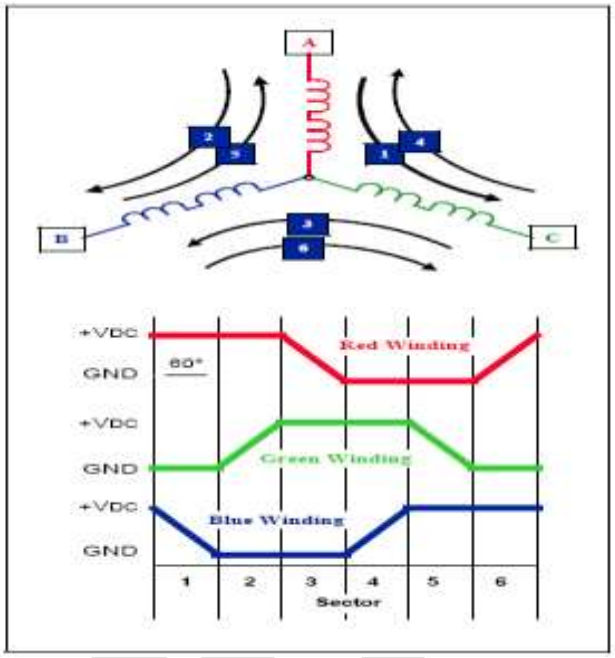


Fig. 3: Trapezoidal Back EMF waveform for a BLDC motor

A PWM control technique is used to adjust the duty cycle whose frequency is about 10 times to that of the maximum frequency of the circuit. The average output voltage is controlled through duty cycle of PWM control technique whose relationship is given by:

$$V_{avg} = D\ V_{input}$$

A PID controller is used for the speed control of a PMBLDC motor which incorporates two types of speed control techniques such as open loop speed control and closed loop speed control. A feedback path is given to the circuit which measures the actual speed and compared with the reference speed, the error speed signal generated is given as input to the PID controller and the output of the PID controller is subjected to the current limiter. The output of the PID controller is a DC square wave that is compared with a continuous triangular wave. The values of K_p, K_i, and K_d are calculated using a Ziegler Nicholas method.

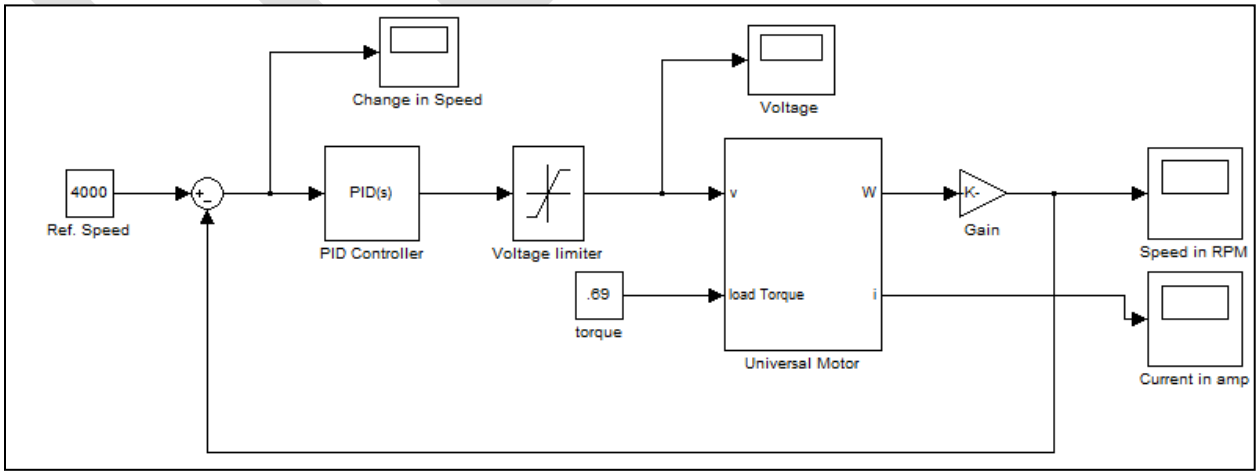


Fig. 4: Speed Control diagram through PID Controller

The figure shown above represents the simulink model for a PID control loop which is formed by the combination of Proportional-integral-derivative control.

IV. SIMULATION CIRCUIT AND RESULT ANALYSIS

A Matlab Simulation model of a PMBLDC motor for both sensor control method and sensor less control method is shown in the figure where a reference speed for both the control techniques has been set at 1650 rpm where a load torque disturbance is applied for a time period of 0.05 seconds. From the figure the two control techniques are compared with the simulink model and their waveforms.

The model shown below is of a PMBLDC motor with sensor control technique where reference speed is set at 1650 rpm. A PWM generator is used which adjusts the duty cycle and controls the speed of the motor. A decoder is used for the conversion of hall sensor signal to the equivalent EMF signal that is given to the PWM generator. A demultiplexer is used so that the pulses obtained are divided equally and given to the gate signals.

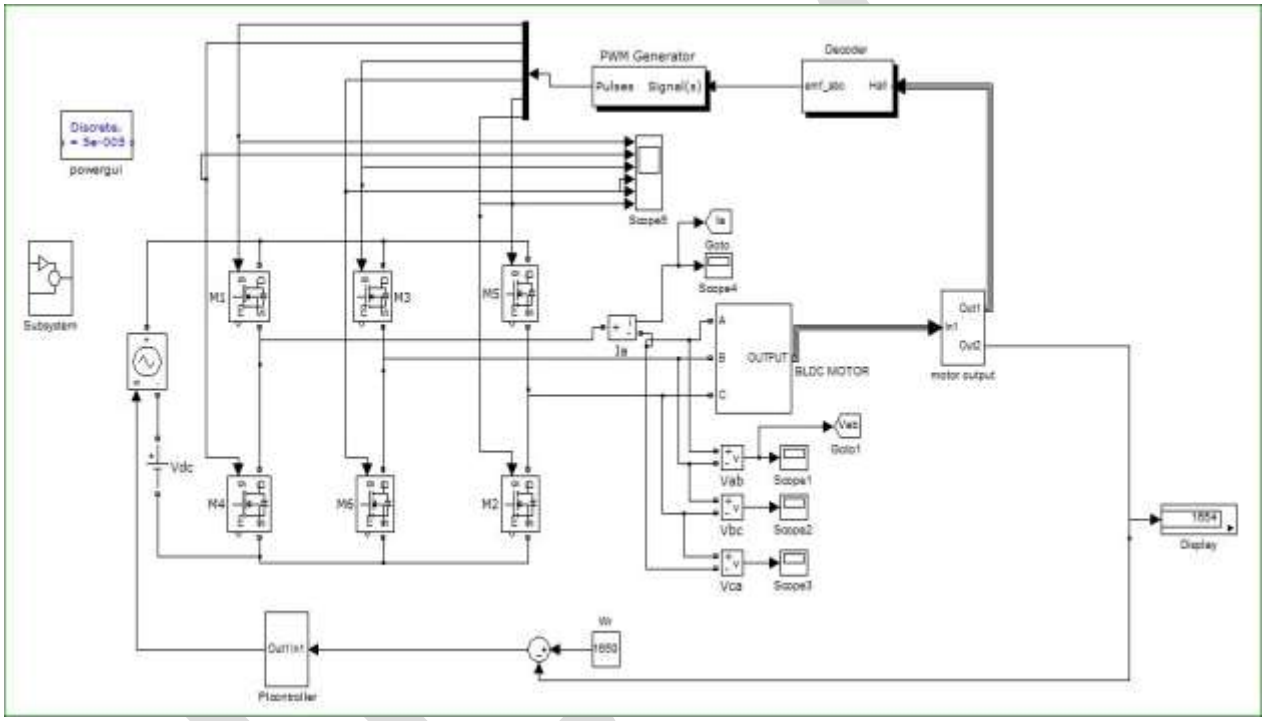
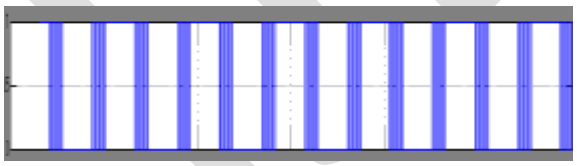
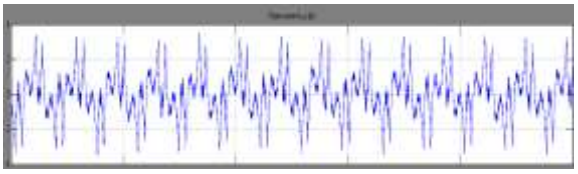


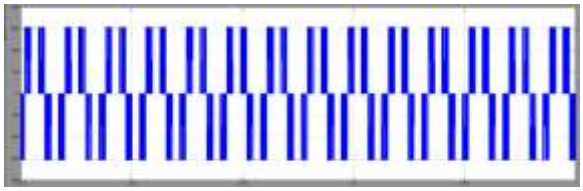
Fig. 5: Simulink model of a PMBLDC motor using sensor control



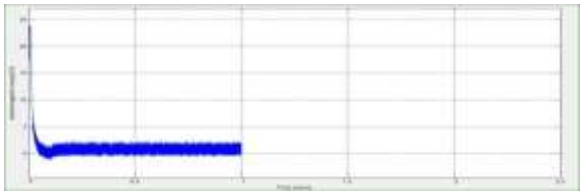
Gate Pulse for sensor control



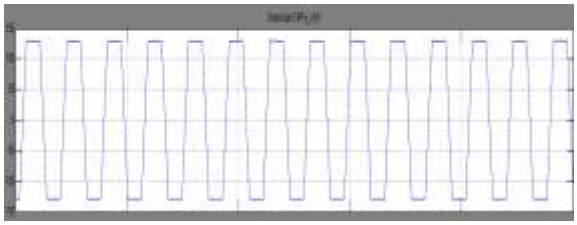
Phase Current Waveform



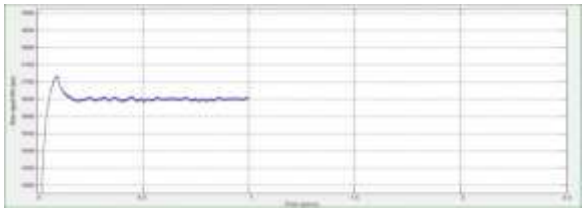
Line Voltage Pulses



Speed in rpm for sensor control



Back EMF Waveform



Electromagnetic Torque for sensor control

The model and the result analysis shown below is of a PMBLDC motor of a sensor less control technique where a motor torque has been divided into two parts that is stator back EMF and the motor output. The output from the stator back EMF is given to the PWM generator. Using demultiplexer the pulses obtained are equally divided and given to the gate pulse of the IGBT.

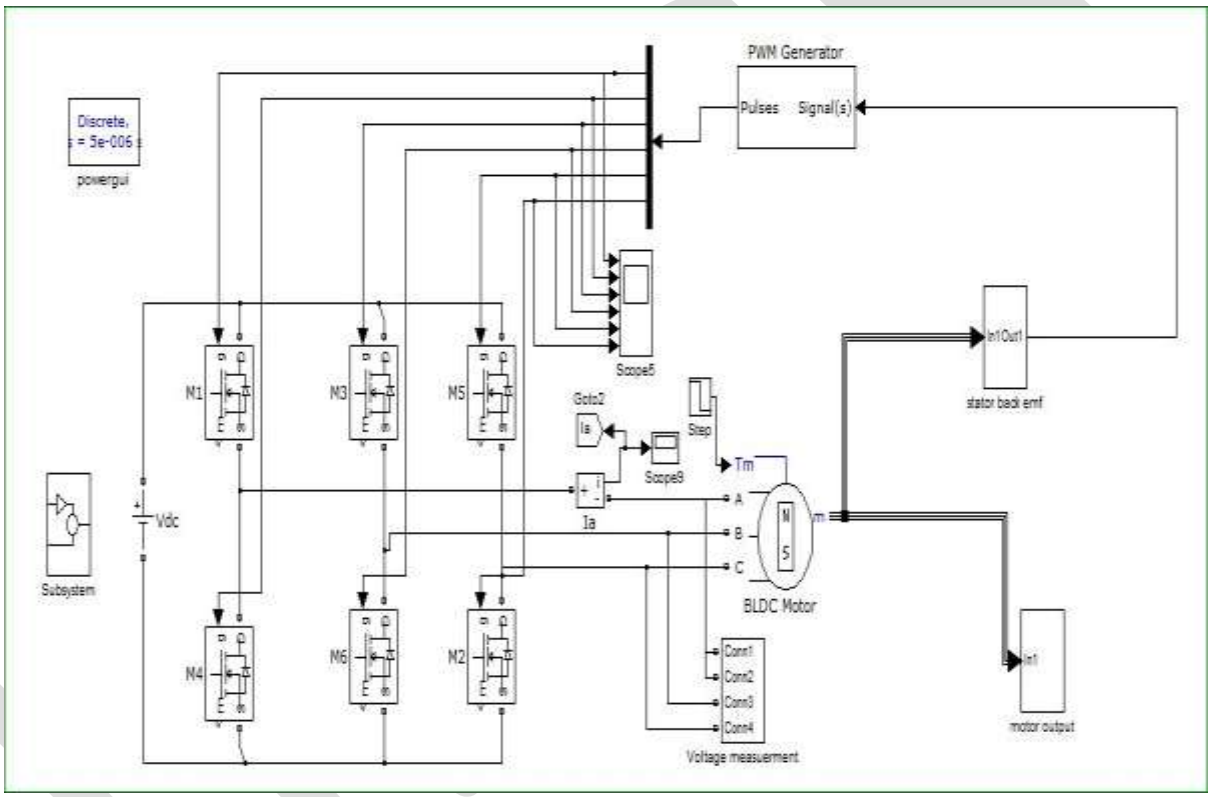
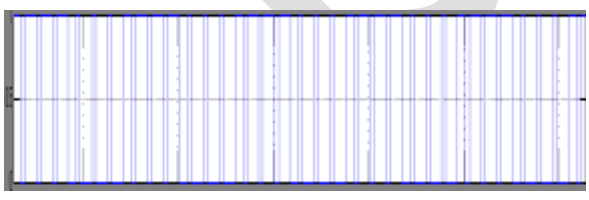
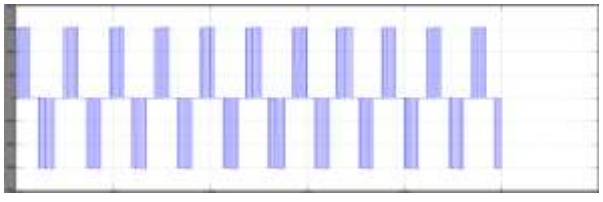


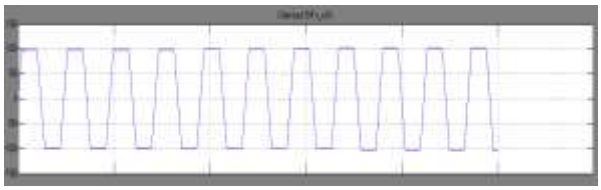
Fig. 6: Simulink model of a PMBLDC motor using sensor less control



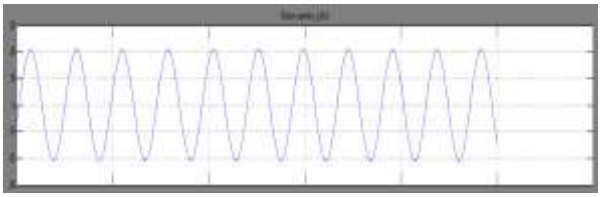
Gate Pulse for sensor less control



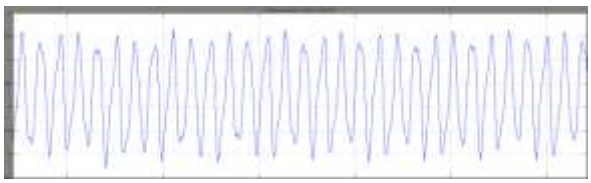
Line Voltage Pulses



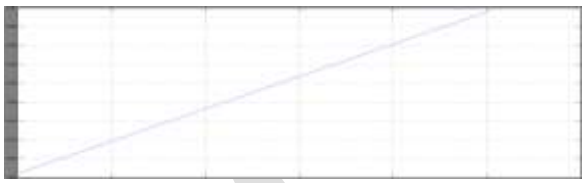
Back EMF Waveform



Phase Current Waveform



Electromagnetic Torque for sensor less control



Speed in rpm for sensor less control

V. CONCLUSION

This paper deals with the modeling and performance of a PMBLDC motor and comparison between the sensor control method and the sensor less control method using a PID control for speed analysis and current limiter and a PWM control for variation of duty cycle. From the calculation of the values and graphical analysis of voltages and currents it is found that a BLDC motor with sensor less control technique is more advantageous as compared to a BLDC motor with sensor control technique. In this paper controlling of a PMBLDC motor with different techniques is proposed, analyzed, and extended by overcoming the drawbacks of a BLDC motor over a conventional DC motor of same rating.

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OBJECT IDENTIFICATION USING FOVEAL EXPLORATION

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Abstract— In human vision, interpretation is the main phase which analyses the small instantaneous image projected onto the foveal region in eye. Human eyes analyzes the object using different features like edges, corners etc. An edge can be defined as the sharp change in intensity or brightness. Edges can occur on the boundary of the objects and in between the objects. Human eyes are more attracted to corners than edges. It provides an important cue factor to the object identification. Boundary forms the outline of an object from which we can easily interpret the object. From these three cue factors the shape details of an object can be identified in an intelligent manner. Unlike the normal image processing where the whole image is fed as input, the work uses foveal images. A sequence of foveal exploration leads to the object identification

Keywords— Boundary Tracing, Corner, Edge, Extrapolation, Eight pixel connectedness, Fovea, Sobel.

INTRODUCTION

Human vision is an extremely powerful information processing system that facilitates our interaction with the surrounding world. Optic nerve transmits the image captured by eyes to brain. Optic nerve terminates on the lateral geniculate nucleus (LGN), which is the first relay in the brain's visual pathways. The lateral geniculate nucleus then project to the primary visual cortex, their main target. Here brain begins to reconstitute the image from the retina. The main pre processing step in any object identification systems are feature extraction. Likewise, in brain also this process happens.The actual process of feature extraction happens at the lateral-geniculate nucleus of the brain. This early level processing in human vision consists of both attentive and pre-attentive stages. In the pre-attentive stage only pop out features are detected. These are the local regions of the image which present some form of spatial discontinuity. In the attentive stage relationships between these features are found and grouping takes place. Objects are primarily characterized by distinctive shape. Shape is commonly defined in terms of the set of contours that describe the boundary of the object. Human visual system performs edge detection very efficiently. Visual image search actually progresses through foveal exploration. Through foveal exploration the whole image is interpreted. This interpretation process builds through extracting the features like edge [4], boundary, corners [2] etc.

Edge detection [11], [12] is one of the fundamental steps in object analysis and recognition. The edge detected image can provide information regarding the shape of the object. A corner can also be defined as points for which there are two dominant and different edge directions in a local neighbourhood of the point. By using both the edge and corner information we can easily identify the object. Contours can also help to explain the shape of the object. So combining the information from these areas the efficiency of the system can be improved.

The ultimate goal is to extract the shape of the object of interest. Unlike the normal image processing where the whole input image is fed as input, the system uses the foveated exploration. In foveated exploration, a small portion, that is 2 to 5 degree foveal region, is used to fill the clear picture of the object under consideration and from that region the features are extracted

LITERATURE SURVEY

Canny J (1986) proposed a computational approach for finding the edges of object efficiently [1]. This algorithm uses a bilateral filtering for smoothening the edges. This process helps in covering up the noise without losing the information content. Then it adaptively finds the low and high threshold values using OTSU method. The algorithm mainly consists of three steps. They are smoothing process using a Gaussian filter, calculating the gradient magnitude and direction and finally non maximum suppression.

Sobel I (1990) proposed an important method based on gradient values [3].The Sobel operator performs a 2-D spatial gradient measurement on an image and emphasizes regions of high spatial gradient that are edges. Typically it is used to find the approximate absolute gradient magnitude at each point in an input gray scale image.

Je De Vries (2005) introduced a novel artificial intelligence approach to object recognition [5]. Its main emphasis is on its neural elements that allow the system to learn to recognise objects about which it has no prior information. The main concepts include edge extraction algorithm to find the edge pixels in the image. The edge detection tool used is the SUSAN. The edge it produces are more solid and better connected, this will be helpful in extracting the shape of whole image. Using these edge pixels, create the contours of the shapes. In final step the shapes are extracted. Using the shape different descriptors is identified.

Wu et al (2007) described the system based on the behaviour of biological receptive fields and the human visual system [6]. A network model based on spiking neurons is proposed to detect edges in a visual image. It consists of 3 layers in which first layer represent photonic receptors where each pixel corresponds to each receptor. Intermediate layer is composed of four types of neurons corresponding to four different receptive fields respectively. The firing rate map of the output layer forms an edge graphic corresponding to the input image.

Arnow T L et al (2007) proposed a new approach to find corners in images that combine foveated edge detection and curvature calculation with the saccadic placement of foveal fixations [7]. Each saccade moves the fovea to a location of high curvature combined with high edge gradient. Edges are located using a canny edge detector with the spatial constant that increases with eccentricity. Then they computed a factor called corner strength which is a product of curvature and gradient. An inhibition factor is used to avoid visits to the regions which are previously visited. A long saccade moves the fovea to the unexplored areas of the image.

Shabab.W et al. (2009**)** they proposed a modified 2D Chain Algorithm that can be applied to color images [8]. The segmented object is used to derive the chain code [9] in the image. The proposed algorithm implements a 4 connectivity rule but differs by the fact that it is concentrated much on the position of each pixel. After necessary initializations the input image is dealt with a row wise and column wise manner suing the 4 connectivity manner. By the end of the computations the coordinates of the corners will be available. It sis found valid for shapes composed of triangular, rectangular and hexagonal shapes and the results demonstrated it could extract the coordinates of the shapes.

Reddy P R et al (2012) proposed various stopping criterions for boundary tracing algorithms [10]. The main contour tracing algorithms include square tracing, Moore Neighbour Hood tracing, radial sweep, and Theo Pavlidis algorithms. The first two algorithms are easy to implement and are frequently used. Upon analyzing the algorithms the selection of stopping criterion is important in case of all algorithms. Considering the ease of implementation and selection of stopping criterion Moore Neighbourhood algorithm found more efficient. It uses eight neighbourhood connectivity for boundary tracing.

OBJECTIVE OF THE PROJECT

The main objective of the project is to identify the shape of the object through foveal exploration. Main focus required is to the concept of both the foveal exploration and extraction of the shape. Based on the literature survey, various approaches are found for the extraction of shape. To meet the requirements of the project the following steps are adapted for foveated edge detection. As initial step a foveal region will be selected. For that region edge extraction is performed. In the edge detected image contour following will be initialised at the first non zero pixel. Contour following forms the method for foveal exploration. The trend of the contour will decide the next foveal region. The work aims at extracting the shape information with the minimum error or single pixel accuracy.

PROPOSED METHODOLOGY

The foveal colour image is fed as input to the system. As an initial step the input in the RGB format is converted to gray scale image. Then shape extraction is done using edge detection. This step facilitates the boundary tracing. Boundary tracing is done on the binary image. After completing the tracing in the foveal image, trend of the contour will decide the next fixation. Finally the concept of extrapolation is used to find the positional information that is, the position where high curvature point occurs

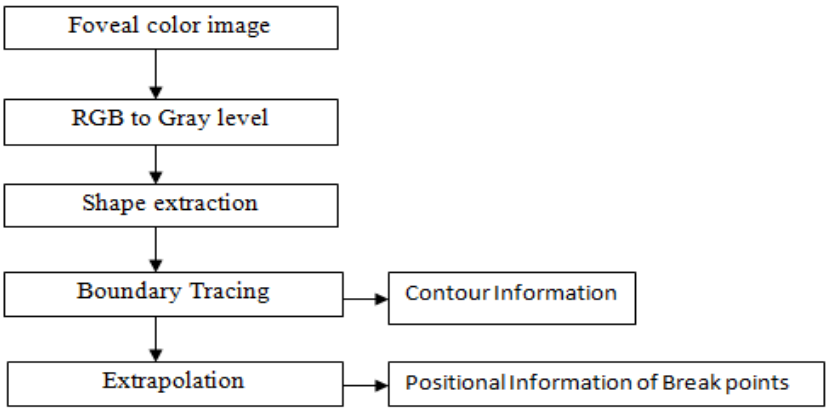

Figure 1: Methodology for the system

RGB TO GRAY SCALE CONVERSION

When converting an RGB image to grayscale, take the RGB values for each pixel and make output a single value reflecting the brightness of that pixel. One of the methods is to take the average of the contribution from each channel: (R+B+C)/3.

THRESHOLDING

Thresholding is a process of converting a grayscale input image to a bi-level image by using an optimal threshold. The aim of thresholding is to extract those pixels from any image which represent an object.

ALGORITHM USED FOR EDGE DETECTION

The Sobel operator is used in image processing, particularly within edge extraction algorithms [4]. The Sobel operator performs a 2-D spatial gradient measurement on an image and so emphasizes regions of high spatial frequency that correspond to edges. The Sobel edge detector uses two masks, vertical and horizontal. Each direction of Sobel masks is applied to an image, and two new images are created. One shows the vertical response and the other shows the horizontal response. Two responses are combined to form a single image. The purpose is to determine the existence and location of edges in an image.

The properties of derivative mask are:

- Each mask should contain opposite sign.
- Sum of each mask should be equal to zero.
- More weight means implies more edge detection.

The operator uses two 3×3 kernels which are convolved with the original image to calculate approximations of the derivatives - one for horizontal changes, and one for vertical changes.

Let us consider f(x, y) is the image grayscale distribution and G is the edge of the image gradient value and Gx and G_y are two images which at each point contain the horizontal and vertical derivative approximations, the calculations are as follows:

$$G_x = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix} * f(x, y)$$

$$G_y = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix} * f(x, y)$$

where *here denotes the 2-dimensional convolution operation. The *x*-coordinate is defined here as increasing in the "right"-direction, and the *y*-coordinate is defined as increasing in the "down"-direction. At each point in the image, the resulting gradient approximations can be combined to give the gradient magnitude, using:

$$G=\sqrt{Gx^2 + Gy^2} \quad (1)$$

Using this information, we can also calculate the gradient's direction:

$$\theta=\arctan(G_y/G_x) \quad (2)$$

Sobel masks have better noise suppression characteristics and make them preferable because it is an important issue when dealing with the derivatives. Sobel operator is suitable for FPGA implementation. The quality of the Sobel edge detector is adequate enough to be used in numerous applications.

ALGORITHM USED FOR BOUNDARY TRACING

Contour Tracing also known as border following or boundary following; is a technique that is applied to digital images in order to extract their boundary. Contour tracing [10] is one of main pre processing methods done on digital images in order to extract information about their general shape. Once the contour of a given object is obtained, its different characteristics will be examined and used as features .Therefore, correct extraction of the contour will produce more accurate features which will increase the chances of correctly classifying a given pattern. The contour pixels are generally a small subset of the total number of pixels representing a pattern. Therefore, the amount of calculation is greatly reduced when we run feature extracting algorithms on the contour instead of on the whole pattern. In conclusion, contour tracing is often a major contributor to the efficiency of the feature extraction process -an essential process in the field of pattern recognition.

The following algorithm gives output as an ordered sequence of points. The Moore neighborhood of a pixel, NP, is the set of 8 pixels which share a vertex or edge with that pixel. These pixels are namely pixels NP1, NP2, NP3, N P4, N P5, N P6, NP7 and NP8.

	NP1	NP2	NP3	
	NP8	NP	NP4	
	NP7	NP6	NP5	

Figure 2: Moore Neighborhood

Given a digital pattern i.e. a group of black pixels and white pixels; locate a boundary pixel and declare it as the "start" pixel. Locating a "start" pixel can be done in a number of ways; it can start at the bottom left corner, scan each column of pixels from the bottom going upwards -starting from the leftmost column and proceeding to the right- until get a black pixel. Then declare that pixel as the "start" pixel. Without loss of generality, we will extract the contour by going around the pattern in a clockwise direction. The general idea is: every time we hit a boundary pixel, backtrack i.e. go back to the white pixel you were previously standing on, then, go around that pixel in a clockwise direction, visiting each pixel in its Moore neighborhood, until you hit a black pixel. The algorithm terminates when the start pixel is visited for a second time. The boundary pixels walked over will be the contour of the pattern.

HIGH CURVATURE POINT SELECTION

The output obtained from the boundary tracing will be a set of pixel coordinate values. By using this information we have to find the high curvature points or the break points, since the output from the gray scale image gave only wrong results. The main challenge is to find the break points. For this purpose a manual analysis is being done. From that some abrupt change is found out. To find the same abrupt change, the concept of extrapolation is found suitable.

Extrapolation is the process of taking data values at points x_1, ..., x_n, and approximating a value outside the range of the given points. This is most commonly experienced when an incoming signal is sampled periodically and that data are used to approximate the next data point. The same concept is used to find the high curvature points from the pixel coordinates. The pixel coordinate values are analyzed using the concept of extrapolation.

SIMULATION RESULTS

The following figures show the simulation output in MATLAB using simple shapes. In order to start with the simulation to show the foveal fixations the object segment is divided into 4 foveal regions. In the foveal regions the steps detailed in the methodology is done. The result found successful.

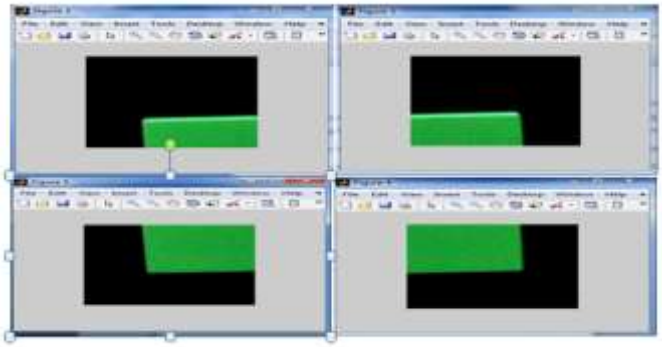

Figure 3: A square divided into four foveal regions

In the foveal images the tracing starts and the trend of the contour will decide the next foveal fixation. This continued till the object was completely detected. This results in the contour information of the object.
The fig 4 below shows the pixel coordinates of a rectangle.
Break points are also shown.

Variable Editor - org_val

File Edit View Graphics

org_val <668x2 double>

	1	2
28	67	172
29	67	171
30	67	170
31	67	169
32	67	168
33	67	167
34	66	166
35	66	165
36	66	164
37	66	163
38	66	162
39	66	161
40	66	160
41	66	159
42	66	158
43	66	157
44	66	156
45	66	155
46	66	154
47	66	153
48	66	152
49	66	151
50	66	150
51	65	149
52	65	148
53	65	147
54	66	146
55	66	145
56	66	144
57	66	143
58	66	142
59	66	141
60	66	140

```
final_pts =

    64   288   392   512


no_of_corners =

     1     4

BREAK POINT FOUND
```

Figure 4: Contour information and break points for rectangle

The next object taken into consideration was the circle. Fig 5 shows the foveal regions for the circle. Fig 6 shows the pixel coordinates and since the circle has got infinite corner point's initial and final points is taken. By plotting the pixel coordinates the object can be re created.

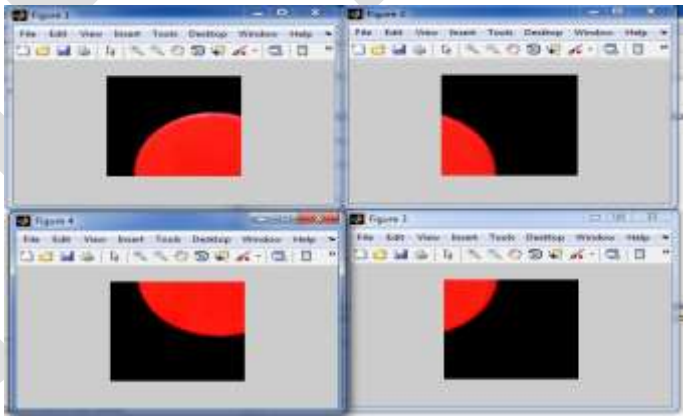

Figure 5: A circle divided into four foveal regions

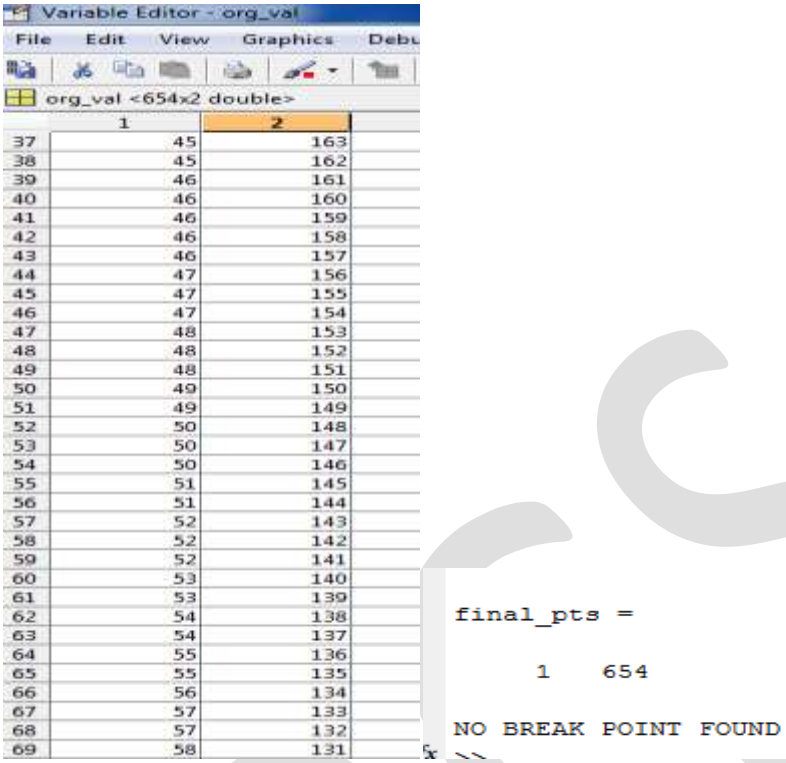

Figure 6: Contour information and break points of Circle

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CONCLUSION

By using the ideas perceived from the literature survey, the work uses three different concepts for simulating the system requirements. These include edge detection, contour tracing and high curvature point selection. The work was successfully completed on a database which consists of basic shapes like rectangle, square, triangle, circle and ellipse.

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TEST AUTOMATION FRAMEWORK FOR RTU

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Abstract---Early electrical substations required manual switching or adjustment of equipment, and manual collection of data for load, energy consumption, and abnormal events. As the complexity of distribution networks grew, it became economically necessary to automate supervision and control of substations from a centrally attended point, to allow overall coordination in case of emergencies and to reduce operating costs. The development of the microprocessor made for an exponential increase in the number of points that could be economically controlled and monitored. Today, standardized communication protocols such as DNP3, IEC 60870-5 and Modbus, to list a few, are used to allow multiple intelligent electronic devices to communicate with each other and supervisory control centers. This enables migration to the digital substation, delivering smaller foot print, less wiring, increased personnel safety and improved reliability, resulting in reduced cost of ownership. In this project, testing of DNP3 protocol has been done to ensure whether the correct information is going to the master station (or) not and there by better communication is achieved. For this, the automation of testing of Host- and Sub- Communication Interfaces of RTU for DNP3 protocol for data points in the monitoring and control direction has been done. The test cases have been written in SATEEN Testing Console.

Key Words---RTU-Remote Terminal Unit, PCU-Process Control Unit, DNP-Distributed Network Protocol, HCI-Host Communication Interface, SCI-Sub-device Communication Interface, OPC-OLE for Process Control, OLE-Object Linking and Embedding.

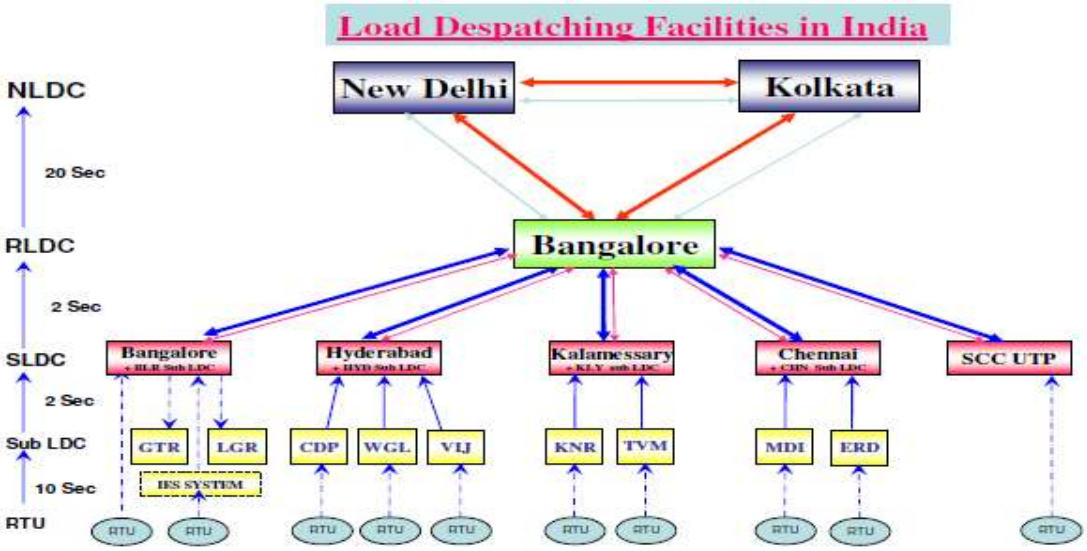
I.INTRODUCTION

The development of Indian Electricity System hitherto had been on a Regional basis with five RLDCs established in the mid – 1960s having the responsibility to co-ordinate the integrated operation within each region. The Southern Regional Load Dispatch Centre (SRLDC) is one of these five RLDCs, located at Bangalore, the IT Hub of India and it is the nerve centre for monitoring and coordinating operations of the Southern India Regional Grid comprising the states of Andhrapradesh, Karnataka, Kerala, Pondicherry and Tamilnadu.

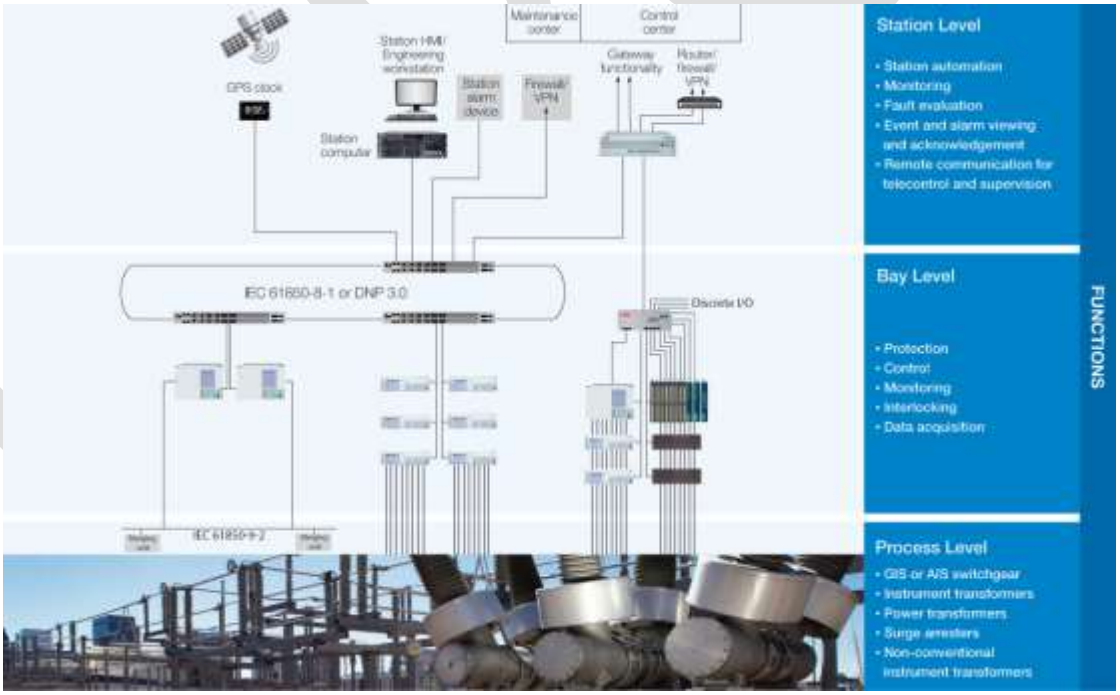
A. Unified Load Dispatch Scheme

Computerized load dispatch and communication facilities are an essential requirement in managing the control centre operations encompassing a large and complex interconnection such as Southern Regional Grid.

The hierarchy of ULDC in Southern Region is given below:



B. Example of migration to the digital substation



The information is sent from process level to station level through a RTU. To send this information, a protocol must be maintained. The different protocols are DNP 3.0, IEC 60870-5 101 and IEC 60870-5 104.In this project, we are testing DNP3 protocol to ensure whether the correct information is going to the master station (or) not.

II. Literature Survey

The present day Supervisory Control and Data Acquisition (SCADA) systems consisting of SCADA hosts, Remote Terminal Units (RTUs) and field devices monitor and control process equipment and systems from multiple locations and exchange data from various distributed control systems along the local and wide area networks. Communication within substations, between substations and to remote control centres is not new but has evolved from slower analog to faster digital communication. A large number of different serial SCADA and RTU protocols have been used by different utilities and manufacturers around the world resulting in costly and time consuming work with "protocol converters".

The RTUs are pre-programmed to communicate with the central station SCADA and other networked systems in the form of protocols. Protocols are similar to languages, which allow the RTU/SCADA units to communicate with each other.

A. Existing System

In a SCADA system, the RTU accepts commands to operate control points, Set analog output levels, and provide responses; it sends status, analog, and accumulator data to the SCADA master station. An RTU may be interfaced to multiple master stations and IEDs with different communication media (usually serial (RS232, RS485, RS422) or Ethernet). An RTU support standard protocols like Modbus, IEC 60870-5-101/103/104 and DNP3 etc. Automation of the protocol testing has to be done in order to ensure that data transfer from RTU to master station (i.e., SCADA) is done correctly.

B. Proposed System

In this project, the automation of testing of Host- and Sub- Communication Interfaces of RTU for DNP3 protocol for data points in the monitoring and control direction has been done. The test cases have been written in SATEEN Testing Console.

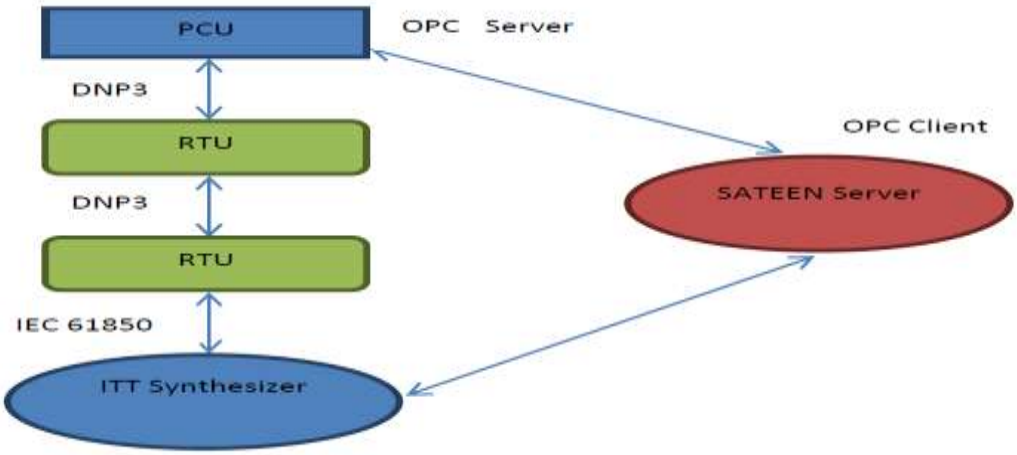
III.HOW TEST AUTOMATION FRAMEWORK FOR RTU IS DONE

- In this paper, the automation of testing of Host- and Sub- Communication Interfaces of RTU for DNP3 protocol for data points in the monitoring and control direction has been done. The test cases have been written in SATEEN Testing Console.
- ITT Synthesizer is used to simulate data points of IED's. Two RTU's have been cascaded so that both HCI and SCI testing can be done simultaneously. PCU is used as a DNP3 master to the Master RTU.
- SATEEN server has OPC Data Access from PCU and ITT. This will enable us to write values through ITT and read the corresponding values from PCU for monitoring points, and write values through PCU for control points.
- The configuration of RTU and PCU has been done so that there is one point with each variation of a particular type of data supported by RTU560. Generation of XML files for PCU configuration is done using Excel DE tool. The polling modes of PCU can be changed by modifying the 'rtupoll' variable in the .ini files for the required line.
- A SATEEN Test Scheduler is used to run the scripts in a sequential manner at the required time.

IV. IMPLEMENTATION OF AUTOMATION TESTING

In this project, test cases are to be automated for DNP3 protocol and these test cases are written in SATEEN (substation automation testing environment). The configuration of RTU and PCU has been done so that there is one point with each variation of a particular type of data supported by RTU560. Generation of XML files for PCU configuration is done using Excel DE tool. The polling modes of PCU can be changed by modifying the 'rtupoll' variable in the .ini files for the required line.

A. Monitoring Direction: Setup



The setup for monitoring direction involves an IEC 61850 line from ITT Synthesizer (for simulation of IED's) to Slave RTU, which has a host DNP3 line with Master RTU. This RTU is further connected to PCU via a DNP3 line. The SATEEN server can interact and access data from PCU and ITT Synthesizer through OPC.
This will ensure that both SCI and HCI test cases can be verified as one RTU acts as a host and another act as a sub-device.
Test cases have been written by writing the ITT Synthesizer scripts and SATEEN scripts. Test cases have been written for the following data points (An example script is shown later in the report):

1. SPI (Single Point Input)
   a. Object 1 Variation 0, 1 and 2
   b. Object 2 Variation 0, 1, 2, 3
2. DPI (Double Point Input)
   a. Object 3 Variation 0, 1 and 2
   b. Object 4 Variation 0, 1, 2 and 3
3. AMI (Analog Measured Input)
   a. Object 30 Variation 0, 1, 2, 3, 4
   b. Object 32 Variation 0, 1, 2, 3, 4
4. DMI (Digital Measured Input)
   a. Object 30 Variation 1, 2, 3, 4
   b. Object 32 Variation 1, 2, 3, 4
5. BSI (Bit String Input)
   a. Object 30 Variation 1, 2, 3, 4
   b. Object 32 Variation 1, 2, 3, 4
6. MFI (Analog Measured Floating Input)
   a. Object 30 Variation 1, 2, 3
   b. Object 32 Variation 1, 2, 3, 4, 5, 7
7. ITI (Integrated Totals Input)
   a. Object 20 Variation 1, 2, 3, 4, 5, 6, 7, 8
   b. Object 21 Variation 1, 2, 9, 10
   c. Object 22 Variation 1, 2
8. STI (Step Position Input)
   a. Object 30 Variation 2, 4
   b. Object 32 Variation 2, 4

B. EXAMPLE ITT Synthesizer Script for SPI (Object 1 Variation 0)

```
//-----------------------------------------------------------------
// Synthesizer Script: SPI_DNP3_obj1var0.cs
// Created          : 6/9/2014 12:26:44 PM
// Author           : ADMIN
// Description      :
//-----------------------------------------------------------------

using System;
using System.Net;

using ABB.IEC61850.CoreTypes;
using ABB.IEC61850.MetaModel;
using ABB.ITT.SASynthesizer.SimulationUtils.ServerSimulator;
using ABB.ITT.SASynthesizer.SubstationUtils;

namespace ABB.ITT.SASynthesizer.SimulationUtils.Scripting
{
        public class SPI_DNP3_obj1var0: GenericScriptObject
        {
                public override void Main()
                {
                        // [START SCRIPT]
        SetValue("AA1J1Q01A2LD1/SP8GGIO1.Ind5.stVal", "True");

                        Wait(6000);                     //SetValue("AA1J1Q01A2LD1/SP8GGIO1.Ind1.q", new
IEC61850_Quality(QualityValidity.Invalid, true, true, true, false, false, false, false, false,QualitySource.Substituted, false, true), true);
                        SetValue("AA1J1Q01A2LD1/SP8GGIO1.Ind5.q", new IEC61850_Quality(QualityValidity.Invalid, true,
true, true, false, false, false, false, false,QualitySource.Substituted, false, true));
                        Wait(6000);
                            //SetValue("AA1J1Q01A2LD1/SP8GGIO1.Ind1.q","Good" , true);
                        SetValue("AA1J1Q01A2LD1/SP8GGIO1.Ind5.q","Good" );
                        Wait(6000);
                        //SetValue("AA1J1Q01A2LD1/SP8GGIO1.Ind1.stVal", "False", true);
                        SetValue("AA1J1Q01A2LD1/SP8GGIO1.Ind5.stVal", "False");
                        //Insert script commands here.
                    // [END SCRIPT]
                }
// [START USER METHODS]
//    Insert additional user methods here (event handlers, etc...)
// [END USER METHODS]
        }
}
```

C. EXAMPLE SATEEN Script For SPI (Object 1 Variation 0)

D. RESULT OF ABOVE TESTCASE

==========HEADER ==========

==========BODY ============

SPI Value off to on change: True

on with invalid status: True

on->valid status: True

SPI Value change from on to off: True

SPI Values changes from ITT sysnthesizer to RTU.Values changes from RTU's to PCU via DNP3:**********----------**********

TimeStamp=2014-07-23 16:48:12.781; ItemName=SPI_IND3; NewValue=1;

TimeStamp=2014-07-23 16:48:18.796; ItemName=SPI_IND3; NewValue=1;

TimeStamp=2014-07-23 16:48:19.484; ItemName=SPI_IND3; NewValue=1;

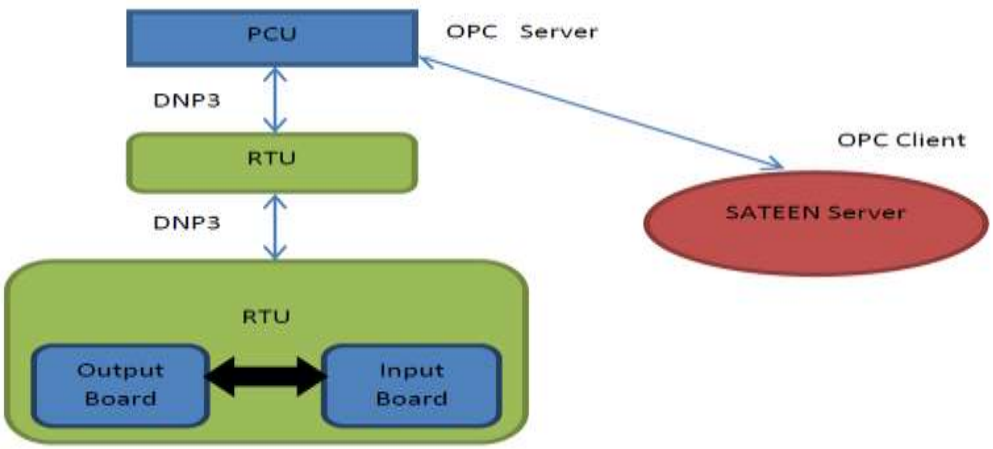
TimeStamp=2014-07-23 16:48:30.937; ItemName=SPI_IND3; NewValue=2;

==========FOOTER ==========

Testcase result: Succeeded

Verify timestamps for Obj1 var 0: Compare the event timestamps from MMS & DNP3 filter timestamp steps

E. CONTROL DIRECTION: SETUP



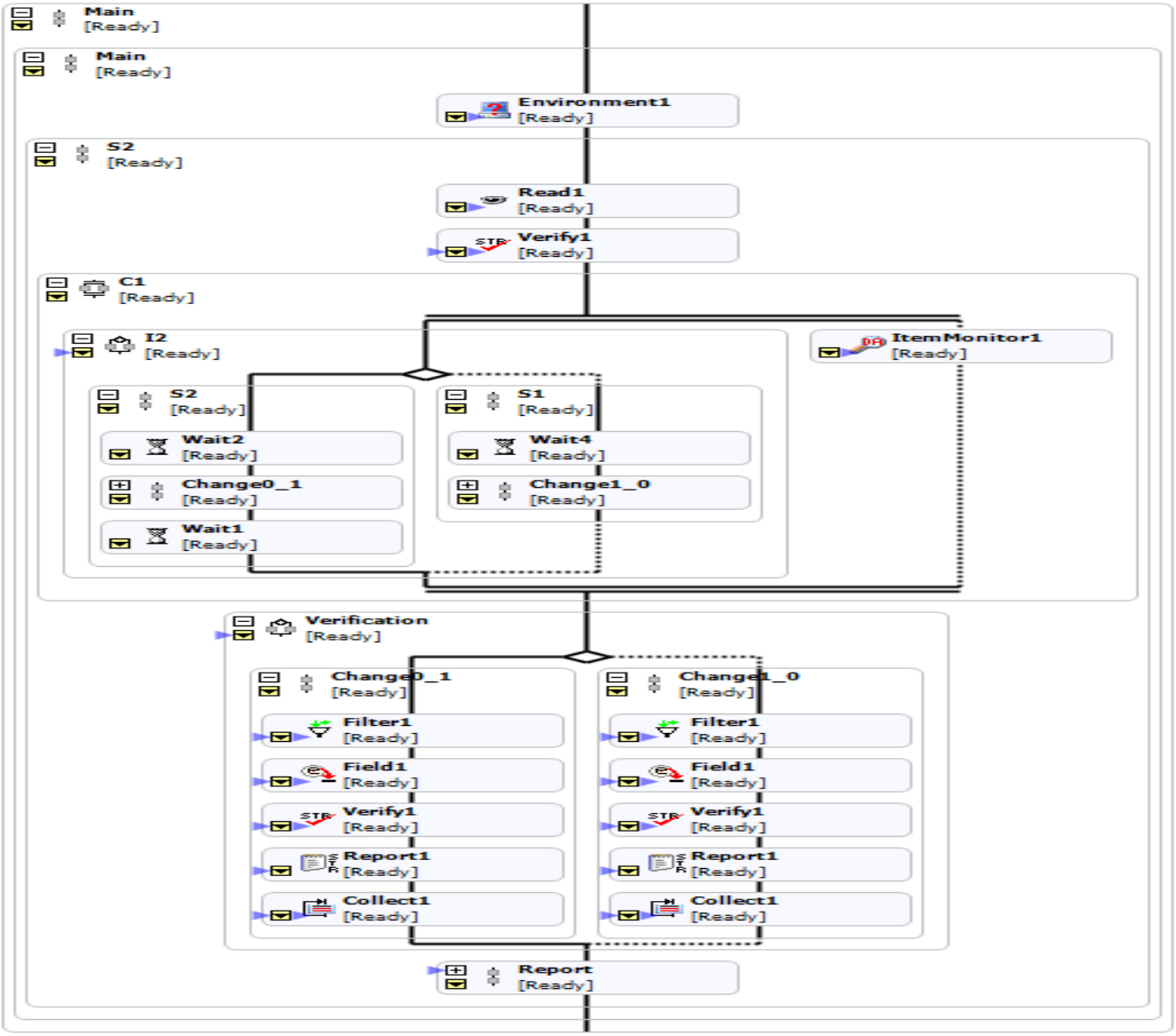
Here, the Slave RTU is configured with PDP boards such that each command point in a Binary Output Board is shorted with corresponding input point on a Binary Input Board. This will reflect any commands from the host as changes in the input data points of the RTU. Rest of the configuration is similar to the previous setup for monitoring direction.

For analog values, the previous setup is again used as some points in the simulated IED's of ITT Synthesizer can be used both as Command and Status points.

Test cases have been written for the following data points (An example script is shown later in the report):

1. SCO (Single Command Output)
   a. Direct Operate (DO)
   b. Select Before Operate (SBO)
2. DCO (Double Command Output)
   a. Direct Operate (DO)
   b. Select Before Operate (SBO)
3. RCO (Regulation Command Output)
   a. Direct Operate (DO)
   b. Select Before Operate (SBO)
4. BSO (Bit-String Output)
   a. Object 41 Variation 2
5. DSO (Digital Set point Output)
   a. Object 41 Variation 2
6. FSO (Floating Set point Output)
   a. Object 41 Variation 3

F. Example SATEEN script for Command point (For SCO - Single Command Output)



G. RESULT OF ABOVE TEST CASE

=========HEADER=========

========= BODY ==========

SCO value changed forn on to off: True

SPI Values changes from ITT sysnthesizer to uSCADA via RTU:

*******----------******

TimeStamp=2014-10-15 14:36:10.115; ItemName=SPI_IND1; NewValue=2;

=========FOOTER ==========

V. Advantages of Automation Testing of RTU

- Reduce Operating Costs.
- Automation runs test cases faster than human resources.
- The development of DNP was a comprehensive effort to achieve open, standards-based interoperability between substation computers, RTUs, IEDs, and master stations (except inter-master-station communications) for the electric utility industry.
- Further benefits of the usage of DNP are less maintenance and long product life.

VI. Conclusion

The automation of testing of Host- and Sub- Communication Interfaces of RTU for DNP3 protocol for data points in the monitoring and control direction has been done. Hence better communication between RTU and SCADA is being ensured with reduced costs and less maintenance compared to manual testing.

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Performance Analysis of SCIG Coupled With Wind Turbine with and Without Fault Using RLC Load

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Abstract: Wind energy is a form of energy which is pollution free and eco-friendly. In this paper we have introduced a wind power in a power generation and transmission system alongside the programmable 3-phase sources and have simulated its working and performance. The aim of this paper is to provide the basic concepts to understand a wind energy generation system and the way it must be operated to be connected to the utility grid. In this paper we analyze the performance of SCIG when STATCOM and load are connected with WECS: (A) With Fault (B) Without Fault. This also includes simulation of 9MW wind farm power using Squirrel Cage Induction Generator (SCIG) by variable pitch wind turbine. All these scenarios have been simulated with the help of the simulation program using MATLAB and its inbuilt components provided in Simulink library.

Keywords: Squirrel cage Induction Generator (SCIG), RLC Load, Static Synchronous Compensator (STATCOM)

INTRODUCTION

The size of wind turbine has increased from a few kilowatts to several megawatts each. In addition to on-land installation, larger wind turbines have been pushed to offshore location to harvest more energy and reduce their impact on land use and landscape. It covers general background on wind turbine knowledge, not only related to the electrical system, but also to mechanical and aerodynamics characteristics of wind turbines.
A squirrel cage induction generator always consumes reactive powerReactive power consumption of the squirrel cage induction generatoris nearly partly or fully compensated by capacitors in order to achieve a power factor close to one. It acts as a great way to supply electricity to rural areas. It does not release any harmful emissions or pollutants that enter the atmosphere from using them. SCIG is fairly straightforward technique was first used since it is simple and has rugged construction, reliable operation, and low cost. However, the fixed-speed essential and potential voltage instability problems severely limit the operations of wind turbine. The well-known advantages of SCIG are it is robust, easy and relatively cheap for mass production. In addition, it enables stall-regulated machines to operate at a constant speed when it is connected to a large grid, which provides a stable control frequency. Although the stall control method is usually used in combination with the fixed speed SCIG for power control, the active stall control or pitch control have also been applied.SCIG has two parts, namely stator, rotor. The stator is made of thin silicon steel lamination. The laminations are insulated to minimize iron losses caused by induced eddy currents. The rotor of SCIG is composed of laminated core and rotors bars. The rotors bars are embedded in slots inside the rotor laminations and are shorted on both ends by end rings. When stator winding is connected to 3 phase supply, a rotating magnetic field is generated in the air gap. Rotating magnetic field induces a 3 phase voltage in rotor bars, since rotor bars are shorted, the induced rotor voltage produces rotor current.

SIMULATION OF WIND FARM USING SCIG

Simulation of 9MW wind farm power using Squirrel Cage Induction Generator (SCIG) by variable pitch wind turbine. This model consists of a 9MW wind form which is consisting of six 1.5-MW wind turbines is connected to a 25-kV distribution system exports power to a 120-kV grid through a 25-km 25-kV feeder. The 9-MW wind farm is simulated by three pairs of 1.5 MW wind-turbines. Wind turbines use squirrel-cage induction generators (IG). The stator winding is connected directly to the 60 Hz grid and the rotor is driven by a variable-pitch wind turbine. The pitch angle is controlled in order to limit the generator output power at its nominal value for winds exceeding the nominal speed (9 m/s). In order to generate power the IG speed must be slightly above the synchronous speed. Speed varies approximately between 1 pu at no load and 1.005 pu at full load. Each wind turbine has a protection system monitoring voltage, current and machine speed.

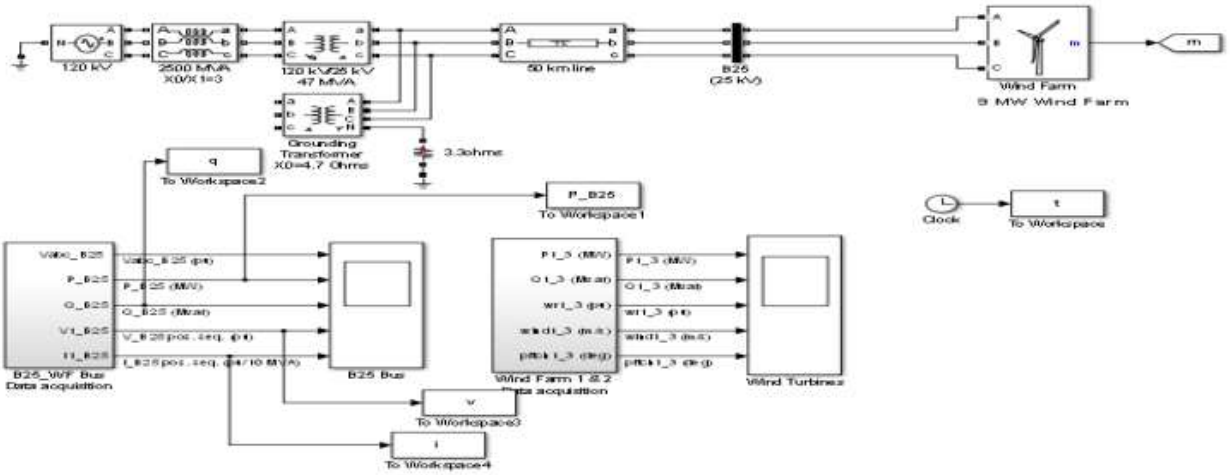


Fig.1 Model of wind farm using SCIG

Simulation of wind power model using three phase parallel RLC load, and phase to phase fault at wind turbine-2

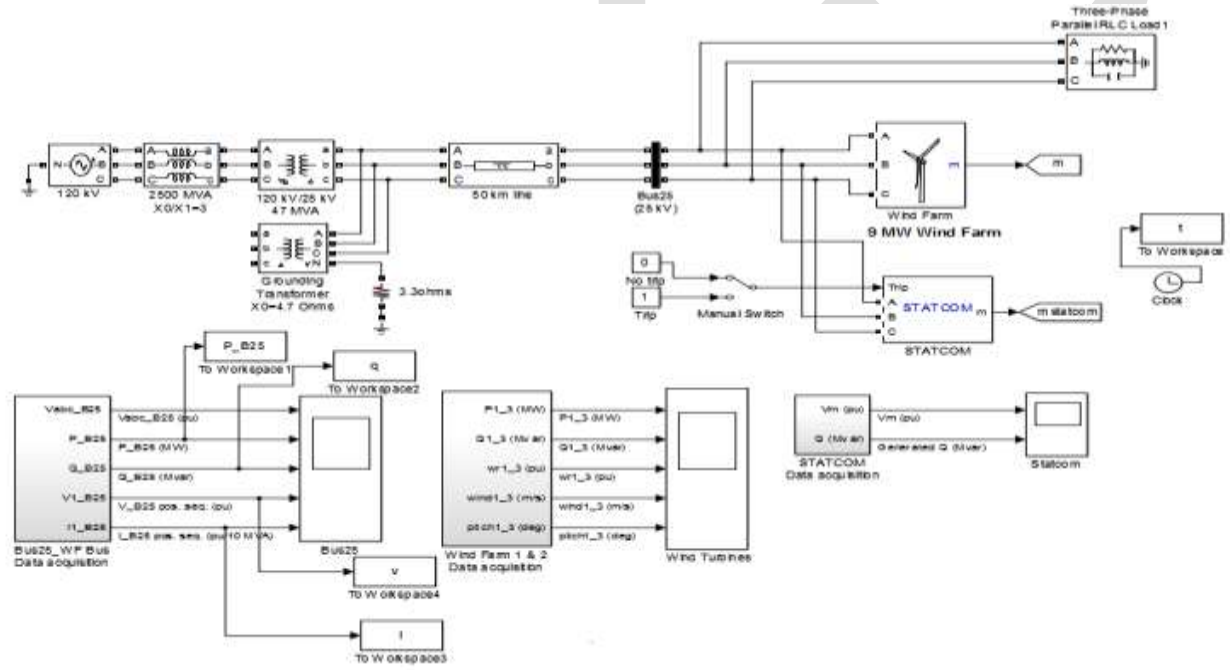


Fig.2: By connecting a three phase RLC load along with the STATCOM, we get following model which is given above

Three Phase RLC LOAD with fault at wind turbine terminal 2 we get the model as:

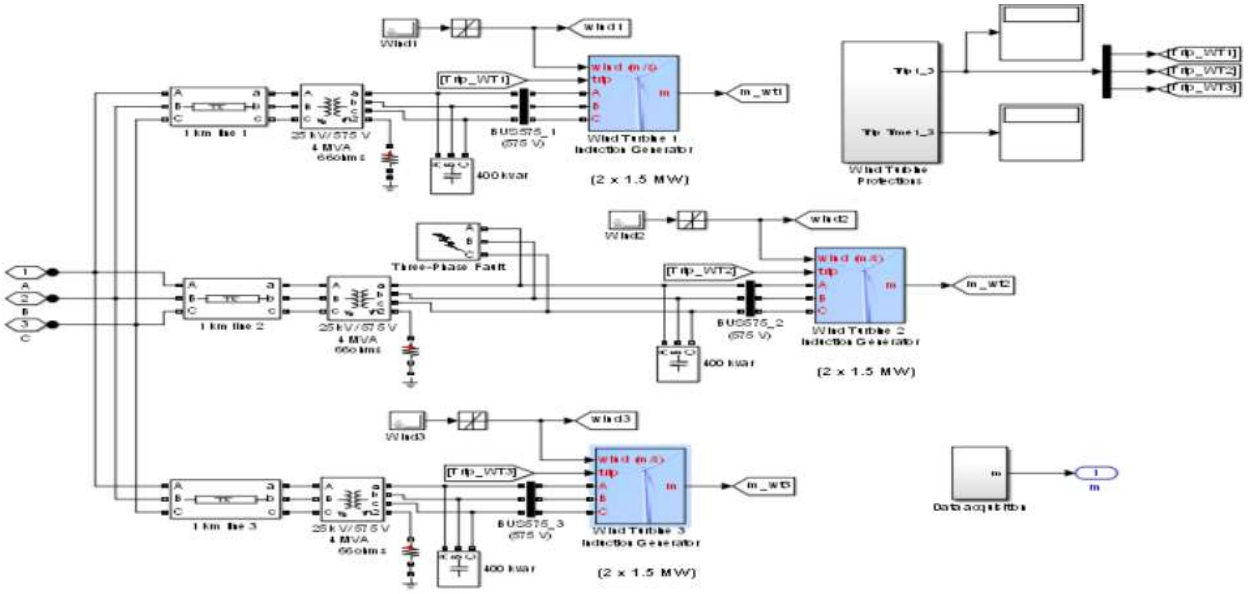
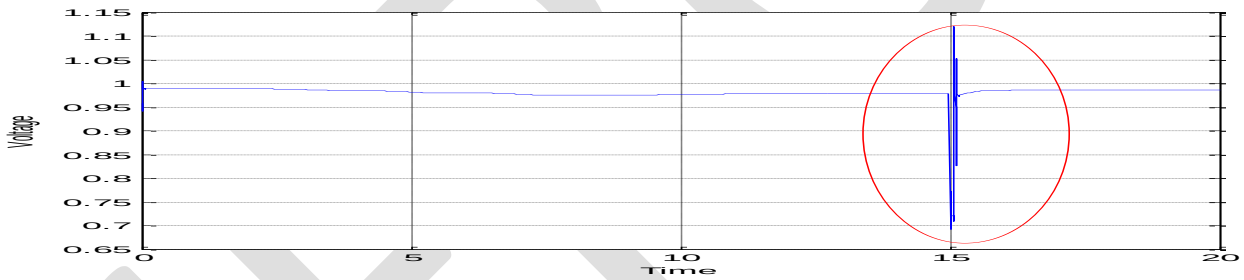
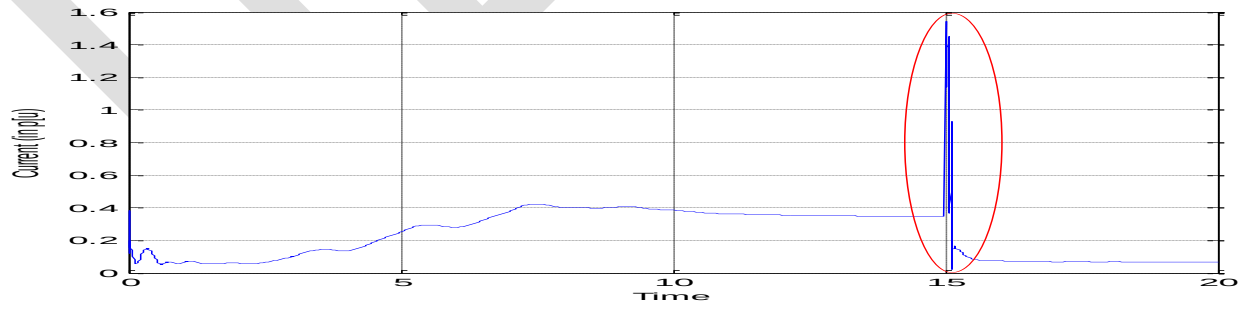


Fig.3: Subsystem model with three phase Fault at terminal of wind turbine-2

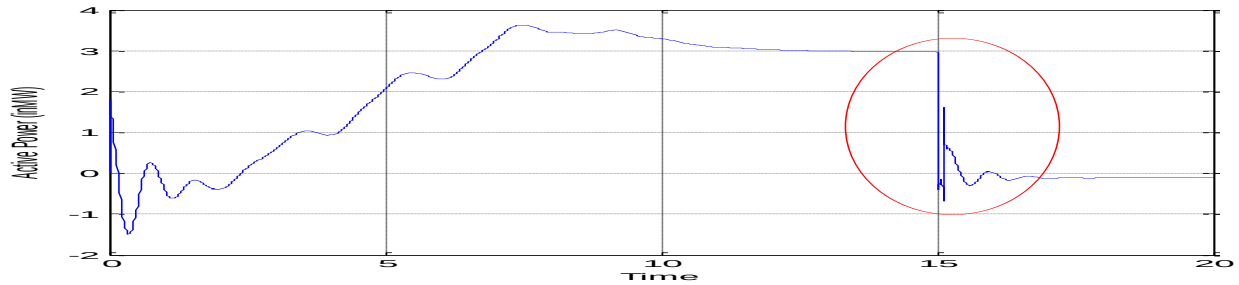
Waveform of output voltage and current



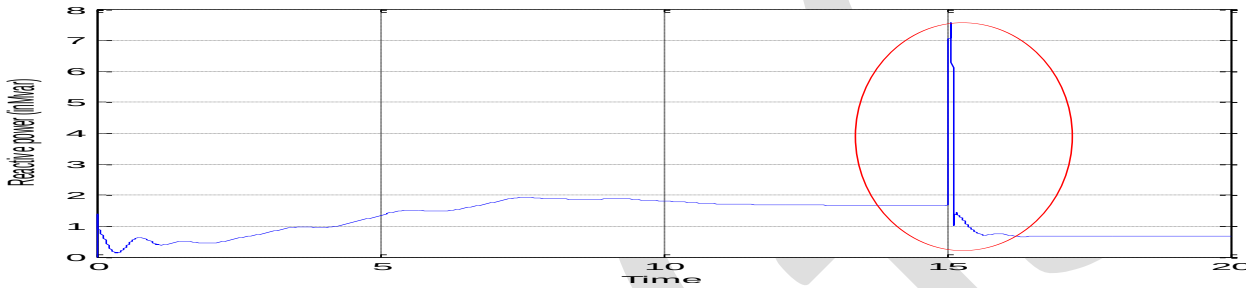
When three phase load, STATCOM is connected and phase to phase fault is occurred at the terminal of wind turbine-2, then voltage waveform, we get as shown in above fig. At t=15s (at the time of fault) voltage decreases to.7pu (shown inside the ellipse) and finally becomes to .998pu.



When three phase load, STATCOM is connected and phase to phase fault is occurred at the terminal of wind turbine-2, then current waveform, we get as shown in above fig. At t=15s (at the time of fault) current increases to1.6pu (shown inside the ellipse) and finally becomes to .1pu.



When three phase load, STATCOM is connected and phase to phase fault is occurred at the terminal of wind turbine-2, then active power waveform, we get as shown in above fig. At t=15s (at the time of fault) power decreases to-.7pu (shown inside the ellipse) and finally becomes to -.01MW.



When three phase load, STATCOM is connected and phase to phase fault is occurred at the terminal of wind turbine-2, then reactive power waveform, we get as shown in above fig. At t=15s (at the time of fault) power increases to7MVAr (shown inside the ellipse) and finally becomes to .7MVAr

RESULTS AND CONCLUSIONS

RESULT OF OUTPUT WAVEFORM WITH FAULT AND WITHOUT FAULTUSING STATCOM AND THREE PHASE RLC LOAD

1. Without fault (with the time of introduction of turbine being t=12 seconds)

(a). At t=0s, V=.989pu,

At t > = 12s,V=.979pu

(b).At t=0s, i=.15pu,

At t > = 12s, i=.3pu,

(c).At t=0s, P=1.5MW'

At t > =12s P=3MW'

(d). At t=0s, Q=.8Mvar,

At t > = 12s, Q=1.7Mvar

Thus we observe that the introduction of turbine at t=12 seconds brings an improvement in the current, real power and reactive power.

2. With Fault

(a). At t=0s, V=.98pu,

At t = 15s, V=.7pu

(b).At t=0s, i=.1pu,

At t = 15s, i=1.6 pu,

(c).At t=0s, P=1.4MW'

At t =15s P=-.5MW'

(d). At t=0s, Q=.8Mvar,

At t = 15s, Q=7.5Mvar

Thus we observe that the introduction of fault at wind turbine terminal two at t=15 seconds, we see that voltage reduces suddenly and reactive power increases rapidly. Also in general three phase fault voltage reduces rapidly

RESULT OF OUTPUT WAVEFORM WITH FAULT AND WITHOUT FAULT, WITHOUT STATCOM AND WITHOUT THREE PHASE RLC LOAD

1. Without Fault

(a). At t=0s, V=.68pu,

At t > = 15s,V=.98pu

(b).At t=0s, i=1.35pu,

At t > = 15s, i=.7pu,

(c).At t=0s, P=8.2MW'

At t > =15s P=6MW'

(d). At t=0s, Q=1.1Mvar,

At t > = 14s, Q=2.1Mvar

WITHOUT STATCOM AND WITHOUT THREE PHASE RLC LOAD, we see that voltage and reactive power reduces as compared to case with load and STATCOM. We have used statcom which compensate the reactive power generated by 9 MW wind turbine

2.With Fault

(a). At t=0s, V=.7pu,

At t = 15s, V=.90pu

(b).At t=0s, i=.1pu,

At t = 15s, i=1.6 pu,

(c).At t=0s, P=8.2MW'

At t =15s P=1.5MW'

(d). At t=0s, Q=11Mvar,

At t = 15s, Q=7.9Mvar

Thus we observe that the introduction of fault at wind turbine terminal two at t=15 seconds, we see that voltage reduces suddenly and reactive power increases rapidly. Also in general three phase fault voltage reduces rapidly, but the variation in voltage dip is more than above cases, in which STATCOM is used.

A COMPARATIVE TABLE SHOWING THE PERFORMANCE ANALYSIS FOR EACH OF THE DISCUSSED CASE

Parameter	condition	Voltage	Current	Active power	Reactive power
STATCOM and three phase load					
With fault	T=0s	0.98pu	0.1pu	1.4MW	0.8Mvar
	T=15s	0.7pu	1.6pu	-0.5MW	7.5Mvar
Without fault	T=0s	0.989pu	0.15pu	1.5MW	0.8Mvar
	T>=12s	0.979pu	0.3pu	3MW	1.7Mvar
Without STATCOM& with load					
With fault	T=0s	0.7pu	0.1pu	8.2MW	11Mvar
	T=15s	1.08pu	1.6pu	1.5MW	7.9Mvar
Without fault	T=0s	0.68pu	1.35pu	8.2MW	1.1Mvar
	T>=14s	0.98pu	0.7pu	6MW	2.1Mvar
Three phase load without STATCOM					
With fault	T=0s	0.68pu	1.5pu	-3MW	10Mvar
	T=15s	0.65pu	1.6pu	-3MW	8Mvar
Without fault	T=0s	0.70pu	0.15pu	-3MW	10Mvar
	T=15s	0.90pu	0.25pu	0.3MW	2.2Mvar

CONCLUSION

We observe that without fault using STATCOM and RLC Load the introduction of turbine at t=12 seconds brings an improvement in the voltage, real power and reactive power. And with fault we observe that at t=15 seconds, we see that voltage reduces suddenly and reactive power increases rapidly. Also three phase fault voltage reduces rapidly. Without STATCOM and without load, we see the voltage and reactive power reduces as compared to with load and STATCOM.

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Study of Factors Affecting Success Rate of Immediate Implant Loading

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Abstract - This paper aims at providing a preliminary understanding in a biomechanics effect of immediate dental implant loading. Immediate loading of an implant interface has been used for completely and partially edentulous patients. Forces may be influenced by patient factors, implant position, cantilever forces, occlusal load direction, occlusal contact intensity. The surface area of load distribution may be increased by implant size, implant design, and surface condition of the implant body. This article addresses the effect of implant material on stress and strain in the bone. These factors affect the amount of stress on the developing at implant interface and hence may affect the risk of immediate occlusal loading for implant prostheses.

Keywords - Immediate implant, Occlusal loading, Osseointegrate, Bruxism, Masticatory forces, Parafunctional forces, Bone implant interface.

Introduction

Dental implants function to transfer the occlusal load to surrounding biological tissues. Thus the primary functional design objective is to dissipate and distribute biomechanical loads to optimize the functioning of implant supported prosthesis. Immediate loading of dental implants not only includes a non-submerged one stage surgery, but actually loads the implant with provisional restoration at the same appointment[1]. Immediate function or immediate loading is defined as the placement of a dental implant fixture, abutment and functional (provisional) restoration all at stage one surgery. The abutment and restoration is placed into "limited" function within the first 48 hours and allowed to osseointegrate during the ensuing months[2]. Immediately after the placement of the implants, a bone remodelation begins on the bone/implant interface, accelerated by the loads which induce the bone cells stimulation[3]. In addition, the patient's diet has a major importance during the bone apposition and remodelation after the immediate loading procedures. Consequently, small portions of soft diet should be indicated during the initial period (3 to 4 months) of the healing process and bone deposition[4,5]. The benefits of "Immediate Function" are shortened treatment time, better clinical efficiency and less trauma to the patient - it is now possible to go from suffering from tooth loss to having functional and aesthetic teeth in one treatment session. There are advantages and disadvantage with the use of the immediate loading concept as outlined below:

Advantages - Decreases treatment time; Improves patient comfort; No transitional prosthesis i.e. denture, bonded bridges; Limits unwanted exposures and maintains gingival contours; Minimizes number of surgeries; Less trauma to soft and hard tissues; Cost savings to patient and doctor; Improves acceptance rates for treatment; and Psychological benefit to the patient.

Disadvantages - Clinically demanding; Generally cannot be undertaken when guided bone regeneration is required; Provisional crown - single tooth, Partially edentulous bridge should be out of occlusion in centric and free in lateral movements; Requires good bony support and implant stability; Strict patient compliance required.

The patient does not need to wear a removable restoration during initial bone healing, which greatly increases comfort, function, speech, and stability and enhances certain psychologic factors during the transition period[5]. Immediate implant loading prevents any change in shape of bone and gum surrounding the extracted tooth. It is convenient for the patient as it allows the surgical treatment as shown in Fig.1 (a),(b),(c),(d),(e),(f),(g) to be completed in one insertion.

(a) Incisor is Atraumatically Position
Extracted in Maxillary Bone.

(b)The Implant Drills Prepare the Site and then Rotated Under Incisal Edge.

(c) A Implant is Threaded into

(d) A Permucosal Extension is Placed into the Implant (e) After 4 Month Healing Period (f) Abutment (g) Crown

Fig.1: Surgical Process of Immediate Implant

The risk in the immediate implant loading is reduced by bone microstrain, loaded bone changes its shape. Microstrain conditions 100 times less than the ultimate strength of bone may trigger a cellular response. Frost[6] has developed a microstrain language for bone based on its biological response at different microstrain levels as shown in Fig.2. Bone fractures at 10,000 to 20,000 microstrain units ie 1% to2% strain. However, at levels of 20% to 40% of this value, bone already starts to disappear or form fibrous tissue and is called the pathologic overload zone.

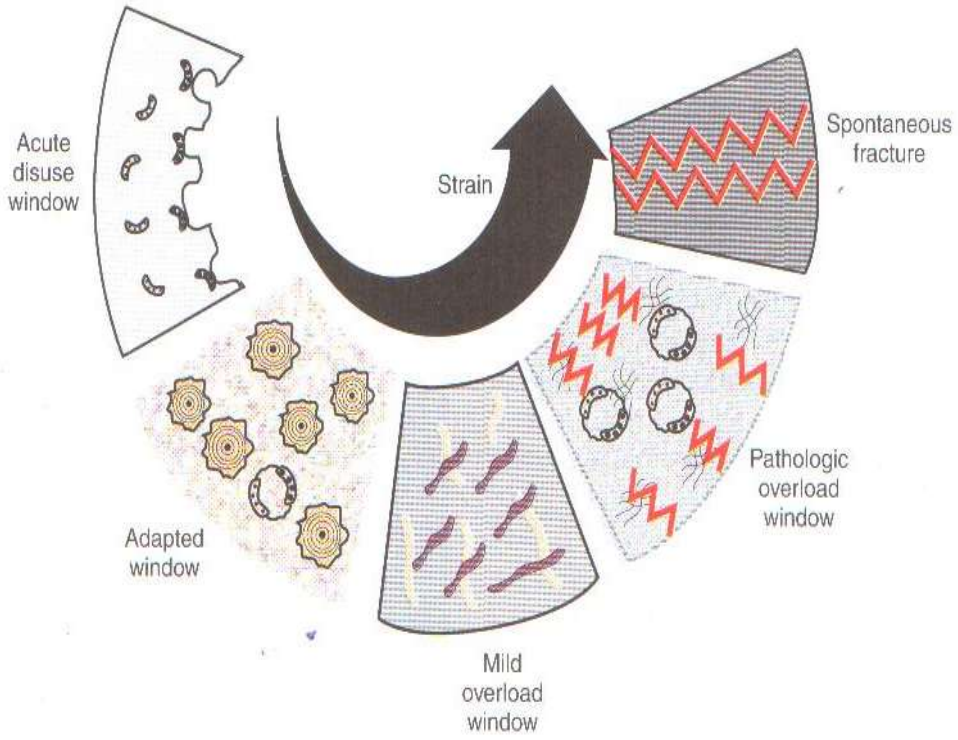

Fig.2 : Biological Response at Different Microstrain Levels[6]

The ideal microstrain for bone is called the physiologic or adapted zone. The remodeling rate of the bone in the jaws of a human being that is in the physiologic zone is about 40% each year[7]. At these levels of strain, the bone is allowed to remodel and remain an organized, mineralized lamellar bone. This is called the ideal load bearing zone for an implant interface. The mild overload zone corresponds to an intermediate level of microstrain between the ideal load bearing zone and pathologic overload. In this strain region, bone begins a healing process to repair microfractures, which are often caused by fatigue. Rather than the surgical trauma causing this accelerated bone repair, the microstrain causes the trauma from overload. In either condition, the bone is less mineralized, less organized, weaker, and has a lower modulus of elasticity. Bone is strongest to compression and weakest to shear loading[8]. Compressive forces decreases the microstrain to bone compared with shear forces.

In Fig.3 the stress strain relation for natural bone and titanium is explained under increasing load situations. The relationship results in two mechanical indexes that is flexibility or modulus of elasticity of both the material. Therefore the modulus conveys the amount of deformation in a material for a given load level. The lower the stress applied to the bone the lower the microstrain in the bone is also shown in fig.3. The microstrain difference between the two zone at the interface 0 to 50 units is disuse loading zone. When the microstrain difference is 50 to 2500 units, the ideal loading zone is present. Between 2500 to 4000 units, the zone is in mild overload. At more than 4000 units, the zone is in pathologic overload. Therefore to decrease microstrain and the remodeling rate in the bone is to provide conditions that increase functional surface area to the implant-bone interface[9]. The surface area of load may be

increased by implant number, implant size, number of threads, implant surface conditions, occlusal force direction, mechanical properties of bone.

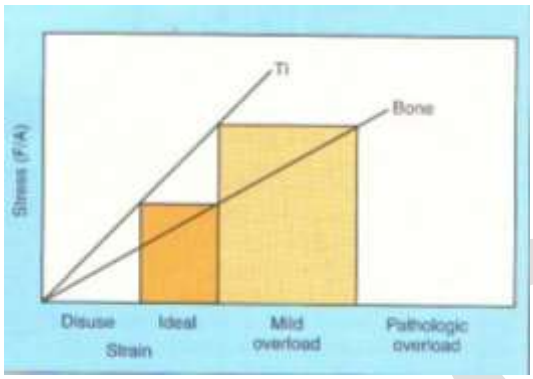

Fig.3: Stress and Strain Curve[6]

The dentist may increase the functional surface area of occlusal load at an implant interface by increasing number of implant[10]. The implant body design should be more specific for immediate loading because the bone has not had time to grow into recesses or undercuts in the design or attach to a surface condition before the application of occlusal load. Each 3mm increase in length can improve surface area support by more than 20%[11]. Most of the stresses to an implant-bone interface are concentrated at the crestal bone, so the increased implant length does little to decrease the stress that occurs at the transosteal region around the implant[12].

The number of threads also affects the amount of area available to resist the forces during immediate loading. The smaller the distance between the threads, the greater the thread number and corresponding surface area[13]. The thread design would be more beneficial to an immediate load application.

Implant surface conditions may affect the rate of bone contact, lamellar bone formation, and the percentage of bone contact. The coating or surface condition of the implant is most beneficial during the initial healing and early loading conditions.

The greater the occlusal force applied to the prosthesis, the greater the stress at the implant-bone interface and the greater the strain to the bone. Parafunctional forces such as bruxism and clenching represent significant force factors because magnitude of the force is increased, the duration of the force is increased, and the direction of the force to the implant with a greater shear component[14]. Balshi and Wolfinger[14] reported that 75% of all failure in immediate occlusal loading occured in patients with bruxism. Moreover, parafunctional loads may increase the looseness or fracture risk of the abutments and of the temporary restorations[15].

The modulus of elasticity is related to bone quality as shown in Fig.4. The less dense the bone, the lower the modulus. The strength and elastic modulus of bone is directly related to the density of the bone[16].

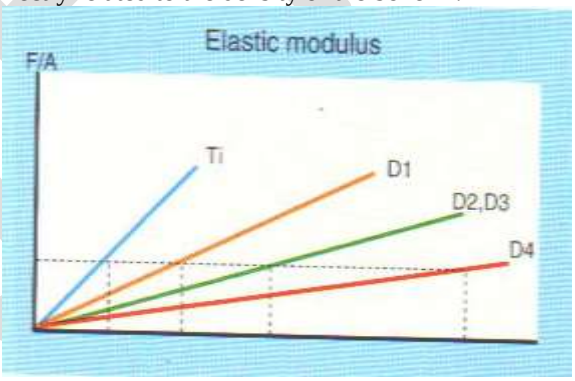

Fig.4: Bone Quality with Modulus of Elasticity[16]

The finite element study on immediately loaded implants showed that increased implant diameter better dissipated the simulated masticatory force and decreased the stress and strain around the implant neck, especially when the diameter increased from 3.3 to 4.1 mm. It appears that dental implants of 10 mm in length for immediate loading should be at least 4.1 mm in diameter, and uniaxial loading to dental implants should be avoided or minimized. Further research concerning human bone response to stress and strain is needed[17].

Stress distribution along the implant should be even and minimal to avoid possible complications[18]. The increase in stress to an implant body also increases the risk of abutment screw loosening or implant body fracture. The relationship between stress and strain determines the modulus of elasticity(stiffness) of a material[19]. The modulus of elasticity of a tooth is similar to the cortical

bone. Dental implants are fabricated from titanium or its alloy. The modulus of elasticity of titanium is five to ten times greater than that of cortical bone as shown in Fig.5.

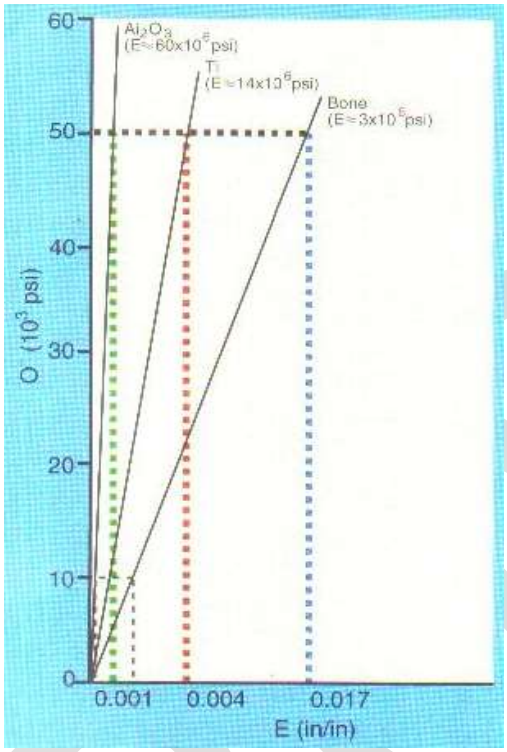

Fig.5: Comparison of Modulus of Elasticity for Bone and Titanium[20]

The composite beam analysis states that when two materials of different elastic modulus are placed together with no intervening material and one is loaded, a stress contour increase will be observed where the two materials first come into contact[20]. In denser bone, there is less strain under a given load compared with softer bone. As a result, there is a less bone remodeling in denser bone compared with softer bone under similar load conditions[21,22]. Bone is relatively brittle material, which if strained past its elastic limit, will break. If masticatory forces on implants can produce stresses at the bone-implant interface greater than the elastic limit of bone, then fractures may occur. Bone implant contact has a major role in stress concentration in immediate loading implants[23].

According to Misch et al.[24], the reduction of the surgical trauma in immediate loading procedures can be obtained by reducing the generation of heat during the surgical steps and reducing the stress on the bone/implant.

CONCLUSION

Although several studies have demonstrated high success rates for the immediate loading dental implants, several aspects remain without an explicit definition and further studies are needed to elucidate some reservations related to detail study in stress and strain. According to the information described in the literature, a precise and safe indication of immediate loading procedures can be required to reduce complications, thus reducing its potential of failure face to the different variables as per need.

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Optimizing the Performance of Mobile Web Application

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Abstract - For any enterprise that uses a website to build brand awareness and sell its products, the explosive growth in mobile devices is impossible to ignore. But while many companies would love to extend their website or e-Commerce application to a mobile audience, they're often uncertain about how to proceed. Does it will affect performance? This paper examines a topic at the heart of any mobile web application i.e. performance optimization. With today's people carrying a vast array of mobile devices that operate across a massively fragmented and shifting market, institutions can find themselves wondering how to deliver content and services specifically designed for mobile use most effectively. The usefulness of mobile devices has increased greatly in recent years allowing users to perform more tasks in a mobile context. This increase in usefulness has come at the expense of the usability of these devices in some contexts.

Keywords— Mobile Web Application, HTML5, Optimization, Execution Efficiency, Hybrid Apps, Native Apps, Smart Phone

INTRODUCTION

There are 6.8 billion people on the planet, 5.1 billion of whom own a cell phone. And today, an ever-growing percentage of these devices are smartphones. According to a recent Pew Research Center Study, the number of users accessing the Internet on their smartphones has more than doubled in the past 5 years, as has the number of users downloading and using mobile apps. Of those who use the Internet or email on their phones, more than a third go online primarily through their handheld devices.

Recent times have seen the field of mobile technology grow exponentially, leading to institutions increasingly recognizing the importance of delivering content and services to users through their mobile devices. In many cases these can simply be delivered using the web, optimizing your websites for use on smaller screens. However, in some cases you may wish to deliver a service that takes advantage of the native capabilities of today's powerful smartphones, such as GPS for location based services for example.

The development of mobile applications that can run across multiple heterogeneous devices is challenging. Not only do mobile devices differ considerably at the hardware level, but the software development environments are also very different. Generally speaking, there are two approaches to mobile app development: Web-based, which involves technologies such as HTML5, CSS, Javascript, and related frameworks; and development on native platforms, such as iOS, Android, and Windows Mobile 8.

One of the main advantages of native app development is the ability to reach hundreds of millions of customers simply by uploading your app to a store. Apps developed in a native platform technology currently outpace Web-based alternatives in both the number of available apps and the time spent by users on the device. That being said, the main advantage of the mobile Web approach is its rapid deployment model and its ability to run immediately on multiple platforms via a Web browser. Many developers see the ability of Web-based apps to circumvent the somewhat formal, and often lengthy, process required to deploy apps in a store as a huge benefit. However, Web-based solutions suffer from browser incompatibilities, an uncertain monetization strategy, and slow evolution of mobile Web development standards.

A good understanding of the advantages and limitations of both development approaches will be important to successful application deployment and a positive user experience. Many developers see hybrid approaches as a natural migration path for developing cross-platform code that can run in a device-independent way across multiple hardware platforms. Companies such as PhoneGap and AppMobi are selling hybrid cross-platform solutions using the HTML5 programming model, thereby leveraging Web technologies that developers already know.

MOBILE WEB APPLICATION

As is true with most technology selections, there's no one-size-fits-all answer when it comes to the type of mobile app to develop. There are numerous web app best practices to consider, not all of which are technical. Who is your target audience? Are they more likely to prefer a mobile web or a native app? What development resources do you have and which mobile technologies are they most familiar with? What is the licensing and sales model that you're envisioning for your product?

Generally speaking (although there are always exceptions), the mobile web route is faster and cheaper than the native app route, especially when the objective is to support a wide range of devices. Conversely, there may be capabilities native to the mobile device (such as the movement sensor and so on) that are essential to your app, but which are only accessible via a native app (which would therefore make the mobile web app choice a non-starter for you).

And beyond the web vs. native question, a hybrid app may be the right answer for you, depending on your requirements and resource constraints. Hybrid apps, like native apps, run on the device itself (as opposed to inside a browser), but are written with web technologies (HTML5, CSS and JavaScript). More specifically, hybrid apps run inside a native container, and leverage the device's browser engine (but not the browser) to render the HTML and process the JavaScript locally. A web-to-native abstraction layer enables access to device capabilities that are not accessible in mobile web applications, such as the accelerometer, camera, and local storage.

But whatever choice you make – whether it be mobile web, native or hybrid app – be careful to adequately research and confirm your assumptions. As an example for the purposes of this mobile web app development concept, you may have decided to develop a native app for e-commerce to sell your products, but according to *Hubspot*, 73% of smartphone users say they use the mobile web more than native apps to do their shopping… so you may have bet on the wrong horse.

But whatever choice you make – whether it be mobile web, native or hybrid app – be careful to adequately research and confirm your assumptions.

And then, of course, there are the practical considerations of time and budget. As one of my favorite sayings goes, "faster, better, cheaper… pick any two". While time-to-market and cost constraints are of paramount importance in web application development, it's crucial not to compromise too heavily on quality in the process. It's quite difficult to recover the confidence of a user who has had a bad first experience.

Figure 1.1: Mobile Web Application Used by Users

LIMITING FACTORS FOR MOBILE WEB APPLICATION PERFORMANCE

No matter how interesting, beautiful, or cleverly interactive your Web pages are, if they take more than two or three seconds to render, whether on a desktop or a mobile device, users quickly become impatient. They are measurably less likely to convert from browsing to buying and may even hit the back button or close the browser before the page ever loads.

Even delays of less than one second significantly affect revenues. In 2006 Marissa Mayer, with Google at the time, recounted that, after users indicated they wanted to see more than 10 search results per page, Google experimented with showing 30 instead. To Google's surprise, traffic and revenue dropped by 20 percent in this experiment, apparently because the pages with more results took just an extra half-second to load.[5]

User expectations have only escalated since then. A 2009 study by Forrester Research on behalf of Akamai identified two seconds as the threshold for acceptable Web-page response times and found that 40 percent of consumers abandon a page that takes longer than three seconds to load. Just one year later, another study done for Akamai found that the number of users who abandon a page after three seconds had risen to 57 percent.

Furthermore, users on mobile devices expect performance to be at least as good as if not better than what they experience on their desktops. The Harris Interactive 2011 Mobile Transactions Survey, commissioned by Tealeaf Technology (now part of IBM), reported that 85 percent of adults who had conducted a mobile transaction in the previous year expected the mobile experience to be equal to or better than shopping online using a laptop or desktop computer, and 63 percent said they would be less likely to buy from the same company via other channels if they experienced a problem conducting a transaction on their mobile phones.[10] In other words, poor mobile performance hurts companies on all other platforms, including brick-and-mortar.

Mobile traffic is expanding rapidly. For many consumers, their phone or tablet has become their primary portal to the Internet, but performance is falling short of expectations. A study published by Equation Research on behalf of Compuware in February 2011 found that almost half (46 percent) of mobile users said Web sites load more slowly than expected on their phones. Nearly 60 percent expect pages to load in three seconds or less, and 74 percent report they would leave a site if a single page took five seconds or more to load. A 2012 study of 200 leading e-commerce sites by Strange loop Networks (now part of Radware) found that the median load time was 11.8 seconds over 3G (Figure 1.2); performance over LTE fared only slightly better, at 8.5 seconds.[8]

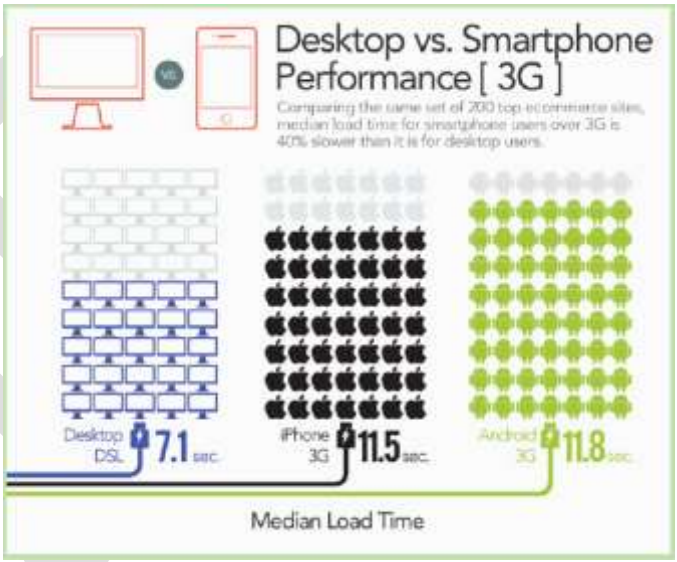

Figure 1.2: Median Load Times for Desktop and Mobile Devices

i. Three Limiting Factors for Mobile Performance

As already mentioned, mobile devices have inherent performance limitations: lower bandwidth, smaller memories, and lower processing power. These challenges are compounded by external issues, notably:

Web pages are bigger than ever. According to the HTTP Archive, the average Web page carries a payload of more than 1 MB and contains at least 80 resources such as images, JavaScript, CSS (Cascading Style Sheets) files, etc. This has a significant impact on desktop performance. Its impact on mobile performance - and particularly on 3G performance is much more dramatic. This impact will be felt even more keenly over the next three years. At the current rate of growth, average page size could surpass 2 MB by 2015.

Latency can vary widely. It can range from as little as 34 ms for LTE to 350 ms or more for 3G. Mobile latency is consistent only in its inconsistency, even when measured at the same location. This is due to a number of variables beyond the amount of data passing through the tower. Factors such as the weather, and even the direction the user is facing, can have a significant impact.

OPTIMIZING THE PERFORMANCE OF MOBILE WEB APPLICATION

Only 20% of the time required to display a typical Web page, whether in a desktop or mobile browser, is consumed by loading the page's HTML. The remaining 80% is spent loading the additional resources needed to render the page - including style sheets, script files, and images - and performing client-side processing.

The three main strategies for improving performance are:

- Reducing the number of HTTP requests required to fetch the resources for each page.
- Reducing the size of the payload needed to fulfill each request.
- Optimizing client-side processing priorities and script execution efficiency.

Because mobile networks are usually slower than those available to desktop machines, reducing requests and payloads takes on huge importance. Mobile browsers are slower to parse HTML and execute JavaScript, so optimizing client-side processing is crucial. In addition, mobile browser caches are much smaller than those of desktop browsers, requiring new approaches to leveraging local storage of reusable resources.

You must think carefully about how to reduce and optimize each byte and server transfer to reduce the user's wait time. Google found that, for every extra 5 seconds of load time, traffic dropped by 20% (and it is also worth noting that search engines look at load times as part of their calculation of page quality score). *60% of mobile web users say they expect a site to load on their mobile phone in 3 seconds or less.* Here are a few tips that can help optimize the performance of your mobile web app and minimize latency:

- ***Image Optimization.*** Image load time is well-known to be one of the biggest performance issues affecting page load on mobile devices. Use of online image optimizers, such as *smushit.com*, can be helpful in addressing this issue.

- ***Code compression.*** Compressing your JavaScript and CSS files, depending on the amount of code you have, can potentially have a significant impact on performance. A useful tool for compressing your code is *refresh-sh.com*.

- ***Database queries.***
  - Some mobile device browsers don't accept as many cookies as desktop browsers do, which can result in the need to execute even more queries than usual. Server-side caching is therefore especially crucial when supporting mobile web app clients.
  - Remember to employ the appropriate filters to preclude SQL query injection that could otherwise compromise the security of your site and server.

- ***Content delivery networks (CDN).*** If you are planning to provide lots of videos, images, audio files, or other types of media, use of a CDN is highly recommended. Some of the more common commercial CDNs include *Amazon S3, Microsoft Windows Azure, and MaxCDN.* The advantages of using a CDN are numerous and include:

- *Improved download performance.* Leveraging a CDN's resources enables you to distribute load, save bandwidth, and boost performance. The better CDNs offer higher availability, lower network latency, and lower packet loss. Moreover, many CDNs provide a globally distributed selection of data centers, enabling downloads to occur from a server closer to the user's location (resulting in fewer network hops and faster downloads).
- *More concurrent downloads.* Browsers typically limit the number of concurrent connections to a single domain, after which additional downloads are blocked until one of the previous downloads has completed. You can often see this limit in action when downloading many large files from the same site. Each additional CDN (on a different domain) allows for additional concurrent downloads.
- *Enhanced analytics.* Many commercial CDNs provide usage reports that can supplement your own website analytics and which may offer a better quantification of video views and downloads. *GTmetrix*, for example, has an excellent website reporting tool for monitoring and optimizing the sources loaded on your site.

If you want to use some of the cool HTML5 stuff, remember to verify in advance that the functionality you're looking for is supported across the device landscape that your customers are likely to be using. For example, in iOS 6 and above, there is no support for the navigator getUserMedia functionality since the camera is only accessible through native apps. Two great resources for checking what's supported on specific devices and browsers are *caniuse.com* and *html5test.com*.

Remember to verify in advance that the functionality you're looking for is supported across the device landscape that your customers are likely to be using.

CSS3 media queries can also help you provide customized content for each device. Here's some example code for capturing different device characteristics, such as pixel density, screen resolution, and orientation:

```
/* For lower than 700px resolutions */
@media ( max-width : 700 px) { ... }
/* Same as last but with the device orientation on land scape */
@media ( max-width : 700 px) and (orientation: landscape) { ... }
/* Including width and orientation you can add a media type clause,
  in this case 'tv' */
@media tv and ( min-width : 700 px) and (orientation: landscape) { ... }
/* for low resolution display with background-image */
. image {
   background -image : url(/path/ to /my/image . png);
   background -size : 200 px 300 px;
   height: 300 px;
   width: 200 px;
}
/* for high resolution (Retina) display with background-image */
@media only screen and ( min-- moz -device-pixel-ratio : 2 ),
only screen and ( -o-min-device-pixel-ratio : 2 / 1 ),
only screen and ( -webkit-min-device-pixel-ratio : 2 ),
only screen and ( min-device-pixel-ratio : 2 ) {
```

```
    -repeat ;
        background -size : 200 px 400 px;
    /* rest of your styles... */
    }
}
```

CONCLUSION

The paper has discussed the mobile web application with respect to the development of mobile web applications and performances. We identified and discussed some of the limiting factors those affect the performance of mobile applications. Also, this paper suggested how to optimize the performance of mobile web applications. This paper is given some of the examples in terms of source code for capturing difference device characteristics, such as screen resolution, orientation, and pixel density. The final goal of this research paper is identifying major factors those affects the performance of mobile web applications and linked those challenges to improve the quality features.

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Analysis on new Avenues in Opinion mining and Sentiment Analysis

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Abstract— The main goal of this New Avenues in Opinion mining and Sentiment Analysis is to extracting, classifying, understanding and accessing the opinions expressed in various online news sources social media comments, and other user-generated content. Here opinion mining refers to computational techniques for analysing the opinions that are extracted from various sources. Current opinion research focuses on business and e-commerce, such as product reviews and movie ratings.

Researchers developed a framework for analysis in their major stages such as stakeholder analysis, topical analysis, sentiment analysis and stock modeling. During the stakeholder analysis stage, they identified the stakeholder groups participating in Web forum discussions. The sentiment analysis stage consists of assessing the feelings expressed by the Web forum participants in their treatments. Lastly, in the stock modeling stage, they test the relationships between various attributes of Web forum discussions and the firm's stock behaviour.

Keywords— Opinion mining , Sentiment Analysis , Lexical affinity, Statistical methods and Concept-based approaches,etc.

1. INTRODUCTION

1.1 Opinion Mining

Opinion mining is a process for tracking the mood of the public about a certain product, for example, by building a system to examine the conversations happening around it. Opinion mining is a type of natural language processing for tracking the mood of the public about a particular product, which is also called Sentiment analysis, involves building a system to collect and categorize opinions about a product. Automated opinion mining often uses machine learning, a type of artificial intelligence (AI), to mine text for sentiment [14].Opinion mining is used to automate the process of identifying opinion whether it is a positive or negative view. Majority of previous works on this field uses natural language programming techniques to identify the sentiment [3].

1.2 Sentiment Analysis

Sentiment analysis is often used in opinion mining to identify sentiment, affect, subjectivity, and other emotional states in online text. For example, they might seek to answer these such questions:

- What was the opinions of young US voters toward the Democratic and Republican presidential candidates during the most recent election?
- Since September 11, how do the international Jihadi forums introduce radical ideology and incite young members?

- What are the opinions and comments of investors, employees, and activists toward Wal-Mart in light of its cost-reduction efforts and global business practices?

- What was the most successful McDonald's promotional campaign conducted recently in China, and why did it succeed? Which McDonald's product is most preferred by young students in China and why?

Much advanced research in this area has recently focused on several critical areas. Researchers have also been able to classify text segments based on sentiment, affect, and subjectivity by analyzing positive or negative sentiment expressed in sentences, the degree of violence expressed in forum messages, and so on.

Expressing opinions on a particular product or service is very easy with the advancement of online communication technologies. Opinions and sentiments are expressed freely in electronic forums, blog or the most famous would be social networking Websites such as Twitter or Facebook. These opinions are referred to by other customers before any transaction takes place. Therefore, it is important for the provider of a product or service to capture and analyze opinions or sentiments that are expressed online. The feedbacks from customers can help an organization to improve the quality of its product and service. From this, a provider can also spark ideas towards new product or service.

Opinion mining or sentiment analysis refers to activities that automatically identify a sentiment (such as a positive or negative sentiment) from a group of words such as a sentence or a document. Since 2001, this field has gained popularity among researchers due to the advancement of Internet technology and the advancement of machine learning techniques in information retrieval [1]. Prior to that, most works in sentiment analysis were done using methods that are embodied in natural language processing (NLP). Even though NLP techniques produce good result, it cannot be applied to online reviews due to the occurrence of noisy texts. Incorrect spelling, incorrect language structure, use of slang and the mixing of languages that cause difficulty in constructing correct sentence structure [2].

2. BRIEF LITERATURE SURVEY

The main sources of information were friends and specialized magazine or websites. Now, the "social web" provides new tools to efficiently create and share ideas with everyone connected to the World Wide Web. Forums, blogs, social networks, and content-sharing services help people share useful information [1]. This information is unstructured, because it's produced for human consumption, it's not something that's "machine process able." Capturing public opinion about social events, political movements, company strategies, marketing campaigns, and product preferences is garnering increasing interest from the scientific community (for the exciting open challenges), and from the business world (for the remarkable marketing fallouts and for possible financial market prediction)[2].

In New Avenues in Opinion Mining and Sentiment Analysis researchers concluded opinion was, resulting emerging fields of opinion mining and sentiment analysis commonly used interchangeably to denote the same field of study, opinion mining and sentiment analysis actually focus on polarity detection and emotion recognition, respectively. Because the identification of sentiment is often exploited for detecting polarity, however, the two fields are usually combined under the same umbrella or even used as synonyms. Both fields use data mining and natural language processing (NLP) techniques to discover, retrieve, and distil information and opinions from the World Wide Web's vast textual information.[3]

Mining opinions and sentiments from natural language is challenging, because it requires a deep understanding of the explicit and implicit, regular and irregular, and syntactical and semantic language rules. Sentiment analysis researchers struggle with NLP's unresolved problems: co reference resolution, negation handling, anaphora resolution, named-entity recognition, and word-sense disambiguation. Opinion mining is a very restricted NLP problem, because the system only needs to understand the positive or negative sentiments of each sentence and the target entities or topics. Therefore, sentiment analysis is an opportunity for NLP researchers to make tangible progress on all fronts of NLP, and potentially have a huge practical impact.

In Common Sentiment Analysis Tasks, opinion mining is polarity classification. Polarity classification occurs when a piece of text stating an opinion on a single issue is classified as one of two opposing sentiments. Reviews such as "thumbs up" versus "thumbs down," or "like" versus "dislike" are examples of polarity classification [3].They strongly discussed that, sentiment analysis research is distinguishing itself as a separate field, falling between NLP and natural language understanding. Unlike standard syntactical NLP

tasks, such as summarization and auto categorization, opinion mining mainly focuses on semantic inferences and affective information associated with natural language, and doesn't require a deep understanding of text. They envision sentiment analysis research moving toward content-, concept-, and context-based analysis of natural language text, supported by time efficient parsing techniques suitable for big social data analysis[3].Multimodal Sentiment Analysis reviews new sources of opinion mining and sentiment analysis abound. Webcams installed in Smartphone's, touchpad's, or other devices let users post opinions in an audio or audio-visual format rather than in text, many new areas might be useful in opinion mining, such as facial expression, body movement

Margaret Rouse posted in her article Opinion mining (sentiment mining) challenges: There are several challenges in opinion mining. The first is that a word that is considered to be positive in one situation may be considered negative in another situation. Take the word "long" for instance. If a customer said a laptop's battery life was long, that would be a positive opinion. If the customer said that the laptop's start-up time was long, however, that would be is a negative opinion. These differences mean that an opinion system trained to gather opinions on one type of product or product feature may not perform very well on another [15]. A second challenge is that people don't always express opinions the same way. Most traditional text processing relies on the fact that small differences between two pieces of text don't change the meaning very much. In opinion mining, however, "the movie was great" is very different from "the movie was not great".

Norlela Samsudin, Mazidah Puteh and his colleagues reports the use of artificial immune system (AIS) technique in identifying Malaysian online movie reviews. Artificial immune system (AIS) refers to the reaction of an organism to infectious diseases by foreign substances known as pathogens or antigens. This opinion mining process uses three string similarity functions namely Cosine Similarity, Jaccard Coefficient and Sorensen Coefficient. In addition, AIS performance was compared with other traditional machine learning techniques, which are Support Vector Machine, Naïve Baiyes and k-Nearest Network. The result of the findings are analyzed and discussed [4].

Alexandra Balahur, Ralf Steinberger and their friends published an article Opinion Mining on Newspaper Quotations in which they present Opinion mining is the task of extracting from a set of documents opinions expressed by a source on a specified target. This article also presents a comparative study on the methods and resources that can be employed for mining opinions from quotations (reported speech) in newspaper articles. Opinion holders are more important in news articles because we often explicitly state the person or organization that holds a particular opinion. An opinion on a feature f (or object o) is a positive or negative view or appraisal on f (or o) from an opinion holder. Positive and negative are called opinion orientations [2].

Alexander Pak, Patrick Paroubek express their opinion on Twitter as a Corpus for Sentiment Analysis and Opinion Mining, Micro blogging today has become a very popular communication tool among Internet users. Therefore microblogging Web-sites are rich sources of data for opinion mining and sentiment analysis. They focus on using Twitter, the most popular microblogging platform, for the task of sentiment analysis in that they show how to automatically collect a corpus for sentiment analysis and opinion mining purposes. Twitter Sentiment Analysis can be cast as a classification problem where the task is to classify messages into two categories depending on whether they convey positive or negative feelings [9]. Twitter sentiment analysis is not an easy task because a tweet can contain a significant amount of information in very compressed form, and simultaneously carry positive and negative feelings.

Researchers from Opinion Miner: A Novel Machine Learning System for Web Opinion Mining and Extraction expressed their opinion. Merchants selling products on the Web often ask their customers to share their opinions and hands-on experiences on products they have purchased. Unfortunately, reading through all customer reviews is difficult, especially for popular items, the number of reviews can be up to hundreds or even thousands. This makes it difficult for a potential customer to read them to make an informed decision. The Opinion Miner system designed in this work aims to mine customer reviews of a product and extract high detailed product entities on which reviewers express their opinions. Opinion expressions classified as positive or negative .

3. MOTIVATION

As mentioned in the previous section, extensive work has already been conducted on opinion mining, at different levels of text and on different polarity scales. Applications include a variety of areas, depending on the source and final user of the extracted data – from monitoring the image of public figures to company reputation or trust, monitoring and analysing social media to detect potentially dangerous situations and what is done about them, or tracking opinion across time for market and financial studies.

Advent of Web 2.0 and social media content has stirred much excitement and created abundant opportunities for understanding the opinions of the general public and consumers toward social events, political movements, company strategies, marketing campaigns, and product preferences. Many new and exciting social, geo political, and business-related research questions can be answered by analyzing the thousands, even millions, of comments and responses expressed in various blogs (such as the blogosphere), forums (such as Yahoo Forums), social media and social network sites (including YouTube, Facebook, and Flikr), virtual worlds (such as Second Life), and tweets (Twitter). Reviews abound on the Web 2.0 consumer demands for review on electronics, hotels, etc. Automatic extraction of customer opinionsn can benefit both manufacturers and customer.

On recent years, The e-commerce sector is one of the most affected by the amount of data produced by customers, which increased dramatically during the phase known as Web 2.0. Customer's opinions represent a valuable unique type of information which should not be mistreated or ignored by the research community. From the customer perspective, considering others opinions before purchasing a product is a common behaviour long before the existence of Internet. In the era of the digital world, the difference is that a customer has access to thousands of opinions, which greatly improves decision making. Basically, customers want to find the best for the lowest price. In other words, they search for products that best fulfil their needs inside a price range that they are willing to pay.

It is important to emphasize that the benefit of analyzing other opinions, comes from their neutral nature, which are usually not linked to an organization or company. They represent the voice of ordinary consumers, and that differs greatly from ads (advertisements are biased and tend to favour the product, emphasizing the positives aspects and concealing the negatives ones). From the e-commerce perspective, receiving consumer's feedback can greatly improve its strategies in order to increase profits of the sector. For example, an online shop can place smart ads by measuring the level of satisfaction of consumers for a given product. For instance, if a product has a low level of satisfaction, a smart strategy would be placing a competitor. The actual search systems are focused on facts (e.g ranking mechanisms used by search engine). Therefore, one opinion from an object under discussion (OuD) is usually different from multiple opinions for the same OuD. The proposed framework will combine several techniques to extract valuable information out of natural language text (user-generated content), in order to provide enrichment of the experience of users by taking advantage of the available content in a more intelligent and organized way.

4. PROBLEM DEFINITION

Sentiment analysis is the computational study of people's opinions, appraisals, and emotions toward entities, events and their attributes. In the past few years, this field has attracted a great deal of attention from both the academia and industry due to many challenging research problems and a range of applications.

Opinions are important because whenever people and organizations need to make a decision, they want to hear others' opinions existed before the Web. In the past, when making a decision, individuals typically asked for opinions from friends and families. When an organization wanted to find opinions of the general public about its products and services, it conducted surveys and focus groups. People can now post reviews of products at merchant sites and express their views on almost anything in discussion forums and blogs, and at social network sites. Hence, individuals are no longer limited to asking friends and families because of the plethora of user-generated product reviews and opinions available on the Web.

In many cases, opinions are hidden in long forum posts and blogs, so it is difficult for a human reader to find relevant sites, extract related sentences with opinions, read them, summarize them, and organize them into usable formats. The research in the field started with sentiment and subjectivity classification, which treated the problem as a text classification problem.1Sentiment classification classifies whether an opinionated document (such as product reviews) or sentence expresses a positive or negative opinion.2 Subjectivity classification determines whether a sentence is subjective or objective.3 Many real-life applications, however, require more detailed analysis because users often want to know the subject of opinions. For example, from a product review, users want to know which product features consumers have praised and criticized.

5. OBJECTIVE(S)

The Goals intended to be achieved according to Problem Statement, described in below section:

1. Opinion mining, a sub discipline within data mining and computational linguistics, refers to the computational techniques for extracting, classifying, understanding, and assessing the opinions expressed in various online news sources, social media comments, and other user-generated content.

2. Sentiment analysis is often used in opinion mining uses natural language programming (NLP)techniques to identify the sentiment to identify sentiment, affect, subjectivity, and other emotional states in online text.

3. Researchers have also been able to classify text segments based on sentiment, affect, and subjectivity by analyzing positive or negative sentiment expressed in sentences, the degree of violence expressed in forum messages, and so on.

4. Advanced and mature techniques have been developed especially for English, public opinions expressed by citizens in different parts of the world, new, scalable opinion mining and sentiment analysis resources and techniques need to be developed for various languages.

5. Current opinion mining research artificial immune system (AIS) technique has focused on business and e-commerce applications, such as product reviews and movie ratings.

6. captured the opinion-related body language expressed by Second Life participants (such as thumbs-up, thumbs-down, and applause) for opinion mining.

7 Polarity classifications occur when a piece of text stating an opinion on a single issue is classified as one of two opposing sentiments. Reviews such as “thumbs up” versus “thumbs down,” or “like” versus “dislike” are examples of polarity classification..

8. Agreement detection determines whether a pair of text documents should receive the same or different sentiment-related labels.

9. General textual analysis uses part of speech (POS) information (for example, nouns, adjectives, adverbs, and verbs, phrases) as a basic form of word-sense disambiguation.

10. Here tried for achieved From Heuristics to Discourse Structure, From Coarse- to Fine-Grained Analysis, Keyword spotting, Lexical affinity, Statistical methods and Concept-based approaches.

6. PROPOSED WORK

6.1 Methodology and Workflow

Following are the steps to extracting the opinions.

- Identify the objects.
- Feature extraction and synonym grouping.
- Opinion orientation determination.
- Integration.
- polarity classification
- Agreement detection
- keyword spotting
- Lexical affinity
- Statistical methods
- Concept-based techniques

6.1.1 Natural Language Processing

NLP to discover, retrieve, and distil information and opinions from the World Wide Web’s vast textual information. Word Sense Disambiguation (WSD) is an intermediate task of Natural Language Processing. Use natural processing algorithm to find the positive and negative opinion, use data mining algorithm to extracting data from data base. Use of a Word Sense Disambiguation algorithm is done to determine the correct sense of the words in the opinion. Word-based Method Applied to Polarity Classification. It consists in

selecting the appropriate meaning of a word given the context in which it occurs. WSD algorithm for the finding the correct meaning of the sentence.

6.1.2 Module Description

Posting opinions:

In this module, they get the opinions from various people about business, e-commerce and products through online. The opinions may be of two types. Direct opinion and comparative opinion. Direct opinion is to post a comment about the components and attributes of products directly. Comparative opinion is to post a comment based on comparison of two or more products. The comments may be positive or negative.

Object identification:

In general, people can express opinions on any target entity like products, services, individuals, organizations, or events. In this project, the term object is used to denote the target entity that has been commented on. For each comment, we have to identify an object. Based on objects, we have to integrate and generate ratings for opinions.

The object is represented as "O". An opinionated document contains opinion on a set of objects as $\{o_1, o_2, o_3 \ldots o_r\}$.

Feature extraction:

An object can have a set of components (or parts) and a set of attributes (or properties) which they collectively call the features of the object. For example, a cellular phone is an object. It has a set of components (such as battery and screen) and a set of attributes (such as voice quality and size), which are all called *features* (or *aspects*). An opinion can be expressed on any feature of the object and also on the object itself. With these concepts in mind, we can define an object model, a model of an opinionated text, and the mining objective, which are collectively called the *feature-based sentiment analysis model*. In the *object model*, an object "O" is represented with a finite set of features,

$$F = \{f_1, f_2, \ldots, f_n\}$$

This includes the object itself as a special feature. Each feature $f_i \in F$ can be expressed by any one of a finite set of words or phrases

$$W_i = \{w_{i1}, w_{i2}, \ldots, w_{im}\}$$

Which are the feature's *synonyms*.

Opinion-orientation determination:

The opinion holder is the person or organization that expresses the opinion. In the case of product reviews and blogs, opinion holders are usually the authors of the posts. An opinion on a feature *f* (or object *o*) is a positive or negative view or appraisal on *f* (or *o*) from an opinion holder. Positive and negative are called opinion orientations. From this opinion orientation we have to determine the type of opinion whether it is direct opinion or comparative opinion.

- ***Direct opinion:***

A *direct opinion* is a quintuple $(o_j, f_{jk}, oo_{ijkl}, h_i, t_l)$,

where o_j is an object,

f_{jk} is a feature of the object o_j,

oo_{ijkl} is the orientation of the opinion on feature f_{jk} of object o_j,

h_i is the opinion holder, and

t_l is the time when the opinion is expressed by h_i.

The opinion orientation oo_{ijkl} can be positive, negative, or neutral.

- ***Comparative opinion:***

A *comparative opinion* expresses a preference relation of two or more object based their shared features. A comparative opinion is usually conveyed using the comparative or superlative form of an adjective or adverb, such as "Coke tastes better than Pepsi."

Integration:

Integrating these tasks is also complicated because we need to match the five pieces of information in the quintuple. That is, the opinion oo_{ijkl} must be given by opinion holder h_i on feature f_{jk} of object o_j at time t_l .To make matters worse, a sentence might not explicitly mention some pieces of information, but they are implied using pronouns, language conventions, and context. Then generate ratings based on above tasks. Thus we can clearly see how holders view the different features of each product.

***Polarity Classification*:**

The basic task of opinion mining is polarity classification. Polarity classification occurs when a piece of text stating an opinion on a single issue is classified as one of two opposing sentiments. Reviews such as "thumbs up" versus "thumbs down," or "like" versus "dislike" are examples of polarity classification. Polarity classifications also identify pro and con expressions in online reviews and help make the product evaluations more credible.

Agreement detection:

Agreement detection is another form of binary sentiment classification. Agreement detection determines whether a pair of text documents should receive the same or different sentiment-related labels. After the system identifies the polarity classification, it might assign *degrees of positivity* to the polarity—that is, it might locate the opinion on a continuum between positive and negative.

Keyword spotting:

This approach classifies text by affect categories based on the presence of unambiguous affect words such as happy, sad, afraid, and bored. Keyword spotting relies on the presence of obvious affect words that are only surface features of the prose.

Lexical affinity:

Lexical affinity is slightly more sophisticated than keyword spotting. This approach not only detects obvious affect words, it also assigns arbitrary words a probable "affinity" to particular emotions.

Statistical methods:

This approach, which includes Bayesian inference and support vector machines, is popular for affect text classification. Researchers use statistical methods on projects such as Pang's movie review classifier and many others. By feeding a machine-learning algorithm a large training corpus of affectively annotated texts, the system might not only learn the affective valence of affect keywords (as in the keyword spotting approach), but also take into account the valence of other arbitrary keywords (similar to lexical affinity), punctuation, and word co-occurrence frequencies.

Concept-based techniques:

These methods use Web ontologies or semantic networks to accomplish semantic text analysis. This helps the system grasp the conceptual and affective information associated with natural language opinions. By relying on large semantic knowledge bases, such approaches step away from blindly using keywords and word co-occurrence counts, and instead rely on the implicit meaning/features associated with natural language concepts. Superior to purely syntactical techniques, concept-based approaches can detect subtly expressed sentiments. Concept-based approaches can analyze multi-word expressions that don't explicitly convey emotion, but are related to concepts that do.

6.1.3 Algorithm for WSD

P(w) = Positive value of s in a lexical resource.
N(w) = Negative value of s in a lexical resource.
Finally, the global positive and negative scores (Sp, Sn) are calculated as:

$Sp = \Sigma P(w)$ w:P(w)>N(w)

$Sn = \Sigma N(w)$ w:N(w)>P(w)

If Sp>Sn then the opinion is considered as positive. If Sp<Sn the opinion is negative.
Finally, if Sp=Sn the opinion is considered as neutral.

6.1.4 Artificial Immune System (AIS) Technique

AIS technique use in identifying Malaysian online movie reviews. This opinion mining process uses three string similarity functions namely Cosine Similarity, Jaccard Coefficient and Sorensen Coefficient. In addition, AIS performance was compared with other traditional machine learning techniques, which are Support Vector Machine, Naïve Baiyes and k-Nearest Network. In order to classify online reviews into corresponding positive and negative reviews, each review was considered as an artificial immune cell.

6.1.5 Feature Selection with Opinion Mining

Feature Selection based on Immune Network System (FSINS) which inspired from the Artificial Immune System (AIS) theory, technique was better than the traditional 'filter' typed feature selection techniques. Feature selection is an activity, which select relevant features based on a particular measurement On the other hand, it is important to select a feature selection technique which reduces the number of features without reducing the performance of opinion mining. Several common feature selection techniques such as POS, Information Gain, Document Frequency and Chi Square were incorporated. There are three groups of feature selection techniques i.e. filter, wrapper and embedded.

In a filter category, a group of features is selected based on a particular mathematical equation and may be used with any classifier. Contrary to that, the features that are selected in the wrapper and the embedded techniques are bound to a particular classifier. The calculation which is used:

$$CPD(t) = \frac{|FP_i - FN_i|}{DF_i}$$

Where:
FPi is the number of feature i in the positive class
FNi is the number of feature i in the negative class
DFi is the number of document where feature i exist.

6.2. Functional Block diagram

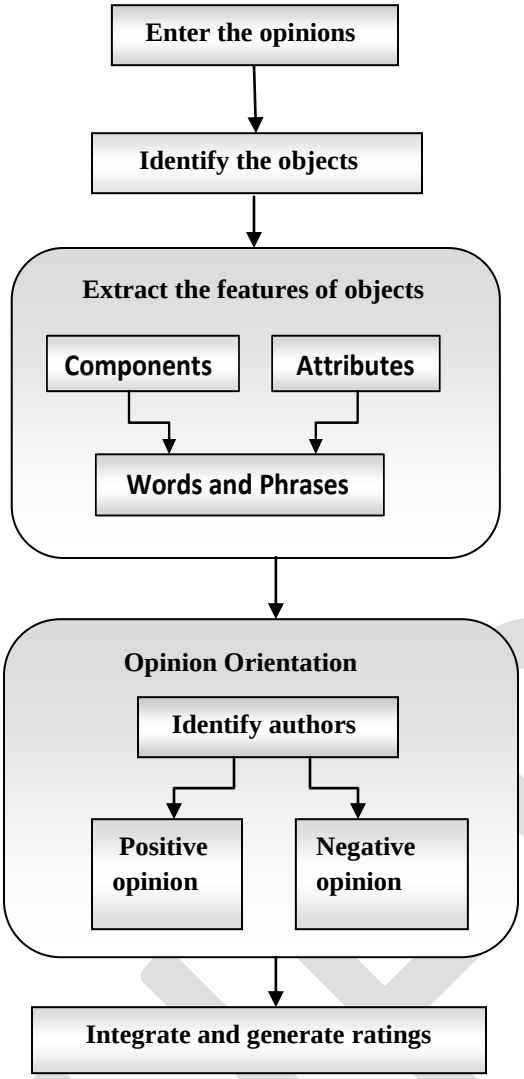

Figure 1. Functional block diagram of Natural Language Processing

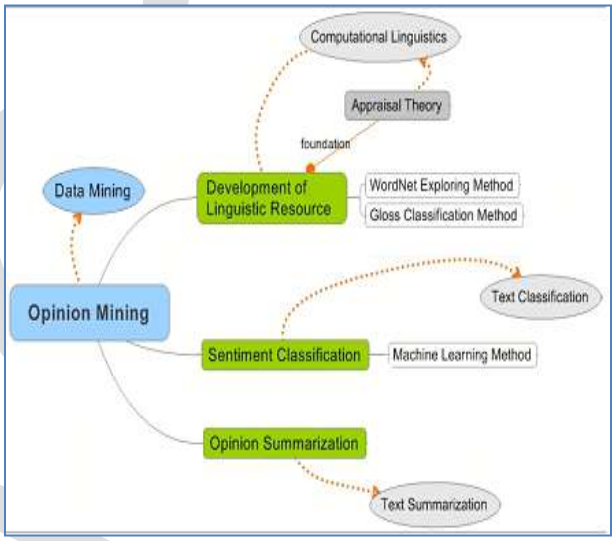

Figure 2. Tasks for opinion mining and its relationship with related areas

7. CONCLUSION

The key is to fully understand the whole range of issues and pitfalls, cleverly manage them, and determine what portions can be done automatically and what portions need human assistance. Despite these difficulties and challenges, the field has made significant progress over the past few years. This is evident from the large number of start-up companies that provide opinion mining services.

Sentiment analysis research is distinguishing itself as a separate field, falling between NLP and natural language understanding. Opinion mining and sentiment analysis are inextricably bound to the affective sciences that attempt to understand human emotions,. Word Sense Disambiguation (WSD) is an intermediate task of Natural Language Processing. Feature Selection based on Immune Network System (FSINS) which inspired from the Artificial Immune System (AIS) theory as opinion mining technique was investigated for movie rating review.

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VIDEO TRACKING SYSTEM

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Abstract- Video tracking is the process of locating a moving object (or multiple objects) over time using a camera. It has a variety of uses, some of which are: human-computer interaction, security and surveillance, video communication and compression, augmented reality, traffic control, medical imaging and video editing .Video tracking can be a time consuming process due to the amount of data that is contained in video. Adding further to the complexity is the possible need to use object recognition techniques for tracking over time. However, video needs more space for storage and wider bandwidth for transmission

Video tracking is a complex problem because the environment, in which video motion needs to be tracked, is widely varied based on the application and poses several constraints on the design and performance of the tracking system. Current datasets that are used to evaluate and compare video motion tracking algorithms use a cumulative performance measure without thoroughly analyzing the effect of these different constraints imposed by the environment. But it needs to analyze these constraints as parameters.

The advance of technology makes video acquisition devices better and less costly, thereby increasing the number of applications that can effectively utilize digital video. Compared to still images, video sequences provide more information about how objects and scenarios changes.

Index term: video, video tracking, image segmentation , tracing system, object detection, compression, object tracking

INTRODUCTION

Object tracking can be defined as the process of segmenting an object of interest from a video scene and keeping track of its motion, orientation, occlusion etc. in order to extract useful information. Object tracking in video processing follows the segmentation step and is more or less equivalent to the *'recognition'* step in the image processing. Detection of moving objects in video streams is the first relevant step of information extraction in many computer vision applications.

Object tracking is required in many vision applications such as human-computer interfaces, video communication/compression, road traffic control, security and surveillance systems. Often the goal is to obtain a record of the trajectory of the moving single or multiple targets over time and space, by processing information from distributed sensors. Object tracking in video sequences requires on-line processing of a large amount of data and is time-expensive. Additionally, most of the problems encountered in visual tracking are nonlinear, non-Gaussian, multi-modal or any combination of these. Different techniques are available in the literature for solving tracking tasks in vision and can be divided in general into two groups: *i)* classical applications, where targets do not interact much with each other, *behave independently* such as aircrafts that do not cross their paths, and *ii)* applications in which targets do not behave independently, their identity is not always very well distinguishable. Tracking multiple identical targets has its own challenges when the targets pass close to each other or merge.

RELATED WORK

Many researchers have tried various approaches for object tracking. Nature of the technique used largely depends on the application domain. Some of the research work done in the field of object tracking includes:

1. *A. Gyaourova, C. Kamath, S. and C. Cheung* has studied the block matching technique for object tracking in traffic scenes. A motionless airborne camera is used for video capturing. They have discussed the block matching technique for different resolutions and complexities [1] .
2. *Yoav Rosenberg and Michael Werman* explains an object-tracking algorithm using moving camera. The algorithm is based on domain knowledge and motion modeling. Displacement of each point is assigned a discreet probability distribution matrix. Based on the model, image registration step is carried out. The registered image is then compared with the background to track the moving object [2].
3. *A. Turolla, L. Marchesotti and C.S. Regazzoni* discusses the camera model consisting of multiple cameras. They use object features gathered from two or more cameras situated at different locations. These features are then combined for location estimation in video surveillance systems [3].
4. One simple feature based object tracking method is explained by *Yiwei Wang, John Doherty and Robet Van Dyck.* The method first segments the image into foreground and background to find objects of interest. Then four types of features are gathered for each object of interest. Then for each consecutive frames the changes in features are calculated for various possible directions of movement. The one that satisfies certain threshold conditions is selected as the position of the object in the next frame [4].
5. *Çi˘gdem Ero˘glu Erdem and Bülent San* have discussed a feedback-based method for object tracking in presence of occlusions. In this method several performance evaluation measures for tracking are placed in a feedback loop to track nonrigid contours in a video sequence [5] .
6. The earliest relevant review on human motion analysis was probably due to Aggarwal et al [6]. It covered various methods used in articulated and elastic non-rigid motion prior to 1994. As for articulated motion, the approaches with or without a prior shape models were described.
7. Cedars and Shah [7] presented an overview of methods for Motion extraction prior to 1995, in which human motion analysis was illustrated as action recognition, recognition of body parts and body configuration estimation on.

8. Aggarwal and Cai gave another survey of human motion analysis [8], which covered the work prior to 1997. Their latest review [9] covering 69 publications was an extension of their workshop paper [10]. The paper provided an overview of various tasks involved in motion analysis of human body prior to 1998. The focuses were on three major areas related to interpreting human motion: (a) motion analysis involving human body parts, (b) tracking moving human from a single view or multiple camera perspectives, and (c) recognizing human activities from image sequences.

9. A similar survey by Gavrila [11] described the work in human motion analysis prior to 1998. Its emphasis was on discussing various methodologies that were grouped into 2-D approaches with or without explicit shape models and 3-D approaches. It concluded with two main future directions in 3-D tracking and action recognition.

10. Recently, a relevant study by Pentland [12] centered on person identification, surveillance / monitoring, 3-D methods, and smart rooms / perceptual user interfaces to review the state-of-the-art of “looking at people”. The paper was not intended to survey the current work on human motion analysis, but touched on several interesting topics in human motion analysis and its applications.

11. The latest survey of computer vision based human motion capture was presented by Moeslund and Granum [13]. Its focus was on

a general overview based on the taxonomy of system functionalities, viz. initialization, tracking, pose estimation and recognition. It covered the achievements from 1980 into the first half of 2000. In addition, a number of general assumptions used in this research field were identified and suggestions for future research directions were offered.

12. Different techniques are available in the literature for solving tracking problems in vision. Liang Wang, Weiming Hu, Tieniu Tan [14] focused mainly on Monte Carlo techniques (particle filters) because of their power and versatility [15-18]. The Monte Carlo techniques are based on computation of the state posterior density function by samples, and are known under different names*:* *particle filters (PFs)* [16], *bootstrap methods* [15] or the *condensation algorithm* [11] which was the first variant applied to video processing. The abbreviation condensation stems from conditional density propagation.

13. Color histograms have been widely used for tracking problems [19-21] because they are robust to partial occlusion and are rotation and scale invariant. They have limitations in areas where the background has a similar color as the target object in that the tracker can be confused and lose track of the object. Color histograms also have poor performance when the illumination varies.

14. Other features have been proposed for tracking including shape [22] and gradient direction [23] or a combination of shape and color [24]. A single feature does not provide enough information about the object being tracked and hence using multiple features can provide more information about the object.

OBJECT CLASSIFICATION

Different moving regions may correspond to different moving targets in natural scenes. For instance, the image sequences captured by surveillance cameras mounted in road traffic scenes probably include pedestrians, vehicles, and other moving objects such as flying birds, flowing clouds, etc. To further track people and analyze their activities, it is very necessary to correctly distinguish them from other moving objects.

At present, there are two main categories of approaches towards moving object classification.

Shape-based classification

Different descriptions of shape information of motion regions such as representations of point, box, silhouette and blob are available for classifying moving objects. For example, classified moving object blobs into four classes such as single human, vehicles, human groups and clutter, using a viewpoint-specific three-layer neural network classifier. Input features to the network were a mixture of image-based and scene-based object parameters such as image blob dispersedness, image blob area, apparent aspect ratio of the blob bounding box, and camera zoom. Classification was performed on each blob at every frame, and the results of classification were kept in histogram. At each time step, the most likely class label for the blob was chosen as the final classification.

Motion-based classification

Generally speaking, non-rigid articulated human motion shows a periodic property, so this has been used as a strong cue for moving object classification. For example, a similarity-based technique to detect and analyze periodic motion. By tracking moving object of interest, they computed its self-similarity as it evolved over time. As we know, for periodic motion, its self-similarity measure was also periodic. Therefore they applied time-frequency analysis to detect and characterize the periodic motion, and implemented

tracking and classification of moving objects using periodicity. Optical flow is also very useful for object classification.

Two common approaches mentioned above, namely shape-based classification and motion-based classification can also be effectively combined for moving object classification [15]. Furthermore, Stauffer proposed a novel method based on time co-occurrence matrix to hierarchically classify both objects and behaviors. It is expected that more precise classification results can be obtained by using extra features such as color and velocity.

TYPICAL MOTION AND OBSERVATION MODELS

Motion Models

The techniques used to accomplish a given tracking task depend on the purposes, and in particular on *i)* the objects possessing certain characteristics : cars, people, faces; *ii)* objects possessing certain characteristics with a specific attribute, e.g. moving cars, walking people, talking faces, face of a given person; *iii*) objects of *a priori* unknown nature but of specific interest, such as moving objects. In each case part of the input video frame is searched against a reference model describing the appearance of the object. The reference can be based on image patches, which describe the appearance of the tracked region at the pixel level, or on contours, and/ or on global descriptors such as color models.

To characterize a target, first a feature space is chosen. The *reference object (target) model* is represented by its PDF in the feature space. For example, the reference model can be the color PDF of the target . In the subsequent frame, a *target candidate* is defined at some location and is characterized by the PDF. Both PDFs are estimated from the data and compared by a *similarity function*. The local maxima in the similarity function indicate the presence of objects in the second image frame having a representation similar to the reference model defined in the first frame. Examples of similarity functions are the Bhattacharyya distance and the Kullback-Leibler distance.

In the light of tracking a specified object or region of interest in image sequences, different object models have been proposed in the literature. Many of them make only weak assumption about the precise object configuration and are not particularly restrictive about the types of objects.

Observation models

The observation models for object tracking in video sequences are usually highly nonlinear and can be either *parametric* or *nonparametric* . Some of the most often used observation models are based on color, shape and/ or motion cues. The localization cues impact the tracker based on a PF in different ways. Usually, likelihood models of each cue are constructed. These cues are assumed mutually independent; having in mind that any correlation that may exist between, e.g., the color, motion and sound of an object is likely to be weak. Adaptation of the cues is essential in distinguishing different objects, making tracking robust to appearance variations due to changing illumination and pose etc.

METHODS USED IN THE TRACKING PROCESS

Model-based tracking

Traditionally, the geometric structure of human body can be represented as stick figure, 2-D contour or volumetric model. So body segments can be approximated as lines, 2-D ribbons and 3-D volumes accordingly.

Stick figure

The essence of human motion is typically addressed by the movements of the torso, head and four limbs, so the stick-figure representation can be used to approximate a human body as a combination of line segments linked by joints. The stick figure is obtained in various ways, e.g., by means of median axis transform or distance transform .The motion of joints provides a key to motion estimation and recognition of the whole figure.

2-D contour

This kind of representation of human body is directly relevant to the human body projection in the image plane. In such description, human body segments are analogous to 2-D ribbons or blobs . A silhouette or contour is relatively easy to be extracted from both the model and image. Based upon 2-D contour representation, Niyogi and Abelson used the spatial-temporal pattern in XYT space to track, analyze and recognize walking figures.

Volumetric models

The disadvantage of 2-D models is its restriction to the camera's angle, so many researchers are trying to depict the geometric structure of human body in more detail using some 3-D models such as elliptical cylinders, cones, spheres. The more complex 3-D volumetric models, the better results may be expected but they require more parameters and lead to more expensive computation during the matching process.

An important advantage of 3-D human model is the ability to handle occlusion and obtain more significant data for action analysis. However, it is restricted to impractical assumptions of simplicity regardless of the body kinematics constraints, and has high computational complexity as well.

Region-based tracking

The idea here is to identify a connected region associated with each moving object in an image, and then track it over time using a cross-correlation measure. Region-based tracking approach has been widely used today. The region-based tracking approach works reasonably well. However, difficulties arise in two important situations. The first is that of long shadows. This problem may be resolved to some extent by making use of color or exploiting the fact that shadow regions tend to be devoid of texture. The more serious, and so far intractable, problem for video tracking has been that of congested situations. Under these conditions, people partially occlude one another instead of being spatially isolated. This makes the task of segmenting individual humans very difficult. The resolution to this problem may require tracking systems using multiple cameras.

Feature-based tracking

Abandoning the idea of tracking objects as a whole, this tracking method uses sub-features such as distinguishable points or lines on the object to realize the tracking task. Its benefit is that even in the presence of partial occlusion, some of the sub-features of the tracked objects remain visible. Feature-based tracking includes feature extraction and feature matching. Low-level features such as points are easier to extract. It is relatively more difficult to track higher-level features such as lines and blobs. So, there is usually a trade-off between feature complexity and tracking efficiency.

In addition, Segen and Pingali's tracking system utilized the corner points of moving silhouettes as the features to track, and these

feature points were matched using a distance measure based on positions and curvatures of points between successive frames.The tracking of point and line features based on Kalman filtering has been well developed in the computer vision community. Another tracking aspect, the use of multiple cameras has recently been actively studied. Multi-camera tracking is very helpful for reducing ambiguity, handling occlusions and providing general reliability of data.

For the tracking systems based on multiple cameras, one needs to decide which camera or image to use at each time instant. That is to say, it is an important problem for a successful multi-camera tracking system how the selection and data fusion between cameras are handled.

HOW DOES VISUAL TRACKING WORK?

First, we need a description for the object to be tracked. This can, for example, be a template image of the object, a shape, texture color model or something alike. Building such an initial object description is a very critical and hard task, because the quality of the description directly relates to the quality of the tracking process. Additionally, such a description is not always available to the tracking application beforehand and thus, it may need to be built up during runtime.

Second, objects are usually embedded into certain context. Visual context has been successfully studied in object detection tasks as well as the image understanding field

Most visual tracking methods include image input, appearance feature description, context information integration, decision and modal update, as shown in Fig. 1. For different methods, emphasis is not the same, so their schemes will be different. Due to the great success of Particle Filtering , also known as sequential Monte Carlo methods (SMC), visual tracking has been formulated as a problem of Bayesian inference in state space. Compared with the regular exhaustive search-based methods, the main advantage of the use of a particle filter is the reduction of sampling patches during tracking. Another benefit of the particle filter is that the sampling effort can be kept constant, independent a to the size of the object to track which is not the case with simply expanding the search region around the object with fixed factor. Therefore, introducing more advanced Monte Carlo sampling methods would greatly elevate the visual tracking performance.

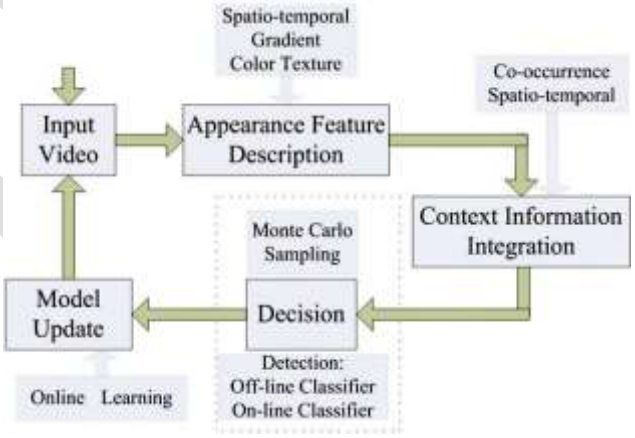
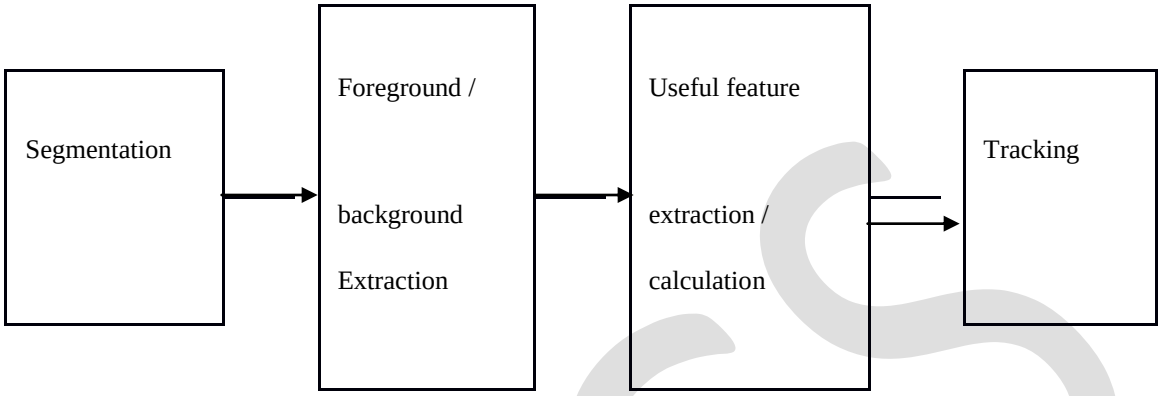


Fig. 1. The flowchart of visual tracking

STEPS IN OBJECT TRACKING

The process of object tracking is summarized in the block diagram below:



Basic steps in object tracking can be listed as:

- Segmentation
- Foreground / background extraction
- Camera modeling
- Feature extraction and tracking

Segmentation

Segmentation is the process of identifying components of the image. Segmentation involves operations such as boundary detection, connected component labeling, thresholding etc. Boundary detection finds out edges in the image. Any differential operator can be used for boundary detection . Thresholding is the process of reducing the grey levels in the image. Many algorithms exist for thresholding .

Foreground extraction

As the name suggests this is the process of separating the foreground and background of the image. Here it is assumed that foreground contains the objects of interest. Some of the methods for foreground extraction are

Use of difference images

In this method we use subtraction of images in order to find objects that are moving and those that are not. The result of the subtraction is viewed as another grey image called *difference image*. Three types of difference images are defined.

- Absolute accumulative difference image is given by

$$f(x,y) = f(x,y) +1 \quad \text{.....if } |g(x,y,t_{i+1}) - g(x,y,t_i)| > T$$

- Positive accumulative difference image is given by

$$f(x,y) = f(x,y) +1 \quad \text{.....if } g(x,y,t_{i+1}) - g(x,y,t_i) > T$$

- Negative accumulative difference image is given by

$$f(x,y) = f(x,y) +1 \text{ ……if } g(x,y,t_i) - g(x,y,t_{i+1}) > T$$

The following figures illustrate the three difference images.

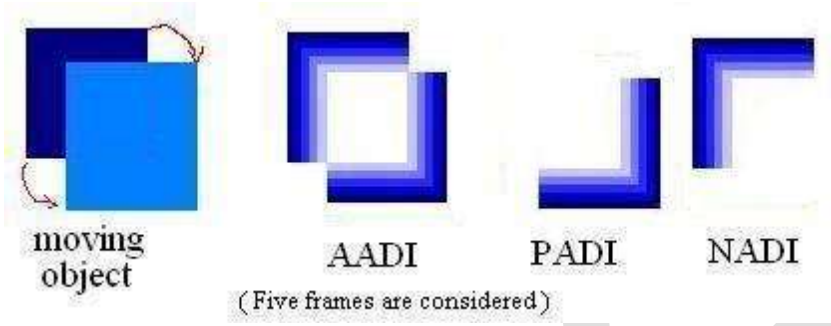


Fig.2

A gap- mountain method described in [4] can then be applied to identify image blocks that are moving and those that are not moving. The gap-mountain method works as follows- Consider a difference image shown in the adjacent figure. A gap is a sequence of consecutive black pixels and mountain is a sequence of consecutive white pixels. If width of a mountain in a particular row is greater than a preset threshold then we assume that a moving object is present in that row. Similar technique is the algorithm proceeds by dividing the image into smaller sub images until each sub matrix contains exactly one object. In the adjacent figure by choosing proper thresholds we can detect the presence of two blocks.

Kalman filtering this method employs 'kalman filter' for predicting the image at t_{i+1} based on some noise model. The difference between predicted and actual intensities is thresholded to classify the image pixel as foreground or background. One advantage of this method is it considers effect of noise, which is very important feature in real world Applications. For example an automatic road traffic management system may detect false objects due to bad weather, wind etc.

Background extraction

Once foreground is extracted a simple subtraction operation can be used to extract the background [67]. Following figure illustrates this operation:

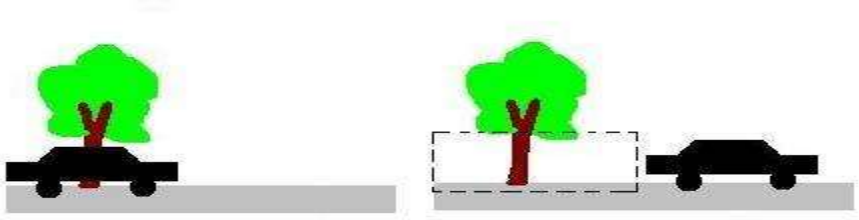


Fig 3. Background extraction

Another method that can be used in object tracking is *Background learning*. This approach can be used when fixed cameras are used for video capturing. In this method, an initial training step is carried out before deploying the system. In the training step the system constantly records the background in order to 'learn' it. Once the training is complete the system has complete information about the background. Though this step is slightly lengthy, it has a very important advantage. Once we know the background, extracting the foreground is matter of simple image subtraction.

Camera modeling

Camera model is an important aspect of any object-tracking algorithm. All the existing objects tracking systems use a preset camera model. In words camera model is directly derived from the domain knowledge. Some of the common camera models are –

1. Single fixed camera

   Example: Road traffic tracking system

2. Multiple fixed cameras

   Example: Simple surveillance system

3. Single moving camera

   Example: Animation and video compression systems

4. Multiple moving cameras

   Example: Robot navigation system

For a single fixed camera no extra processing is necessary. In case of multiple cameras, we get inputs from more than one source. Hence first some 3D transformations are required to adjust all the inputs. This what is done in [3]. For a moving camera, we need some heuristic about camera motion. If exact information about the camera movement is available then it can be included in the form of transformations. Having multiple moving cameras is very complicated situation (but can be faced with in many real world Applications). It needs the algorithm to model motion of all the cameras as well as to integrate results from all the cameras. For multi-camera tracking systems, one needs to decide which camera or image to use at each time instant. That is, the coordination and information fusion between cameras are a significant problem.

Feature extraction and object tracking

The next step is to extract useful features from the sequence of frames. Depending on the algorithm, definition of 'feature' may vary. The next few sections explore some of the important techniques used for tracking:

In the feature based approach discussed by Yiwei Wang, John Doherty and Robet Van Dyck [4] four features namely centroid, dispersion, grayscale distribution, object texture are used for tracking objects. The features are defined as follows:

Centroid = (c_x, c_y) where,

$c_x = \Sigma(p_{i,j} * i) / \Sigma(p_{i,j})$

$c_y = \Sigma(p_{i,j} * j) / \Sigma(p_{i,j})$

dispersion = $(\Sigma \sqrt{((I - c_x)^2 + (j - c_y)^2)} * p_{i,j}) / (\Sigma p_{i,j})$

In current frame under consideration each useful object is assigned the feature vector. Based on the domain knowledge some expected 'tracks' could be generated. Thus the tracking algorithm becomes finding the best track for each object. For this a matrix X of m objects versus n tracks is computed. An element X[i][j] is the number of features that 'match' with the observed features based on some threshold. Further for matrix a threshold for eligible tracks is set (generally 3). If in a row there is only one track satisfying the eligibility threshold then it becomes the current track of the object. The row and column corresponding to the object and the track is removed from the matrix. For objects with multiple possible tracks, weights are given to the features to evaluate 'cost' for each track. The track that gives the least cost is assigned to the object. Here the weights are given purely on the basis of domain knowledge or based on some heuristic about usefulness of the feature.

Block matching method for tracking

The block matching technique [1] gives good results when single fixed camera is used to capture video. The performance degrades considerably in the presence of snowfall or when moving camera is used. The blocks are usually defined by dividing the image frame into non-overlapping square parts. The measure used for matching is Mean Absolute Difference (MAD), which is given by

$$MAD = \frac{1}{mn} \sum_{i=1}^{m} \sum_{j=1}^{n} |A(i,j) - B(i.j)|$$

Each block from the current frame is matched into a block in the destination frame by shifting the current block over a predefined neighborhood of pixels in the destination frame. At each shift, the sum of the distances between the gray values of the two blocks is computed. The shift, which gives the smallest total distance, is considered the best match. Other than Mean Absolute Difference (MAD), mean squared distance (MSD), and normalized cross-correlation (NCC) can be used for matching.

Exploiting the domain knowledge

T_ Huang_ D_ Koller_ J_ Malik_ G_ Ogasawara_ B_ Rao_ S_ Russell_ and J_ Weber discussed a different approach in which domain knowledge is exploited to simplify object tracking. As the objects under consideration are vehicles, image path can be

approximated by affine transformations. Since motion is constrained to the road plane and since possible rotation components along the normal of the plane are small the degrees of freedom can be reduced to the extent that we obtain a velocity equation of only a scale parameter s and a displacement vector u(x):

$$\boldsymbol{u}(\boldsymbol{x}) = s\,(\boldsymbol{x} - \boldsymbol{x}_m) + \boldsymbol{u}_0,$$

Compressed domain object tracking

This tracking method [70] uses compressed domain MPEG video as the source. In the method described by Radhakrishna Achanta, Mohan Kankanhalli, phillipe Mulhem user selects the object of interest. The bounding rectangle of object R_c is then traced in the compressed domain I frame. This region is projected onto the predicted P and B frames. The histogram matching operation is performaed to track the object. For histogram matching clipped DCT coefficients for Cb and Cr are used. A measure called diffused sum defined by

$$DiffSum = \sum_{n \text{ in } [1,9]} Wt[n]\ (\ |HDiffCr| + |HDiffCb|\ )$$

is used for histogram comparison. Here *HDiffCr and HDiffCb* are histogram bin differences and Wt[n] is weight factor of particular histogram bin. Higher weights are used for DC and low frequency AC values and lower weights are used for relatively higher AC values.

ARCHITECTURAL AND PERFORMANCE CONSIDERATIONS

Object tracking and other video-processing applications are computation intensive operations; hence performance considerations become critical when they are to be used in real time systems. Following are the various factors affecting the system architecture (i.e. memory, processor, degree of parallelism)

- Whether real time response is required or not
- Is the processing carried out in compressed domain or not
- Affordable budget

A typical approach to evaluating the performance of the detection and tracking system uses ground truth to provide independent and objective data (e.g. classification, location, size) that can be related to the observations extracted from the video sequence. Manual ground truth is conventionally gathered by a human operator who uses a 'point and click' user interface to step through a video sequence and select well-defined points for each moving object. The manual ground truth consists of a set of points that define the trajectory of each object in the video sequence. The human operator decides if objects should be tracked as individuals or classified as a group. The motion detection and tracking algorithm is then run on the pre-recorded video sequence and ground truth and tracking results are compared to assess tracking performance.

The reliability of the video tracking algorithm can be associated with a number of criteria: the frequency and complexity of dynamic

occlusions, the duration of targets behind static occlusions, the distinctiveness of the targets (e.g. if they are all different colors), and changes in illumination or weather conditions.

CONCLUSION

From the discussion, it can be seen that object tracking has many useful applications in the robotics and computer vision fields. Several researchers have explored and implemented different approaches for tracking. The success of a particular approach depends largely on the problem domain. In other words, a method that is successful in robot navigation may not be equally successful in automated surveillance. Further there exists a cost/performance trade off. For real time applications we may need a fast high performance system on the other hand offline applications we may use a relatively cheap (and slower in performance). It can also be seen from the diverse nature of the techniques used that the field has a lot of room for improvement.

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EIGEN VALUES AND EIGEN VECTORS FOR FUZZY MATRIX

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Abstract- Many applications of matrices in both engineering and science utilize Eigen values and Eigen vectors. Control theory, vibration analysis, electric circuits, advanced dynamics and quantum mechanics are the few of the applications area. In this paper, first time we introduced the Eigen values and eigen vectors of fuzzy matrix. This paper consist four sections. In first section, we give the introduction about Eigen values, Eigen vectors and fuzzy matrix. Proposed definitions of Eigen values and eigen vectors were derived in second section. In the third section, we give the application of proposed Eigen values and Eigen vectors of fuzzy matrix. Conclusions were given in final section.

Keywords- Characteristic Equation, Eigen values, Eigen Vectors and Fuzzy Matrix.

1. INTRODUCTION

The eigen value problem is a problem of considerable theoretical interest and wide-ranging application. For example, this problem is crucial in solving systems of differential equations, analyzing population growth models, and calculating powers of matrices (in order to define the exponential matrix). Other areas such as physics, sociology, biology, economics and statistics have focused considerable attention on "Eigen values" and Eigen vectors"-their applications and their computations.

The basic concept of the fuzzy matrix theory is very simple and can be applied to social and natural situations. A branch of fuzzy matrix theory uses algorithms and algebra to analyze date. It is used by social scientists to analyze interaction between actors and can be used to complement analyses carried out using game theory or other analytical tools.

2. PROPOSED DEFINITIONS AND EXAMPLES

In this section we give the proposed Characteristic Equations of Fuzzy matrix, Polynomial equations of fuzzy matrix, working rule to find characteristic equation of fuzzy matrix, Fuzzy Eigen Values and Eigen vectors, Properties of Fuzzy Eigen values and Eigen vectors are presented as follows:

2.1. Characteristic Equation of Fuzzy Matrix

Consider the linear transformation $Y = A_F X$

In general, this transformation transforms a column vector $X = \begin{bmatrix} x_1 \\ x_2 \\ . \\ x_n \end{bmatrix}$ into the another column vector $Y = \begin{bmatrix} y_1 \\ y_2 \\ . \\ y_n \end{bmatrix}$

By means of the square fuzzy matrix A_F where

$$A_F = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ . & . & \cdots & . \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix}$$

If a vector *X* is transformed into a scalar multiple of the same vector. i.e., *X* is transformed into λX , then $Y = \lambda X = A_F X$

i.e., where I is the unit matrix of order 'n'.

$$A_F X - \lambda I X = O$$

$$(A_F - \lambda I)X = O \qquad \ldots (2.1)$$

$$\left[\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} - \lambda \begin{bmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ . & . & \ldots & \ldots \\ . & . & \ldots & \ldots \\ 0 & 0 & \cdots & 1 \end{bmatrix}\right]\begin{bmatrix} x_1 \\ x_2 \\ . \\ . \\ x_n \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ . \\ . \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} a_{11} - \lambda & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} - \lambda & \cdots & a_{2n} \\ . & . & . & . \\ . & . & . & . \\ a_{n1} & a_{n2} & \cdots & a_{nn} - \lambda \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ . \\ . \\ x_n \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ . \\ . \\ 0 \end{bmatrix}$$

$$\begin{aligned} &(a_{11} - \lambda)x_1 + a_{12}x_2 + \ldots + a_{1n}x_n = 0 \\ &a_{21}x_1 + (a_{22} - \lambda)x_2 + \ldots + a_{2n}x_n = 0 \\ \text{i.e.,}\quad &. \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \\ &. \ . \ . \ . \ . \ . \ . \ . \ . \ . \\ &a_{n1}x_1 + a_{n2}x_2 + \ldots + (a_{nn} - \lambda)x_n = 0 \end{aligned} \qquad \ldots (2.2)$$

This system of equations will have a non-trivial solution, if $|A_F - \lambda I| = 0$

$$\text{i.e.,} \quad \begin{vmatrix} a_{11} - \lambda & a_{12} & \ldots & a_{1n} \\ a_{21} & a_{22} - \lambda & \ldots & a_{2n} \\ . & . & \ldots & . \\ . & . & \ldots & . \\ a_{n1} & a_{n2} & \ldots & a_{nn} - \lambda \end{vmatrix} = 0 \qquad \ldots (2.3)$$

The equation $|A_F - \lambda I| = 0$ or equation (2.3) is said to be the characteristic equation of the transformation or the characteristic equation of the matrix *A*. Solving $|A_F - \lambda I| = 0$, we get *n* roots for λ , these roots are called the characteristic roots (or) Eigen values of the matrix A_F . Corresponding to each of value of λ , the equation $A_F X = \lambda X$ has a non-zero solution vector *X*. Let X_r , be the non-zero vector satisfying $A_F X = \lambda X$. When $\lambda = \lambda_r$, X_r is said to be the latent vector or Eigen vector of a matrix A_F corresponding to λ_r .

2.1.1. Characteristic polynomial of Fuzzy Matrix

The determinant $\left|A_F - \lambda I\right|$ when expanded will give a polynomial, which we call as characteristic polynomial of fuzzy matrix A_F.

2.2. Eigen Values and Eigen Vectors of a Fuzzy Matrix

2.2.1. Fuzzy eigen values or Proper values or Latent roots or Characteristic roots

Let $A_F = \left[a_{ij}\right]$ be a square matrix.

The characteristic equation of A_F is $\left|A_F - \lambda I\right| = 0$.

The roots of the characteristic equation are called Fuzzy Eigen values of A_F.

2.2.2. Eigen vectors or Latent vector

Let $A_F = \left[a_{ij}\right]$ be a fuzzy square matrix. If there exists a non-zero vector $X = \begin{bmatrix} x_1 \\ x_2 \\ . \\ x_n \end{bmatrix}$.

Such that $A_F X = \lambda X$, then the vector *X* is called Eigenvector of A_F corresponding to the fuzzy eigenvalue λ.

Note:

(i) Corresponding to *n* distinct Fuzzy Eigen values, we get *n* independent Eigen vectors.

(ii) If two or more Fuzzy Eigen values are equal, then it may or may not be possible to get linearly independent Eigenvectors corresponding the repeated Fuzzy Eigen values.

(iii) If X_i is a solution for an Eigen value λ_i, then it follows from $\left(A_F - \lambda I\right)X = O$ that $C\ X_i$ is also a solution, where *C* is an arbitrary constant. Thus, the Eigenvector corresponding to a Fuzzy Eigen value is not unique but may be any one of the vectors *CX*.

(iv) Algebraic multiplicity of an Fuzzy eigenvalue λ is the order of the fuzzy Eigen value as a root of the characteristic polynomial (i.e., if λ is a double root then algebraic multiplicity is 2)

(v) Geometric multiplicity of λ is the number of linearly independent eigenvectors corresponding to λ.

2.2.3. Working rule to find Eigenvalues and Eigenvectors

Step 1: Find the characteristic equation $\left|A_F - \lambda I\right| = 0$.

Step 2: Solving the characteristic equation, we get characteristic roots. They are called Fuzzy Eigen values.

Step 3: To find Eigenvectors, solve $\left(A_F - \lambda I\right)X = O$ for the different values of λ.

2.2.4. Non-symmetric matrix

If a fuzzy square matrix A_F is non-symmetric, then $A_F \neq A_F^T$.

Note:

(i) In a non-symmetric fuzzy matrix, the Fuzzy Eigen values are non-repeated then we get linearly independent sets of Eigen vectors.
(ii) In a non-symmetric fuzzy matrix the Fuzzy Eigen values are repeated and then we may or may not be possible to get linearly independent eigenvectors. If we form linearly independent sets of eigenvectors, then diagonalisation is possible through similarly transformation.

2.2.5. Symmetric matrix

If a fuzzy square matrix A_F is symmetric, then $A_F = A_F^T$

Note:

(i) In a symmetric fuzzy matrix the Fuzzy Eigen values are non-repeated, and then we get a linearly independent and pair wise orthogonal sets of eigenvectors.
(ii) In a symmetric fuzzy matrix the Fuzzy Eigen values are repeated, then we may or may not be possible to get linearly independent and pairwise orthogonal sets of eigenvectors. If we form linearly independent and pairwise orthogonal sets of eigenvectors, the diagonalisation is possible through orthogonal transformation.

2.2.6. Properties of Eigenvalues and Eigenvectors of Fuzzy Matrix

Property 1:

(i) The sum of the Fuzzy Eigenvalues of a matrix is the sum of the elements of the principal (main) diagonal of the Fuzzy Matrix. (or) The sum of the Fuzzy Eigenvalues of a matrix is equal to the trace of the Fuzzy matrix.

(ii) Product of the Fuzzy Eigenvalues is equal to the determinant of the Fuzzy matrix.

Proof: Let A_F be a fuzzy square matrix of order n.

The characteristic equation of A_F is $|A_F - \lambda I| = 0$

i.e., $\lambda_n - S_1\lambda^{n-1} + S_2\lambda^{n-1} - \ldots + (-1)^n S_n = 0$ … (2.4)

where S_1 =Sum of the diagonal elements of A_F

……

……

S_n = determinant of A_F.

We know the roots of the characteristic equations are called Fuzzy Eigen values of the given fuzzy matrix.

Solving (1) we get n roots.

Let the n roots be $\lambda_1, \lambda_2, \ldots \lambda_n$.

i.e., $\lambda_1, \lambda_2, \ldots \lambda_n$ are the Fuzzy Eigen values of A_F

we know already,

λ^n -(sum of the roots) λ^{n-1} +(sum of the product of the roots taken two at a time) λ^{n-2} - . . . + $(-1)^n$ (Product of the roots) = 0 … (2.5)

Sum of the roots = S_1 by (2.4) and (2.5)

i.e., $\lambda_1 + \lambda_2 + \ldots + \lambda_n = S_1$

i.e., $\lambda_1 + \lambda_2 + \ldots + \lambda_n = a_{11} + a_{22} + \ldots + a_{nn}$

i.e., Sum of the Fuzzy Eigen values = Sum of the main diagonal elements

Product of the roots = S_n by (2.4) & (2.5)

$\lambda_1, \lambda_2, \ldots \lambda_n$ = det of A_F

i.e., Product of the Fuzzy Eigen values = $|A_F|$

Property: 2

A fuzzy square matrix A_F and its transpose A_F^T have the same Fuzzy Eigen values. (or) A fuzzy square matrix A_F and its transpose A_F^T have the same characteristics values.

Proof: Let A_F be a fuzzy square matrix of order n .

The characteristic equation of A_F and A_F^T are $|A_F - \lambda I| = 0$ … (2.6)

and $|A_F^T - \lambda I| = 0$ … (2.7)

Since the determinant value is unaltered by the interchange of rows and columns.

We know $|A| = |A^T|$

Hence, (1) and (2) are identical.

Therefore, Fuzzy Eigen values of A_F and A_F^T is the same.

Note: A determinant remains unchanged when rows are changed into columns and columns into rows.

Property: 3

The characteristic roots of a triangular fuzzy matrix are just the diagonal elements of the fuzzy matrix. (or) The Fuzzy Eigenvalues of a triangular fuzzy matrix are just the diagonal elements of the fuzzy matrix.

Proof: Let us consider the triangular fuzzy matrix.

$$A_F = \begin{bmatrix} a_{11} & 0 & 0 \\ a_{21} & a_{22} & 0 \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

Characteristic equation of A_F is $|A_F - \lambda I| = 0$

i.e., $$\begin{vmatrix} a_{11}-\lambda & 0 & 0 \\ a_{21} & a_{22}-\lambda & 0 \\ a_{31} & a_{32} & a_{33}-\lambda \end{vmatrix} = 0$$

On expansion it gives $(a_{11}-\lambda)(a_{22}-\lambda)(a_{33}-\lambda) = 0$

i.e., $\lambda = a_{11}, a_{22}, a_{33}$

which are diagonal elements of fuzzy matrix A_F.

Property: 4

Prove that if λ is an Fuzzy Eigen value of a fuzzy matrix A_F, then $\frac{1}{\lambda}, (\lambda \neq 0)$ is the Eigenvalue of A_F^{-1}.

Proof: If X be the Eigen vector corresponding to λ, then $A_F X = \lambda X$ … (2.9)

Pre multiplying both sides by A_F^{-1}, we get

$$A_F^{-1} A X = A_F^{-1} \lambda X$$

$$IX = \lambda A_F^{-1} X$$

$$X = \lambda A_F^{-1} X$$

$$\div \lambda \Rightarrow \frac{1}{\lambda} X = A_F^{-1} X$$

$$A_F^{-1} X = \frac{1}{\lambda} X$$

This being of the same form as (i), shows that $\frac{1}{\lambda}$ is an Fuzzy Eigen values of the inverse matrix A_F^{-1}.

Property: 5

Prove that if λ is a Fuzzy Eigen value of an orthogonal fuzzy matrix, and then $\frac{1}{\lambda}$ is also Fuzzy Eigen value.

Proof:

By the definition of orthogonal fuzzy matrix

A Fuzzy square matrix A_F is said to be orthogonal if $A_F A_F^T = A_F^T A_F = I$

i.e., $A_F^T = A_F^{-1}$

Let A_F^{-1} be an orthogonal fuzzy matrix

Given λ is a Fuzzy Eigen value of A_F

$\Rightarrow \frac{1}{\lambda}$ is and Fuzzy Eigen value of A_F^{-1}.

Since, $A_F^T = A_F^{-1}$

Therefore, $\frac{1}{\lambda}$ is a Fuzzy Eigen value of A_F^T.

But, the matrices A_F and A_F^T have the same Fuzzy Eigen values, since the determinants $\left|A_F - \lambda I\right|$ and $\left|A_F^T - \lambda I\right|$ are the same.

Hence $\frac{1}{\lambda}$ is also a Fuzzy Eigen value of A_F

Property: 6

Prove that if $\lambda_1, \lambda_2, \ldots \lambda_n$ are the fuzzy Eigen values of a fuzzy matrix A_F, then A_F^m has the Fuzzy Eigen values $\lambda_1^m, \lambda_2^m, ..., \lambda_n^m$, ($m$ being a positive integer)

Proof:

Let A_{F_i} be the fuzzy eigen values of A_F and X_i the corresponding Eigen vector.

Then, $A_F X_i = \lambda_i X_i$ … (2.10)

We have $A_F^2 X_i = A_F\ (A_F X_i)$

$= A_F\ (\lambda_i X_i)$
$= \lambda_i\ A_F (X_i)$
$= \lambda_i\ (\lambda_i X_i)$
$= \lambda_i^2 X_i$

|||ly $A_F^3 X_i = \lambda_i^3 X_i$

In general, $A_F^m X_i = \lambda_i^m X_i$ … (2.11)

(2.10) and (2.11) are in same form.

Hence λ_i^m is a fuzzy eigenvalue of A_F^m.

The corresponding Eigenvector is the same X_i.

Note : If λ is the Eigenvalue of the matrix A_F then λ^2 is the Eigenvalue of A_F^2.

Property: 7

The fuzzy eigen values of a fuzzy symmetric matrix are fuzzy numbers.

Proof :

Let λ be an Fuzzy Eigenvalue (may be complex) of the fuzzy symmetric matrix A_F. Let the corresponding Eigenvector be *X*, Let A_F' denote the transpose of A_F.

We have $A_F X = \lambda X$

Pre-multiplying this equation by $1 \times n$ matrix $\bar{X}'$, where the bars denotes that all elements of $\bar{X}'$ are the complex conjugate of those of X', we get

$\bar{X}' A_F X = \lambda \bar{X}' X$ … (2.12)

Taking the conjugate complex of this we get $X' \bar{A}_F \bar{X} = \bar{\lambda} X' \bar{X}$ of

$X' A_F \bar{X} = \bar{\lambda} X' \bar{X}$

since $\bar{A}_F = A_F$ for A_F is real.

Taking the transpose on both sides, we get

$\left(X' A_F \bar{X}\right)' = \left(\bar{\lambda} X' \bar{X}\right)$ (i.e.,) $\bar{X}' A_F' X = \bar{\lambda} \bar{X}' X$

(i.e.,) $\bar{X}' A_F X = \bar{\lambda} \bar{X}' X$ since $A_F' = A_F$ for A_F is symmetric.

But from (1), $\bar{X}' A_F X = \bar{\lambda} \bar{X}' X$ hence $\lambda \bar{X}' X = \bar{\lambda} \bar{X}' X$

Since $\bar{X}' X$ is an 1×1 matrix whose only element is a positive value, $\lambda = \bar{\lambda}$ (i.e.,) λ is real.

Property 8:

The Eigenvectors corresponding to distinct fuzzy eigen values of a fuzzy symmetric matrix are orthogonal.

Proof:

For a fuzzy symmetric matrix A_F, the Eigen values are fuzzy.

Let X_1, X_2 be Eigenvectors corresponding to two distinct fuzzy eigen values λ_1, λ_2 [λ_1, λ_2 are fuzzy numbers]

$$A_F X_1 = \lambda_1 X_1 \quad \ldots (2.13)$$

$$A_F X_2 = \lambda_2 X_2 \quad \ldots (2.14)$$

Pre multiplying (2.13) by X_2', we get

$$X_2' A_F X_1 = X_2' \lambda_1 X_1$$

$$= \lambda_1 X_2' X_1 \quad \ldots (2.15)$$

Pre-multiplying (2.14) by X_1', we get

$$X_1' A_F X_2 = \lambda_2 X_1' X_2$$

But $(X_2' A_F X_1)' = (\lambda_1 X_2' X_1)'$

$$X_1' A_F' X_2 = \lambda_1 X_1' X_2$$

(i.e.,) $X_1' A_F X_2 = \lambda_1 X_1' X_2 \quad \ldots (2.16)$

From (2.15) and (2.16)

$$\lambda_1 X_1' X_2 = \lambda_2 X_1' X_2$$

(i.e.,) $(\lambda_1 - \lambda_2) X_1' X_2 = O$

$$\lambda_1 \neq \lambda_2, X_1' X_2 = O$$

$\therefore X_1 X_2$ are orthogonal.

Property 9:

The similar matrices have same fuzzy eigen values.

Proof:

Let A_F, B_F be two similar fuzzy matrices.

Then, there exists a non-singular fuzzy matrix *P* such that $B_F = P^{-1} A_F P$

$$\begin{aligned} B_F - \lambda I &= P^{-1} A_F P - \lambda I \\ &= P^{-1} A_F P - P^{-1} \lambda I P \\ &= P^{-1} (A_F - \lambda I) P \end{aligned}$$

$$\begin{aligned} |B_F - \lambda I| &= |P^{-1}| \, |A_F - \lambda I| \, |P| \\ &= |A_F - \lambda I| \, |P^{-1} P| \\ &= |A_F - \lambda I| \, |I| \\ &= |A_F - \lambda I| \end{aligned}$$

Therefore, A_F, B_F have the same characteristic polynomial and hence characteristic roots.

They have same fuzzy eigen values.

Property 10:

If a fuzzy symmetric matrix of order 2 has equal fuzzy eigen values, then the matrix is a scalar matrix.

Proof:

Rule 1: *A* fuzzy symmetric matrix of order n can always be diagonalised.

Rule 2: If any diagonalised matrix with their diagonal elements equal then the matrix is a scalar matrix.

Given : A fuzzy symmetric matrix A_F of order 2 has equal fuzzy eigen values.

By Rule 1 : A_F can always be diagonalised, let λ_1 and λ_2 be their fuzzy eigen values then

We get the diagonalized matrix = $\begin{bmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{bmatrix}$

Given $\lambda_1 = \lambda_2$

Therefore, we get = $\begin{bmatrix} \lambda_1 & 0 \\ 0 & \lambda_1 \end{bmatrix}$

By Rule 2 : The given matrix is a scalar matrix.

Property 11:

The Eigenvector *X* of a matrix A_F is not unique.

Proof:

Let λ be the fuzzy eigen value of A_F, then the corresponding Eigenvector *X* such that $A_F X = \lambda X$.

Multiply both sides by non-zero scalar *K*,

$$K(A_F X) = K(\lambda X)$$

$$\Rightarrow A_F (KX) = \lambda (KX)$$

i.e., an Eigenvector is determined by a multiplicative scalar.

i.e., Eigenvector is not unique.

Property 12:

If $\lambda_1, \lambda_2, \ldots \lambda_n$ be distinct fuzzy eigen values of an $n \times n$ matrix then corresponding fuzzy eigen vectors $X_1, X_2, \ldots X_n$ form a linearly independent set.

Proof:

Let $\lambda_1, \lambda_2, \ldots \lambda_m \left(m \le n\right)$ be the distinct fuzzy eigen values of a fuzzy square matrix A_F of order n.

Let $X_1, X_2, \ldots X_m$ be their corresponding Eigenvectors we have to prove $\sum_{i=1}^{m} \alpha_i X_i = 0$ implies each $\alpha_i = 0, i = 1, 2, \ldots, m$

Multiplying $\sum_{i=1}^{m} \alpha_i X_i = 0$ by $\left(A_F - \lambda_1 I\right)$, we get

$$\left(A_F - \lambda_1 I\right) \alpha_1 X_1 = \alpha_1 (A_F X_1 - \lambda_1 X_1) = \alpha_1 (0) = 0$$

When $\sum_{i=1}^{m} \alpha_i X_i = 0$ is multiplied by

$$\left(A_F - \lambda_1 I\right)\left(A_F - \lambda_2 I\right) \ldots \left(A_F - \lambda_{i-1} I\right)\left(A_F - \lambda_{i+1} I\right) \ldots \left(A_F - \lambda_m I\right)$$

We get $\alpha_i \left(\lambda_i - \lambda_1\right)\left(\lambda_i - \lambda_2\right) \ldots \left(\lambda_i - \lambda_{i-1}\right)\left(\lambda_i - \lambda_{i+1}\right) \ldots \left(\lambda_i - \lambda_m\right) = 0$

Since λ 's are distinct, $\alpha_i = 0$

Since, *i* is arbitrary, each $\alpha_i = 0, i = 1, 2, \ldots, m$

$\sum_{i=1}^{m} \alpha_i X_i = 0$ implies each $\alpha_i = 0, i = 1,2,\ldots,m$

Hence $X_1, X_2, \ldots X_m$ are linearly independent.

Property 13:

If two or more fuzzy eigen values are equal it may or may not be possible to get linearly independent Eigenvector corresponding to the equal roots.

Property 14:

Two Eigenvectors X_1 and X_2 are called orthogonal vectors if $X_1^T X_2 = 0$.

Property 15:

If A_F and B_F are $n \times n$ fuzzy matrices and B_F is a non singular fuzzy matrix, then A_F and $B_F^{-1} A_F B_F$ have same fuzzy eigen values.

Proof:

Characteristic polynomial of $B_F^{-1} A_F B_F$

$$= | B_F^{-1} A_F B_F - \lambda I | = | B_F^{-1} A_F B_F - B_F^{-1} (\lambda I) B_F |$$
$$= | B_F^{-1} (A_F - \lambda I) B_F | = | B_F^{-1} | \, | A_F - \lambda I | \, | B_F |$$
$$= | B_F^{-1} | \;\; | B_F | \, | A_F - \lambda I | = | B_F^{-1} B_F | \;\; | A_F - \lambda I |$$
$$= | I | \, | A_F - \lambda I | = | A_F - \lambda I |$$

= Characteristic polynomial of A_F

Hence A_F and $B_F^{-1} A_F B_F$ have same fuzzy eigen values.

3. CONCLUSION

In this paper, derived the properties of Eigen values and Eigen vectors for the fuzzy matrix, fuzzy matrix is vast area and the application of eigen values and eigen vectors of fuzzy matrix are Heat transfer equations, Control theory, vibration analysis, electric circuits, advanced dynamics and quantum mechanics, Moreover the eigen values of fuzzy matrix satisfies the properties of eigen values and eigen vectors is the main objective of this research paper.

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A Study on Factors for Preferring Old Age Home using Bidirectional Associative Memory(BAM)

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Abstract: Bidirectional Associative Memory(BAM) is a hetero-associative, content-addressable memory consisting of two layers. It uses the forward and backward information flow to produce an associative search for stored stimulus-response association. Number of old age homes are increasing due to the deterioration of joint family system. In this paper, the important common factors for preferring old age homes are analyzed.

Keywords- BAM, Synaptic Projections, Neuronal field, Binary Pair, Activation Equation , State Vector, Old age people, Old age home.

1.INTRODUCTION

The BAM was introduces by Bart Kosko. It is heteroassociative, content-addressable memory. A BAM consists of neurons arranged in two layers say A and B. The neurons are bipolar binary. The neurons in one layer are fully interconnected to the neurons in the second layer. There is no interconnection among neurons in the same layer. The weight from layer A to layer B is same as the weights from layer B to layer A. Dynamics involves two layers of interaction. Because the memory process information in time and involves Bidirectional data flow, it differs in principle from a linear association, although both networks are used to store association pairs. It also differs from the recurrent auto associative memory in its update mode[1]. The network structure of the Bi-directional Associative Memory model[2,3] is similar to that of the linear associator model, but the connections are bidirectional in nature, i.e., wij = wji, for i = 1, 2, ..., m and j = 1, 2, ..., n. The units in both layers serve as both input and output units depending on the direction of propagation. Propagating signals from the X layer to the Y layer makes the units in the X layer act as input units while the units in the Y layer act as output units. The same is true for the other direction, i.e., propagating from the Y layer to the X layer makes the units in the Y layer act as input units while the units in the X layer act as output units.

2. BAM MODEL

A group of neurons forms a field. Neural networks contain many fields of neurons. Fx denotes a neuron field which contains n neurons and Fy denotes a neuron field which contains p neurons.

2.1neuronal Dynamical Systems: The neuronal dynamical system is described by a system of first order differential equations that govern the time evaluation of the neuronal activations or membrane potentials.

$$X_i = g_i(X, Y, \ldots), Yi = h_j(X, Y, \ldots)$$

where xi and yj denote respectively the activation time function of the ith neuron in Fx and the jth neuron in Fy. The over dot denotes time differentiation, gi and hj are functions of X, Y etc., where $X(t) = (x_1(t), \ldots\ldots, x_n(t))$, $Y(t) = (y_1(t), \ldots\ldots, y_n(t))$
Define the state of the neuronal dynamical system at time t. Additive bivalent Models describe asynchronous and stochastic behavior. At each moment each neuron can randomly decide whether to change state, or whether to omit a new signal given its current activation. The BAM is a non-adaptive, additive, bivalent neural network.

2.1.1 Bivalent Additive Bam

In neural literature, the discrete version of the earlier equations is often referred to as the Bidirectional Associative Memories or BAMs. A discrete additive BAM with threshold signal functions, arbitrary thresholds and inputs, an arbitrary but a constant synaptic connection matrix M and discrete time steps K are defined by the equations.

$$X_i^{k+1} = \sum_{j=1}^{p} S_j(y_j^k) m_{ij} + I_i \qquad (1)$$

$$Y_j^{k+1} = \sum_{i=1}^{n} S_i(x_i^k) m_{ij} + J_j \qquad (2)$$

Where $m_{ij} \in M$, Si and Sj are the signal functions. They represent binary or bipolar threshold functions. For arbitrary real-valued thresholds U=(U_1,U_2…,U_n) for Fx neurons and V=(V_1,V_2…,V_n) for Fy neurons. The threshold binary signal functions corresponds neurons.

2.1.2 Synaptic Connection Matrices

Let us suppose that the field F_x with n neurons is synaptically connected to the field F_y with p neurons. Let m_{ij} be a synapse where the axon from the i^{th} neuron in F terminates, m_{ij} can be positive, negative or zero. The synaptic matrix M is a n × p matrix of real numbers whose entries are the synaptic efficacies m_{ij}. The matrix M describes the forward projections from the neuronal field F_x to the neuronal field F_y. Similarly, M^T, a p × n synaptic matrix and describes the backward projections F_y to F_x.

2.1.3 Unidirectional Networks

These kinds of networks occur when a neuron synoptically interconnects to itself. The matrix N is n × n square matrix.

Bidirectional Networks.

A network is said to be a bidirectional network if M = N^T and N = M^T

2.1.4 Bidirectional Associative Memories

When the activation dynamics of the neuronal fields F_x and F_y lead to the overall stable behavior, the bi-directional networks are called as Bi-directional Associative Memories or BAM. A unidirectional network also defines a BAM if M is symmetric i.e. M = M.

2.1.5 Additive Activation Models

An additive activation model is defined by a system of n + p coupled first-order differential equations that interconnects the fields F_x and F_y through the constant synaptic matrices M and N described earlier. $S_i(x_i)$ and $S_j(y_j)$ denote respectively the signal function of the i^{th} neuron in the field F_x and the signal function of the j^{th} neuron in the field F_y . Discrete additive activation models correspond to neurons with threshold signal functions. The neurons can assume only two values **ON** and **OFF**. On represents the signal value + 1 and OFF represents 0 or -1 (-1 when the representation is bipolar). The bipolar version of these equations yield the signal value -1 when xi< Ui or yj< Vj.

$$x = -A_i x_i + \sum_{j}^{p} S_j(y_j^k) m_{ji} + I_i$$

$$y = -A_j y_j + \sum_{i}^{n} S_i(x_i^k) m_{ij} + J_j$$

The bivalent signal functions allow us to model complex asynchronous state-change patterns. At any moment different neurons can decided whether to compare their activation to their threshold. A each moment any of the 2^n subsets of F_x neurons or the 2^p subsets of the Fy neurons can decide to change state. Each neuron may randomly decide whether to check the threshold conditions in the equations given above. At each moment each neuron defines a random variable that can assume the value ON (+1) or OFF (0 or -1). The network is often assumed to be deterministic and state changes are synchronous ie an entire field of neurons is updated at a time. In case of simple asynchrony only one neuron makes a state change decision at a time. When the subsets represent the entire fields F_x and F_y synchronous state change results.

In a real life problem the entries of the constant synaptic matrix M depends upon the investigator's feelings. The synaptic matrix is given a weightage according to their feelings. If x F_x and y F_y the forward projections from Fx to Fy is defined by the matrix M.: $\{P(x_I, x_j)\}$ = M , 1<I<n, 1<j<p.

The backward projection is defined by the Matrix M^T. : $\{F(y_j,x_I)\} = (m_{ij}) = M^T$, 1< I < n, I<j<p.

2.1.6 Bidirectional Stability

All BAM state changes lead a fixed-point stability. This property holds for synchronous as well as asynchronous state changes.

A BAM system (Fx, Fy, M) is bidirectionally stable if all inputs converge to fixed pint equilibrium. Bidirectional stability is a dynamic equilibrium. The same signal information flows back and forth in a bidirectional fixed point.

Let us suppose that A denotes a binary n-vector and B denotes a binary p-vector. Let A be initial input to the BAM system. Then the BAM equilibrates a bi directional fixed point (A_i,B_j) as

$$A \rightarrow M \rightarrow B$$
$$A' \leftarrow M^T \leftarrow B$$
$$A' \rightarrow M \rightarrow B'$$
$$A'' \leftarrow M^T \leftarrow B'$$
$$\cdots$$
$$A_f \rightarrow M \rightarrow B_f$$
$$A_f \leftarrow M^T \leftarrow B_f$$
$$\vdots$$

Where A', A''... and B', B''... represents intermediate or transient signal state vectors between A and A_f , B and B_f. respectively. The fixed point of a bidirectional system is time dependent. The fixed point for the initial input vectors can be attained at different times. Based on the synaptic matrix M which is developed by the investigators feelings, the time at which bi directional stability is attained also varies accordingly.

3.DESCRIPTION OF THE PROBLEM

The closing period in the life span is old age. The dividing line between middle and old age is usually considered as age sixty. Old people have to adjust with their declining strength and gradually failing health. This often means the roles they played in the home and outside have changed dramatically. The urban family is undergoing in its traditional status and roles due largely to the impact of migration, changes in occupation, high level of education, urbanization and breaking up of joint family. Families have led to increase in the problem of old age like personal, social, economic, family and psychological problems. To explore these factors the present study was undertaken.

The most important common factors for preferring old age home are

A_1 - Daughter in law

A_2 - No male Child

A_3 - Finance Problem

A_4 - No children

A_5- Attitude Problem

A_6 - Health Problem

To analyze the factors the following family status where analyzed

B_1.Poor family,

B_2. Low middle family,

B_3. Middle family,

B_4. High middle family

B_5. Rich family

We take the neuronal field F_x as the attributes connected with the factors of the old age people and F_y as the attributes of their family status. The 6 × 5 matrix V represents the forward synaptic projections from the neuronal field F_x to the neuronal field F_y. The 5× 6 matrix M^T represents the backward synaptic projections from the neuronal field F_x to the neuronal field F_y.

$$V = \begin{pmatrix} & B_1 & B_2 & B_3 & B_4 & B_5 \\ A_1 & 5 & 6 & 0 & 6 & 2 \\ A_2 & 8 & 8 & 6 & -5 & 4 \\ A_3 & 6 & 9 & 10 & 9 & 5 \\ A_4 & 10 & 6 & 8 & 5 & -4 \\ A_5 & -5 & -4 & 6 & 7 & 8 \\ A_6 & -3 & 0 & 5 & 8 & 9 \end{pmatrix}$$

$$V^T = \begin{pmatrix} & A_1 & A_2 & A_3 & A_4 & A_5 & A_6 \\ B_1 & 5 & 8 & 6 & 10 & -5 & -3 \\ B_2 & 6 & 8 & 9 & 6 & -4 & 0 \\ B_3 & 0 & 6 & 10 & 8 & 6 & 5 \\ B_4 & 6 & -5 & 9 & 5 & 7 & 8 \\ B_5 & 2 & 4 & 5 & -4 & 8 & 9 \end{pmatrix}$$

Let X_k be the input vector given as (3 -4 0 2 6 5) at the K^{th} time period. We suppose that all neuronal state change decisions are synchronous.

The binary signal vector

$S(X_k)$ = (1 0 0 1 1 1)

$S(X_k)V$ = (7 8 19 26 15)

= Y_{k+1}.

From the activation equation

$S(Y_{k+1})$ = (1 1 1 1 1)

Now

$S(Y_{k+1})V^T$ = (19 24 39 25 12 19)

= X_{k+2} .

From the activation equation

S (Xk+2) = (1 1 1 1 1 1)

S (Xk+2)V = (21 25 35 30 24)

= Yk+3.

From the activation equation

$S(Y_{k+3})$ = (1 1 1 1 1)

$S(Y_{k+3})V^T$ = (19 24 39 25 12 19)

= X_{k+4}

From the activation equation

$S(X_{k+4})$ = (1 1 1 1 1 1)

Thus the binary pair {(1 1 1 1 1 1) , (1 1 1 1 1)} represents a fixed point of the dynamical system. Equilibrium of the system has occurred at the time K+2, when the starting time was K. When these factors are in on state, the factors no male children, Finance problems become ON. From this we can conclude that Daughter in law, No children, Attitude Problem, Health Problem are the major factors for proffering old age home.

Suppose we take Daughter in Law in the ON state. Say at the K_{th} time we have

X_k = (5 0 0 0 0 0)
$S(X_k)$ = (1 0 0 0 0 0)
$S(X_k)V$ = (5 6 0 6 2)
= Y_{k+1}.
$S(Y_{k+1})$ = (1 1 0 1 1)
$S(Y_{k+1})V^T$ = (19, 15, 29, 17, 8, 14)
= X_{k+2}.
$S(X_{k+2})$ = (1 1 1 1 1 1)
$S(X_{k+2})V$ = (21 29 35 30 24)
= Y_{k+3}.
$S(Y_{k+3})$ = (1 1 1 1 1)
$S(Y_{k+3})V^T$ = (19 24 39 25 12 19)
= X_{k+4}
$S(X_{k+4})$ = (1 1 1 1 1 1)
$S(X_{k+4})V$ = (21 29 35 30 24)
= Y_{k+5}.

Thus the binary pair { (1 1 1 1 1 1) , (1 1 1 1)} represents a fixed point of the dynamical system. Thus in this system given by the expert even if only Daughter-in-Law is in ON state, all the other states become ON.
Daughter-in-Law the one of the factor for preferring old age home.The following table gives the fixed points when other attributes are kept in ON state consecutively.

Sl.No	Input vector	Fixed Point
1	(1 0 0 0 0 0)	(1 1 1 1 1 1),(1 1 1 1 1)
2	(0 1 0 0 0 0)	(1 1 1 1 1 1),(1 1 1 1 1)
3	(0 0 1 0 0 0)	(1 1 1 1 1 1),(1 1 1 1 1)
4	(0 0 0 1 0 0)	(1 1 1 1 1 1),(1 1 1 1 1)
5	(0 0 0 0 1 0)	(1 1 1 1 1 1),(1 1 1 1 1)
6	(0 0 0 0 0 1)	(1 1 1 1 1 1),(1 1 1 1 1)

4.CONCLUSION

T o analyze our problem by BAM, each factor is kept in ON state. When the factor A_1 is in ON state, the other factors A_2, A_3, A_4, A_5, A_6 becomes ON and also the family status B_1, B_2, B_3, B_4, B_5 becomes ON. This shows that A_1 is one of the important factors. Similarly for all the other factors A_2, A_3, A_4, A_5, A_6, every other factors for each case becomes ON and also the family status B_1, B_2, B_3, B_4, B_5.

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Smart Grid Communication

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Abstract -This paper give an introduction to the smart grid communication. It describes a communication-oriented smart grid framework. It provides comprehensive understanding of the communications issues in the smart grid. Hence the framework given can be used properly to design a smart grid communication system. Italso introduces a three-entity, high-level, communication-oriented framework for the smart grid along with a closer look at each entity.

Keywords – Wide-area monitoring and control network (WAMCN), Local area network (LAN), smart meter (SM), local energy management (LEM), consumers network gateway(CNG), Smart grid, Control centers (CC

i. INTRODUCTION

The traditional electricity grid has four major components: power generation, power transmission, power distribution, and grid operation. Power generation usually consists of numerous types of generation plants, such as fossil-fuel power plants and nuclear power plants. The generated electricity is fed into the transmission network. It consists of High voltage and extra high voltage transmission lines and transmission substations. It delivers power over long distances. This electricity is handed over to the distribution subsystem and then dispatched to the customers. Power operation monitors and controls the flow of electricity and all grid components and is essential to the proper functioning and efficiency of the grid.

After serving for more than a century, existing electricity grids have found to be incapable of satisfying the desire for greater system reliability and increased usage of renewable energy sources so as to reduce emissions of the greenhouse gases that cause global warming. The amount of electricity generation and consumption should be exactly matched at any given instant in time. Otherwise, either the excess amount of electricity generated is wasted or power outages will occur due to insufficient energy supply. In the existing electricity grid, numerous schemes have been developed to balance generation and consumption. Because of the stochastic nature of renewable energy generation, however, none of the existing schemes will be adequate when there is a high percentage of renewable energy generation in the grid. Most existing electricity grids cannot tolerate more than 10% of renewable energy. Also there is a desire to involve customers in grid operations. Hence there is an urgent need to upgrade the existing grid. The future electricity grid is the "smart grid." This future smart grid will be capable of:

- Accommodating a high percentage of renewable energy generation.
- Providing high-quality and highly reliable electricity services to customers.
- Actively involving consumers in grid operations.

For successfully up gradation of to a smart grid, advanced communication technologies are essential. The benefits of these technologies are more accurate and timely dissemination of state information about the grid. Hence the grid operation programs can be carried out with precise and efficient real-time scheduling. It is necessary to reduce the problems brought due to volatility of renewable generation and fluctuations in customer demand.

This paper gives an introduction of the smart grid and describes a communication-oriented smart grid framework. It also introduces a three-entity, high-level, communication-oriented framework for the smart grid

ii. SMART GRID FRAMEWORK

The smart grid communication framework consists of three networks: the operation network, the business network, and the consumer network as shown in fig. 1. Each of these three networks represents a different set of communication networks serving for different functions. The operation network is used by power companies for maintaining the grid functionality. The business network is used by participants in the electricity market to efficiently regulate the market and to provide electricity services to consumers. The consumer network is used by each consumer for management of home energy and to enhance the electricity usage.

The operation network is the backbone of the smart grid communication system. The design of operational network requires a deep understanding of the existing power system. It involves collaboration with power system and communication engineers. The business network is the connection between the operation network and the consumer network. Its design requires knowledge of economics and government policies. It maximizes the efficiency of the electricity market. The consumer network is used for serving the end users. It also exploits the advantages retrieved by the other two entities.

The important merits of this network are that it captures the major differences between the communication systems used in traditional electricity grids and in smart grids.

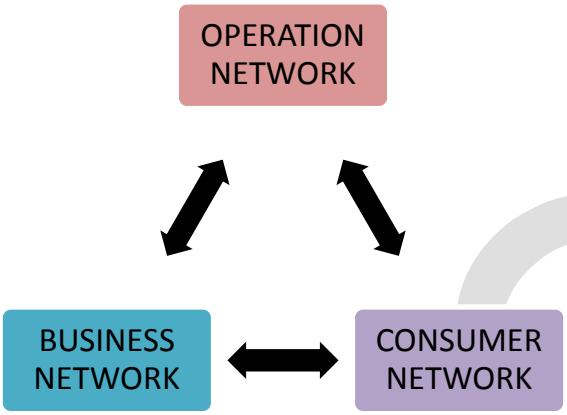

figure 1. A smart grid communication framework

iii. COMMUNICATIONS WITHIN AND BETWEEN ENTITIES

a. Communications in the Operation Network

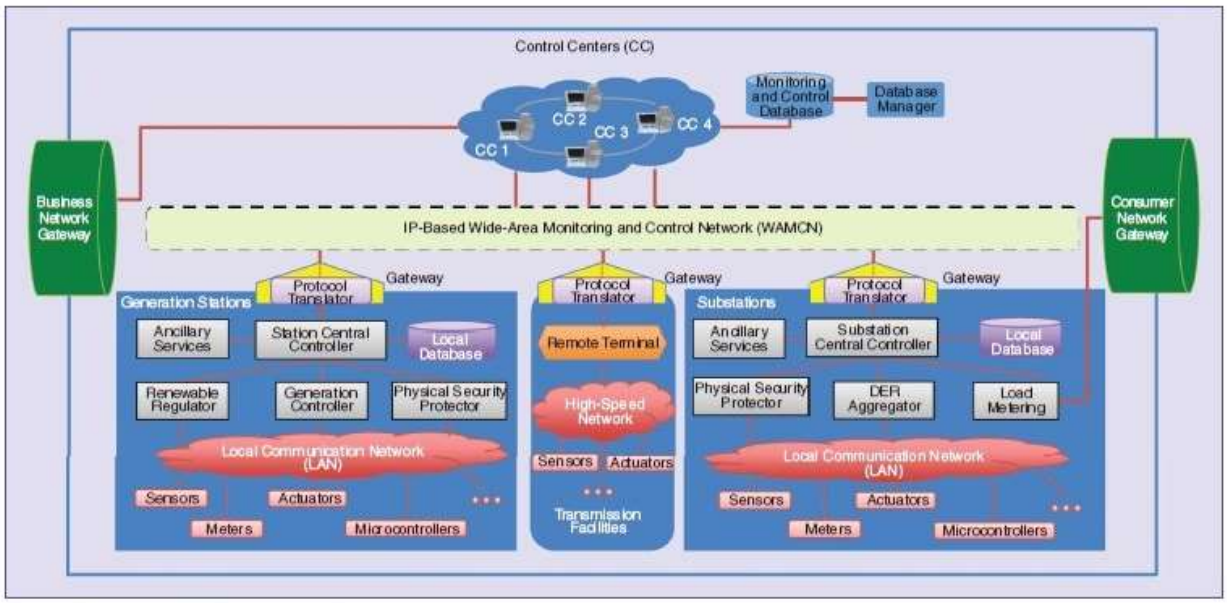

figure 2. The Operation network

The operation network consists of seven major components: the business network gateway (BNG), consumer network gateway (CNG), control centers (CC s), generation station (GS), substation (SS), transmission facilities (TFs), and wide-area monitoring and control network (WAMCN).

The BNG and CNG are the communication bridges. It connects the operation network with the other two entities. As the three entities are used by different parties and serves different purposes in the smart grid, when interentity communications are needed, the BNG and CNG serve as firewalls. It protects the operation network from external, malicious attacks.

CC s is the central control units of smart grid. The monitoring and control database (MCD B) is storing all grid operation information. This is accessed by CC s and maintained by database managers. In the traditional electricity grid, CC s follow a strict hierarchical design, with each grid area controlled by a single CC that in turn is controlled by upper-level CC s. A distributed CC design has strong advantages over the centralized one in increasing service availability. The distributed CC design is therefore taken as the future of control in the smart grid.

The GS component usually consists of a collection of large power generation stations, each of which may contain many sensors and actuators connected by a local-area network (LAN) and controlled by a local control unit. The local control unit in each GS communicates with CCs via the WAMCN, through a gateway. This second gateway, which complements the CNG and BNG, is used to prevent insider attacks initiated by someone who has managed to get into the WAMCN

The SS component is the collection of transmission and electricity distribution substations. It typically has a communication structure similar to that found in the GS component. Since distribution substations are close to consumers and are sometimes configured so as to have access to consumer datavia the CNG , the privacy of those data must be carefully protected. Other than that, the communication requirementsinside the SS and GS components are mostly the same.

The TF component consists of the assets involved in long-distance electricity transmission. These assets include transmission towers and underground cables. The TF component consists of some remote control terminals and a huge number of sensors and actuators located across a wide area. These terminals, sensors, and actuators are connected via a wide-area, high-speed network. Usually, data gathered by the TF component are concentrated by remote control terminals to avoid network congestion before being sent into the WAMCN and delivered as needed.

The WAMCN is the backbone of the operation network and is used to transfer huge volumes of data among the GS, TF, SS, and CC components. In designing the WAMCN, the following requirements must be met:

- High availability: Since the unavailability of the WAMCN means the loss of most communication services, it is crucial that backup schemes for this network be properly provisioned.
- High security: Although gateways such as the CNG and BNG are installed in the operation network, the routers and switches inside the WAMCN still need to be able to resist insider attacks.
- Quality of service: Since different types of data are needed by different parties and different applications, the WAMCN needs to be able to prioritize data transmissions according to needs.
- Compatibility: During the process of upgrading the existing grid to the smart grid, it is possible that multiple legacy protocols that are incompatible with each other will be used simultaneously in the operation network. Protocol translators in the GS, TF, and SS components can help alleviate such problems. The WAMCN must employ globally accepted protocol such as the Internet Protocol (IP) to truly accommodate such compatibility requirements.

b. Communications in the Consumer Network

The consumer network is made up of six major components: the BNG and operation network gateway (ONG), the smart meter (SM) component, the home electronics (HE) component, local energy management (LEM),a smart controller (SC), and a LAN.

The BNG and ONG here serve as the primary protectors of the information inside the consumer network against intrusions by outsiders. Since data protection requirements at the consumer end are usually less stringent than those in the operation and business networks, designing these two gateways is a simpler task. The only major concern is the protection of consumer privacy. The BNG and ONG in the consumer network should be designed in such a way that consumers are aware of the types of information being requested by other parties and are capable of deciding whether or not the requested information should be released.

The SM is the electricity meter, with a built-in communications module and processor. It receives real-time electricity price data from the business network and sends consumer consumption profile data to the operation network. The price information received by SM is used by other components in the consumer network to perform various functions, and the environmental data collected by the sensors on those appliances, the power level of these appliances may be automatically adjusted to reduce overall electricity costs. An extra gateway is proposed to control access to the HE component, for security reasons. This gateway provides security functions, such as an authenticity check, to protect the appliances from being controlled by unauthorized parties.

LEM is present on the consumer network to accommodate distributed energy generation, such as small-scale wind generation or solar panels, and larger energy storage devices such as electric vehicles at a consumer's premises. With these distributed generation and storage assets, a consumer can actively participate in the electricity market by selling stored electricity when the price is high and purchasing extra electricity when the price is low. LEM is under the control of the SC, and the decision is made largely based on the current electricity price shown by the SM, which is in turn based on the current electricity demand-supply relationship in the market and the operational status of the grid. The SC is the central controller on the consumer network and is therefore considered its most important component. Since the functionality of the SC relies heavily on the LAN, the LAN is seen as essential to the consumer network. Two of its most important general communication requirements can be summarized as follows:

- Authenticity: Since consumers' premises usually are close to each other, undesirable consequences may be caused if a command issued by the SC in one consumer's home is accepted by the appliances inside another consumer's home. As a result, it is necessary that the LAN in the consumer network be able to encrypt messages in such a way that only authenticated devices can decrypt the contents and only authenticated commands are executed. This functionality may be aided by the HE gateway.
- Integrity: LAN in this context does not require high reliability or low latency but it must be ensured that the integrity of messages is strictly guaranteed. For instance, it must be ensured that the HE component will only execute commands issued by the SC if they are guaranteed to have been correctly received.

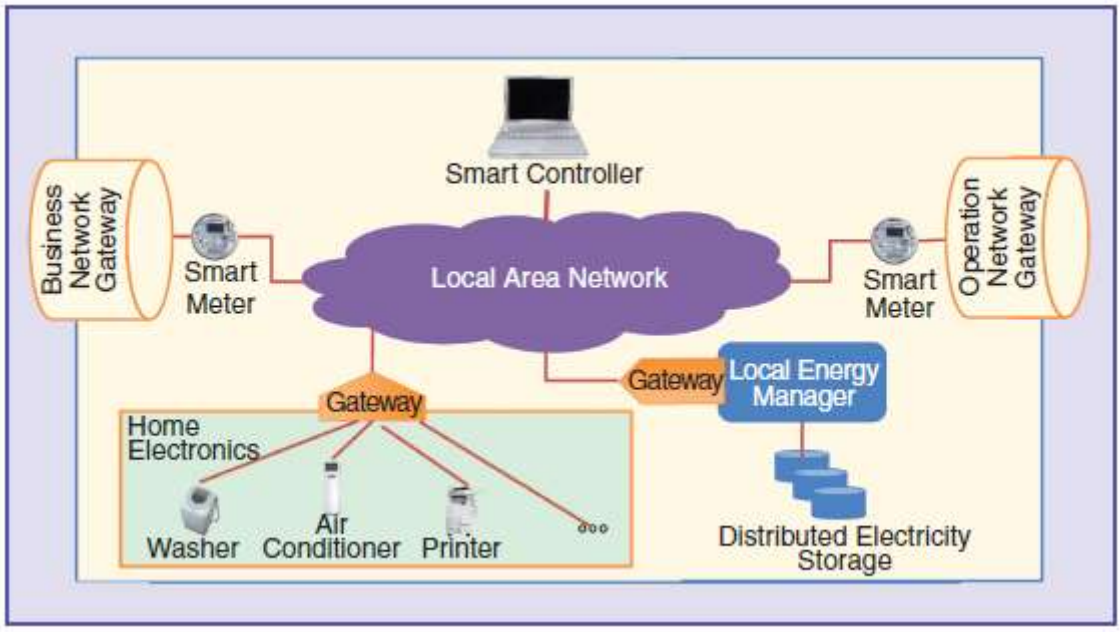

Figure3. The Consumer network

c. Communications in the Business Network

The business network does not possess dedicated communication architecture. It includes numerous new participants and players in the electricity market that communicate with each other using an IP based virtual private network (VPN). As shown in Figure 4, the electricity market regulator, smart meter service provider, demand responder, and electricity market participants are the major players

in the business network. There are also parties that communicate with the consumer and operation networks to obtain smart meter data and smart grid operation data via the CNG and ONG, respectively.

Communications within the business network are mostly for commercial use, and hence economy and security are of the utmost concern. This will not be a big issue once an IP based network is used, however. Since IP has been under development for decades, players in the business network will not have much difficulty finding their desired applications and services from the market.

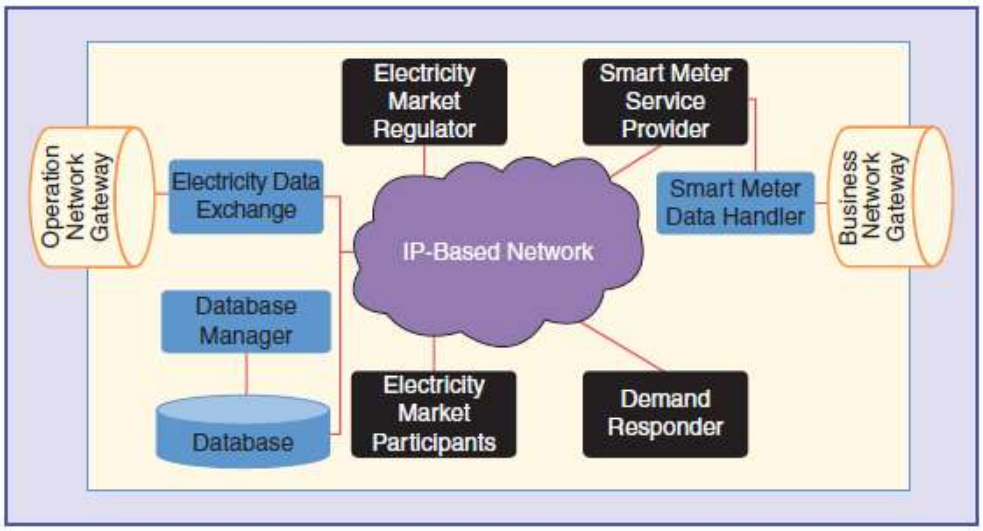

figure 4. The Business Network

iv. INTERENTITY COMMUNICATIONS

Interentity communications are very important for the proper functioning of the entire communication system in the smart grid. Communications between the operation and business networks require high reliability and security. Those between the operation and consumer networks require high security but relatively lower reliability. However for communications between the business and consumer networks only moderate levels of reliability, data availability, and security are required.

v. CONCLUSION

In designing the communication systems within the operation network, compatibility with existing technologies is of the utmost concern. Designing the consumer and business networks requires innovation to enhance the user experience but carries limited compatibility restrictions. In the traditional electricity grid, the most important communication system is supervisory control and data acquisition (SCADA), used by system operators to monitor the operational status of the entire system and to issue commands to particular components remotely. SCADA may be too slow to respond properly to urgent events. Instead of this a high speed system offering similar functionalities called a wide-area measurement system (WAMS) can be used in the smart grid. But as SCADA has been in existence for decades, it is neither economic nor feasible to simply throw it out and use new technologies. As a result, the coexistence of SCADA and new advanced systems such as WAMS is seen as the true future in smart grid communications.

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Variants of CORDIC for Trigonometric Function Calculation and its Applications

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Abstract **-** Trigonometric functions have wide variety of applications in real life. Especially sine and copsine functions have been very useful in applications for medical science, signal processing, geology, electronic communication, thermal analysis, satellite communication and many more. There are certain applications where the power consumption of the hardware need to be reduced at the expense of accuracy. This paper presents a design that calculate sine and cosine values of a given angle using COordinate Rotation DIgital Computer (CORDIC) algorithm. This paper compares the variants of CORDIC which can be used for the calculation of the trigonometric functions of an angle such as bi-rotation CORDIC and four micro rotation CORDIC. It is found that these two methods increases the speed of computation at the expense accuracy.

Keywords-JPEG, CORDIC, SINE, COSINE,DCT,image compression,rotations

INTRODUCTION

Calculation of sine and cosine of given angle is an essential requirement in many areas of real life. In medical science, medical equipment that measures regular cyclical body functions like heartbeat, breathing etc. use sine and cosine waves. In signal processing, digital audio and high definition videos are based on sums of sine and cosine. Two popular methods of computing the sine and cosine of an angle involves the Taylor series method and look up table method, each have its own disadvantages like Taylor series involves the use of large number of multipliers and lookup table method increases the silicon area both increases the power consumption[12]. This paper presents hardware design for calculating sine and cosine value of given angle using CORDIC algorithm with limited hardware usage. As proposed by Volder[1] CORDIC is an iterative algorithm which is used to calculate trigonometric, exponential and hyperbolic function. Due to limited hardware architecture CORDIC requires low power as compared to their counterparts because for all calculation, CORDIC

architecture uses adder and shifter circuits. Since the modification in reference CORDIC provides only a

limited accuracy, it is suitable for application where a quantization is required[9]. The best example for this is JPEG image compression.

The paper has been organized as follows: section 2 introduces CORDIC algorithm, section 3 summarizes some of the previous work done in the same field. Section 4 explains variants of CORDIC and methodology Section 5 summarizes results of experiments and finally section 6 concludes the paper.

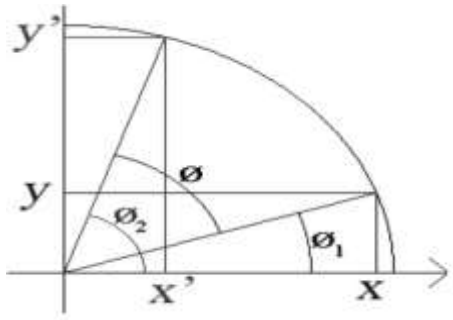
CORDIC algorithm

The CORDIC algorithm was proposed by Jack E volder [1] in 1959 for use in air borne system. As the time passed it have find its use in a wide variety of applications the basic CORDIC equations[1]

$Y' = K(Y \cos\lambda + X \sin\lambda)$

$X' = K(X \cos\lambda - X \sin\lambda)$

The only drawback of the CORDIC algorithm is the latency[1]



The initial value of x and y is (1,0) and through successive rotation the value we get sine and cosine of the angle which we give as input.

The analysis of equation in [9]

$(U_x)_{i+1} = (U_x)_i - \sigma.(U_y)_i .2^{-i}$ (1)

$(U_y)_{i+1} = (U_y)_i - \sigma.(U_x)_i .2^{-i}$ (2)

$\Phi_{i+1} = \Phi_i - \sigma\tan^{-1}(2^{-1})$ (3)

where $(U_x)_{i+1=}$Cos of the angle after n iterations,

$(U_y)_{i+1=}$Sin of the angle after n iterations.

i=1,2,3……n;

REVIEWS

Jack E Volder[1] proposed the CORDIC algorithm, which has a latency problem. A.S.N Mokhtar (2013)[11] discussed how to increase the speed of the conventional CORDIC algorithm by combining third order approximation, In 2001, Kharrat et.al.[4]. proposed an optimized CORDIC implementation which offers reduction in silicon area and provides good precision of results but this approach was found suitable for up to 20 bits application. Pramod Kumar Meher, Sang Yoon Park (2013)[9] has suggested various variation in the reference CORDIC like four micro rotation, bi-rotation CORDIC (where the accuracy of the computation decreases but is sufficient for many application like image compression, audio compression etc). Pravin B. Pokle and N. G. Bawane (2012)[6] details about the JPEG (Joint Photographic Experts Group) process which is an lossy image compression technique which uses the DCT(Discrete Cosine Transform).

Varients of CORDIC and Methodology

Pramod Kumar Meher, Sang Yoon Park has suggested various variation in the reference CORDIC like four micro rotation, bi-rotation CORDIC.the sine and cosine angle using reference CORDIC typically involves 8 iterations to get a satisfactory result. This 8 iteration is the main reason for the latency in the CORDIC algorithm but it provides the best accuracy.

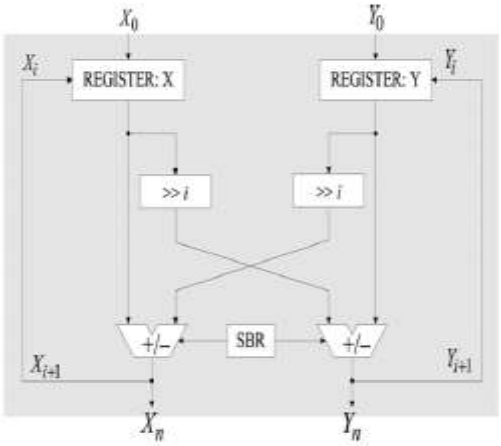


Fig1-Refernce CORDIC circuit

This paper also provides the tables for computation of the angles using 4-Micro rotations and bi- rotation this two algorithm increases the speed, but the accuracy is affected.

The equation for 4 micro-rotation is

$$U_x)_{i+1} = (U_x)_i - (U_y)_i .2^{-k(i)} \quad (4)$$

$$(U_y)_{i+1} = (U_y)_i - .(U_x)_i .2^{-k(i)} \quad (5)$$

The equation (3) can be eliminated as the table gives a s value which can be used instead of σ. In 4-micro only angles from 0-45 can be calculated the rest of the angle can be calculated using simple angle mapping described in [15].

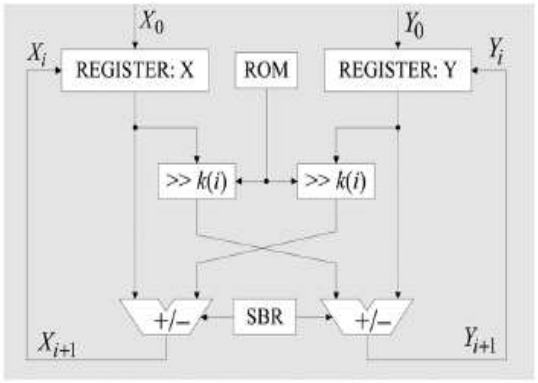


Fig 2-4-micro rotation

The diagram of bi-rotation CORDIC is shown below:

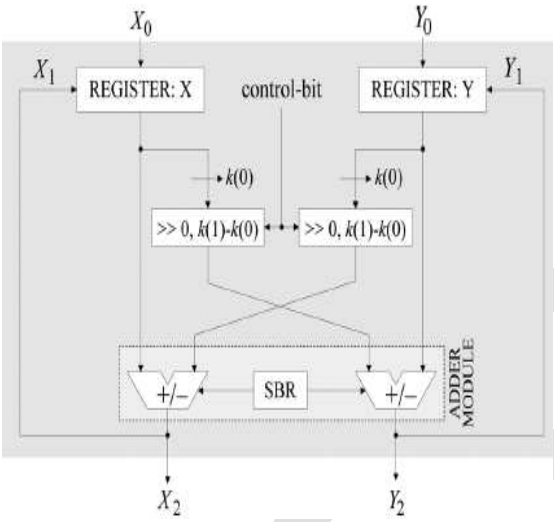


Fig 3. bi rotation CORDIC

In bi-rotation, out of the four values in the tables only two values is needed k(1), k(0). The input value for x_0 and y_0 (0.60725 and 0)[12] is given which is successively shifted by k(0), 0 and K(1)-k(0).and after 4 iterations we get the result in case of 4-micro rotation and after 2 iteration in case of bi-rotation and this can be effectively used for the computation of DCT in JPEG image compression.

RESULT OF SIMULATION

The following snapshots shows the result of simulation using the variants of CORIC multiplied by a multiplying factor (4096) as the FPGA's below SPARTAN 6 cannot process floating numbers directly. So the result shows the sine and cosine values of angle 37º

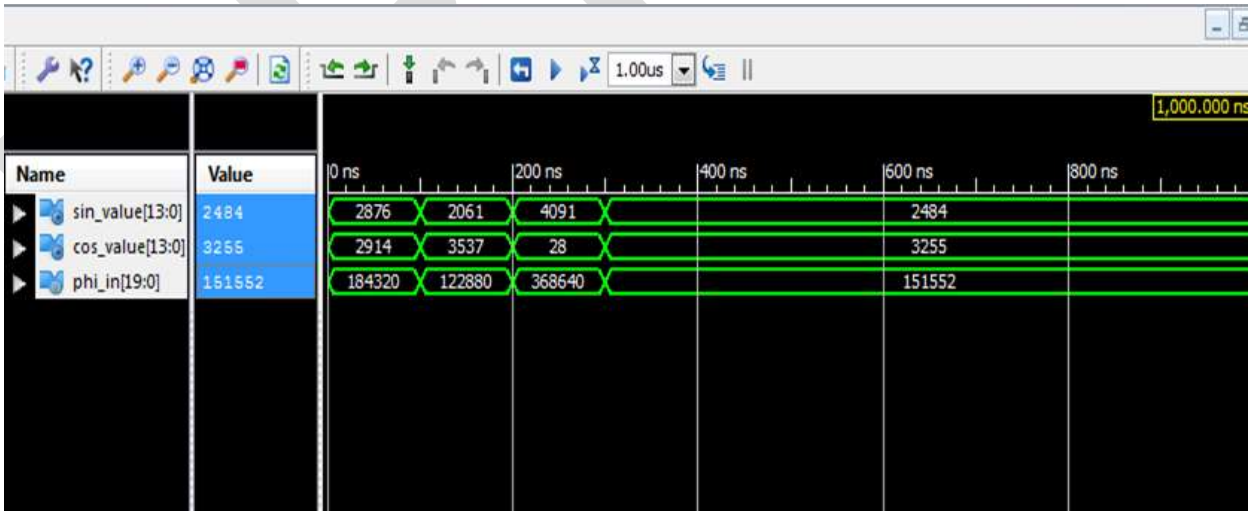


Fig 4. Simulation of reference CORDIC

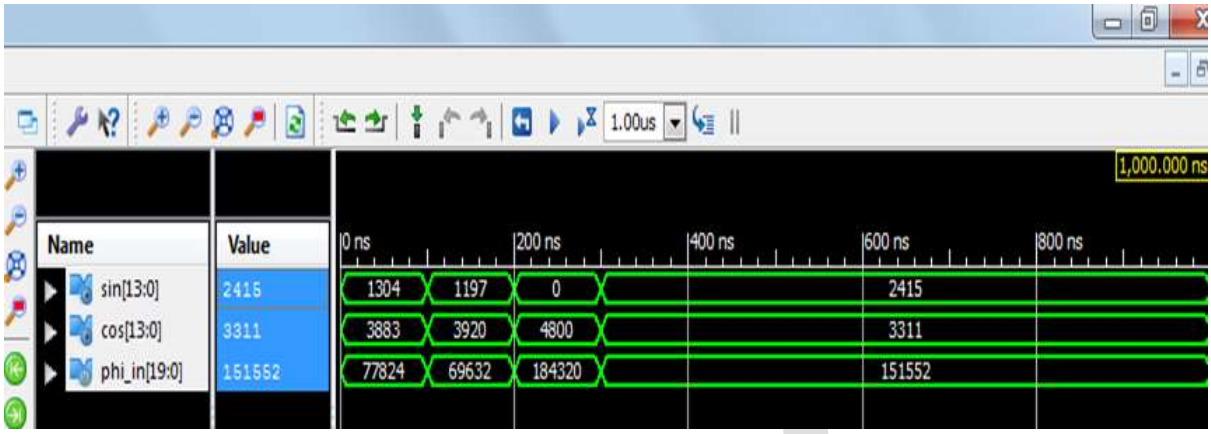


Fig 5. Simulation of 4-micro rotation CORDIC

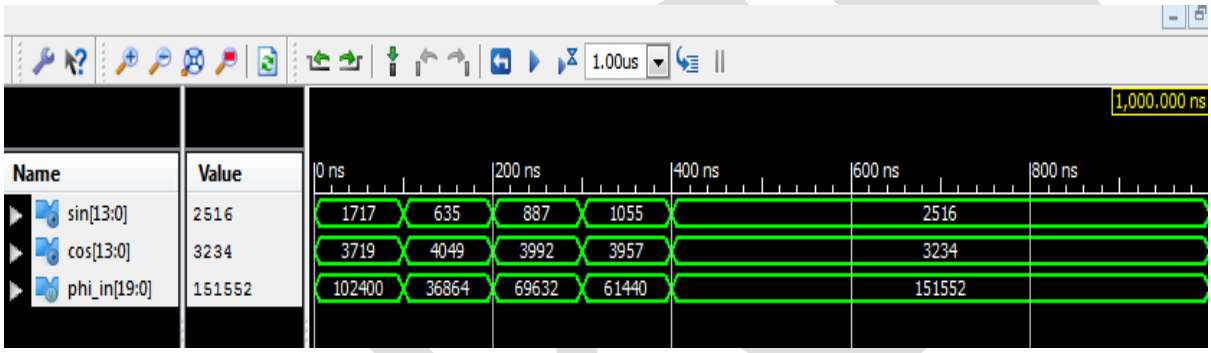


Fig 6. Bi-rotation CORDIC

Factors	**Variant of CORDIC**		
	Reference CORDIC	***4-micro rotation***	***Bi-rotation***
Number of slices used	1615	1054	175
Number of slices flip flops used	--	19	8
Number of 4 input LUT used	3170	1938	317
Number of bounded IOB used	48	48	48
Maximum combinational delay path (ns)	117.304	77.992	26.179

Table 1. Comparison of various CORDIC algorithms

The simulation result shows that the reference CORDIC gives the maximum accuracy at the expense of higher delay and utilizing 4 times the hardware as bi-rotation

CONCLUSION

From the simulation results, it can be concluded that the reference CORDIC provides the best accuracy for an angle but needs higher hardware and delay is also more,while the variants of the CORDIC reduces the hardware and delay but the accuracy will be reduced so these type can be effectively employed in application were a quantization is required like image compression or audio compression

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Experimental Investigation of PCM on Inconel 600 Using Response Surface Methodology

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Abstract— Photochemical machining (PCM) is one of the non-conventional machining processes that produce burr free & stress free flat complex metal components. In the present work optimization of process parameters for Photochemical machining of Inconel 600 by using response surface methodology. Mathematical models have been developed to study the effect of input parameters on Undercut from the results of the experiments. The predictive models' analyses were supported with the aid of the statistical software package-Design Expert (DE 9). The different input parameters such as etching time, etchant concentration and etchant temperature were set during the photochemical machining. Design of Experiment was done by Face centered composite design method by having 20 experiments to see the effect on etching of Inconel 600. Minimum Undercut was observed at the etching temperature 55.276^0C, etchant concentration 470.781 gm/lit and 55.276 min etching time. The optimum material undercut was found 0.0029 mm.

Keywords — Photochemical machining (PCM), Undercut, Response surface methodology (RSM), Face centered composite design, Inconel 600.

I. INTRODUCTION

Photochemical machining (PCM) is one of the least well known non-conventional machining processes. Photochemical machining basically removes material by chemical action. Application of the process frequently produces a flat metal blank which in turn can be formed into a three dimensional shape if need be. The features are produced by exposing the work piece of interest through a photographic mask and chemically etching away areas that disappear the features of interest. The method is relatively modern and became recognized as a manufacturing process about fifty years ago [1]. The manufacturing process creates features by dissolving away metal rather than cutting or burning it away. So the stresses and defects that normally arise from metal cutting or EDM are absent in the final part. That means there are no burrs, no residual stresses, no changes in magnetic properties, and no deformations. There are no changes in hardness, grain structure, or ductility during the process. Moreover, because photo tools don't "wear," tolerances stay the same regardless of how many parts are produced. In addition, it is possible to precisely control the "Z" (depth) dimension. The application of photochemical machining has increased widely in the precision engineering, electronics, medical and decorative industries as well as in the micro component manufacturing industry. The increasing application of photochemical machining as an option to stamping for the manufacturing of small, burr free, stress free parts and the inevitable trend towards ever smaller and more complex designs has brought the problem of undercut. Fig. 1, show Undercut is the difference between the final width of the etched feature across the top (B) and the width of the developed resist line (A). The factors affecting undercut are grouped into three broad areas, etchant concentration, etching time and etchant temperature. To improve the product quality proper selection of PCM process parameter is very important. In this paper we used Response surface methodology (RSM) to optimize the process parameters of PCM on Inconel 600 with consideration of output parameter such as Undercut is reported. RSM is frequently employed to obtain the optimum parameter setting following analysis of variance (ANOVA) for identifying significant factors.

In the literature, David et al. [2] has studied Characterization of aqueous ferric chloride etchants used in industrial photochemical machining process. $Fecl_3$ most commonly used as etchants. But there is wide variety in grades of $Fecl_3$. Defining standards for industrial purpose etchants and methods to analyze and monitor them. Rajkumar et al. [3] have explained the Cost of photochemical machining in which they gave the cost model for PCM. Saraf et. Al. [4] has studied optimization of photochemical machining of OFHC copper by using ANOVA. Saraf and Sadaiah et. Al. [5] have investigated optimization of photochemical machining of SS304. Cakir O, et. Al. [6] found that ferric chloride (FeCl3) was a suitable etchant for aluminum etching. From literature, it is found that no statistical study has been reported to investigate the interaction effects of input parameters on etching process of Inconel 600. To improve the product quality proper selection of PCM process parameter is very important. Inconel 600 (nickel-chromium alloy) is a typical engineering material for applications which have need of resistance to corrosion and heat. Inconel 600 has excellent mechanical properties and having desirable combination of high strength and good workability. The chemical composition of Inconel 600 is shown in Table I. The high nickel content in Inconel 600 alloy gives the resistance to corrosion by many organic and inorganic compounds. Chromium confers resistance to sulfur compounds & oxidizing conditions at high temperatures or in corrosive solutions. The adaptability of Inconel 600 has led to its utilize in a variety of applications involving temperatures from cryogenic to above 1000°C. The alloy is used extensively in the chemical industry for its strength and corrosion resistance. The alloy's strength and

oxidation resistance at high temperatures make it useful for many applications in the heat-treating industry. In the aeronautical field, Inconel 600 is used for a variety of engine and airframe components which must withstand high temperatures.

TABLE I. CHEMICAL COMPOSITION OF INCONEL 600

Ni	Cr	Mn	C	Cu	Si	S	Fe
72	14-17	1	0.15	0.50	0.50	0.015	6-10

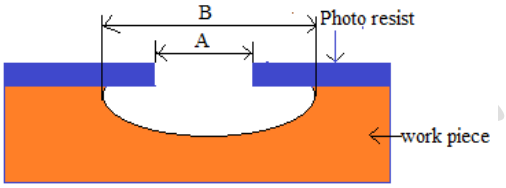

Fig. 1. Undercut

II. EXPERIMENTAL DESIGN WITH MULTIVARIATE

Response surface methods (RSM) are powerful process optimization tools in the arsenal of statistical design and analysis of experiment. Response surface methodology (RSM) is a sequential form of experimentation used to find out or optimize output response variables made up of mathematical-statistical model of many number of input variables [7]. RSM was used in this study to check the effect of different input variables on Undercut during the PCM process of Inconel 600 material, where Face centered composite design (FCCD) requires 20 number of runs to cover all possible combination of the three input variable with three level of each input variable which consist of 8 factorial points with its origin at the center, 6 star points fixed axially at a distance from the central point to generate the quadratic values & 6 replicates of the centre point. The centre point have vital role since it represents a set of experimental conditions at which six independent replicates were run. The deviation between them reflects the variability of all design. It was used to estimate the standard deviation. In this model each input variable was investigated at three levels. At the same time, the number of runs for a complete replicate of the design increases as the number of input variables increases. The model was developed with the responses and their optimization was done using ANOVA to estimate the statistical parameters by using response surface methodology. In this paper optimization process is based on three major steps first performing the statistically designed experiments then evaluating the coefficients in a mathematical model and finally predicting the response. Fig. 2, shows FCCD structure for three input variables.

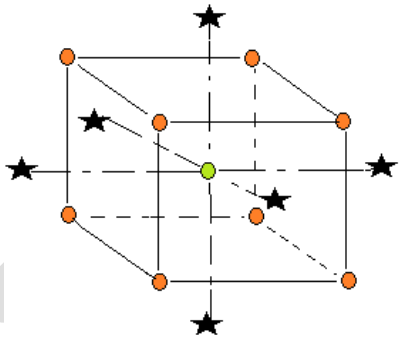

Fig. 2. Face centered composite design for three factors

The present reserch work studied the results of the effects of input parameters such as Concentration, Time and Temperature on the undercut during the PCM process of Inconel 600 material. Input parameters and their levels are shown in Table II. Table III shows experimental design matrix with coded and un-coded values of Face centered composite design

TABLE II. INPUT PARAMETERS AND THEIR LEVELS

Input Parameter	Level 1	Level 2	Level 3
Concentration (gm/lit)	300	500	700
Time (min)	30	50	70
Temperature (^{0}C)	55	60	65

TABLE III. EXPERIMENTAL LAYOUT PLAN FOR FACE CENTERED COMPOSITEDESIGN OF EXPERIMENTS

Ex No.	Coded Value			Un-Coded Value		
	A	B	C	Conc. (gm/lit)	Time (min)	Temp. (^{0}C)
1	-1	-1	-1	300	30	55

2	1	-1	-1	700	30	55
3	-1	1	-1	300	70	55
4	1	1	-1	700	70	55
5	-1	-1	1	300	30	65
6	1	-1	1	700	30	65
7	-1	1	1	300	70	65
8	1	1	1	700	70	65
9	-1	0	0	300	50	60
10	1	0	0	700	50	60
11	0	-1	0	500	30	60
12	0	1	0	500	70	60
13	0	0	-1	500	50	55
14	0	0	1	500	50	65
15	0	0	0	500	50	60
16	0	0	0	500	50	60
17	0	0	0	500	50	60
18	0	0	0	500	50	60
19	0	0	0	500	50	60
20	0	0	0	500	50	60

III. EXPERIMENTAL PROCEDURE

In this research work experiments were performed according to the Face Centered Composite design (FCCD) which is a kind of response surface methodology. Work piece first chemically cleaned to remove oil, grease, dust, rust or any substance from the surface so the photo resist can adhere. Deep the prepared work piece in photo resist for some minutes. Then it is hanged till extra photo resist drops fall into tank. After photo resist apply keep work piece into dryer for four minute. Select circular shape having dimensions 8 mm cut this section on black color radium & stick this section on the transparence paper with suitable distance so photo tool is ready to use. Exposed photo tool and masked work piece together in such way that the work piece should be above the photo tool. If both side exposing is carried out match corner to corner of photo tool and work piece. Expose this photo tool and masked work piece for five minute. Rinse the work piece in developer for some time till visibility of figure on work piece. For confirmation it is dipped into dye where visibility is increased or it can be seen by naked eye. Wash it in running water. Then the chemical etching operation is carried out in etching machine, adjust the time and temperature as per experiment planning. The thickness of specimen was 0.3 mm and cut at 20mmX20mm dimension. $FeCl_3$ chemical etchant was prepared. 100 ml amount of $Fecl_3$ was prepared for each run. In this paper single sided photochemical etching was conducted. The measurements of Undercut were carried out by Tool maker's Microscope (± 0.001 mm). Fig. 3, shows schematic representation of Photochemical machining experimental setup.

Fig. 3.Experimental setup of Photochemical machining

IV. RESULT AND DISCUSSION

A. Statistical Analysis

Although additional trials are required to fully confirm the results, the actual and the predicted undercut during the PCM process of Inconel 600 material are shown in Fig. 4, Actual values are the experimentally performed response data for a certain experiment and the predicted values are measured from the RSM design. This plot explains the effectiveness of the developed mathematical model. The difference between the actual and predicted values shown in Table IV. It is clear that model provided values are quite close to the experimental values.

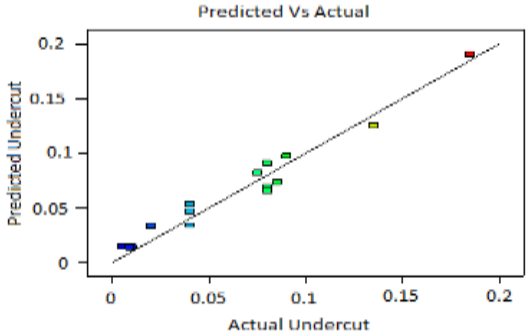

Fig. 4.The actual and predicted plot of Undercut of Inconel 600.

TABLE IV. EXPERIMENTAL DESIGN FOR THE ACTUAL AND PREDICTED RESPONSE.

Ex No.	Un-Coded Value			Response Undercut (mm)		
	Conc. (gm/lit)	Time (min)	Temp. (^{0}C)	Actual Values	Predicted values	Residual
1	300	30	55	0.075	0.082	-0.007
2	700	30	55	0.080	0.066	0.014
3	300	70	55	0.040	0.034	0.006
4	700	70	55	0.040	0.053	-0.013
5	300	30	65	0.19	0.19	00
6	700	30	65	0.085	0.074	0.011
7	300	70	65	0.080	0.069	0.011
8	700	70	65	0.040	0.034	0.006
9	300	50	60	0.040	0.034	0.006
10	700	50	60	0.040	0.047	-0.007
11	500	30	60	0.009	0.014	-0.005
12	500	70	60	0.080	0.090	-0.01
13	500	50	55	0.040	0.034	0.006
14	500	50	65	0.005	0.015	-0.01
15	500	50	60	0.020	0.033	-0.013
16	500	50	60	0.040	0.034	0.006
17	500	50	60	0.14	0.13	0.01
18	500	50	60	0.040	0.034	0.006
19	500	50	60	0.090	0.097	-0.007
20	500	50	60	0.01	0.014	-0.004

Three-dimensional plots were drawn by using the response surface methodology to investigate the effects of the time, concentration and temperature factors on the undercut during the PCM process of Inconel 600 material. Fig. 5, indicates Undercut along with temperature and time and it is clear that with increasing time Undercut increases but almost no effect with increasing temperature. Fig. 6, indicates Undercut first decreases as concentration increases up to concentration 500 gm/lit but then increases, up to at 700 gm/lit concentration it reaches to 0.011 mm. Fig. 7, shows Undercut along with temperature and concentration and it is clear that with increasing concentration Undercut increases but almost no effect with increasing temperature. Based on the ANOVA results obtained in Table V, time and temperature were found to have significant effects on Undercut of Inconel 600. With the help of this statistical model we have tried to find out the significant and non-significant terms in the variables (Table V), so non-significant terms are omitted in the developed mathematical model. Actual values were calculated through response surface data for a particular run & the predicted values were evaluated from the model and were generated by using the approximating functions. The fair correlation coefficients might have resulted by the insignificant terms in Table V, and most likely due to different variables chosen in wide ranges with a limited number of tests as well as the nonlinear effect of the investigated parameters on process response.

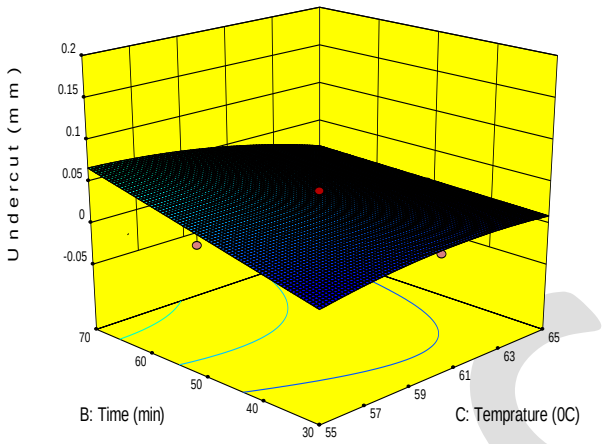

Fig. 5. The combined effect of time and Temperature on Undercut

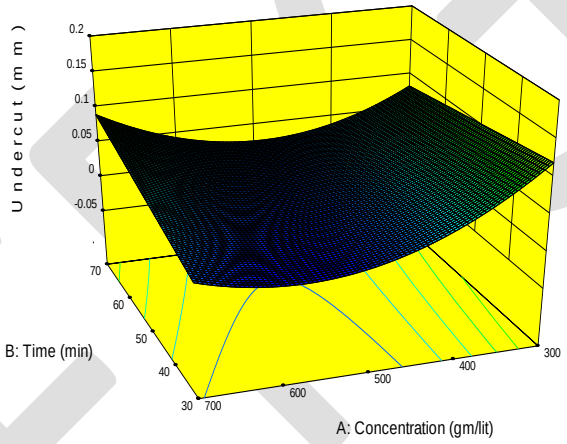

Fig. 6. The combined effect of time and concentration on Undercut

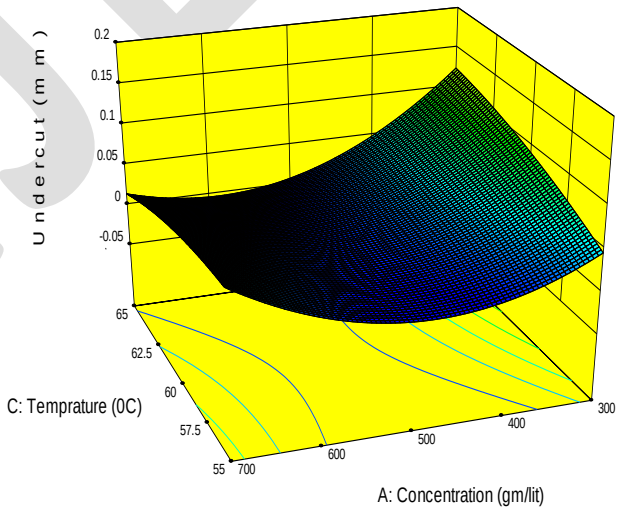

Fig. 7. The combined effect of temperature and concentration on Undercut

TABLE V. ANALYSIS OF VARIANCE TABLE FOR UNDERCUT (MM)

Source	SS	df	MS	F-value	p-value Prob.>F	
Model	0.036	9	3.95E-3	25.66	< 0.0001	significant
A	1.22E-4	1	1.22E-4	0.80	0.3933	
B	3.80E-3	1	3.80E-3	24.70	0.0006	
C	9.21E-4	1	9.21E-4	5.99	0.0344	
AB	5.25E-3	1	5.25E-3	34.12	0.0002	
AC	8.77E-3	1	8.77E-3	57.02	< 0.0001	
BC	1.95E-3	1	1.95E-3	12.69	0.0052	
A^2	9.88E-3	1	9.88E-3	64.21	< 0.0001	
B^2	5.68E-9	1	5.68E-9	3.69E-5	0.9953	
C^2	3.05E-4	1	3.05E-4	1.99	0.1890	
Residual	1.53E-3	10	1.53E-4			
Lack of Fit	1.53E-3	5	3.07E-4			
Pure Error	0.000	5	0.000			
Cor Total	0.037	19				

B. Development of Regression Model Equation

Face centered composite design was used to develop correlation between the undercut during the PCM process of Inconel 600 material to concentration, temperature and time. Experimental error was determined by using 20 experiments at the center point. Associate to the sequential model sum of squares, the models were selected based on the F-value. The independent input variables of the model were significant so that the models were not aliased and the quadratic model was taken as proposed by the software Design Expert (DE9). Based on quadratic model, experiments were planned to obtain 20 trials plus a star configuration (0, ±1) and their duplicates at the center point. Table IV shows the design of experiment, together with the experimental results. The minimum undercut was found to be 0.0029mm. Regression analysis was performed to fit the response function of undercut. The mathematical model expressed by Eq. 1, where the variables fill their coded values, represents the Undercut (Y) as a function of concentration (A), time (B) and Temperature(C).

$$\text{Undercut} = 0.0034+0.0035A+0.019B-0.0096C+0.026AB - 0.033AC-0.016BC+0.06A^2-0.000045B^2-0.011C^2 \quad (1)$$

C. Optimization by Response Surface Modeling

The main purpose of this study was to find out the optimum process parameters to minimize undercut during the PCM process of Inconel 600 material from the developed mathematical model equations. Design Expert (DE9) software package was used to optimize quadratic model equation within the experimental range. The optimum Undercut conditions determined for PCM process on Inconel 600 materials shown in Table VI.

TABLE VI. OPTIMIZATION RESULT OF PCM OF INCONEL 600

Desirability	Temp. (°C)	Time (min)	Conc. (gm/lit)	Undercut(mm)
1	55.276	32.39	470.781	0.0029

V. CONCLUSIONS

The response surface methodology based on three variables, face centered composite design was used to determine the effect of time (ranging 30-70 min), concentrations of etchant (ranging 300– 700 gm/lit) and temperature (55-65 ^{0}C) on the Undercut during the PCM process of Inconel 600 material. The regression analysis, statistical significance and response surface were applied using Design Expert Software for forecasting the responses in all experimental areas. Quadratic models were developed to show a relationship between variables and the responses. Through analysis of the response surfaces derived from the models, role of time was found to have the most significant effect on Undercut. Process optimization was carried out and the experimental values acquired for the Undercut during the PCM process of Inconel 600 material are found to agree satisfactorily with the values predicted by the models. Since experimentally obtained and model predicted values are residual which shows the effectiveness of model, based on the designed experiment. The optimal predicted Undercut 0.0029 mm of Inconel 600 was obtained as Ferric chloride concentration, time and temperature of etching and these were found to be 470.781gm/lit, 32.39 min and 55.276 ^{0}C respectively.

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Image Edge Enhancement And Denoising Techniques For Computer Vision Applications

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Abstract— When dealing with images, denoising is an inevitable preprocessing part. The key in denoising also depends on the type of noises present in the image. There are different methods for denoising and the method suitable for computer vision application is chosen to be LOWESS and Savitzky-Golay smoothening techniques. Analyzing an image to extract the features of its contents require edge enhancement. Among the various types of techniques for enhancing the edges, Unsharp Masking is selected to suit the requirement for it gives good results. These methods can be used for the preprocessing phase of a vision processor or similar applications.

Keywords— Blurring, Denoising, Edge Enhancement, LOWESS Algorithm, Savitzky-Golay technique, Smoothening, Unsharp masking technique.

INTRODUCTION

Capturing visual information may be done using cameras of one's choice, but one will have to apply certain denoising techniques for cleaning the images obtained. Noises creep in due to reasons like camera misfocus, sensor noise, blur effect, etc. Camera misfocus may lead to blurred images and processing them is tedious. Sensor noises are unavoidable, whichever be the image sensors used. Some noises that are commonly found as referred in [5] are amplifier (Gaussian) noise, salt and pepper noise, shot noise, speckle noise, etc. Amplifier noise has a Gaussian distribution and hence it is known under that name also. Images with salt and pepper noise have dark spots (pixels) on brighter areas and white spots on darker areas. Such noises are generated due to analog to digital converters, bit transmission errors, etc. Shot noises are mostly found in lighter parts of an image due to variations in photons sensed at a given exposure level. Speckle noises are multiplicative and to eliminate all these noises, there are different methods available. Here the focus is on smoothening techniques.

In computer vision applications, the features of objects, primarily edges, are used to identify them. Objects in an image can be extracted efficiently when its edges are enhanced. There are different types of edge enhancement methods among which the Unsharp Masking technique is being discussed here. Unsharp masking is a type of sharpness enhancement, the other methods being high pass filters, high boost filtering etc. Contrast enhancement is another type which also has many applications.

THEORY

A. Edge Enhancement of color images

In colored images, enhancement of the colors is also important because edges can be colored also. Two methods to extract edges from multispectral satellite images were presented in [9]. A multispectral image was modeled as a vector field with the number of dimensions equal to the number of bands in the image. In this model, a pixel was defined as a vector formed by a number of elements equal to the number of bands. Two vector operators were applied to such vector field. In their first method, they extended the definition of the gradient. In this extension, the vector difference of the window central pixel with neighboring pixels was obtained. A multispectral image was then generated where each pixel represented the maximum change in spectral response in the image in any direction.. The other method, considered the generalization of the Laplacian by means of an h-dimensional Fourier transform. This image was named a multispectral Laplacian. The vector operators performed a simultaneous extraction of edge-content in the spectral bands of a multispectral image. These methods were parameter-free and they worked for a multispectral image of any number of bands.

Another method for edge enhancement in SAR (Synthetic aperture radars) images based on the exploitation of the information provided by the wavelet coefficients was proposed by Jaleel S et al, V. Bhavya, N.C. Anu Sree and P. Sajitha [10]. It managed the multi-scale data in a different way. It worked exclusively in the transform domain. They said that their proposed approach would tackle the robustness and the precision issues of edge enhancement and detection at the same time.

Al-Samaraie M et al and Al Saiyd N et al in the reference[11] proposed a method for enhancing and sharpening medical color digital images. They used the wavelet transforms and Haar transform followed by using the Sobel, the Laplacian operator to obtain the sharpened image. First, a medical image was decomposed with wavelet transform. Next, all high-frequency sub-images were decomposed with Haar transform and the noise in the frequency field was reduced by the soft-threshold method. Later the high-frequency coefficients were enhanced by different weight values in different sub-images. Then, the enhanced image was obtained through the inverse wavelet transform and inverse Haar transform. Lastly, the filters were applied to sharpen the image; the resulting image was then subtracted from the original image.

Another method for color image enhancement was proposed by S. Bettahar, A. B. Stambouli, P. Lambert and A. Benoit [12] as an extension of scalar diffusion-shock filter coupling model, where noisy and blurred images were denoised and sharpened. The proposed model was based on using single vectors of the gradient magnitude and the second derivatives as a technique to relate different color components of the image. This model could be viewed as a generalization of Bettahar-Stambouli filter to multi-valued images. Their experiments showed that their proposed algorithm was more efficient than the mentioned filter and some previous works on color image denoising and deblurring without creating false colors.

Starck J et al, Murtagh F et al, Candès E et al, and Donoho D et al [13] presented a new method for contrast enhancement based on the curvelet transform. They stress on curvelet transform because it represented edges better than wavelets, and therefore well-suited for multi-scale edge enhancement. Their findings were that curvelet based enhancement out-performs other enhancement methods on noisy images, but on noiseless or approximately noiseless images curvelet based enhancement was not remarkably better than wavelet based enhancement.

The Unsharp mask method is a sharpening operator which enhances the edges and other high frequency components in an image by subtracting a blurred version of an image from the original image[14]. The Unsharp filtering technique is mostly used in the photographic and printing industries for crispening the edges. First, a blurred version of the image is created. It is subtracted from the original one to obtain the mask. The mask is then added to the original image to get the enhanced image.

B. Denoising of Images

Noise in natural color photos has special characteristics that are different from those that have been added artificially. Wang Y et al and Zhou H et al [8] proposed a Multiscale Total Variational method (MTV) for denoising. The MTV method is a variational PDE method using wavelet bases. They found that the MTV method was well effective in denoising monochromatic images. Denoising methods for monochromatic images are numerous, which include neighborhood filters, frequency domain methods, variational PDE based methods and non-local methods. There are pros and cons for each method, but they vary with images. But in HUVIS Pro, the interest is to denoise color images as well.

Wavelet transform gives a superior performance in image denoising due to properties such as sparsity and multi-resolution structure. Thus the focus was shifted from the Spatial and Fourier domain to the Wavelet transform domain. Different types of noises would be amplifier (Gaussian) noise, salt and pepper noise, shot noise, speckle noise etc.

SUREShrink [15] uses a hybrid of the universal threshold and the SURE [Stein‟s Unbiased Risk Estimator] threshold and performs better than VISUShrink. Cross Validation [16] replaces wavelet coefficient with the weighted average of neighborhood coefficients to minimize generalized cross validation (GCV) function providing optimum threshold for every coefficient. The assumption that one can distinguish noise from the signal solely based on coefficient magnitudes is violated when noise levels are higher than signal magnitudes.

We can make it more adaptive by choosing different threshold values in a sub band. Basics of denoising involve operating around choosing the appropriate thresholds. S.Y.Pattar [6], proposed an approach ‘modified stochastic method’ where band corresponding to detail coefficients were also decomposed to utilize the information present in the details part. The decompositions were followed by determination of the threshold limit in each sub band .This made the threshold limit to be chosen adaptively and causes better denoising. His results had shown that there has been considerable improvement in terms of Peak signal to noise ratio (PSNR) in

comparison with other techniques. The Modified stochastic model uses correlation properties of signal in each sub-band and thus makes proper determination of an edge and noise in the image. Thus, this results in edge preservation in the image and retention of the good visual quality of the images. He had considered orthogonal wavelet for analyzing the characteristics of the signal. If instead, we could use non orthogonal or semi orthogonal wavelets for analyzing, the coefficients obtained would be more correlated and could give still better denoising techniques.

Smoothening of image is a way of denoising it. It is use to draw a smooth curve through an image or through an object's edges. There are different types of smoothening techniques.

Z = smooth(Y,SPAN,METHOD) smooths data Y with specified METHOD. The available methods are:

'moving' - Moving average (default)

'lowess' - Lowess (linear fit)

'loess' - Loess (quadratic fit)

'sgolay' - Savitzky-Golay

'rlowess' - Robust Lowess (linear fit)

'rloess' - Robust Loess (quadratic fit)

Z = smooth(Y,METHOD) uses the default SPAN 5.

Z = smooth(Y,SPAN,'sgolay',DEGREE) and

Z = smooth(Y,'sgolay',DEGREE).

IMAGE ENHANCEMENT TECHNIQUE

A. Unsharp Masking Technique

There is a procedure for performing the Unsharp masking method as shown in Figure 1.

In Unsharp masking technique referred in [1], prior to enhancing , a mask is to be created for which the image has to be blurred. A blur kernel is used for the same according to the following equation.

$$kernel = \frac{1}{2\pi s^2}\, e^{-\frac{(X-m)^2+(Y-m)^2}{2s^2}}$$

The '*' denotes convolution of the original image and the blur kernel. Once the image is blurred, it is subtracted from the original image to get the mask. The mask is added to the original image, with a gain if needed, to obtain the enhanced image.

The basic equation of Unsharp masking technique is

$$v = y + \gamma(x - y)$$

where 'x' is the input image, 'y' is the result of linear low pass filter and gain 'γ' > 0 is a real scaling factor.

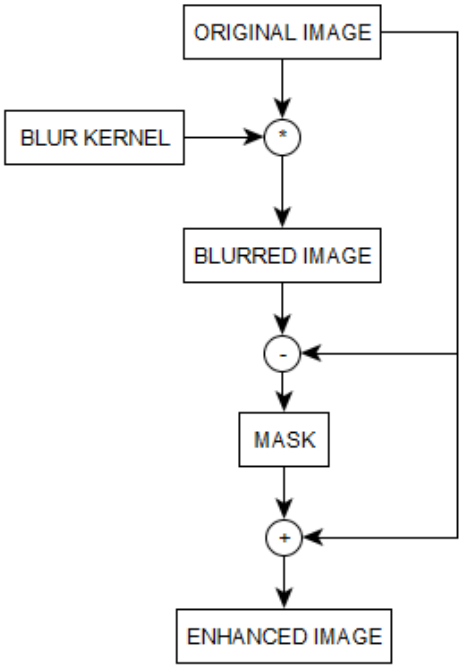

Figure 1. Flowchart of Unsharp masking method

IMAGE DENOISING TECHNIQUE

As mentioned in [5], denoising can be done either by transform domain filtering or spatial domain filtering. Spatial filtering includes non-linear filters like median and weighted median filters along with linear filters like mean and Weiner filters. The transform domain filtering includes spatial frequency filters and wavelet domain ones having adaptive and non adaptive filters.

Denoising of color images requires more care than gray scale ones. It is usually advised to use the YCrCb format rather than RGB for denoising. The reason for this as explained in [8] is that the former is linear. Reference [8] also tries to create a new color space for superior performance. Here this paper describes the method using the RGB format itself to denoise the image. Smoothening is a kind of denoising that can be performed which is being selected in this context. Usually, the cameras provide outputs in RGB format which can directly be used for denoising without manipulations.

A. Smoothening Methods

From the matlab Toolbox, different smoothening algorithms for image processing are available. Two of the algorithms are being used here, namely LOWESS and Savitzky-Golay algorithms.

LOWESS Algorithm

Many expanded forms for LOWESS is found, like 'locally weighted least squares', 'locally weighted regression' etc. it carries out robust locally weighted time series and scatter plot smoothing for equispaced and non-equispaced data. This is addressed as local because the process is carried out using the neighboring set of data points defined within the span. This is also weighted because a weight function is defined for those data points.

Savitzky-Golay Algorithm

This is a digital filter used on data points to smoothen them to increase the signal to noise ratio without distorting the signal much. When the data points are equally spaced an analytical solution to the least-squares equations can be found, in the form of a single set of 'convolution coefficients' that can be applied to all data sub-sets, to give estimates of the smoothened signal, (or derivatives of the smoothened signal) at the central point of each sub-set. The method was popularized by Abraham Savitzky and Marcel J. E. Golay who published tables of the convolution coefficients for various polynomials and sub-set sizes in 1964. The tables had been corrected later and has been extended for the treatment of 2- and 3-dimensional data.

SIMULATION

The test image Figure 2. contains four different basic shapes which are first edge enhanced and then smoothened to get good results. Normally, denoising techniques are performed in the first phase, but here denoising after edge enhancement using the mentioned methods gave good results.

Enhanced image is good enough to extract the features of objects. If a *jpeg* compression occurs, some of the data would be lost. The smoothening algorithms help in rectifying such noises.

The simulation is done in Matlab, an image processing tool, where the images can be read and processed in spatial or frequency domains.

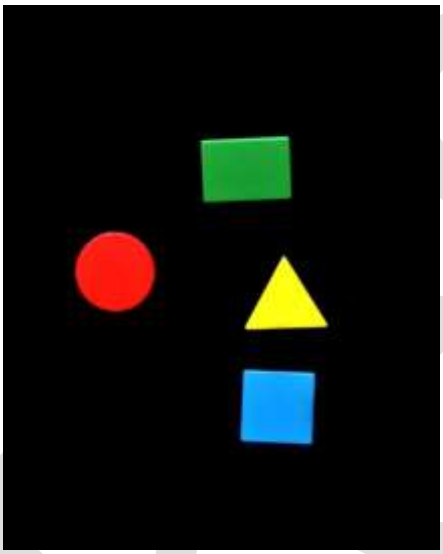

Figure 2. Test Image

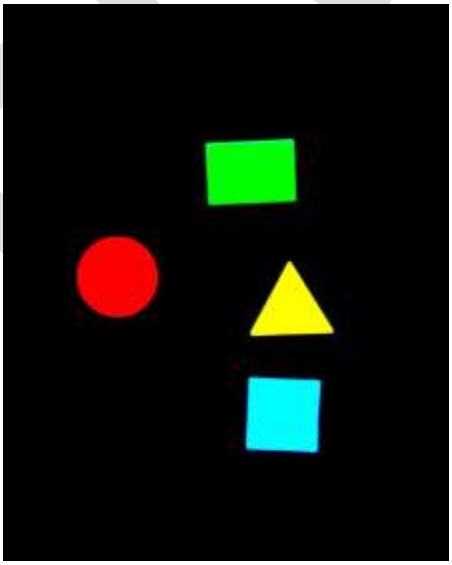

Figure 3. Enhanced Image

Figure 4. Smoothened Image (closer glance)

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CONCLUSION

Denoising methods are inevitable when one deals with images taken from an image sensor. For any computer vision application, the mentioned method is useful. Edge enhancement is done for easy feature extraction of objects of interests. These methods are studied for the purpose of an application which emulates human vision.

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ALGORITHM OF GESTURE BASED INTERACTION ROBOT

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ABSTRACT: Interaction between human beings and machines is changing from day to day. In olden days used to control machines with big gears and buttons, after remote controllers are used .now controlling of machine with physical interaction of human beings. S o many ways to control the machine like voice, and gestures ...etc.to achieve gesture robot, can use accelerometers but the circuit beco me complex, using image processing can built gesture based interaction robot. This paper talks about machine can be control by any in terfacing objects with help of hand gestures using different algorithms

KEYWORDS: Robot vision, Image processing, Gesture recognition, Resolution segmentation, Image detection, Gesture controls , Gesture control robot

1 INTRODUTION:

Interfacing between humans and machines is very difficult processes for example take a personal computer which is loaded with any o perating system and user software like word 2010 etc...Without operating system cant accesses the user software, here operating syste m acts as an interface between user and computer. Same thing in the machines also, we need a interfacing object to control the machin e. in olden days we need to control the machines with gears ,big switches and well trained persons .next generation was using remote c ontrollers (wired and wireless).now machines are controlled by human interactions like voice ,gestures and mood etc .this paper conce ntrates on gestures only .gesture means passing information from a person to person or thing by movements of hands .so many ways f or designing gesture robot like using accelerometers ,image processing and artificial neural networks .out of all this image processing is easy design for this kind of robots. Image processing based algorithm helps to overcome the controlling of robot by specific device .we can control robots with any interfacing object like pen, wallet, hand louse or bare hand.

Requires 3 basic hardware components they are

1. Camera
2. Computer
3. Robot with circuit

Camera and robot connected to computer as shown below

Camera acts as an input, robot acts as a output and computer serves as a processing unit

2 ALGORITHMS:

This paper deals machines can control by any interfacing object with the help of hand gestures
There are 7 simple steps to achieve gesture recognition ,these simple steps as shown in below

BLOCK DIAGRAM OF STEP BY STEP PROCESSES

2.1 IMAGE ACQUISITION:

Acquisition means fetch the data or own the data. Image acquisition means fetch the data in image format, nothing but take a snapshot or picture. This can be achieved by CCD (charge coupled device) cameras, even web cams perform better for basic operations.

2.2 RGB CONVERSION:

Figure 1 *Figure 2*

There are so many formats of image like black and white, grey; YCBCR (luminance croma blue croma red) and RGB.each format have their own storage capacity. Figure 1 show ycbcr format it holds less information to processing the data. Figure 2 shows rgb format of same image but it holds more information of data .by using more information, processing of data is very easy. Normally rgb is the best format for image processing.

2.3 THRESHOLDING:

In past 2 steps we gave vision to machine but it doesn't have capability of recognition. Thresholding helps to identify the object which is to be interfaced object. It can be explained below by help of figure 2.
Figure 2 description: a black pen in front of white wall

In rgb format each pixel hold 3 different values belong to red, blue and green. Each unique color has unique values so white wall has their unique values and black pen has their unique values. designing a program which detect only rgb values of black pen ,resulting the values which hold by pixels are same according to code is projected as white and remaining pixels projected as black as shown in figure 3.now successfully completed the detecting the interfacing object

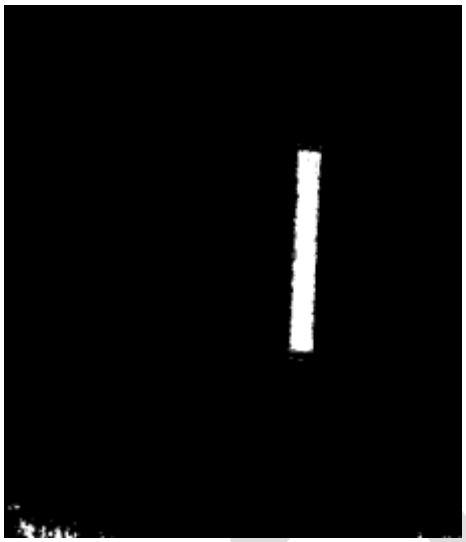


Figure 3

2.4 FIND REFERENCE POINT:

After detecting the object need a reference point of detected object to control the machine reference point may or may not be a centroid.to find out reference point a simple formula in the figure 3 diagram find the coordinates of top and bottom most and left most and right most of white pixels. Now calculate the mean for top and bottom gives vertical mean same procedure for left and right most gives horizontal mean mutually both means give reference point.

According to figure 4, reference point (horizontal) =(360+380)/2=370
Reference point (vertical)=(190+260)/2=225
Mutually together (370,225) is reference point as shown in figure 4

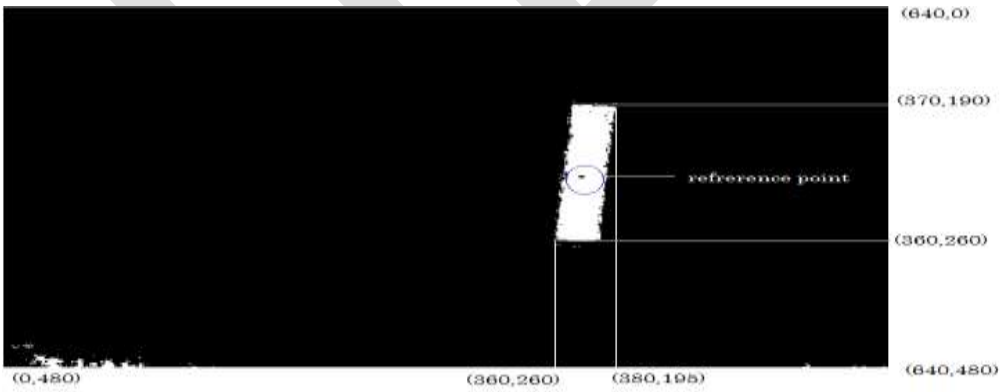


Figure 4

2.5 RESOLUTION SEGMENTATION:

For precision results resolution segmentation is best .resolution segmentation is a method of divide the screen pixels into set of boxes. it is shown in figure 5

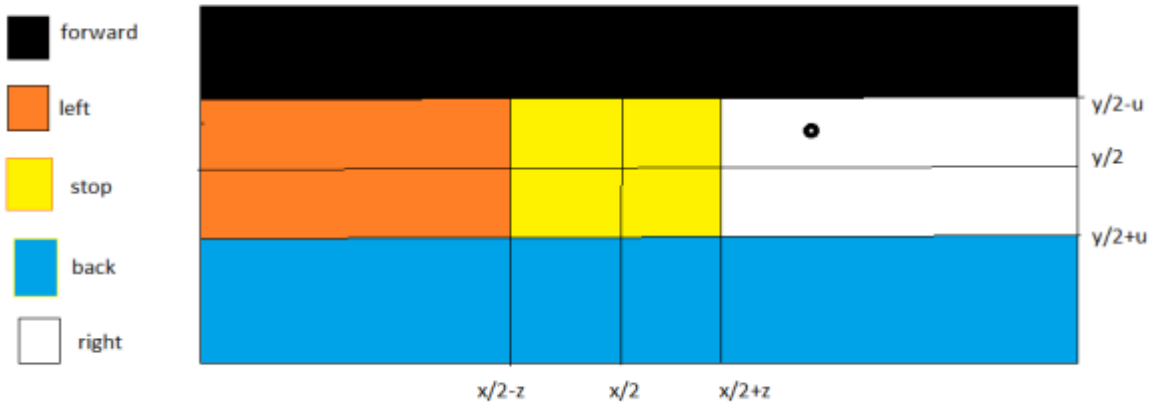


Figure 5

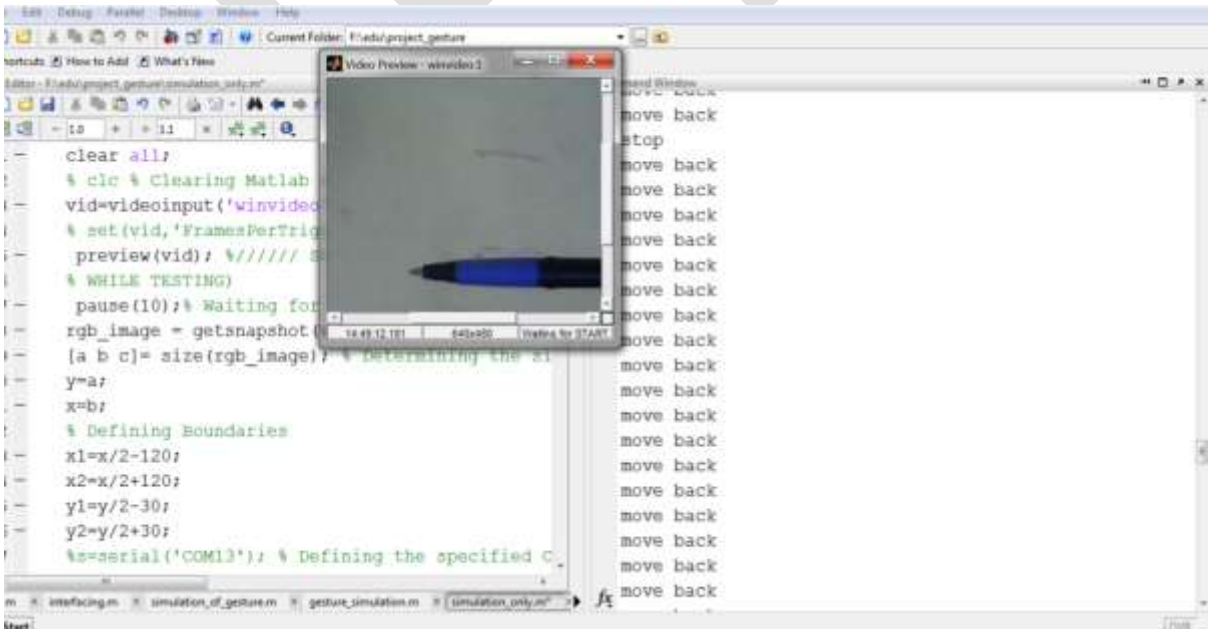
In figure 5 (x, y) is coordinates of center pixel in resolution z and u are number of pixels apart from center pixel these values are user defined. In this paper total resolution is divided into 5 segments.

2.6 **TRACE REFERENCE POINT AND ACESSING**:
The position of reference point is plays important role here .a black ring in figure 5 is reference point of detected object. Now check the position of reference point in which segment it belongs. According to reference point position access the robot by passing commands.

For example in figure 5 reference point position is in white color portion (segment) so pass the command to robot turn RIGHT. if reference point position is in black portion (segment) access the robot by passing command to move FORWARD

3 **RESULTS**:

Simulation result had been attached below.



Matlab has been used for simulation, above image pen has be recognized in below segment of resolution so according to algorithm it shows output as "move back" in result window (right half of the image)

4 CONCLUSION:

Briefly robots can also response for gesture interactions by take any object and make vision to find the object and recognize the position of reference point of the object then passing commands to the machine or robot.
Designing of the gesture interaction module is very easy by using image processing and design complex increases when the degree of freedom of robot increases.

Main advantage of gesture recognitions increases the interaction and precision of robots

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A SUPERVISED LUNG NODULE CLASSIFICATION METHOD USING PATCH BASED CONTEXT ANALYSIS IN LDCT IMAGE

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ABSTRACT- In our daily life, cancer is well-known disease that causes of death in both men and women and understand about the survival rate of lung cancer which is extremely poor. To increase this survival rate of cancerous patient, it is primarily to detect at premature stage which enables many new options for the cancer treatment without risk. This project deals with one of the efficient method to classify four types of lung nodules. That is well-circumscribed, juxta pleural, pleural tail and vascularised. This proposed method was based on patch based contextual analysis by combining the lung nodule and surrounding anatomical structures in LDCT image and it has three main stages: an adaptive patch-based division is used to construct nodule patch and context patch; then, a new feature set is designed to identify the intensity, texture, and gradient information, and then a contextual latent semantic analysis-based classifier and the SVM classifier are designed to calculate the probabilistic estimations for the relevant images. Our proposed method was evaluated on a publicly available dataset and clearly demonstrated promising classification performance.

KEYWORDS- Patch, LDCT, context, latent schematic classifier, SLIC, superpixel, fs3

INTRODUCTION

The lung is an important organ that performs multiple functions every second of our lives. Lung cancer is a disease characterized by uncontrolled cell growth in tissues of the lung and it is the major cause of cancer related deaths in human worldwide. Approximately 20% of the lung nodule represents lung cancer [1]. Hence it was important to identify whether it is malignant or non malignant [2]. Lung nodules are small masses in the human lung, small structures that are roughly spherical. These structures are called pulmonary nodules; however, they can be distorted by surrounding anatomical structures such as vessels and the adjacent pleura [3]. Pleura form an envelope between the lungs and chest wall. Lung nodules are divided into different types according to their virtual positions. At present, the classification from Diciotti et al. is the most popular approach and it divides nodules into four types: well-circumscribed (W) with the nodule located centrally in the lung without any connection to vasculature; vascularized (V) with the nodule located centrally in the lung but closely connected to adjacent vessels; juxtapleural (J) with a large portion of the nodule connected to the pleural surface; and pleural-tail (P) with the nodule near the pleural surface connected by a thin tail.

The difficulty of early detection for this disease is a main reason why lung cancer has the highest mortality rate. Like most cancers, survival rate depends on how early cancer is detected. Unfortunately, it is a long and difficult process for the physician to detect the presence of this disease. One of the most important and difficult tasks the radiologist has to carry out consists of the revealing and diagnosis of cancerous lung nodules from chest radiographs. Some of these lesions may not be detected due to the fact that they may be invisible by the underlying anatomical structure, or the low-quality of the images or one-sided and variable decision criterion used by radiologists. Computed tomography (CT) Offers higher resolution and faster acquisition times. In current clinical practice, however, interpretation of CT images is challenging for radiologists due to the large number of cases. Where the radiologists fail to diagnose small lung nodules in as many as 30% of positive cases. In recent research, digital image processing techniques have been

used in developing CAD systems for locating suspected nodules [4], but too many false-positive (FP) classifications/chest radiograph are made.

RELATED WORK

Data Mining and Image processing plays very crucial role in healthcare industry especially for disease diagnosis. Data Mining is very beneficial for finding hidden information or pattern form the huge databases, some widely used data mining techniques are classification, prediction, association analysis, pattern matching and clustering. Image Processing plays significant role in cancer detection when input data is in the form of images; some techniques used in Image Processing for information retrieval are Image acquisition, Noise Removal, Segmentation, and Morphological operations etc.

Farag[5] et al present a feature based extraction to classify lung nodules in low-dose CT slices (LDCT) into four categories: juxta, well-circumscribed, vascularized and pleural-tail, based on the extracted information. The Scale Invariant Feature Transform (SIFT) and an adaptation to Daugman's Iris Recognition algorithm are used for analysis. The SIFT descriptor results are anticipated to lower-dimensional subspaces using PCA and LDA. Iris Recognition algorithm publicized improvements from the original Daugman binary iris code. But here the larger nodule database cannot be generated and it only purposeful on identifies the nodules located in the intersections among dissimilar types.

Abdullah et al. [2012][6] stated that the segmentation of the lung region due to the curb regarding on the similarities of the intensity in the X-ray image. As for lung cancer nodule detection process, it does not seem to be the problem because of the deficient of the similar intensity due to the lung segmentation done. It can be used in the lung cancer application, the system can also be used in the application such as the detection and classification of breast tumour in mammography images a propos on the higher discrepancy of intensity present.

Another alternative would be making the methods themselves publicly accessible. The increased availability of open-source software (such as the Image Segmentation and Registration Toolkit (ITK) is an encouraging movement in that direction. Okada *et al. [7]*presented an automated method to approximate solid nodules as well as ground glass opacities by ellipsoids using anisotropic Gaussian fitting. The volume of the nodule was estimated by the volume of the ellipsoid.

M.F.McNittGray 1999[8] reported on some of initial studies in the classification problem were the patients with a solitary nodule were imaged using high decree computed tomography. Quantitative channel of texture were extracted from these images using co-occurrence matrices. These matrices were twisted with different combinations of gray level quantization, distance between pixels and angles. The derived measures were input to a linear discriminant classifier to predict the classification (benign or malignant) of each nodule. We suggest, however, that improved performance could be obtained by better feature design and a more advanced classifier.

METHEDOLOGIES

In this work, propose a new image classification method for lung patches, based on an LSA classifier. Scrutiny of primary lung tumours and nodules is significant for lung cancer staging, and a computerized system that can perceive both types of abnormalities and it will be helpful for clinical routine.

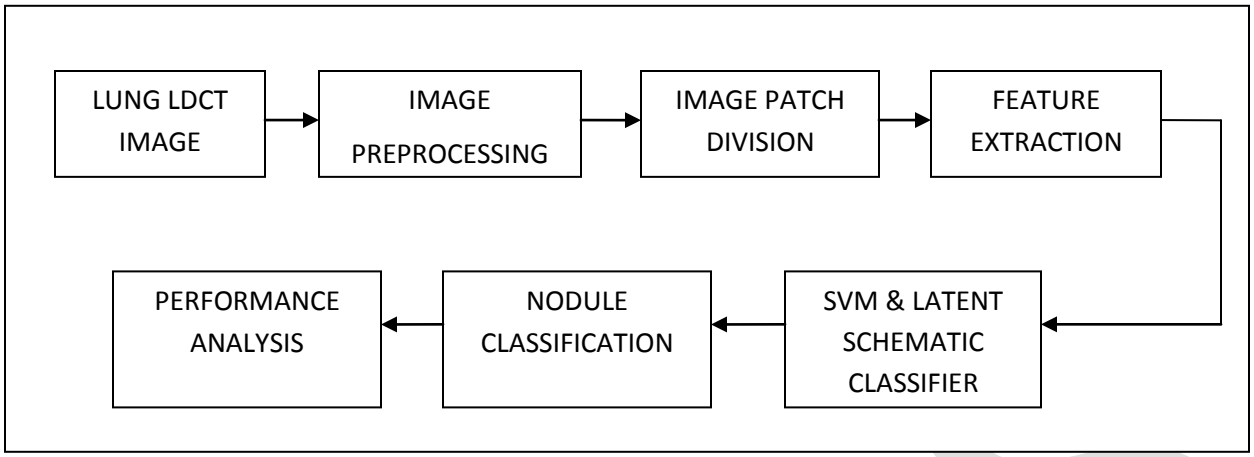


Fig 1: Lung nodule classification systems

LUNG NODULE DETECTION

Nodule detection is an image processing problem. The task is to find positions (and shape) of specific pathological structures in the lungs called nodules. A nodule is a small, round lesion in the lungs, or worm-shaped lesion connected to pleura (the lung boundary) with radio density greater than lung parenchyma. Lung nodules detection in complicated, Nodules in LDCT images show up have relatively low contrast white circular shape and it also overlap with shadows, vessels and ribs.

INPUT LUNG LOW DOSE (LD) CT IMAGE

The lung LDCT images having low noise when compared to scan image and MRI image[9]. So we can take the LDCT images for detecting the lungs. The main pro of the computer tomography image having better clarity, low noise and distortion. The mean and Variance can be easily calculated. The calculated value is very closer to the original value. LDCT is highly effective spot tiny lung nodules. It is also a primary of clinicians for early detection of lung cancer. The LDCT gathers a complete 3D volume of a human thorax in a single breath-hold and it provides very high spatial, temporal and contrast resolution of anatomic structures. The National Lung Screening Trial (NLST) research in 2011 shown, the LDCT screening can avoid more than 8000 lung cancer deaths per year.

Fig 2: Input LDCT image

PREPROCESSING

Preprocessing is the initial step for detecting the lung cancer. In preprocessing step we have done two steps [10]. They are:

1. Denoising

2. Wiener Filter

3. Iterative segmentation

Denoising: Image denoising algorithms may be the mostly used in image processing. Many methods, despite of execution, share the same basic idea noise lessening through image blurring. Blurring can be done in the vicinity, as in the Gaussian smoothing model or in anisotropic filtering by calculating the variations of an image. White noise is one of the most common problems in image processing. The LDCT image is a gray scale image that contains noises such as white noise, salt and pepper noise etc. This can be removed by using wiener filter from the extracted lung image.

Noise removal y=im2single(y1),where y1 is the input image

Wiener Filter: The goal of the Wiener filter is to filter out noise that has corrupted a signal. It is based on a statistical approach. Typical filters are designed for a desired frequency response. However, the design of the Wiener filter takes a different approach. One is assumed to have knowledge of the spectral properties of the original signal and the noise, and one seeks the linear time-invariant filter whose output would come as close to the original signal as possible. Wiener filters are characterized by the following:

1. Assumption: signal and (additive) noise are stationary linear stochastic processes with known spectral characteristics or known autocorrelation and cross-correlation

2. Requirement: the filter must be physically realizable /causal (this requirement can be dropped, resulting in a non-causal solution)

fy=wiener2(y1,[3 3]) this equation represents filtering of the lung LDCT image from noise

IMAGE PATCH DIVISION

The current approaches are usually based on patches with fixed size and shape[11], such as dividing the images into square patches or into circular sectors based on radial partitions with predefined number of pixels in these areas. In our system we have to form the patches according to local anatomical structure and pixel values and based on super pixel formulation and SLIC using an improved quick shift clustering method.

Simple linear iterative clustering super pixels

Due to small size of lung nodule, quick shift clustering method applied only to amplified image. In our proposed method the image is first amplifier with nearest neighbour interpolation with local intensity information. Amplify the image twice or thrice according to input image size

fy2=imresize(fy,[30 30])
fy=imresize(fy,[64 64])
fy=imresize(fy,[128 128])
fy=imresize(fy,[256 256])

Two parameters are introduced in quick shift 1) *kernelsize*: size of kernel used to estimate density 2) *maxdist*: maximum distance between points in feature space. The maximum distance should set small multiple of the kernel size. In our system we have to choose kernel size as 2 and maxdist as 20.

[Iseg labels map gaps E] = vl_quickseg(fy, ratio, kernelsize, maxdist);

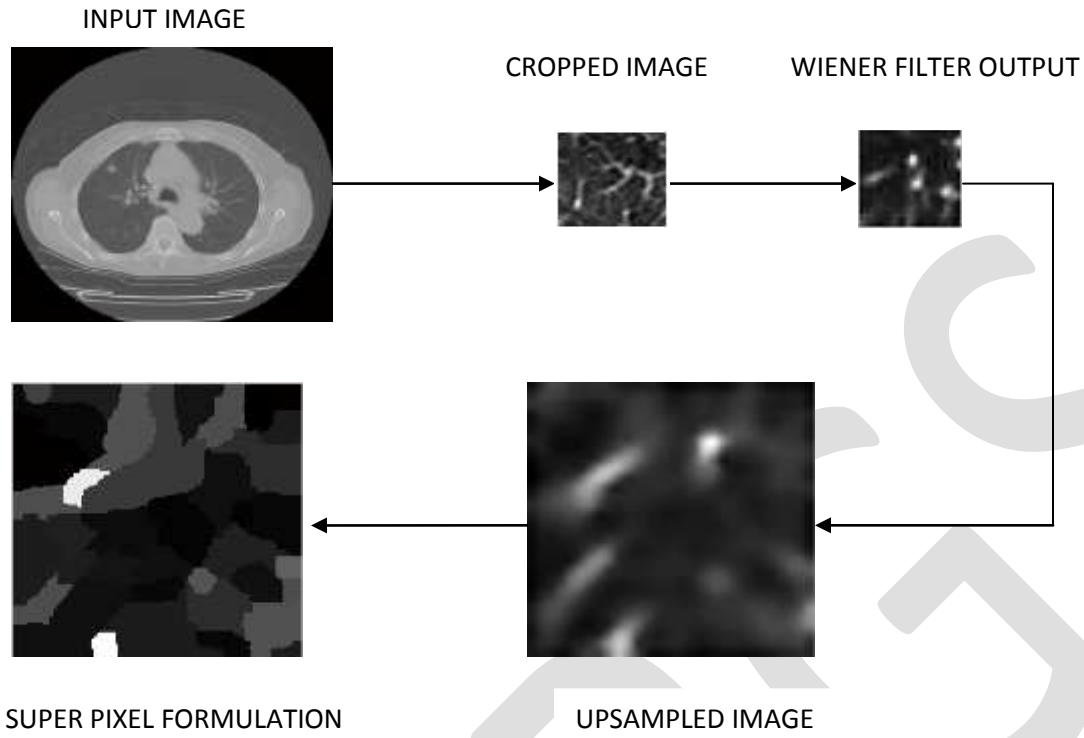


Fig 3: Superpixel formulation

LEVEL PARTITION OF PATCHES

Next we have to divide the image patches into multiple concentric levels. The patch contains the nodule segment and the patch with surrounding structure. The patch that contains the nodule centroid is nodule patch. In our method we construct two concentric levels based on distance between each patch with nodule patch.

FEATURE EXTRACTION

The features extraction is especially effective by using algorithms and applying methods to detect and separate several shapes from an LDCT image. The concern features to be extracted by domain-specific knowledge using image processing tools in MATLAB.

Features, characteristics of the objects of interest, if selected carefully are representative of the maximum relevant information that the image has to offer for a complete characterization an image. Feature extraction methodologies analyze objects and images to extract the most prominent features that are representative of the various classes of objects. Features are used as inputs to classifiers that assign them to the class that they represent. Based on our visual analysis the lung nodules, we suggest that intensity, texture, and gradient can characterize the various nodules and the diverse contextual structures. In this Work SIFT[12], HOG[13] and MR8+ LBP[14] (Local Binary Pattern) features are extracted. From each of the patch determine fs3 feature(texture, intensity and gradient).

SIFT(scale invariant feature transform)

Sift, the overall descriptor determines texture, gradient and intensity features from each of the patches i.e., from nodule patches and contextual patches. It generates a 128 length vector near the centroid of each patch. SIFT (pao) -calculated by selecting one key point near the centroid. It describe the local features of image.

Function varargout=siftvarargin)

SIFT is invariant to image rotation and scaling. But partially invariant to change in illumination .it was highly distinctive.

MR8 + Local Binary Pattern (LBP)

The combination of MR8+LBP used here for attainment better off texture description of patches. Maximum Response 8 (MR8) filter bank which is composed by 38 filters. The MR8 bank contains an edge filter at 3 scales, and a bar filter at the same 3 scales and we use only 8 filter response.

The local binary pattern (LBP) feature has emerged as a silver lining in the field of texture classification and retrieval. Ojala et al. proposed LBPs, which are converted to a rotational in-variant version for texture classification. Various extensions of the LBP, such as LBP variance with global matching, dominant LBPs, completed LBPs, joint distribution of local patterns with Gaussian mixtures, etc., are proposed for rotational invariant texture classification. The LBP operator on facial expression analysis and recognition is successful. Xi Li et al.[15] pro-posed a multistage heat-kernel-based face representation as heat kernels is known to perform well in characterizing the topological structural information of face appearance. Furthermore, the LBP descriptor is incorporated into multiscale heat-kernel face representation for the purpose of capturing texture information of the face appearance.

The Lung image is divided into several regions from which the LBP feature distributions are extracted and concatenated into an enhanced feature vector to be used as a image feature descriptor.

HOG

Histogram of oriented gradients are feature descriptors, has a set of feature vectors. Each feature vector is computed from a block placed across the source image. Each element of a vector is a histogram of gradient orientations.

The algorithm of finding the HOG descriptors [16] consists of the following steps

- Compute gradients for each pixel of an image
- Perform binning of gradients orientation
- Collect the histogram within a call of pixels
- Weight the histogram by blocks and cells for local normalization of the contrasts
- Normalize the histogram

Assuming that the center of patch p_{ao} is c_{pao} , we built 8 coordinate systems that share the same origin c_{pao} but have different initial orientations (0 degree). Two of them are shown with (x0, y0) and (x1, y1). Contra-rotating the first coordinate system (i.e., (x0, y0)) by 45 degree generates the next one (i.e., (x1, y1)). Instead of predefining the initial orientation of the first coordinate system, we set it as the direction from the centroid of the patch to the centroid of lung nodule. Next, for each coordinate system, patch pao is divided into 9 cells, within which gradient orientations of the pixels in 9 undirected histograms are counted to encode the gradient distribution.

```
HOG = vl_hog(im2single(fy2), CELLSIZE) ;
HOG1=[];
HOG1=[HOG1 hist(HOG(:,:,1:30))];
```

NODULE CLASSIFICATION

For any classification problem, a given image feature is considered to be good only if it has enough information to distinguish classes. A single feature by itself is insufficient for classification; several features are used by various classification algorithms. Sequence of stages progressed from image preprocessing, image cropping and image patch division and to end with the image classification. The final result is to determine the normality or abnormality of an image. To predict the probability of lung cancer presence; two approaches are SVM and latent schematic classifier [17], which are based on data powerfully related to lung

anatomy and lung CT imaging. It involves SVM for lung nodule patches and pLSA analysis for context patches, Estimates probability by applying k means clustering strategy

$$\mathcal{P}_{\text{level-nodule}}(t_{pt}|\mathbf{I}) = \mathbf{P}_{\text{SVM}}(t_{pt}|\mathbf{I})$$

$$\boldsymbol{P(tpt|I) = \lambda * P_{level\text{-}nodule}(tpt|I) + (1-\lambda) * P_{level\text{-}context}(tpt|I)}$$

Where λ **E (0, 1)**

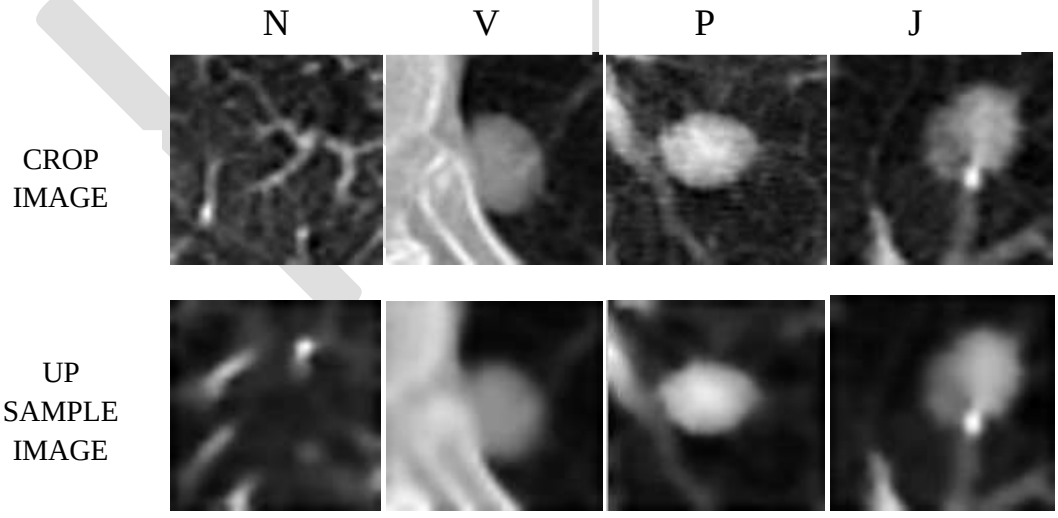
$P_{SVM}(tpt|I)$- probability estimate from SVM

NODULE TYPE	PROBABILITY
Vascularized	**0.10-0.19**
Juxta pleural	**0.20-0.25**
Well-circumscribed	**0.25-0.30**
Pleural tail	**0.30-0.35**

Table 1:probability estimations

PERFORMANCE ANALYSIS AND RESULT

Patch based context analysis method is developed for diagnosis and classification of candidate nodules after applying training and testing process. The lung tumour diagnosis is an important criterion in medical field. In this project, we detect and segment the tumour area from the lung LDCT image. The segmented lung tumour can be classified using SVM and LSA classifier. Then the lung tumours are classified as benign or malignant. The performance analysis is carried out in terms of sensitivity, specificity, positive predictive value, negative predictive value and Accuracy. We used publically available early lung cancer action program ELCAP) data base for experiments. The ELCAP database contains 50 sets of low-dose CT lung scans with 379 unduplicated lung nodules annotated at the centroid. The average accuracy achieved is 89% for malignant tumour region in accordance with ground truth images.



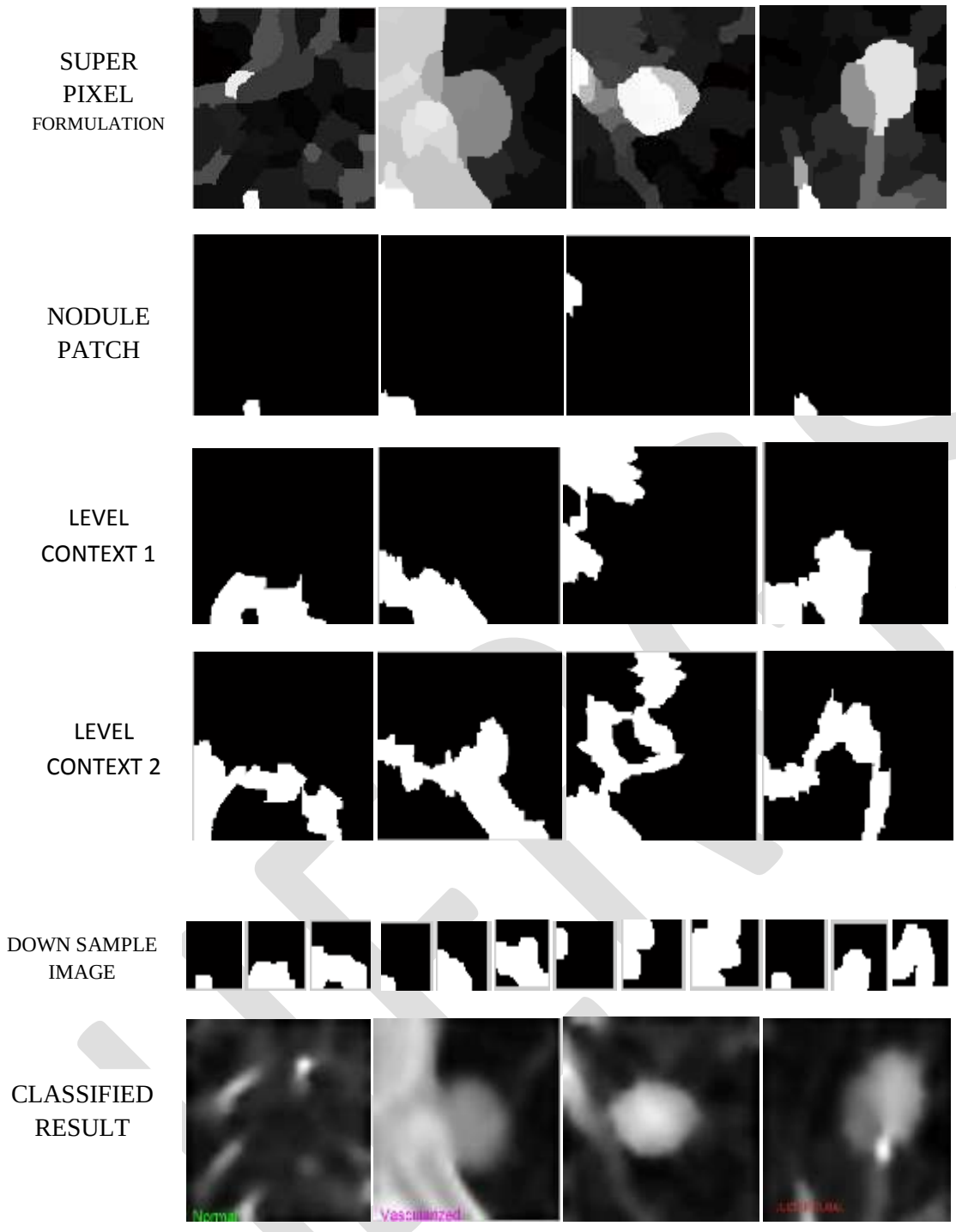


Fig 4: classified result

PERFORMANCE CHARECTERISTICS

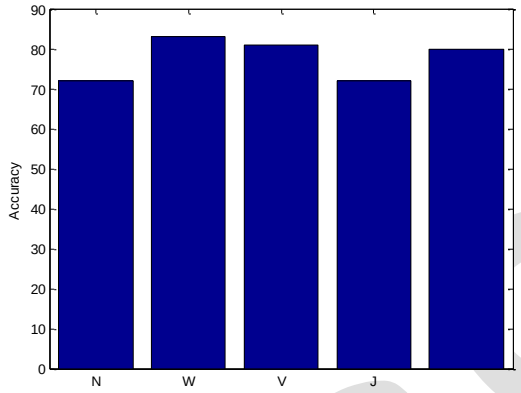


Fig 5: performance characteristics of lung nodule classification system

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CONCLUSIONS AND FUTURE RESEARCH

Lung cancer is the most risky and prevailing in the human race according to the stage of detection of the lung cancer nodules in the LDCT images. The process of discovery of disease plays a very vital and essential task to avoid crucial stages and to condense its percentage spreading in the humanity. To achieve further perfect outcomes, the three stages are covered by Image patch division, Features Extraction and nodule classification. Finally, a supervised classifier was designed through combining level nodule probability and level context probability, using image processing tools in MATLAB software.

Future directions are geared towards improving the accuracy rate by removing the SVM and Plsa classifier with decision tree classifier and use the t-test for feature selection. This will improve the efficiency rate and accuracy.

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Receptive Field Position Disparity Estimation Using Cross-Correlation Algorithms

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Abstract—In human vision, retinal disparity is an important attribute which is the main reason for stereopsis. Mechanisms used for encoding binocular disparity through simple cells in striate cortex are difference in receptive field position and difference in receptive field phase. In the case of two dimensional objects position disparity has the major contribution in binocular fusion. Since human brains are more similar to correlators, cross correlation algorithms are the most simplest and natural method for disparity estimation. This paper is a comparative study of different cross correlation measures that can be used for the estimation of receptive field position disparity.

Keywords— Binocular disparity, computer vision, Correlation, Disparity map , Image registration, Normalized cross correlation ,Receptive field position disparity, Striate cortex.

INTRODUCTION

Human beings are blessed with the attributes of binocular vision. If the eyes are functioning normally and equally the images formed in the retinas will be same in size, illuminance and colour. But, it has slight difference due to the positioning and angle through which eyes view an object [12].This difference is usually termed as binocular disparity or retinal disparity. Striate cortex is the first site along the central visual pathways at which signals from left and right eyes combines to a single neuron [3].The process of encoding binocular disparity begins here. Receptive field (RF) position disparity and RF phase disparity are the two major reasons for binocular disparity [9]. In the case of two dimensional object RF position disparity is the major concern. This position disparity can be experienced by just closing our eyes one by one. If observing an object far away from our eyes, this position disparity has the main contribution in binocular fusion, it is due to the distance to an object is inversely proportional to the disparity. Visual system utilizes binocular disparity to discriminate relative depth of object in space.

In computer vision human vision processing is an important aspect, in which a model of human eye is created. In such systems, receptive field position disparity estimation is important due to the horizontal shift between cameras. Disparity estimation is important, because it can be used for adjusting the focus of cameras, so that cameras can be converged to a single object. Disparity estimation is also useful for binocular fusion in computer vision systems and distance to object calculation. Most of the earlier works in this area were used for plotting disparity map, which gives the depth information of the object, and it is used to provide three dimensional visions to the system. This paper analyses the receptive field position disparity in two dimensional images. Different methods are there to compute receptive field position disparity. But correlation measures are the most simplest and natural method for a system, that emulate human vision processing. The ultimate goal of this paper is to compare different cross- correlation measures that can be used to estimate receptive field position disparity.

RELATED WORKS

Andre R et al (1999) developed a paper on correspondence estimation in image pairs [2].Image pairs can be classified as spatial and temporal. Spatial images can be obtained by recording a scene with two cameras at different position and same time. Correspondence estimation in spatial pair is called disparity estimation. Proposed paper analyses various techniques used for finding geometric correspondence and photometric correspondence of image pair. Additional constraints can be introduced to enhance the quality of the estimation results. The improvements discussed in this paper include the estimation of all pseudo correspondences, the incorporation of image restoration models, modeling of specular reflectivity of scene surfaces, the use of image sequences instead of pairs. The latter provides one of the most powerful constraints in correspondence estimation. It has been applied widely on parallel image pairs, and

recently also on uncalibrated spatial pairs.

Zitova B et al (2003) developed a review of image registration methods [5]. Image registration is the process of overlaying two or more images of the same scene taken at different times, viewpoints, and sensors. The registrations geometrically align the reference and sensed images. The approaches were classified according to their nature as feature-based and area based techniques, and according to four basic steps of image registration procedure: mapping function design, feature detection, image transformation, and feature matching, Main advantages and drawbacks of the methods are also mentioned in the paper. Scopes in future researches are also discussed in the paper. The main objective of this paper is to provide a reference source for the researchers involved in image registration, regardless of application areas.

Banks J et al (1997) developed non parametric techniques for stereo matching [1]. This paper compares a number of stereo matching algorithms in terms of robustness and suitability to fast implementation. This includes area based algorithms and algorithms based on non parametric transforms notably the rank and census transforms. The rank transform is is defined as the number of pixels in the window whose value is less than the centre pixel. The images will therefore be transformed into an array of integers whose value ranges from 0 to N-1 where N is the number of pixels in the window. Census Transform maps the window surrounding the centre pixel to a bit string. Results show that the rank and census transforms are robust with respect to radiometric distortion and introduce less computational complexity than conventional area based matching techniques.

Yan H et al (2008) designs a robust phase correlation based sub-pixel feature matching technique and its application in pixel-to-pixel image registration, DEM generation and motion estimation [7]. In particular, a median shift propagation (MSP) technique has been introduced to refine the unreliable motion estimation in image areas either featureless or subject to significant spectral changes. This paper proposes to use a phase fringe filter and a highly robust technique in the direct Fourier-based phase correlation algorithm for translational shift estimation. The local phase correlation based feature matching may fail in areas either featureless or with significant spectral differences between an image pair, a frequency based motion estimation technique and a motion flow refinement techniques are designed to improve the unreliable local motion estimates around these areas. Using the robust phase correlation based local matching algorithm, we can derive pixel-to-pixel image registration and disparity mapping for DEM generation in most synthetic and real images from different sensor.

Fengjun H et al (2013) developed a detailed study on a local matching algorithm and a semi-global matching algorithm which are representatives in stereo matching [11]. For the local matching they choose the SAD algorithm, while semi-global matching algorithm takes the SGBM algorithm. Experiments show that when the SAD window is small or large, there will be larger matching errors and low precision in results. In SGBM algorithm, BT(Birchfield and Carlo Tomasi) algorithm is used in matching cost calculation and smooth restraints are added in the energy formula and the experiments show that SGBM stereo matching algorithm is much better than SAD algorithm since it has authority in real time. Matching algorithm aims to get a disparity map with denseness and high precision. But as a result of factors like shelter, the light change and lack of texture, there will be wrong matching points in disparity map. Matching algorithm can handle the problem of shelter, but requires large amount of calculation, further research is required to obtain precise stereo matching information and meets the real time requirement.

Luca L et al (2013) proposed a method for autonomously learning representations of visual disparity between images from left and right eye, as well as appropriate saccadic movements to fixate objects with both eyes [10]. A sparse coding model encodes sensory information using binocular basis functions, while a reinforcement learner generates the eye movement, according to the sensed disparity. A multi-scale approach, which exploits binocular basis functions at different resolutions, is used to encode disparities in different ranges. The sparse disparity matching technique has the advantages of the small amount of calculation and the short matching time. This method just can gain some limited disparity information, so it is bad for the reconstruction of the scene.

Wang D et al (2008) formulate a new energy function followed by the use of graph cuts to refine the disparity map which takes segment as node [8]. Firstly, the robust disparity plane fitting is modeled and the method of Singular Value Decomposition (SVD) is used to solve least square. To ensure reliable pixel sets for the segment, they filter out outliers through three main rules, namely; judging reliable area, cross-checking and measuring the distance between previous disparities to the computed disparity plane. Secondly, improved hierarchical clustering algorithm is applied to merge neighbour.

Martin S et al(2005) developed local cross correlation model for stereo correspondence[6].As the disparity gradient of a stimulus increases, observers' ability to solve the correspondence problem and thereby estimate the disparities becomes poorer. It finally fails altogether when the critical gradient reaches the disparity gradient limit. They investigated the cause of the disparity-gradient limit as a part of this work, and developed a local cross-correlator similar to ones proposed in the computer vision literature and similar to the disparity-energy model of neurons in cortex V1. The cross-correlator exhibits poorer performance as the disparity gradient increases. To establish this they conducted a psychophysical experiment in which observers were presented sawtooth waveforms defined by disparity. Thus, human observers and a cross-correlators exhibit similar behavior, which insist humans to use such an algorithm to estimate disparity. As a result, disparity estimation is done with local estimates of constant disparity, which places a restriction on the highest possible stereo resolution.

Nuno R et al (2000) developed a comparative analysis of the performance and characteristics of a set of similarity measure algorithms proposed in the past few years [4]. The presented analysis was focused on the study of final matching error and computational load of the considered correlation functions. The studied similarity function constitute asset of different cross correlation based matching algorithms. Some of the cross correlation measures are given below. R (u, v) denotes a reference window pixel, S(c, l) a search window pixel, $\bar{R}$ the local mean of reference window and $\overline{S(c,l)}$ the pixel mean in the block of search window being compared. The advantages of using pyramidal resolution approach was also considered, to obtain fast running times and a few arithmetic operations with significant loss in final matching error.

$$\bar{R} = \sum_{v=0}^{Rlength} \sum_{u=0}^{Rwidth} R(u,v) \quad (1)$$

$$\overline{S(c,l)} = \sum_{v=0}^{Rlength} \sum_{u=0}^{Rwidth} S(c+u,l+v) \quad (2)$$

$$\text{Simple Cross correlation } SCC(c,l) = \sum_{v=0}^{Rlength} \sum_{u=0}^{Rwidth} R(u,v).S(c+u,l+v) \quad (3)$$

$$\text{Normalized Cross-correlation } NCC(c,l) = \frac{\sum_{v=0}^{Rlength} \sum_{u=0}^{Rwidth} R(u,v).S(c+u,l+v)}{\sqrt{\sum_{v=0}^{Rlength} \cdot \sum_{u=0}^{Rwidth} R^2(u,v).\sum_{v=0}^{Rlength} \cdot \sum_{u=0}^{Rwidth} S^2(c+u,l+v)}} \quad (4)$$

$$\text{Sum of Squared Difference } SSD(c,l) = \sum_{v=0}^{Rlength} \sum_{u=0}^{Rwidth} (R(u,v) - S(c+u,l+v))^2 \quad (5)$$

$$\text{Sum of Absolute Difference } SAD(c,l) = \sum_{v=0}^{Rlength} \sum_{u=0}^{Rwidth} |R(u,v) - S(c+u,l+v)| \quad (6)$$

According to literature survey, it is found that human observers and a cross-correlators exhibit similar behavior. In a system that emulate human vision processing ,most simplest and accurate method is to use cross correlation algorithm as a disparity measure. Another challenging task was to choose a better cross correlation algorithm.

OBJECTIVE OF THE PROJECT

Main objective of the paper is to compare different correlation measures found during literature survey and choose a best disparity measure that can be used for estimating receptive field position disparity in the computer vision systems. Comparison is carried out by computing the disparity value and computation time.

PROPOSED METHODOGY

Image captured from cameras are the input to the proposed system. Before capturing the images camera calibrations has to be done properly .Because the image captured from both cameras should have same size, brightness and colour with slight position disparity for proper processing. For analyzing various cross correlation algorithms Cameras are arranged in a setup to get a disparity of 100 pixels. Proposed methodology is shown in Figure 1.

RGB TO GRAY SCALE CONVERSION

Image captured from cameras are in RGB format. Disparity estimation in RGB image is complex, because it has to deal with red, green and blue pixels. So before processing, RGB image is converted to Gray scale. Gray scale images are distinct from one-bit bidirectional black and white images. Gray scale images have many shades of gray in between. This conversion will compress the image .So the complexity of processing can be reduced. RGB value are converted to intensity values by using equation,

$$I = (.2989 \times R) + (.5870 \times G) + (.1140 \times B) \quad (7)$$

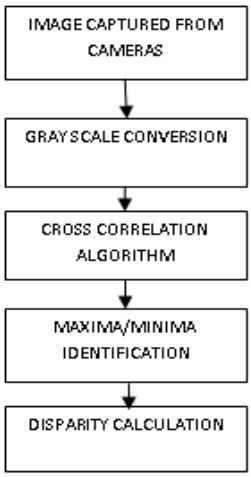

Figure 1 Methodology for the system

CROSS CORRELATION ALGORITHMS

Disparity can be computed by using similarity measures and disparity measures. Mainly different correlation functions can be used for this. Functions like SCC, NCC are some of the similarity measures used. SSD and SAD are some of the dissimilarity measures. To find a best cross correlation algorithm that meets the requirement of proposed system an analysis is performed by testing correlation measures like SCC, NCC, SSD and SAD. Computation time and disparity value are the various parameters used for analysis.

MAXIMA/MINIMA IDENTIFICATION

For a similarity measures the best match is obtained when the returned value is maximum and for dissimilarity measure best match corresponds to minimum value. Horizontal and vertical coordinates of this maxima/minima value is the pixel shift in images required to get maximum correlation. Disparity value is computed by subtracting horizontal coordinates of maximum value of the disparity estimation algorithm from the size of the image. Since disparity is the horizontal shift, vertical coordinates of peak value is neglected.

SIMULATION RESULTS

Simulation is done in matlab 2013a. Figure 2 shows the input images with a disparity of 100 pixels. Both images are analyzed using correlation measures like SCC, NCC, SAD, and SSD .The figure 3 shows the graph plotted by analyzing different cross correlation measures.

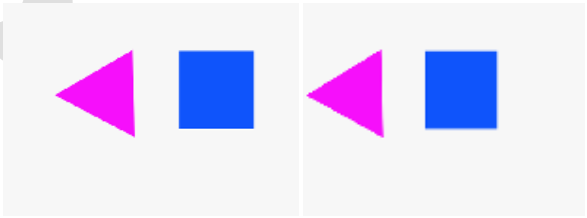

Figure 2. Input images with disparity of 100 pixels

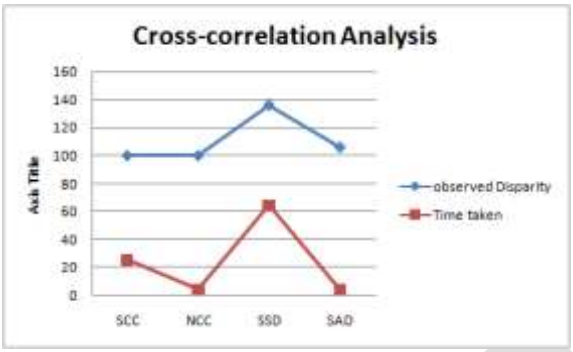

Figure 3.Cross correlation Analysis

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CONCLUSION

According to the simulation results, normalized correlation gave accurate and best result comparing to other measures. Sum of absolute difference correlation require less computation time. Sum of squared difference correlation is more sensitive to variations. Simple cross correlation also provides exact results, but computation time is comparatively large. Results can be modified by analyzing other parameters like error in computation, variations with colour, brightness, contrast etc. Other correlation measures like ZNCC(Zero Mean Normalized Cross Correlation), LSAD (Locally Scaled Sum of Absolute Difference), ZSAD (Zero Mean Sum of Absolute Difference) etc can be added in the comparative study to choose a best cross correlation measures. Also combination of different correlation measures can be used for improving results.

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WAVELET BASED ADVANCED ENCRYPTION STANDARD ALGORITHM FOR IMAGE ENCRYPTION

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Abstract— With the fast evolution of digital data exchange, security of information becomes much important in data storage and transmission. Due to the increasing use of images in industrial process, it is essential to protect the confidential image data from unauthorized access. As encryption process is applied to the whole image in AES ,it is difficult to improve the efficiency. In this paper, wavelet decomposition is used to concentrate the main information of image to the low frequency part. Then dynamic S-Box based AES encryption is applied to the low frequency part. In Dynamic chaotic S-BOX Based AES the Substitute bytes provide security because the S-Box is constructed from the key. The high frequency parts are XORed with the encrypted low frequency part and a wavelet reconstruction is applied. Theoretical analysis and experimental results show that the proposed algorithm has high efficiency, and satisfied security suits for image data transmission.

Keywords— Image encryption; Wavelet Transforms; Advanced Encryption Standard; dynamic S-Box; High frequency wavelet coefficients; Haar- Discrete wavelet transforms.

I. INTRODUCTION

With the rapid development of network and through which information transmission is widely used, the protection of information becomes a crucial issue. Multimedia information, as an important information carrier, how to confirm the confidentiality, integrity and usability when transmitted on the network becomes a research hotspot in recent years.

Wavelet analysis [6] is a mathematical tool, which has been developed only in recent decades, but has been quickly applied to many research areas, such as image processing and audio analysis. Wavelet transform time-domain and frequency-domain or the space-domain and frequency domain have a good local optimization features, as well as the Multi-Resolution Analysis features make wavelet transform suitable for image processing on transform domain.

The S-Box is a substitution box [2] and the only nonlinear component assuring the confusion property of the Advanced Encryption Standard (AES). The strength of the AES algorithms depends on the design of cryptographically strong S-Box. In recent years, chaos has attracted a great deal of attention in many fields especially in cryptography. Using chaos may have potential benefits such as added security and low complexity due its random like behavior that exhibits sensitive dependence on initial conditions [5]. According to the chaotic systems properties it seems to be convenient and simple to obtain ”good” S-Boxes by modifying slightly the initial conditions or system parameters. Many approaches for obtaining S-Boxes based on chaos have been presented, and they severely rely on iterating and discretization chaotic maps.

In this paper, a new image encryption algorithm is proposed which is based on wavelet transform and dynamic S-box based AES algorithm. First of all, wavelet decomposition is used for concentrating original image in low-frequency wavelet coefficients [7], then dynamic S-Box based AES algorithm is applied to encrypt the low-frequency wavelet coefficients. In dynamic S-Box based AES algorithm[3] the S-Box is generated from the key by using pairwise linear chaotic maps. Secondly, an XOR operation is used for high-frequency wavelet coefficients and the encrypted low-frequency wavelet coefficients (as a key stream), so that the image information contained in high-frequency wavelet coefficients is hidden; Thirdly, a wavelet reconstruction is used for spreading the encrypted low-frequency part to the whole image.

II. HAAR -DISCRETE WAVELET TRANSFORMS

The frequency domain transform applied in this algorithm is Haar-DWT [1], the simplest DWT. A 2-dimensional Haar-DWT [1] consists of two operations: One is the horizontal operation and the other is the vertical one. Detailed procedures of a 2-D Haar-DWT are described as follows:
Step 1: At first, scan the pixels from left to right in horizontal direction. Then, perform the addition and subtraction operations on neighboring pixels. Store the sum on the left and the difference on the right as illustrated in Figure 1.

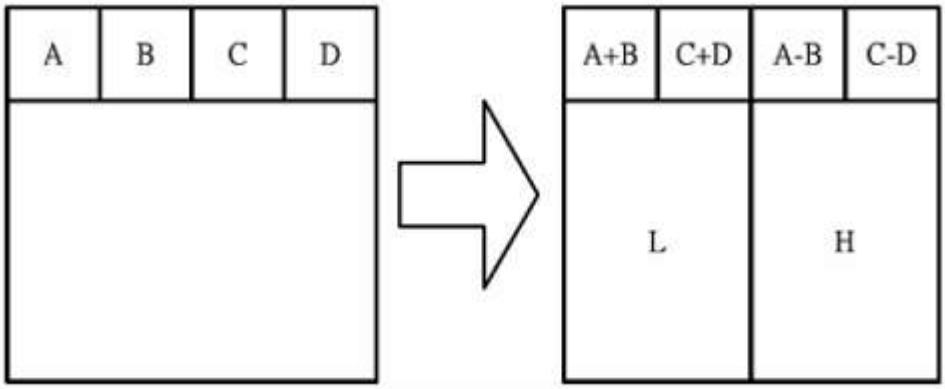

Figure 1. The horizontal operation on the first row.

Repeat this operation until all the rows are processed. The pixel sums represent the low frequency part (denoted as symbol L) while the pixel differences represent the high frequency part of the original image (denoted as symbol H).

Step 2: Secondly, scan the pixels from top to bottom in vertical direction. Perform the addition and subtraction operations on neighboring pixels and then store the sum on the top and the difference on the bottom as illustrated in Figure 2. Repeat this operation until all the columns are processed. Finally we will obtain 4 sub-bands denoted as LL, HL, LH, and HH respectively. The LL sub-band is the low frequency portion and hence looks very similar to the original image.

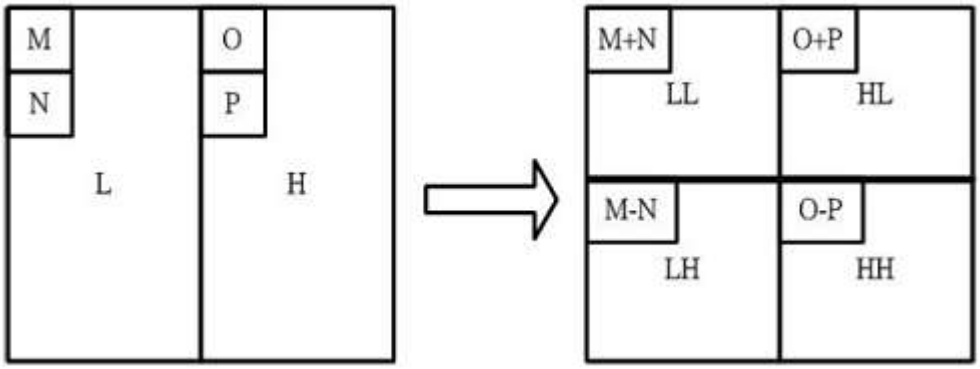

Figure 2. The vertical operation

The whole procedure described above is called the first-order 2-D Haar-DWT. The first-order 2-D Haar-DWT applied on the image ”Lena” is illustrated in Figure 3.

III. WAVELET BASED AES ENCRYPTION ALGORITHM

The AES algorithm [3] is divided into four different phases, which are executed in a sequential way forming rounds. The encryption is achieved by passing the plaintext through an initial round, 9 equal rounds and a final round. The four phases are SubByte Transformation, Shiftrows Transformation, Addroundkey Transformation and Mixcolumns Transformation. The structure of AES algorithm [3] is shown in Figure 4.

A. SubByte Transformation

After the wavelet decomposition the maximum value in each column is 1024. So the S-Box used in AES algorithm can’t be used in the Wavelet Based AES Encryption Algorithm. In the SubByte Transformation dynamic S-Boxes based on one-dimensional chaotic maps are used. A piece-wise linear chaotic map (PLCM) [2] is given by

$$F(x,p) = \begin{cases} \frac{x}{p} & 0 \le x \le p \\ \frac{x-p}{\frac{1}{2}-p} & p < x \le 1/2 \\ F(1-x,p) & 1/2 < x \le 1 \end{cases}$$

(a) (b)

Figure 3. (a)Original image-Lena, (b) Result after the first-order 2-D Haar-DWT

where 0< p< 1/2, x serves as an initial condition, and p is the control parameter for the map F.

Step 1. Divide the output range [0.1, 0.9] into 1024 intervals of equal length. During the iteration of the chaotic map, the output of the PLCM that occurs outside the considered range will be neglected. This is done to generate more chaotic numbers, since initial conditions close to 0 and 1 are not good starting points.

Step 2. Label each region sequentially from 0 to m, where m is equal to 1023. Let the length of each region be denoted by ΔL. Let us denote the first region by R0 =[0.1, 0.1+ ΔL], and the last region by Rm =[0.1+mΔL, 0.1+(m+1)ΔL]. Now, label each region sequentially, that is, R0 → 0, R1 →1, R2 → 2, and Rm → m.

Step 3. Calculate the arbitrary initial condition, IC from the Key using the logistic maps.

Logistic map:

$$x_{n+1} = 1 - \mu x_n,\ \mu \in (0,2), x_n \in [-1,1]$$

Chebyshev map:

$$x_{n+1} = \cos\left(k cos^{-1}(x_n)\right), k \geq 2, x_n \in [-1,1]$$

The 128 bit key is divided into 4 32-bit unsigned integer keys: key1, key2, key3, key4. In the initial condition generation process u0 = 1.9999.

x01 = (key0+key1)/(0xffffffff*2)

x02 =(key2+key3)/(0xffffffff*2)

x21 and x22 are calculated after 100 rounds iteration using Logistic map with the initial value x01 and x02, x2= (x21+x22)/2. The initial condition IC for the dynamic S-Box is calculated after 100 rounds iteration using Chebyshev map with x2 as the initial value

Step 4. Iterate the PLCM using the initial condition. Whenever the PLCM visits a particular region, store that number in an array S. If the PLCM has already visited a particular region, then do not store the assigned number to that region in the array S.

Step 5. Stop iterating the PLCM when it traverses all regions.

Step 6. Rearrange the array S in the form of a table by filling rows sequentially.

B. Shift Rows

The ShiftRows step operates on the rows of the state, it cyclically shifts the bytes in each row by a certain offset as shown in Figure 4. The first row is left unchanged. For the second row, a 1-byte circular left shift is performed. For the third row, a 2-byte circular left shift is performed. For the fourth row, a 3-byte circular left shift is performed. The inverse shift row transformation, called InvShiftRows, used in the decryption, performs the circular shifts in the opposite direction for each of the last three rows, with a one-byte circular right shift for the second row, and so on.

C. Mix Columns

The forward mix column transformation, called Mix-Columns, operates on each column individually. Each byte of a column is mapped into a new value that is a function of all four bytes in that column. The transformation can be defined by the following matrix multiplication on State.

The inverse mix column transformation, called InvMix- Columns, is defined by the following matrix multiplication Where the C matrix used in inverse mix column should be the inverse of A matrix used in forward mix column transformation. That is, the inverse transformation matrix times the forward transformation matrix equals the identity matrix.

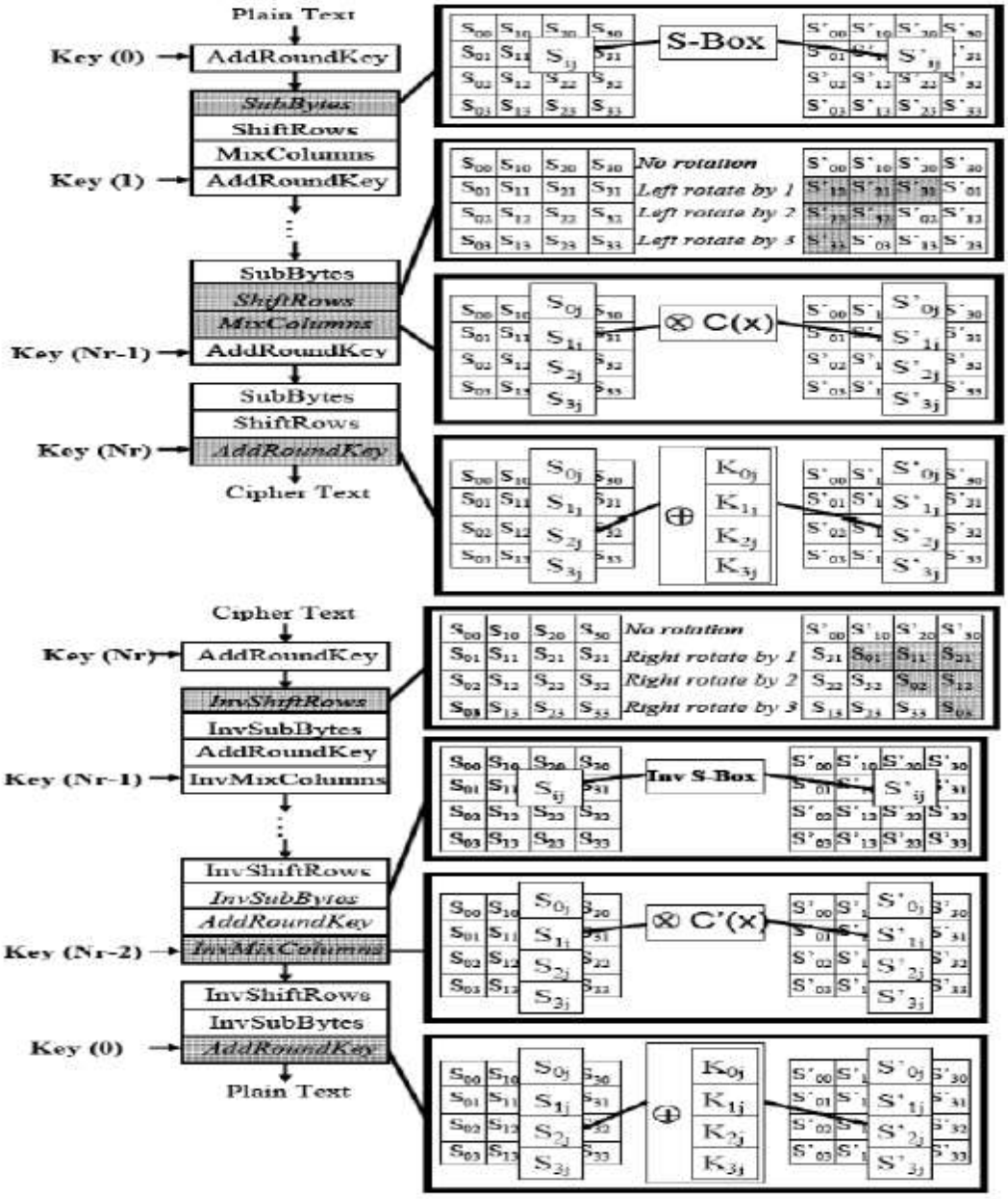

Figure 4. Description of the AES cryptographic algorithm

D. Add Round Key

In the AddRoundKey step [3], the sub-key is combined with the state. For each round, a sub-key is derived from the main key using AES key schedule, each sub-key is the same size as the state. The sub-key is added by combining each byte of the state with the corresponding byte of the sub-key using bitwise Exclusive OR (XOR).

The inverse add round key transformation is identical to the forward add round key transformation, because the XOR operation is its own inverse.

E. Encryption of High-Frequency Wavelet Coefficients

The low frequency wavelet co-efficient (LL part) is encrypted using the modified AES algorithm. The high frequency wavelet co-efficients (LH,HL,HH) are encrypted by EXORing the high frequency parts with the encrypted low frequency part. After that a wavelets reconstruction is used for spreading the encrypted low-frequency part to the whole image.

IV. PERFORMANCE ANALYSIS

A. Efficiency

The Wavelet Based AES image encryption algorithm is tested and evaluated based on software and hardware simulation. Different standard images have been used ”lena” and ”cheetah” (greyscale format) in the simulations which are encrypted with wavelet Based AES and AES algorithms. Table I shows the average time required by Wavelet Based AES and AES for each image. From the Table it is clear that Wavelet Based AES algorithm is much faster than AES algorithm.

Image(Size)	AES Encryption Time	Wavelet Based AES Encryption Time
Lena(256*256)	31.75 ms	8.2 ms
Cheetah(200*320)	29.25 ms	7.52 ms

Table I: AVERAGE TIME REQUIRED BY AES AND WAVELET AES FOR DIFFERENT IMAGES

B. Differential Approximation Probability

The nonlinear transformation S-box should ideally have differential uniformity. An input differential Δxi should uniquely map to an output differential Δyi, thereby ensuring a uniform mapping probability for each i. The differential approximation probability of a given S-box, DPs, is a measure for differential uniformity and is defined as

$$DP^{s}(\Delta x \rightarrow \Delta y) = \left(\frac{\#x \in X | S(x) \oplus S(x + \Delta x) = \Delta y}{2^{m}}\right)$$

where X is the set of all possible input values, and 2m is the number of its elements.

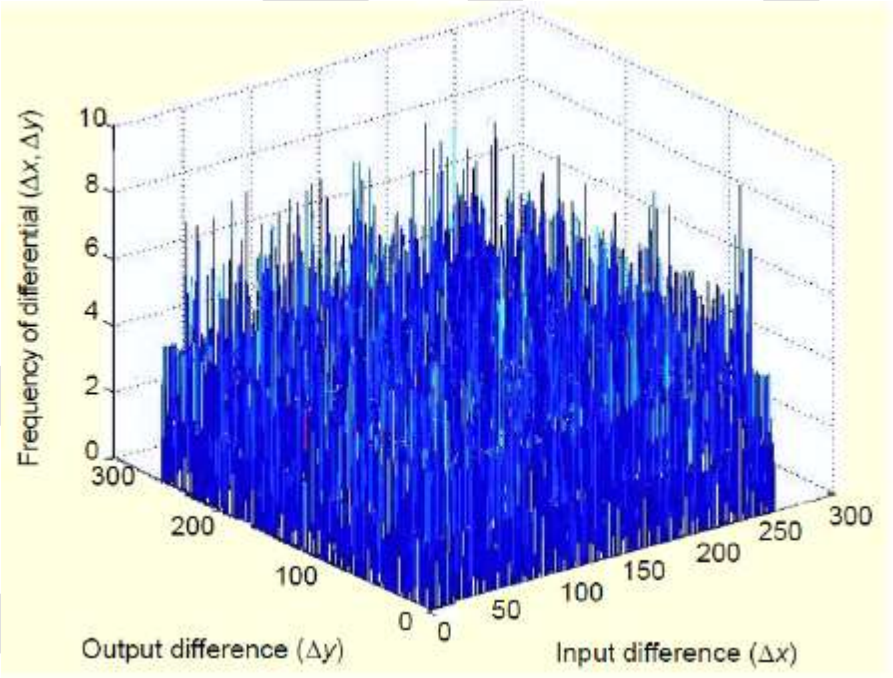

Figure 5:. Differential distribution of S-box in Table 1

In Figure 5, the distribution of the differentials for the S-box constructed by On Dynamic chaotic S-BOX [2] is shown, where the x-axis represents the input differentials Δx, the y-axis represents the corresponding output differentials Δy, and the z-axis represents the number of occurrences of the particular input and output differential (Δx, Δy). Table I shows those differentials that occur with the maximum probability of 10/256. The rest of the differentials occur with a probability of less than 10/256. The maximum differential probability, DPs, is 12/256 in case of [2]. Also, more input and output differential pairs occur with the maximum probability of 10/256 as compared to PLCM S-box.

C. Histograms of Encrypted Images

To prevent the leakage of information to an opponent, it is also advantageous if the cipher image bears little or no statistical similarity to the plain image. An image histogram illustrates how pixels in an image are distributed by graphing the number of pixels at each

colour intensity level. The histograms of the several encrypted images as well as its original images that have widely different content are calculated and analyzed. One typical example among them is shown in Figure 6.

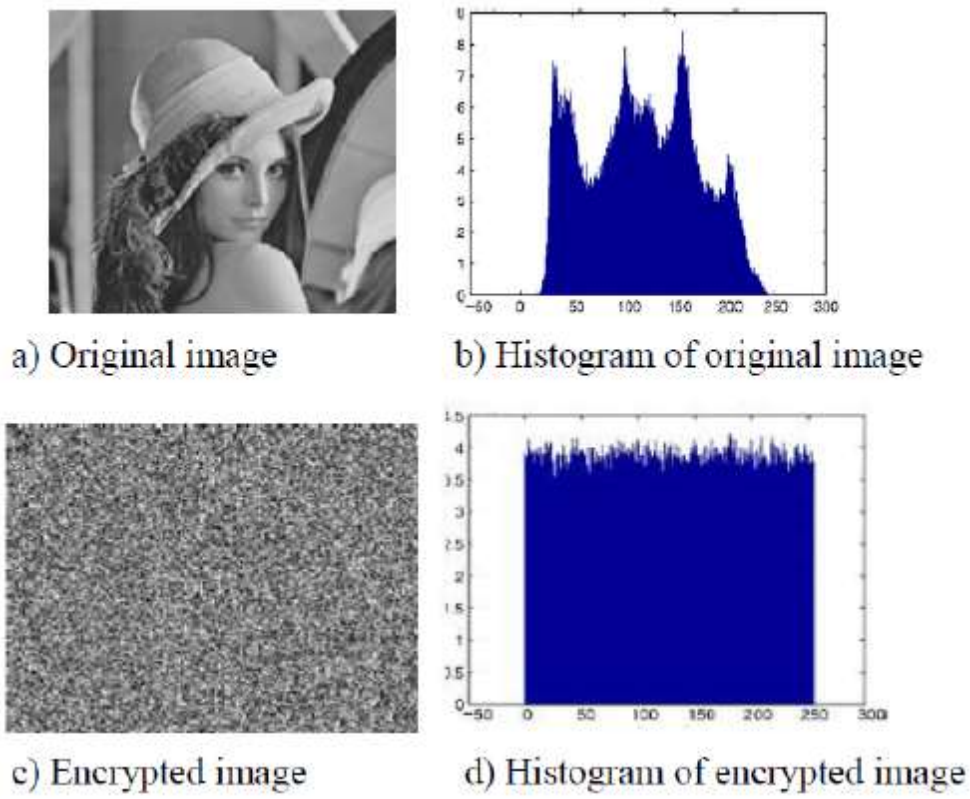

Figure 7. Histograms of the plain image and ciphered image

The histogram of a plain image Lena image (Figure 6a) of size 256x256 pixels) contains large spikes. The histogram of the cipher image as shown in Figure 6d, is uniform, significantly different from that of the original image, and bears no statistical resemblance to the plain image. It is clear that the histogram of the encrypted image is fairly uniform and significantly different from the respective histograms of the original image and hence does not provide any clue to employ any statistical attack on the proposed image encryption procedure.

D. Correlation Property Test

The following method is used to test the pixel correlation property. First, 1000 couples of pixels are randomly chosen (horizontally, vertically and diagonally) from the cipher image. Second, the correlation coefficient of adjacent pixels of the cipher image obtained using the following formulas:

$$\boldsymbol{E(x) = \frac{1}{N}\sum_{1}^{N} xi}$$

$$\boldsymbol{D(x) = \frac{1}{N}\sum_{1}^{N}(x_i - E(x))2}$$

$$\boldsymbol{Con(x,y) = \frac{1}{N}\sum_{i=1}^{N}\big(x_i - E(x)\big)(y_i - E(y))}$$

$$\boldsymbol{\gamma_{xy} = \frac{Con(x,y)}{\sqrt{D(x)\sqrt{D(y)}}}}$$

In which x, y are gray value of two adjacent pixels, $\boldsymbol{\gamma_{xy}}$ is the correlation coefficient. Adjacent pixels of original image are usually highly correlated, that is, the correlation coefficient is close to 1. Figure 7 shows the results of correlation property analysis. Ideally,

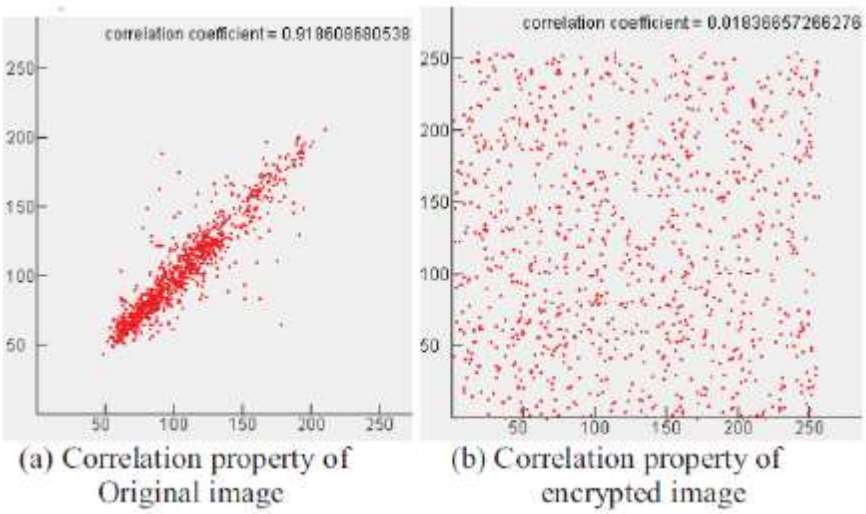

Figure 8. Pixel correlation analysis

encryption algorithm should make the adjacent pixels correlation coefficient of cipher image close to 0, that is, pixels are basically uncorrelated, which illustrates the statistical properties of original image have been randomly diffused into cipher image.

V. CONCLUSION

To improve the efficiency of AES wavelet decomposition is used to concentrate the main information of image to the low frequency part. Then dynamic S-Box based AES encryption is applied to the low frequency part. In Dynamic chaotic S-BOX Based AES the Substitute bytes provide security because the S-Box is constructed from the key. The high frequency parts are XORed with the encrypted low frequency part and a wavelet reconstruction is applied.

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QR code: A safe and secure method of authenticating legal documents

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Abstract*:* In today's world security of data is an important issue. Nowadays the forgery of legal documents is increasing at an alarming rate. To solve this problem, we provide an innovative way to authenticate the legal document (mark sheet). In this paper, we provide a method where each legal document (mark sheet) will come with a QR code. Each QR code will contain the unique details of the document which will be encoded using AES algorithm. So, if anyone tries to change the data he cannot do it because the encryption key is not known to him. The data can be retrieved using unique key. Paper proposes the idea of detecting the tampered data in legal document.

Keywords: AES algorithm, Encryption, Decryption, Quick Response (QR) code.

I. INTRODUCTION

In today's data sensitive world, it is almost impossible to secure legal data. Data of the legal documents like mark sheets, license, ATM card can be easily forged and used for greedy purposes. Example, tampering of marks or changing names in any document. Such fake mark sheet can be submitted to any company to get job or in any institution to get admission. Such forged documents can cause huge financial loss to the system. In present method the data authenticity [1] is done by humans and there are chances that it is not completely accurate. There is no method to detect such forged documents. So there's a need to secure such hard bounded legal data. In this paper, we are representing the method to detect such forged documents. In our system, we will print each document with a QR code [1][7]. This QR code will contain unique details about the document holder. These details can be encrypted using AES algorithm [8][9] and will be converted into QR code. So, whenever any person wants to check if this document is forged or not then that person can scan that QR code [1][7]. This scanned image will be sent to server. This server will decrypt this code using unique key and check for corresponding entry in database. If any record matches with it, then that record will be sent to that person.

QR Code is a type of 2D matrix barcode [1][7], which is popular because of its large storage capacity. The main feature of QR code which distinguishes it from other similar codes is that it can be easily integrated with mobile devices. In our mark-sheet system, we encode the necessary data of each student in the QR Code, like the student's name, roll number, permanent registration number (PRN), semester and year of study, and marks obtained in different subjects. All the data is encrypted using AES encryption algorithm [8][9] and stored in the QR code, and then the QR Code is printed on each mark-sheet.

II. METHOD USED

In our paper, we are using the AES algorithm. AES is based on rijndael cipher block .It is developed by two Belgian cryptographers *Joan Daemen and Vincent Rijmen*. Rijndael is a type of cipher with different block and key sizes. The block size is 128 bit and there are 3 different key sizes available i.e. 128 bit, 192 bit & 256 bit. In AES size of key and plain text need to be selected independently .The size of key and plain text decide the number of rounds to be executed. There are minimum of 10 rounds for 128 bit key and maximum of 14 rounds for 256 bit key. It is also called as symmetric key algorithm, which means same key is used for encrypting and decrypting of data. The process of converting plain text to cipher text is given below:

ALGORITHM:

(1) Do the following one time initialization process:
   (a) Expand the 16 byte key to get the actual key block to be used.
   (b) Do one time initialization of the 16 byte plain text block (STATE).
   (c) XOR the state with the key block.
(2) For each round, do the following:
   (a) Apply S-BOX to the each of the plain text bytes.
   (b) Rotate the row K of the plain text block by K bytes.

(c) Perform the mix column operation.
(d) XOR the state with the key block.

AES algorithm [8][9] process is divided into two parts:-

1) One time initialization process: This process is divided into two parts such as initialization of key and initialization of text.

a) Expand the 16 byte key to get the actual key block to be used:- In this step, we expand the 16 byte key into 11 array of each of 4*4 matrix i.e.16 byte is expanded to 11*4*4= 176 byte.

Out of 11 arrays, we use 1st array for initialization and remaining 10 arrays used for 10 rounds, 1 array per round. A word means four bytes. Therefore, our 16-byte initial key will be expanded into 176 byte key i.e. 176/4 words i.e. 44 words.

ALGORITHM FOR KEY EXPANSION:-

```
KeyExpansion (Byte key [16], word w [44])
{
  Word temp;
  for (i=0; i<4; i++)
  w[i]=(key[4*i], key[4*i+1], key[4*i+2], key[4*i+3]);
  for (i=4; i<44; i++)
  {
   temp=w[i-1];
   If(i mod 4 = 0)
   {
     temp= subWord(RotWord(temp)) XOR const[i/4];
   }
    w[i]=w[i-4]  XOR temp;
}
}
```

In first step, the original 16 byte key is copied into first four words of the expanded key. After filling the first array (for words numbered W[0] to W[3]) of the expanded key block. The remaining 10 arrays are filled one-by-one. Every added key block depend on the immediately preceding block and the block 4 positions earlier to it. i.e. W[i] depends on W[i-1] and W[i-4].

For filling four words at a time, the following logic is used:–

I) If the word W in the array is a not a multiple of 4 then simply XOR is used.

W[i] = W[i-1] XOR W[i-4]

Example 1- W [5] can be calculated by using W[4] XORing with W[1]

i.e. W[5]= W[4] XOR W[1].

II) Else perform substitution, rotate and constant operation for the value of temp.

i.e. temp = substitute(Rotate(temp)) XOR (Constant [i/4]).

Where, temp is a temporary variable used to store value of W[i-1].

Rotate – perform circular left shift on the content of the word by 1 byte.

Example - input : {00,01,02,03} will become {01,02,03,00}

Substitute – perform a byte substitution on each byte of the input word using S-BOX[8].

Constant - XOR the output of above step with constant. A Constant is a word consisting of 4 byte. The value of constant depends on round number.

b) One time initialization of 16 byte plain text block:- 16 byte plain text block is copied into a 2D 4*4 array called state. Order of copying is column wise order. First four byte of plain text is copied to first column of state array. Next four byte of plain text is copied to second column of array and so on.

c) XOR state and key:- First 16 byte of expanded key is XORed into the 16-byte state array. And the result is saved in the state array.

2) Process in each round :

The following process is executed 10 times, one per round.

a) Apply S-BOX to each of the plain text byte:- The content of state array is looked up into the S-BOX[8]. Byte-by-byte substitution is done, to replace the content of state array with the respective entry in the S-BOX [8].

b) Rotate row K of the plain text block by k bytes:- Each of the four rows of the state array is rotated to left. Row 0 is rotated by 0 byte, row 1 by one byte, row 2 by two byte and row 3 by 3 bytes.

c) Perform a Mix Columns operation: This step consists of two operations.

i) Matrix multiplication

ii) GALOIS field multiplication

i) Matrix multiplication- Each value in the column is multiplied against every value of the matrix. The results of these multiplications are XORed together to produce only 4 resulting bytes for the next state. The multiplication is performed one matrix row at a time against each value of the state column.

Example 2 -

2	3	1	1	B1	B5	B9	B13
1	2	3	1	B2	B6	B10	B14
1	1	2	3	B3	B7	B11	B15
3	1	1	2	B4	B8	B12	B16

Therefore,

b1= (b1*2) XOR (b2*3) XOR (b3*1) XOR (b4*1)

b2= (b1*1) XOR (b2*2) XOR (b3*3) XOR (b4*1) and so on.

Perform the same multiplication for all the 16 values.

ii) Galois Multiplication – the result of multiplication is actually the output of lookup of L-table, followed by the addition of result, followed by lookup of E-table. The addition means the mathematical addition, not a bit-wise AND operation. All numbers being multiplied using the MixColumn function converted to HEX will form a maximum of two digit HEX number. We use first digit in the number on the vertical index & second on horizontal index. If the value being multiplied composed of only one digit we use 0 on the vertical index.

Example 3:- If the two hex values being multiplied are AF * 8 we first look-up L-index which return B7 and then Look-up L(08) which returns 4B. Once the L-Table Look-up is Complete, we can simply add the numbers together. If addition exceeds FF value then subtract result from respective result. i.e.

B7+4B

```
   1011   0111
+  0100   1011
-------------------------------------------------
1  0000   0010   = 102 > FF  therefore, subtract FF from result

       0000  0010
+      0000  0001  (2's compliment of  FF)
```

0000 0011 = 03

- The last step is to Lookup the result in E table. Again we take the first digit to look-up the vertical index and second digit to look-up the horizontal index. i.e. E(03) = 0F

d) XOR the state with the key block : this step XOR the key for this round into the state array.

For decryption, the process can be executed in the reverse order.

III. GENERATION OF QR CODE

To generate a QR code [1][7], we first make the string of data bits. String includes the data which need to be encoded in the QR code. QR uses Reed-Solomon error detection [10] technique to generate the error correction code word for the QR code.

The resultant data is used to generate the QR code of 8 types. Each QR code have different mask pattern. Each mask pattern changes the bits according to their coordinates in the QR matrix. Mask pattern helps to make the QR code easier to read for a QR scanner. If character length exceeds 1264 characters then the same process is repeated till the time entire message is not encrypted.

CONCLUSION

In today's world as the usage of data is increasing, so is the ways to forge data. Authenticity of data is a very important issue nowadays. This paper presents an innovative method to detect such forgery of data and ensure the authenticity of data. We present a method to encrypt the data using AES and store the encrypted data in QR code. By using simple android mobile application we can generate the query to receive the original data from the server side. And finally, the data can be compared with the original data.

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CAVITY BACKING IN SPIRAL ANTENNAS

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Abstract— Archimedean spiral antenna with different cavity-backing configurations have a vital role in determining the antenna characteristics. The antenna can be designed with different cavities to improve the half power beam width and axial ratio. In the paper the different methodologies and theoretical support by those cavities are presented. The results show that the antennas are better than those of traditional abnormal cavity-backed Archimedean spiral antennas with good features. The designed antennas can be used in the ultra-wideband communication system on the mobile carrier mainly in defence

Keywords— Archimeden spiral antenna, cavity-backing, antenna gain, MIMO, slot antenna, Hat-shaped reflecting cavity, chip resistors, PEC

INTRODUCTION

Wireless communication technologies continue to evolve and expand at a phenomenal pace. Many wireless applications thus require low cost and compact size [1] wideband antennas. Wideband antennas are widely used in many applications such as ground penetrating radars, tracking, sensing and imaging, multiple input and multiple output (MIMO) and diversity operations [2], [3], short pulse radar for automotive and robotics applications [4], [5]. The spiral antenna is an antenna with low profile and circular polarization with wideband characteristics. The frequency band of a spiral antenna depends only on the physical dimension of the antenna. However, spiral antennas require balanced feed structures and the input impedance of the spiral antenna can also vary from 140-200 Ω. Most standard feeders such as coaxial cables are unbalanced with 50 Ω input impedance. Therefore, balanced feeding structures which can also perform the impedance transformation are needed for spiral antennas. Spiral antennas also have a low gain.how ever s these spiral antennas are generally used for defence industry, its primarily should have a right hand polarization for the application including gps. In military appications wideband antennas with unidirectional pattern is preferred. But in spiral antenna bidirectional pattern is obtained. A reflecting cavity can be placed at the bottom of the antenna at a distance of one fourth of wavelength of the center frequency. So a study is made using different types of cavity backing in the spiral antenna that could obtain a pattern with good gain and axial ratio.

ARCHIMEDEAN SPIRAL ANTENNA

Spiral antenna belongs to the class of frequency independent antennas, those with a very large bandwidth. The fractional bandwidth can be as high as 40:1. This means that if the lower frequency is 1 GHz, the antenna could still be in band at 40GHz, and every frequency in between. Spiral antennas are usually circularly polarized. The spiral antenna's radiation pattern typically has a peak radiation direction perpendicular to the plane of spiral. The half-power beam width is approximately 70-90 degrees. The smallest and largest circumference of the spiral structure determine their respective upper and lower cut-off frequencies. Most of the previous research on spiral antennas was based on experiment and the band theory. Band theory is defined by the spiral antenna operating in the region where the circumference of the spiral is equal to a wavelength. In most cases, a spiral antenna consists of a thin metal foil spiral pattern etched on a substrate fed from the centre. Spiral antennas radiate bi-directionally. However, most of the applications require unidirectional radiation characteristics as well as having low profile. It can be resolved by adding a lossy cavity to the spiral antenna, backed by conductor, or adding absorbing materials. It absorbs the back radiation from the spiral providing for a wide bandwidth by reducing the reflection from ground plane.

ANTENNA DESIGN

The Archimedean spiral antenna has extremely wide bandwidth and its two arms are linearly proportional to the polar angle. The slot type Archimedean spiral is the dual of the strip type Archimedean spiral. Thin film wideband width planar antenna applications of 3D Monolithic Microwave Integrated Circuits (MMIC) use slot type spiral. A dual arm is obtained by duplicating the single arm along the normal axis with 180o degree rotation. Dual arm spiral antenna has symmetrical radiation pattern and better axial ratio compared to a single arm spiral antenna [25]. It requires a balanced feeding due to its balanced structure. Therefore, authors in [25]

used a balun to obtain balanced structure from unbalanced source and it transforms the characteristic impedance of a transmission line to input impedance of the antenna.Figure1 shows the single arm and two-arm Archimedean spiral antenna with inner radius r1 and outer radius r2 and with width and spacing w and s respectively. The circular Archimedean spiral antenna produces a smooth change when the current adjusts with frequency. The two-arm Archimedean spiral antenna radiates from a region where the circumference of the spiral is approximately equal to one wavelength. This region is called an active region of spiral.

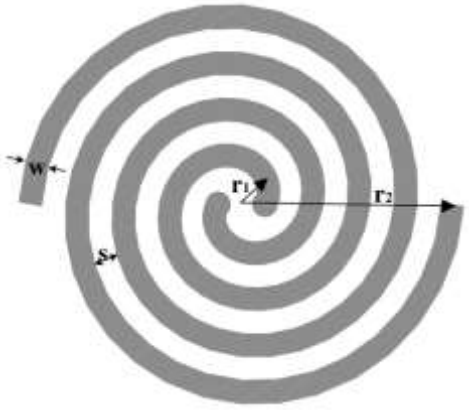

Figure1: Archimedean spiral antenna

CAVITY BACKING

Cavity backing in spiral antenna is generally done to make the bidirectional pattern unidirectional. Most of the applications require unidirectional radiation characteristics as well as having low profile. It can be resolved by adding a lossy cavity to the spiral antenna, backed by conductor, or adding absorbing materials. It absorbs the back radiation from the spiral providing for a wide bandwidth by reducing the reflection from ground plane. The lossy cavity improves the low frequency impedance behaviour and axial ratio of the spiral by reducing reflections from the end of the each arm of the spiral. Furthermore, [5] showed that in order to reduce the reflected currents from the arm ends of the unbalanced-mode Archimedean spiral antenna, a ring-shaped absorbent material may be applied to the cavity. It also absorbs the back radiation from the spiral giving a large pattern bandwidth by reducing the reflection from the ground plane that causes pattern nulls [8], [9]. However, lossy cavity creates gain reduction due losses. Moreover, lossy cavity gives extra depth and weight to the antenna. Without backing, spiral antennas have bidirectional radiation, which is not desirable. Therefore, conductor backed spiral antennas have been used in many applications to get an unidirectional radiation [10]. Reference [11], [12] and [13] showed that the conductor backed spiral antenna, where a metal ground plane is used as a conductor, has a 1:2:1 circular polarization bandwidth and to reflect unwanted power in order to get unidirectional path. However, in conductor backed spiral antenna, the conductor will reflect the radiated fields that enter the cavity. However, the reflected fields will destroy the forward travelling fields of the spiral antenna if the cavity depth is smaller than a wavelength. Another method to get unidirectional pattern in spiral antenna is adding absorbing materials. In absorbing material backed spiral antenna, the reflected fields from the cavity will be attenuated. Therefore, spiral antenna can have its wideband characteristics. One of the absorbing materials is a chip resistor which is used in a microstrip spiral antenna structure. The usage of microwave absorbing material is not approved for some applications due to the reduced gain. Reference [13] used three metal plates inside the hollow metal cavity to improve the bandwidth of the spiral antenna. However, a hollow metal cavity reflects the wave into the spiral and degrading the antenna performance, particularly at the low frequency. Thus, resistive loads were added at the end of each of the spiral arms to overcome the above problem. Moreover, it reduces the reflection from the end of each arm and improved the low frequency Voltage Standing Wave Ratio (VSWR) and axial ratio. Reference [14] investigated that the standing wave is appeared when the thickness of the substrate becomes thinner and it disrupts the radiation patterns. Furthermore, standing wave deteriorates the impedance matching and radiation patterns when the distance between the spiral antenna and the ground plane is less than $\lambda/2$. The thin thickness of the substrate reduced the gain at lower frequencies. Reference [15] therefore proposed a method to remove the standing wave by loading the antenna with chip resistors and it was placed inside the substrate. However, the resistive loading was not enough to remove the standing waves of higher frequencies. Thus, it was replaced along the spiral antenna. However, it made undesirable effects and much power was

dissipated in the loads. Size of the spiral antenna is another issue that has been considered for many years. One way to reduce the size is through material loading. However, it can be a problem in some applications due to material loss and weight. Therefore, slow wave spiral techniques were developed to overcome the problems inherent in material loading. A slow wave spiral is produced by adding some type of high frequency profile, such as a zigzag or sine wave, to spiral antenna and increasing the circumference of the spiral antenna, such as the square spiral. Reference [16] assert that antenna size can be reduced by choosing a small starting angle φstart while keeping the spiral constant unchanged. However, changing the antenna height from bottom plane makes a variation to the antenna characteristics. Therefore, antenna height cannot be made extremely small without additional measures to reduce the variation in the antenna characteristics [17]. The electrical antenna height (Hant/ λ) decreases when the frequency decreases and the spiral becomes strong due to the reflected EM fields impinging on it. The current along the conducting spiral arms are affected by these reflected EM fields. The impinging EM fields can become weaker by increasing antenna height which increases the electrical antenna height. However, it is not possible for low profile antennas. Therefore, [18] proposed a method to use a ring shaped strip absorber to remove the EM fields reflected from the bottom of the cavity. Furthermore, ring shaped strip absorber was reduced to arc shaped strip absorber by considering the size of the antenna. Reference [9] suggests that thick dielectric, low dielectric constant , and low insertion loss is always desired for broadband purposes and increased efficiency. In addition, slow wave techniques are employed to move the radiation zone closer to the centre of the spiral for a specific wavelength. As a result, this reduces the velocity of propagation along the length of the spiral, which reduces the low frequency cut-off of the spiral providing for size reduction. Reference [20] argues that when the length of the longitudinal direction of the antenna decreases, the operation bandwidth of the antenna increases. Furthermore, the low frequency cutoff can be reduced by terminating the end of each arm of the spiral with resistive loads to remove the reflections from the end of the spiral. However, it reduces the efficiency and gain. Spiral antennas are classified into several types; square spiral, star spiral, Archimedean spiral, and equiangular spiral. The square spiral antenna has the same advantage as circular Archimedean spiral antenna at the lower frequencies. However, the square spiral geometry seems to be less frequency independent at high frequencies [19]. A star spiral provides as much size reduction same as the square spiral and it allows tighter array packing that the square spiral does not exist [19]. However, one of the major disadvantages of the star and square spiral antenna is its dispersive behaviour. Archimedean spiral is the most popular configuration due to its wide bandwidth and allowing tighter array spacing. The equiangular planar spiral antennas have similar characteristics to the Archimedean spiral. by using an elliptical configuration, it is possible to regulate the beam-width in the two orthogonal planes by compromising to some extent the purity of the circular polarization. Beam steering properties can be incorporated by using phased arrays of spiral elements and improve upon the axial ratio performance of similar structures to be used in wideband satellite communications systems. Also, to make Archimedean spiral antennas more power efficient, electromagnetic band gap materials to be incorporated into the cavities of spiral antennas.[20] . A ring shaped strip absorber is placed under the spiral arms to restore the wideband characteristics of the antenna. Subsequently the strip absorber is divided into two arc shaped strip absorber and the volume of each is decreased by reducing angles. It is chosen that when this arc angle is chosen greater than 90 degree the antenna characteristics of 180 degree are reproduced. . It is noted that at low frequencies the presence of cavity causes a noticeable variation in antenna characteristics. [20] . The antenna has the broad beam width that more than 80° and low axial ratio that less than 4dB and are better than those of traditional abnormal cavity-backed Archimedean spiral antennas when it is is configured with a hat-shaped reflecting cavity and chip-resistor loads to improve the half power beam width and axial ratio.[21] The loading of chip-resistors at the outer edge of the spiral, as well as developing a hat-shape cavity that enhances the antenna performance.[20] A novel hybrid backed cavity with the EBG structure in the outer region and PEC in the center region can effectively improve spiral antenna gain and broaden operating frequency band[7].

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CONCLUSION

An Archimedean spiral antenna with cavity backing is surveyed and analysed with various conditions. This shows that cavity backing can not only make the pattern unidirectional but also it can improve the gain axial ratio and other parameters significantly by change in the design pattern

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FPGA BASED CONTROLLER CARD FOR DATA ACQUISITION SYSTEM

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Abstract— Data acquisition is the process of measuring real world physical conditions and converting it into digital numeric values. A typical data acquisition system consists of (i) Sensors that convert physical parameters to electrical signals, (ii) Signal conditioning circuitry, (iii) Analog to Digital Convertors [1]. For Sound Navigation and Ranging (SONAR) front end application specific data acquisition systems, a controller card is required which controls the transmission of data that is received. In this paper, the focus is for an efficient controller card development by using the Virtex – 5 FPGA (Field Programmable Gate Array). FPGAs have soft IPs (Intellectual Property) and hard IPs that can be used on demand. Here the controller card is based on a soft processor microblaze. The use of soft processor reduces the complexity of developing the controller card with an FPGA and an external processor as a controller since the soft processor exists on the same FPGA. This creates a highly robust and reliable system.

Keywords— FPGA; Microblaze; Intellectual Property (IP); SONAR; Human Machine Interface (HMI); Xilinx Platform Studio (XPS); Software Development Kit (SDK)

INTRODUCTION

The data acquisition system receives the data from sensors and is converted to digital form by the Analog to Digital (ADC) cards. The data in digital form is fed from ADC cards to the controller card. Controller card has two regions, an embedded processor and a transceiver hardware section. Embedded processor communicates with the HMI through which necessary control data is taken. Depending on the instructions given by the HMI to the embedded processor, data received from ADC cards are routed to required destination. Virtex5LXT FPGAs have microblaze soft processors and peripherals like UART (Universal Asynchronous Receiver/Transmitter), Ethernet, DDR2 SDRAM (Double Data Rate Synchronous Dynamic Random-Access Memory), Flash etc. as soft IPs. Microblaze is a 32 bit Reduced Instruction Set Computing (RISC) processor [5]. The peripherals can be instantiated based on the requirement to create an embedded system inside the FPGA. Here, an embedded soft processor based controller is developed for SONAR front end application.

METHODOLOGY

ML505 evaluation board based on Virtex 5 FPGA of Xilinx is used for the system development. Block diagram of controller card is shown in Figure -1. The transceiver takes the configuration data from the block RAM (Random Access Memory) which is written by the soft processor. This paper focuses on development of microblaze soft processor based controller.

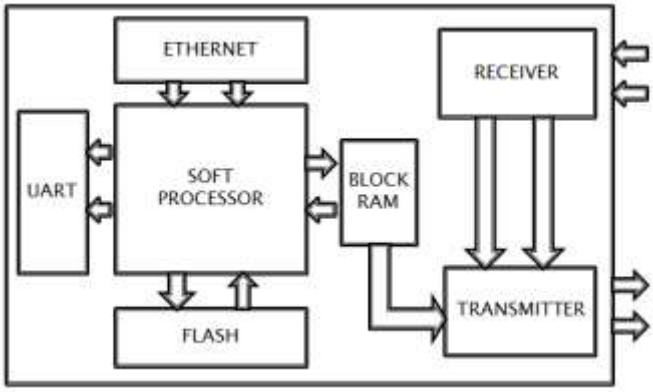

Figure – 1: Block diagram of controller card

Hardware Design

The embedded controller hardware is developed in XPS by instantiating the microblaze soft processor with peripherals UART, Ethernet, Flash and a custom memory peripheral generated from core generator. This custom memory peripheral is the bridge between the transceiver and the embedded processor.

The microblaze processor is instantiated with clock 125MHz and local memory of 64KB. UART and Ethernet forms the Human Machine Interface. The configuration details of the system and any debugging information are shown on the PC through the Tera Term/ Hyper Terminal using the UART 16550 through the RS232 cable. The Ethernet configured was a hard Ethernet MAC which could support speed up to 1Gps and is configured in Gigabit Media Independent Interface (GMII) mode with required jumper settings [6]. The custom Block RAM was made with 32 bit width and 1024 bit depth from the IP Core and the custom Block RAM (BRAM) was added by using the IP – IC (Intellectual Property – Inter-Connect) interface. It was done so because the BRAM must be common to hardware transceiver and the embedded controller. The control data was written to BRAM through the Ethernet and based upon the control data the transceiver would work.

The microblaze soft processor accesses its peripherals using Processor Local Bus [8]. Hence a Processor Local Bus top module is written over the custom memory in order to import the memory peripheral to microblaze processor using the IP – IC interface technology. Intel JS28F256P30T95 BPI flash is used to take back up of last configuration data in BRAM [4].

Software Design

The hardware design is exported on to the SDK to start with the embedded programming. Upon this hardware, a Board Support Package is made. The BSP was made such that the microblaze processor was loaded with Xilkernel OS [3]. Xilkernel is a small, robust, and modular kernel. It is highly integrated with the Platform Studio framework and is a free software library that is available with the Xilinx Embedded Development Kit (EDK) [9]. It allows a very high degree of customization, letting users tailor the kernel to an optimal level both in terms of size and functionality. To this BSP lwIP and xilflash are added for the Ethernet and flash support [11]. Since the design is based on Xilkernel OS, the lwIP is configured in socket mode [7]. The main advantage of Xilkernel OS is multithreading functionality.

Software design can be divided into three sections. The first section includes the startup procedure to initialize the UART along with a programming to assign specific IP address and MAC address to the board. The second section does the reception of packet and extracting the data to write into the BRAM. The third section does the initialization of flash and unlocking the specific memory areas to write the same data from BRAM to flash.

IMPLEMENTATION

The hardware implemented is shown in Figure – 2. The microblaze processor is instantiated with peripherals UART, Ethernet, DDR2, Flash and custom memory core. It could be seen that the microblaze processor communicates with the peripherals using the Processor Local Bus (PLB) and Local Memory Bus (LMB) is used to access the local memory Tools used is Xilinx 13.3 ISE/EDK, Lab VIEW, Wire shark and Tera Term.

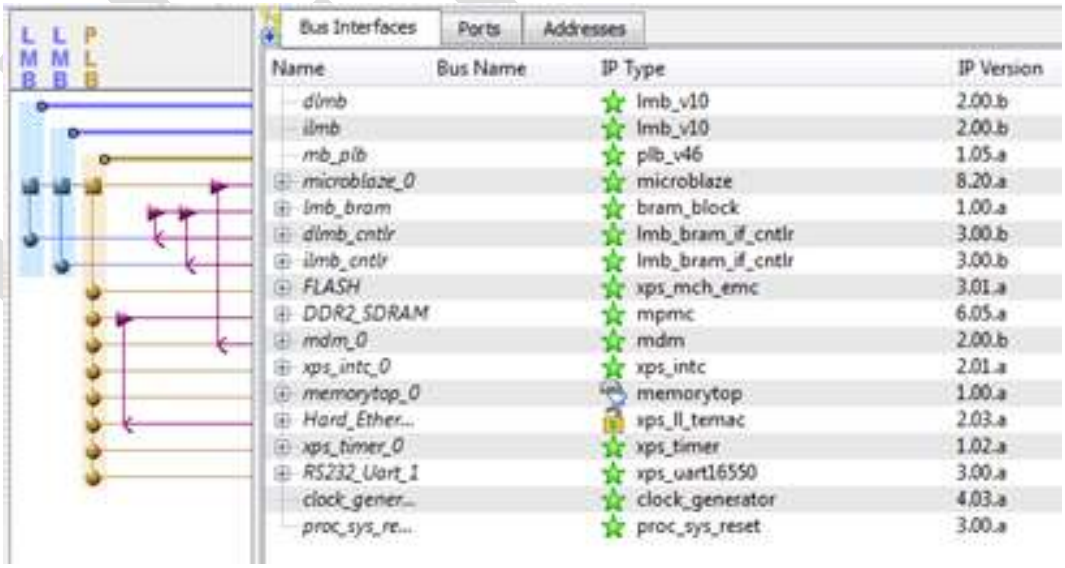

Figure – 2: XPS view of the hardware

Figure – 3 shows the addresses mapped to each of the microblaze peripherals. The memory added is assigned an address space of 1K and the starting address is 0x89840000. The Flash address starts at 0x8C000000 and has a size of 32M.

Bus Interfaces | Ports | Addresses

Instance	Base Name	Base Address	High Address	Size	Bus Interface(s)	Bus Name
microblaze_0's Address Map						
dlmb_cntlr	C_BASEADDR	0x00000000	0x0000FFFF	64K	SLMB	dlmb
ilmb_cntlr	C_BASEADDR	0x00000000	0x0000FFFF	64K	SLMB	ilmb
xps_intc_0	C_BASEADDR	0x81800000	0x8180FFFF	64K	SPLB	mb_plb
xps_timer_0	C_BASEADDR	0x83C00000	0x83C0FFFF	64K	SPLB	mb_plb
RS232_Uart_1	C_BASEADDR	0x83E00000	0x83E0FFFF	64K	SPLB	mb_plb
mdm_0	C_BASEADDR	0x84400000	0x8440FFFF	64K	SPLB	mb_plb
DDR2_SDRAM	C_SDMA_CTRL_BASEADDR	0x84600000	0x8460FFFF	64K	SDMA_CTRL1	mb_plb
Hard_Ethernet_MAC	C_BASEADDR	0x87000000	0x8707FFFF	512K	SPLB	mb_plb
memorytop_0	C_BASEADDR	0x89840000	0x898403FF	1K	SPLB	mb_plb
FLASH	C_MEM0_BASEADDR	0x8C000000	0x8DFFFFFF	32M	SPLB	mb_plb
DDR2_SDRAM	C_MPMC_BASEADDR	0x90000000	0x9FFFFFFF	256M	SPLB0:SDMA_LL1	mb_plb:Hard_Et...

Figure – 3: Address mapped to each peripherals

This implemented hardware is ported to SDK tool for writing the embedded code. Figure – 4 shows the SDK view of the system developed.

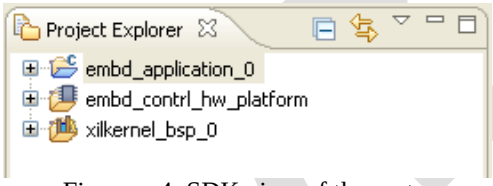

Figure – 4: SDK view of the system

RESULTS

An embedded soft processor controller was developed on ML505 board for SONAR front end application and the coding was done in embedded C [12]. The protocol supports provided include Internet Protocol (IP), Internet Control Message Protocol (ICMP), User Datagram Protocol (UDP), Transmission Control Protocol (TCP), and Internet Group Message Protocol (IGMP) [10]. The system was configured with IP address 192.168.1.100 [2]. The ping command was used to verify the ICMP protocol. TCP protocol was verified by checking the correctness of data by sending it back to PC. A UDP packet was send from lab view and that data was extracted and written on to the custom memory peripheral.

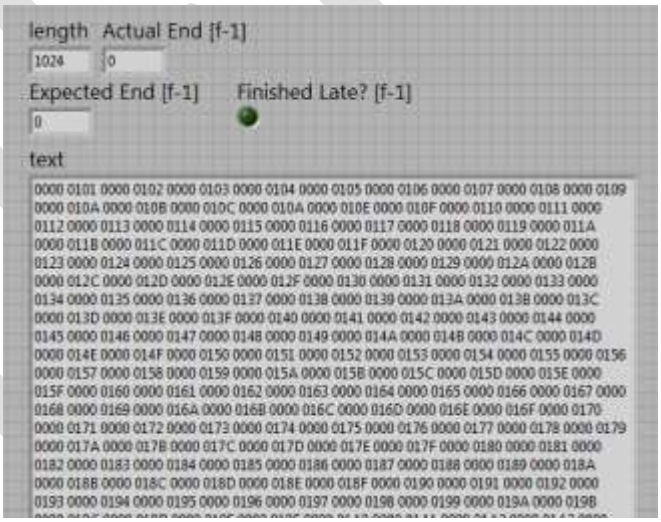

Figure – 5: Lab view providing inputs

The UART output in Tera Term shows the board configuration details initially. Tera Term screen shot is shown in Figure – 6. Once the UDP packet is received by the system, the received number of bytes and the data written to each memory location is displayed which validates the input data. After the completion of data writing to the custom memory, back up of same data is taken by writing the same to flash memory.

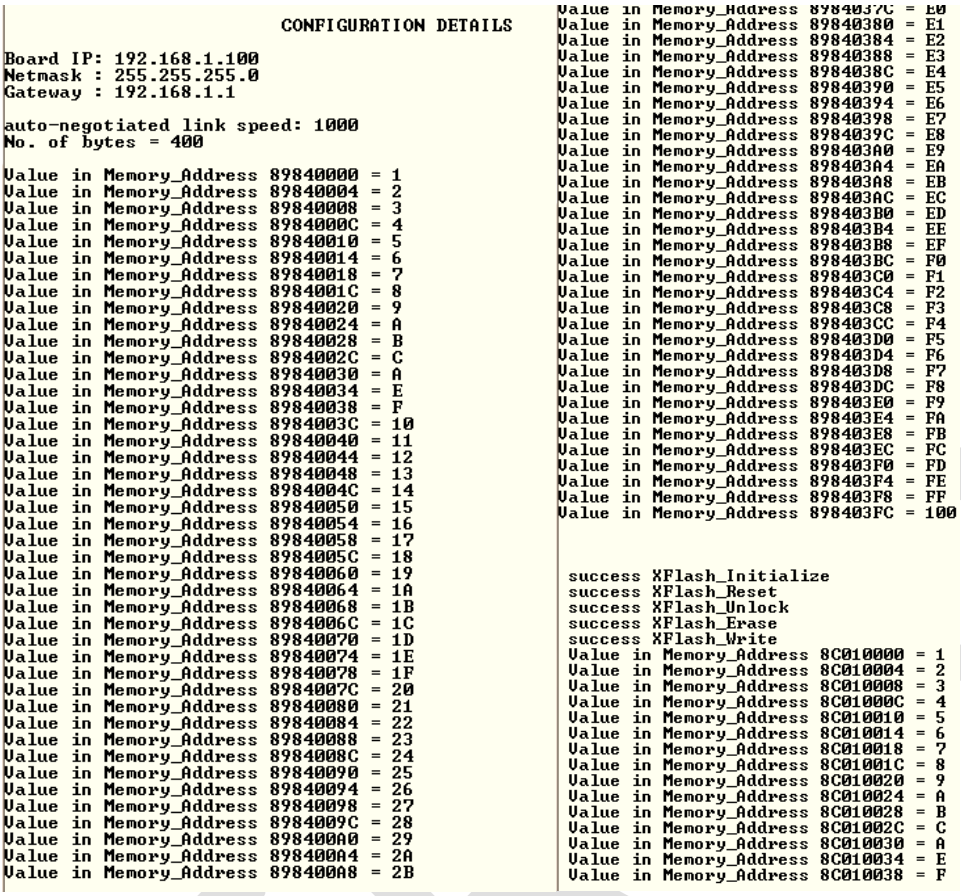

Figure – 6: Display in Tera Term

Wire shark was used as a monitoring tool which showed the data sent and the protocol followed by the data. It is shown in Figure – 7.

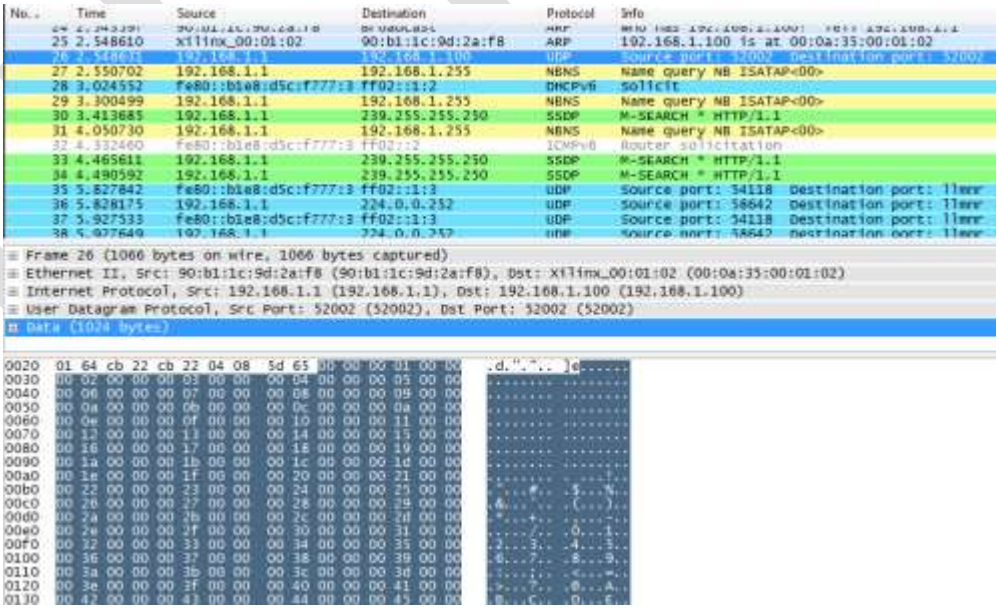

Figure – 7: Wire shark view

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CONCLUSION

Soft processor based FPGA controller card is a promising reliable and robust system for SONAR front end applications. The hardware was built by instantiating microblaze soft processor with UART, Ethernet, Flash and custom memory as peripherals. On this hardware an embedded system was developed which receives data in UDP packet and extract the data to write to the custom memory and a backup of data was taken in flash simultaneously. The system was implemented on Xilinx ML505 board and the required functionalities were verified. Here a highly efficient system is suggested which reduces the handshake unreliability between the hardware and the processor that becomes a big bottle neck while designing controller cards.

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A SURVEY ON CHALLENGES IN WDM-PON SYSTEMS

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Abstract— Communication is a process of exchanging information and ideas between users. In today's world communication networks have emerged as a source of empowerment. Optical communication has a dynamic role in providing secure communication. A Wavelength Division Multiplexing-Passive Optical Networks (WDM-PON) generally supports much higher bandwidth in optical communication. This paper involves a survey on the analysis of the performance parameters for WDM-PON systems. A PON network provides upstream and downstream communication through WDM with different wavelengths. Many parameters such as BER, quality factor, power penalty, etc. are analyzed in this survey for WDM-PON system. With this survey the future researchers will get idea about colorless WDM-PON which supports simultaneous transmission of multiple services in optical communication

Keywords— Wavelength division multiplexing (WDM), Passive optical networks (PON), colorless, downstream, upstream, (Bit error rate) BER, power penalty.

INTRODUCTION

The wavelength division multiplexed passive optical network (WDM-PON) is highly used for its large data bandwidth, enhanced security and scalability to support several local subscribers. Still now various techniques have been proposed by researchers in WDM-PON system. A system that involves with transmission of a single service or a number of services is proposed with WDM-PON. Each system operates with different and discrete techniques. Various methods are also employed for providing both upstream and downstream in a WDM-PON. Simultaneous transmission of wireless and wireline services in which one WDM slot is used to carry the downstream signals is proposed for a WDM-PON [1]. In case of wireless signal some particular range of radio wave signals are used. Many techniques that involve the transmission and analysis of Ultra Wideband signal is proposed for a WDM-PON. For this it should be first noted that whether a corresponding signal is compatible with a WDM-PON or not. Thus a UWB over fiber system that is compatible with WDM-PON based on Fabry-Perot laser diode is reported in [2].

A simple approach to realize flexible access of wireline and IR-UWB services was proposed. The performances of both the services were measured in case of different data rates [3]. A WDM-RoF-PON that can achieve wireline and wireless access synchronously was designed. This system is based on the polarization multiplexing (PM) and Carrier-Suppressed Return to Zero Quadrature Differential-Phase-Shift-Keying (CSRZ-QDPSK). It provides source free (Optical Network Units) ONUs [4]. A spectrally sliced ASE (Amplified Spontaneous Emission) injected RSOA (Reflective Semiconductor Optical Amplifier) with 50 GHz channel spacing was investigated. Then a loop back WDM-PON with 100 Gb/s capacity using the spectrally sliced ASE injected RSOA was designed [5]. A WDM/OCDM PON with loop back configuration is designed which is also capable of upstream transmission. This system is proposed as a simple system with the use of short optical pulses. The quality of these short optical pulses are examined for the designed WDM/OCDM PON system and found to be sufficient for 4-chip OCDM encoding at the Optical network units (ONUs) [6].

An analysis and investigation of the performance of receivers of different classes of WDM PON system is proposed. The performance is analyzed using Manchester coding for different receivers using various data rates and various fibre distances at the optical network unit in a 32 user WDM PON and DWDM PON [7]. WDM-PON architecture is demonstrated which provides a high speed point-to-point downlink data and double-broadcast services with a data rate of 1.25 Gb/s. These two services are provided simultaneously by the proposed WDM-PON system [8]. A centralized light source WDM-PON which supports simultaneous transmission of two services is proposed. The two services are point-to-point data and broadcast services with data rates of 10 Gbit/s differential quadrature phase shift keying (DQPSK) as downstream data and superimposed 2.5 Gbit/s inverse return-to zero (IRZ) broadcast service [9]. A WDM-PON system is designed with upstream scenario and the performance of the system is measured by incorporating tunable lasers in the ONUs [10].The performances of the systems are analyzed along with various parameters. Some of the important parameters are BER and power penalties. The remaining part of this article analyzed and examined about concept behind WDM-PON systems, upstream and downstream communication and performance analysis of the different parameters of WDM-PON systems.

WDM-RoF PON systems

A wavelength division multiplexing–passive optical networking (WDM-PON) architecture that is compatible with 60 GHz Radio-over-Fiber (RoF) systems is designed. This system is capable of providing both wireless and wired services simultaneously. Each wireless/wire-line channel is placed in one WDM slot to carry a 2.5 Gb/s Orthogonal Frequency Division Multiplexing (OFDM) signal. The downstream wavelengths of the wireless and wire-line channels and reused for uplink by an on–off-keying modulation format signal. In this paper, the design for wireless and wireline channels is independent. Because of this the layouts of wireless or wire-line channels are flexible for different applications. From the analysis results it is noted that the power penalty for both 2.5 Gb/s wire-line downstream and 2.5 Gb/s wireless downstream are less than 0.5 dB. This performance exists for BER of 1×10^{-4} for 20 km

transmission. The power penalty is less than 1 dB for BER of 1×10^{-4} for 50 km transmission. It is also analyzed that the wireless upstream power penalty is less than 0.4 and 0.7 dB at a BER of 10^{-9} over 20 and 50 km of SMF, respectively. The power penalty for wire-line upstream is less than 0.2 and 0.4 dB at a BER of 10^{-9} over 20 and 50 km SMF, respectively.

Compatibility of UWB in WDM-PON:

A novel approach to check the compatibility of ultra-wideband (UWB) over fiber system with wavelength-division-multiplexing passive optical network architecture is demonstrated. This method is designed with a key device which is a Fabry–Pérot laser diode (FP-LD). The FP-LD is made to operate as an active optical filter. In order to generate the UWB signal, the phase modulation is converted to intensity-modulation. This is achieved by locating the optical carrier of a phase-modulated injection optical signal at one slope of the filter response. The generated UWB signal has a power spectrum that meets the FCC-specified spectral mask. Experimental evaluations are made with measured eye diagrams and bit-error rates. Transmission is carried by a 20-Km single-mode fiber. Two cases were examined. Error free operation is achieved while placing the FP-LD in the remote site and the in the center office. The power penalty for the transmission is less than 3.2 dB. This approach is used for applications in future wired/wireless converged optical access networks.

WDM-PON-Compatible System for distribution of two different services

A novel and simple scheme for realizing flexible access for gigabit wireline and impulse radio ultra wideband (IR-UWB) wireless services for IR-UWB-over fiber based on multi-subcarrier up conversion has been proposed and experimentally demonstrated. Multi-carrier up conversion and reshaping of the baseband signals is used to create the UWB signals. This method of generation provides very simple UWB generation and efficiently improves access flexibility. Experimental demonstration of the proposed system was carried with the performances of 2.0-Gb/s data in both baseband and UWB formats. Performances are also measured after transmission of the signal by a 46-km single mode fiber and further 0.5-m wireless for UWB data. The system's flexibility is confirmed by investigating the performance of the system at different data rates. Performances are measured for data rates including 1.0 and 1.6 Gb/s. The compatibility of the system is confirmed with the existing Wavelength division multiplexing (WDM)-Passive optical networks (PON) systems because of the optical wavelength independency and data-rate flexibility of UWB signal generation.

WDM-RoF-PON for wireless and wireline access

A wavelength-division multiplexed radio-over-fiber passive optical network (WDM-RoF- PON) based on polarization multiplexing (PM) and carrier suppressed return-to-zero quadrature differential phase- shift keying (CSRZ-QDPSK) is designed. This design can achieve wire-line and wireless access synchronously. The bandwidth utilization is improved by the system because of the use of PM and QDPSK modulation. This approach provides a key new feature which contains a source-free optical network units (ONUs) including wireless access and upstream communication. The WDM-PON system is colorless because the ONU saves the laser source. This happens by the use of a Reflective Semiconductor Optical Amplifier (RSOA) and the reuse of the downstream light source. It is found that the networking has some credible transmission properties through the analysis results. The properties include wireless access and fiber transmission. It also has a large coverage area. From this analysis it is noted that the narrow laser bandwidth and steady frequency and phase of the subcarrier signal are the key technologies to achieve a better property of access networking.

A loop-back WDM-PON system

A successful demonstration of loop-back wavelength division multiplexing passive optical network (WDM-PON) with a 100 Gb⁄s (80 × 1.25 Gb⁄s) capacity using a spectrally sliced amplified spontaneous emission (ASE) injected reflective semiconductor optical amplifier (RSOA) is proposed. An investigation of the 1.25 Gb⁄s operation of a spectrally sliced ASE injected RSOA with 50 GHz channel spacing is carried here. Three methods were used to alleviate the system performance degradation which is caused by relative intensity noise (RIN) deterioration. First the injection current is adjusted into the RSOA properly in order to mitigate post-filtering induced RIN degradation. Then the dispersion management method is employed to improve the Chromatic Dispersion-induced intensity noise degradation for spectrally sliced light. Finally, an optical receiver is adopted with an optimized decision threshold level. This is done to detect a modulated signal with a relatively large intensity noise component. By these methods, complete operation of error free upstream and downstream transmissions were obtained in the loop back WDM-PON.

In order to realize the WDM-PON with a large capacity (~100 Gb⁄s), transmission experiments were performed over 20 km of SMF with 80 WDM channels at 1.25 Gb⁄s. The transmission impairments, like dispersion penalty and back-reflection induced penalty are also examined for a 1.25 Gb⁄s bidirectional WDM-PON that is based on an RSOA with 50 GHz channel spacing. Error-free transmission for almost all WDM channels within a 1.5 dB power penalty is achieved in the downstream transmission experiments. Similarly, error free transmission performance for all upstream WDM channels is also accomplished. The power penalty arising from the variations of power injected into the RSOA at the ONU and from variations in the downstream extinction ratio (ER) was approximately 3dB. It is concluded that there is no problem in transmitting a spectrally sliced ASE at a 1.25 Gb⁄s line rate in a loop-back WDM-PON based on an RSOA with a 50 GHz channel spacing and in future the capacity of this system could be expanded to up to 100 Gb⁄s (80 × 1.25 Gb⁄s).

WDM/OCDM-PON system with loop-back configuration

Design of a 2WDM/4OCDM-PON was successfully demonstrated using a remotely supplied short optical pulse source. The design is proposed in loop-back configuration. This system is designed without the use of any high cost devices. An investigation of loop-back transmission of short optical pulses for OCDM in upstream transmission was done in this paper. This makes the Optical network units (ONUs) simple. The short optical pulses of two gain switching laser diodes (GS-LDs) which has a repetition rate of 1.25 GHz is generated in the OLT and is amplified by the remotely pumped EDFA. The amplified short pluses after passing the AWG and splitter at the remote node (RN) are transmitted to the ONUs.

The pulse sources are individually injected into the reflective semiconductor optical amplifiers (RSOAs) at the ONUs. Along with these pulse sources the injected short pulses at the RSOAs were amplified and intensity modulated with upstream data at 1.25 Gb⁄s. The quality of these short optical pulses was supplied through a 23 km single-mode fiber (SMF), and this is sufficient for 4-chipOCDM encoding at the ONUs. And for this system, error-free transmission of the signals at a BER of $<10^{-9}$ was achieved. By the analysis results the power penalties were examined for one interfering channel and three interfering channels. It was found that the power penalties are about 0.8 dB with only one interfering channel and around 2 dB with three interfering channels.

Performance analysis of different receivers for a WDM-PON

Performance analysis and investigation of receivers for different classes of WDM PON system was carried out in this paper. Two different photo receivers were taken for the analysis. One is the PIN receiver and the other is the Avalanche Photo Detectors (APD) receiver. These two different receivers were taken with various data rates and various fibre distances at the optical network unit (ONU). The performance is analyzed using Manchester coding. The analysis is carried on for a 32 user WDM PON and DWDM PON. The results are analyzed using the parameters BER, Qfactor and Eye Pattern. It is found that at higher distance, in PIN receiver the BER value is significantly very less as compared to that of APD receiver. It is also noted that as the distance is increased to 150 Km the BER value for PIN is even less than the minimum required BER value. And at less distances i.e., distances less than 60 Km range there is not much difference between PIN and APD BER values. In terms of data carrying capacity per user the performance gain is found to be around 2.5 Gbps. This is achieved if the APD receivers are used in the receiver side downstream direction.

WDM-PON with different services and source free ONUs

In this paper, a novel WDM-PON architecture is experimentally demonstrated with simultaneous provision of high speed point-to-point downlink data and double-broadcast services. These services are provided with a data rate of 1.25-Gb/s. It is proposed that the double broadcast services could be overlaid over high-speed point-to-point downlink data in a WDM-PON with source-free optical network units (ONUs). A set of single-drive Mach- Zehnder modulators (MZMs) are driven in the optical line terminal (OLT) by downlink point-to-point data to generate a differential phase-shift keying (DPSK) format. Here a dual-parallel MZM (DPMZM) is used as a double broadcast services transmitter. The downlink DPSK signals which are obtained from different wavelengths are multiplexed.

The multiplexed signals are then fed to the DPMZM. The broadcast service-1 is optical carrier suppression (OCS) format, while the broadcast service-2 is an inverse return-to-zero (IRZ) format. The broadcast service-2 i.e., the DPSK/IRZ signals are split into three parts, first part is made to be detected by an IRZ receiver. This recovers the broadcast service-2. The second part is detected by a DPSK receiver, which retrieves the downlink data and the third part is re-modulated by the upstream amplitude shift keying (ASK). At each Optical network unit (ONU), the optical signals are separated with the help of an optical filter after transmission. The broadcast service-1 is retrieved after detecting the filtered OCS signals. After 25-km transmission of the signals the power penalties of less than 1.5 dB are obtained. The proposed WDM-PON system is found to provide significant improvement on both implement cost and system reliability.

A simple and cost-effective WDM-PON

This paper deals with the performance analysis of centralized light source WDM-PON. This system supports simultaneous transmission of two different services i.e., point-to-point data and broadcast services. Both downstream and upstream operations are carried out by this system. The downstream operation involves a data rate of 10 Gbit/s differential quadrature phase shift keying (DQPSK) and superimposed 2.5 Gbit/s inverse return-tozero (IRZ) broadcast service which are simultaneously transmitted from optical line terminal (OLT) in downstream channels without pulse carving and EDFA amplification. The upstream operation at optical network unit (ONU) involves a data rate of 2.5 Gbit/s on-off keying (OOK) signal using re-modulation of downstream signal power. Additional laser is not used at (ONU).

The performance of such WDM-PON is examined by transmitting both the signals through a 20 km single mode fiber (SMF). It is found that both the downstream and upstream transmission of the different signals with different data rates can be successfully achieved for a distance of 20 km. It is also noted that the system provides improved transmission power penalties and receiver sensitivity which is made clear from the transmission performance analysis in which the eye diagrams has clear and wide eye-openings. Because of this a simple and cost-effective WDM-PON could be implemented in future.

WDM-PON with tunable lasers in ONUs

Design of WDM-PON with tunable lasers in the ONU is proposed in this paper. The tunable lasers are mainly focused for upstream data transmission. These lasers are potential upstream optical light generators and are considered as a promising solution for next-generation broad-band optical access. More traffic could be admissible with broader tuning ranges of the lasers. But this requires sophisticated technology which is of high cost. Thus an optimal tradeoff between the admissible traffic and the cost must be achieved. For this the relationship between tuning ranges of the lasers and admissible traffic of the networks is investigated. By this investigation lasers with proper tuning ranges for the upstream data transmission could be selected and the appropriate WDM PON is designed. Two issues under three scenarios were addressed and focused for this.

The two issues are: how the largest traffic is admitted by proper selection of lasers, and how the given upstream traffic is admitted by using lasers with tuning ranges as narrow as possible. The three scenarios are: the availability of full-range tunable and wavelength-specific lasers, the availability of limited-range tunable lasers, and the lasers with specific tuning ranges are given exactly. In this paper it is given that in the first scenario some full-range tunable lasers are replaced with wavelength-specific lasers. And this is done without decreasing the admissible traffic. In the second scenario the admissible traffic is maximized by selecting lasers with proper tuning ranges. In the third scenario the given rate can be admitted by allocating lasers to ONUs. The ideas in each scenario provide steps to design cost-effective WDM-PON.

CONCLUSION

This research provides a survey on various WDM-PON designs with downstream operation and some designs with upstream operation along with the downstream. Each design has distinct and different techniques for transmitting a single signal or multiple signals. The performances of each design are noted in this survey. The performances are examined and analyzed by the parameters like power penalty, BER and some other simulation results. With the help of this survey, the researchers can implement WDM-PON with simultaneous upstream and downstream operation for both wireless and wireline data. In case of wireless data millimeter wave, Impulse radio Ultra wideband and some other signals can be used for analysis based on the requirement of the research and the performance of the system can be measured by analyzing the parameters like power penalty, BER and receiver sensitivity.

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Improving spectral efficiency of short-distance Er^{3+} modified optical fiber amplifiers by implementing acousto-optic tunable filters

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Abstract— The purpose of this article is description the main experimental results conducted to improve the spectral characteristics of short-distance erbium doped optical amplifiers (SD-EDFA) created on the basis of high erbium concentrated modified optical mediums. Nowadays, the problem of improving spectral characteristics of optical amplifiers (EDFA) is a topical problem. Optical amplifiers which have linearized spectral characteristics and low level automatic spontaneous emission (ASE) could increase the transmission length of DWDM system. Previous experiments were demonstrated that SD-EDFA amplifiers have a low level of ASE and NF (noise-figure), but due to the high concentration of active erbium ions (10^{20}-10^{21} cm^{-3}) the light amplification characteristics SD-EDFA amplifiers are nonlinear. Nonlinear spectral characteristics of SD-EDFA amplifiers introduce additional losses and noises for wavelength multiplexed signal and reduce the optical-signal noise ratio (OSNR) of common DWDM system. Thus, the main objective of a study is identifying linearization opportunities the spectral characteristics of SD-EDFA amplifiers. To linearize the amplified optical signals at the output of optical amplifiers were implemented acousto-optic tunable filters based on TeO_2. Revealed that, acousto-optic tunable filters with cross-pin design and with embedded scheme of modulation transverse polarized modes can effectively linearized spectral components with accuracy 0,2 nm grid in 1200-2500 nm range. The article also presents the results of experimental studies simultaneous usage of acousto-optic tunable filters with short-distance optical amplifiers.

Keywords— Acousto-optic tunable filter, erbium doped fiber, rare-earth element, automatic spontaneous emission, gain, power, optic signal, DWDM, optical-signal noise ratio.

INTRODUCTION

Day by day optical fiber communication networks cover more and more areas. Currently, research and development the new generation of optical amplifiers which can effective amplify the optical signals is a topical problem. Respectively, the existing optical amplifiers amplification parameters for effective gaining of the optical signal without 3R-regeneration are imperfect.

The main disadvantages of these amplifiers are a high value of the noise figure and nonlinearity of spectral characteristics. So, the high value of ASE and NF (noise-figure) negatively affect to the level of OSNR in the fiber-optic communication system. In general, the level of EDFA amplifier noise figure directly depends on automatic spontaneous emission (ASE) level of erbium ions (Er^{3+}) in the alloyed region of the optical fiber. The length of erbium doped fiber in the modern optical amplifiers reaches from 3 to 30m [1]. To reduce the noises occurring due to ASE, in our laboratory were developed short-distance optical fiber amplifiers [2]. These amplifiers have a short length of alloyed area and the value of the alloyed active section varying from 3 to 10 cm. The short length of the active fiber gives a small value of the noise factor and increases the DWDM system OSNR accordingly. The amplification commensurate with modern fiber-optic amplifiers is achieved by creating high concentrated modified optical mediums, with extremely high active erbium ions in a pumped area (10^{20} - 10^{21} cm^{-3}) [3].

Table 1 shows the comparative characteristics of modern optical amplifiers (EDFA) and short-distance erbium doped fiber amplifier (SD-EDFA) created on base high concentrated modified optical mediums [4].

Table 1. EDFA and SD-EDFA main parameters

Parameters/type	**EDFA**	**SD-EDFA**
Amplification medium length , *L*	2 m	3 cm
Maximum gain, *G*	16 dB	10 dB
Amplifier sensitivity, P_{min}	-25 dBm	- 45dBm
Noise-figure, *NF*	5-6 dBm	1-2 dBm

It is well known that the systems with dense wavelength division multiplexing (DWDM) with a frequency grid 0,4nm (ITU-T G.694.1) are sensitive to the slightest non-uniformities in the spectral characteristic of the optical amplifier, especially in the case of short-distance optical amplifiers (SD-EDFA) [5].

SD-EDFA amplifiers, despite the lowest noise-figure level have a nonlinear amplification over the whole amplification bandwidth and the amplified optical signal groups will have a nonlinear gain with each other.

This effect is explained by the fact that, SD-EDFA amplifiers have a several simultaneous amplifying centers due to the extremely high concentration of active rare earth ions of erbium (Er^{3+}) [6]. Fig. 1 demonstrates the comparative spectral characteristics of modern EDFA and SD-EDFA amplifiers.

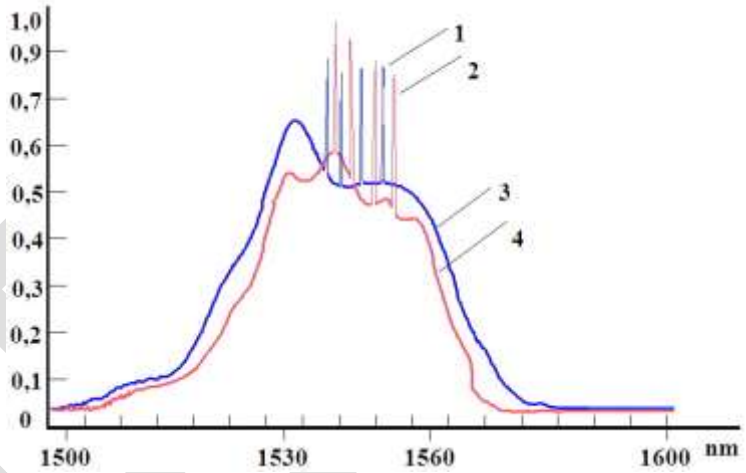

Fig. 1. Comparative spectral characteristics of EDFA and SD-EDFA in amplification mode

1 – Amplified WDM signal by EDFA; 2 – amplified WDM signal by SD-EDFA; 3 – ASE level of EDFA; 4 – ASE level of SD-EDFA.

The input of optical amplifier is fed by the sequentially optical signals (λ = 1540, 1542, 1544 and 1546 nm) with different wavelengths and detecting by OSA (Optical Spectrum Analyzer). As a result of spectral characteristics summation of the lasers we obtaining a simulated DWDM signal. According to the Fig. 1, in spite of the low-noise ratio and low level noise-figure, due to the nonlinear amplification, the SD-EDFA amplifiers becomes not effective for DWDM systems which have the maximum channel capacity 80 channels or channel spacing 50GHz [7].

The results of the experiments oriented to solve this problem and improve the spectral efficiency of SD-EDFA amplifiers further described.

DESCRIPTION OF EXPERIMENTAL METHOD

To linearize the output signal from the optical amplifiers acousto-optic tunable (AOTF) filters could be used. AOTF widely use in modern fiber-optic communication systems to isolate narrowband signals from a common broadband spectrum and perform a wavelengths selective switching in the ROADM (Reconfigurable optical add/drop multiplexors) systems [8].

Acousto-optic tunable filters are solid-state optical filters, which work on acousto-optic diffraction principle in an anisotropic medium. The main advantages of such filters is a wide range, quick adjustment by changing the frequency of the applied RF signal, a large angular aperture while maintaining high spectral resolution, the intensity and the possibility of modulating selected wavelength [9]. Based on these features, acousto-optic filters can be use for adjusting and changing the intensity level of spectral multiplexed optical signals. For the experiment were chosen acousto-optic tunable filter based on the TeO_2 (Tellurium dioxide) crystal [10].

Filters on TeO_2 crystals have 4 operating ranges. The third range is from 1200 to 2500 nm. This range meets the requirements of modern DWDM systems. Currently all DWDM systems operate in the third window transparency ~1550 nm [11]. Fig. 2 shows a block diagram of equipments interconnection on which the measurements were spent.

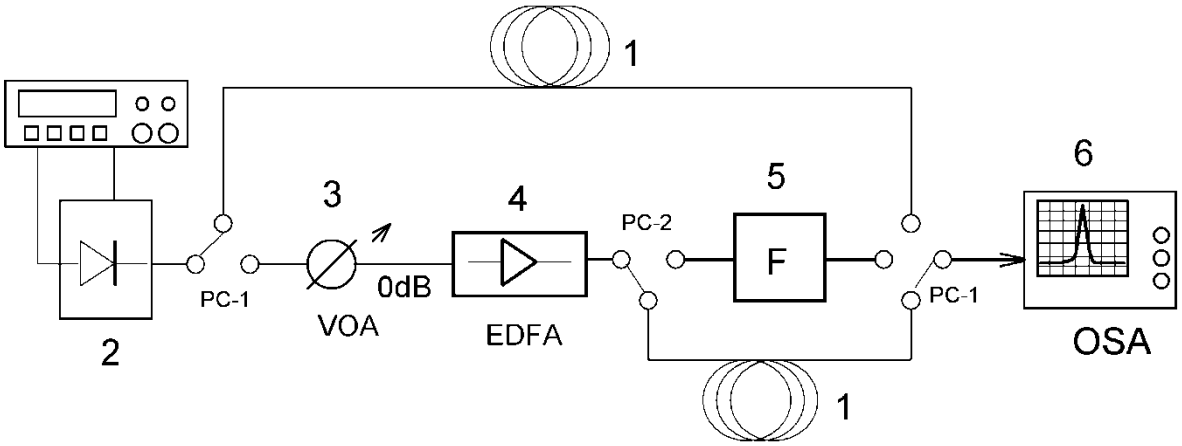

Fig. 2. Block diagram of equipments interconnections

1 – LEAF – G.655 standard optical fiber; 2 – semiconductor DFB-laser; 3 – variable optical attenuator; 4 – SD-EDFA (EDFA); 5 – AOTF on base TeO_2; 6 – optical spectrum analyzer; PC-1, 2, 3 – optical patch-cord and pigtails connection.

Generated by a semiconductor laser (2), optical signal consist of a several transverse modes. Through the microlens the optical signals are entering in to the single-mode fiber (1). Next, optical signals are passing through the amplifier cascade (4). Usage of acousto-optic rebuild filters (5) with a cross-pin electrode configuration produces the transformation of transverse laser modes up to 99.9% and receives filtering wavelengths of laser radiation in the range of the third transparency window ~1550 nm. The width of the optical waveguide is 6-7 mm and a TeO_2 crystal dimension is around 20-40 mm.

EXPERIMENTAL RESULTS AND DISCUSSION

Fig. 3 illustrates optical signals (WDM simulated signals) at the input from a DFB - semiconductor laser with a wavelength λ = 1540, 1542, 1544 and 1546 nm.

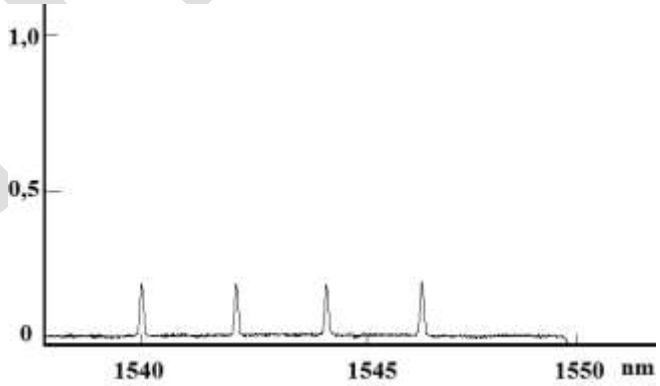

Fig. 3. Optical spectrum analyzer indication at the position (SD-EDFA-off, AOTF - off)

According to the picture at the disabled optical amplifier and deactivated acousto-optic filter, there is not amplified laser peaks at wavelengths corresponding to the input signal. In this experiment the variable optical attenuator (VOA) is set to the threshold power (P_{TH} = 0dB). The path lengths of the optical signals are equal to the length of the optical fiber. In the experiment was used optical fiber LEAF - G.655 standard. Optical fiber length L = 10 m, the attenuation coefficient of the optical fiber is equal to α = 0,25 dB/km. Detecting optical power without amplification at the optical spectrum analyzer input is equal to (- 0,4dBm).

At the second stage of an experiment, as shown in Fig. 2, the SD-EDFA amplifier connecting in-series to the line. Fig. 4 shows the spectral characteristics of optical signals after interaction with the SD-EDFA amplifier.

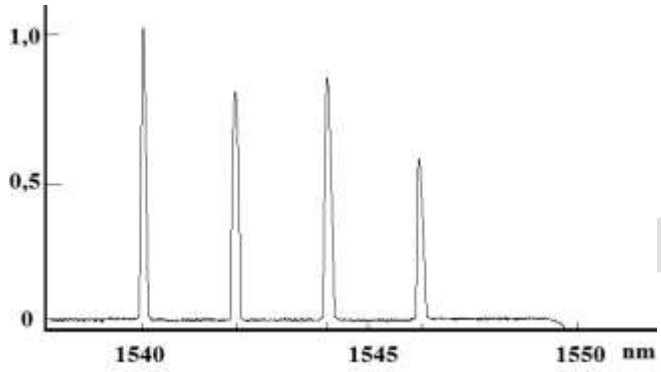

Fig. 4. Optical spectrum analyzer indication at the position (SD-EDFA-on, AOTF - off)

When SD-EDFA amplifier was turned on, the average optical power for each lasers beam were ~12,5dBm. Amplification of the optical signal to 12,5dBm achieved by creating a population inversion in the erbium doped region of the modified optical fiber. Next operation is measuring the ASE of SD-EDFA without input laser signals when acousto-optic tunable filter in-series turning on in to the line [11]. Fig. 5 represents the smoothing spectral characteristics of optical amplifier due to the modulation of surface waves in the acousto-optic filter.

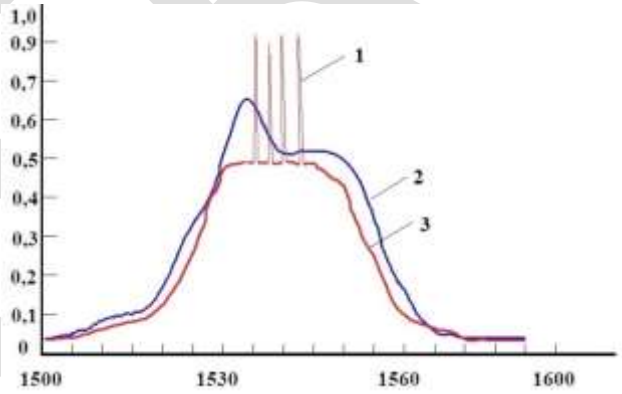

Fig. 5. SD-EDFA ASE curvature smoothing and WDM signals amplification.

1 – WDM signals amplification by the linerearized AOTF spectrum; 2 – EDFA ASE spectrum without linearization; 3 – SD-EDFA linearized spectrum after passing through AOTF.

After smoothing the curvature of ASE, signal source is turned on and on smoothed area (C-Band) the DWDM optical signal is amplifying.

Table 2 shows the results of using the SD-EDFA amplifiers in different modes of input power. Using an optical attenuator VOA at the input of optical amplifier is supplied optical signal with different values of input power. Simultaneous using of the acousto-optic tunable filter allows linearization of the spectral characteristics of the optical amplifier over the entire working spectral range (1530 - 1465 nm) [12]. The optical signal input power range is from -30 to 0dB [13]. The experiment was carried out for different values of the input power P_{IN}=0, -10, -20, -30dB. In this case, the pump power optical amplifier remained on constant value P_{PUMP}=50mW. Short-distance optical amplifiers due to the high concentration of active rare earth ions (Er^{3+}) are working in the saturation mode at the

level below 1dB [14]. Therefore, the mark is 0dB bordering zone data amplifiers, i.e. further increase of input power will not change the level of ASE. The table 2 below and Fig. 6, 7, 8 represent spent measurements.

Table 2. SD-EDFA amplification measurements for input power (P_{IN}=0, -10, -20, -30dBm)

	SD-EDFA – off, AOTF - off				SD-EDFA – on, AOTF - off				SD-EDFA – on, AOTF - on			
P_{IN}=0dB	-0,1	-0,11	-0,1	-0,1	1	0,5	-1	-3	0,2	0,3	0,1	0
P_{IN} =-10dB	-10,09	-10,05	-10,02	-10,1	2	1,5	0	-1	0	0,1	0,2	0
P_{IN} =-20dB	-21,09	-21,1	-21,1	-21,01	0	-1	-2,2	-5	-0,1	-0,2	-0,3	-0,1
P_{IN} =-30dB	-31,1	-31,05	-31,1	-31,09	-3	-4	-6	-7	-0,5	-0,6	-0,7	-0,5

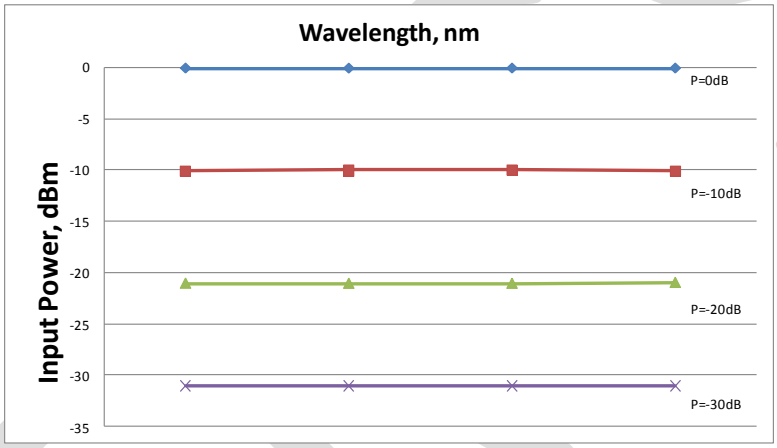

Fig. 6. Power detection at the SD-EDFA – off, AOTF – off (λ = 1540, 1542, 1544 and 1546 nm)

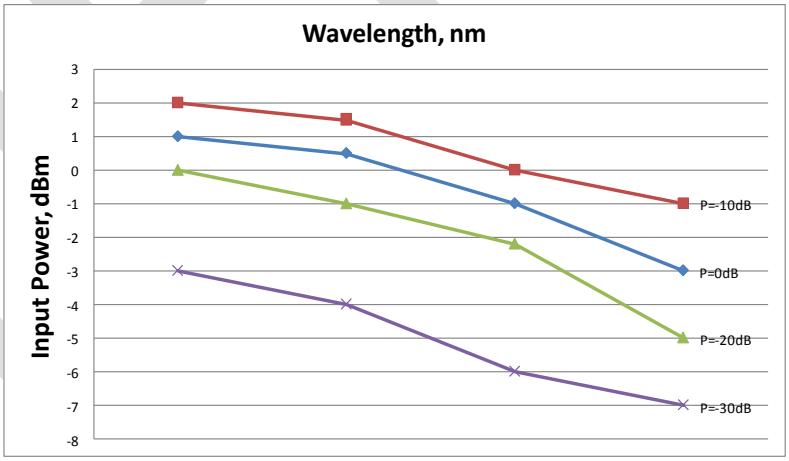

Fig. 7. Power detection at the SD-EDFA – on, AOTF – off (λ = 1540, 1542, 1544 and 1546 nm)

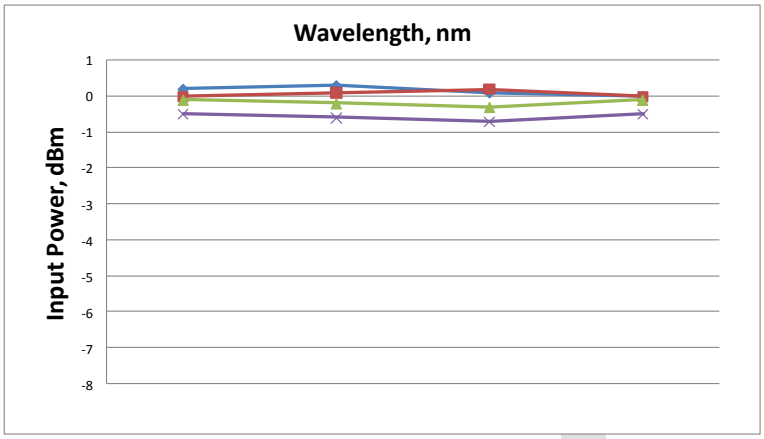

Fig. 8. Power detection at the SD-EDFA – on, AOTF – on (λ = 1540, 1542, 1544 and 1546 nm)

CONCLUSION

The possibility of linearization of the spectral characteristics SD-EDFA amplifiers with a small measure of the noise factor, gives an opportunity to improve OSNR fiber-optic communication lines. Consequently, this leads to an increase of the distance amplifying sections and organizing fiber optic communication assured. It should be added that the insertion loss of a single cascade acousto-optic filter does not exceed 0,2dB. The response time of the acousto-optic filter depends on the size and design of the filter. Mean time response of less than 50μs. Average power consumption acousto-optic filters varies 100μW [10]. The experiment found that the application of acousto-optic filters allows increasing the quality of the spectral characteristics of erbium doped optical amplifiers due to linearization peak spontaneous emission (ASE).

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Analytical study and Designing of a I-PD controller (a practical Modified PID controller) for a third order system using MATLAB simulation

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Abstract— The paper discusses the most prominent advantage of an I-PD controller over the conventional PID controller, with the identical use of hardware circuits. Even the MATLAB based PID parameters optimization could easily be applied for an I-PD controller and making the controller 'simpler to design' and 'easier to implement' in practice. For unit step inputs the PID control action results into sudden overshoot of the output variable, because of the presence of the differentiating action in the forward path, whereas in the I-PD configuration no such steep rise of the output should take place. Hence I-PD controller will always safer than the PID, as the sharp rise in the output variable may in some cases cause breakdown of the system, if the ratings of various subsystems are not chosen properly.

Keywords— I-PD controller, Optimal PID tuning using MATLAB, I-PD advantage over PID controller, set-point kick-off , closed loop control , differentiator , as the set-point kick phenomenon.

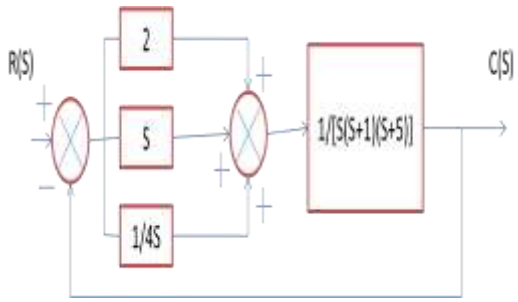
Introduction

In this article, an I-PD controller is being studied to highlight the advantages of I-PD controller actions over conventional PID controllers. We know that with respect to usual step inputs, PID module which contains a differentiator block, gives rise to a sudden high magnitude peak of the system response. To eliminate such a disadvantage, the derivative action is introduced in the feedback path, and improving the response of the system. The system chosen for our analysis is a servo mechanism whose transfer function is $\frac{1}{s(s+1)(s+5)}$

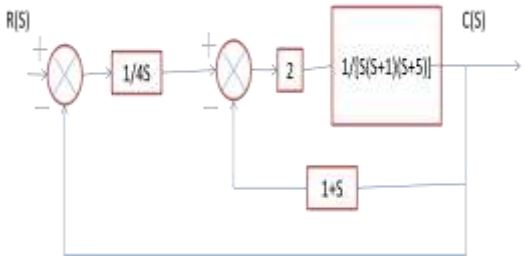
Analysis of the conventional PID response for a system:

The transfer function of the system chosen for our study is: $\frac{1}{s(s+1)(s+5)}$

PID BLOCK DIAGRAM:



I-PD BLOCK DIAGRAM:



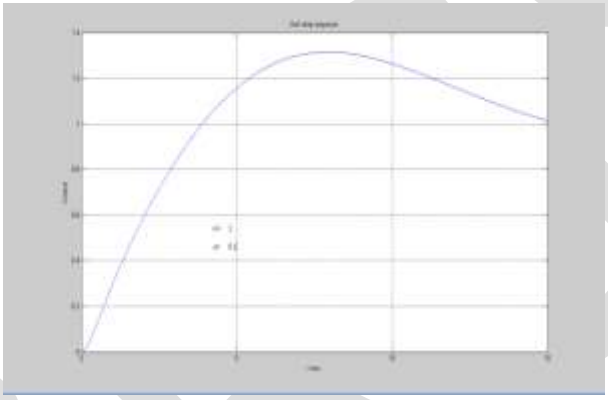
MATLAB PROGRAM

Matlab program that finds the optimal values of PID parameters for a specified range of maximum peak overshoot for a unit step input given to a third order system:

```
t=0:0.01:15;

for K=20:-0.2:2; %starts the outer loop to vary the K values

for a=1.5:-0.2:0.5; %starts the inner loop the vary the 'a' values

num=[0 0 K 2*K*a K*a^2];

den=[1 6 5+K 2*K*a K*a^2];

y=step(num,den,t);

m=max(y);

if m<1.25 &m>1.05

break; %breaks the loop

end

end

plot(t,y)

grid

title('Unit step response')

xlabel('t sec')

ylabel('Output')

KK=num2str(K); %String-value of K to be printed on plot

aa=num2str(a); %String value of a to be printed on plot

text(4.25,0.54,'K= '),text(4.75,0.54,KK)

text(4.25,0.46,'a= '),text(4.75,0.46,aa)
```

```
sol=[K;a;m]

end


sol =


   2.0000

   0.5000

   1.3139
```

The corresponding system response of the optimal PID controlled system is as shown below



MATLAB PROGRAM

Matlab program that finds the corresponding response of the said system for an I-PD control action with same values of Kp, Td and Ti for a unit step input given to the same third order system:

```
num=[0 0 0 0 0.5]

den=[1 6 7 2 0.5]

tf1=tf(num,den)

t=0:1:30

step(tf1,t)

num =


         0         0         0         0    0.5000

den =

   1.0000    6.0000    7.0000    2.0000    0.5000
```

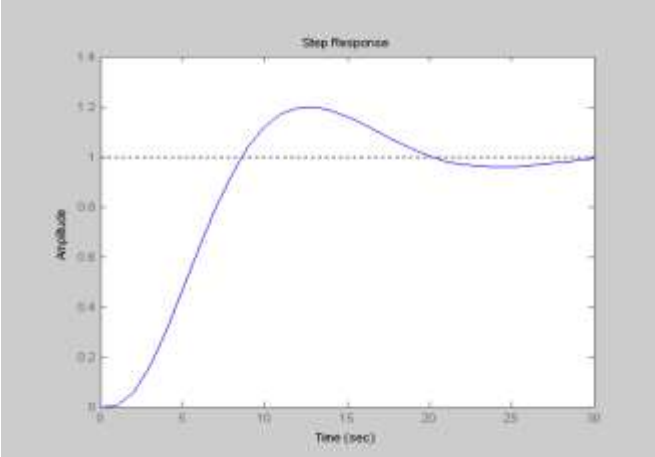
Transfer function:

0.5

---

s^4 + 6 s^3 + 7 s^2 + 2 s + 0.5

The corresponding system response with I-PD controller:



ANALYSIS OF THE MODIFIED PID CONTROLLER (NAMELY I-PD CONTROLLER) MODULE

It is observed that the maximum overshoot is reduced due to the application of I-PD configuration for the same third order system. But the system rise time is increased, making the system sluggish. In our opinion, avoidance set-point kick-off (generation of an impulse due to the introduction of differentiating device in the forward path in the case of conventional PID module) phenomenon is more important for any physical system that deals with a highly sensitive change in the output variable.

HARDWARE CIRCUITS NEEDED FOR THE PURPOSE

Op-amp based Amplifier, differentiator, and Integrator circuits are to be used for the hardware implementation of the I-PD controller

AREAS OF APPLICATIONS

The I-PD Control action can be used in any physical systems that uses closed loop control of output variable. It can therefore be applied for position, speed, temperature, level control systems etc.

CONCLUSIONS

So far as the results of the I-PD controllers are concerned, the system response is highly acceptable, *as the set-point kick phenomenon* i.e. the generation of an impulse due to the presence of differentiator in the forward path of a conventional PID controller is avoided.

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Review on Experimental Analysis and Performance Characteristic of Heat Transfer In Shell and Twisted Tube Heat Exchanger

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Abstract— All new heat exchanger applications in oil refining, chemical, petro-chemical, and power generation are accommodated through the use of conventional shell and tube type heat exchangers. The fundamental basis for this statistic is shell and tube technology is a cost effective, proven solution for a wide variety of heat transfer requirements. However, there are limitations associated with the technology which include inefficient usage of shell side pressure drop, dead or low flow zones around the baffles where fouling and corrosion can occur, and flow induced tube vibration, which can ultimately result in equipment failure. This paper presents a recent innovation and development of a new technology, known as Twisted Tube technology, which has been able to overcome the limitations of the conventional technology, and in addition, provide superior overall heat transfer coefficients through tube side enhancement. This paper compares the construction, performance, and economics of Twisted Tube exchangers against conventional designs for copper materials of construction including reactive metals.

Keywords— Heat exchanger, twisted tube technology, heat transfer, corrosion resistance, Vibration free, Increase efficiency, Baffles free.

I. INTRODUCTION

Heat Exchanger is a device used for efficient heat transfer from one fluid to other fluid a typical heat exchanger is shell and tube heat exchanger. They consist of series of finned tubes in which one of the fluid runs in the tube and the other fluid run over the tube to be heated or cooled During the heat exchanger operation high Pressure High temperature water or steam are flowing at high velocity inside the tube or plate system. A heat exchanger utilizes the fact that, where ever there is a temperature difference, flow of energy occurs. So, That heat will flow from higher temperature heat reservoir to the lower temperature heat reservoir. The flowing fluids provide the necessary temperature difference and thus force the energy to flow between them. The energy flowing in a heat exchanger may be either sensible energy or latent heat of flowing fluids. The fluid which gives its energy is known as hot fluid. The fluid which receives energy is known as cold fluid. It is but obvious that, Temperature of hot fluid will decrease while the temperature of cold fluid will increase in heat exchanger. The purpose of heat exchanger is either to heat or cool the desired fluid.

A heat exchanger is a device that is used to transfer thermal energy (enthalpy) between two or more fluids, between a solid surface and a fluid, or between solid particulates and a fluid, at different temperatures and in thermal contact. In heat exchangers, there are usually no external heat and work interactions. Typical applications involve heating or cooling crystallize, or control a process fluid. In a few heat exchangers, the fluids exchanging heat are in direct contact. In most heat exchangers, heat transfer between fluids takes place through a separating wall or into and out of a wall in a transient manner. In many heat exchangers, the fluids are separated by a heat transfer surface, and ideally they do not mix or leak. Such exchangers are referred to as direct transfer type, or simply recuperators. In contrast, exchangers in which there is intermittent heat exchange between the hot and cold fluids via thermal energy storage and release through the exchanger surface or matrix are referred to as indirect transfer type, or simply regenerators. Such exchangers usually have fluid leakage from one fluid stream to the other, due to pressure differences and matrix rotation/valve switching. Common examples of heat exchangers are shell and tube exchangers, automobile radiators, condensers, evaporators, air pre-heaters, and cooling towers. If no phase change occurs in any of the fluids in the exchanger, it is sometimes referred to as a sensible heat exchanger. There could be internal thermal energy sources in the exchangers, such as in electric heaters and nuclear fuel elements. Combustion and chemical reaction may take place within the exchanger, such as in boilers, fired heaters, and fluidized bed exchangers. Mechanical devices may be used in some exchangers such as in scraped surface exchangers, agitated vessels, and stirred tank reactors. Heat transfer in the separating wall of a recuperator generally takes place by conduction. However, in a heat pipe heat exchanger, the heat pipe not only acts as a separating wall, but also facilitates the transfer of heat by condensation, evaporation, and conduction of the working fluid inside the heat pipe. In general, if the fluids are immiscible, the separating wall may be eliminated, and the interface between the fluids replaces a heat transfer surface, as in a direct-contact heat exchanger.

II. HEAT TRANSFER ENHANCEMAENT TECHNIQUES

- Heat transfer enhancement is one of the fastest growing areas of heat transfer technology.
- The technologies are classified into active and passive techniques depending on how the heat transfer performance is improved.
- A twisted tube is a typical passive technique that uses a specific geometry to induce swirl on the tube side flow.
- The twisted tube heat exchanger consists of a bundle of uniquely formed tubes assembled in a bundle without the use of baffles.
- Twisted tube technology provide highest heat transfer coefficient possible in tubular heat exchanger.
- In uniform shell side flow the complex interrupted swirl flow on shell side maximizes turbulence while minimizing pressure drop.
- The tube ends are round to allow conventional tube to tube sheet joints.
- Swirl flow in tube creats turbulence to improve heat transfer.
- By keeping the flow turbulent one secures a high heat transfer performance.

III. REVIEW OF WORK CARRIED OUT

P.S..Gowthaman et al. have experimentally analyzed heat exchanger is a device used for efficient heat transfer from one fluid to other fluid a typical heat exchanger is shell and tube heat exchanger. They consist of series of finned tubes in which one of the fluid runs in the tube and the other fluid run over the tube to be heated or cooled during the heat exchanger operation high Pressure high temperature water or steam are flowing at high velocity inside the tube.

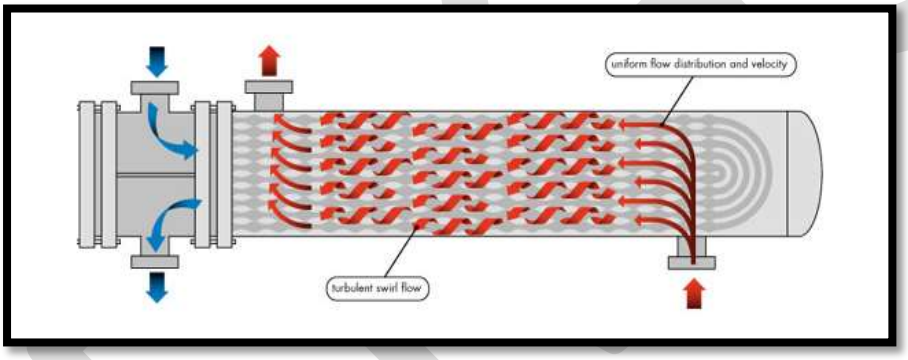

Fig.1.1 Shell and Twisted tube heat exchanger

Butterworth,D**.** et al have experimentally analyzed the Twisted Tube exchanger, it consists of a bundle of uniquely formed tubes assembled in a bundle without the use of baffles (Fig.1.1). The tubes have been subjected to a unique forming process which results in an oval cross section with a superimposed helix providing a helical tube-side flow path also cold water inlet and hot water outlet is indicated by blue colour from the top side and bottom side of shell respectively. The forming process ensures that tube wall thickness remains constant and the material yield point is not exceeded thereby retaining mechanical integrity. The tube ends are round to allow conventional tube to tube sheet joints .

The helical channel formed in the inter tubular space can be looked upon as series of consecutive short sections of which the build up of a steady velocity profile is interrupted by the constant direction change of the flow. Good transverse mixing is achieved by these interruptions, and the numerous disturbances keep the flow turbulent even at relatively low Reynolds numbers. The turbulent regime offers substantially higher convective heat transfer coefficients compared to laminar flow. By keeping the flow turbulent one secures a high heat transfer performance. These mechanisms contribute to higher heat transfer coefficients on the shell side flow (Fig.1.2). For the tube side flow there are several mechanisms that contribute to high thermal performance(Fig.1.3).

In a conventional shell and tube heat exchanger the radial temperature gradient on the tube side can be considerable because the transverse mixing is relatively low. More specifically the core of the tube flow will have a different temperature than the flow near the wall. The heat transfer between the two fluids is then reduced as a result of the lowered temperature difference across the wall. The twisted tube has an important feature that overcomes this problem. Because the swirl flow produces inertial mass forces there will by generated a secondary flow which enhance the tube side mixing.

A wide range of tube materials can be used including carbon and stainless steels, Cr-Mo alloys, duplex and super duplex alloys as well as titanium, zirconium and tantalum. Tube diameter may vary from 10mm to 15mm. The tube material used in this experiment is copper while the shell material used is mild steel. Tubes are assembled into a bundle on a triangular pitch one row at a time with each

tube being turned to align the twists at every plane along the bundle length. This alignment results in tubes contacting adjacent tubes at many points along the length of the tube in the bundle (Fig.2). The completed bundle is then tightly strapped circumferentially to ensure no tube movement and a robust bundle is the end result, Bundles can be constructed with more than 5000 tubes depends on requirement but in this experiment 18 tubes are used and shell size up to 160mm in diameter with tube lengths up to 700mm, but in our actual setup we reduce number of tubes, diameter and lengths.

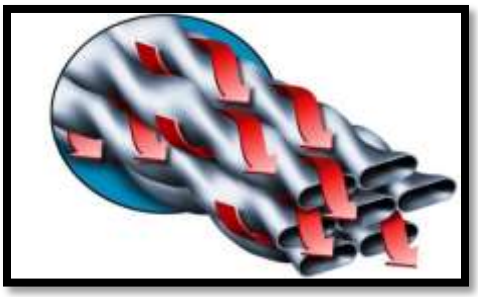

Fig.1.2 Shell side flow path (uniform shell side velocity)

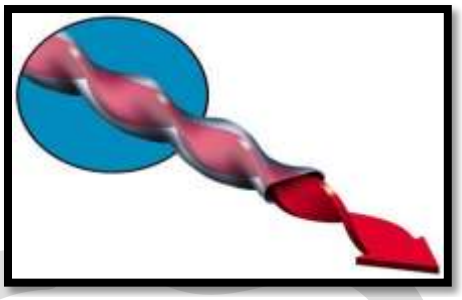

Fig.1.3 Inside tube hot water swirl flow path

The shell-side flow path is complex and predominantly axial in nature as shown above (Fig.1.2). Typically, the shell side flow area is approximately equal to the tube side flow area. The bundle is often shrouded to ensure shell side flow remains in the bundle and minimizes bypassing. Paths are available to allow the fluid to flow into and out of the bundle at each end. When high inlet and outlet velocities must be avoided, "vapor belts" may be used as with conventional designs. The Twisted Tube design imparts a swirl flow to the tube-side fluid enhancing the tube-side heat transfer coefficient.

The twisted tube is a baffle free design. One could think that this result in a fragile tube bundle construction making the heat exchanger exposed to fluid induced vibration. In reality the twisted tube design gives a more rigid tube bundle compared to the conventional shell and tube concept.

Fig.2 Completed twisted tube bundle

This is a consequence of the fact that each tube is in physical contact with the surrounding tubes along the whole length. These contact points are more frequent per unit length than baffle-to-tube joints in a conventional exchanger. The baffle free design is also claimed to give lower pressure drop (relative to heat transfer rate) because the shell side flow is not forced to do turns and pass sharp edges.

The shell side flow follows a complex pattern which is predominantly axial. To make sure that the shell side flow does not bypass the tubes, the bundle is shrouded. The shroud itself is a metal sheet that covers the bundle. The tube side flow is swirled enhancing heat transfer. The intensity of the swirl depends on the cross sectional shape and the twist pitch to diameter ratio.

This exchanger, shown in Fig.1.1, is generally built of a bundle of round tubes mounted in a cylindrical shell with the tube axis parallel to that of the shell. One fluid flows inside the tubes, the other flows across and along the tubes. The major components of this

exchanger are tubes (or tube bundle), shell, front-end head, rear-end head, and tube sheets. A variety of different internal constructions are used in shell-and-tube exchangers, depending on the desired heat transfer and pressure drop performance and the methods employed to reduce thermal stresses, to prevent leakages, to provide for ease of cleaning, to contain operating pressures and temperatures, to control corrosion, to accommodate highly asymmetric flows, and so on. Shell-and-tube exchangers are classified and constructed in accordance with the widely used TEMA (Tubular Exchanger Manufacturers Association) standards (TEMA, 1999), DIN and other standards in Europe and elsewhere, and ASME (American Society of Mechanical Engineers) boiler and pressure vessel codes. TEMA has developed a notation system to designate major types of shell-and-tube exchangers. In this system, each exchanger is designated by a three-letter combination, the first letter indicating the front-end head type, the second the shell type, and the third the rear-end head type.

IV. Improving Efficiency

Increased heat transfer coefficient

- Swirl flow creates turbulence resulting in higher tube side coefficient.
- Uniform fluid distribution combined with interrupted swirl flow result in optimized shell side coefficient.
- 40% higher tube side heat transfer coefficient

Lower pressure drop

- The longitudinal swirl flow of twisted tube technology reduces the high pressure drop associated with segmental baffles.
- Twisted tube heat exchanger are usually shorter in length and have fewer number of passes for a lower pressure drop on the tube side.

No vibration

- Baffles free design directs shell side fluid to true longitudinal flow.
- Each tube using twisted tube technology is extensively supported at multiple contact points along its entire length.
- Tube fretting and failure due to vibration is eliminated.

Reduced fouling

- Baffles free design eliminates dead spots where the fouling can occure.
- Velocity is constant and uniform.
- Constant flow distribution controls tube wall temperature.

V. CONCLUSION

The construction, thermal characteristics, performance, and use of Twisted Tube type heat exchangers have been reviewed. It has been shown that this type of heat exchanger offers a number of advantages over the conventional shell and tube exchanger with segmental baffles. In suitable applications, Twisted Tube heat exchangers offers superior economic performance as defined by cost per unit heat load when compared to the alternative of conventional shell and tube type equipment

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Effect of Austempering Temperature and Time on the Wear Characteristics of Austempered Ductile Iron(ADI)

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ABSTRACT - The present work was taken up to study the influence of austempering temperature and time on the wear characteristics in austempered ductile iron. Microstructure and wear behavior have been studied at austenitization temperature of 900°C and followed by austempering for 60 and 120 minutes at different temperatures, namely 235, 260, 285 and 310°C. Pin on disc test apparatus was used to determine the sliding wear characteristics of the ADI samples. The variation of wear loss with sliding distance, at different austempering temperatures were presented and discussed. It was found that increasing austempering temperature increased the Abrasion resistance of austempered ductile iron.

Keywords: austempered ductile iron, austenitization, austempering, abrasion resistance.

1. INTRODUCTION

Due to the attractive properties like good ductility at high strength, high fatigue strength, fracture toughness, along with good wear resistance, austempered ductile iron(ADI) is an interesting engineering material [1-4] and is related to its unique microstructure that consists of ferrite and high carbon austenite. Properties of ductile iron may be improved by subjecting it to austempering heat treatment process consisting of two stages namely austenitization [5,6] and austempering [6,7]. Wear is an important study in characterizing a material for a particular application [8,9]. It has been classified by different authors based on mechanism involved, interaction between the surfaces and medium used [6,10]. In the present study, investigation have been carried out on microstructure, wear properties of ADI at different austempering temperature and time [12].

2. EXPERIMENTAL WORK

The composition of ductile iron shown in table 1. Eight specimens size of 10mm thick and 15mm*10mm dimension cut from the given block for metallographic work.

Table 1 Chemical composition of ductile iron used in present work.

Element	C	Mn	Si	S	P	Ni	Cu	Cr	Ti	Mg
Wt%	3.332	0.275	3.325	0.017	0.026	0.263	0.713	0.012	0.013	0.027

Austenitization was done at 900°c for 120 minutes on all the samples in programmable heat treatment furnace. The samples were quickly transferred to the salt bath at 235°c, 260°c, 285°c, 310°c for the time period of 90 and 120minutes and then cooled in air at room temperature. The austempering temperature and time details are shown in table 2.

Optical microscopy was performed on all the polished and 5% etched natal solution. To test the wear resistance, pin on disk machine was used [11]. Abrasion test was calculated on 120 meshes alumina abrasive disk with a load of 40N, in accordance with ASTM standard. A standard time of 4 hours was selected the test on all the samples and sliding distance was calculated by using the formula.

Sliding distance (d) = Sliding velocity * time (t)

The test was used to calculate the wear loss after a gap of every 1 hour and compare wear loss of ADI with changing austempering temperature and time.

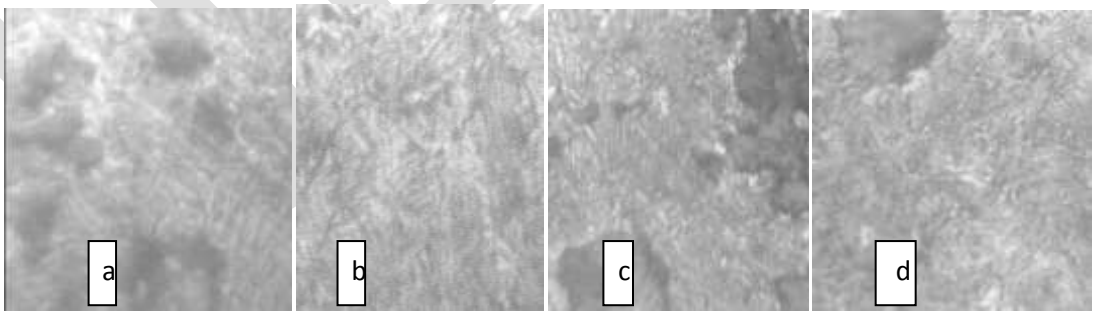
Table 2 List of austenitization and austempering temperature and time for all the samples.

Sample No.	Austenitization temperature (°C)	Austenitization time (minutes)	Austempering temperature (°C)	Austenitization time (minutes)
a	900	120	235	90
b	900	120	235	120
c	900	120	260	90
d	900	120	260	120
e	900	120	285	90
f	900	120	285	120
g	900	120	310	90
h	900	120	310	120

3. RESULTS AND DISCUSSION

Microstructural study

Fig 1 shows microstructure ADI samples through the magnification of 3000X under a microscope. Study of microstructure shows the formation of bainite and also shows the carburization of samples except in the sample e where a white patch is visible which lead to the decarburization of the particular sample. By studying all the samples it was seen that with the increase in austempering temperature size of bainite and martensite present in the ADI samples increases which leads to coarsening of the structure. Size of bainite needle remains approximately same for sample a, b and c but there is little increase in size for sample d and e and size increases drastically as we move to sample h with highest austempering temperature and time.



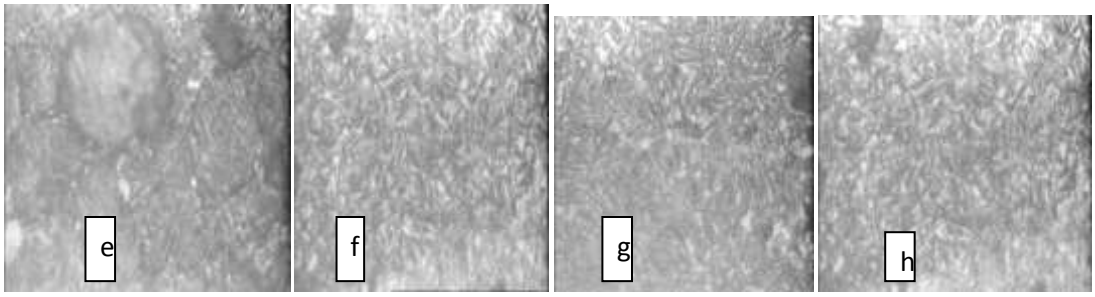
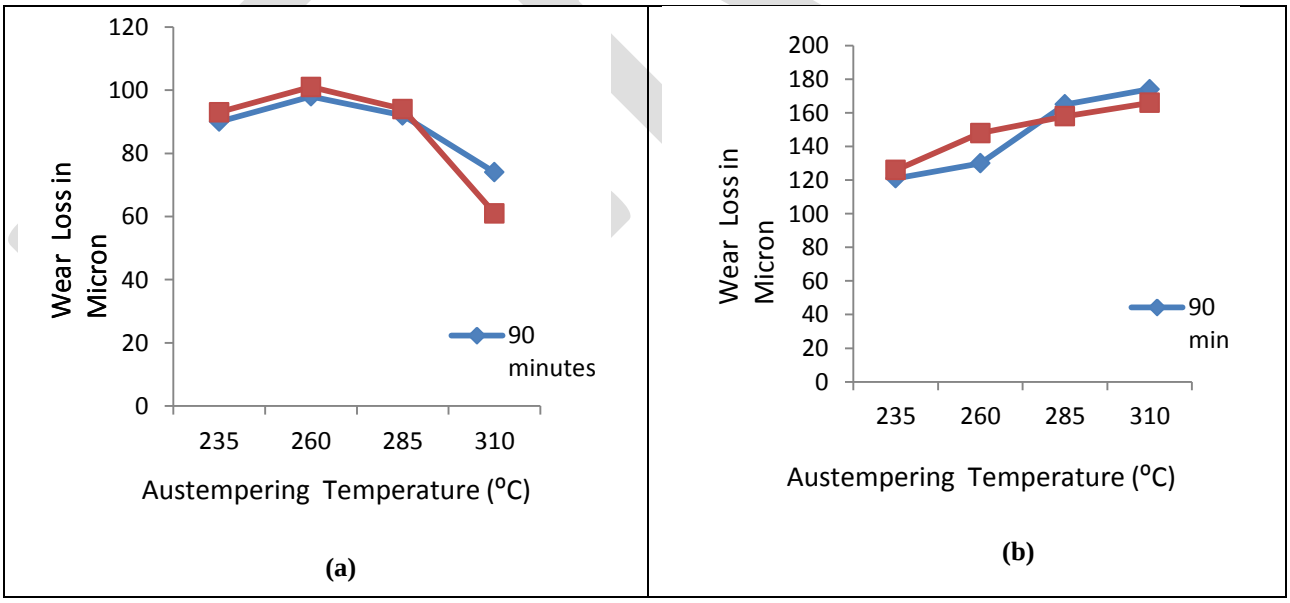


Fig 1 Microstructure of samples under optical microscope showing bainite formation. a(finer structure), b (finer structure), c (finer structure) and shows carburization, d (medium size needle), e(decarburized sample), f (medium needle), g (coarser structure), h (coarser structure).

Wear Analysis

Fig 2(a),(b),(C) and (d) shows wear loss of ADI samples at preselected temperatures and time. Wear loss is similar in first hour for both 90 and 120 minutes of heat treatment it increases as austempering temperature moves from 235°C to 260°C further with the increase of austempering temperature to 285°C wear loss decreases marginally and wear loss is more rapid when austempering temperature rises to 310°C. For wear between 1 to 2 hours wear loss is low for 235°C and 260°C of 90 minutes samples as compared to 120 minutes samples, but it remains same with further increase in temperature for both the time period. In the third and fourth hour of wear, wear loss is maintained for 235°C and 260◦C for both 90 and 120 minutes. with further increase in temperature to 285°C of 90 minutes sample wear loss is very drastic but marginally for 120 minutes sample and with rising of temperature to 310°C there is only little increase in wear for both the timings. As a result it was observed that wear loss increases with increasing the time period but it is rapid in starting and increases normally after some time. The abnormality in the sample e (285˚C,austempering temperature for 90 minutes) is because of fact that structure has undergone a drastic decarburization during austenitizing process. It is quite probable that during austenitization the sample must have remain outside the carburizing bed resulting in loss of carbon which contribute to decrease in wear resistance of this sample.



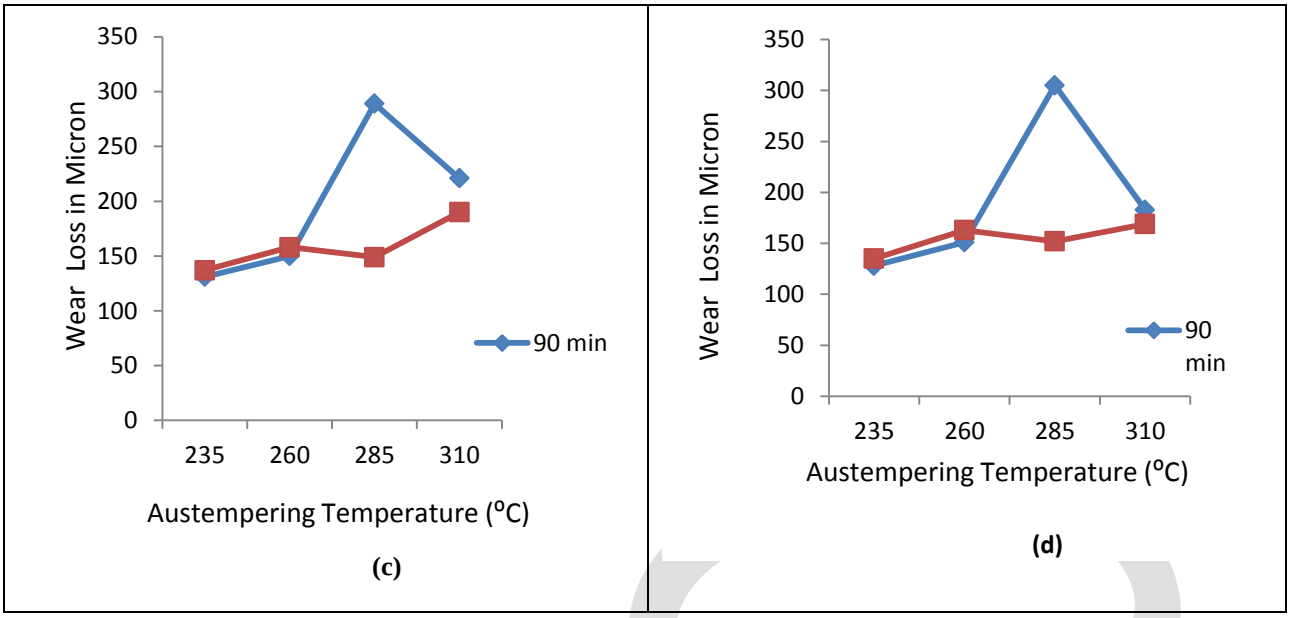


Fig 2 The wear loss changes with the change in austempering temperature and time. after (a) 1 hour (b) 2 hours (c) 3 hours (d) 4 hours

In fig.3(a) it was observed that with increasing sliding distance wear loss increases for all the samples but wear is more significant in 285°C and 310°C. With increasing the sliding distance from 15000m to 22000m sample austemepred at 285°C shows drastic wear loss as compared to the other austempering temperatures. After 22000m sliding distance wear becomes stable for all the samples except 285°C sample in which wear still increases. Fig 3(b) shows that wear starts an average of 87 microns except for 310°C sample which starts at 63 microns and goes to 156 microns as the sliding distance rises upto 15000m which is more than all other samples. With further increase in distance wear remained same upto 22000m of sliding distance except for sample austempered at 285°C for which wear comes down upto this point and again starts increasing beyond this as sliding distance rises upto 29000m. At that point wear for 310°C becomes stable and rises at same rate for all other samples which means wear for 260°C austempered sample is highest at this point. By comparing fig 3(a) and (b) it was observed that wear is less for sample austempered at lower temperature than the higher temperature.

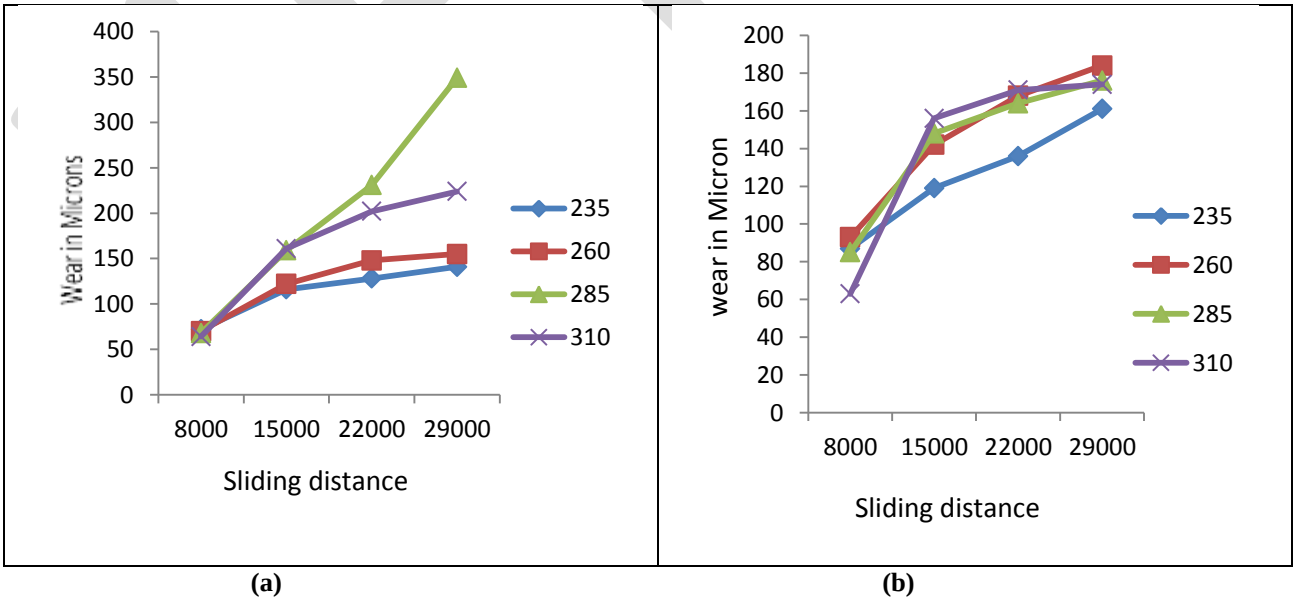


Fig 3 The amount of wear as sample covers more distance on the abrasive surface when austempering time is (a) 90 minutes (b) 120 minutes.

CONCLUSION

With the increase in austempering temperature and time microstructure of austempered ductile iron (ADI) becomes coarser. Abrasion resistance of austempered ductile iron (ADI) decreases with increase in austempering temperature and time. But the abrupt behavior shown by sample e in abrasion resistance is attributed to the decarburization that occurred during the austenitization process.

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Traveller Tracking Using Pilgrims Model in WSN

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Abstract— Every year millions of pilgrims gather in the small city like NASHIK for Kumbhmela, or in Amarnath or in the Holy area of Kashmir, India, to perform the rituals of GODs. Finding the position and movements of such a large number of people is important to the pilgrims themselves and the authorities managing the whole event. This paper deals a real-time pilgrim tracking or finding system that has been designed and implemented. The system relies on a dedicated delay-tolerant wireless sensor network (WSN). This WSN is interfaced to the Internet through lots of gateway(s) available from an internet service provider (ISP). Energy efficiency is most important factors in designing such system but there are few more like robustness, and reliability. Each pilgrim is given a mobile sensor unit which includes a GPS chip, a microcontroller, and antennas. A network of fixed units is installed in the Holy area for receiving and forwarding data. After a fixed period of time, each mobile unit sends its user identification (UID), latitude, longitude, and a time stamp. A central server maps the latitude and longitude information on a geographical information system (GIS). The developed system can be used to track or find a specific or a group of pilgrims.

Keywords— Kumbhmela season, pilgrim tracking, wireless sensor network (WSN).

I. INTRODUCTION

Kumbhmela or Holy area of Kashmir or Amarnath yatra or HAJJ (Pilgrimage) is the world's largest gathering of Muslims worldwide. It has unique characteristics with regards to the people who attend (pilgrims), the place they meet in, and the rituals they perform. Such a setup poses a real challenge to the authorities in managing the crowd, and tracking/identifying people. What makes it even more challenging is that all pilgrims move at the same times and to the same places. The Kumbhmela authorities control the quotas for pilgrims from each country. Yet, the number of visitors exceeds 6 million per year. This number is expected to reach 10 million in the near future. While Kumbhmela is a unique spiritual experience for all pilgrims, it poses major challenges of all sorts to the authorities responsible for facilitating this annual event. Some of the major difficulties facing pilgrims and the authorities alike include: identification of pilgrims (lost, dead, or injured), medical emergencies, guiding lost pilgrims to their respective camps, and congestion management.

For such a scenario, there is a need for a robust tracking system for pilgrims. Thus, the idea of using wireless sensor network (WSN) for tracking pilgrims was initiated [2] because passive and active RFID systems have been tested in the past with limited success (details of these experiments are discussed in [1]) and also other approaches such as image-based tracking systems are not suitable for a large crowd as in this application. Here, we propose a tracking and monitoring system that consists of small portable wireless sensor units carried by pilgrims and a fixed infrastructure of wireless network capable of gathering, processing, and routing information on locations and time stamps of the pilgrims. This paper focuses on the design, implementation and testing of a real time pilgrim tracking system. The paper is organized as follows: Section II gives the overview of literature survey of already proposed and implemented system. Section III describes the proposed design of the mobile units and the WSN. The proof of concept for the system is discussed in Section IV. Some concluding remarks are discussed in Section V.

II LITERATURE SURVEY

In wireless sensor network tracking system uses a delay/disruption tolerant design. There are mobile units as well as fixed units. This is because we have to create adhoc and fixed sensor network. The nodes in this network used to transmit and receive the data among the network. In wireless network energy efficiency is very important point because all nodes and devices are portable and they are battery backup this will be a major threat to the tracking and identification of pilgrims. Also low bandwidth is very crucial point. There are some researchers who already work on tracking of position of peoples in crowd and send the information within the network. **M.** Mohandes [3], putted the problems and difficulties facing the pilgrims and the Hajj authorities have also been on the rise - especially in crowd control and the prevention of accidents. A significant number of pilgrims die due to both accidents and natural causes, and a

large number get lost in this extremely crowded gathering. The authorities are faced with the problem of identifying the dead and injured pilgrims as well as helping those who get lost during the Hajj. In this paper, a solution based on RFID technology to help the Hajj authorities in the identification of pilgrims is developed. A pilot study is performed on 1000 pilgrims from Ivory Coast to prove the concept and get feedback on the performance. S. Mahlknecht, S.A. Madani,[4], The container trade faces a lot of challenges comprising of container tracking, real time monitoring and intrusion detection, real time theft reporting mechanism, and status reporting of shipment items. While in principle the above functionality can be provided by state of the art industrial monitoring systems, it does not provide the advantages in flexibility and cost of wireless sensor networks (WSNs). In combination with GSM and GPS/Galileo technologies, WSNs can result in a system capable of tracking and monitoring of containers in the real time. Mohamed Mohandes Digest of Technical Papers [5], developed a system for the tracking and identification of pilgrims in the Holy areas, in Makkah-Saudi Arabia, during Hajj (Pilgrimage). The area is already covered by a sophisticated 3.5G network by several service providers. Upon request or periodically, the mobile phone sends it's UID, latitude, longitude, and time stamp. A server maps the latitude and longitude information on a Google map or any geographical information system. If the Internet connection is lost the mobile phone stores the location information in its memory until the Internet connection is restored, then it sends all stored location information and clears this information from memory. The developed system can be used to track a specific pilgrim. Alternatively any pilgrim can request emergency help using the same system. M. A. Haleem, C. N. Mathur, and K. P. Subbalakshmi [6], in this paper there is study of a joint distributed data compression and encryption scheme suitable for wireless sensor networks where we adopt the structured encryption system of advanced encryption standard (AES). The distributed compression is achieved as per the Slepian-Wolf coding theorem, using channel codes. Core to achieving optimal compression in the joint compression and encryption is the preservation of correlation among different blocks of data despite applying cryptographic primitives. It is established that the correlation between sources remains unchanged when cryptographic primitives, namely key addition and substitution are applied. However, as a requirement of security in the encryption, any correlation between two inputs to a encryption system is removed with diffusion techniques. Compliance to the requirements of diffusion layer of AES cipher is achieved by designing the compression function so as to maintain branch number property.

Our proposed system having some advantages over the existing system like:

- Heath monitoring is first time being implemented in the tracking system.
- Bluetooth range used in mobile is for 10 m only, but Zigbee range is 30 m and can be varied.
- Bluetooth is used for single pair, but multiple tracking is possible in our project.
- Efficient way for wireless data logging of hazardous applications.
- Less time delays and Quick response time.
- Fully automate system robust system, Low power requirement.

III. SYSTEM DESIGN

The wireless sensor network created for the pilgrim tracking system uses a delay/disruption tolerant design. There are mobile units as well as fixed units. This is because we have to create adhoc and fixed sensor network. The number of mobile units to be monitored is significantly large compared to the fixed units. The mobile units are used to capture the movement of pilgrims. Thus, the WSN for this application has similarity to the ZebraNet [3] designed for habitat monitoring. It makes use of opportunistic, ad-hoc, and short-range wireless communications to disseminate data. Ad hoc networks increase total network throughput by using all available nodes for forwarding and routing. Therefore, the more nodes that take part in packet routing, the greater is the overall bandwidth, the shorter is the routing paths, and the smaller the possibility of a network partition.

In our application, each pilgrim carries a matchbox-sized mobile unit that includes a GPS receiver and an IEEE802.16.4/ ZigBee radio to communicate with the network of fixed units. The fixed sensor units consist of hardware and software to communicate with the mobile units carried by pilgrims to make queries and to receive location and UID information. Further, these fixed units communicate with each other to route the collected data to the tracking and monitoring station via gateway nodes. The gateway nodes are part of a commercial high data rate network, such as a high speed packet access (HSPA) or any other 3.5G network. The server can receive large volume of data via this high data rate network.

The major factors considered in the design are energy efficiency and reliability. The mobile units are battery powered and therefore require energy-efficient hardware and software. This can be achieved by optimizing the data volume and signal processing to minimize energy consumption. One technique is to minimize the duty cycle (percentage of time the mobile node is on) using sleep/awake protocol. The fixed units, on the other hand, do not necessarily have strict restrictions on energy and processing power. They may, for example, drawenergy from the power supply of the street lighting system. Nevertheless, their communication range is limited in a similar way to the mobile units due to regulations on emission and coexistence issues with other wireless networks in the area.

The location information of a pilgrim carrying the mobile unit along with the time stamp and UID are transmitted to the nearest fixed sensors periodically, or in response to a query originating from the monitoring station. Periodic transmission of location information facilitates continuous monitoring but leads to increased power consumption and bandwidth occupancy. Instead of periodical transmission, a mobile unit may wait to respond to a query generated by the tracking station. However, this approach may delay accessing the required information. A compromise between delay and power efficiency can be achieved by optimally selecting the interval for periodic transmission of required data. The subsections to follow elaborate on the mobile and fixed unit design, sensor network configurations, and protocols involved in the WSN based tracking system.

A. Mobile Sensor Units

The mobile units are battery powered and therefore require power-efficient hardware and software. Intuitively, the amount of signal processing and data volume to be transmitted in the mobile unit should be kept minimal. In general, there are three aspects of the nodes and the network which impact energy consumption. These are: the number of descendants in the routing

tree, radio duty cycle, and role of the node. In the designed WSN, most critical nodes in terms of energy are the mobile nodes as they are operated by small batteries. Nevertheless, the energy efficiency of the fixed nodes are also of concern. Thus, the elements of the protocols and algorithms residing in the network, MAC, and PHY layers are designed to maximize energy efficiency and limit signal interference. The components of the mobile sensor unit are shown in Fig. 1. This unit includes an off-the-shelf SiRF GPS chip capable of estimating the location information with 5 m accuracy. A microchip PIC nano Watt series microcontroller collects the data from the GPS chip and frames the same according to WSN protocol. An ISM band radio from Texas Instruments (Chipcon CC1100) transfers the location data to the fixed sensor units with a range of 50–100 m. The module also inclues a ceramic chip fractal antenna for the radio, and a separate antenna for GPS receiver. Two lithium Ion AA batteries provide the power and a DC-DC converter, from Texas Instruments, conditions the battery power to 3.6 V DC.

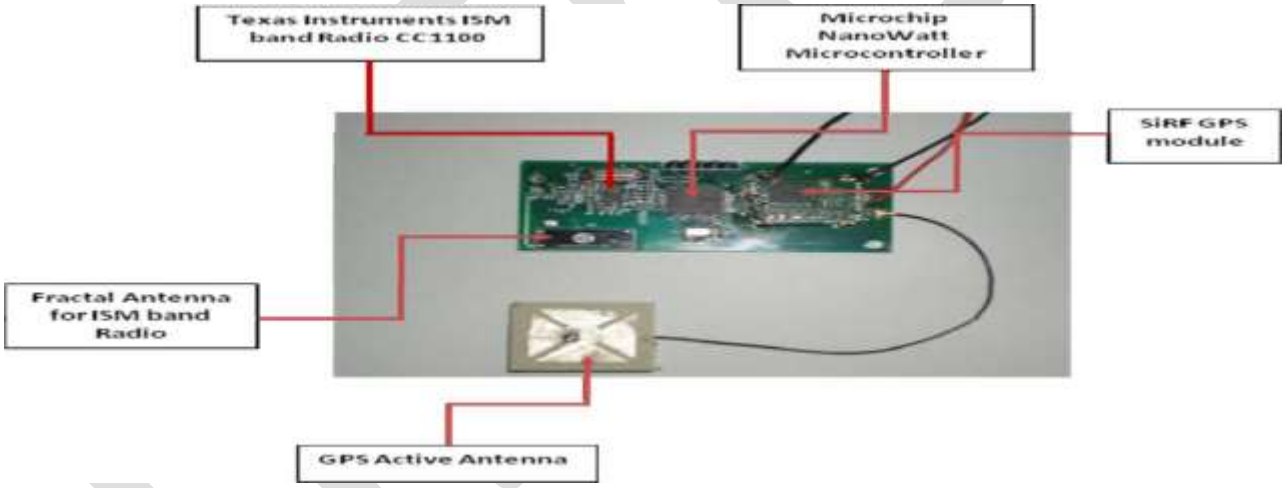

Fig. 1. Developed mobile sensor unit.

B. Fixed Sensor Units

The WSN is based on a set of fixed wireless nodes. Each fixed wireless node consists of a UHF high gain antenna, RF transceiver, microcontroller, battery and Ethernet for interfacing to the server via internet (TCP/IP connection).Whenever there is a need to locate a pilgrim, the fixed units broadcast his/her unique UID. Each mobile unit checks whether this UID matches its own. If there is a match, the mobile unit sends an acknowledgement while others remain silent. Subsequent protocol ensures that the appropriate location information is sent to the fixed node which in turn sends it to the server. To keep the overall software managing the system simple, we did not consider any data encryption at this stage since only UID (known only to authorized officers at the central server), time stamp, and location information are sent across the network.

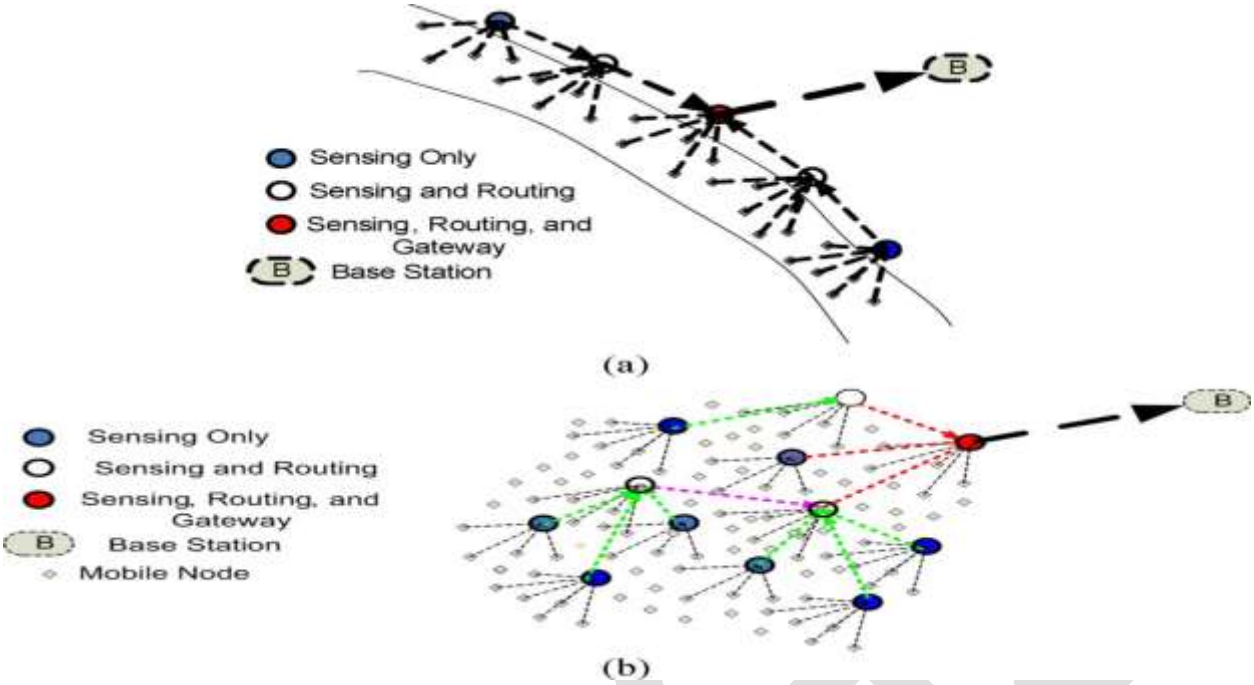

Fig. 2. (a) Sensors configuration under the pilgrim trail scenario. (b) Sensors configuration under the congregation scenario.

C. Node Configuration in the WSN

All nodes in the fixed WSN are made identical to keep the deployment, configuration and reconfiguration process simple. Under the proposed configuration, the different nodes are classified either as sensing only, sensing and routing, or gateways. Sensing-only nodes receive queries from the network; collect data from the mobile units in the vicinity, then send the data to nearby sensors. In addition to sensing, some nodes function also as routers. Moreover, few strategically placed nodes are selected to communicate with the public communication networks. Fig. 2(a) and (b) show two different deployment scenarios: long a pilgrim trail, and in a congregation.

D. Protocols and Algorithms

The minimization of energy consumptions highly relies on the processing and communication requirements of the protocols and algorithms at various layers of the WSN. Consideration of the elements at all layers with a cross layer design approach is vital to the overall efficiency of the network. At the PHY and MAC layer levels, the duty cycle of the nodes (the ratio of ON to OFF periods) is reduced by using a modified carrier-sense multiple access (CSMA) protocol. By sensing and detecting whether there is activity on the channel, a node may sleep and periodically sample the channel. If a node detects incoming energy on the channel, it stays awake to receive the packet. Because the transmitter might repeatedly send a packet, the receiver must be awake during at least one transmission of the packet—a scheme commonly called low-power listening (LPL)—inspired by ALOHA with preamble sampling. The node's duty cycle using LPL depends on the number of its neighbors, as well as the application and sensor sampling rate. Multi-hop communication is used to route information. Multihop communication yields reduced power consumption and scalability advantages. Under the simplest scenario, all location queries are sent by a single monitoring station. One important challenge is the design of an optimal routing protocol for sending a query to a particular pilgrim. Along with other criteria, this protocol may use prior knowledge about the location of the person being queried. Another challenge is the design of a protocol to include parallel routing of multiple queries to minimize the latency resulting from multiple queries. To simplify the complexity, the mobile units may use a flooding protocol so that a group of closest fixed sensors receive the same data. The data is stored and routed through the best multihop route to the tracking and monitoring station. The flow of commands in a typical query for a given pilgrim is outlined in Fig. 3.

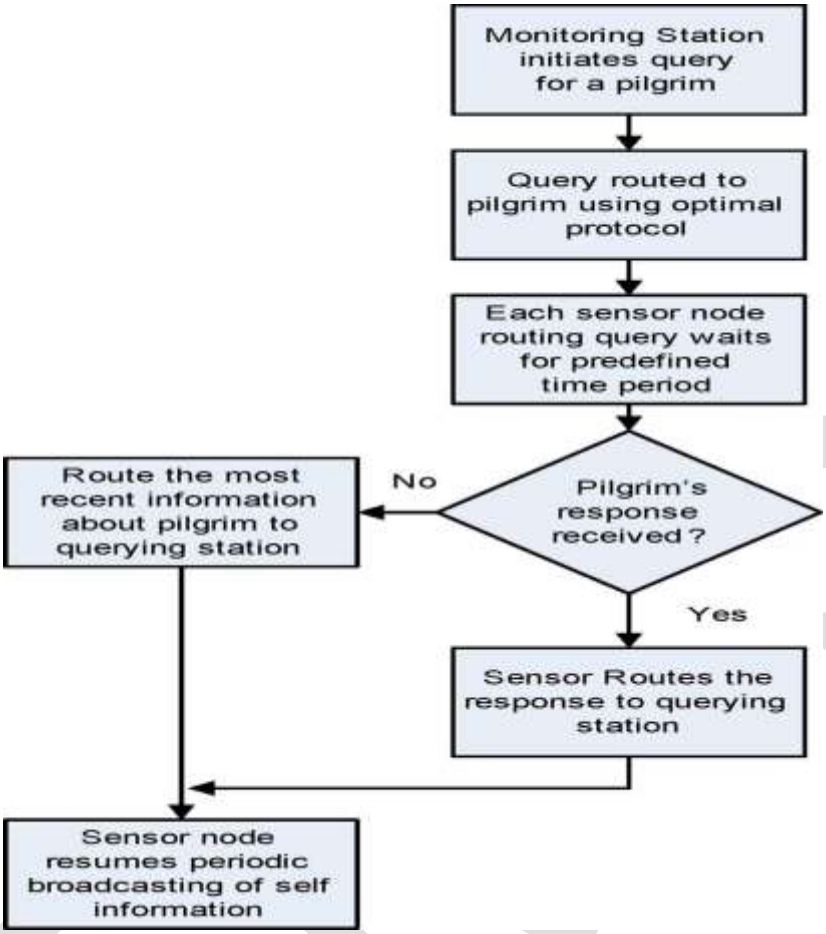

Fig. 3. Flow of commands for querying a pilgrim.

An important cost function used in the design of efficient routing protocols is discussed in [7]. For node i, this cost function is given by

$$C(\text{power}) = \varepsilon \frac{\delta_i - \sum_{j=0}^{k} \delta_j / k}{\sqrt{\sum_{j=0}^{k} \delta_j^2 / k - \sum_{j=0}^{k} \delta_j k}}$$

Where k is the number of neighbors of node, Si is the duty cycle of node, and is the duty cycle of neighbor. The cost C is considered only if it is equal or less than the cost value of the parent node in the routing table.

The history of location information is retained and used in subsequent computations for increased energy efficiency and reduced computational load. Moreover, the use of previous location information minimizes latency in responding to future queries. Another aspect is the efficient in-network processing of data. This includes data encryption and compression. Even though we did not consider encryption at this stage, a joint data compression and encryption scheme can be used to achieve high security and good energy efficiency [8]. The benchmark standard for such implementation is the IEEE 802.15.4/ZigBee protocol suite for low bit rate communications.

IV. SCHEME DESCRIPTION

To implement the system we divided the system into two parts one is pilgrim unit and other is server unit. We have taken microcontroller ARM-7 2138.This has different units like IR sensors, LCD display, GPS, ZIGBEE, buzzer and emergency keys. The sensor senses the signals from pilgrims units which are to be tracked and has analog to digital converter of 10 bits. The pilgrim unit stores the digital data in microcontroller RAM. After this ZIGBEE is used to send the data to the desktop PC via RS232. On desktop PC we have installed VB software which is used to access data from storage.

The block diagram of pilgrim unit and server unit are shown in fig 4 and fig 5.The description of units is as follows.

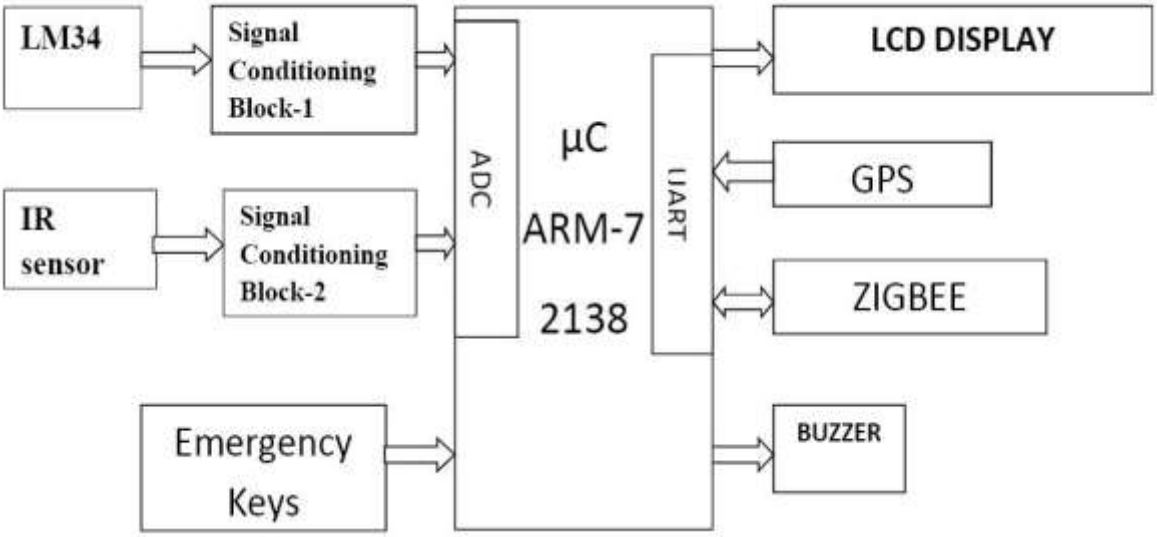

Fig 4: Block Diagram of Proposed System (Pilgrim Unit)

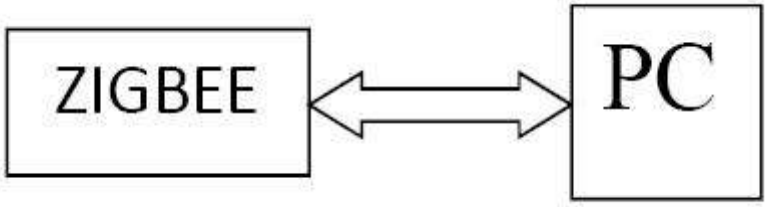

Fig 5: Server unit

A. Pilgrims Unit

The pilgrim unit is combination of different individual parts which perform together to track the pilgrims. The sensor senses body temperature and pulse rate of the body will be sensed and counted by temperature sensor LM34 and pulse rate sensor IR obstacle sensor. The emergency keys has Keypad with 4 keys is used for emergency alertness. If the pilgrim himself will feel that something wrong is happening with him, then he can use this facility. Pilgrim where he can ask 4 predetermined questions to the base camp like- Lost, Help, water and oxygen. The buzzer is used in case of emergency. When the emergency keys are pressed the buzzer will get ON.

The signal conditioning given to sensor LM34 and IR Obstacle sensor. Signal conditioning given to sensor converts the input values compatible to the ARM7.For example if input voltage given by the sensor is 20 V but controller only needs 5V.Then signal conditioning circuit converts the voltage 20V to 5V. The LPC2138 contain two ADCs. These converters are single 10-bit successive approximation ADCs with eight multiplexed channels. ADC converts analog signal to digital signal. DAC does it vice versa.

ARM 7 is the heart of the project, which contains ADC and DAC inbuilt. It monitors the whole program given to the project. The values of health parameters will be continuously given to the LCD to display. The UART 0 and 1 which is used here is used for serial communication. It transmits and receives the data lines. It gives the data lines to the LCD, and receives the data lines from GPS. The GPS-PROGIN is used in this project. GPS receiver provides high position, velocity and time accuracy performances as well as high sensitivity and tracking capabilities. GPS finds out the location of the pilgrim. The GPS is used to log the longitude and the latitude of Pilgrim which is stored in the μc memory. The ZIGBEE unit sends the frame to the Monitoring base CAMP containing the health parameters and the location of Pilgrim and also if any emergency then that will be communicated to server using ZIGBEE. The ZIGBEE-S1 is used for the wireless communication between pilgrim units to server unit. The data collected by ARM-7 like health parameters like body temperature and pulse rate and GPS coordinates are transferred to the PC through ZIGBEE.

B. Server Unit

In server unit VB Graphic User Interface (GUI) is used. In server unit all the location, body parameters are transferred to the PC through the ZIGBEE .In PC all the data of each pilgrim is sorted out in VB. The information of the pilgrim is stored in UID form. So the information will be kept secured.

Upon receiving the SMS, the VB s/w sorts the Pilgrim's location based on the GPS coordinates also the health status is displayed. In this way the official's can keep a track of all the Pilgrims. Here we making XBEE based network for environment application .Here we have master and slave structure for the Application .The range of XBEE is about 30 mtrs. So, the whole area cannot be covered by a single Master slave combination .For this we are covering the whole mine by a master and slave combination. We have a main PC master terminal which has the VB software on it .The PC master terminal is used to monitor the status of all the slaves which covers the whole area.

At master terminal we are receiving data from pilgrim units. In Visual Basic software we gather all data and separate it in VB software and store it in excel format. When we want to access data of all pilgrims we can generate that excel file via VB software.

Collision Avoidance protocol:

Here we are using a master Request and slave response protocol. In this system the Master sends the request to the all the slaves. In the request frame the master mentions the slave ID. The request frame is received by all the slaves who are in range. The slaves who are in range receive the incoming frame and store it in its internal RAM memory. Then they check for the slave ID. If the incoming slave ID matches with their own slave ID then they Accept the 28 frame and send the parameter back to the master .If the ID does not match then the slave discards the frame.

Cooperative communication:

Here we are using the cooperative communication technique to make sure that the slave is always in range of the master. For this we use two sub masters units. These units are basically repeater unit which will enhance the data signal when the slave is not in range of the master. Here the request is first given to the sub master. The frame transmitted by PC master will contain the sub master id as well as the slave id from whom the data is to be retrieved. The sub master upon receiving the frame will then check for the slave id and will retransmit the frame as it is. If one of the sub masters fails then the other sub master can also send the data of the other slave.

Simulation Results:

The simulation of above experiments has been taken and it exactly detects the pilgrims and tracks them in crowded area. The experiments has taken on ARM-7 which has sensing units to sense the body temperature and the data will sent in digital format to the server unit where it has processes for tracking. The figure 6 shows the simulation results.

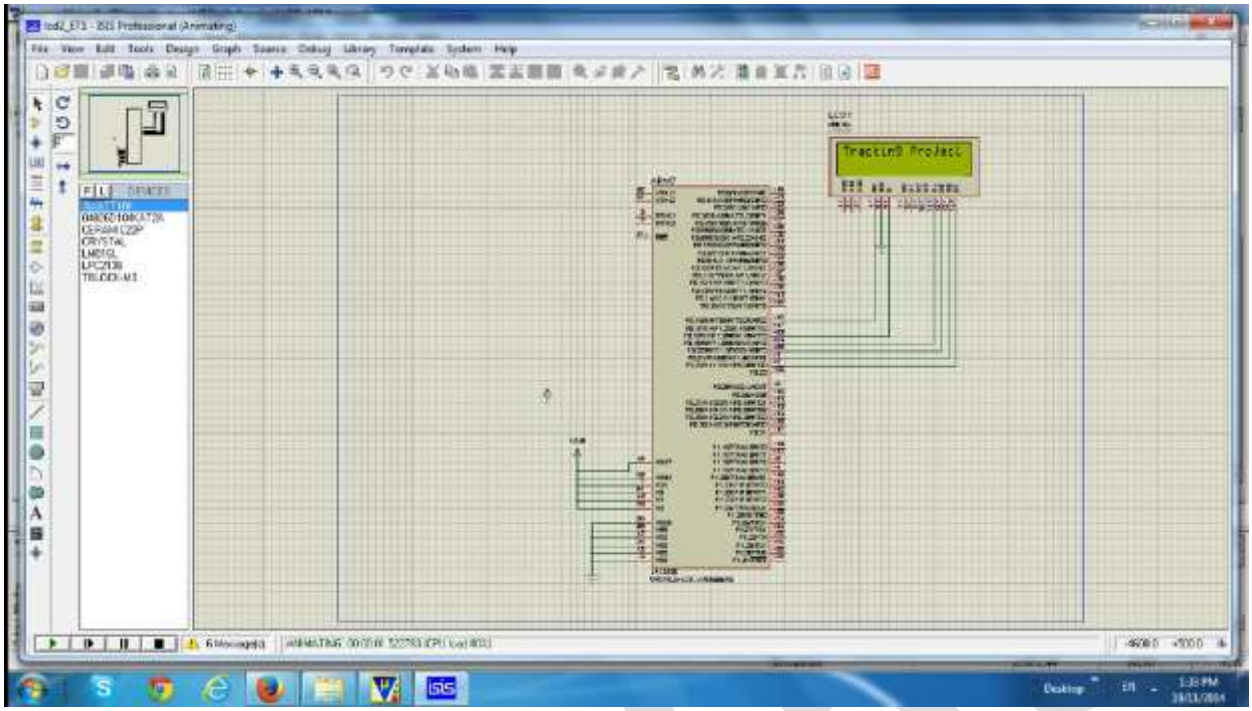

Fig:6 Simulation of LCD

In addition to tracking pilgrims, the system can also help in detecting areas with high congestion so that proper measures are taken to relieve such bottlenecks. Special software can be developed to recognize such congestions and alert authorities about these.

CONCLUSION

It is clear that the design and implementation of a system can be used for tracking and monitoring pilgrims during Amarnath, Kumbhmela season in the Holy area of Kashmir, Nashik. The system consists of mobile units carried by pilgrims and a fixed wireless sensor network. Based on some preset parameters, the WSN communicates periodically location information of pilgrims to a central server. The communication between mobile units and the WSN relies on the Zigbee protocol. The design provides an option (such as an alarm button on the mobile unit) for pilgrims to request help in case of emergency. The location information is mapped onto a GPS system for ease of localization and efficiency in providing help. It can be concluded that the system will be robust and reliable even in dense urban areas.

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A System for Retrieval Mobile Document Images Efficiently from Digital Library

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Abstract— Recently mobile devices are used to improve the user experience of digital library browsing and search. Various applications such as education, product retrieval and location search. Searching the document and transferring the query are important issues in mobile document search. In this paper, provides a model for automatically generating a caption for images with a mobile document image retrieval framework. The proposed system, consist of three stages: Content Selection, Surface realization and document retrieval. Here author considering both extractive and abstractive model and discuss. A Hamming distance KD-Tree is used for scalable searching. A JBIG2 based query image compression to fulfill the low bit rate query.

Keywords— Caption generation, image annotation, Digital library, Hamming space, JBIG2 compression, K-D tree, mobile visual search

INTRODUCTION

Recent years the amount of digital information available on the Internet is growing. This digital information consists of scanned documents stored in the digital image format. Many search engines retrieve images, simply by matching user queries against collocated textual information. A query is formulated as a photo that captures the visual objects of user interest, for example, a book cover, a document page, a picture. The query is sent to the server end, where the similar documents are matched and returned.

To improve the matching efficiency, develop methods that generate description of words for an image automatically. An image can be annotated to generate a list of keywords such as planes, bombs, airport, where as the caption "planes carrying bombs are landing at the airport" would make the relationship between the words. The description is sufficient to understand the image, after that retrieve the document related to the image from digital library. A system that generates these descriptions automatically can improve the image retrieval.

1. Automatic Caption Generation

Although image understanding is a popular topic within computer vision, relatively little work has focused on caption generation. A handful of approaches create image descriptions automatically following two stage architecture. The picture is first analyzed using image processing techniques into an abstract representation, which is then rendered into a natural language description with a text generation engine. Much work within computer vision has focused on image annotation, [3] a task related to but distinct from image description generation. The goal is to automatically label an image with keywords relating to its content without however attempting to arrange these into a meaningful sentence or text.

Keyword based indexing techniques are popular and the method of choice for image retrieval engines. Furthermore, image descriptions tend to be concise, focusing on the most important depicted objects or events. A method that generates such descriptions automatically could therefore improve image retrieval by supporting longer and more targeted queries, by functioning as a short summary of the image's content, and by enabling the use of question-answer interfaces. The image description generation adopts a two stage; consist of content selection and surface realization. The former stage analyzes the content of the image and identifies "what to say", whereas the surface realization determines "how to say it".

In this paper, researches had focus on various problems related to captions generation for mobile images, normally on web every single image co-occur with some related document. A Captioned images embedded with article and learn both techniques of content selection as well as surface realization. Here the extractive and abstractive models for generating meaningful, short and precise captions for the image are used. The benefit of this model, it does not require manual annotation of images. The probabilistic image annotation model suggests keywords for an image.

2. Document Retrieval

The problem of document image retrieval has been widely studied in 1990s, due to a wide variety of applications in digital library. The main target is to find the similar documents by querying a scanned document image over a large document corpus. Previous works typically depend on Optical Character Recognition (OCR) techniques [22]. More recently, visual matching is becoming a promising alternative to solve the limitation of poor OCR performance in scanned documents retrieval.

However, none of existing techniques is dedicated to sort out the challenging issues in the emerging task of mobile document image retrieval. An image query from a mobile camera is negatively affected by photograph distortion of the embedded camera on a mobile device is different from the scanned image, such as rotations, lighting changes, and de-focusing. Such kinds of distortion have posed a big challenge in OCR techniques. Existing visual descriptors in terms of words and paragraph layouts, they doesn't describe the textual regions in document images properly and also query delivery latency in mobile search scenarios.

The distortion of mobile captured images would seriously degenerate the performance of visual search. So a robust visual descriptor is required to characterize these line drawing regions. To retrieve document images, the relative layout of the shape, rather than the absolute scale and position, plays an important role. In addition to line drawings, a significant proportion of document images are textual regions, which, in many cases, presents visually similar or even identical paragraph layouts and fonts. When wireless network connections are subject to bandwidth limit, a mobile query of small size is preferred.

The Hamming Distance KD-Tree to seek the tradeoff between document retrieval performance and memory complexity of indexing structure in searching textual regions. JBIG2 based query image compression, to reduce the query delivery latency in search scenario.

Figure1: Left: Document image capture by mobile device.
Right: Document retrieve from digital library [2]

3. Digital library

The digital library is a collection and scanned documents stored in the digital format, which enables users to browse and search locally as well as remotely. The World Digital Library (WDL) project has collected huge amounts of books from handwritten, maps, printed documents, newspapers etc.

RELATED WORK

An image comprehension is considered as most popular factor in computer vision. The image description should generate from the images. To generate description from the images two steps must be followed. The first one is to analyze the image with the help of image processing techniques and extracts foremost factors from the images by means of some extraction methods which is then transcribe into natural language text by taking into account text generation engine.

In addition to above mentioned technique, image description can be generating by other fashion also. For example, Hiroshi Miki, Atsuhiro Kojima, and Koichi Kise [4], evaluate various usages of objects from the images and also identify different functions of an object, and in turn classify them accordingly by means of probability networks. This paper represents the method of creation of model of object recognition that can be done by examine relationship between human actions and function of object.

P. He´de and all [5], author has described usually to represent images of objects in some natural language or in a human readable form image annotation system is utilize in image base management. Automatic image annotation is a way to assigns metadata in the form of captioning or keywords to a digital image. Their system describe that manual database creations, they required color and texture to generate a caption in a natural language. In order to generate a description of Images step wise procedure must followed. In first step, perform segmentation technique on images with respect to available objects in the image. In second step, retrieve the attributes from the database, and finally generate a description for image using templates.

B. Yao and all in [6], discuss the methods of image parsing and text generation. It generates image text description in detail using parsing technique. Parsing technique shows correspondence between different sharing visual patterns within an image and partition the image into various parts namely scenes-object-parts. Specifically inputted images get decompose by means of image parsing engine. At the end, the task of text description is to generate meaningful and human understandable text. Paper also consist of image parsing engine that parse the input image into various parse graph and an And-or Graph that shows syntactic and semantic relation between visual features of images scenes, objects, parts. And-or Graph not only parse the image into top down approach but also provides mechanism that transfigure parse graph into semantic representation. Semantic web furnish interconnection between various semantic elements that are capture from previous method.

Ali Farhadi and all [7], demonstrate the formation of sentences from the required images by simply compare given images and sentences of documents and obtained a score in the paper related to every picture tells a story. This score in used to solely attach given sentence to the images. This method simply retrieves a given sentence rather than composing a new one. Here also an images split into three parts scenes, objects, and action applied over the scenes and objects. It contains two main factors Illustration and annotation. From the collection of pictures find picture suggested by keywords by an illustration method. V. Ordonez and all [8], Advances in Neural Information Processing Systems, describe the caption generation by using large collection of images based on word based model by taking into account about 1 millions photographs which is really a huge and enormous database. But in word based model some drawbacks arises. As the image annotation model does not take function words into account. Image annotation mechanism also auspiciously used relevance models, mainly implemented for information retrieval. In image annotation model keywords are used to convert imageinto human readable form. Relevance models, originally developed for information retrieval, have been also successfully used for image annotation (e.g., [9], [10]). A key idea behind these models is to find the images most similar to the test image and then use their shared keywords for annotation,

Simone Marinai and all [11], deal with a general framework for document image retrieval has been proposed. The system allows users to retrieve documents on the basis of both global features of the page and features based on blocks extracted by layout analysis tools. Global features include texture orientation, gray level difference histogram, and color features. The block-based features use a weighted area overlap measure between segmented regions and Authors describe the integration of the word and layout indexing and retrieval in a unique framework that can be used in Digital Library (DL) applications. We first review most common paradigms exploited by Internet DLs for document retrieval. Hong Liu and all [12] deal with document image retrieval. It retrieves the document image from the database, when they find most similar document images. It makes use of density distribution features and key block features, it is weak for those images which are very similar to each other in distribution and block features. The technique of density distribution of document image retrieval based on key block features of document images, for improving the retrieval performance Key block features are applied to confirm the reliability of the raw candidate images.

Joost van Beusekom, Daniel Keysers, Faisal Shafait, Thomas M. Breuel in [13], they use the layout information for document image retrieval. This method performs in two steps. In first step, the distance for every pair of blocks from the two layouts are computed using a block distance and in second step a matching is done to minimize the total distance between the two layouts and thus assign blocks to each other.

Shijian Lu in their paper [14] discusses the document image retrieval technique. The query keyword or query document image techniques are used. This paper presents a new word image annotation technique. The image can be annotated by using a set of topological shape features. The document images can be retrieved by using query keywords. There are various advantages of this technique; the first one is much faster because it does not require the time-consuming. The second is character shape features in use are more tolerant to the document skew and the variations in text fonts and text styles and finally most importantly, its collision rate is much lower.

Shijian Lu and all in [15] discuss a novel document image retrieval algorithm based on local feature sequence and common substring matching. The local feature sequences can be extracted without print-core detection. In this method can locate the match parts words by words. The discuss method achieve good performances on some document image databases. However, the local features such as character, character shape and word shape are depend on the quality of images.

The problem of logo recognition is very important in document image analysis because it enables immediate identification of the source of documents based on the originating organization [16]. In this method, segmentation free and layout independent and author address logo retrieval in an unconstrained setting of 2-D feature point matching. At the end, quantitatively evaluate the effectiveness of technique using large collections of real-world complex document images.

Tomohiro Nakai in their paper [17] described a real- time retrieval method for document images. In this technique the query consist of image of document captured by a camera. In real time document image for the query image is retrieved from the document image database. Since an object is linked with its relevant information in the database. From a captured image of the object, the relevant information is retrieved and provided to users. When a digital camera is used as an input device, object recognition of camera captured images is a difficult problem.

RezaAzmi, Hossain Akbari, Mohammad Akbari, Hossain Shirazi in [18], a system for retrieving document images from digital library based on visual similarity is described. The goal of document image retrieval is finding, all documents related to a query document, based on their visual characteristics. The method first creates a graph layout based on document extracted blocks. This graph represents document layout structure and second they create a vector based on path patterns to represent a graph. In this method the query document directly retrieve from the database without comprised in database files.

Kazutaka Takeda in paper [19] retrieves a real time document image from a 10 million pages database. They use the technique of Locally Likely Arrangement Hashing (LLAH), but this technique has some drawback. They required a large number of memories and another is the retrieval accuracy is going to decreases when a database is increases.

PROPOSED METHOD

The proposed method is divided in two stages, one is client side and other is server side. The client can take single image by using the camera or select the image from gallery as input. The caption can be generated for the image by using the article stored at the server side, by selected keyword. The mobile query is send to the server side, as a wireless connection the mobile query must be small in size is preferred. JBIG2 compression technique is used for compress the image at the client side. The same technique is used for the decompressed the image

at the server side. Text segmentation is used for segment the text. Hamming distance KD-tree is used for the searching the document. Finally the rank fusion algorithm is applied for retrieving the document. The top rank document is shown at the client side.

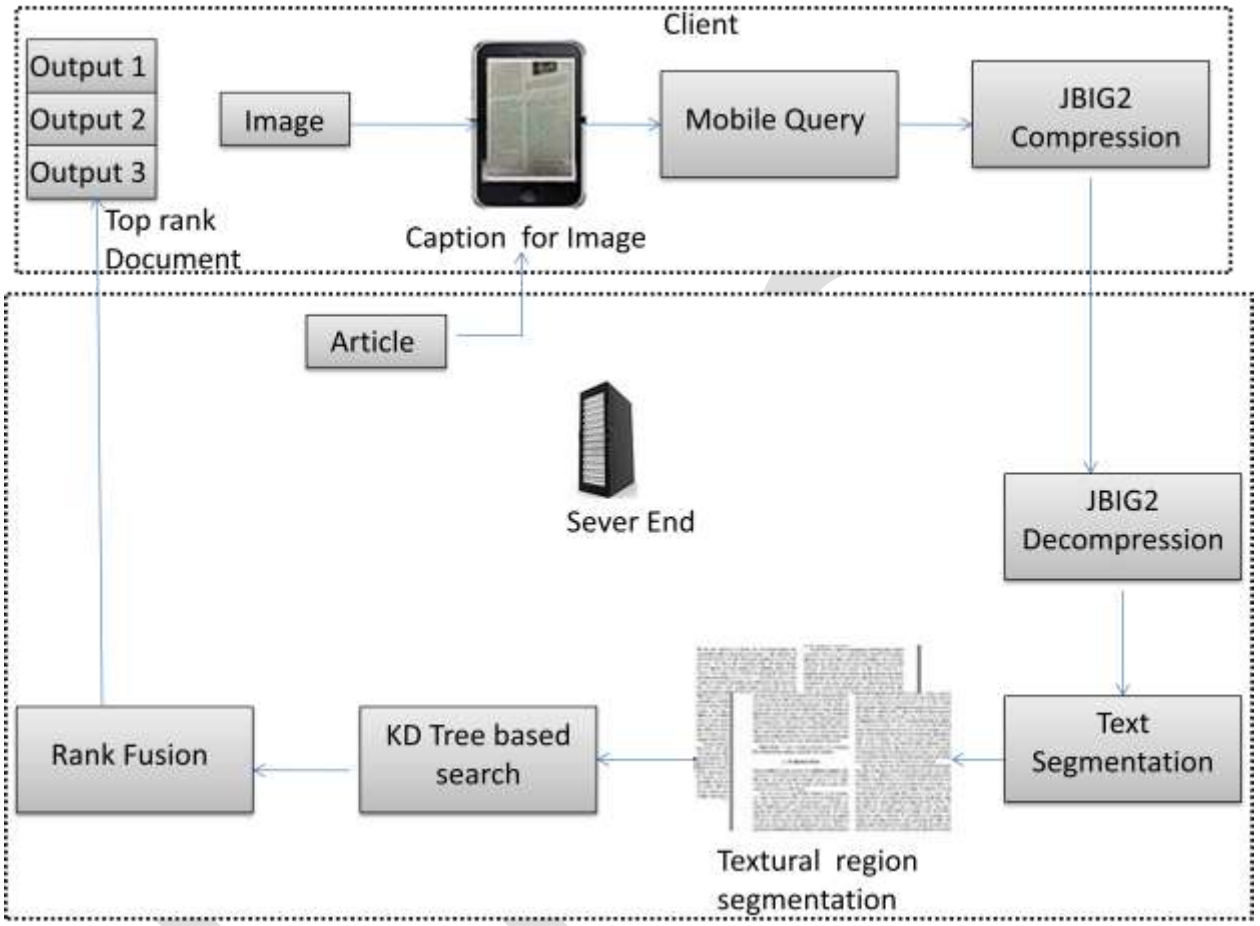

Figure 2: The architecture of project

The proposed method is divided into three tasks: Content selection identifies what the image, whereas surface realization determines how to verbalize the chosen content and third stage is efficient retrieval of the document. Before describing our model in detail, we summarize our assumptions regarding the caption generation task and the nature of the data on which it is being modeled. The caption describes the content of the image directly or indirectly. In traditional image annotation, keywords describe salient objects; captions supply more detailed information, not only about objects and their attributes, but also events. The accompanying document describes the content of the image. Since our images are implicitly rather than explicitly labeled, so do not assume that researchers can enumerate all objects present in the image. Instead, hope to model event-related information such as "what happened," "who did it," and "where" with the help of the document.

A. Image Content Selection

Researchers define probabilistic image annotation model based on the assumption that images and their surrounding text are generated by a shared set of latent variables or topics. Specifically, we describe documents and images by a common multimodal vocabulary consisting of textual words and visual terms. Due to polysemy and synonymy, many words in this vocabulary will refer to the same underlying concept. Using Latent Dirichlet Allocation (LDA [20]), a probabilistic model of text generation, we represent visual and textual meaning jointly as a probability distribution over a set of topics. Our annotation model takes these topic distributions into account while finding the most likely keywords for an image and its associated document

Words and images are distinct modalities, but both modalities are on same level as they describe same objects. The first step is the segmentation of the picture into regions, using image segmentation algorithm. Regions are then described by a standard set of features, including color, texture and shape. The visual features receive a discrete representation and each image is treated as a bag of words. To achieve this, Scale Invariant Feature Transform (SIFT) algorithm is used [21], [22].

They represent any image-caption-document tuple together as a mixed document. Here assume that the two modalities express the same meaning. The LDA is a three- level Bayesian model. It consists of the various documents. The document is model by mixture with topic. The words for the document are generated by using the topic distribution.

B. Image Annotation

Image annotation is the application of the computer vision. Image annotation is the method to assign a keywords or description of words to the image. It is used a machine learning technique to automatically apply the keyword for the image. First task is to learn the image features training annotation of image. After that the technique can be constructed by using the machine translation. Previously the document image can be retrieve by using the content based retrieval system. The advantage over content based retrieval system is less time required to search the document and also it is less expensive.

Researchers use the Latent Dirichlet Allocation that generates a text for the image. It represents visual and textual meaning together as a probability distribution over a set of topics. It uses the topic distributions for detecting the most likely keywords for an image and their related document. The mix LDA is compared with the other types of LDA. the Mix LDA significantly ($p < 0:01$) is preferable than other models.

C. Extractive Caption Generation

The idea behind Extractive caption generation is to create a summary simply by identifying and subsequently concatenating the most important sentences in a document, independently of text type, style and subject matter. For the task of caption generation, only the extraction of a single sentence is required. This sentence must be maximally similar to the description keywords generated by the annotation model [23], [24]. There are different ways to represent extractive caption generation

Word Overlap-Based:

In this sentence selection method measure a similarity of the image keyword and document sentence. Where W_I is the set of keywords and S_d a sentence in the document.

$$\text{Overlap}\ (W_I, S_d) = \frac{WI \cap Sd}{WI \cup Sd}$$

Vector Space-Based:

The disadvantage of word overlap method is removing by representing a keyword and sentences in vectors space. The vectors represented by keywords $\overrightarrow{WI}$ and document sentence $\overrightarrow{Sd}$

$$\text{sim}\ (\overrightarrow{W_I}, \overrightarrow{S_d}) = \frac{\overrightarrow{WI} \cdot \overrightarrow{Sd}}{\overrightarrow{WI}\ ||\overrightarrow{Sd}}$$

Topic-Based:

In this method, the similarity can be measured by a probability distribution over a set of latent topic between the image and sentences by using the same topic distributions

D. Abstractive Caption Generation

There is often no single sentence in the document that uniquely describes the image's content. In most cases the keywords are found in the document but interspersed across multiple sentences. The selected sentences make for long captions, which are not concise. For these reasons, we turn to abstractive caption generation technique.

Word-based Caption Generation:

To content selection is modeled as the probability of a word appearing in the headline given that the same word appears in the corresponding document and is independent of other words in the headline. The likelihood of different surface realizations is estimated using a bigram model. Since the individual words cannot frame a meaningful caption.

Phrase- based Caption Generation:

In Word-based Caption Generation, there is no guarantee that these will be compatible with their surrounding context or that the captions will be globally coherent beyond the trigram horizon. To avoid these, shift our attention to phrases. The phrases are linked together to create headlines using a set of handwritten rules,

E. Scalable Search:

To accomplish effective and efficient retrieval, we resort to the K-D Tree based approximate nearest neighborhood search, with a Hamming embedding scheme [25] to reduce memory cost. The motivation is to introduce a compact binary code to reduce the memory cost from storing original local descriptors for backtracking. In the proposed Hamming Distance (HD) KD-Tree, we replace the Euclidean feature space with a Hamming space. The Hamming distance KD-Tree enables very fast similarity matching, while maintaining matching accuracy,

F. Low Bit Rate Query

Here discuss, the query compression scheme towards low bit rate mobile visual search in the field of document images. Rather than extracting compact descriptors as in [26], [27], [28], we propose to compress query images in JBIG2 at low complexity.

JBIG2 first tries to segment a document image into three types of regions, namely, text regions, halftone regions, and regular regions. For text regions, the symbol compression is used. For halftone regions, the grid coding is applied and the arithmetic coding is applied to regular regions.

Figure 3: Left: Original Image of size 120 kb Right: compressed Image of size 24 kb

EXPERIMENTAL RESULT

At the client side, single image can be taking as input. Client showing the original as well as compressed image is shown in a diagram. The original image of size 362 kb is compressed to 12 kb for low bit query rate. The article is shown in the below, is stored at the server side. The article is used for generating a caption for the image. Image annotation model is used to extract the keyword from the article. The phase based method, generate a caption for the image (Shown in figure).

The Hamming distance KD tree is used to search the document in the library. Server side contains a large number of documents. When the client searches for the document they can be retrieving on the basis of rank assign to the document. The document retrieve at the client side is shown in the figure.

Database:

The article for images that used to generate a caption is stored in database. The database contains large number of document stored in a txt file format. For example the butterfly image shown in the client side, the article used for generating a caption is as follows.

Article:

Barcode-An optical machine-readable code, A barcode is an optical machine-readable consist of data relating to the object to which it is attached. It consists of multiple numbers of parallel lines. It can also available in into rectangles, dots, hexagons and other geometric patterns. They are generally referred to as barcodes as well. for reading the Barcodes, it is scanned by special optical scanners called barcode readers, by using the barcode reader recognize the product. In current year software became available on devices like Smartphone, computers to recognize the barcode. [30].

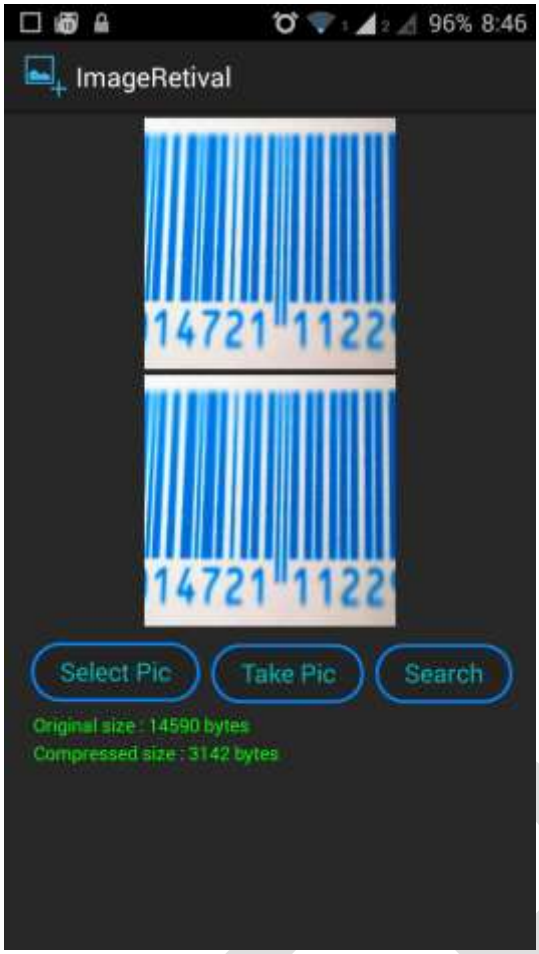

Figure 4: Top - Original image
Bottom - Compressed image

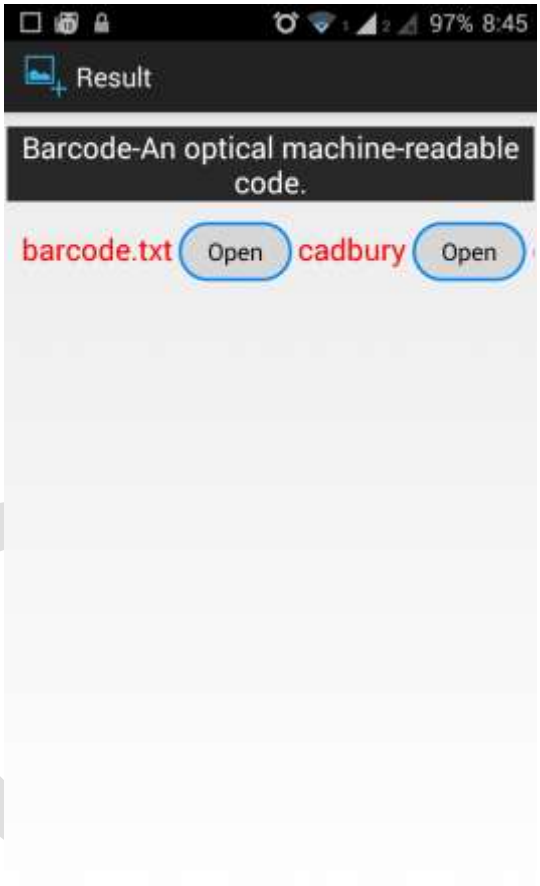

Figure 5: Caption for the Image\

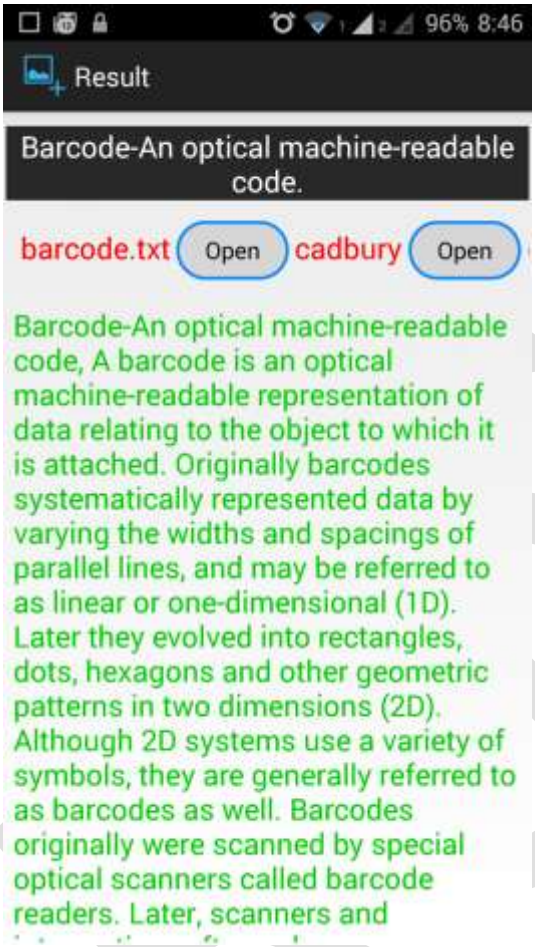

Figure 6: Document for Image.

CONCLUSION

The proposed method generate caption for mobile images automatically and also retrieve the document. An efficient method of automatic text generation from the images and searching methods that search the images with respect to content of images, without giving more importance to surrounding text. So that gets more targeted images. Also shows relationship between content selection and surface realization to achieve caption generation using phrase based model for image annotation method.

The Hamming Distance KD-Tree is addressing the issue of high memory cost in building up the indexing structure towards scalable search. JBIG2 based compression scheme of low complexity is introduced to reduce the query delivery latency while maintaining comparable search accuracy.

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Review paper on finding Association rule using Apriori Algorithm in Data mining for finding frequent pattern

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Abstract— Because of the rapid growth in worldwide information, efficiency of association rules mining (ARM) has been concerned for several years. Association rule mining plays vital part in knowledge mining. The difficult task is discovering knowledge or useful rules from the large number of rules generated for reduced support In this paper, based on the Apriori algorithm association rules is based on interestingness measures such as support, confidence and so on. Confidence value is a measure of rule's strength, while support value corresponds to statistical significance. Traditional association rule mining techniques employ predefined support and confidence values. However, specifying minimum support value of the mined rules in advance often leads to either too many or too few rules, which negatively impacts the performance of the overall System. In this algorithm, we will create association rules depending upon the dataset available in the database. The algorithm majorly works on finding the minimal confidence and so association rules which frequently used and follow the minimum confidence. So the research part of this paper is this by changing the value of minimum confidence, gives different association rules. The value of minimum confidence is high then rules filtered more accurately..

Keywords— Data Mining, e-Commerce, Apriori algorithm, association rules, support, confidence, retail sector.

INTRODUCTION

Today retailer is facing dynamic and competitive environment on global platform and competitiveness retailers are seeking better market campaign [I][2]. Retailer are collecting large amount of customer daily transaction details. This data collection requires proper mechanisms to convert it into knowledge, using this knowledge retailer can make better business decision. Retail industry is looking strategy where they can target right customers who may be profitable to their business . Data mining is the extraction of hidden predictive information from very large databases. It is a powerful technology with great potential to help organizations focus on the most important information in their data warehouses [4][6]. Data mining tools predict future trends and behaviors, helps organizations to make proactive knowledge-driven decisions [7] [5]. The automated, prospective analyses offered by data mining move beyond the analyses of past events provided by retrospective tools typical of decision support systems. Data mining tools have the answer of this question.

Those traditionally methods were lot of time consuming to resolve the problems or decision making for profitable business. Data mining prepare databases for finding hidden patterns, finding predictive information that experts may miss because it lies outside their expectations. From the last decade data mining have got a rich focus due to its significance in decision making and it has become an essential component in various industries [7][5].Hence, this paper reviews the various trends of data mining and its relative applications from past to present and discusses how effectively can be used for targeting profitable customers in campaigns.

LITERATURE REVIEW

Algorithms for mining association rules from relational data have been done since long before. Association rule mining was first presented at 1993 by R. Agrawal, T. Imielinski, and A. Swami [3]. Association rule mining is interested in finding frequent rules that

define relations between emulated frequent items in databases, and it has two main measurements: support and confidence values. The frequent item sets is defined as the item set that have support value greater than or equal to a minimum threshold support value, and frequent rules as the rules that have confidence value greater than or equal to minimum threshold confidence value. These threshold values are traditionally assumed to be available for mining frequent item sets. Association Rule Mining is all about finding all rules whose support and confidence exceed the threshold, minimum support and minimum confidence values.

Association rule mining proceeds on two main steps. The first step is to find all item sets with adequate supports and the second step is to generate association rules by combining these frequent or large item-sets [8][9][lO]. In the traditional association rules mining [11][12], minimum support threshold and minimum confidence threshold values are assumed to be available for mining frequent item sets, which is hard to be set without specific knowledge; users have difficulties in setting the support threshold to obtain their required results. To use association rule mining without support threshold [13][14][15][16], another constraint such as similarity or confidence pruning is usually introduced.

Association Rule Mining is all about finding all rules whose support and confidence exceed the threshold, minimum support and minimum confidence values. In the traditional association rules mining with FPtrees and reduction technique[11][12],minimum support threshold and minimum confidence threshold values are assumed to be available for mining frequent itemsets, which is hard to be set without specific knowledge; users have difficulties in setting the support threshold to obtain their required results. Setting the support threshold too large, would produce only a small number of rules or even no rules to conclude. In that case, a smaller threshold value should be guessed (imposed) to do the mining again, which may or may not give a better result, as by setting the threshold too small, too many results would be produced for the users, too many results would require not only very long time for computation but also for screening these rules.

DESIGN

Mining for association rules:

Association rules are the form

A->B

This implies that if a customer purchase item A then he also purchase item B. For the association rule mining two threshold values are required. As given in the design part.

• Minimum support

• Minimum confidence

The ordering of the items is not important. a customer can purchase item in any order means if he purchased Milk first then Butter and after purchasing both he can buy Bread or after buying Bread he can purchase Milk and Butter. But in the association rules the direction is important.

If A->B is different from B->A

There is general procedure for defining the mining association rules using Apriori algorithm.

• Use apriori to generate frequent item-sets of different Sizes

• At each iteration divide each frequent item-set X into two parts antecedent (LHS) and consequent (RHS) this represents a rule of the form LHS->RHS.

• The confidence of such a rule is support(X) /support (LHS)

• Discard all rules whose confidence is less than minimum confidence

The support of an association pattern is the percentage of task - relevant data transactions for which the pattern is true.

Support (A -> B) = P (A U B)

Support (A -> B) = # # Tuple containing both A & B

Total # of Tuples

If the percentage of the population in which the antecedent is satisfied is s, then the confidence is that percentage in which the consequent is also satisfied.

The confidence of a rule A -> B, is the ratio of the number of occurrences of B given A, among all other occurrences given A. Confidence is defined as the measure of certainty or trustworthiness associated with each discovered pattern A -> B

Confidence (A -> B) = P (B |A) means the probability of B that all know A

CO NFIDENCE (A-> B) = # Tuple containing both A & B

# of Tuples containning A

So the research part of this paper is this by changing the value of minimum confidence, gives different association rules. the value of minimum confidence is high then rules filtered more accurately.

TABLE II. TRANSACTION DATABASE

TXl	Bread	Butter	Milk
TX2	Ice-cream	Bread	Butter
TX3	Bread	Butter	Noodles
TX4	Bread	Noodles	Ice-cream
TX5	Butter	Milk	Bread
TX6	Bread	Noodles	Ice-cream
TX7	Milk	Butter	Bread

TX8	Ice-cream	Milk	Bread
TX9	Butter	Milk	Noodles
TX10	Noodles	Butter	Ice-cream

The transaction table given above is showing the item sets Purchased by the customer in a period of time. The support for the item sets Bread and noodles means a customer who purchased bread also purchased the noodles is given below.

The support for ten transactions where bread and noodles occur together is two.

Support for {Bread, Noodles} = 2/10= 0.20.

This means the association of data set or item set, the bread and butter brought together with 20 percent support.

Confidence for Bread ----> Noodles = 2/8 = 0.25

This means that a customer who buy bread then there is a confidence of 25 percent that it also buy butter.

METHODOLOGY

The Apriori Algorithm:

Apriori is a seminal algorithm for finding frequent item-sets using candidate generation [18]. Mining for association among items in a large database of sales transaction is an important database mining function. Given minimum required support s as interestingness criterion:

1. Search for all individual elements (I-element item-set) that have a minimum support of s.

2. Repeat

   l. Form the results of the previous search for I element item-set, search for all i+ 1 element item.

   Sets that have a minimum support of item-set.

   2. This becomes the set of all frequent (i+ 1) item Sets that are interesting

3. Until item-set size reaches maximum.

A large supermarket tracks sales data by Stock-keeping unit (SKU) for each item, and thus is able to know what items are typically purchased together. Apriori is a moderately efficient way to build a list of frequent purchased item pairs from this data.

By using the consumer database given in table no.2

Let's illustrate the process of Apriori with an example, let takes the consumer database which is showing the number of item sets purchased by the consumers from a bakery shop.

The first step of Apriori is to count up the frequencies, called the supports, of each member item separately:

C1 -> L1

item	support	item	support
Bread	0.8	Bread	0.8
Butter	0.7	Butter	0.7
Ice-Cream	0.5	Ice-Cream	0.5
Milk	0.5	Milk	0.5
Noodles	0.5	Noodles	0.5

Now the support for two element item- sets. Interestingness 2-element item-sets

C2

item-sets	support
{Bread, Butter}	0.5
{Bread, Milk}	0.4
{Bread, Noodles}	0.2
{Bread, ice-cream}	0.3
{Butter, Milk}	0.4
{Butter, Noodles}	0.3
{Noodles, ice-cream }	0.3

L2

item-sets	support
{Bread, Butter}	0.5
{Bread, Milk}	0.4

{Bread, ice-cream}	0.3
{Butter, Milk}	0.4
{Butter, noodles}	0.3
{Noodles, ice-cream }	0.3

Here {Bread, Noodles} Item-set thrown away because its support value is less then minimum support

Interestingness 3-element item-sets

C3

item-sets	support
{Bread, Butter, Milk}	0.3
{Bread, Milk, ice-cream}	0.1
{Bread, Butter, ice-cream}	0.0
{Butter, Milk, Noodles}	0.1
{Bread, Milk, Noodles}	0.0
{Noodles, ice-cream, Bread}	0.2

L3

item-sets	support
{Bread, Butter, Milk}	0.3

Here only one item-sets which satisfy the minimum support value. So after three iteration, only one item-set filtered. {Bread, Butter, Milk}

ASSOCIATION RULES FOR FREQUENT ITEM-SETS

Rules	Confidence(percentage)
{Bread}->{Butter, Milk}	37

{Bread, Butter}->{Milk}	60
{Bread, Milk}->{Butter}	75
{Butter}->{Bread, Milk}	42
{Butter, Milk}->{Bread}	75
{Milk}->{Bread, Butter}	75

If the minimum confidence threshold is 70 percentages then discovered rules are

{Bread, Milk}-> {Butter}

{Butter, Milk}-> {Bread}

{Milk}-> {Bread, Butter}

Because the confidence value of these rules are greater than minimum confidence threshold value which is 70 percent. So in the simple language if a customer buy Bread and Milk he is likely to buy Butter. A customer buy Butter and Milk is likely to Bread. A customer buy Milk is likely to buy Bread and Butter.

This paper is an attempt to use data mining as a tool used to find the hidden pattern of the frequently used item-sets. An Apriori Algorithm may play an important role for finding these patterns from large databases so that various sectors can make better business decisions especially in the retail sector. Apriori algorithm may find the tendency of a customer on the basis of frequently purchased item-sets.

CONCLUSION

This paper is an attempt to use data mining as a tool used to find the hidden pattern of the frequently used item-sets. An Apriori Algorithm may play an important role for finding these patterns from large databases so that various sectors can make better business decisions especially in the retail sector. Apriori algorithm may find the tendency of a customer on the basis of frequently purchased item-sets. There are wide range of industries have deployed successful applications of data mining. Data mining in retail industry can be deployed for market campaigns, to target profitable customers using reward based points. The retail industry will gain, sustain and will be more successful in this competitive market if adopted data mining technology for market campaigns

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PERCEIVING THE REGION OF INTEREST FOR HUMAN VISION PROCESSING

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Abstract— Eye is the most interesting and most widely studied sensing organ in human body. The vision is always a magical phenomenon in the world done by the co-ordination of eye and brain. Artificial intelligent is making the life easier and more intelligent. Emulating the human vision intelligently is a challenging task for engineers. Finding the region of interest is related with the focused attention for human vision. Texture analysis and segmentation plays a vital role for perceiving the region of interest. There are several algorithms available for this. This project developed an efficient algorithm for finding the region of interest. As well as it finds the better texture analysis filter for perceiving the region of interest.

Keywords— ROI (Region of interest), Segmentation, Texture analysis, Saccadic movement ,Attracting factors, Visual gaze, High level factors, Low level factors.

INTRODUCTION

The human visual system the most widely studied and most understood mammalian sensory system. Not only the anatomical features is well described, but function of its neuron is have also been characterized at many stages of the visual pathway. Because of this reason, the visual system has become the system of choice for the study of both sensory coding as well as for such higher cognitive processes as memory and attention. Our visual world is very complex and most dynamic one. To successfully interpret this world beautifully, the human visual system performs the analysis of various attributes of the visual image and combines these attributes into a percept of a visual scene. The most fundamental characteristic of our visual world is that it is not uniform in time and space. The visual system is well designed to analyze these non-uniformities. Such fundamental dimensions of visual stimuli as spatial and temporal variations in luminance and chromaticity are encoded at the level of the retina, while the encoding of other more complex stimulus features like motion, complex form and depth, emerge at the level of visual cortex.

One of the extraordinary capabilities of the human visual system is its ability to find the attractive region in a complex visual scene. The region of interest is a particular region in a scene in which we are interested. It is essential to extract that region from the scene which has significant information. In order to extract significant region there need to determine its cognitive boundary. We treat this boundary as ROI which is different from existing definition of it. The selection of this cognitive boundary by human itself is difficult. This is because humans have different psychology of interest and decision making criteria.

In cognitive psychology, human interest is a mental state in which human feels intuitive or curiosity about some matter. In the a visual scene, human tries to observe the interesting objects in the scene. This needs selection of ROI which confines objects of interest in it. We usually feel interest when something draws our attention. Therefore, ROI is related with focused attention. In order to get focused attention there need to find combinations of features. Attention allows simple physical properties of objects to be combined correctly. In the case of perceptual grouping, some psychologists have suggested that attention is directed to perceptual groups. Therefore, object based attention selection is better for its perceptual importance. The cognitive boundary also depends on human psychology of relevance. Relevance theory claims that humans do have an automatic tendency to maximize relevance but because of the way our cognitive systems have evolved. The region of interest is used for the saccadic movement of eye. The saccadic movement is the rapid movement of eye for the fixation of eye.
The human vision system is attracted to some feature such as colour, contrast, size, motion etc., while human brain also include the intension or thoughts along with this features. Perceiving the region of interest by learned attentive mapping is for finding the region of interest by processing the low level and high level factors of vision

THEORY

Visual fixation is the maintaining of the visual gaze on a single location.co-ordination of eyes and brain is needed for this process. Visual fixation is never perfectly steady: factional eye movement [6] occurs involuntarily. In the current consensus, factional eye movement contributes to maintaining visibility, by continuously stimulating neurons in the early visual areas of the brain, which mostly respond to transient stimuli. Fixation is also used in experiments in vision science or neuroscience. Human subjects are often

told to fixate on an object on a monitor before any experiment takes place. This serves to direct the person's attention to the point where visual information.

Osberger w et al (1998) presents a method for automatically determining the perceptual importance regions of different regions in an image [8]. The algorithm proposed is based on human visual fixation and saccadic movement of eye characteristics [9]. Several features known to influence human visual attention low level factors and high level factors including are evaluated for each region of a segmented image to produce an importance value for find out the most attracted region [3]. The calculated values of each low level factors and high level factors are combined to produce an Importance Map, which classifies each region of the image in relation to its perceptual importance.
Human visual attraction is controlled by both low level factors and high level factors, where High level factors generally involve some feedback process from memory and involving template matching. Low level processes are generally fast, feed forward mechanisms involving relatively by simple processing. Low level factors which have been influence visual attention include[4]: Contrast, Size, Shape, Colour and Motion. Several high level factors have also should considered. They are Location, Foreground/background, and context.

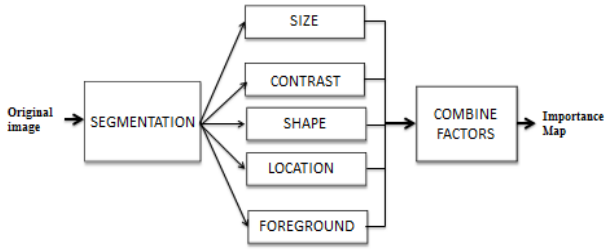

Figure 1:Importance map calculation

Zhang J et al (2008) propose a novel approach for the region of interest using the combination of visual attention model and watershed segmentation [5]. This approach extracts the region of interest by automatically. Proposed research uses visual attention model to locate salient point, here the winner point, the most salient point selected as seed point of watershed transformation.
Image segmentation is the prior step for the detection of region of interest. Several algorithms are developed for image segmentation. Senthilkumaran N (2010) propose several image segmentation 10 technique [1]. Image segmentation is an initial and vital step in a series of processes for overall image understanding. Image segmentation means partition an image into meaningful regions with respect to a particular application. The segmentation is based on measurements taken from the image which might be grey level, colour, texture, depth or motion. This proposed paper mainly aims to understand the digital image segmentation techniques [7] and to gain practical experience in implementing an image segmentation using MATLAB functions[9].
The main objective of image segmentation[12] is used to distinguish different objects in the image content. The image is divided into two parts: background and foreground. The foreground is defined as the interesting objects and the background as the rest [11]. Image segmentation is simply distinguishing and separating the two from one another. There are mainly three approaches for segmentations are Threshold based Segmentation, Edge based Segmentation and Region-based segmentation. Threshold techniques make decisions based on local pixel information and are effective when the intensity levels of the objects fall squarely outside the range of levels in the background. Because spatial information is ignored, however, blurred region boundaries can create havoc.

Edge-based methods center around contour detection used their weakness in connecting together broken contour lines make them, too, prone to failure in the presence of blurring. A region-based method usually proceeds as follows. The image is partitioned into connected regions by grouping neighboring pixels of similar intensity levels. Adjacent regions were then merged under some criterion involving perhaps homogeneity or sharpness of region boundaries. Over stringent criteria create fragmentation; lenient ones overlook blurred boundaries and over merge.

FINDING REGION OF INTEREST

The ability to look at things is a familiar part of the process of seeing. Looking is achieved by orienting the eyes, that is to say directing their visual axes to point to a new location. Large orienting movements involve co-ordinated action of the eyes, head and body, but smaller movements, such as those made when looking at a picture are made with the eyes alone. Automatic detection of regions of interest in images is one of the most critical problems in computer vision. For a human observer, detecting a perceptually

important region in an image is a natural task which is done instantaneously, but for a machine it is far more difficult, as the machine lacks the cultural references and knowledge to identify the content of the scene. One of the causes for this difficulty is the subjective nature of the notion of region of interest (ROI) [10]. In the most general sense, a ROI, as its name suggests, is a part of the image for which the observer of the image shows interest. Of course, the interest shown by the observer in viewing the image is determined not only by the image itself, but also by the observer's own sensitivity. For a given image, different people could find different regions of interest. However, it can be said, in most cases, regions of interest generally have visually and structurally distinctive features than the rest of the image. Then some structural characteristics can be used to detect the ROI of an image without making hypotheses about the semantic content of the picture. The detection of the ROI consists in finding a region of the image which appears different from the background with respect to low-level features such as contrast, colour, region size and shape, distribution of contours or texture pattern. Different methods have been proposed to detect regions of interest in an image. Some are based on models of low-level human vision which detects perceptually important regions on the image by building importance maps based on various visual characteristics.

The aim of this project is to find the region of interest in an image for emulating the human vision processing.

The main steps to be follow for detecting the ROI are

- Texture analysis
- Image segmentation
- Feature extraction
- Finding the region of interest

There are several texture analysis methods are available. And the project aims to find out the best texture analysis method for finding the ROI and also the best algorithm for the image segmentation better for human vision processing. Human vision is an active process in which information is sampled during brief periods of stable fixation in between gaze shifts. Foveal analysis serves to identify the currently fixated object and has to be coordinated with a peripheral selection process of the next fixation location. The region of interest gives the location for next fixation.

METHODOLOGY

Simulation is a challenging problem, where the concept should be realized and arranged well to get the result. The steps should be followed can be representing as follows. The input to ROI block single image by combining the two images from the camera (two eyes in the case of human).

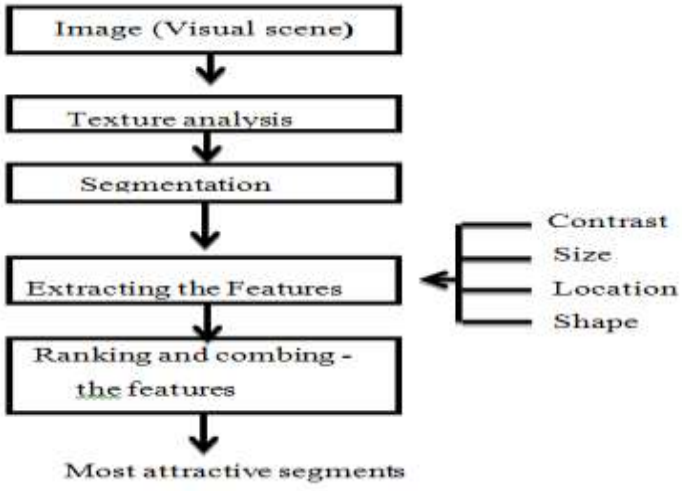

Figure 2: Algorithm for perceiving the ROI

The image from the camera has a size of 1600×1200. The image from the two camera of same size will combine to from a single image have the same size, which will be a colour image. For the simulation we are starting with the image of simple shapes. It will be the feed to ROI block.

Texture analysis: Image segmentation is an initial and vital step in a series of processes aimed at overall image understanding. Image segmentation is to partition an image into meaningful regions with respect to a particular application. The segmentation is based on measurements taken from the image and might be grey level, colour, texture, depth or motion. The first process is going to do by ROI block is the texture analysis before segmentation. Natural image processing put in obviousness the necessity to build reliable models for image analysis taking to account some textured regions for a posterior interpretation. Texture analysis is an important problem in image processing because it conditions the quality of image segmentation and interpretation. A texture is a region of an image, for which a window with minimal dimensions can be defined, such that the visual perception of an observation inside the window, is the same for all possible translation of the window inside the region.

There a three commonly used texture analysis algorithms. They are fuzzy based algorithms. There a three commonly used texture analysis algorithms. They are fuzzy based algorithms. These use three statistical texture filtering functions. They are based on

- Local standard deviation of an image
- Local entropy of an image
- Local range of an image

Local standard deviation of an image calculate local standard deviation of an image.in this technique it will specify defining a neighborhood around the pixel of interest and calculating the statistic for the neighborhood to determine the pixel value of output image. Local range of an image: it finds the local range of image. Range filter is used to find the edge with an image and works only for monochrome. The colour value of each pixel is replaced with difference of maximum and minimum of colour value surrounded in the region. We can specify neighborhood or different shape and size. Local entropy of an image: entropy of a small section of noted pixel is calculated and noted pixel is renewed by the obtained entropy value. Using entropy filter, a smooth portion in an image quality is extracted from the original image. The entropy filter technique specification defining a neighborhood around the pixel value of interest and calculating the statistics defining a neighborhood to determine the pixel value in the output image

The best filter the suitable of Human vision processing is local entropy image. Because it gives a shape and smooth portion of object in image. Segmentation: Extracting the features for finding the region of interest is the next step. The features are size, contrast, location and shape of an image. The size can be calculated by estimating the pixel count of an object. The average value of intensity of all pixel will give the contrast of the object. The location can be finding by considering the centroid of a segment. We have to find out the centroid of complete image and centroid of the segments. Calculating the distance between the centroid of complete image and segments by using quadratic equation will give the location. Finally the shape of an object can be calculated by calculating the roundness of an object.

Contrast is a very strong visual attracter. The human visual system converts luminance to contrast. The region which have more contrast than its surroundings have more visual attraction. This particular region is selected as the perceptually important region. The larger region is more attract our attention. So the Size is also likely to have an important role in the calculation of perceptually important region. However a saturation point exists, after which the importance due to size levels off.

Long and thin (edge-like) Shape have been found to be visual attractors. They are more likely to attract attention than rounder regions which of the same area and contrast. Viewer's eyes are directed at the center 25% of a screen for a majority of viewing material and more likely to be attracted to objects in the foreground than those in the background. So we have to find out priority of the features to find out the most attractive region or region of interest. The steps that should follow for prioritizing the features is,

For finding the ROI ,the features have to be ranked. From person to person the order of attractive features will vary. For Some person the most attractive features will be colour, and for some others it will be size. So assigning the priority is designer friendly. For human vision processing the order of priority of features is,

1. Contrast
2. Size
3. Location
4. Shape

SIMULATION RESULTS

Image segmentation is an initial and vital step in a series of processes aimed at overall image understanding

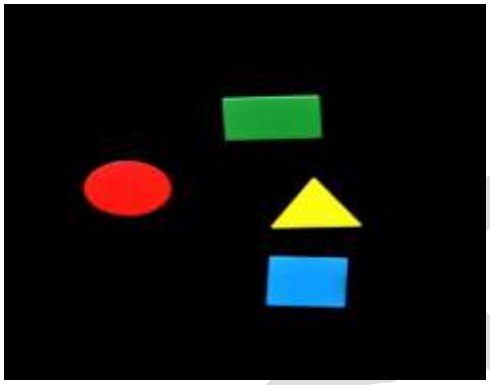

Figure 3: Input Image

It seems that local entropy an image filtering method gives an output better than other filtering technique. It gives a smooth portion of an object from the image. So this filtering method selected for texture analysis for this project.

After texture analysis we have to do a segmentation of this object. Initial step is to find the connected component in the image. It will give all objects in the image and number object in the connected component or object. The result of this particular input image will have number of connected component as 4.

Once the connected component found, finding the location of object in image is the next step. And also want to find out the pixel value of the object. After separating the each object, a boundary box should be drawn according to the size of object. According to than ranks which we give the most attractive region can be found. The priority assigned to finding the region of interest for Human vision processing.

Features	Rank
Contrast	40
Size	30
Location	20
Shape	10

Table 1: Rank value of each features

And the final segments according to the priority is given in the figures below,

Figure 4: Segment of circle with First priority

Figure 5: Segment of rectangle with second priority

Figure 6: Segment of triangle with third priority

Figure 7: Segment of square with Last priority

CONCLUSION

Different methods have been proposed to detect regions of interest in an image. Some are based on models of low-level human vision which detects perceptually important regions on the image by building importance maps based on various visual characteristics. From the experiments for finding the better texture analysis method is give the result that texture analysis by finding the local entropy give a smooth portion of an object. And the proposed algorithm simulated successfully. The proposed algorithm simulated by using the images of simple shapes.

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A Text Sentimental Approach for Online Portals Using Hadoop

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Abstract: Big data is an emerging technology to process the vast amount of both structured and unstructured data. Now a day social media such as twitter, face book, blogs and forums are the well suitable source to gathering the huge amount of data. Text sentiment analysis for the online portals such as flip kart, Amazon, Godaddy, etc.. are very important to review about their product performance in the market. Sentiment analysis is a text analysis method which aims to contextualize the meaning of the social network data. In the existing work, sentiment analysis is done by polarizing the sentences which derived from the public opinion. However it cannot polarize the public opinion accurately where the sentiment analysis is performed over the social network data's. In this work, we target on finding an appropriate polarity recognition method for public opinion supervision system. In our method, we explore new feature extraction rules which extract emotional nouns, verbs, adjectives, and bigrams as representative features. Then, we apply Fuzzy Naïve Bias to classify these online opinions into positive and negative class. Also we introduce the new category of sentiment analysis namely called as 'Neutral'. The experimental conducted were proves that the proposed methodology provides better result than the existing methodology

Index Terms*:* Big Data, Fuzzy Naïve Bias, Hadoop, Rule Base Sentiment Analysis, Sentiment Analysis, Job Tracker, Task Tracker, Name Node, Data Node

1. INTRODUCTION

Big data (also spelled Big Data) is a general term used to describe the voluminous amount of unstructured and semi-structured data a company creates -- data that would take too much time and cost too much money to load into a relational database for analysis. Although Big data doesn't refer to any specific quantity, the term is often used when speaking about petabytes and exabytes of data. A primary goal for looking at big data is to discover repeatable business patterns. It's generally accepted that unstructured data, most of it located in text files, accounts for at least 80% of an organization's data. If left unmanaged, the sheer volume of unstructured data that's generated each year within an enterprise can be costly in terms of storage. Unmanaged data can also pose a liability if information cannot be located in the event of a compliance audit or lawsuit. Big data is the term for a collection of data sets so large and complex that it becomes difficult to process using on-hand database management tools or traditional data processing applications. The challenges include capture, duration, storage, search, sharing, transfer, analysis, and visualization.

Hadoop:

Hadoop is a data processing software framework. It is a recent big data technology. It handles structured as well as unstructured information. It is open source software. It is recognized in 2008 and supports multiple operating systems, which was developed by Google and popularized by yahoo.

For effective scheduling of work, every Hadoop-compatible file system should provide location awareness: the name of the rack where a worker node is. Hadoop applications can use this information to run work on the node where the data is, and, failing that, on the same rack/switch, reducing backbone traffic. HDFS uses this method when replicating data to try to keep different copies of the data on different racks. The goal is to reduce the impact of a rack power outage or switch failure, so that even if these events occur, the data may still be readable. A small Hadoop cluster includes a single master and multiple worker nodes. The master node consists of a Job Tracker, Task Tracker, Name Node and Data Node. A slave or worker node acts as both a Data Node and Task Tracker, though it is possible to have data-only worker nodes and compute-only worker nodes. These are normally used only in nonstandard applications. Hadoop requires Java Runtime Environment (JRE) 1.6 or higher. The standard start-up and shutdown scripts require Secure Shell (ssh) to be set up between nodes in the cluster.

Personal computers, smart phones, tablets, and an ever-growing number of embedded devices can now all connect and communicate with each other via the internet. Computing devices have numerous uses and are essential for businesses, scientists, governments, engineers, and the everyday consumer. What all these devices have in common is the potential to generate data. Essentially, data can come from anywhere. Sensors gathering climate data, a person posting to a social media site, or a cell phone GPS signal are example sources of data. The popularity of the Internet alongside a sharp increase in the network bandwidth available to users has resulted in the generation of huge amounts of data. Furthermore, the types of data created are as broad and diverse as the reasons for generating it.

II. RELATED RESEARCH

This section presents the development of sentiment analysis in recent years. Since the first study in this area focused on the analysis of the semantic orientation of adjectives [8], techniques of sentiment analysis have been extensively used in text filtering, tracking of public opinion, and customer relationship management [1], [4]–[6]. Sentiment analysis is mining affective information from data and recognizing the sentiment polarity contained in the information (e.g., happy or sad, approve or disapprove, and agree or disagree). The classification of former studies has been done by different standards [2], [7]. In accordance with the study by
Zhang *et al.*, the present study discusses previous studies by their level of granularity, type of analytical technique, and language [7].

1) Level of Granularity: Previous studies discuss the problem related to sentiment analysis at different levels of granularity, from the document level to the sentence level. For example, Pang *et al.* classified the sentiments of articles by adopting a standard bag-of-features framework, which features unigrams and bigrams of words [8]. Turney *et al.* proposed an unsupervised learning algorithm known as pointwise mutual information and information retrieval (PMI-IR) to predict these semantic orientations of an article by calculating the similarity of its contained phrases to two reference words: “excellent” and “poor” [9]. Several recent studies have also considered the spread, density, and intensity of polar lexical terms to improve the performance of sentiment classification [10].

2) Type of Analytical Technique: Existing approaches to sentiment analysis can be categorized into rule- and learning based approaches. Rule-based approaches often require an expert-defined dictionary of subjective words; this approach predicts the polarity of a sentence or document by analyzing the occurring patterns of such words in text [11]. For example, Wiebe *et al.* provided a lexicon source of subjectivity clues, such as verbs, adjectives, and nouns, with their polarity (i.e., positive, negative, or neutral) and strength (i.e., strong or weak) annotated [12]. However, this lexicon is able to define the original polarity of a word only, and the actual polarity of a word may be modified by its context in a sentence. Several approaches that consider the context of words have been proposed to determine the sentiment orientation of words. Yuen *et al.* proposed an approach to deriving the semantic polarity of words on the basis of morphemes [13]. Knowledge sources, such as WordNet, have also been used to measure the semantic polarity of adjectives [14].

As to learning-based approaches, Hu and Liu [15] developed an approach to extracting option features from product reviews based on linguistic patterns called class sequential rules, which can be mined from a set of labeled training sequences of words and part-of-speech tags. Pang *et al.* [8] represented reviews as a bag of unigram/bigram features and applied three machine-learning methods to predict their sentiment. However, they found that, for sentiment classification, machine learning algorithms did not perform as well as traditional topic categorization tasks. In addition, learning-based sentiment classification requires sufficiently large training data sets with positive and negative examples manually labeled, which are often very costly and time consuming [9].

3) Language: Most sentiment analysis studies have focused on the English language and achieved remarkable success in numerous applications. By contrast, Chinese sentiment analysis has not been sufficiently investigated [17]. The unique linguistic characteristics of the Chinese language pose several technical challenges for Chinese sentiment analysis. The primary challenge is that the Chinese language does not segment words by spaces in sentences. Therefore, word segmentation is often required as an additional step in Chinese language processing [16]. In addition, the Chinese language contains various adverbs. The use of these adverbs can lead to subtlety
and ambiguity in sentences. The English language mainly uses suffixes to express comparative and superlative words (-er and -est, respectively), whereas the Chinese language uses various adverbs in varying degrees such as “ /more” and “ /most.”

Thus, determining the sentiment polarity of Chinese sentences presents greater difficulty, particularly when multiple adverbs and subjectivity clues appear in one sentence. Moreover, considering the differences of contexts and the ambiguity of the Chinese language itself, a document that contains several positive words may indicate a strong negative tone, and vice versa.

III. PROPOSED WORK

We are proposed the Fuzzy Naïve Bias (FNB) classification algorithm. In this algorithm we are combined the Fuzzy clustering with Naïve Bias classification algorithm. Fuzzy clustering is that the set of text was consider here to find the similar data and those similar data was grouped into the separate set. This output is given as an input to the Naïve Bias classification. In Fuzzy Naïve Bias (FNB), multiple clusters have the similar data. We are calculating the conditional probability for all data set. Also here we can introduce the third category namely called as neutral polarity. Due to this the computation time is low. Also it shows the performance accuracy in higher.

FNB has some modules. They are,

Data collection:

Data set can be collected in social media such as face book, twitter, micro blogs and forum, etc… Now a day data is increasing up to zeta byte. So that it was too complicated to process this volume of data. Big data is an emerging technology to process volume of data.

Preprocess:

In this module, the tool WordNet is used to remove the prepositions and discriminator. Stop words are words which are filtered out before or after processing of natural language data (text).There is no single universal list of stop words used by all tools processing of natural language. Non-significant words are removed from text such as articles, preposition and conjunction by using the "stemmer". **Stemmer**- Would reduce each word their "root". Example**: "funniest"** would become **"funny"**

Feature Extraction:

The choice of feature plays a key role in deciding precision. As illustrated in the front section, our target is to find a suitable approach to identify emotional trend of online public opinions. Of all sources of public opinions, micro blog and BBS occupy biggest share. And these two sources have distinctive features. First, it's short in length; then, emotional polarity is obvious; also, netizens use lots of phizs, this could be extracted as important feature for emotional trend identification. According to these features, we set a set of extraction object to select suitable feature. HowNet is a tool to process the Chinese text. So that it was not useful to process the English language. We extract the sentence features emotional noun, emotional verbs, adjectives, and adverbs by using the Natural Language Processing (NLP) tool. For an example, if the word is **Noun**, then it is represented as **NN.** If the word is **Pronoun**, then it is represented as **NNP.** If the word is an **adjective**, then it is represented as **JJ.** If the word is an **Adverb**, then it is represented as **RB.** If the word is **Conjunction**, then it is represented as **DT.** If the word is **Preposition**, then it is represented as **PRP.** If the word is **Verb**, then it is represented as **VV**

Opinion Classification:

After choosing the right characteristics to express the opinion of the short online text, we need to select an appropriate classifier to distinguish between different points. In a generalized Naive Bayesian classifier is proposed that uses the fuzzy partition of variables instead of them. It partitions the domain of each continuous variable into fuzzy regions. Therefore, each variable is a linguistic variable taking linguistic values. The training of Fuzzy Naive Bayesian classifier is done by performing an unsupervised fuzzy clustering in the feature space to obtain an optimal fuzzy partition. The conditional probabilities of each node in Fuzzy Naive Bayesian classifier are then estimated.

The proposed method is based on a fuzzy bayesian classifier over LR-type fuzzy numbers. Fuzzy bayes formula is introduced with the following equation:

$$p(w_j|\breve{x}) = \frac{p(\breve{x}|w_j)P(w_j)}{p(\breve{x})} \qquad (1)$$

In order to u se Bayesian classification for fuzzy numbers, it is required to compute for each class. In N-dimensional feature space, samples are in the form of $\breve{x} = \widetilde{x1}, \widetilde{x2}, \ldots \widetilde{xn}$.

In the current work, though, we present Bayesian classifier over fuzzy numbers as a quite new approach. In similar works with the proposed method [(1) and (2)], density estimation over fuzzy data (both discrete and continuous) have been studied with known density function according to following equation:

$$P(e_i|H_j) = \int \mu_{ei}(x) f(x|H_j) dx \qquad (2)$$

Where f(x|Hj) is the conditional probability density function at value x given Hj.

Sentiment Base

The extraction of properties is based on the sentiment, modifier, and rule bases. Here, we identify the updating issues of these bases, which are the key point in practice. Since topics and fashion terms discussed online are quickly changing, the rule and object bases need to be updated with time. In this work, we update the base semi automatically. With regard to the object base, given that the topics change quickly, we should summarize the related topics and objects, as well as their attributions and components.

$$\text{Weight P}c_i = \frac{fp_{c_i} / \sum_{i=1}^{n} fp_{c_i}}{fp_{c_i} / \sum_{i=1}^{n} fp_{c_i} + fn_{c_i} / \sum_{i=1}^{n} fn_{c_i}} \quad (3)$$

$$\text{Weight N}c_i = \frac{fn_{c_i} / \sum_{i=1}^{n} fn_{c_i}}{fn_{c_i} / \sum_{i=1}^{n} fn_{c_i} + fp_{c_i} / \sum_{i=1}^{n} fp_{c_i}} \quad (4)$$

$$Sc_i = \text{WeightP}c_i - \text{WeightN}c_i \quad (5)$$

In the above formula, the polarity Sc_i depends on morphemes c_i, and the absolute value of Sc_i is the degree of tendency of morphemes C_i. The steps for calculating the sentiment polarity of words are as follows. Scan the positive and negative word lexicons; if the word w appears in the positive word lexicon, $S_w = 1$; if the word appears in the negative word lexicon, $S_w = -1$. Otherwise, the sentiment polarity is computed using morphemes by

$$S_w = \frac{1}{p}\sum_{j=1}^{p} S_{c_i} \quad (6)$$

Where S_w represents the sentiment polarity of the word w, which consists of $c_1, c_2 \ldots c_p$. If $S_w > 0$, the sentiment polarity of the word is positive; otherwise, the sentiment polarity of the word is negative. If the value obtained is close to zero, the word can be considered neutral.

FNB Algorithm Steps:

Step1: Create two classes of LR-type fuzzy numbers with arbitrary distribution.

Step2: Consider test samples from one of the created classes.

Step3: Apply K-NN algorithm in order to estimate likelihood density function by using a distance metric. (e.g. Hausdorff, Hathaway and Yang distance).

Step4: Using the estimated likelihood density function, compute a confusion matrix that includes the probability of belonging test samples into classes.

Step5: Finally, the recognition rate is achieved from obtained confusion matrix.

Modifier Base:

Negation adverbs cause sentiment polarity reversal to mean the opposite (e.g., "awesome" is positive, but it becomes negative if the word 'not' presented before it). Similarly, degree adverbs that either strengthen or weaken the intensity of the sentiment polarity must be considered as well. In addition, sentence structure also affects the sentiment polarity value of a sentence. A complex sentence is modified by relational schema.

Performance Evaluation:

We can compare the FNB method with the R-BSA Algorithm which was shown in the following graphs. Due to this our FNB had achieve the higher performance when compared to the R-BSA.

Accuracy

Accuracy can be calculated from formula given as follows

$$\text{Accuracy} = \frac{\text{True positive} + \text{True negative}}{\text{True positive} + \text{True negative} + \text{False positive} + \text{False negative}} \quad (7)$$

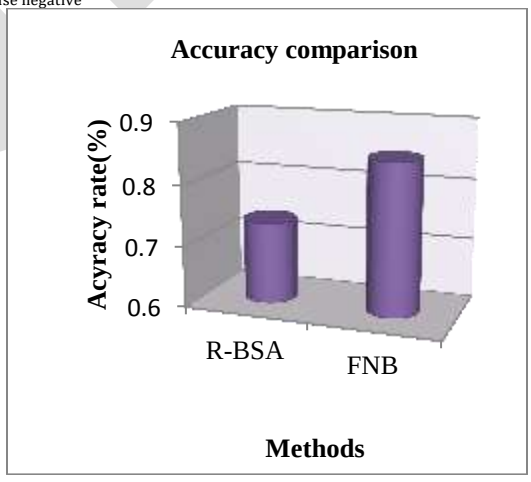

Fig 1. Comparing accuracy between R-BSA and FNB

Precision

Precision value is calculated based on the retrieval of information at true positive prediction, false positive .In healthcare data precision is calculated the percentage of positive results returned that are relevant.

$$\text{Precision} = \frac{\text{True positive}}{\text{True positive+False positive}} \quad (8)$$

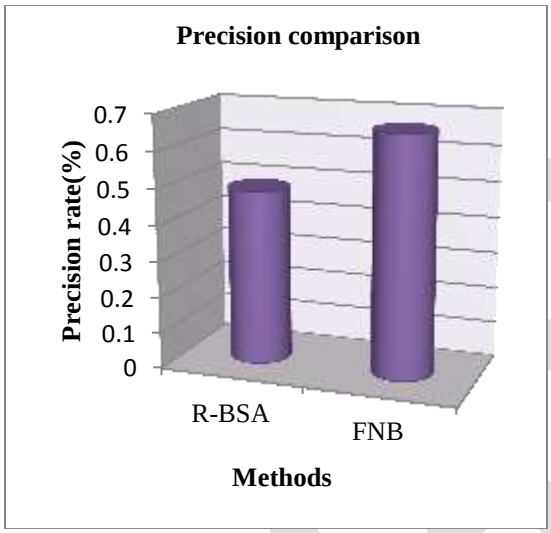

Fig 2. Comparing precision between R-BSA and FNB

Recall

Recall value is calculated based on the retrieval of information at true positive prediction, false negative. In healthcare data precision is calculated the percentage of positive results returned that are Recall in this context is also referred to as the True Positive Rate. Recall is the fraction of relevant instances that are retrieved,

$$\text{Recall} = \frac{\text{True positive}}{\text{True positive+False negative}} \quad (9)$$

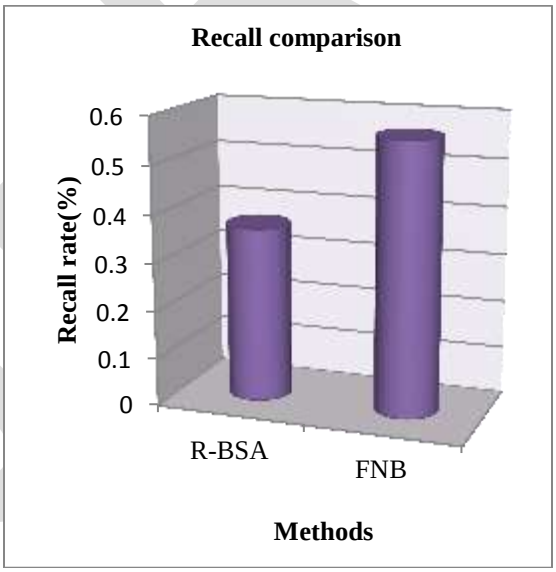

Fig 3. Comparing Recall between R-BSA and FNB

By using the confusion matrix we can calculate the TP, TN, FP and FN.

CONCLUSION

We proposed the FNB method to find the sentiment analysis, sentiment polarity and also evaluate the performance. We introduced the new category namely called as 'Neutral Polarity'. Also we were compared our FNB method with R-BSA method. So that our FNB method has been achieved the performance accuracy in higher. In our future work we can decide to find some of the classification method to improve better performance.

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Overview of Swarm Robotics

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Abstract: The swarm robotics inspired from nature is a combination of swarm intelligence and robotics, which shows a great potential in several aspects. It is important to study swarm robotics system because it has desirable properties unlikely to be found in other systems, for example they scale very well; there is no single point of failure, making swarm systems very robust and well suited in operating in safety critical situations. As research progresses in robot system, more and more aspects are explored in multi robot system. This paper describes advances in multi robot system and discusses the current state of art. The focus is principally on the research that has been demonstrated in various entity projects.

INTRODUCTION

The field of swarm robotics has its origin in the late 1980's [1]when researchers began investigating issues in multi robot systems. Swarms have many advantages such as enhanced task performance, high reliability (fault tolerance), low unit complexity and less cost over traditional robotic systems. It is possible to accomplish some tasks that would be impossible for a single robot to achieve. Swarm-bots are a collection of mobile robots able to self-assemble and to self-organize in order to solve problems that cannot be solved by a single robot[2]. These robots bring together the power of swarm intelligence with the flexibility of self-reconfiguration as aggregate swarm-bots can dynamically change their structure to match environmental variations. Swarm robots are more than just networks of independent agents; they are potentially reconfigurable networks of communicating agents capable of coordinated sensing and interaction with the environment.

Biological inspiration

Since the swarm robotics is mostly inspired from the nature swarms, it's a good reference for analyzing the characteristics of nature swarms. The research of swarm robotics started a century ago. The first hypothesis is quite personified [10] and assumes that each individual has a unique ID for cooperation and communication. The information exchange in the swarm is regarded as a centralized network. The queens in ant and bee colonies are supposed to be responsible for transmitting and assigning the information to each agent [11]. However, Jha, et al.[12] proved that the network in the swarm is decentralized. Thanks to the research in recent half century, the biologists can now assert that there are no unique IDs or other globally storage information in the network. No single agent can access to all the information in the network and a pacemaker is therefore inexistent.

What is Swarm intelligence?

As an emerging research area, the swarm intelligence has attracted many researchers' attention since the concept was proposed in 1980s. It has now become an interdisciplinary frontier and focus of many disciplines including artificial intelligence, economics, sociology, biology, etc. It has been observed a long time ago that some species survive in the cruel nature taking the advantage of the power of swarms, rather than the wisdom of individuals. The individuals in such swarm are not highly intelligent, yet they complete the complex tasks through cooperation and division of labor and show high intelligence as a whole swarm which is highly self-organized and self-adaptive. The individuals can be regarded as agents with simple and single abilities. Some of them have the ability to evolve themselves when dealing with certain problems to make better compatibility.

LITERATURE REVIEW

This section details and explains research that has been previously carried out in the subject area of swarm robotics including four entity projects:

(i)Kobot Robotic System
(ii) Kilobot Project
(iii)e-puck project

(iv)irobot project

(i)THE KOBOT ROBOTIC SYSTEM

Fig 1: A picture of the KOBOT

Ali E. Turgut et al in their paper mentions two challenges for the Swarm Robotics system to be used in real world application [13]. First is the need for large numbers of robots, which settles for no less than the means of well-established mass production. Second is the need for robust, flexible and scalable coordination methods to operate on swarm robotic systems.
The requirements of a mobile robot to be used as part of a swarm robotic system differ from that of a mobile robot to be used as stand-alone. The challenges require a platform for the researchers, that would facilitate study, rather than interfering with it, and allow the researchers to concentrate on the problems of coordination.
The parameters to be considered for mobile robot over standalone are:

- Sensing and Signalling
- Interference from environmental factors:
- Kin-detection
- Stigmergic sensing and signalling
- Communication
- Physical interaction
- Power
- Size
- Cost

A new robot platform "KOBOT" is designed to tackle most of these requirements.
Kobot mobile robot platform is specifically designed for swarm robotic studies. The robot has the size of a CD (diameter of 12 cm), a weight of 350 grams, and it is differentially driven by two high quality DC motors. It has IR sensors for kin and obstacle detection and a digital compass for heading measurement. An IEEE 802.15.4/ZigBee compliant XBee wireless module with a range of approximately 20 m indoors can be used for communication between robots and between the robots and a computer console. The robot hosts a 20 MHz PIC18F4620A microcontroller. Batteries are designed to be light, small, but extendable and power-efficient and relatively cheap robot platform for swarm robotics research.
Kobot's body consists of : (1) a cylindrical base, which houses the motors, the battery pack and the short-range sensor board, and (2) a cylindrical cap that covers the body. Both pieces are manufactured by casting polyurethanes, a low-density material that is ideal to create a light yet durable body structure for the robot. The cap is wrapped with white paper, to increase the "visibility" of the robots to each other. High efficiency (to save power), low profile (to save space), high torque DC gear-head motors are used which are directly connected to the wheels. The motors are driven using high switching frequency Si9988 motor drivers.

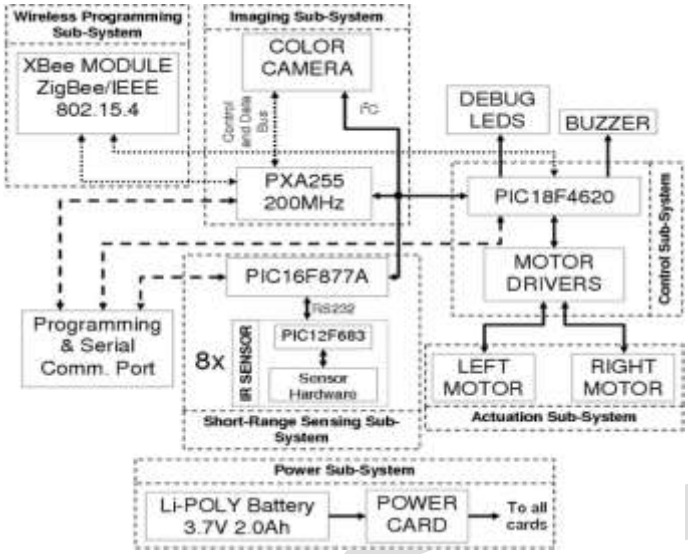

Fig 2:Block diagram for kobot

The overall system design of Kobot is shown in Figure 2. At the heart of the Kobot, there is the control sub-system to which all of the information from the other sub-systems, that is short range sensing, communication, vision and power, are fed to the control sub-system. With the information acquired, a 20MHz PIC16F877A, called the main controller, implements the control algorithm which determines the behaviors of Kobot.

There are several items that can be regarded as future work. Imaging sub-system is yet to be fully integrated, as an optional sensing system. A new short-range sensing system is planned to be designed which will be faster, more modular and will enable short-range communication between nearby Kobot's. Communication among Kobot's will also be enabled using ZigBee protocol.

(ii)**KILOBOT**

The Kilobot is designed to make tests of collective algorithms on hundreds or thousands of robots accessible to robotics researchers. Kilobot is a simple modular robot that is designed to work in a collective to self-assemble and self-heal that collective's shape. Though the Kilobots are low-cost, they maintain abilities similar to other collective robots. These abilities include differential drive locomotion, on-board computation power, neighbor-to-neighbor communication, neighbor-to-neighbor distance sensing, and ambient light sensing. Additionally they are designed to operate such that no robot requires any individual attention by a human operator. This makes controlling a group of Kilobots easy, whether there are 10 or 1000 in the group.

Michael Rubenstein et al in their paper have given the algorithm that allows a simulated collective of robots to self-assemble and self-heal a desired shape, keeping the shape sized proportional to the number of robots in the collective[14].

In previous work [3,4] a distributed control method called S-DASH was presented which enables a collective of robots to form a given shape at a scale proportional to the total number of robots. If the shape of the collective is damaged, for example by removing some robots, then S-DASH will reform the shape at a new, smaller scale, proportional to the new number of robots.

In the previous work of S-DASH, the collective behaviors are demonstrated only in simulation. These simulated robots are very simple in their capabilities. They are capable of moving forward, rotating, communicating with local neighbors, and measuring the distance between themselves and their local neighbors. Many robot platforms exist that have these capabilities, for example [5,6,7], and therefore in theory are capable of demonstrating S-DASH. However, these robots are not practical to operate as a collective on the order of 2^{10} robots.

For an example of why they are not practical in such large numbers, consider the simple task of powering on the robots in the collective. With a standard robot, for example the E-PUCK [7] turning on the robot requires a user to toggle a power switch located on the side of the individual robot. If one robot could be powered up this way on average every 2 seconds, it would still take a single user over 30 minutes to power on all 1024 robots in the collective! Some other reasons these robots are not practical for such a large scale collective include: robot cost, operability (powering, charging, programming, etc...), and physical size.

The Kilobot module is designed to meet the requirements of S-DASH, while at the same time easily operate in large collectives (more than 2_{10} robots). The requirements of S-DASH are that the robot be able to move forward, turn, communicate with neighbors, and measure distances to neighbors. Kilobot meets these requirements, while keeping the design balanced against other needs for operating a large collective, such as keeping the cost per robot under $15(US), and ease in programming. Fig. 3 shows a prototype version of Kilobot.

The Kilobot is designed to provide scientists with a physical testbed for advancing the understanding of collective behavior and realizing its potential to deliver solutions for a wide range of challenges.

The Kilobot module is designed to meet the requirements of S-DASH, while at the same time easily operate in large collectives (more than 210 robots). The requirements of S-DASH are that the robot be able to move forward, turn, communicate with neighbors, and measure distances to neighbors. Kilobot meets these requirements, while keeping the design balanced against other needs for operating a large collective, such as keeping the cost per robot under $15(US), and ease in programming. Fig. 3 shows a prototype version of Kilobot.

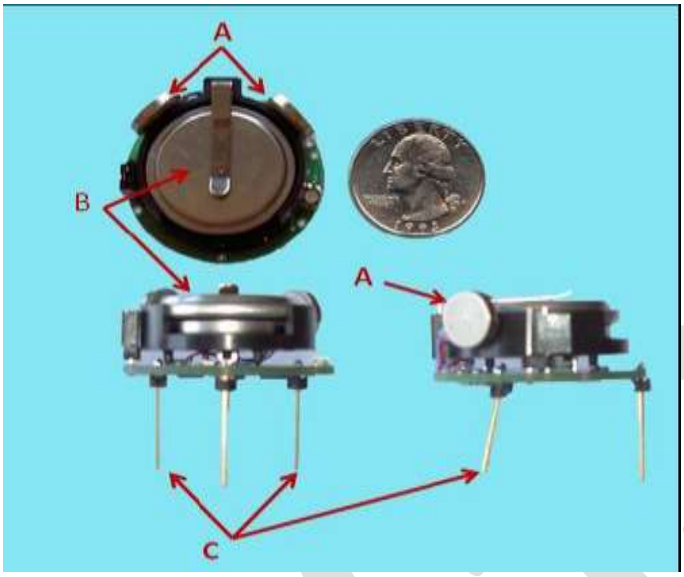

Figure 3. A prototype Kilobot module (top view in upper left, front view in lower left, side view in lower right) next to a US quarter for scale. Some features are (A) vibration motors, (B) battery, (C) slanted legs.

The Kilobot swarm is a thousand-robot swarm designed to allow one to program and experiment with collective behaviors in large-scale autonomous swarms. Each robot has the basic capabilities required for an autonomous swarm robot (programmable controller, basic locomotion, and local communication), but is made with low-cost parts and is mostly assembled by an automated process. In addition, the system design allows a single user to easily and scalably operate a large Kilobot collective, such as "hands-off" programming, powering on, and charging all robots.

Charging:

Each robot has a built in lithium ion battery charger, that will charge the on board battery when 6 volts is applied to the two slanted legs. The charger will automatically cease charging when the battery becomes full. This allows bulk charging of the Kilobots by placing each robot on a set of conducting strips attached to a 6v power supply, as visualized in Fig 4. This charging method is inspired from [8].

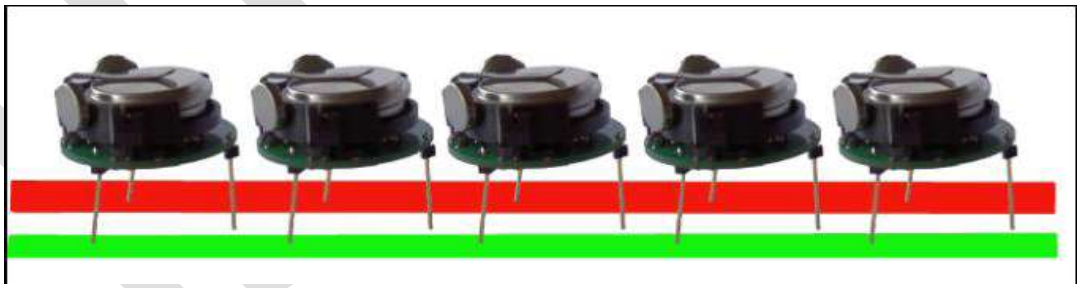

Figure 4. A visualization of the Kilobot charging scheme.

(iii) **e-puck**:

e-puck is the latest mini mobile robot developed at the Swiss Federal Institute of Technology in Lausanne (EPFL) for teaching purposes. It is now commercially available from GCtronic.

e-puck is powered by a dsPIC processor and features a very large number of sensors in its basic configuration. The e-puck hardware and software is fully open source (www.e-puck.org) providing low-level access to every electronic device and offering unlimited extension possibilities.

- **Microcontroller** - dsPIC at 60MHz (15MIPS), DSP core for signal processing
- **Sensors** - 8 proximity and ambient light, 3D accelerometer, 3 omni-directional microphones, VGA color camera, IR receiver for remote control
- **Outputs** - 8 red leds, green body light, 1 strong red LED in front, speaker (WAV files)

- **Communication** - RS232 and Bluetooth connection and programming
- **C programming** - free C compiler, GNU GCC, Webots simulator
- **Battery** - 5 WH LiIon battery for ~3 hours autonomy
- **Low price** - 850 CHF (~570 €, ~850 $). Quantity discount available.

Mobile robots have the potential to become the ideal tool to teach a broad range of engineering disciplines. Indeed, mobile robots are getting increasingly complex and accessible. They embed elements from diverse fields such as mechanics, digital electronics, automatic control, signal processing, embedded programming, and energy management. Moreover, they are attractive for students which increase their motivation to learn. However, the requirements of an effective education tool bring new constraints to robotics. Thanks to its particular design, the e-puck can be used in a large spectrum of teaching activities, not strictly related to robotics. The epuck fits this purpose and is appreciated by 90 percent of a large sample of students.

Francesco Mondada et al have for the first time, presented the design approach resulting in the e-puck, an educational desktop mobile robot developed at the ´ Ecole Polytechnique F´ed´erale de Lausanne (EPFL) for a broad exploitation in teaching activities[15].

At EPFL,[9] several courses exploit the e-puck robot as experimentation platform. Practical excesises are organized in following teaching areas:

- Signal processing.
- Automatic control.
- Behaviour-based robotics.
- Distributed intelligent systems.
- Position estimation and path finding of a mobile robot.

Table 1: Ongoing courses

Courses using e-puck	Laboratory	school
Biological and artificial intelligent system	Laboratory of intelligent system	EPFL
Robots mobile	Laboratory of intelligent system	EPFL
Swarm intelligence	Swarm-intelligent group	EPFL

More than 200 students over 3 years have validated this concept and shown their satisfaction using the e-puck. The open-source nature of this robot improves the quality of the support to the students by providing full access to knowledge at every level. For teachers this simplifies maintenance and opens new experimentation possibilities. Finally, the rapid diffusion of the e-puck in the research community shows its versatility as a scientific experimentation tool.

(iv)**IROBOT PROJECT**

The iRobot Swarm project represents the state of the art in algorithms, hardware, and user interfaces for large swarms of autonomous robots. The goal of the project is to develop distributed algorithms for robotic swarms composed of hundreds of individual robots. Programs for individual robots need to be robust to complex real-world environments, and the group software needs to be tolerant to the addition or failure of any number of individuals.

For co-operating for cooperating over 100 robots iRobot Swarm Project [94] is projected by MIT. James McLurkin et al in their paper have described a set of distributed algorithms that can be used to disperse a large group of autonomous mobile robots efficiently throughout an indoor environment[16].

Also in dangerous situations like earthquake and fire it is not always possible for a rescue team to enter a building immediately, due to safety concerns for the human rescuers. However, a team of small robots could be deployed to explore the building, locate survivors, and mark pathways to the exits. This information can then be relayed back to the human search and rescue team. Elizabeth Jensen et al in her paper has proposed a rolling dispersion algorithm, which makes use of a small number of robots and achieves full exploration[17].

CONCLUSION

In this paper we have first discussed the biological inspiration for swarm robotics and the role of swarm intelligence. Further, few of the entity projects have been discussed-kobot, kilobot , e-puck and irobot. These are a few of the projects undertaken by various researchers to explore the possibilities of introducing swarm robots in real life.

FUTURE SCOPE

Robot swarms might one day tunnel through rubble to find survivors, monitor the environment and remove contaminants, assist dwindling bee populations in pollinating crops, and self-assemble to form support structures in collapsed buildings. Swarms of robots acting together to carry out jobs could provide new opportunities for humans to harness the power of machines.They could play a part in military, or search and rescue operations, acting together in areas where it would be too dangerous or impractical for humans to go. In industry too, robot swarms could be put to use, improving manufacturing processes and workplace safety.

Researchers are developing Artificial Intelligence to control robots in a variety of ways. The key is to work out what is the minimum amount of information needed by the robot to accomplish its task. That's important because it means the robot may not need any memory, and possibly not even a processing unit, so this technology could work for nano scale robots, for example in medical applications.

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Prediction of Financial Performance Using Genetic Algorithm and Associative Rule Mining

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Abstract— The proposed system introduces a new genetic algorithm for prediction of financial performance with input data sets from a financial domain. The goal is to produce a GA-based methodology for prediction of stock market performance along with an associative classifier from numerical data. This work restricts the numerical data to stock trading data. Stock trading data contains the quotes of stock market. From this information, many technical indicators can be extracted, and by investigating the relations between these indicators trading signals can discovered. Genetic algorithm is being used to generate all the optimized relations among the technical indicator and its value. Along with genetic algorithm association rule mining algorithm is used for generation of association rules among the various Technical Indicators. Associative rules are generated whose left side contains a set of trading signals, expressed by relations among the technical indicators, and whose right side indicates whether there is a positive ,negative or no change. The rules are being further given to the classification process which will be able to classify the new data making use of the previously generated rules. The proposed idea in the paper is to offer an efficient genetic algorithm in combination with the association rule mining algorithm which predicts stock market performance.

Keywords— Genetic Algorithm, Associative Rule Mining, Technical Indicators, Associative rules, Stock Market**, Numerical Data, Rules**

INTRODUCTION

Over the last decades, there has been much research interests directed at understanding and predicting future. Among them, to forecast price movements in stock markets is a major challenge confronting investors, speculator and businesses. How to make a right decision in stock trading extracts many attentions from many financial and technical fields. Many technologies such as evolutionary optimization methods have been studied to help people find better way to earn more profit from the stock market. And the data mining method shows its power to improve the accuracy of stock movement prediction, with which more profit can be obtained with less risk.

Applications of data mining techniques for stock investment include clustering, decision tree etc. Moreover, researches on stock market discover trading signals and timings from financial data. Because of the numerical attributes used, data mining techniques, such as decision tree, have weaker capabilities to handle this kind of numerical data and there are infinitely many possible ways to enumerate relations among data.

Stock prices depend on various factors, the important ones being the market sentiment, performance of the industry, earning results and projected earnings, takeover or merger, introduction of a new product or introduction of an existing product into new markets, share buy-back, announcements of dividends/bonuses, addition or removal from the index and such other factors leading to a positive or negative impact on the share price and the associated volumes. Apart from the basic technical and fundamental analysis techniques used in stock market analysis and prediction, soft computing methods based on Association Rule Mining, fuzzy logic, neural networks, genetic algorithms etc. are increasingly finding their place in understanding and predicting the financial markets.

Genetic algorithm has a great capability to discover good solutions rapidly for difficult high dimensional problems. The genetic algorithm has good capability to deal with numerical data and relations between numerical data. Genetic algorithms have emerged as a powerful general purpose search and optimization technique and have found applications in widespread areas.

Associative classification, one of the most important tasks in data mining and knowledge discovery, builds a classification system based on associative classification rules. Association rules are learned and extracted from the available training dataset and the most suitable rules are selected to build an associative classification model. Association rule discovery has been used with great success in

domains such as market basket analysis but it finds an even wider domain of applications when used in combination with other classification and predictive approaches.

Classification is a well-known task in data mining that aims to predict the class of an unseen instance as accurately as possible. While single label classification, which assigns each rule in the classifier the most obvious label, has been widely studied, little work has been done on multi-label classification. Most of the work to date on multi-label classification is related to text categorization. In existing associative classification techniques, only one class label is associated with each rule derived, and thus rules are not suitable for the prediction of multiple labels. However, multi-label classification may often be useful in practice.

Although associative classification has better prediction accuracy than traditional classification approaches, it has a weak capability of handling numerical data and its relations. To improve the capability of handling numerical data in associative classification, there are two issues that must be addressed, including constructing a suitable relation representation method of numerical data and building associative classifiers from numerical data with suitable relation representations. The major contributions of this study are to propose a simple yet powerful structure for relation representation of numerical data in associative classification problem and to improve the capability of handling numerical data in associative classification.

Constructing fast and accurate classifiers for large data sets is an important task in data mining and knowledge discovery. There is growing evidence that merging classification and association rule mining together can produce more efficient and accurate classification systems than traditional classification techniques.

LITERATURE SURVEY

Dow Jones Industrial Average

The Dow Jones Industrial Average also called the Industrial Average, the Dow Jones, the Dow Jones Industrial, the Dow 30, or simply the Dow, is a stock market index, and one of several indices created by Wall Street Journal editor and Dow Jones & Company co-founder Charles Dow. It was founded on May 26, 1896, and is now owned by Dow Jones Indexes, which has its majority owned by the CME Group.The Dow Jones Industrial Average is simply the average value of 30 large, industrial stocks. It is an index that shows how 30 large publicly owned companies based in the United States have traded during a standard trading session in the stock market. It is the second oldest U.S. market index after the Dow Jones Transportation Average, which was also created by Dow.

Technical Indicators in Stock Market

A Technical Indicator [1] is a series of data points that are derived by applying a formula to the price data of a security. Price data includes any combination of the open, high, low or close over a period of time. Some indicators may use only the closing prices, while others incorporate volume and open interest into their formulas. The price data is entered into the formula and a data point is produced. A technical indicator offers a different perspective from which to analyze the price action. Indicators serve three broad functions: to alert, to confirm and to predict**.**

The Technical Indicators used in this papers are:

SMA--Simple Moving Average: A simple, or arithmetic, moving average that is calculated by adding the closing price of the security for a number of time periods and then dividing this total by the number of time periods. A simple moving average is formed by computing the average price of a security over a specific number of periods

EMA--Exponential Moving Average Calculation: EMA reduce the lag by applying more weight to recent prices. The weighting applied to the most recent price depends on the number of periods in the moving average. There are three steps to calculating an exponential moving average. First, calculate the simple moving average.

MACD--Moving Average Convergence-Divergence: MACD indicator is one of the simplest and most effective momentum indicators available. The MACD turns two trend-following indicators, moving averages, into a momentum oscillator by subtracting the longer moving average from the shorter moving average. As a result, the MACD offers the best of both worlds: trend following and momentum.

CCI: The Commodity Channel Index (CCI) is a versatile indicator that can be used to identify a new trend or warn of extreme conditions. In general, CCI measures the current price level relative to an average price level over a given period of time. CCI is relatively high when prices are far above their average. CCI is relatively low when prices are far below their average.

Williams %R: Williams %R is a momentum indicator that is the inverse of the Fast Stochastic Oscillator. Also referred to as %R, Williams %R reflects the level of the close relative to the highest high for the look-back period.

Stochastic Oscillator: The Stochastic Oscillator is a momentum indicator that shows the location of the close relative to the high-low range over a set number of periods. It doesn't follow price, it doesn't follow volume or anything like that. It follows the speed or the momentum of price. As a rule, the momentum changes direction before price.

RSI- Relative Strength: Relative Strength Index (RSI) is a momentum oscillator that measures the speed and change of price movements. RSI oscillates between zero and 100.

ROC—Rate of Change: The Rate-of-Change (ROC) indicator, which is also referred to as simply Momentum, is a pure momentum oscillator that measures the percent change in price from one period to the next. The ROC calculation compares the current price with the price "n" periods ago. The plot forms an oscillator that fluctuates above and below the zero line as the Rate-of-Change moves from positive to negative.

LIBOR: The London Interbank Offered Rate is the average interest rate estimated by leading banks in London that they would be charged if borrowing from other banks. It is usually abbreviated to Libor or LIBOR, or more officially to BBA Libor (for British Bankers' Association Libor) or the trademark bba libor. It is the primary benchmark, along with the Euribor, for short term interest rates around the world.

Genetic Algorithm

The Genetic Algorithm was proposed in 1975 and its framework is based on a direct analogy to Darwinian natural selection and mutations in biological reproduction [2]. It belongs to a category of heuristics known as the stochastic method, which employs randomized choice operators in the search strategy [3]. The appeal of GAs comes from their simplicity and elegance as strong search algorithms, as well as their ability to discover good solutions rapidly for difficult high-dimensional problems. The genetic algorithm is a popular method which has been applied in different data mining tasks, such as clustering [4]. Selection, crossover, and mutation are the three major GA operations.

The genetic algorithm can be summarized as:

```
Randomly generate Initial population;
Evaluate fitness of each chromosome in the population;
While (result doesn't achieve the goal)
{
    Perform selection operation;
    Perform crossover operation;
    Perform mutation operation;
    Evaluate fitness of each chromosome in the population;
}
```

RELATED WORK

Ya-Wen Chang Chien, Yen-Liang Chen [5] presented a GA-based algorithm used to build an associative classifier that can discover trading rules on stock trading data with many numerical technical Indicators. Associative classifiers are a classification system based on associative classification rules. The main goal is to build associative classifiers from numerical data. This paper employs a GA-

based method to mine from stock trading data the best k associative classification rules, and to build a classification system with high trading prediction accuracy from the best k associative classification rules. The GA–ACR algorithm incorporates the static capital allocation method to build an automatic stock trading system. Within this automatic stock trading system, trading signals for each stock can be discovered using the GA–ACR algorithm. The major contributions of this study is to propose a simple yet powerful structure for relation representation of numerical data in associative classification problem and to improve the capability of handling numerical data in associative classification.GA with phenotype encoding structure was employed to express relations between numerical data. To simplify the relationship between two numerical data and to express the common relations in stock trading problems, three relations were used to discover associative classification rules. Semantic roles (SR) were used to pre-prune rules with infeasible comparisons with technical indicators and the best k rules strategy was used to make the GA–ACR algorithm more efficient. The prediction accuracy of GA-ACR was extremely comparable to the data distribution method.

Ya-Wen Chang Chien , Yen-Liang Chen[6] proposed a phenotypic genetic algorithm (PGA) to overcome the weaknesses of Inductive Logic Programming (ILP) like: (1) weak capabilities in numerical data processing, (2) zero noise tolerance, and (3) unsatisfactory learning time with a large number of arguments in the relation and to strengthen the numerical data processing capabilities, a multiple level encoding structure is used that can represent three different types of relationships between two numerical data. To tolerate noise, PGA's goal of finding perfect rules is changed to finding top-k rules, which allows noise in the induction process. Finally, to shorten learning time, the semantic roles constraint were incorporate into PGA, reducing search space and preventing the discovery of infeasible rules. Stock trading data from Yahoo! Finance Online was used for the experiments. The results indicate that the PGA algorithm can find interesting trading rules from real data.

B. Manjula, R. Lakshman Naik and S.S.V.N. Sarma [7] presented a paper to track the trends of financial applications using genetic algorithm. The First stage is classifying the prone direction of the price for India cements stock price index (ICSPI) futures with several technical indicators using artificial intelligence techniques. And second stage is mining the trading rules to determined conflict among the outputs of the first stage using the evolve learning. This study intends to find good sets of rules which would have made the most money over a certain historical period. To mine reasonable trading rules using genetic algorithms for ICSPI future. They found trading rule which would have yield the highest return over a certain time period using historical data. These groundwork results suggest that genetic algorithms are promising model yields highest profit than other comparable models and buy-and-sell strategy. Experimental results of buying and selling of trading rules were outstanding. Although the trading systems that have worked well in the past seem to have a reasonable chance of doing well in the future, a more extensive validation process is required.

Preeti Paranjape-Voditel and Dr. Umesh Deshpande [16] presented a paper on Association Rule Mining (ARM) based Recommender system for the stock markets which deals with the prediction of individual stocks. The method uses ARM, fuzzy ARM, weighted fuzzy ARM, ARM with time lags, fuzzy ARM with time lags and weighted fuzzy ARM with time lags to predict relationships between stocks. The authors have used Association Rule Mining along with fuzzy classification methods to develop a Recommender system for the stock markets. Recommender System deals with the generation of Association Rules. The Recommender System handles inter-day as well as intra-day associations.

The system mines relationships between items or scrips. It does not recommend the scrips in isolation but in relation to the other existing scrips. The objective is to show good returns. The transaction files for this system were created by finding out the percentage rise/fall of certain scrip from its previous trading day's close. Thus a transaction will contain all the scrips which have risen/fallen by more than some minimum amount. The scrips of relevance are generated from the database by finding the frequent itemsets and then discovering the rules for all itemsets above some minimum support threshold. The association rules between scrips are positively or negatively correlated. These rules recommend to buy stock2 if stock1 is bought, if stock1 and stock2 exhibit positive correlation. If a negative correlation exists between them a rise in stock1 can trigger a sell stock2. Rules are generated on the individual frequent itemsets and only the strongest rules are chosen. The days on which the strongest rules occur gives the time lag for that particular rule.The system can be used for portfolio management, assumed that a portfolio has to be managed with the obvious intention of making a profit. The portfolio already contains scrips which can be replaced and the portfolio restructured or the portfolio can be created by initializing it with the scrips from different sectors. Then a time frame for monitoring is considered which is fixed. After periodic intervals association rules are generated and loss making stocks can be replaced by corresponding negatively correlated rising stocks of the same amount.

B. Liu, W. Hsu, Y. Ma [18] proposed the CBA (Classification based on association) algorithm which was one of the first associative classification algorithms that used an Apriori-based candidate generation step to build complete classification models from association

rules. In the CBA algorithm, all class-association rules are extracted from the available training dataset, i.e. all the association rules containing the class attribute in their consequents. The most suitable rules are selected to build an associative classification model, which uses a default class to complete it. It relies on a single rule to classify data. This classifier builder uses a brute-force exhaustive global search, and yields better results than the C4.5 [19]. This framework integrates classification and association rule mining algorithm to build an accurate classifier for prediction from the set generated rules.

X. Yin, J. Han [22] proposed the CPAR (Classification based on Predictive association rules) algorithm was proposed after the CBA and CMAR algorithms. Using ideas taken from traditional rule-based classification methods (such as Quinlan's FOIL [23]), the CPAR algorithm avoids generating a large number of candidate rules by generating candidate rules directly from the training data. It is a compromise between exhaustive and greedy algorithms and combines the advantages of both. CPAR uses the best k rules, rather than all of a group's rules, to predict the class label of a new tuple. This avoids the influence of lower ranked rules and is much more efficient with large sets of training data. CPAR uses expected accuracy to evaluate each rule.

PROPOSED SYSTEM

The diagram below gives the overview of the project. The numerical Stock Market data: DJIA is being used. Stock trading data contains the quotes of stock market. From this information, many technical indicators can be extracted, and by investigating the relations between these indicators trading signals can discovered. Genetic algorithm is being used to generate all the relations among the technical indicator and its value. Along with genetic algorithm association rule mining algorithm is used for generation of association rules among the various Technical Indicators. Associative rules are generated whose left side contains a set of trading signals, expressed by relations among the technical indicators, and whose right side indicates whether there is a positive negative or no change. The rules are being further given to the classification process which will be able to classify the new data making use of the previously generated rules.

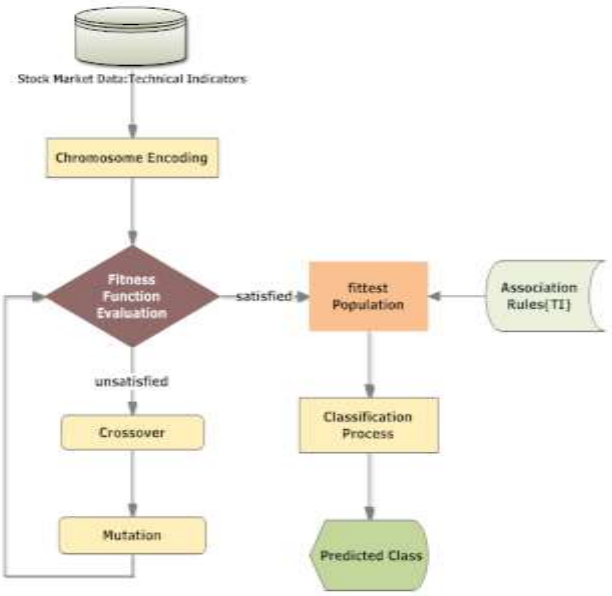


Figure 1 Flow of the system

Data Preprocessing

The first module deals with the collection of stock market data quotes of DJIA. The data is being collected from yahoo finance. After the data is being made available the technical indicators are being calculated using the stock market data quotes. The technical indicators used for the project are: RSI, EMA, MACD, k, ROC, CCI, William %R and LIBOR. In order to apply genetic algorithm to the data first the technical indicators are investigated and various relations are being generated between them which will help to discover trading signals. The three types of relations commonly used are:

- The value of attribute A < continuous value (eg: RSI<70)
- The value of attribute A > value of attribute B
- $A_t < A_{(t+1)}$ where t is the time

These relations are being used and various relations among the technical indicators are being generated. Now the data is being ready for the input to the next module.

Genetic Algorithm

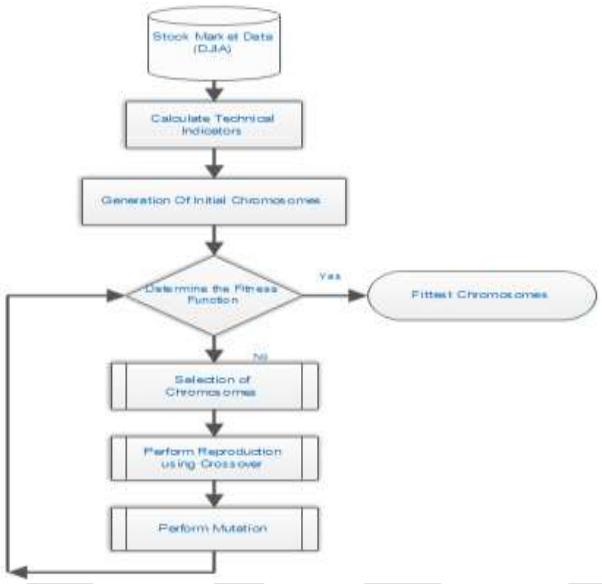


Figure 2 Genetic Algorithm

The genetic algorithm starts with the generation of initial chromosomes. Here, the chromosomes are represented as 64bits. The chromosome structure is as mentioned below:

RSI	EMA	MACD	K	ROC	CCI	William%R	LIBOR

Where each of the technical indicators mentioned is assigned 8bits each.

Relations generated from the technical indicators are

Technical Indicators	Rules
RSI	RSI>70 , RSI <30
EMA	EMA12>adj close, EMA26>adj close, EMA12>EMA26, EMA26>EMA12, EMA12(t)>EMA26(t-1), EMA26(t)>EMA12(t-1), EMA12 (t) > adj close (t-1), EMA26 (t) > adj close (t-1)
MACD	MACD>0, MACD>100, MACD>K, MACD>ROC, MACD(t) > K(t-1), MACD(t)>ROC(t-1), MACD>adj close, MACD(t)>adj close(t-1)

K	K>70, K(t-1)>70, K<30, K(t-1)<30, K(t-1)>K(t), K(t)>D(t-1), K(t-1)>D(t), K(t-1)>D(t-1)
ROC	ROC>3, ROC<-1, ROC>K, ROC(t)>k(t-1)
CCI	CCI>100, CCI>high, CCI>Low, CCI>adj close, CCI(t)>Adj close(t-1), CCI<-100
Williams %R	%R >ROC, %R>ROC(t-1), %R>-30, %R<-70, %R>adj close, %R>adj close(t-1)
LIBOR	LIBOR>0.7

Table 1 Technical Indicators relations

Each bit of the chromosome represents to the relations generated from the technical indicator. While generation of initial chromosome each bit in the chromosomes are assigned to either 1/0 depending upon the rules satisfy the data or not. Thus the initial chromosome is being generated.Now, the fitness function of each of the chromosomes is being calculated. And the chromosomes which are fit are being given to the next step. The next step is crossover function wherein the two chromosomes are randomly being selected and a crossover site is being chosen randomly and then the contents of the two chromosomes are being swapped forming two new chromosomes. If the chromosomes already exists they are deleted or otherwise the added to the final chromosome list.

The last step is the mutation function wherein specific amount of chromosomes which are being determined by mutation rate are undergone mutation where one random bit of the chromosome is being flipped if this results in a new chromosome then its being added to the final chromosome list. Now the final new chromosomes list in turn gives us the rules or relations of various technical indicators. This is being given as an input to the next module.

Association Rule Mining Algorithm

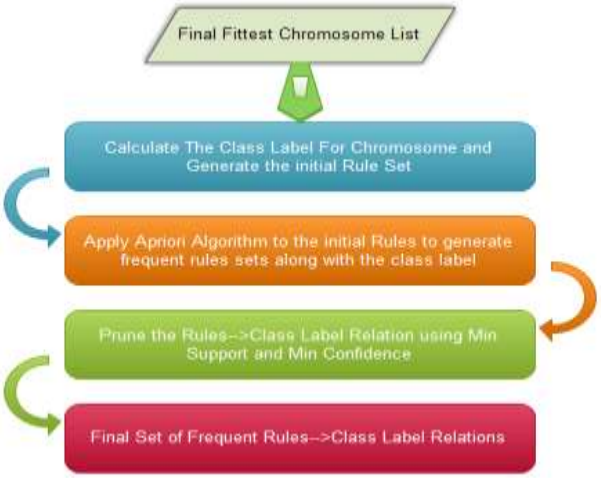


Figure 3 Flowchart for Association Rule Mining Algorithm

In this Module, the chromosomes generated are being assigned to the date and the class label. The class label is calculated using the stock market data.

Change = (Close-Open)

If Change>0 then class label is Positive

Change<0 then Negative and if Change=0 then the class label is No Change

The rules obtained from the Genetic Algorithm are being given to the Apriori Algorithm.

The Apriori Algorithm takes in the rules and generates all possible combination of frequent rules sets. During each iteration rules are being assigned to each of the class label and then the support count of the rule along with the class is being calculated. All the rules→class label set is being pruned which are below the Support and confidence threshold.

The support and confidence is being calculated as below:

Support (rule→class) = count (rule→class) / |total number of chromosome| *100

Confidence = support (rule→ label) / support (rule)

At the end of the module we are left with the all possible frequent combination of the rule set along with the class label. These sets of frequent rule will help us in classification of the new test data.

Prediction

In the Classification step, the new test data is being collected and is being given to the genetic algorithm to generate the initial set of chromosome. The chromosomes obtained will help us in obtaining the rules which can be used to predict the class label. The rules obtained from the new set of chromosomes are mapped against the rules obtained from the previous step i.e. association rule mining algorithm.

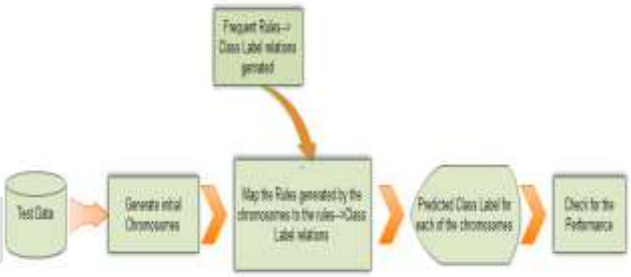
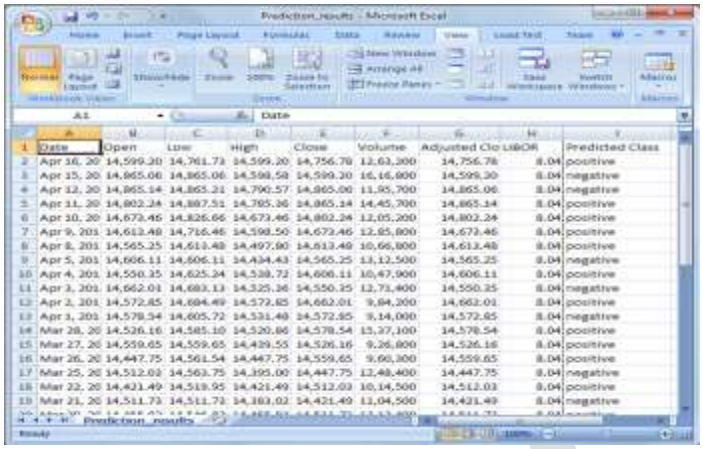


Figure 4 Flowchart for Prediction Process

The rule set which match the rules from the chromosomes are sorted out and checked against their class label. The prominent class label is being assigned to the new set of chromosome thus predicting the new class label for the test data.

RESULTS AND OBSERVATION

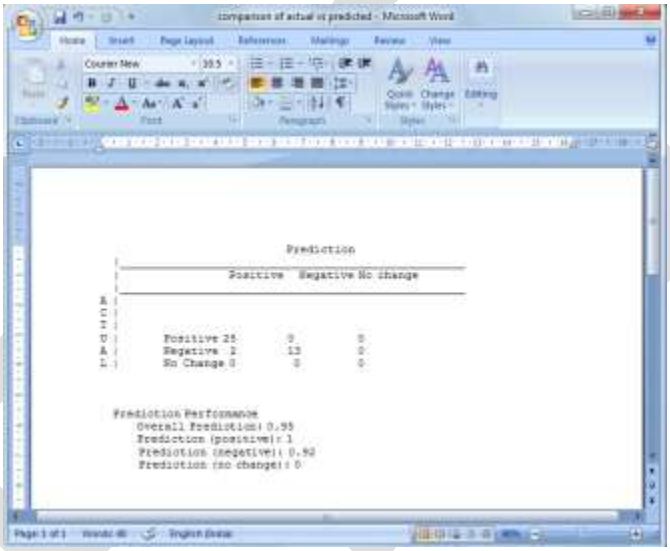
Training Data Set: DJIA from 30th December 2011 to 19th February 2013
Number of Chromosomes generated by the genetic Algorithm: 463
Association rule mining Algorithm generated 5-ruleset frequent rules with threshold of Support count as 40 and Confidence as 0.5
Total number of unique rule combination generated: 710
Test data set: 20st February 2013 to 16th April 2013 (40days)



Date	Open	Low	High	Close	Volume	Adjusted Clo	LIBOR	Predicted Class
Apr 16, 20	14,599.20	14,761.73	14,599.20	14,756.78	12,63,300	14,756.78	8.04	positive
Apr 15, 20	14,865.06	14,865.06	14,598.58	14,599.20	16,16,800	14,599.20	8.04	negative
Apr 12, 20	14,865.14	14,865.21	14,790.57	14,865.06	11,95,700	14,865.06	8.04	negative
Apr 11, 20	14,802.24	14,867.51	14,765.36	14,865.14	14,45,700	14,865.14	8.04	positive
Apr 10, 20	14,673.46	14,826.66	14,673.46	14,802.24	12,05,200	14,802.24	8.04	positive
Apr 9, 201	14,613.48	14,716.46	14,598.50	14,673.46	12,85,800	14,673.46	8.04	positive
Apr 8, 201	14,565.25	14,613.48	14,497.90	14,613.48	10,66,800	14,613.48	8.04	positive
Apr 5, 201	14,606.11	14,606.11	14,434.43	14,565.25	13,12,500	14,565.25	8.04	negative
Apr 4, 201	14,550.35	14,625.24	14,538.72	14,606.11	10,47,900	14,606.11	8.04	positive
Apr 3, 201	14,662.01	14,683.13	14,525.36	14,550.35	12,71,400	14,550.35	8.04	negative
Apr 2, 201	14,572.85	14,684.49	14,572.85	14,662.01	9,84,200	14,662.01	8.04	positive
Apr 1, 201	14,578.54	14,605.72	14,531.48	14,572.85	9,14,000	14,572.85	8.04	negative
Mar 28, 20	14,526.16	14,585.10	14,520.86	14,578.54	15,37,100	14,578.54	8.04	positive
Mar 27, 20	14,559.65	14,559.65	14,429.55	14,526.16	9,26,800	14,526.16	8.04	positive
Mar 26, 20	14,447.75	14,561.54	14,447.75	14,559.65	9,60,300	14,559.65	8.04	positive
Mar 25, 20	14,512.03	14,563.75	14,395.00	14,447.75	12,48,400	14,447.75	8.04	negative
Mar 22, 20	14,421.49	14,519.95	14,421.49	14,512.03	10,14,500	14,512.03	8.04	positive
Mar 21, 20	14,511.73	14,511.73	14,383.02	14,421.49	11,04,500	14,421.49	8.04	negative

Figure 5 Prediction Results

The Prediction performance is being calculated by comparing the actual results to the predicted ones.



Prediction

Actual	Positive	Negative	No change
Positive	25	0	0
Negative	2	13	0
No Change	0	0	0

Prediction Performance
Overall Prediction: 0.95
Prediction (positive): 1
Prediction (negative): 0.92
Prediction (no change): 0

Figure 6 Prediction Performance Results

The above figure gives the prediction performance of the application as compared to the actual results. From this it can be concluded that the overall prediction performance was 95%. Individually, The Positive Class Label showed 100% accuracy while Negative Class Label had 98% accuracy.

Figure 7 Prediction Performance Graph

The above Figure shows the prediction performance graph, which shows the predicted positive to the actual positive results and the predicted negative to the actual negative.

The x-axis of the graph shows the number of days and y axis represents the positive or the negative value. From the graph it can be concluded that twice the predicted negative result differed from the actual one.

CONCLUSION

A detailed Study was conducted on the DJIA stock market and the various technical indicators being used for Stock Market data which help in analysing the Stock Market.The Literature survey was conducted on Genetic Algorithm and Association rule Mining Algorithm and a combine approach was being implemented. As Association Rule Mining Algorithms cannot handle numerical data efficiently a modified Genetic Algorithm was being used for the representation of the stock market data and to generate rules among the various technical indicators. Association rule mining Algorithm help in generation of the frequent rule set along with the class label and then predict the class label for the new test data i.e. if it is positive, negative or no change.

Overall a new method was proposed for Stock Market Prediction using a combination of Genetic and Association rule Mining Algorithm which can handle numerical data.

The Prediction Performance was also being calculated and a comparison was carried out with the actual performance. The overall prediction process had 95% of accuracy.

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Bearing Only Tracking using a Particle Filter

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Abstract— Target Tracking has always been a challenging problem arising in different contexts ranging from military applications to biology. The tracking problem consists of computing the best estimate of the target's trajectories based on noisy measurements (observations). This tracking problem can be modeled as Dynamic State Space Model. Either the system model or the measurement model can be nonlinear in terms of state variables. Also the uncertainty in the process model and/or in the measurement model may be non-Gaussian. In such cases the solutions obtained from the traditional methods are much complex. Particle filter offers a general numerical tool to approximate the posterior density function for the state in nonlinear and non-Gaussian filtering problems. This paper considers the application of particle filtering technique to a target tracking example, in which a radar sends a signal towards a target (aircraft) and estimates the state (position and velocity) of the target using the observation (Bearing angle). State model and measurement model have been derived for the proposed target tracking problem.

Keywords—Target Tracking, Dynamic state space models, Nonlinear Systems, Non-Gaussian Systems, Particle Filter, Monte Carlo Simulations and Relative RMSE.

INTRODUCTION

Target tracking has been an active research area in image/signal processing in recent years. It has many potential applications in the fields of intelligent robots [1], monitoring and surveillance [2], human computer interfaces [3], smart rooms [4]-[5], vehicle tracking [6], biomedical image analysis [7], video compression [8], etc. [9]-[10]. Such application problems require estimation of the state of the system that changes over time using a sequence of noisy measurements made on the system. For such application areas, it is becoming important to include elements of nonlinearity and non-Gaussian in order to model accurately the underlying dynamics of the physical system. Such problems can be written in the form of the so-called Dynamic State Space (DSS) model. Moreover, it is crucial to process data on-line as it arrives, which results in a recursive method of estimation. Numerous approaches have been proposed to track moving objects, such as the Kalman filter, the extended Kalman filter, approximate grid-based filter and the Particle filter.

PARTICLE FILTERS

Particle Filter [14]-[15] is used to perform filtering for problems that can be described using dynamic state space modeling [14]. In most practical scenarios, these models are non-linear and the densities involved are non-Gaussian. Traditional filters like the Classical Kalman Filter [11], Extended Kalman Filter [12] are known to perform poorly in such scenarios. The performance of PFs on the other hand, is not affected by these conditions. PFs are Bayesian in nature and their goal is to find an approximation to the posterior density of the states of interest (e.g. position of a moving object in tracking, or transmitted symbol in communications) based on observations corrupted by additive noise which are inputs to the filter. This is done using the principle of Importance Sampling (IS) whereby, samples (particles) are drawn from a known density (Importance Function (IF)) and assigned appropriate weights based on the received observations using IS rules [14]. This weighted set of samples represents the posterior density of the state and can be used to find all kinds of estimates of the state (like Minimum Mean Square Error MMSE). PF algorithms allow for recursive propagation of this density as the observations become available. However, performance of this scheme is affected by weight degeneracy [15]. Because of this, after several sampling periods there are only a few particles with significant weights while those of the rest become negligible. This problem is solved by introducing resampling which discards particles with negligible weights and replicates those with large weights while preserving constant number of particles. These operations form the traditional PF algorithm known as the Sampling Importance Resampling Filter (SIRF).

The main steps in the particle filter algorithm include:

1) Initialization

   Draw a set of particles for the prior $p(X_0)$ to obtain $\{X_0^{(i)}, w_0^{(i)}\}_{i=1}^{N}$, let *k=1*.

2) Sampling

   (a) For *i=1,..., N*

   Sample $X_k^{(i)}$ from the proposal distribution $p\left(X_k^{(i)} \middle| X_{k-1}^{(i)}\right)$.

   (b) Evaluate the new weights

   $$w_k^{(i)} = p\left(Z_k \middle| X_k^{(i)}\right), i = 1,2 \ldots., N \quad (1a)$$

   (c) Normalize the weights

$$w_k^{(i)} = \frac{w_k^{(i)}}{\sum_{j=1}^{N} w_k^{(j)}}, i = 1,2 \ldots., N \quad (1b)$$

3) Output
Output a set of particles $\{X_k^{(i)}, w_k^{(i)}\}_{i=1}^{N}$ that can be used to approximate the posterior distribution as
$p(X_k|Z^k) \approx \sum_{i=1}^{N} w_k^{(i)} \delta(X_k - X_k^{(i)})$
and the estimate as
$E_{p(g|z^k)}(f_k(X_k)) \approx \sum_{i=1}^{N} w_k^{(i)} f_k(X_k^{(i)})$, where $\delta(g)$ is the Dirac delta function.

4) Resampling
Resample particles $X_k^{(i)}$ with probability $w_t^{(i)}$ to obtain *N* independent and identically distributed random particles $X_k^{(j)}$, approximately distributed according to $p(X_k|Z^k)$.

5) *k=k+1*, go to step2.

TARGET TRACKING EXAMPLE

This paper considers a typical target tracking example in which the position and velocity of a target is estimated using a 2D constant velocity model. In this case the bearing angle is the measurement which is applied to the filter. From the dynamic state space model, it can be seen that the model has linear state equation and nonlinear measurement equation.
The dynamic state space model of the above tracking example is given below.

$$x_{t+1} = \begin{pmatrix} 1 & 0 & T & 0 \\ 0 & 1 & 0 & T \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} x_t + w_t \quad (2a)$$

$$y_t = (\varphi) = arctan(p_y|p_x) + e_t \quad (2b)$$

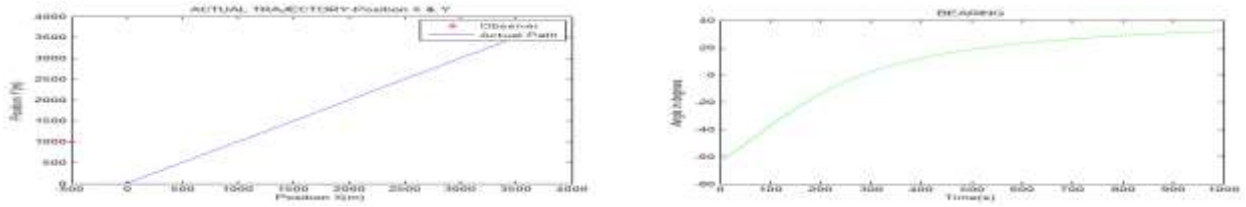
where the state vector $x_t = [p_x\ p_y\ \ v_x\ v_y]^T$ i.e. position and velocity. We have discarded the height component, since a level flight is considered. The sample time is taken as constant and denoted by T=1sec.The measurement noise e_t is Gaussian with zero mean and variance R=2. The process noises are assumed Gaussian with zero mean and covariances Q=Diag (5, 5, 0.01, 0.01).
The simulation for the tracking of the target using particle filter is done using MATLAB. The various steps done in this simulation is given below.

i) Generation of the trajectory.
ii) Calculation of corresponding measurement (bearing angle) from the trajectory and corrupting with noise.
iii) Simulating particle filter using the noise corrupted measurement generated for 100 Monte Carlo Simulations.
iv) Comparing the estimate with that of the actual path.

Here a linear trajectory is considered. Trajectory is generated using the equations of motion and all the values of position and velocity in the x and y co-ordinate at each time instant along with the corresponding angle (in degrees with respect to x axis) is stored. Then the measurement is corrupted with noise before giving to the filter.
Details of parameters used in the simulation of linear trajectory are given below.

Parameter	**Value**
Number of Monte Carlo Simulations	100
Initial Position $[p_x\ p_y]$(m)	[500 -1000]
Constant Velocity(m/s)	5
Initial state Covariance Q	Diag (5, 5, 0.01, 0.01)
Measurement noise variance R	2

The trajectory of aircraft that are used for simulation using particle filter are shown below. The bearing is measured from the generated trajectory.

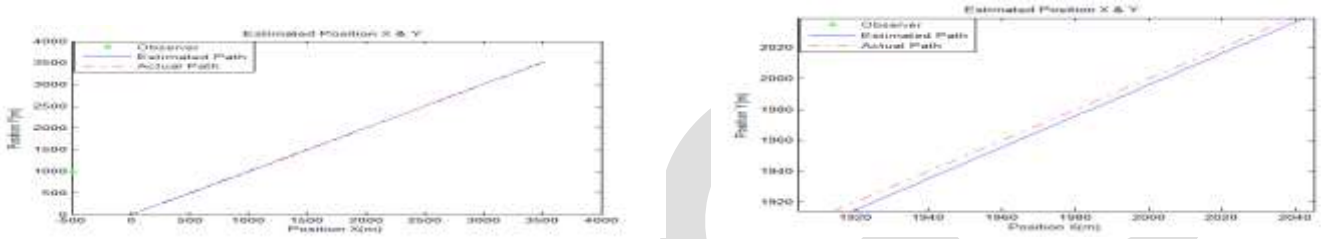


(a) (b)

Figure 1: (a) shows the linear trajectory generated. (b) shows the measured bearing angle from the generated trajectory.

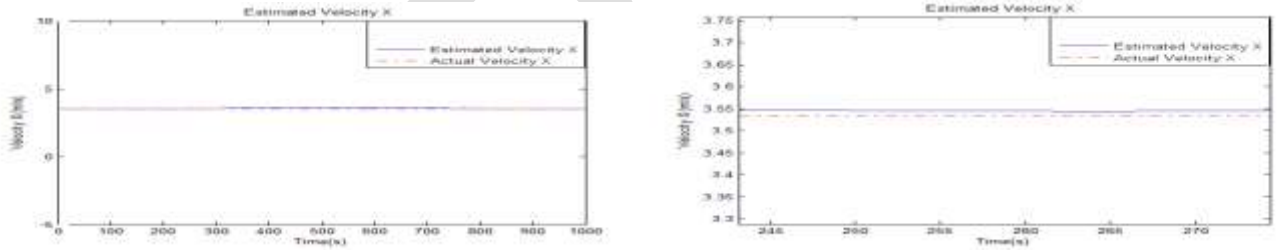
SIMULATION RESULTS

In this section, Estimation of position and velocity using Particle Filter for linear trajectory with N=1000 particles are shown below.



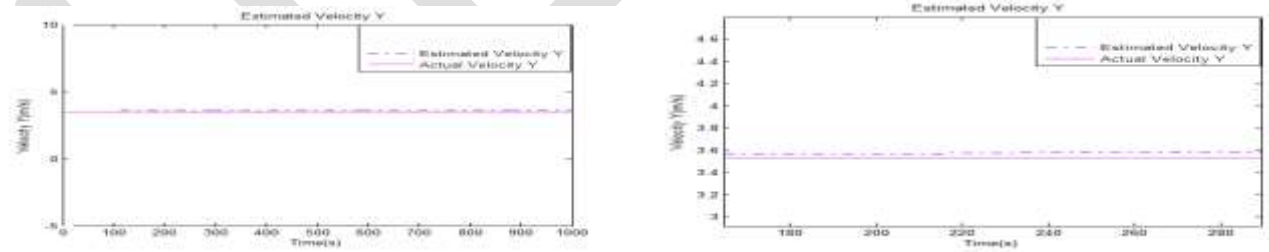
(a) (b)

Figure 2: (a) Estimation of Position of linear trajectory using 100 Monte Carlo simulations with N=1000 particles for complete time samples. (b) Zoomed version.



(a) (b)

Figure 3: (a) Estimation of Velocity X of linear trajectory using 100 Monte Carlo simulations with N=1000 particles for complete time samples. (b) Zoomed version.



(a) (b)

Figure 4: (a) Estimation of Velocity Y of linear trajectory using 100 Monte Carlo simulations with N=1000 particles for complete time samples. (b) Zoomed version.

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CONCLUSION

In this paper, we verified particle filtering technique for a target tracking example using a linear state model and a non-linear measurement model with additive white Gaussian noise in MATLAB.

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A NEW SINGLE STUCK FAULT DETECTION ALGORITHM FOR DIGITAL CIRCUITS

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Abstract— Single stuck line is a deficiency model utilized as a part of computerized circuits. It is used for post assembling testing. The model expects one line or hub in the computerized circuit is stuck at logical high or logical low. When a line is stuck it is called a fault. Fault detection in digital circuits is very important to get accurate results. When redundancy is introduced into digital circuits to achieve fault tolerance, the necessary overhead must be weighed against the improvement in reliability. In order to achieve a new design to simulate fault for a digital combinational circuit that is made up of ten gates and three inputs with one output. Results for single stuck at all faults are presented with details and the code written by c language.

Keywords—Combinational Circuit; Stuck-at Faults; Serial Fault Simulation; Deductive Fault Simulation; and Test Pattern Generation.

INTRODUCTION

The fault testing and diagnosis of digital circuits become an important and indispensable part of the manufacturing process at the point when advanced circuits are utilized as a part of security discriminating applications, their flaw conduct and its results must be assessed. A run of the mill inquiry is: will this issue lead to an unsafe circumstance? The idea of "hazardous" makes an application-specific gathering of inadequacies. The issue of test example era is more noteworthy. Since the sweep based configuration for testability systems are progressively utilized as a part of VLSI circuits, test example pattern for combinational circuits is getting significantly more essential. The test example pattern issue can be seen as a limited space look issue of discovering suitable logical assignments to the essential inputs such that the given flaw is recognized [1].

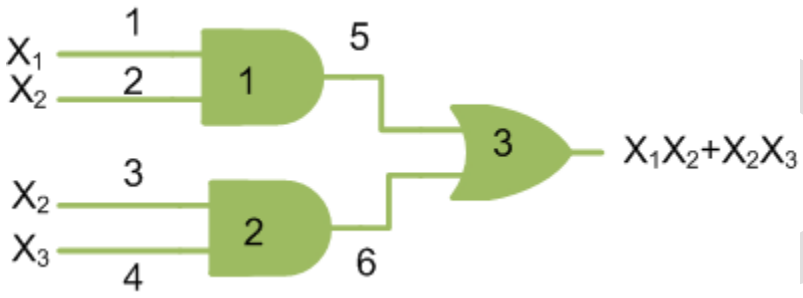
There are problems in the ASCs are the races. A race can exist in a circuit if two or more feedback signals are changing simultaneously. The race is essential for the order of changes can affect the final circuit state. Therefore another problem at the ASCs design is to avoid critical races [2]. A defect in an automated system is the unintended difference between the implemented hardware and its intended design. A representation of a weakness at the abstracted function level is called a fault. The term fault refers to electrical, Boolean, or functional malfunctions [3].

The faults of ASCs can be process faults, transient faults, or delay faults. Process faults originate from fabrication. Transient faults are the ones that might occur at some time, but are not stable in the sense they might not occur at other times. If a fault causes a circuit to exceed its timing specifications, but does not affect its logical function, it is deemed to be a delay fault [4]. The most known and used process fault model is the stuck-at fault model. The stuck-at fault is modeled by assigning a fixed logic zero or one to a signal line in the circuit [5]. In this paper, only stuck-at faults are considered.

Finally, in this paper the serial fault simulation method is utilized. The simulation is done by Computer Programming "C Language". It is a powerful language which is being used for wide varieties of applications and Embedded Systems.

TYPES OF CIRCUITS

Types of digital circuits under study are simple two stage combinational circuits. The practical digital circuits, which are composed of AND, OR, NOT, NAND and NOR gates are alone chosen for measuring the performance of the methods in survey. Furthermore, methods derived for obtaining tests for this class of circuits are general enough to be applied to circuits consisting of gates other than these five types, such as the XOR gate, with minor modifications. It is assumed that the response delays of all the gate elements are the same. Figure (1) shows an example of a simple two stage combinational circuits. X1, X2 and X3 are the circuit inputs and X1X2+X2X3 is the fault free response of the circuit. Interconnections between the gates are numbered.



Figure(1)sample circuit

PROBLEM STATEMENT

The issue of deterministically creating a test example for a given stuck at deficiency (s_a_{0, 1 }) is to discover a mix of assignments of logical values (0 or 1) to the essential inputs which recreate the given shortcoming (line support) and screen the given shortcoming no less than one of the essential yields (deficiency proliferation) [6].

The undertaking of a deterministic test example generator is to create a test design or recognize the shortcoming as untestable (repetitive) for each deficiency in the defect rundown and structure a test set for testable flaws. Since the pursuit of discovering a test example devours inadmissible measures of calculation time, a prematurely ending measure is utilized as a part of all test generators. On the off chance that the quest for a given issue couldn't be completed, the defect is recognized as prematurely ended [7].

SERIAL SIMULATION

This is the simplest algorithm for simulating faults. The circuit is first simulated in the true-value mode for all vectors and primary output values are stored in a file. Next, faulty circuits are simulated one by one. This is achieved by modifying the circuit description for a target fault and then using the true-value simulator. As the simulation proceeds, the output values of the faulty circuit are dynamically opposed to the saved true responses. The simulation of a faulty circuit is switched off as soon as the comparison indicates detection of the target fault. All faults are simulated serially in this way.

ALGORITHM of SERIAL SIMULATION

Logical faults affect the state of logic signals. Normally, the state may be modeled as {0, 1, X (unknown), Z (high impedance) }, and a fault can transform the correct value to any other value. The serial fault simulation is a result of stuck _at_ 1 and stuck_ at _0 which is briefly outlined in the following and illustrated by the flowchart of serial fault simulation. Total number of faults is generated is:

Total number of faults(x) = #PI + #gates + # (fanout branches) (1)

Where

PI is a primary inputs of the circuit.

#Gates is the number of gates that it is a digital circuit used, and

fanout branch that are necessary components for a circuit.

In flowchart below x equal 25 that it is absolute fault sites. The count is to determine fault detected, in initialized set count to zero, also flag, when flag is one in each state (stuck_at_0 and stuck_at_1) which it is mean detected fault then account it. As showed in Figure (2).

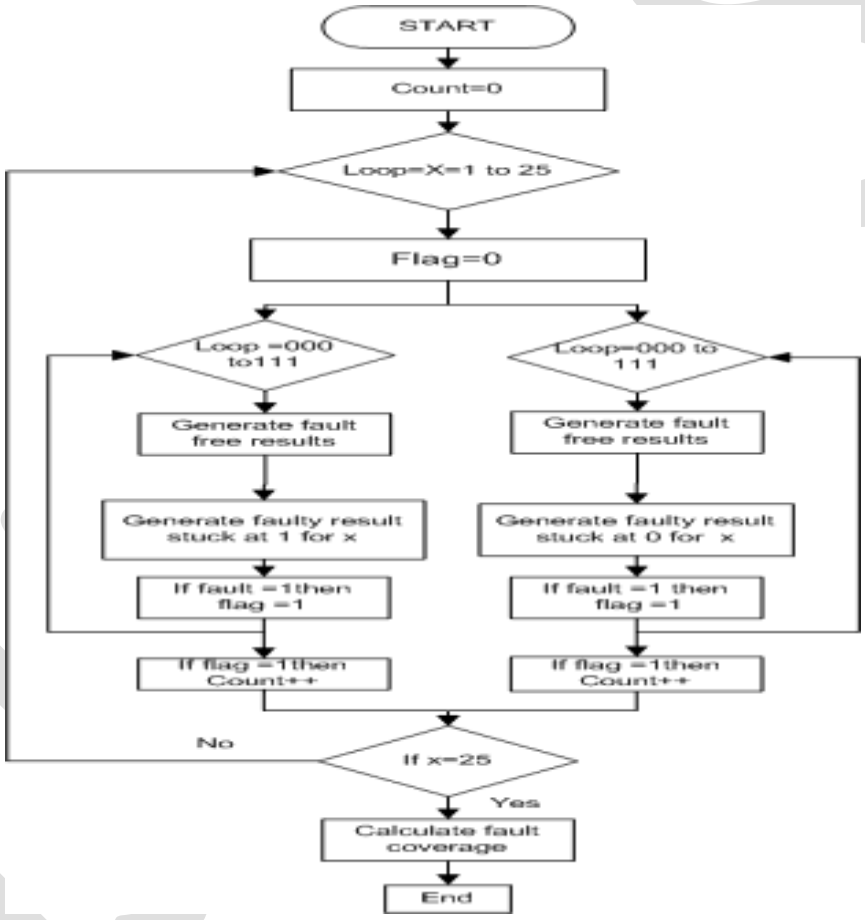


Figure (2): Algorithm flowchart for analysis of the serial fault simulation method.

SIMULATION RESULTS

Fault simulation comprises of simulating a circuit's behavior in the presence of faults. Comparing the faulty response of the circuit to that of the fault-free response using the same test set T, can determine the faults detected by T. Fault simulation has many applications, such as test set evaluation, fault-oriented test generation, fault dictionaries construction, and examination of circuit operation in the vicinity of deficiencies. There are various calculations for deficiency recreation: serial, parallel, deductive,

simultaneous, parallel-example single-flaw engendering and basic way is following. The greater part of these calculations focused on the single stuck at deficiency model for physical flaws.

Figure (3) shows the Logic circuit under test, the combinational circuit which is composed of at ten gates and three inputs and only one output to be used to demonstrate fault simulator.

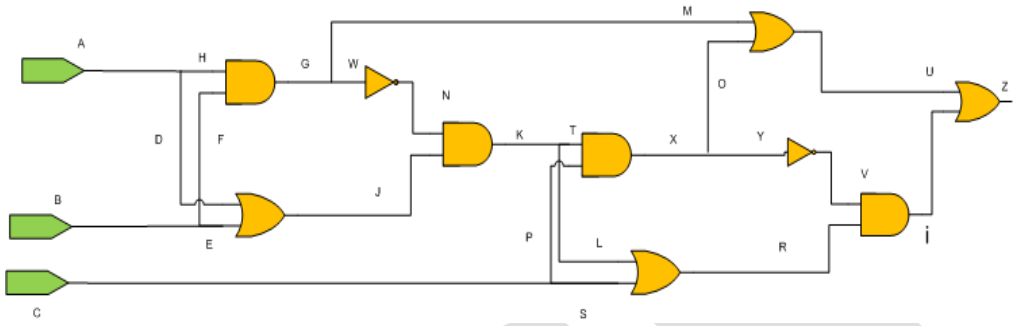


Figure (3): Logic circuit under test

For Figure (2) shows that the circuit through three inputs lines a total eight inputs was given from 000 to 111. Output obtained by the simulation program for both cases of stuck _at_0 and stuck _at_ 1 are given in Table (1) and Table (2).

Table 1: Stuck at fault 0 (stuck_at_0)

Fault List	Test Result	Detected By
1	1	100,
2	1	010,
3	1	001,
4	0	
5	0	
6	1	010,
7	0	
8	0	
9	1	110,
10	1	010,100,
11	1	010,100,
12	1	010,100,
13	0	
14	1	010,100,
15	1	100,
16	1	001,
17	0	
18	0	
19	0	
20	1	011,101,
21	1	011,101,110,
22	1	001,010,100,
23	1	001,010,100,
24	1	001,010,100,
25	1	001,010,011,100,101,110,111,

Figure (4) shows that the Relationship between fault and its occurrence for stuck _at_0.

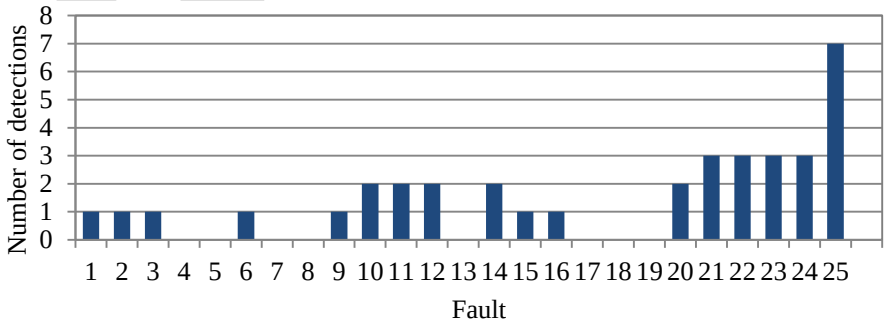


Figure (4): Relationship between fault and its occurrence

Table2: Stuck at fault 1(stuck_at_1)

Fault List	Test Result	Detected By
1	1	000,
2	1	000,
3	1	000,
4	0	
5	0	
6	1	000,
7	1	000,
8	1	010,100,
9	1	000,
10	1	000,
11	0	
12	1	000,
13	0	
14	1	000,
15	1	000,
16	1	000,
17	0	
18	1	000,
19	1	001,010,100,
20	1	000,
21	1	000,
22	0	
23	1	000,
24	1	000,
25	1	000,

Figure (5) shows that the Relationship between fault and its occurrence for stuck _at_1.

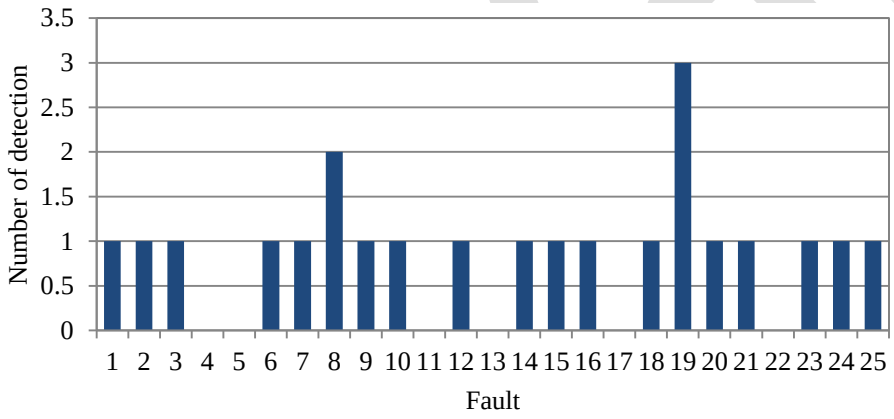


Figure (5): Relationship between fault and its occurrence

From results shows that a fault is detected during any of the give 8 inputs (000 to 111). Results for fault stuck _at _0 and stuck _at_1. Various faults were detected by various injected input values ranging from 000 to 111. The detected method is done by generating a truth table by hand calculation as well as by stimulating program. The results were compared with final output pin that is pin 25. The truth table for accurate circuit (Non-faulty circuit) is given Table (3).

Table (3) TEST PATTERNS

TEST PATTERNS	RESULT
000	0
001	1
010	1
011	1

100	**1**
101	**1**
110	**1**
111	**1**

The simulation program starts with the value 1 and finishes at 25 because the chosen digital circuit has 25 lines. So each number represents that the corresponding line is faulty. For each line, the both faulty circuits stuck at fault will compare the output value for inputs 000 to 111. It turns the flag HIGH if the output of the faulty circuit is different from Non-Faulty circuit. Hence this sequence will run upto 25 cycles. After each iterating, the number of faults is counted by using a variable "count". In the end, fault coverage is calculated by dividing number of fault with 50 (because total possible faults for a given circuit are 50; 25 faults for each stuck_at_0 and stuck_at_1). From the simulated results shown above, total number of detected fault is 48. So Fault Coverage = 48/50 * 100%= 96 %.

As a contrast between the program output and hand calculation the results as showed in Table (4).

Table (4).Truth table for test pattern and fault coverage

Number of test	Test pattern	Fault coverage(fc)
1	000	20%
2	001	14%
3	010	12%
4	011	9%
5	100	20%
6	101	7%
7	110	7%
8	111	7%
Fault coverage		96%

CONCLUSION

The deductive fault simulator was proposed for the digital circuit with ten gates and three inputs with one output, its implementation and tested. In this paper the comparison results generated by simulation program and calculation results, it is proved that this program is 100% capability for fault detection and gives accurate results. The simulator can be extended to modify for any other circuits, having different number of inputs as well as outputs.

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An Intelligent Walking Stick for the Blind

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Abstract— God gifted sense of vision to the human being is an important aspect of our life. But there are some unfortunate people who lack the ability of visualizing things. The visually impaired have to face many challenges in their daily life. The problem gets worse when they travel to an unfamiliar location. Only few of the navigation systems available for visually impaired people can provide dynamic navigation through speech output. None of these systems work perfectly for both indoor and outdoor applications. In this paper, we propose a navigation device for the visually impaired which is focused on providing voice output for obstacle prevention and navigation using infrared sensors, RFID technology, and android devices. The proposed device is used for guiding individuals who are partially sighted or blind. This device is used to help blind people to travel with the same ease and confidence as sighted people. The device has proximity infrared sensors. RFID tags are installed into public building and also integrated into blind person's walking stick .The whole device is designed to be small and is used in conjunction with the white cane. This device is connected to an android phone through Bluetooth. An android application is designed which gives voice navigation based on RFID tags read and also updates person's location information on the server. One more application is designed for family members to access the blind person's location through the server whenever needed.

Rest is followed by introduction, related work, proposed system architecture, advantages, conclusion, future scope, acknowledgement, references.

Keywords— Android, blind, Intelligent Navigation Device, Infrared sensors, partially sighted, PCB unit, RFID

Introduction

There are number of blind people in the society, who are suffering while exercising the basic things of daily life and that could put lives at risk while travelling. There is a necessity these days to provide security and safety to blind people. There have been few devices designed so far to help the blind.

Blindness or visual impairment is a condition that affects many people around the world. The usage of the blind navigation system is very less and is not efficient. The blind traveler is dependent on other guide like white cane, information given by the people, trained dogs [1] etc. Many virtually impaired people use walking sticks or guide dogs to move from place to place. A guide dog is trained for guiding its users to avoid the accidents from objects and barriers over a fixed path or in a fixed area. When a visually impaired person uses a walking stick, he waves his stick and finds the obstacle by striking the obstacles in his way.

The study of previously developed systems and analysis of the implementation methods used, led us to define a new system which could overcome the disadvantages in the previous systems. Therefore using the existing technologies we provide a solution to the stated problem.

The device has proximity infrared sensors which provide the vibration alert to avoid the obstacles. The RFID tags can be installed into public building and it is also integrated into blind person's walking stick through RFID sensor .The whole device is designed to be small and is used in conjunction with the white cane. This device is connected to an android phone through Bluetooth. An android application is designed which gives voice navigation based on RFID tags read and also updates person's location information on the server. Also, vibration alerts are provided through the smartphone on obstacle detection. One more application is designed for family members to access the blind person's location through the server, whenever needed.

This paper presents a system concept to provide a smart electronic aid for blind people. We propose to design an intelligent device which alerts the person on occurrence of obstacles based on distance between the person and the obstacle. Here, this intelligent device not only alerts but also traces the location of the person and informs the current position of the person to his relatives through the use of server.

RELATED WORK

Blind and visually impaired people find it difficult to travel in unfamiliar places because they do not receive enough information about their location with respect to traffic and obstacles on the way which can be easily seen by people without visual impairment. Now a days, there are different technologies like GSM, GPRS which help the blind people to navigate.

The systems which exist so far use GPS [2] for navigation and technologies like GSM or GPRS for sending emergency alerts to the relatives about current location of the blind person. The first system under study[3], uses GPS for outdoor navigation and RFID tags for indoors. But this solution has proved to be inefficient. The RFID sensor is used for detecting location of blind indoors and GPS is used for outdoor. For indoor navigation, the RFID sensor is attached to the walking stick of blind person and RFID tags are installed in all the areas that need to be identified. These tags serve as a landmark to the person using the cane. Each tag will be equipped with as much information as needed to clearly define the location of that precise tag (i.e. shops, names of places). The tag also contained additional information about direction and locations of other sensitive locations (i.e. Bus stops, telephone booths, subway stations, etc.). The RFID tag were covered by a protective shield to keep it safe from any harm. In outdoor the GPS is used to find the location of the particular place. The GPS which is fixed to the walking stick of blind person will help to give location information in outdoor. The Fig.1 below shows the block diagram of the same.

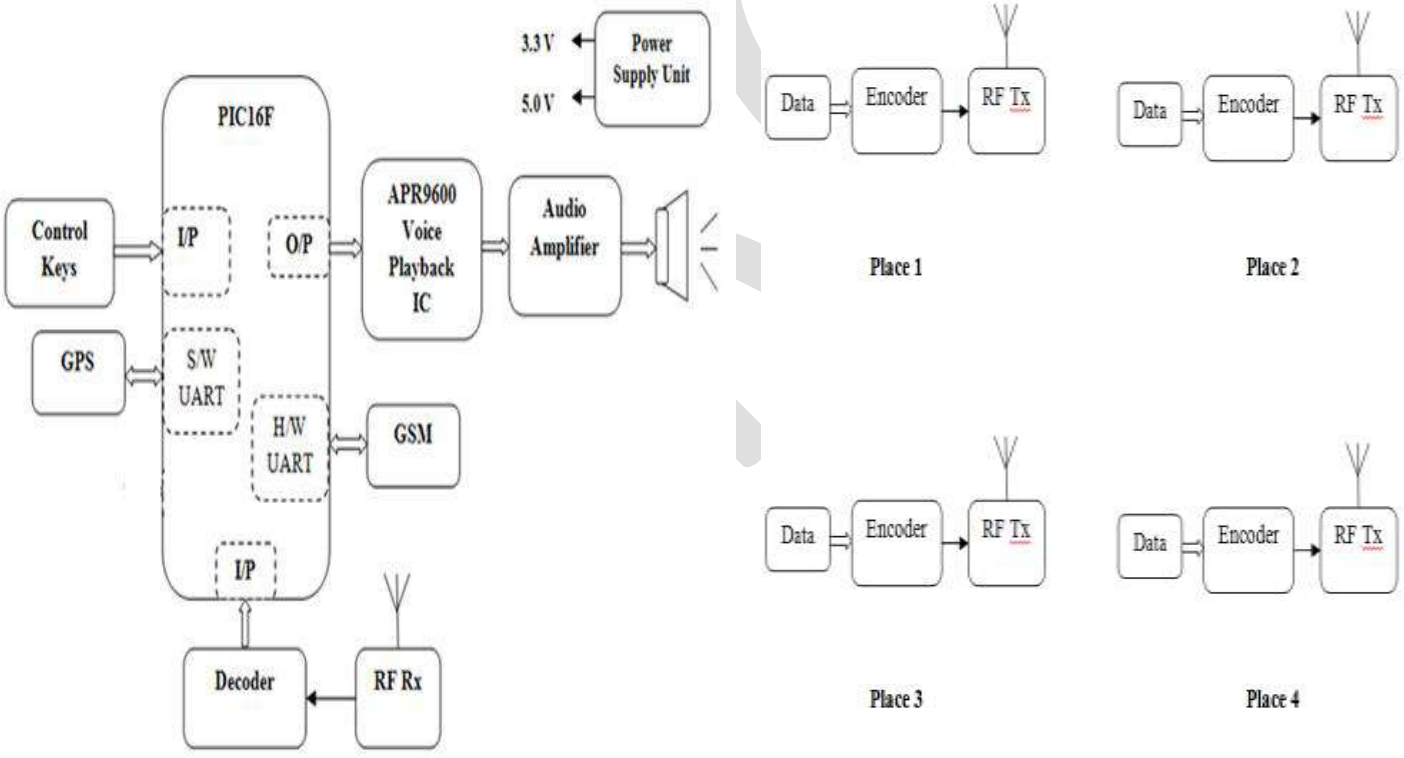

Fig. 1 Block Diagram of System using RFID tags and GPS

But this system has the disadvantage that using RFID tags along with GPS is expensive as two separate technologies are used for indoor and outdoor navigation respectively, and for location tracking. Also the logic has to be developed for identifying whether to use RFID tags or GPS system.

The other system [4] uses GPS and GPRS Technology. It also uses ultrasonic sensors for blind person's navigation which combines voice alert and vibration properties. These are developed for sending command to relative of person in the form of emergency SMS by system registered cell phone number. The system responds to it by transmitting its current coordinates in the form of Latitude and Longitude using a reply SMS to same Cell phone. The device uses the sensors to detect obstacles within the designed range and gives vibration alerts through a sound to the blind person to avoid the obstacle. This system is shown in fig.2.

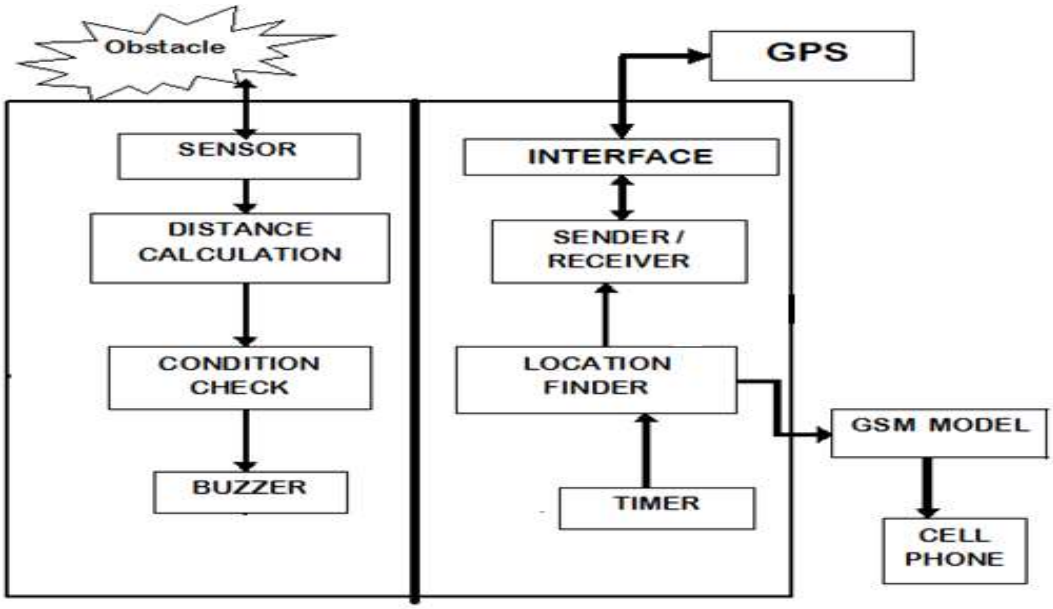

Fig 2. Block Diagram of GSM and GPS based System

This system has the disadvantage that the location of the blind person could be tracked only by using the specified cell phone number i.e. if the saved number in the system is lost or deactivated the location tracking would fail. Only outdoor navigation could be provided using GPS as GPS doesn't work for indoor navigation in India.

Thus, using these ideas we have come up with a device designed to alert the blind person with voice output as well as vibration alerts and update his recent location using GPS on a server which can be accessed by his relatives as and when need arises. The additional benefit being an SMS alert is sent in emergency situations.

PROPOSED SYSTEM ARCHITECTURE

The proposed device is focuses on the visually impaired people who cannot walk independently in unfamiliar environment. The main aim of our system is to help the blind people to move independently in the unfamiliar environment.Fig.3 shows the architecture of the proposed system.

The system has four main modules:

A. PCB unit and RFID sensor

The first is PCB unit, which consists of 89c51 microcontroller [5], Bluetooth HC05, MAX232 [6], ADC 0808 [7] and IR sensors. Along with these components, there will also be an RFID sensor.

89c51 Microcontroller is used to control the various elements on the PCB unit.

IR sensors are used for obstacle detection. IR sensors emits the infrared rays, so when obstacle, rays will be reflected to the sensors. The sensors will then transmit this data to the microprocessor which in turn, via Bluetooth transfers this information to the android application on the phone carried by the blind person. The phone gives vibration alerts and speech output to blind person.

RFID tags and sensors [8] are used to provide additional information about the location to the blind person as RFID tags are read by the sensor and speech output is given accordingly to the user.

This PCB unit is mounted on the white cane.

B. Visually Impaired Person's Android Application

Second part of the system is android application [9] in the visually impaired person's Smartphone. The relative or a family member of that person will have to start and configure the application. This android phone is connected and synchronized with the PCB unit through Bluetooth which is mounted on PCB unit. Android phone gives the speech output for obstacle detection or RFID tags read by the PCB unit to the user. It will also give vibration alerts when obstacle is detected.

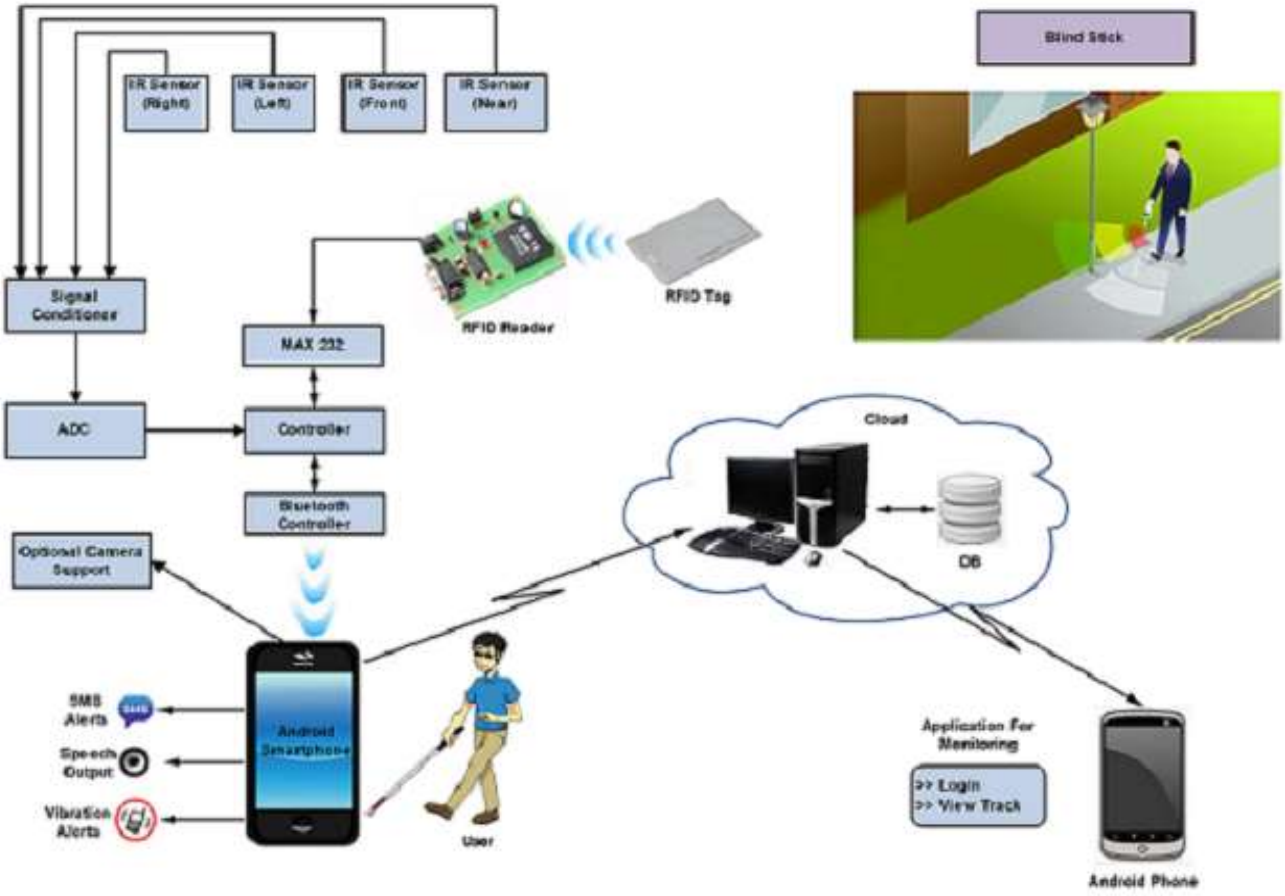

Fig. 3 Proposed System Architecture

C. Server

Third part of the system is server. Server stores the information about the location of the blind person. As blind person moves from one place to other, location will get updated on server. Glassfish server [10] is used for this purpose.

D. Monitoring User's Android Application

The monitoring user's android application is the part of the system which will be used by relatives or family members of the blind person to access his latest location stored in the server.

After integrating all these parts, the system formed, will be useful for the blind person to move from one place to other place.

RESEARCH METHODOLOGY

A. Data Sampling

The idea of the proposed system came into existence because of a short visit to a blind school. It was seen that the individuals were given training to walk with a stick along a fixed path every day with a person to guide each of them. The inception of the project was marked by the conversations held with the blind people in the school and their staff. The data collected was indicative of the facts and miseries of their daily life. The visual disability made them incapable of doing any kind of simple chores independently.

This laid us to research on the already existing technologies and conduct literature survey. The existing systems as highlighted above had some disadvantages so we have tried to design a system which aims to eliminate few of the disadvantages.

B. Technologies used

We have made use of the Android technology which has gained a lot of popularity because of it's easy to use and flexible nature. In conjunction to this, use of hardware components has also been done. The major hardware parts being RFID sensors and IR sensors.Net Beans is used for cloud service deployment using glassfish server.

The system can thus, be divided into two parts, viz. hardware part and software part.

The hardware consists of PCB unit and RFID sensors. These are mounted on the white cane.

The following components are mounted on the PCB:

i. The 89c51 microcontroller which is used, belongs to the 8051 microcontroller family. The 8051 is an 8-bit processor. It has 128 bytes of RAM and 4K bytes of on-chip ROM for memory. It consists of two timers and 6 interrupt sources. One serial port, four I/O ports, each 8 bits wide are present for serial communication I/O operations respectively. The language used for microcontroller programming is embedded C.

ii. Bluetooth HC-05 module is an easy to use Bluetooth Serial Port Protocol module. It has been designed for transparent wireless serial connection setup. It is used for the wireless communication between the PCB unit and the android phone which is held by the blind person.

iii. The MAX232 IC is used to convert the TTL/CMOS logic levels to RS232 logic levels during serial communication of microcontrollers with PC.

iv. ADC 0808 is a monolithic CMOS device. It's basically an 8 bit analog-to-digital converter. The 8 bit A/D converter uses successive approximation as the conversion technique. Registers are used for storing the information while programming. And capacitors are used for storing the power.

v. IR sensors are connected to the ADC. They are used for obstacle detection. IR sensors emit infrared rays which are reflected from the surface of any object in their range to the sensors. The distance to the object is then calculated depending on the angle of reflection and this data is then transmitted to the microprocessor which in turn, via Bluetooth transfers this information to the android application on the phone carried by the blind person. The android application compares this data to the threshold values set for the sensors and accordingly gives vibration alerts and speech output to blind person.

vi. Radio-frequency identification (RFID) [11] uses electromagnetic fields wirelessly to transfer data. It automatically identifies and tracks tags attached to the objects. The tag consists of electronic information. The tags can be of active or passive type.

The RFID sensors read the RFID tags and transmit this data to the microcontroller which is then sent to the android application via Bluetooth.

The software part consists of Blind user's Android application, Monitoring user Android application and a cloud web service. Development of Android applications was done through the freely available, open source Android SDK.

The Blind user's Android application is to be configured once by a family member or relative. The necessary details like the emergency contact number, IP address of the server and authentication details need to be provided. Also the threshold value for the IR sensors can be set here. This application has to be first connected to the PCB via Bluetooth discovery. It then receives its input from the PCB unit. This application provides vibration alerts along with speech output whenever the IR sensor input crosses the set threshold values thus avoiding collision of the blind person with the obstacle. It also has serialized database consisting of information regarding the RFID tags and the corresponding location details. Whenever the RFID tag is read by the RFID sensor, the information is sent to this application. The application then searches the database for the entry corresponding to the RFID tags and gives speech output about the location information stored. The application also updates the user's location on the cloud.

Monitoring user Android application is used for finding the location of the blind person. The application needs to be logged in using the authentication details and the IP address of the server. The location of the user is fetched whenever the button is touched.

The cloud web service [12] is basically used to store the updated location information. The monitoring application send request to the cloud for fetching the blind person's location. The cloud [13] processes this request and sends the location details.

ADVANTAGES

The system proposed in this paper will have the following advantages:

i. The system can be used both indoor and outdoor navigation.
ii. Blind person's location can be tracked whenever needed which will ensure additional safety.
iii. Detects obstacles and alerts the blind person through vibration alert and speech output.

CONCLUSION

The proposed system tries to eliminate the flaws in the previous system. It aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety.

FUTURE SCOPE

It can be further enhanced by using VLSI technology to design the PCB unit. This makes the system further more compact. Also, use of active RFID tags will transmit the location information automatically to the PCB unit, when the intelligent stick is in its range. The RFID sensor doesn't have to read it explicitly.

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A novel Image Fusion Technique using Dual Tree Complex Wavelet Transform

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Abstract— Fusion is basically extraction of best of inputs and transferring it to the output. Image fusion is the process of combining the relevant information from a set of images into a single image, where the resultant image will be more informative and complete than any of the input images. A novel image fusion technique based on Dual-Tree Complex Wavelet Transform (DT-CWT) is presented in this paper. Fusion rule based on magnitude of analytic wavelets is used to extract information from the source images decomposed using Oriented 2D DT-CWT. The fused image is obtained through inverse 2D DT-CWT reconstruction process. Experimental results show that the proposed fusion method based on Oriented 2D DT-CWT is remarkably better than the fusion methods based on real oriented 2D Dual Tree transform, Stationary Wavelet Transform and classical Discrete Wavelet Transform. This paper is organized as follows: (i)introduction ((ii) design overview and algorithm (iv) results and discussions (v) conclusion.

Keywords— Wavelets, 2D-DTCWT,Fusion,Hilbert Transform,Directionality,Shift invariantce,PSNR,MSE.

INTRODUCTION

Data fusion is a process dealing with data and information from multiple sources to achieve refined and improved information for decision making[4].Image and video fusion is a specialization of the more general topic of data fusion, dealing with image and video data. Image fusion can be defined as the process by which multiple images, or some of their attributes are combined together to form a single image. Image fusion provides an effective way for the reduction of increased volume of information by extracting all the useful information from the source images. With rapid developments in the domain of imaging technologies, image fusion has become inevitable in wide fields such as medical imaging, remote sensing, robotics and military applications[3].

Fourier Transform approach for image fusion does not provide simultaneous localization in both space and frequency. Thus Fourier transform is not suitable for multiresolution based image processing. Another Fourier based approach called Short Time Fourier Transform (STFT) which is considered as an improved version of Fourier transform uses narrow windows so that part of non-stationary signal appears to be stationary. This approach provided good spatial resolution but poor frequency resolution. Discrete Wavelet Transform (DWT) provides simultaneous localization in both frequency and space and found to be an efficient tool for image processing applications [12].

The wavelet transform suffers from four fundamental, intertwined shortcomings. The first problem is that wavelet coefficients tend to oscillate positive and negative around singularities as wavelets are band pass functions. This complicates wavelet-based processing, specifically making singularity extraction and signal modeling very difficult [6].Moreover, since an oscillating function passes often through zero, the conventional wisdom that singularities yield large wavelet coefficients is exaggerated. Certainly, it is possible for a wavelet overlapping a singularity to have a small or even zero wavelet coefficient. The second problem is Shift variance, ie, a small shift of the signal greatly disturbs the wavelet coefficient oscillation pattern around singularities. Lack of Shift invariance also complicates wavelet-domain processing; algorithms must be made capable of coping with the wide range of possible wavelet coefficient patterns caused by shifted singularities [9][5]. Aliasing is another problem. Wavelet coefficients are computed via iterated discrete-time decimations interspersed with non ideal low-pass and high-pass filtering resulting in substantial aliasing,ie,wide spacing of wavelet coefficients occurs. Certainly if the wavelet and scaling coefficients are not changed then the inverse DWT cancels this aliasing. Any wavelet coefficient processing such as filtering,thresholding and quantization upsets the delicate balance between the forward and inverse transforms and this leads to artifacts in the reconstructed signal.Stationary wavelet Transform (SWT) does not have shift sensitivity as the downsampling operations are eliminated. But this results in very high redundancy [11].Finally, multi dimensional real wavelets are simultaneously oriented along several directions resulting in checker board appearance.Modeling and processing of geometric image features like ridges and edges becomes complicated due to lack of directional selectivity [2].The main reason for the short comings of DWT is that it is based on real valued oscillating wavelets.

Fourier transform does not suffer from these problems. The magnitude of the Fourier transform does not oscillate positive and negative but rather provides a smooth positive envelope in the Fourier domain.Second,the magnitude of the Fourier transform is perfectly shift invariant, with a simple linear phase offset encoding the shift. Third, the Fourier coefficients are not aliased and do not rely on a complicated aliasing cancellation property to reconstruct the signal; and fourth, the sinusoids of the M-D Fourier basis are highly directional plane waves. This is because Fourier transform is based on complex-valued oscillating sinusoids.

$$e^{j\Omega t} = \cos(\Omega t) + j \sin(\Omega t), \text{with } j = \sqrt{-1}. \quad (1)$$

The oscillating cosine and sine components are the real and imaginary parts respectively and they are 90◦ out of phase with each other.So they forms a Hilbert transform pair and together they constitute an analytic signal $e^{j\Omega t}$ that is supported on only one-half of the frequency axis[7].

DESIGN OVERVIEW AND ALGORITHM

Nick Kingsbury proposed two versions of 2D Dual Tree transform. The first one is Real Oriented 2D Dual Tree Transform with orientations in six distinct directions and approximate shift invariance. The second one is Oriented 2D Dual Tree Complex Wavelet Transform which is fully shift invariant with orientations same as that of Real Oriented 2D Dual Tree Transform[10].Dual tree wavelets are not only approximately analytic but also oriented and thus more suitable for analyzing and processing oriented singularities like edges in images and surfaces in 3-D data sets. Although wavelet bases are optimal for 1-D signals, the 2-D wavelet transform does not possess these optimality properties for natural images[1][8]This is because the separable 2-D wavelet transform is less efficient for line and curve singularities(edges) even though it represents point singularities efficiently.The 2D Dual Tree Transform represents edges more efficiently than separable DWT by isolating edges with different orientations in different subbbands,and they frequently give superior results in image processing applications compared to the separable DWT.

By considering a 2D wavelet $\psi(x, y) = \psi(x)\,\psi(y)$ associated with row-column implementation of wavelet transform, where $\psi(x)$ is a complex wavelet given by $\psi(x) = \psi_h(x) + j\psi_g(x)$,the expression for $\psi(x, y)$ obtained is given as

$$\begin{aligned}\psi(x, y) &= [\psi_h(x) + j\psi_g(x)]\,[\psi_h(y) + j\psi_g(y)] \\ &= \psi_h(x)\,\psi_h(y) - \psi_g(x)\,\psi_g(y) \\ &\quad + j[\psi_g(x)\,\psi_h(y) + \psi_h(x)\,\psi_g(y)] \\ \text{Real Part } \{\psi(x, y)\} &= \psi_h(x)\,\psi_h(y) - \psi_g(x)\,\psi_g(y) \quad (2) \\ \text{Imaginary Part } \{\psi(x, y)\} &= \psi_g(x)\,\psi_h(y) + \psi_h(x)\,\psi_g(y) \quad (3)\end{aligned}$$

The real part of this complex wavelet is obtained as the difference of two separable wavelets and is oriented in -45^0.The spectrum of real part of complex wavelet does not possess checker board artifact as the complex wavelet $\psi(x)$ is approximately analytic,ie, $\psi_g(x)$ is the Hilbert transform of $\psi_h(x)$. Real 2D wavelet oriented at $+45^0$ can be obtained by making $\psi(x, y) = \psi(x)\,\psi(y)^*$,where $\psi(y)^*$is the complex conjugate of $\psi(y)$.Four more oriented real wavelets in the direction of $+75^0$,- 75^0 $+15^0$ and -15^0 can be obtained by repeating the above procedure on $\Phi(x)\psi(y)$, $\Phi(x)\psi(y)^*$, $\psi(x)\Phi(y)$, $\psi(x)\,\Phi(y)^*$.The real part of the complex Dual Tree wavelet Transform alone constitutes the Real Oriented 2D Dual Tree Transform.

Oriented 2D Dual Tree Complex Wavelet Transform was developed by considering the imaginary part in equation(3) along with the real part in equation(2).The spectrum of Imaginary part of complex 2D wavelet in 2D frequency plane is same as its real part oriented at -45^0.This transform give rise to six distinct directions and there are two wavelets in each direction as shown in Figure1.One of the wavelet can be interpreted as the real part of a complex valued 2D wavelet and the other wavelet is interpreted as the imaginary part of a complex 2D wavelet. The magnitude of each complex wavelet is an approximately circular bell-shaped function. Real version of Dual tree transform is two times expansive whereas the complex version of Dual Tree transform is four times expansive.

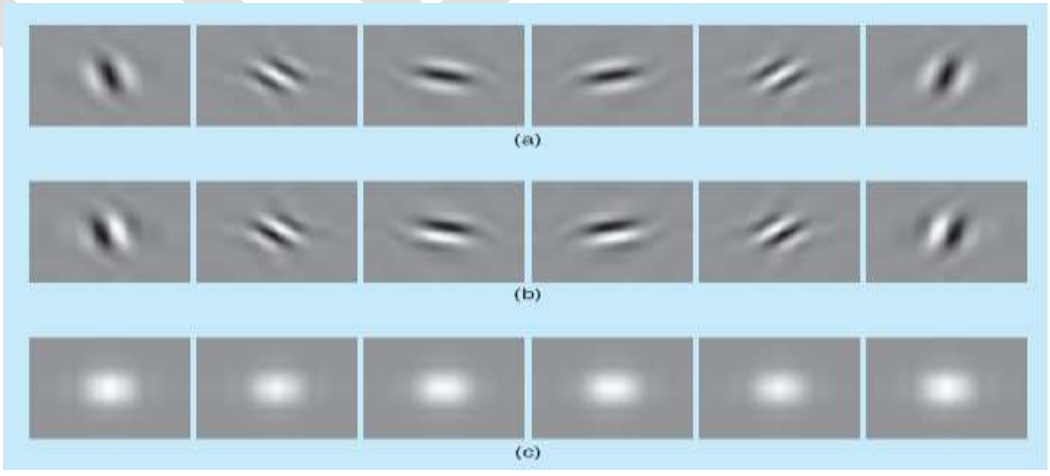


Figure 1:Wavelets associated with the oriented 2D-dual tree CWT.(a)real part of complex wavelet;(b)imaginary part;and (c)illustrates the magnitude

As shown in figure (2) image fusion is performed by decomposing the input images into approximation and detail images using Dual Tree Complex Wavelet Transform.The fusion rule is then applied on the sub images and inverse Dual Tree Wavelet Transform is applied on fused subimages to obtain the fused image.

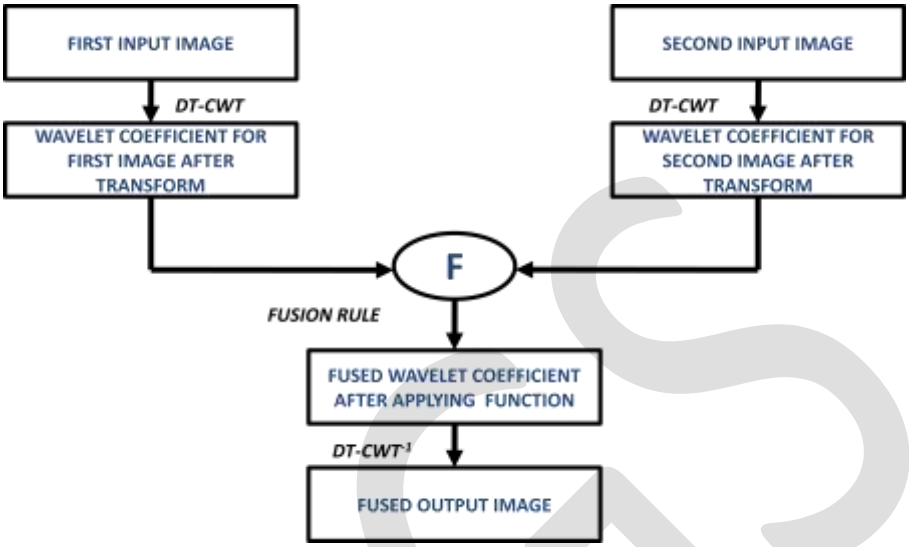


Figure 2:Image fusion methodology

The block diagram in figure(3) explains how image decomposition can be achieved using 2D Dual Tree complex wavelet Transforms. The scaling functions Φ(x)and Φ(y) are implemented using low pass filters and the wavelet functions ψ(x) and ψ(y) are implemented using high pass filters ,which forms Hilbert Transform Pairs.

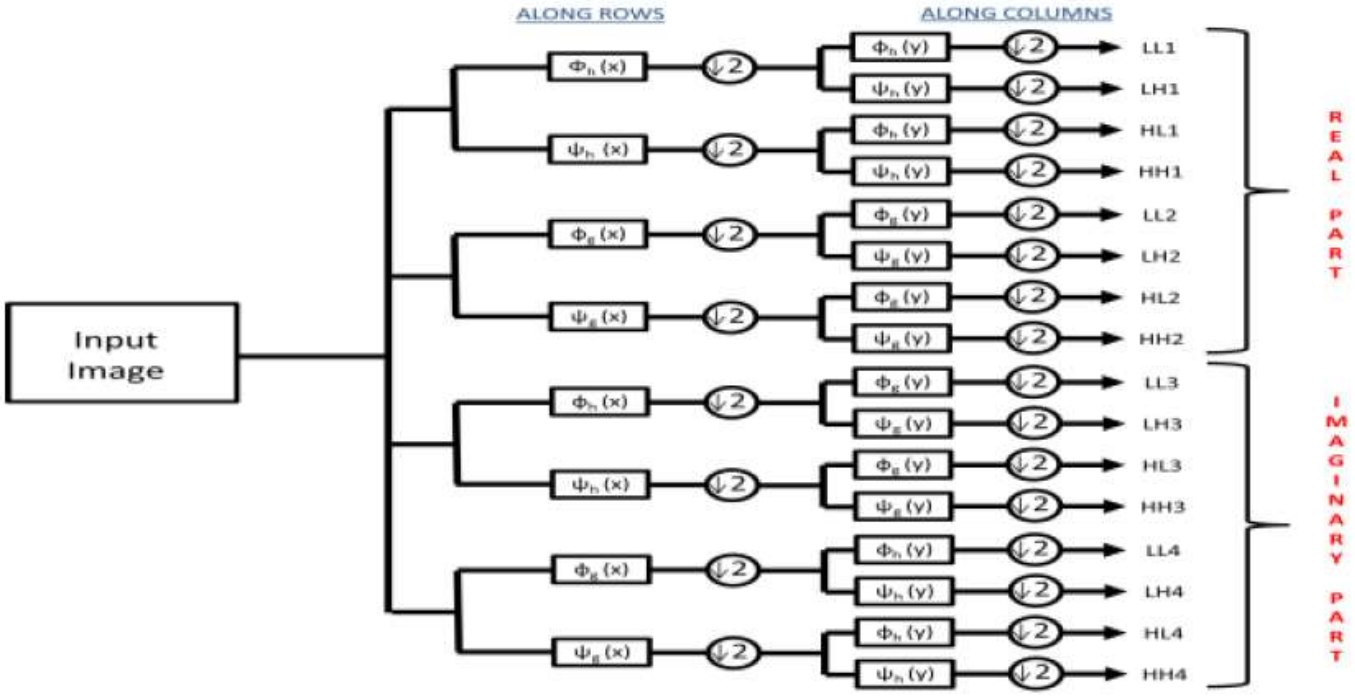


Figure 3:Image decomposition using DT-CWT

The oriented 2-D dual-tree CWT requires four separable wavelet transforms in parallel, and so it is no longer strictly a Dual-Tree Wavelet Transform. However, it is referred as such for convenience and because it is derived from the 1-D dual-tree CWT. Similarly, while the wavelets are approximately analytic, non-separable and oriented, the implementation is still very efficient, requiring only the

addition and subtraction of respective subbands of four 2-D separable wavelet transforms.

Pixel based fusion algorithm applied for DWT,SWT and Real Oriented 2D Dual Tree Transform involves selecting the maximum valued pixels from the subbands of the source images. In the case of oriented 2D Dual Tree Complex Wavelet Transform fusion process involves the calculation of magnitude of complex wavelets using its real and imaginary parts. Then the pixel values from the real and imaginary subimages of source images corresponding to maximum magnitude are selected to create fused subimages. Inverse Dual Tree Transform is applied on the fused subimages to obtain the resultant fused image.

RESULTS AND DISCUSSIONS

To make an objective evaluation of the fused image quality metrics were used. The performance comparison of the proposed methods with DWT and SWT is accomplished in terms of non-referential image quality measures such as PSNR and MSE.

PSNR is defined as the ratio between the maximum possible value (power) of a signal and the power of distorting noise that affects the quality of its representation. It is expressed in terms of the logarithmic decibel scale.

$$\mathrm{PSNR} = 20\log_{10}\left(\frac{\mathrm{MAX_f}}{\sqrt{\mathrm{MSE}}}\right), \tag{4}$$

where MSE is Mean Squared Error and MAX f is the maximum signal value that exist in the original image

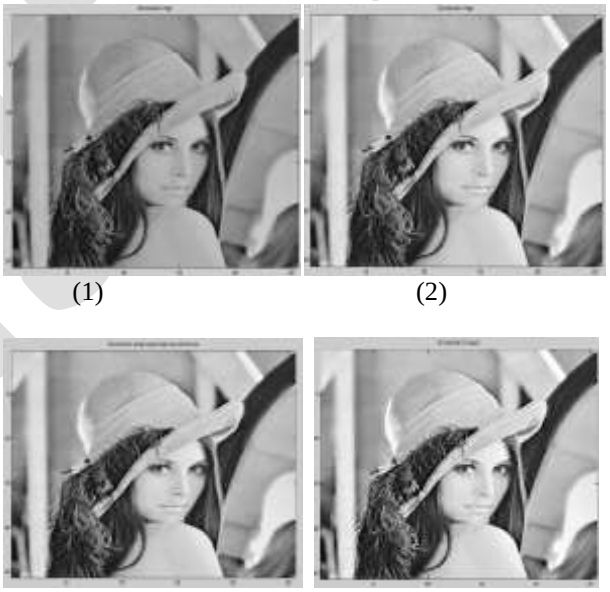
MSE is the average of the squares of the "errors" between actual image and fused image. It is the amount by which the values of the original image differ from the degraded image.

$$\mathrm{MSE}=\frac{1}{mn}\sum_{0}^{m-1}\sum_{0}^{n-1}\|f(i,j)-g(i,j)\|^2 \quad , \tag{5}$$

where f(i,j) represents original image,g(i,j) represents degraded image,m and n corresponds to the numbers of rows and columns of the image.

Figure4:Pair of Input images

Both the input images in figure(4) are registered and the first input image has a PSNR of 34.52 while second input image has a PSNR of 21.52.The fused resultant images using various techniques are shown in figure (6)



(1) (2)

(3) (4)

Figure 5: Fused image based on algorithms (1) to (4) are DWT,SWT, Real oriented 2D Dual Tree Transform and Oriented 2D DT-CWT .

Table 1 shows the evaluation of image fusion using various methods. Image decomposition using oriented 2D DT-CWT and fusion based on selecting the pixel values from the source images corresponding to maximum magnitude of a complex wavelet provides the best result.

Transform	PSNR	MSE
DWT	42.8705	26.296
SWT	44.9671	24.4015
Real Oriented 2D Dual Tree Transform	48.3963	20.9755
Oriented 2D DT-CWT	53.0757	17.4400

Table 1:Qualitative analysis of image fusion

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CONCLUSION

In this project work, attention was drawn towards the current trend of the use of multiresolution image fusion techniques, especially approaches based on Complex Wavelet transforms. A novel image fusion architecture based on Oriented 2D DT-CWT has been proposed, which is capable of achieving improved directionality. Qualitative analysis presented in Table 1 shows that Image fusion based on Oriented 2D DT-CWT has improved PSNR and lowest MSE values. The experimental results shows image quality mainly depends on fusion rules and directionality property of mutliresolution techniques when the input images are registered.

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Energy Efficient and Reliable Routing with Distributed scheme to Improve Performance and the Life Time of Wireless Ad Hoc Networks

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Abstract—An ad hoc network is a decentralized type of wireless network since it does not require any pre existing network infrastructure Since the nodes have limited battery with some degree of capacity, energy administration of a node and entire network is a serious concern in ad hoc wireless networks. Energy administration is an optimization procedure, used to exploit the equipped life span of networks by using energy-efficient routing. The on hand energy aware routing algorithms in ad hoc networks pick a route with a huge number of small-distance hops. Since this type of formulation is based exclusively on the energy depleted in a solitary transmission this can lead to further energy consumption. So that, the proper proposal should comprise the whole energy (including that exhausted for any retransmissions required) exhausted in consistently delivering the packet to its ultimate destination. This paper focuses on finding a new routing scheme which is capable of including energy, link and path reliability factors, as well as packet scheduling scheme to increase network performance and the operational lifetime of the wireless network. The proposed Energy Efficient and Reliable Routing with Distributed scheme (ERD Scheme) selects the path by considers remaining battery capacity and reliability and then it uses packet distribution scheme to the packet within specified deadline. The simulation result shows that the proposed scheme achieves high performance and energy efficiency when compared to the existing system.

Keywords—ad hoc networks, energy aware routing, battery aware routing, energy efficiency, reliability, end-to-end retransmission, hop-by hop retransmission, packet scheduling

INTRODUCTION

Ad hoc wireless networks have acknowledged significant consideration in modern years due to their immediate and cost-effectively deployment and prospective applications such as emergency calamity liberation, armed forces and etc. Ad hoc network is type of wireless network that uses radio waves for their communication and are able to working without any backbone infrastructure. The communication between nodes in network are taken place as follows, if the transmitting nodes are very close to each other, in that case the communication session is achieved either in the course of a single-hop transmission or relaying by intermediate nodes otherwise. In numerous scenarios, wireless routing protocols design requires two necessities that are Energy efficiency to maximize life time and reliability to avoid packet losses.

Organization of energy assets has substantial impact on the ad hoc network since the nodes are constructed by batteries with bounded power. Throughout the transmission, a variety of factors such as desertion, intervention, multi-path effects, and collisions, direct to serious loss rates on wireless links, so that the management of packet losses in wireless network entails essential consequence. Some applications wants end to end reliability obligation, it is compulsory to know how such reliability can be assured in wireless network in an energy efficient manner. In this work we focus the dilemma of energy efficient routing in a wireless ad hoc network that properly handles packet losses in the wireless network. The wireless links are prone to transmission errors, so there is a chance to packet loss at any time, this can be overcome by using the following retransmission schemes.

Hop-by-hop retransmissions- lost packet in each hop is retransmitted by the sender when essential, to make sure link stage reliability. Acknowledgements are sent when receiver receives packet properly

End-to-end retransmissions- here the retransmissions take place only between end nodes that is source and destination nodes, and acknowledgements are sent only by destination node

While finding reliable routes can improve the network quality of the services such as throughput and delay, taking into consideration of the remaining battery energy of nodes in routing can evade nodes from being tired and can ultimately lead to enlarge the operational lifetime of the wireless network. Various proposed energy efficient algorithms [1]-[8] focus on finding energy efficient routes, reliability parameter and life time of network. These algorithms consider either one of these requirements or combination of two but not all three requirements. For example proposed scheme [1] focuses only reliability parameter, [2]-[3] focuses energy efficiency, [2]-[3] focuses prolonging life time and [2]-[3] focuses combination of any of two requirements. We proposed a scheme by considering all these requirements together addition with distributed scheme to improve performance parameters and life time of the wireless ad hoc network.

RELATED WORK

In [4], C. Toh et al. proposed a Conditional Max-Min Battery Capacity Routing (CMMBCR) scheme to exploit the life time of MANET. Max-Min Battery Capacity Routing (MMBCR) is an existing power-aware routing algorithm that addressed the problem of rising the equipped life occasion. MMBCR used Min-Max path selection scheme (it is a method which selects the path that has the uppermost value for its most significant node). Similar to Min-Max route selection method, MMBCR selects the path whose significant node has the uppermost remaining battery energy. In MMBCR, a cost metric C_P links with a particular path P is given by

$$C_P = \min_{\text{node i lies on route P}} \{B_i\}$$

where B_i is the remaining battery capacity of node i lies on path P. The path chosen by P_{MMBCR} is specified by

$$P_{MMBCR} = \max_P \{C_P\}$$

This scheme can evade a node from being tired that is over used. This extends the instance until the first node powers losing and improves the life time before the network is partitioned. On the other hand, these power-aware routing protocols are likely to select longer paths, which enlarge the regular relaying load for every node and consequently decrease of average node life span.

Conditional MMBCR scheme uses lowest energy path if all nodes in the chosen routes have adequate battery capability else it switches from lowest energy path to MMBCR after the battery capability for some nodes goes under a predefined threshold. Conversely, both MMBCR and CMMBCR do not focus the likelihood of error probabilities and changeable broadcast energy costs of links.

In [5], A. Misra et al. proposed a energy aware route finding algorithm called the Maximum Residual Packet Capacity (MRPC) to improve the operational life span of multi-hop wireless networks by taking into consideration of node definite parameters (e.g. remaining battery power) and link definite parameters (e.g. Channel individuality of links)
MRPC identifies the capability of a node by take into account both remaining battery power and probable power exhausted in reliably forwarding a packet over a definite wireless link in wireless network. Similar to *MMBCR*, *MRPC* as well used Min-Max path selection scheme. MRPC selects the path whose significant node (the one with the smallest remaining packet broadcast capability) has the biggest packet capability. Let $C_{i,j}$ be a node link metric for the link (i, j) and is estimated as

$$C_{i,j} = \frac{B_i}{E_{i,j}}$$

where B_i is the remaining battery capability of node and $E_{i,j}$ is the broadcast power required by node i to send out a packet over the link (i, j). Mathematically talking, *MRPC* links with a definite path P, the maximal life span (the utmost number of packets that may be potentially forwarded between source and destination nodes over the route P) $Life_P$ specified by

$$Life_P = \min_{(i,j)\in P} \{C_{i,j}\}$$

The route selected by P_{MRPC} is given by

$$P_{MRPC} = \max \{Life_P | P \in \text{all possible routes}\}$$

Conditional MRPC scheme uses lowest power routing when the $Life_P$ related with the elected route lies over the particular threshold else it switches from lowest energy routing to MRPC
However, these schemes *(MRPC and CMRPC)* lengthen the life span of the network and broadcast a noticeably larger number of packets at superior energy efficiency; these will keep away from lossy links to get better energy efficiency in the occurrence of enlarged network size.

PROPOSED WORK

Network Creation

The topology of a wireless ad hoc network is considered as a graph $G(V, E)$, where V and E are the set of nodes and (edges), correspondingly. Each node assigns unique integer value as their identifier that must be lies between 1 and $N = |V|$. Assume that nodes have only limited battery power. A link between a sending node u and receiving node v in the network is denoted by (u, v). When the received signal strength by v is above a threshold, then there will be a link from u to v. Packet delivery ratio of a link (u, v) to send a packet of length x [bit] is denoted by $p_{u,v}(x)$. The power inspired by a sending node u to pass on a packet of length x bit to a receiving node v by using the wireless link(u, v) is denoted by $\varepsilon_{u,v}(L_d)$ and it is estimated by using the following equation

$$\varepsilon_{u,v}(x) = \left(A_u + \frac{P_{u,v}}{K_u}\right)\frac{x}{r}, \forall x \geq 0, \forall (u, v) \in E$$

The power inspired by the receiving node v to accept and process the packet of length x bit transmitted by sending node u is denote by $\omega_{u,v}(x)$ and it is estimated by using the following equation

$$\omega_{u,v}(x) = \frac{B_v}{r} x, \forall x \geq 0, \forall (u, v) \in E$$

where A_u be the energy necessary to run the processing circuit of the transmitter of node u, $P_{u,v}$ be the communication power from node u to node v. Let K_u be the power efficiency of the power amplifier of node u and it should be lies in the interval $0 < K_u \leq 1$. B_v be the energy necessary to run the receiving circuit of the wireless boundary at node v and r represents the data rate of the wireless link.

Minimum Energy cost Routing

Reliability and energy efficiency of path must be considered in path finding process. In wireless network one interest thing is that, the energy expenditure of a path is interrelated to its reliability. When the routes are with a reduced reliability, then the likelihood of packet retransmission increases. As a result, a superior quantity of power will be inspired per packet due to retransmissions of the packet. Based on this key point about the energy cost of routes and the packet distribution scheme, propose an energy aware reliable routing algorithm for wireless ad hoc network which is called as Energy Efficient and Reliable Routing with Distributed scheme (ERD Scheme).

Energy Efficient and Reliable Routing with Distributed scheme

In [8], J. Vazifehdan et al. proposed Reliable Minimum Energy Cost Routing (RMECR) and Reliable Minimum Energy Routing (RMER) energy aware algorithms for ad hoc wireless network to exploit the network operational life span. RMECR is appropriate for both the network retransmission models. RMECR find the path based on energy efficiency and reliability of link and path, and it also consider the remaining battery capacity to maximize the network life span. The main idea behind this scheme is

- The impact of limited number of retransmission allowed and packet size

- The impact of acknowledgment packets
- Energy utilization of processing elements of transmitter and receiver of processing node.

These points are not addressed in the pioneering studies [1], [2], [3], [4], [5], [6].

At the same time, RMER algorithm selects the path which reduces the total energy consumption for end-to-end packet traversal and does not address the remaining battery energy of nodes. RMER consumes less energy compared to existing energy efficient routing algorithms (e.g., [2]-[7]) and also has better reliability.

We propose a new energy-aware routing algorithm for wireless ad hoc networks called Energy Efficient and Reliable Routing with Distributed scheme (ERD Scheme), which is an extension of previous work RMECR. The proposed scheme is able to enlarge the network life span and is able to find reliable, energy efficient routes concurrently. ERD finds minimum energy cost paths. ERD can reduce the overall energy expenditure in the network by selecting lowest energy cost paths. At the same time it find reliable routes so that the constituent links require less number of retransmissions when there is packet loss. Additionally, ERD Scheme can reduce the end to packet traversal time by using distributed packet scheduling algorithms.

In the proposed scheme, the multi-interfaced mobile router (MMR) packet distribution scheme, distributes packets successfully and fairly on the suitable path using the corresponding network interface. Each network interface is assumed to have a distribution counter coupled with the corresponding traversal path. This distribution counter is used to determine enough capacity to distribute packets on the corresponding traversal path. The weighted capacity is estimated by

$$Weighted\_capacity = Capacity\_unit * Weight$$

The $Capacity\_unit$ in bytes are a useful design parameter and thus can influence on the performance of the proposed scheme. The weight is determined from the estimated available bandwidth of traversal paths. Subsequently, the distribution counter is also decreased by the size of packets being distributed. Consequently, the distribution counter for each network interface is diverse by distributed packets as well as $Weighted\_capacity$

RESULT AND ANALYSIS

In this section, simulations are performed to estimate the proposed scheme. The following tables TABLE I and TABLE II shows the comparison between proposed scheme ERD and existing system RMECR.

TABLE I. ENERGY CONSUMPTION

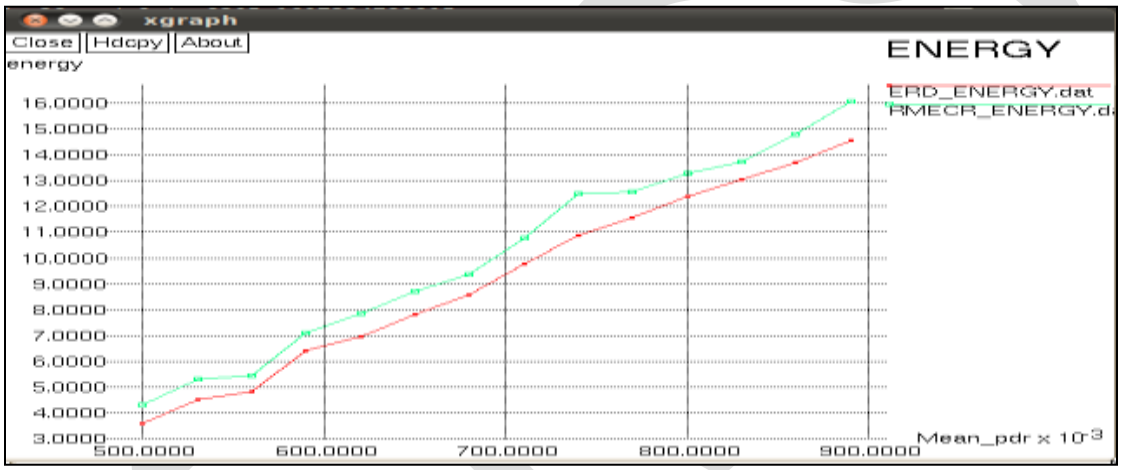
X-axis	**Y-axis**	
Mean_pdr	***RMECR***	***ERD***
0.5000	4.3044	3.6232
0.5899	7.1058	6.3012
0.6799	9.3751	8.9324
0.7999	13.2830	12.2323
0.8900	16.0538	13.55388

TABLE II. RELIABILITY OF PATH

X-axis	**Y-axis**	
Mean_pdr	***RMER***	***ERD***
0.5000	0.2190	0.5072

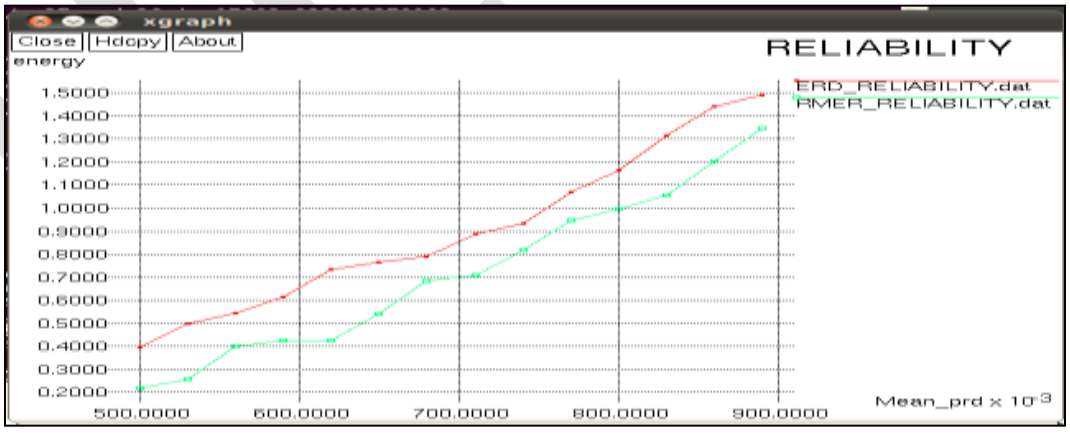
X-axis	Y-axis	
Mean_pdr	***RMER***	***ERD***
0.5900	0.4250	0.7002
0.6800	0.6838	0.8506
0.7700	0.9463	0.9714
0.8900	1.3484	1.2324

The following figure Fig.1 shows that the energy consumption comparison between ERD and RMECR. It clearly shows that the proposed system consumes less energy comparing to RMECR, since it uses packet distribution scheme.



3. Energy consumption

Fig.2 shows the reliability comparison between existing system and proposed system. ERD scheme achieve better reliability compared to RMECR



4. Reliability of Path

CONCLUSION

In this work, we proposed an algorithm for wireless ad hoc networks which is extension of the RMECR. ERD scheme finds minimum energy paths for reliable packet transmission from a source node to a destination node within the deadline.

Our simulation results show that, the proposed ERD scheme can considerably enlarge the operational lifetime of ad hoc networks compared to the similar existing best known algorithms. The proposed scheme further reduces the energy expenditure per packet delivery in the network since it uses distributed packet scheme, which increases the network performance. Additionally, it can select extremely reliable paths.

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An Efficient Elliptic Curve Scalar Multiplication using Karatsuba Multiplier

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Abstract— In this era, network security is becoming a great concern .Cryptography offers high security for communication and networking. Elliptic Curve Cryptography is gaining attraction with their high level of security with low cost, small key size and smaller hardware realization. Elliptic curve scalar multiplication is the most important operation in elliptic curve cryptosystems This paper develops a secure elliptic curve scalar multiplication using Karatsuba multiplier. Initially, three different finite field multipliers are simulated for the construction of an elliptic curve crypto processor for high performance applications. It includes classical polynomial multiplier, recursive Karatsuba multiplier and hybrid Karatsuba multiplier. The simulation results show that hybrid Karatsuba multiplier consumes less area than the other two multipliers. The implementation of the elliptic curve point multiplication is achieved by using a dedicated Galois Field arithmetic simulated on ModelSim. The research work also includes generating key pair for encryption and decryption in elliptic curve cryptography

Keywords—Cryptography, Decryption, Elliptic Curve Scalar Multiplication, Encryption, Finite Field Multiplier, Galois Field, Karatsuba multiplier.

INTRODUCTION

Cryptology is science concerned with providing secure communications. The goal of cryptology is to construct schemes which allow only authorized access to information. All malicious attempts to access information are prevented. An authorized access is identified by a cryptographic key. A user having the right key will be able to access the hidden information, while all other users will not have access to the information. There are two types of cryptographic algorithms such as symmetric key and asymmetric key algorithms. Symmetric key cryptographic algorithms have a single key for both encryption and decryption.It can be used only when the two communicating parties have agreed on the secret key. This could be a hurdle when used in practical cases as it is not always easy for users to exchange keys. In asymmetric key cryptographic algorithms two keys are involved-a private key and a public key. The private key is kept secret while the public key is known to everyone.

Elliptic Curve Cryptography (ECC), which is an asymmetric algorithm ,is gaining attraction as with their high level of security with low cost, small key size and smaller hardware realization. Elliptic curve scalar multiplication (kP), where k is a scalar (integer) and P is a point on the curve, is the most important operation in elliptic curve cryptosystems. Scalar multiplication consists of elliptic curve group operations such as point addition and point doubling. The elliptic curve group operations perform finite field operations like field addition, filed multiplication, field squaring, field division and modular reduction.

Asymmetric encryption uses a separate key for encryption and decryption. Anyone can use the encryption key (public key) to encrypt a message. However, decryption keys (private keys) are secret. This way only the intended receiver can decrypt the message. The key exchange algorithm provides a method of publicly sharing a random secret key. Security of these algorithms depends on the hardness of deriving the private key from the public key.

RELATED WORK

In 2007, Peter S et al discussed approaches that allow constructing efficient polynomial multiplication units. Such multipliers are the most important components of ECC hardware accelerators [1]. The proposed HRAIK multiplication improves energy consumption, the longest path, and required silicon area compared to state of the art approaches.

Sandoval M M et al (2007) designed hardware architecture for GF (2^m) multiplication and its evaluation in a hardware architecture for elliptic curve scalar multiplication [2]. The architecture is a parameterizable digit-serial implementation for any field order, m.The results show that the size of the digit to use in an application of the proposed digit serial multiplier architecture will be determined by the area assigned to the multiplier and also the latency of the multiplier is reduced by the size of the digit.

In 2008, Ansari B et al proposed a high-performance architecture of elliptic curve scalar multiplication based on the Montgomery ladder method over finite field GF (2^m) [3]. A pseudo pipelined word-serial finite field multiplier, with word size w, suitable for the

scalar multiplication is also developed. Implemented in hardware, the proposed scheme performs a scalar multiplication in 25(m-1) clock cycles, which is approximately 2.75 times faster than a straightforward implementation.

Rebeiro C (2008) et al proposed an efficient implementation of a GF (2^n) Elliptic Curve Processor (ECP) target for FPGA platforms [4]. The efficiency is obtained by novel implementations of the underlying finite field primitives required for the ECP. The initial recursions using the Simple Karatsuba multiplier result in low gate count, while the final recursion using the General Karatsuba multiplier results in low LUT requirements. The experimental results show that implementation is simple and fast. It saves about 2500 LUTs. The processors with the Quad Itoh Tsujii inversion require the least clock cycles. It shows that the combination of a Hybrid Karatsuba multiplier and a Squarer based Itoh- Tsujii has best results.

Bilal R (2010) et al developed an FPGA based architecture for elliptic curve cryptography coprocessor, which has promising performance in terms of both space complexity and time complexity[5]. Here, the point addition is performed with mixed coordinates to reduce the number of conversions from affine to projective coordinate's .The time taken and area required to perform point addition is reduced in mixed coordinates when compared with pure projective coordinates. Finally scalar multiplication is carried out by using Lopez Dahab algorithm in order to reduce the number of inversions required.

In 2010, Fan H et al described how to split input operands to allow for fast VLSI implementations of sub quadratic Karatsuba- Ofman multipliers [6]. By selecting different stop conditions for the KOA iterations, the hybrid approach can provide a trade-off between the time and space complexities. The proposed algorithm uses a simple and straightforward method to split input operands. The theoretical XOR gate delay of the proposed subquadratic Karatsuba- Ofman GF(2)[x] multiplier is reduced significantly.The proposed method is also suitable for practical VLSI applications.

In 2010, Rahuman A K et al proposed an architecture based on Lopez-Dahab elliptic curve point multiplication algorithm and uses Gaussian normal basis for GF (2^{163}) field arithmetic [7].Two new word-level arithmetic units over GF(2^{163}) has been designed and in order to achieve high throughput ,parallelized elliptic curve point doubling and addition algorithms with uniform addressing based on Lopez-Dahab method are derived. The different optimizations at the hardware level improve the acceleration of the ECC scalar multiplication, increases frequency and speed of operation like key generation, encryption and decryption.

Rezai et al (2011) explained an approach using a novel finite field multiplication and a high performance scalar multiplication algorithm for wireless network authentication on prime fields [8]. Constant Length Non Zero (CLNZ) sliding window method is used on the signed-digit multiplier in order to reduce the multiplication steps. Also, point addition and point doubling operation are computed in parallel. Window technique and signed-digit representation are used in order to reduce the number of point operation. The results show that the proposed finite field multiplication reduces the number of multiplication steps at about 40%-82.4% in compare with Montgomery modular multiplication algorithm.

In 2012, Chung S Z et al proposed ECC processor architecture which contains a 3 pipelined-stage full-word Montgomery multiplier and supports both finite field operations and elliptic curve scalar multiplication over prime field [9]. The processor is resistant to the simple power analysis (SPA) attack by using the Montgomery ladder-based elliptic curve scalar multiplication. Both hardware sharing and parallelization techniques are used to improve the hardware performance.

Mahdizadeh H et al (2013), presented a new and highly efficient architecture for elliptic curve scalar point multiplication [10]. Here in order to achieve the maximum architectural and timing improvements,the critical path of the Lopez–Dahab scalar point multiplication architecture are reordered and reorganized such that logic structures are implemented in parallel and operations in the critical path are diverted to non critical paths.

In 2013, Rezai A et al analysed a new and efficient implementation approach for the elliptic curve cryptosystem (ECC) based on a novel finite field multiplication in GF(2^m) and an efficient scalar multiplication algorithm [11]. This new finite field multiplication algorithm performs zero chain multiplication and required additions in only one clock cycle instead of several clock cycles. . Here point addition and point doubling operations are computed in parallel.Based on the analysis, the computation cost is effectively reduced in both the proposed finite field multiplication algorithm and the proposed implementation approach of ECC.

Roy S S et al (2013) designed a high speed ECC processor for binary fields on FPGA [12].It uses a theoretical model to approximate the delay of different characteristic two primitives used in an elliptic curve scalar multiplier architecture (ECSMA) implemented on *k* input lookup table based field-programmable gate arrays.A pipelined bit parallel karatsuba multiplier and Itoh-Tsuji's algorithm is used. By using karatsuba multiplier the multiplication steps and number of clock cycles are reduced. The experimental results show that, when the ECSMA is suitably pipelined, optimized field primitives and enhanced scheduling of point arithmetic, the scalar multiplication can be performed in only 9.5 μs.

Leca C L et al (2014) evaluated point operations and proposed an efficient algorithm for combining simple operations such as point tripling (3P),quadrupling (4P), double and add (2P+Q), in order to obtain a significantly less time-consuming method for scalar multiplication, and this aims at reducing the number of inversions required for the operation[13]. The proposed algorithm managed to increase the overall performance of scalar multiplication and reduce the complexity of the operation by lowering the number of inversions involved compared to the double and add algorithm.

Pontie S et al (2014) developed a coprocessor that supports all critical operations of an ECC cryptosystem [14].The proposed algorithm scans left-to-right the scalar with a window method. This algorithm is secure against SPA timing analysis attacks and DPA(Differential Power Analysis).Here one can choose the secure level against DPA attacks by forcing area or forcing time of computation.

Wireless devices are rapidly becoming more dependent on security features such as the ability to do secure email, secure web browsing, and virtual private networking to corporate networks, and ECC allows more efficient implementation of all of these features. The various high speed elliptic curve cryptographic processor architecture that provide integrated high throughput with low power consumption. Hardware platforms used for ECC are discussed; with special focus on FPGA architectures. Various approaches for finite field multiplication are also explained. Out of all these Karatsuba multiplier is the best because it reduces the multiplication steps and the number of clock cycles.

METHODOLOGY

ECC is rapidly becoming the standard for public-key ciphers because of the large amount of security provided per key bit. To be usable in real time applications, implementations of the crypto system must be efficient, scalable and reusable. Elliptic curve scalar multiplication is the most important operation in elliptic curve cryptosystems. Point multiplication is achieved by two basic elliptic curve operations which are point addition and point doubling. To match the speed requirements for real-time applications, hardware acceleration of ECC is a necessity. FPGAs form an ideal platform for hardware implementations of security algorithms such as ECC.

Elliptic Curve Hierarchy

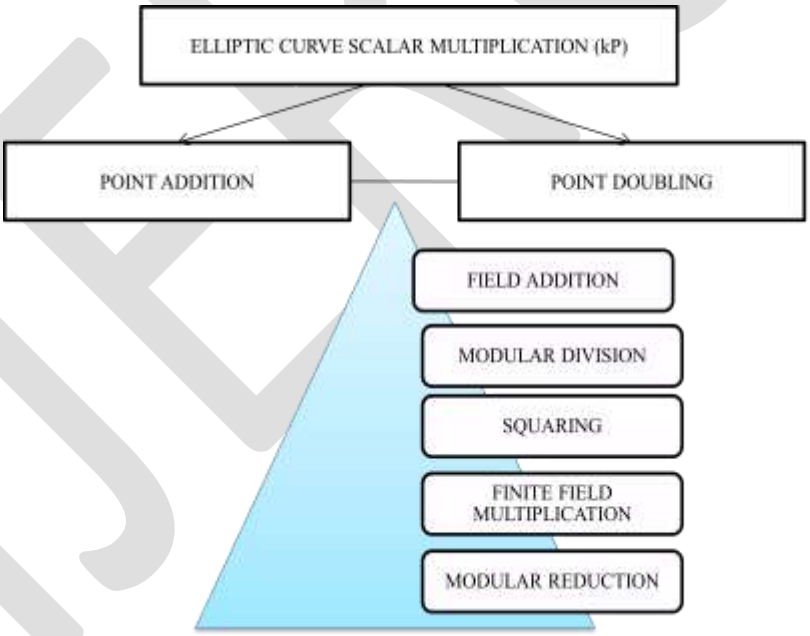


Figure 1. Elliptic Curve Hierarchy

Elliptic curve scalar multiplication (kP), where k is an integer and P is a point on the curve, is the fundamental operation in elliptic curve cryptosystems. Elliptic curve scalar multiplication is normally performed by repeating point addition and doubling operations over the curve. Both operations in turn rely on finite field operations such as addition/subtraction, multiplication, modular division, and squaring, modular reduction. Elliptic curve scalar multiplication is quite different from field multiplication.

Elliptic Curve Mathematical Background

ECC is based on the discrete logarithm problem applied to elliptic curves over a finite field. The mathematical operations of ECC is defined over the elliptic curve with coordinate points (x,y) .

$$y^2 + xy = x^3 + ax + b \quad (1)$$

where $4a^3 + 27b^2 \neq 0$, a and b are real numbers. Each value of 'a' and 'b' gives a different elliptic curve. All points (x, y) which satisfies the above equation plus a point at infinity lies on the elliptic curve. Let P ϵ E (K) and k ϵ N, the eqn (2) is used to compute the new point

$$Q=kP = \underbrace{P+ P + P +...+P}_{\text{K times}} \quad (2)$$

where Q is another point on the curve E. The binary representation of the random integer k has m bits.

Algebraic Formulae

Point Addition Over F_2^m

Let $P=(x_1,y_1)$, $Q=(x_2,y_2)$ on the curve $y^2 +xy=x^3+ax+b$.Then $R(x_3,y_3)=P+Q$ can be computed by the following equations

$$\begin{aligned} X_3&=\lambda^2 +\lambda + x_1 +x_2 +a \\ Y_3&=\lambda(x_1+x_3) +x_3 + y_1 \\ \lambda&= (y_1 + y_2) / (x_1 +x_2) \end{aligned} \quad (3)$$

Point Doubling

Point doubling is adding a point P to itself to obtain another point R. R=2P can be computed by the following equations

$$\begin{aligned} X_3&=\lambda^2 +\lambda +a \\ Y_3&=\lambda(x_1+x_3) +x_3 + y_1 \\ \lambda&= (x_1 + y_1) / x_1 \end{aligned} \quad (4)$$

Finite Field Arithmetic

Arithmetic in a finite field is different from standard integer arithmetic. There are limited numbers of elements in the finite field; all operations performed in the finite fields result in an element within that field.

Addition

Addition operation is performed by bitwise XOR of the operands.Let a(z) and b(z) be two elements in $GF(2^m)$.The addition of a(z) and b(z) is given by

$$a(z)+b(z)=\sum_{i=0}^{m-1} (a_i +b_i)z^i \quad (5)$$

Since the coefficient arithmetic is performed in modulo 2, sum a_i+b_i is an XOR operation between a_i and b_i.

Reduction

In polynomial representation, any field element can have a degree at most m-1.Field operations like multiplication, squaring etc increase degree of the result. The modular operation gives the remainder after dividing the result by the field's irreducible polynomial.

An irreducible polynomial is a polynomial which has no factors of degree less than m in the base field .Since the degree of the irreducible polynomial is m, the degree of the remainder is at most m-1 and thus the remainder is a field element. The efficiency of modular reduction operation depends on the number of nonzero terms in the irreducible polynomial. Lesser number of non zero terms in the irreducible polynomial makes the reduction faster.

Squaring

The square of the polynomial a(z) and b(z) ϵ GF(2^m) is given by

$$a(z)^2=\sum_{i=0}^{m-1} a_i z^{2i} \bmod f(z) \quad (6)$$

The squaring operation spreads out the input bits by inserting zeroes in between two input bits as shown in figure. A modular reduction is followed after the expansion to reduce the result to m bits. Squaring in binary field is a linear operation and is much faster than field multiplication.

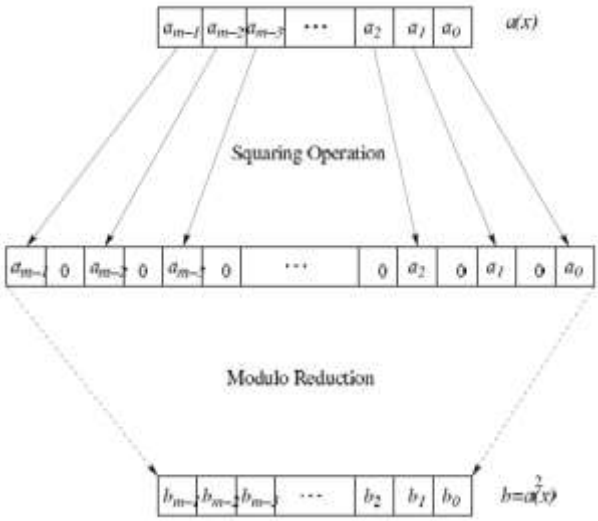


Figure 2. Squaring operation

Multiplication

For two elements a(z) and b(z) ϵ GF(2^m),the product is given by

$$a(z).b(z)=(\sum_{i=0}^{m-1} b(z)a_i z^i) \bmod f(z) \quad (7)$$

There are several multiplication algorithms for binary fields, most of our quadratic complexity. Only Karatsuba multiplication has sub-quadratic complexity. Performance of a multiplication depends on the implementation platform and on the underlying finite field.

Hybrid Karatsuba Multiplier

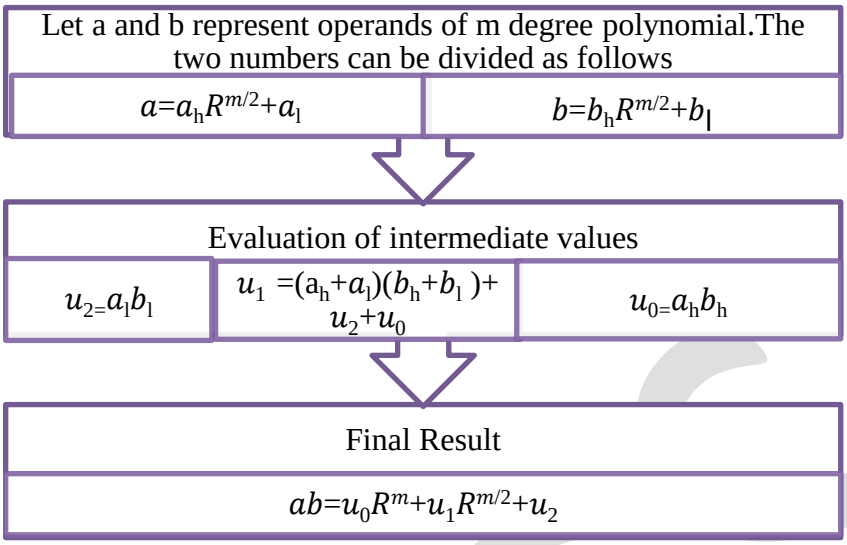


Figure 3. Karatsuba Multiplication Flow Chart

Figure 3 shows the flow chart of Karatsuba multiplication algorithm. In Karatsuba multiplier, the m-degree polynomial operands a and b are split into half as

$$a = a_h R^{m/2} + a_l \quad \text{and} \quad b = b_h R^{m/2} + b_l \tag{8}$$

If m is odd,a_h and b_h are padded with a bit to make all terms of equal size.The m-bit multiplication is given by

$$a.b = (a_h.b_h)R^m + a_l.b_l + ((a_h + a_l).(b_h + b_l) + (a_h.b_h) + (a_l.b_l))R^{m/2} \tag{9}$$

Here a_h and b_h represent higher bits,a_l and b_l -lower bits and R is the radix.

The Karatsuba algorithm is applied recursively for the three m/2 bit multiplications $(a_h.b_h)(a_l.b_l),(a_h + a_l).(b_h + b_l)$.Each recursion reduces the size of the input by half, while it triples the number of multiplications. After several recursions, the number of small multipliers becomes significant. There exists a threshold (τ) in the operand size below which Quadratic-complexity multiplication algorithms outperform the Karatsuba algorithm in terms of both area and delay.Initially the Karatsuba multiplier splits the input operands to produce threshold operands.It consists of threshold level multipliers and recursively combines the outputs from threshold level multipliers and does the modular reduction. Figure 4 shows the hybrid Karatsuba multiplication.

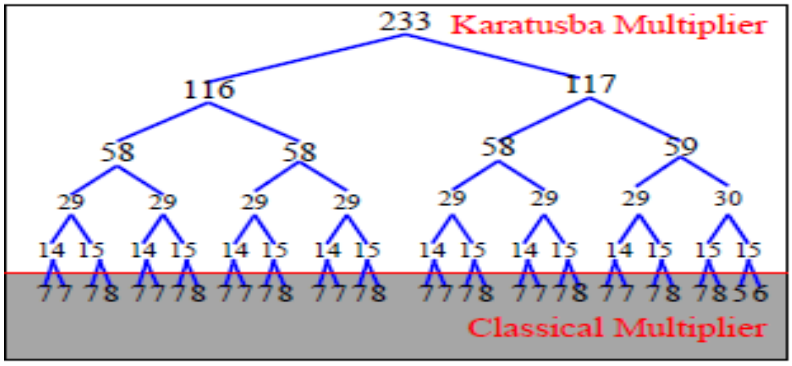


Figure 4. Hybrid Karatsuba Multiplication

Elliptic Curve Key Exchange

Asymmetric algorithms use a pair of keys for encryption and decryption (Figure 5). Encryption is done by a public key which is known to everyone. Decryption can be only done using the corresponding private key. Given the private key, the corresponding public key can easily be derived. However, the private key cannot be efficiently derived from the public key.

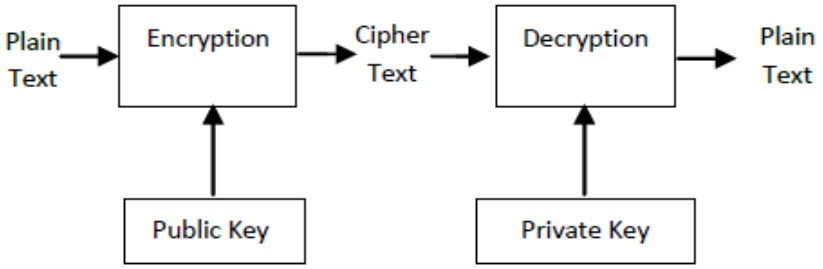


Figure 5. Public Key Cryptosystem

Domain Parameters

In order to turn all these mathematical basics into a cryptosystem, some parameters have to be defined that are sufficient to do meaningful operations and is called "domain parameters": The domain parameters for elliptic curve over F_2^m are m, f(x), a, b, G and n. m is an integer defined for finite field F_2^m. The elements of the finite field F_2^m are integers of length at most m bits. f(x) is the irreducible polynomial of degree m used for elliptic curve operations. a and b are the parameters defining the curve $y^2 + xy = x^3 + ax^2 + b$. G is the generator point (x_G, y_G), a point on the elliptic curve chosen for cryptographic operations. n is the order of the elliptic curve. The scalar for point multiplication is chosen as a number between 0 and n – 1.

Encryption

In order to understand the elliptic curve encryption scheme,consider an example of 2 characters Alice and Bob who want to send information. Alice and Bob publicly agree on an elliptic curve E over a finite field. Next Alice and Bob choose a public base point B on the elliptic curve E.Bob chooses a random integer d and computes Q_A = d.G, and sends Q_A to Alice. Now, Q_A is publicly transmitted with the message.Bob keeps his choice of d secret. Alice chooses a random integer r, computes R_B= r.G and sends R_B to Bob. Alice keeps her choice of r secret. Bob computes K_A=d.R_B ; from the point K_A a symmetric key is derived with which the message is encrypted.

Decryption

Assume that Alice receives the message, which is encrypted with a symmetric key. Together with that message she receives a value of Q_A in plain text. With the aid of her private key, the symmetric key is recovered by just multiplying her private key with the publicly transmitted point Q_A.She will receive the shared secret point K_B , from which she can then derive the symmetric key .Alice computes

$K_B = r.Q_A$.The shared secret key is $K = K_A = K_B$.Even if Eve knows the base point G, or R_B or Q_A, she will not be able to figure out d or r, thus K remains secret!.

ALGORITHM

The Elliptic Curve Scalar multiplication (Q = kP) is performed by adding P, k times over the curve, where P is a point on the curve, called the base point and k is a positive integer. The scalar multiplication of the point P is computed using double and add Algorithm.In this algorithm ,the scalar multiplication starts from the left side of the scalar and for each key bit,a point doubling is performed, while point addition is performed for the non zero key bits. Here is a simple example of point multiplication. Let P be a point on an elliptic curve. Let k be a scalar that is multiplied with the point P to obtain another point Q on the curve. i.e. to find Q = kP.

If k = 23 then kP = 23.P = 2(2(2(2P) + P) + P) + P.Thus point multiplication uses point addition and point doubling repeatedly to find the result. The above method is called 'double and add' method for point multiplication.

Let d= $(d_{t-1},d_{t-2},\ldots d_0)$ be the binary representation of d, then

$$d = \sum_{i=0}^{t-1} d_i \, 2^i \tag{10}$$

$$dP = (d_{t-1}2^{t-1})P) \tag{11}$$

Double and Add Algorithm

Input: Base point P and scalar d

Output: Point on the curve Q = dP

1 begin

2 $P_1 \leftarrow P$; $P_2 \leftarrow 2P$; initialize values to p_1 and p_2

3 for $i = m - 2$ *to* 0 do

4 if $d_i = 1$ then ; if the bits of the scalar d is 1 then

5 $P_1 \leftarrow P_1 + P_2$; point addition and result stored in p_1

6 $P_2 \leftarrow 2P_2$; point doubling and result stored in p_2

7 end

8 else ; if the bits of scalar d is 0 then

9 $P_2 \leftarrow P_1 + P_2$; point addition and result stored in p_2

10 $P1 \leftarrow 2P1$; point doubling and result stored in p_1

11 end

12 end

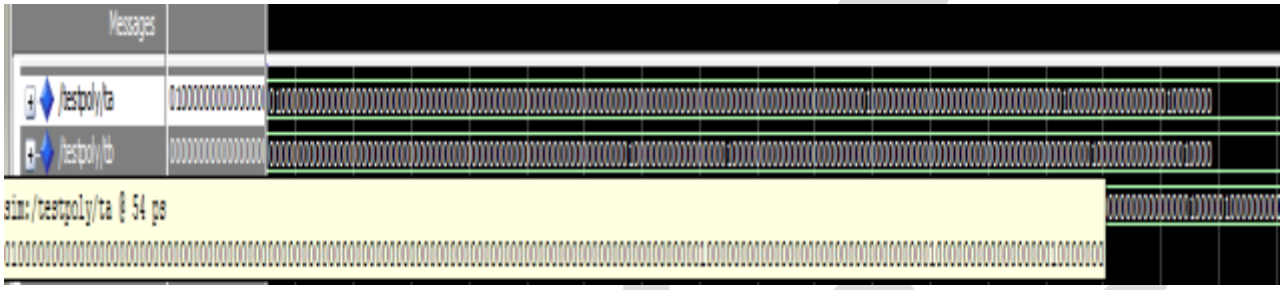
13 return Q ;output after elliptic curve operations is stored in Q

RESULTS AND ANALYSIS

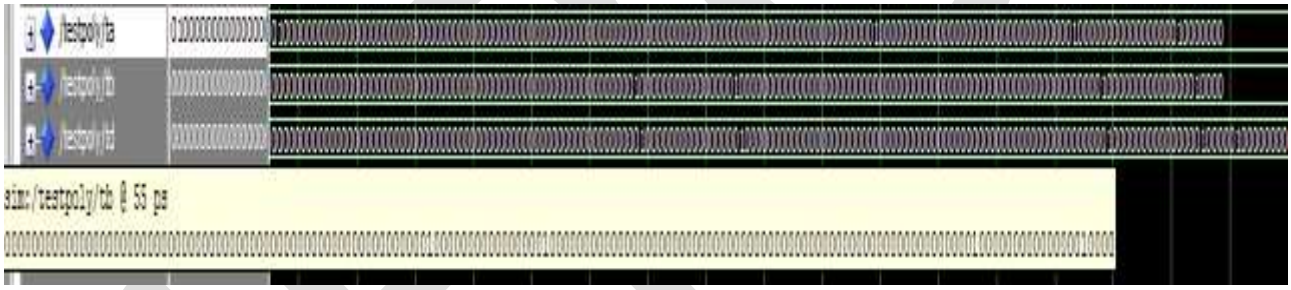
Simulation Analysis of Polynomial, Recursive Karatsuba and Hybrid Karatsuba Multiplications

The three multipliers namely polynomial, recursive Karatsuba and hybrid Karatsuba multiplications for 163 bits are simulated using Modelsim. Here the input of these multiplication algorithms are of ”163 bit” and the corresponding output is obtained in “325”bits.The inputs are given by inserting ‘1’ to random bits and others making ‘0’.We are giving same input bits to all the three multipliers, since all performs finite field multiplication, thus outputs obtained are equal.

Inputs Given

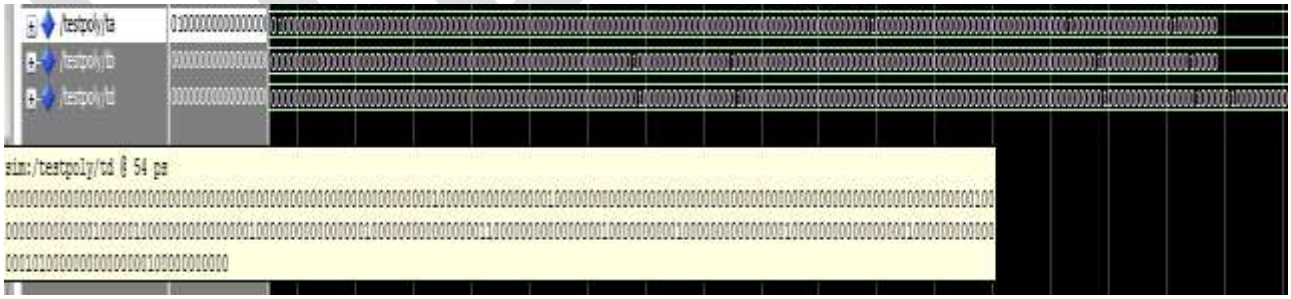


t_a <= (161 => '1' , 59 => '1' , 25 => '1' , 7 => '1' , others => '0')



t_b <= (100 => '1' , 83 => '1' , 20 => '1' , 4 => '1' , others => '0');

Output Obtained:



t_c<=(261=>’1’,244=>’1’,181=>’1’,165=>’1’,159=>’1’,142=>’1’,125=>’1’,108=>’1’,107=>’1’,90=>’1’,79=>’1’,63=>’1’,45=>’1’,

29=>’1’,27=>’1’,1=>’1’,others=>’0’) .

Figure 6. 163 bit Multiplication

Simulaton Analysis of Elliptic Curve Scalar Multiplication (8 bit and 163 bit)

The elements of $F2^m$ are represented using a polynomial basis representation with reduction polynomial f(x). The reduction polynomials for the fields F_2^{163} and F_2^8 are $f(x) = x^{163} + x^7 + x^6 + x^3 + 1$ and $f(x) = x^8 + x^4 + x^3 + 1$ respectively. An elliptic curve E over F_2^m is specified by the coefficients $a,b \in F_2^m$ of its defining equation $y^2 + xy = x^3 + ax^2 + b$.

Inputs Given(163 bit)

X_P - 16#2FE13C0537BBC11ACAA07D793DE4E6D5E5C94EEE8

Y_p - 16#289070FB05D38FF58321F2E800536D538CCDAA3D9

k - 6#40000000000000000000020108A2E0CC0D99F8A5EE

Outputs Obtained (163 bit)

X_q=16 #0CB5CA2738FE300AACFB00B42A77B828D8A5C41EB

Y_q=16 #2B29B3CE937BC90061C65F178CE1DE6DCD4A2BB80

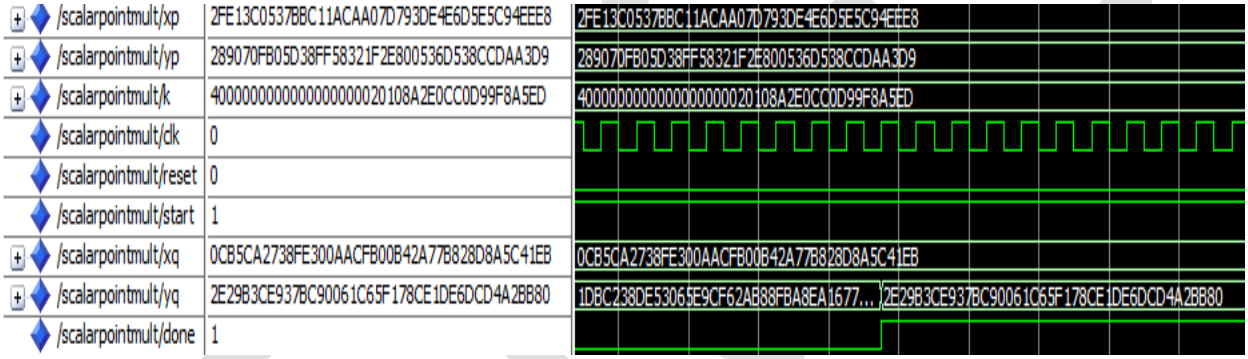


Figure 7. 163 Bit Elliptic Curve Scalar Multiplication

Inputs Given(8 bit)

X_p- 00000001

Y_p-10001110

k- 010000000

Outputs Obtained(8 bit)

X_q-00000001

Y_q-00100011

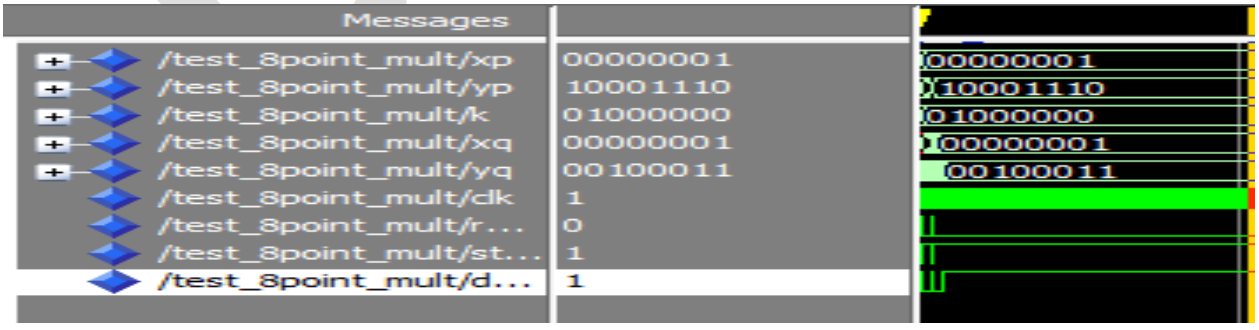


Figure 8. 8 bit Elliptic curve scalar multiplication

Simulation Analysis of Encryption and Decryption

An 8 bit key encryption and decryption is also simulated and derived the shared secret key K which is used for encrypting the message and also decrypted the same secret key from which the message can be retrieved safely and correctly.

Inputs Given(Encryption)

d-22; r-89; X_g-01; Y_g-FE

Output Obtained

X_r- 01; Y_r-13

Xs-01; Y_s-FF

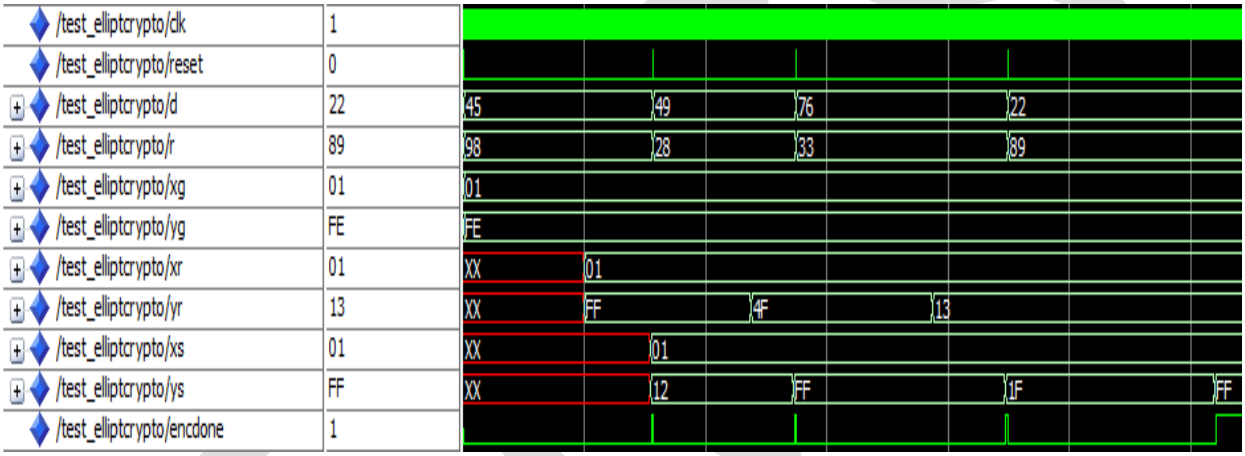


Figure 9. 8 bit Encryption

Inputs Given(Decryption)

d-45; r-98; Xg-01;Yg-FE

Output

Xqa-01;Yqa-13

Xs-01;Ys-FF

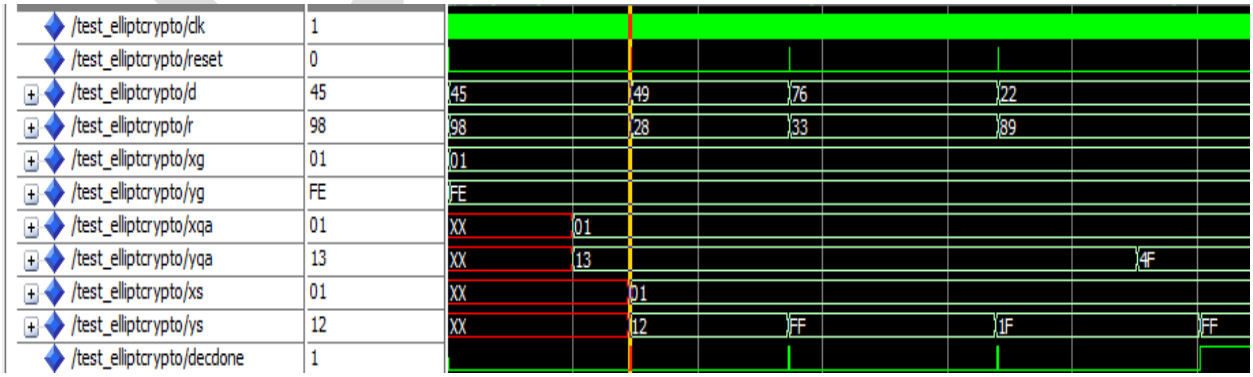


Figure 10. 8 bit Decryption

COMPARISON BETWEEN THREE MULTIPLIERS

In order to verify the advantages of hybrid Karatsuba multiplier over polynomial and recursive Karatsuba multiplier, the three multipliers are synthesised using Xilinx ISE and device utilization values are estimated. The family used is virtex 6.

Device Utilization Summary (estimated values)			[-]
Logic Utilization	**Used**	**Available**	**Utilization**
Number of Slice LUTs	8654	474240	1%
Number of fully used LUT-FF pairs	0	8654	0%
Number of bonded IOBs	651	1200	54%

Figure 11.Polynomial multiplier(163 bit**)**

Device Utilization Summary (estimated values)			[-]
Logic Utilization	**Used**	**Available**	**Utilization**
Number of Slice LUTs	14429	474240	3%
Number of fully used LUT-FF pairs	0	14429	0%
Number of bonded IOBs	651	1200	54%

Figure 12. Recursive Karatsuba multiplier (163 bit)

Device Utilization Summary (estimated values)			[-]
Logic Utilization	**Used**	**Available**	**Utilization**
Number of Slice LUTs	8438	474240	1%
Number of fully used LUT-FF pairs	0	8438	0%
Number of bonded IOBs	651	1200	54%

Figure 13. Hybrid Karatsuba multiplier(163 bit)

From the estimated values after synthesis it is observed that the number of slice LUTs used by hybrid Karatsuba multiplier is 8438 which is the smallest compared with other two multipliers. Thereby the results show that the area consumed by hybrid Karatsuba multiplier is less and more efficient**.**

ACKNOWLEDGEMENT

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CONCLUSION

Elliptic curve point multiplication is the fundamental operation for elliptic curve cryptosystems.The scalar multiplication over the field GF(2^{163}) and GF (2^8) are simulated using the simulation tool-ModelSim. Asymmetric encryption uses a separate key for encryption and decryption. The key exchange algorithm provides a method of publicly sharing a random secret key. The work also expanded to generate the key pair of 8 bit used for encryption in elliptic curve cryptography and also decrypting the secret key by using the private key. A comparison is done between three multipliers after synthesis in Xilinx ISE.The experimental results show that hybrid karatsuba multiplier consumes less area than existing multipliers.

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A SURVEY ON COHERENT AND NON COHERENT RECEIVER FOR GMSK SIGNAL

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Abstract— GMSK is an effective modulation scheme, used in many wireless communication systems (like GSM system). Implementation of GMSK receiver is more complex than other linear receiver, since GMSK signal is non-linear in nature. GMSK receiver can be implemented in two ways, they are coherent and non-coherent. There are various synchronization algorithms used for designing coherent and non-coherent receiver for GMSK signal. This paper give a survey on different algorithm used to estimate the various parameters of coherent and non-coherent receiver for GMSK signal and also includes the comparison of coherent and non-coherent receiver and their performance are emphasized in terms of BER, time delay.

Keywords— Gaussian Minimum Shift Keying (GMSK), Coherent, Non-Coherent, Global System for Mobile Communication (GSM), Time Delay, Synchronization, BER (Bit Error Rate).

1. INTRODUCTION

Gaussian minimum-shift keying (GMSK) is a continuous-phase FSK (frequency shift keying) where pre-modulation Gaussian low pass filter is used to shape MSK (special form of FSK). By using this filter sudden transition in the frequency modulation pulses of an MSK signal is eradicated. Thus bring about a narrow spectrum with attenuated side lobes [1]. GMSK is an effective digital modulation scheme adopted by standards like GSM (Global System for Mobile communication), DECT (digital European cordless telecommunication) and CT-2 (cordless telephone- 2G) [2].

GMSK receiver can be implemented either coherently or non-coherently depending on the standards requirements. In coherent receiver the carrier phase $\phi = 2\Pi fcto$ (where *to* is the time delay and fc is the carrier frequency) is estimated to compensate the channel phase shift. In this typical coherent detector, pilot tones are transmitted in the data spectrum at a convenient frequency, which is extracted at the receiver and the channel impairment is deduced from the receiver tone. The carrier reference signal is renovated at the receiver side by use of information from the channel.

Non coherent receiver does not need carrier phase information and use methods like square law (push detection or energy detection) to recover the transmitted data at receiver end. There are two types of non-limiter /discriminator and differential detection [3]. Limiter/discriminator has a hard limiter tailed by a band pass filter. The limiter is used to eliminate the amplitude noise of the received signal**.** The ensuing signal is a constant-envelope sinusoid and is demodulated by the discriminator. In differential detection, as a substitute of using absolute carrier phase, information is encoded using the carrier phase differences. At the receiver, it is then recovered by attaining the difference in phase of received signal at current time and at past time, usually at multiples of the symbol period. Because only the phase difference of the carrier is used in the transmission and detection, the requirement for carrier recovery is eliminated in non-coherent receiver and it is simpler to implement.

In digital transmission system, the transmission chain contains several oscillators for modulation and demodulation, up-and down convertor, clocking symbol and bit streams and sampling. The synchronization functions of the receiver have to be tied up to the received signal. There is no mechanism to correct frequency or phase in the received signal. The receiver has to 'dig out' the synchronization data from the received signal In differentially coherent or non-coherent systems, adequately accurate frequency adjustment is enough, Where as in coherent system, accurate phase recovery is also needed.

2. synchronization

In order to infer information correctly, a communication transmitter must be synchronized with the corresponding receiver [4]. This can be accomplished in both analog and digital domains. A digital receiver samples the signal at an apt instant within the symbol period, and the carrier phase is estimated. On the other hand, analog components such as voltage-controlled oscillators (VCOs) and phase-locked loops (PLLs) can permit a receiver to adjust its behavior based on the parameters of the incoming signals or the desired signals [5].

Synchronization has to be done at least in the following levels: 1. Carrier recovery 2. Symbol timing recovery 3. Frame synchronization [6].

2.1 Carrier Recovery— All wireless Communications receiver systems are usually independent of transmitting systems and have their own oscillators with frequency and phase offsets and instabilities. In addition Doppler shift may also contribute to frequency differences in mobile radio frequency communication systems. All these frequency and phase variations must be estimated using information in the received signal to reproduce or recover the carrier signal at the receiver and permit coherent demodulation. Carrier recovery can be accomplished with a simple band-pass filter at the carrier frequency or with a phase-locked loop, or both. Different methods must be functioning to recover the carrier for different modulation.

2.1.1 Non-data-aided— This method does not rely on any knowledge of the modulation symbols. They are used for simple carrier recovery schemes or as the initial method of coarse carrier frequency recovery (e.g. Maximum likelihood frequency error detectors.).

2.1.2 Multiply-filter-divide--In this method of non-data-aided carrier recovery a non-linear operation is applied to the modulated signal to create harmonics of the carrier frequency with the modulation detached. The carrier harmonic is then filtered by band pass filter and frequency divided to recover the carrier frequency. The example of open-loop carrier recovery is Multiply-filter-divide, which is favored in burst transactions since the acquisition time is typically shorter than for close-loop synchronizers.

2.1.3 Costas loop-- Carrier frequency and phase recovery as well as demodulation can be established using a Costas loop of the suitable order. A Costas loop which is similar to PLL that uses coherent quadrature signals to measure phase error which is used to discipline the loop's oscillator at the receiver.

2.1.4 Decision-Directed-- In this, the symbol decoder output is fed to a comparison circuit and the phase difference between the decoded symbol and the received signal is used to restraint the local oscillator.

2.2 Symbol Timing Recovery--In wireless communication systems, a coherent receiver should know the accurate symbol timing in order to correctly demodulate the transmitted symbols from the transmitter. Numerous well-known symbol timing recovery methods have been used for estimating the ideal sampling point of the symbol, including Gardner timing recovery, late-early timing recovery, Mueller-Muller timing recovery and Squaring timing recovery.

2.2.1 Gardner timing recovery-- The Gardner timing recovery algorithm requires two samples per symbol and knowledge of the previous symbol timing to estimate the timing error for current symbol. Timing error computation for either the I or Q rail is computed as follows:

$$e = \{x[nT] - x[(n-1)T]\}x[nT - T/2]$$

Where T is symbol duration. When the timing error is calculated, the Gardner timing adjustment algorithm is applied:

1. If $e = 0$, no timing adjustment is essential for the succeeding symbol
2. If $e < 0$, a timing advance is essential for the succeeding symbol
3. If $e > 0$, a timing delay is essential for the succeeding symbol

2.2.2 Late-early timing recovery-- Late-early symbol timing recovery is one of the simplest methods and is widely used in digital communications. This method takes three samples spaced by *Ts (*sampling duration *),* with the duration *T*. The early samples are sampled at *nT - Ts* and late samples are sampled at *nT + Ts*. The difference between the late and early samples is the timing error. Based on the timing error, the next symbol timing sampling time is either advanced or delayed until the timing error is reduced. The timing error computation for the I or Q rail is calculated using the following equation:

$$e = \{x[nT + Ts] - x[nT - Ts]\}x[nT]$$

Once the timing error is computed, the late-early timing adjustment algorithm for the I or Q rail is performed:

1. If $e = 0$, no timing adjustment is essential for the succeeding symbol·
2. If $e > 0$, a timing advance is essential for the succeeding symbol
3. If $e < 0$, a timing delay is essential for the succeeding symbol.

2.2.3 Mueller-Muller timing recovery-- The Mueller-Muller timing recovery algorithm requires only one sample per symbol and knowledge of the previous symbol to estimate the timing error. Timing error calculated for either I or Q as follows:

$$e = \hat{x}[(n-1)T]x[nT] - \hat{x}[nT]x[(n-1)T]$$

Where $\hat{x}[\bullet]$ is the decision symbol of the sample $x[\bullet]$. When the timing error is computed, the Mueller-Muller algorithm is applied.

1. If $e = 0$, no timing adjustment is essential for the succeeding symbol.
2. If $e > 0$, a timing advance is essential for the succeeding symbol.
3. If $e < 0$, a timing delay is essential for the succeeding symbol.

2.2.4 Squaring timing recovery— the first step is squaring of the input signal and then the resultant spectral component at symbol rate is found by filtering operation.

2.3 Frame Synchronization -- In wireless communication, the frame synchronization is defined as the process in which , the incoming frame alignment signals i.e., a distinctive bit sequences or sync words are detected while the stream of framed data is being received. Thereby, passing the data bits within the frame to be extracted for decoding or retransmission.

3. RECEIVER STRUCTURE

3.1 Coherent receiver— In [11] this paper the symbol-by-symbol coherent detector for GMSK signal with BT = 0.3 on both AWGN and a multipath fading channel is designed and BER parameter is estimated. The designed receiver shows better performance than the existing receiver. The proposed receiver in this paper reduce the power consumption of GSM handsets using conditional equalization as more than 70**%** of the time the channel is considered to be weakly dispersive.

3.2 Non-Coherent receiver – In [12] this paper , an attractive Non-coherent receiver structure followed by a nonlinear equalizer, which contain s a RAM and a Viterbi detector, which is capable of equalizing nonlinear multipath fading channels. The cumulative bit error rate (BER) is estimated for a set of channels with different delay with same ms delay spread. In Rician fading model it shows better performance.

4. REVIEW OF ALGORITHM

4.1. Synchronization algorithm – In [7]-[10] this paper, the hybrid receiver architecture is designed using modified synchronization algorithm which contain both coherent and non-coherent and the parameter like symbol timing error and frequency offset for both coherent and non-coherent, and carrier offset in case of coherent receiver. In this the received signal is converted from radio frequency (RF) to baseband real and imaginary components of the received baseband signal are x and y. these signal are oversampled, and then digitally frequency discriminated, and passed into low-pass filter to obtain raw digital data. This data is passed into FFT for synchronization preamble bits detection. After detection, parameter like carrier frequency offset is estimated in hybrid manner and sampling time error is estimated in feed forward manner. Frequency offset is estimated and fed back to VCO during preamble period. The detection mode is selected by using the above estimation. Finally demodulated data is obtained after synchronization. Coherent receiver shows better performance than Non-coherent receiver. The following figure depicts the synchronization method.

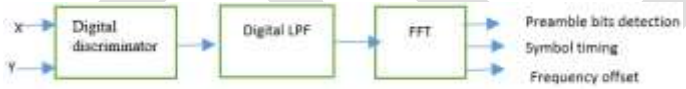

Figure 1.block diagram of synchronization method.

4.2. Squaring algorithm — In [13] this paper, the new digital GMSK demodulator is designed using squaring algorithm in a feed forward manner on AWGN channel. In [10] paper, transmission preamble bits are required to estimate symbol timing error. Even though it gives good performance, the implementation becomes complex. Squaring algorithm is linear in nature, whereas GMSK is non-linear. Thus, the complex envelope of GMSK signal can be converted into two orthogonal signals. Symbol timing error is obtained by assuming GMSK signal as a combination of two orthogonal linear modulations. The performance is evaluated and it is shown that, the designed receiver is less complex than pervious method.

5. CONCLUSION

In this paper various algorithms for designing coherent and non-coherent receivers for GMSK signal is studied for wireless communication (with BT=0.3 (for GSM)). The techniques discussed in this paper are synchronization and squaring methods. The BER (Bit Error Rate) is analyzed for both the techniques and the result obtained shows that squaring is better than synchronization. Implementation of coherent receiver is a complex process but results in better BER whereas, implementation of non-coherent receiver is a comparatively a simpler process with low performance. Thus coherent receiver with squaring technique is recommended.

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A Review on Hole Detection and Healing in Wireless Sensor Network

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Abstract— A wireless sensor network (WSN) comprises of nodes, each node is connected to one or more sensors. Occurrence of fault in a single node is called as cut. And the fault occurred in multiple nodes in a particular region which is called as hole. The region under surveillance is considered as region of interest (ROI). There are various methods for detecting and healing the holes. We study the different methods for hole detection and healing in WSN in this paper.

Keywords—Hole detection, Hole healing, region of interest, boundary detection, coverage area, nodes, wireless sensor network, sensor.

INTRODUCTION

ireless sensor network (WSN) consist of large number of nodes, where a single node is connected to one or more sensors. These Wsensors help to sense various physical parameters like temperature, pressure. The nodes in the Wireless Sensor Networks (WSNs) are usually battery powered. These nodes often suffer from disrupted connectivity caused by its numerous aspects such as limited battery power of a node and unattended operation vulnerable to hostile tampering. The disruption of connectivity, often referred to as network cut, leads to ill-informed routing decisions, data loss and waste of energy. Fault occurred in a single node is called as cut. This paper considers fault occurred in multiple nodes in a particular region which is called as hole.

Monitoring the region of interest (ROI) is the service provided by the wireless sensor network (WSN). The main role of this service is sensing the environment condition and sending the sensed information to the destination node. The ROI must be entirely covered all the time. Holes occur in the ROI cannot be avoided. The occurrence hole is mainly due to nature of WSNs or attacks on WSN network. Hence this affects communication between the nodes. Thus, it is necessary to detect and heal the holes in the network for an effective communication to take place. In this paper the various methods of detecting and healing holes in the WSN is studied.

TECHNIQUES

A. Hole and boundary detection

The various methods involved in the hole detection along with its boundary is studied and the drawbacks of each method is also analyzed.

1. Communication topology graph:

B. Kun, T. Kun, G. Naijie, L.D.Wan and L. Xiaohu [1] presented a distributed scheme based on communication topology graph. In this scheme the problem of detecting topological holes in sensor networks with no localization information in any node. To detect the holes in the network, each node only needs to exchange information with its 1-hop and 2-hop neighbors. In this the node decides if it is on the boundary of a hole. This is done by comparing its degree with the average degree of its 2-hop neighbor.

Drawback: The main drawback of this [1] method is that not all the nodes can identify its boundary.

2. Heuristic Based communication topology graph:

Funke [2] proposed a heuristic based technique for detecting holes based on communication topology graph. The hole detection algorithm is based on the topology of the communication graph, that is, the only information available is which nodes can communicate with each other.

Drawback: This approach is not localized as it requires the computation of distance fields over the whole network.

3. Unit disk graph model:

Funke and Klein [3] proposed linear-time algorithm for hole detection. This method required communication graph that follows the unit disk graph model. The authors had proved that by using a very simple linear-time algorithm that helps to find the boundary of the holes in the sensor network. [3] Also states that there is enough geometry information hidden in the connectivity structure to identify topological features. When comparing with the previous method, the algorithm has worst case.

Drawback: This technique works for only high node density. If the density of the node in the network decreases the algorithm breaks

down.

4. Co-ordinate free boundary method:

Fekete et al.[4] described the co-ordinate free technique to detect the boundary of the hole in WSNs. The assumption made here is that the nodes are uniformly distributed in non-hole areas. The methods used in this method rely on a number of natural assumptions that are present in densely distributed sets of nodes, and make use of a combination of stochastic, topology, and geometry.

Drawback: The drawback of this technique [4] is that it requires a high node density.

5. Bound Hole algorithm:

Fang et al. presented bound hole algorithm [5] using right-hand rule to identify nodes on the boundary of geometric holes.

Drawback: The drawback of this method is that it has high message complexity.

6. Hole boundary detection algorithm:

Shirsat and Bhargava[6] proposed this algorithm assuming the relative geographic information of 2-hop neighbors. The hole boundary detection algorithm takes best approach in detection process.

Drawback: The flaw in this paper [6] is that the algorithm requires synchronization among nodes.

7. Distributed algorithm:

Wang et al. proposed boundary algorithm to find the information of the connectives [12]. For the hole detection process the author had used special structure of the shortest path tree.

Drawback: The author did not make an analysis on its complexity. This algorithm relies on repetitive network flooding.

8. Self-organizing method:

A. Kroller, P.Fekete, D. Pfisterer, and S.Fischer used deterministic method for boundary recognition and also used topology extraction technique for larger network of sensors. The authors had dealt with the self-organization considering its topology and also geometric packing arguments to find the Boundary nodes and also the structure of the sensor network.

Drawbacks: Though, authors [13] had made assumptions, they have considered complex structures like flower structure which is the drawback of this paper.

B. COVERAGE ENHANCEMENT AND HOLE HEALING:

The several movement strategies for improving network coverage are discussed in this section

1. Movement-assisted sensor deployment:

G. Wang, G. Cao and T.F.L. La Porta described three different types of deployment protocols [7]. These protocols use voronoi diagrams to relocate the nodes at once the holes are being detected.

Drawback: The main drawback of this method is that, this technique cannot be used for large holes. And also this method requires global computation.

2. Decentralized and Energy Balanced Algorithm:

C.Y. Chang and co-authors [8] proposed three algorithms for maintaining temporary coverage in WSNs. Authors proposed strategies for hole movement for the large hole. This is done in such a way that either the power consumption of the sensor or the energy consumption of the node is balanced or reduced respectively.

Drawback: The drawback of this proposed algorithm [8] is that there is a requirement of synchronization among the nodes in the network.

3. Robot Repair Algorithm:

C.Y. Lin and co authors proposed tracking mechanism and robot repair algorithm. By using this technique [9] the coverage problem is solved using a moving robot. The robot's footmark is left behind on the sensors during the tracking mechanisms. This helps the sensors to find better routes for sending repairing requests to the robot. The healing algorithm helps to develop an efficient path for communication.

Drawback: The main drawback of this technique [9] is that the authors make an assumption that the WSN has been deployed using robot deployment mechanisms.

4. Pragmatic Approach to Area Coverage:

A. Nadeem, S.K. Salil and J.Sanjay proposed a pragmatic approach [10] to area coverage in hybrid wireless sensor networks. This

paper proposed MAPC- Mobile-Assisted Probabilistic coverage. The MAPC maintained the coverage by moving the sensor nodes to strategic positions in the uncovered area.
Drawback: Using this technique [10] only the sink can involve in the triggering of the hole detection and healing and the source cannot involve in triggering process.

5. Randomized Carrier-Based Sensor Relocation:

X. Li et al. proposed a randomized carrier based sensor relocation [11] where the robots picks up passive sensors and replaces them in the holes. This is done in an random manner and hence called as randomized relocation.
Drawback: This relocation technique [11] assumes that the boundary of the wireless sensor network is known in earlier which is the main drawback of this paper.

6. Sensor deployment algorithm:

Z. Yong et al. proposed a virtual force algorithm (VFA) [14] as a sensor deployment strategy to improve the coverage after an initial random placement of sensors. The VFA attempts to improve the coverage area of the sensors.
Drawback: The disadvantage of this proposed algorithm [14] is that it is a centralized approach.

7. Scan-based sensor deployment method:

S.Yangy et al. proposed scan-based movement-assisted sensor deployment technique for wireless sensor networks [15]. In this paper the region of interest is divided into many small grid cells. And the number of nodes in the grid cell is the load of the grid cell.
Drawback: This technique generates a enormous message overhead in a denser network since the number of rounds of scan is being increased. And at the final stage of clustering process, if two nearby clusters are empty the scanning process will be incorrect.
This is the major drawback of the scan-based method [15].

8. Strictly localized self deployment method:

X. Li et al. proposed two strictly localized solution algorithms, Greedy Advance (GA), and Greedy-Rotation-Greedy (GRG) for sensor deployment problem [16]. These two algorithms drive sensors to move along the TT (triangle tressellation) graph to surround POI (point of interest).
Drawback: This paper [16] considers only point coverage problem and it does not consider the region of interest which is a disadvantage.

9. Bidding protocol for sensor deployment:

G. Wang, G. Cao, P. Berman and T. La Porta had proposed two bidding protocol for sensor deployment [17] in wireless sensor network. Here, static sensors detect coverage holes locally by using Voronoi diagrams and bid mobile sensors to move. And these mobile sensors accept highest bids and help to heal the bigger holes.
Drawback: This method requires global computation which means that all the nodes in the network needs to run the algorithm [17].

RESULT OF SURVEY

In this paper comparison between various techniques involved in hole and boundary detection process has been done. Each method has its own benefit and drawback. The various method studied here are communication topology graph method [1], heuristic based method[2], linear-time algorithm[3] and co-ordinate free method[4]. And also the survey of various techniques involved in hole healing process has been done. The coverage and hole detection technique studied in this paper are movement assist sensor deployment [7], energy balance algorithm [8], robot repair algorithm [9] etc. And the conclusion is that hole detection can be done with the help of stuck nodes and healing can be done with the help of neighboring nodes located at a distance.

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Analysis of modified Blowfish Algorithm in different cases with various parameters

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Abstract— Security has always been a great concern whenever there is communication between sender and receiver. To overcome the issues of security breaches many cryptographic algorithms are used like: AES, DES, Triple DES, Blowfish, etc. The objective of this paper is to enhance and evaluate the Blowfish algorithm on the basis of different parameters like Encryption Quality, Correlation Coefficients, Key Sensitivity Test and Size of Output File. The 'f' function is modified by mixing the XOR and addition used in the original algorithm. Four cases are created and analyzed. The results of all the tests conducted on these cases lead to a common conclusion that the security of the modified algorithm with different cases makes the original Blowfish algorithm more compact and more secure than the earlier.

Keywords— Blowfish algorithm; Encryption Quality; Correlation coefficient; Key Sensitivity; Size of output file; 'f' function; XOR

INTRODUCTION

Due to the swift increase in the digital communication and exchange of electronic data, the security of information has become an important issue in business, industry, and administration. In modern era security is the major issue for every communication between sender and receiver. If there are any security breaches in between communication then there will be major loss to both of them, sender and receiver. The cryptography used today gives many essential techniques for protecting data and securing information.

Cryptography

Cryptography is an essential part for the Information Security System (ISS). It plays an important role in the security of data between sender and receiver. Cryptography provides us confidentiality, accuracy, fairness, along with data integrity. Now the cryptography is used routinely to secure data, which must be communicated and/or saved over long periods, to protect electronic fund transfers and classified communications.

Modern cryptographic techniques are based on number theoretical or algebraic concepts. Before going on our main topic we need to know at least brief information about security trends in cryptography, what are the various security attacks could be possible, what are the various security services and what are security mechanisms should be applied to achieve those services.

Types of Cryptography

Mainly two types of cryptography are known: Asymmetric key cryptography and Symmetric key cryptography.

- Asymmetric Key Cryptography

In this type of cryptography, there are two keys used: public key and private key, one for encryption and one for decryption purpose. Popular examples of asymmetric key cryptography are: RSA, ElGamal, Merkle's Puzzles, Elliptic Curve Cryptography (ECC) [2]. An Asymmetric key cryptography is also known as public key cryptography. This algorithm don't need a secured beginning exchange of

one or more keys between the sender and receiver. The algorithm used for encryption and decryption was designed in such a way that, it makes easy for the receiver to produce the public and private keys and to decrypt the message by private key. It is also easy for the sender to encrypt the message by utilizing public key, and it is very difficult for anyone to find out the private key based on the knowledge of the public key.

- Symmetric Key Cryptography

In this type of cryptography, same key is used for both encryption and decryption purpose. Symmetric algorithms can be divided into two type-stream cipher and block cipher. Stream cipher encrypt one bit of plaintext at a time as compared to block cipher which takes a number of bits (typically 64 bits), and encrypt them as one unit in whole. Symmetric ciphers are likely to be harmed by the known plaintext and chosen text attacks, as well as differential and linear. Some examples of popular symmetric algorithms are: Serpent, Twofish, AES (Rijndael), Blowfish, CAST5, RC4, RC6, DES, 3DES, and IDEA. Symmetric key algorithms are less computationally intensive as compared to asymmetric key algorithms. But in practice, asymmetric key algorithms are much slower as compared to the symmetric key algorithms. Asymmetric algorithms(also known as public-key algorithms) requires at least a 3,000-bit key to reach at the same level of security as that of a 128-bit symmetric algorithm.

Blowfish

Blowfish algorithm is a symmetric block cipher which can be used as a drop-in replacement for IDEA or DES. It takes a changeable-length key, from 32 bits to 448 bits, which makes it perfect for both exportable and domestic use. Blowfish was designed by Bruce Schneier in 1993 as a free alternative to the present encryption algorithms.

Blowfish is a 16 rounds Feistal Structure as shown in fig 1.2 and fig 1.3. Every round is made up of a key- and data-dependent substitution and a key-dependent permutation. All operations are additions on 32-bit words and XOR. The only additional operations, for every round are performed in the following way:

1. Split each block into halves
2. Right half becomes new left half
3. The right half is made when XOR is done on the left half and the result we get after applying ‘f’ to the right half and the key.
4. The rounds which are prior can be obtained even if the function ‘f’ is not turned upside down.

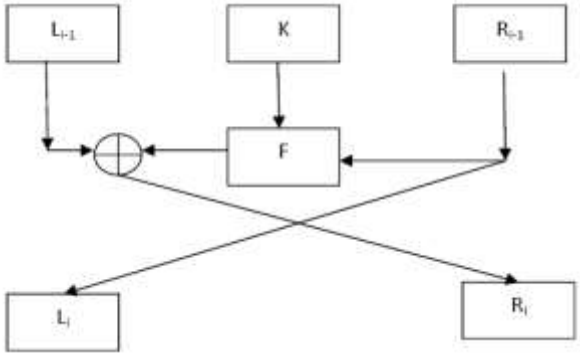

Fig 1.1: Feistal Network

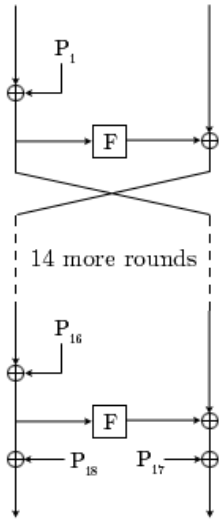

Fig 1.2: Blowfish Feistal Structure of 16 rounds.

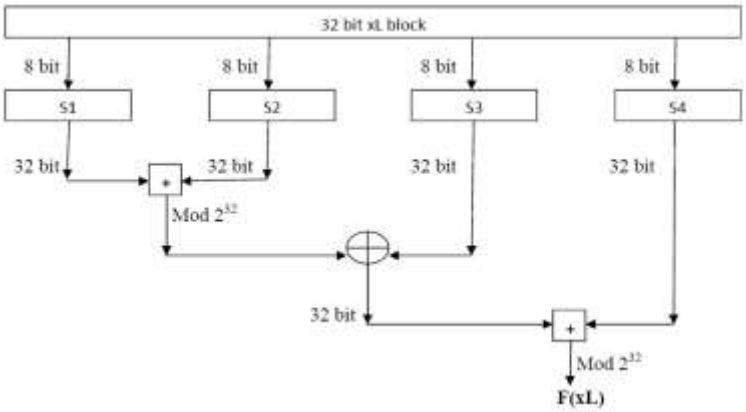

Fig 1.3: S-Box operation (F function) of Blowfish algorithm

REVIEW OF RELATED WORK

Blowfish is one of the fastest block ciphers used by many people, except when changing keys [3].Many researchers have tried to test the security provided by Blowfish algorithm and they have concluded that it is a secure algorithm to use[1][5][6][4]. In this paper we have improved the original Blowfish Algorithm by changing its F function to different cases. After analyzing those changes to F function of Blowfish algorithm, we will see that most of the changes makes original Blowfish Algorithm most secure. One more thing to add here is the capability of compression and decompression to the encrypted files. This additional feature makes it more compact than the earlier. The comparison is based on the basis of Encryption quality, Correlation analysis, Key Sensitivity test and size of the encrypted file.

METHODOLOGY

I have made the four cases of F function with two ADD and one XOR or with two XOR and one ADD operation. The followings are the four cases. These are shown in fig 3.1, fig 3.2, fig 3.3 and fig 3.4 respectively for Case 1, Case 2, case 3 and Case 4.

Case 1:

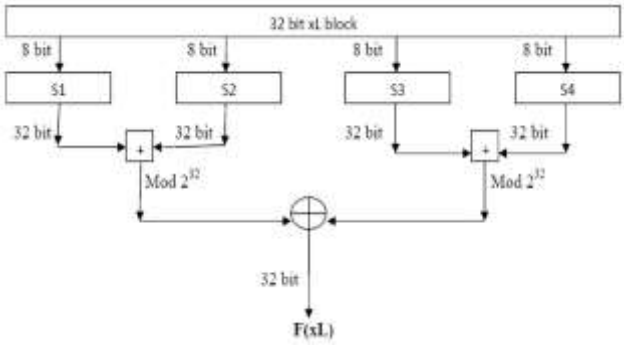

Fig 3.1: Modified Blowfish with case 1.

In this case F(xL) can be calculated as:

F(xL)=(((S1 + S2)mod 2^{32}))XOR((S3+S4)mod 2^{32})).

Case 2:

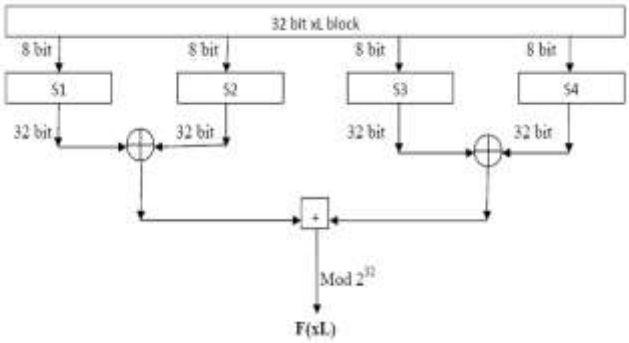

Fig 3.2: Modified Blowfish with case 2.

In this case F(xL) can be calculated as:

F(xL)= ((S1 XOR S2)+(S3 XOR S4)mod 2^{32}).

Case 3:

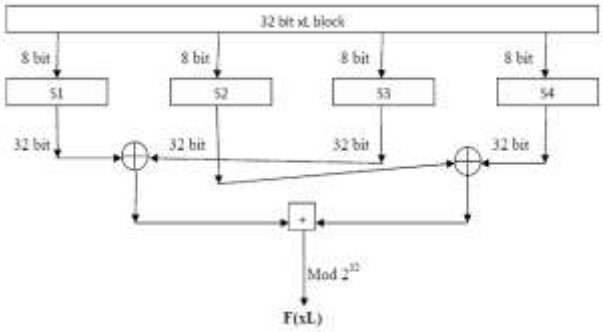

Fig 3.3: Modified Blowfish with case 3.

In this case F(xL) can be calculated as:

F(xL)= ((S1 XOR S3)+(S2 XOR S4)mod 2^{32}).

Case 4:

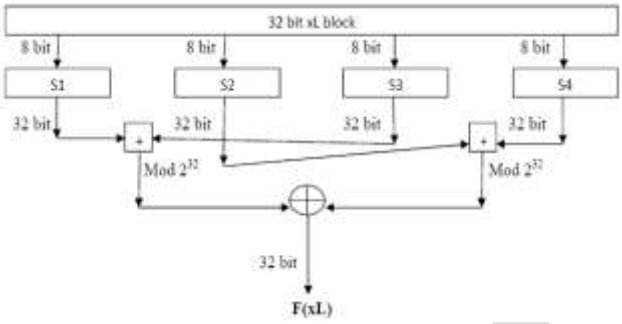

Fig 3.4: Modified Blowfish with case 4.

In this case F(xL) can be calculated as:

$F(xL)=(((S1 + S3) \bmod 2^{32}))XOR((S2+S4) \bmod 2^{32}))$.

EXPERIMENTAL RESULTS AND PERFORMANCE ANALYSIS

The Modified Blowfish Algorithm was successfully implemented in Java. In all experiments a grey scale (0-255) bitmap image is used as the original image (plain image) of size 512x512. The above four cases are analyzed on the basis of following parameters:

Encryption quality, Correlation coefficient analysis, Key sensitivity test and Size of data file after encryption.

i. Encryption Quality:

To evaluate the quality of encryption [7], [8],[11],[12] of modified Blowfish cipher with that of original Blowfish [2], [3], [9], [10] the ciphers are applied to several digital images. Before encryption/decryption, we must first extract the image header for the image to be encrypted/ decrypted. So, we must study the file format for image to determine all parts of the file header and to determine the beginning of the data stream to be encrypted. Then, the ciphers are applied to the image.

How the total number of round (r) affects the encryption quality for blowfish and modified blowfish algorithm is investigated. Both the block size and key length are kept persistent. The encryption quality (EQ) is calculated by using the number of rounds and the result is obtained for the image which is mentioned above in *table 4.1*. These results are also in column-chart as shown in *fig 4.1*.

Table 4.1 : *Encryption quality for image.*

No. Of rounds	Original Blowfish	Mod. Blowfish Case 1	Mod. Blowfish Case 2	Mod. Blowfish Case 3	Mod. Blowfish Case 4
2	809.123	820.279	827.176	839.813	842.105
4	815.236	821.923	830.275	839.998	847.341
6	819.991	828.227	833.702	838.513	848.385
8	821.276	829.769	832.993	839.095	849.113
10	829.458	831.093	835.621	841.387	850.111
12	832.734	836.776	840.789	845.219	853.876
14	839.986	839.997	845.453	849.001	859.176
16	842.669	847.886	849.361	854.639	865.659

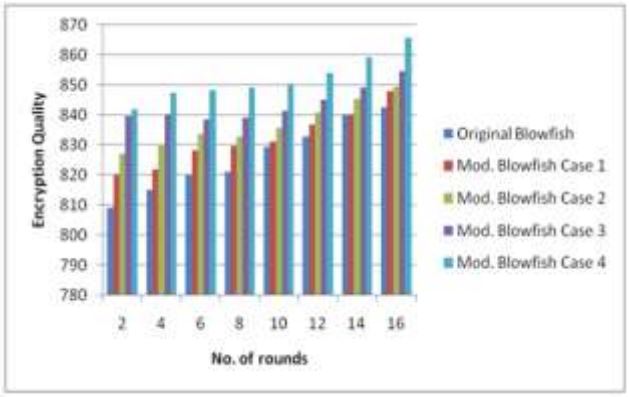

Fig 4.1: *Column chart for comparison of encryption quality.*

ii. Correlation analysis:

To find the correlation between two adjoining pixels [7], [10] of an image, the following steps are taken: First, select 'n' pairs of adjoining pixels from an image randomly. Now calculate the correlation coefficient using the following formula:

r = cov(x,y)/D(x)^0.5*D(y)^0.5

where x and y shows the grey-scale value of adjoining pixels of the image. D(x) and D(y) shows the difference of x and y values, cov(x,y) shows the covariance of x and y; and r shows the correlation coefficient. To identify the correlation between two adjoining pixels we have selected 1000 pixels randomly and pixels adjoining to them from the original picture and the encrypted images. After that we have computed the correlation coefficient using the above equations. *Table 4.2* and *fig 4.2* shows the correlation coefficients in original image and encrypted images encrypted by various Blowfish algorithms.

Table 4.2: *Comparison of correlation coefficients between pixels using different form of blowfish algorithm for the image.*

Algorithm used	Correlation coefficient
Original image	0.9984
Original Blowfish	0.0414
Modified Blowfish with case 1	0.0186
Modified Blowfish with case 2	0.0123
Modified Blowfish with case 3	0.0101
Modified Blowfish with case 4	0.0099

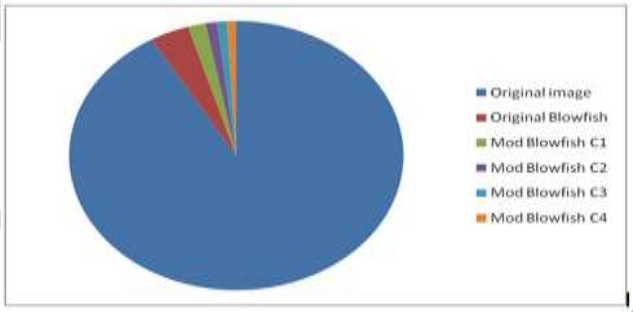

Fig 4.2: *Pie chart for comparison of correlation coefficient for image.*

iii. Key Sensitivity Test:

Assume that a 16-character ciphering key is used. This means that the key has 128 bits. To test the key sensitivity [7], [3], [8] following steps are taken:

Image is encrypted by using the test key 1234567890098765432112345678900**9**(Hex). After that one bit from key is randomly selected and it is changed. Here we have modified one bit of the key, that is; 1234567890098765432112345678900**1**.

The same image is then encrypted by using this modified key. The bit changed is shown in bold in test and the modified key. Ultimately, we have compared the images which are encrypted by the two slightly different keys in Table 4.3.

Table 4.3: *Comparison of pixel difference.*

Original Blowfish	99.565292%
Modified Blowfish Case 1	99.623383%
Modified Blowfish Case 2	99.651372%
Modified Blowfish Case 3	99.671372%
Modified Blowfish Case 4	99.700732%

iv. Size of Data File:

The Entered image file was of size 800.0 KB, when we encrypt it by original Blowfish and by modified Blowfish with all suggested cases, we got the following differences in the file size, as shown in *Table 4.4* and in *fig 4.3*:

Table 4.4: *Size comparison by modified blowfish algorithms.*

Encryption Algorithm Used	Output File size(KB)
Original Blowfish	800
Modified Blowfish(case 1)	485
Modified Blowfish(case 2)	485
Modified Blowfish(case 3)	485
Modified Blowfish(case 4)	485

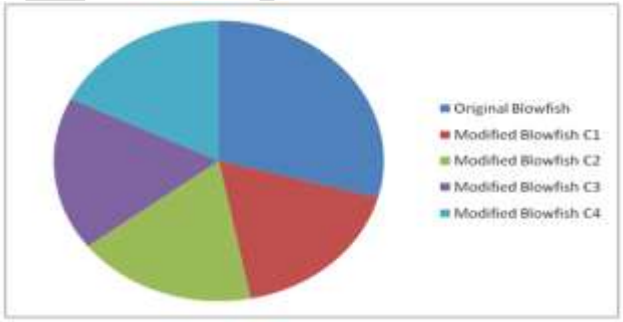

Fig 4.3: *Pie chart for comparison of encrypted file size.*

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CONCLUSION

The main objective of this thesis is to evaluate the performance of modified Blowfish algorithm in four different cases with different parameters like Encryption Quality, Correlation Coefficients, Key Sensitivity Test and Size of Output File. In all those case we find that we have improved the Original Blowfish algorithm to some extents. The results of all the tests conducted above lead to common conclusion that the security of the modified algorithm with different cases makes the original Blowfish algorithm more compact and more secure than the earlier. Here one more thing we want to conclude that case 4 as suggested is most secured than others.

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Feature Selection Technique Using Homogeneity based cluster

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ABSTRACT

Feature subset selection is an important problem in knowledge discovery, not only for the insight gained from determining relevant features variables, but also for the improved understandability, scalability, and, possibly, accuracy of the resulting models by reducing computational cost. It is an important challenge in many classification problems, especially for complex data like images when the number of features greatly exceeds the number of examples available. The research aims to select optimal number of relevant features by eliminating irrelevant features using clustering technique. Clustering techniques are used to form the group of objects based on the characteristics. We have used this characteristic for selecting the features. The main focus of this paper is to search the homogeneity among the features and select the representative features by eliminating remaining features from the set.

Keywords: Feature selection; Feature ranking, Cluster based feature selection

INTRODUCTION

Features are defined as a function of one or more measurements, the values of some quantifiable property of an object, computed so that it quantifies some significant characteristics of the object. A set of features that helps the model to recognize the pattern is called class label. The feature set may contain a set of irrelevant features. The irrelevant input features will induce great computational cost. Feature subset selection is the process of identifying and removing as much irrelevant and redundant information as possible. The reduction of dimensionality the data and may allow learning algorithms to operate faster, accurately more effectively. We propose a novel model for feature selection based on cluster formed by the features of data. A good feature subset is one that contains features highly correlated with (predictive of) the class, yet uncorrelated with (not predictive of) each other [1].

The main idea of feature selection is to choose a relevant subset of input variables by eliminating features or called dimension reduction with little or no predictive information. Feature selection can significantly improve the comprehensibility of the resulting classifier models and often build a model that generalizes better to unseen points. It reduced the computational cost by taking less time and memory.
The different set of features are shown in Table 1.

Sno	Feature Set	Count
1	Haralick Texture Features [5]	47
2	HoG2x2, HoG3x3	840
3.	LBP	1239
4	Sift	512
5	Gist	512
6	Total	3617

We summarize our contribution as follows.

1. We proposed a new model that eliminates the redundant set of features by using cluster algorithms.
2. In order to find optimal number of features we used silhouette algorithm that represents the disjoint set of features.

Paper is organized as follows. In section 2 we discussed related work done in this area. All the related work related to feature selection is elaborated in section 3. Section 4 describe our proposed method. Section 5 provide the experimental results. Section 6 summarizes the work and draws some conclusions.

RELATED WORK

Two approaches that enable standard machine learning algorithms to be applied to large databases are feature selection and sampling. Both reduce the size of the

database—feature selection by identifying the most salient features in the data; sampling by identifying representative examples [2]. The feature selection problem has been studied by the statistics and machine learning and data mining communities for many years like [3].

Feature selection is categorized into two category.

1. Rank based feature selection
2. Subset based feature selection

Information gains, Gain Ratio, Best First search algorithm, Chi-Square test are some specific techniques that are widely using for feature selection purpose. The details are given as below.

2. Rank Based Feature Selection

Kohavi and John [4] proposed variable ranking method for ranking the features based on their importance. Algorithm 1. demonstrate the layout of the feature ranking algorithm.

Algorithm 1 : Ranking the Features

Input : S ← set of features
Output : N ← Top n ranked features
Method

1. Features ← Evaluation_criteria(D) // Evaluation criteria on that basis the features are evaluated.
2. Rank_features← sort_descending(Features)

Return Top n features

2.1.2 Information Gain. This technique is based on decision tree induction ID3 [5] it uses information gain as its attribute selection measure. This measure is based on pioneering work by Claude Shannon from information theory. If p_i represents the number of times tuples occurred in data D. This attribute minimize the information needed to classify the tuples in the resulting partitions. The information gain is represented by equation 1.

$$\inf(D) = -\sum_{i=1}^{m} p_i \log_2(p_i) \qquad (1)$$

Splitting attribute measures, that define information needed to exact classify the data is defined by equation 2.

$$\inf_A(D) = \sum_{j=1}^{v} \frac{|D_j|}{|D|} \times \inf(D_j) \quad (2)$$

Information gain is difference between original information and information after splitting is defined in equation 3.

$$Gain(A) = \inf(D) - \inf_A(D) \quad (3)$$

In this technique the features which have highest information will be ranked high otherwise low. Using Quinlan C4.5 algorithm [5] the attribute that are in the higher level of the tree are considered for further classification and these features have more importance.

2.1.3 Gain Ratio. C4.5 [5] a successor of ID3[6] uses, an extension to information gain known as gain ration. It applies a kind of normalization to information gain using split information defined in equation 5.

$$splitInfo(D) = -\sum_{j=1}^{v} \frac{|D_j|}{|D|} \times \log_2 \frac{(|D_j|)}{(\lfloor D \rfloor)} \quad (4)$$

The gain ratio can be defined by equation 5. Intrinsic information: entropy of distribution of instances into branches by using equation 4.

$$GainRatio(S,A) = \frac{Gain(S,A)}{IntrinsicInfo(S,A)} \quad (5)$$

2.1.4 Random Forest Filter Breiman et. al [7] has proposed random forest algorithm, it is an ensemble approach that work as form of nearest neighbor predictor. The goal of ensemble methods is to combine the predictions of several base estimators built with a given learning algorithm in order to improve generalizability / robustness over a single estimator [10]. Ensembles are divide-and-conquer tree based approach used to improve performance of classifier. The ensemble method is that a group of weak learners that group together and work as a strong learner to take the decision for unknown attributes.

2.1.5 Best First Search. Best first search [9] is an Artificial Intelligence search technique which allows backtracking in search path. It is a hill climbing, best first search through the search space by making change in current subsets.

2.2 Feature Subset Selection

In this approach subsets of features are selected, subset feature selection is an exhaustive search process. If data contain N initial features there exist 2^N possible subsets. Selection of features from 2^N possible subsets is an exhaustive search process that is call heuristic search algorithm.

Subsets of features are selected and analyzed their classification accuracy, if it is increasing, that feature is selected otherwise rejected, a new set of feature are participate in evaluation process.

Many feature selection routines used a wrapper approach [4] to find appropriate variables such that an algorithm that searches the feature space repeatedly fits the model with different predictor sets. The best predictor set is determined by some measure of performance. The objective of each of these search routines could converge to an optimal set of predictors. The layout of subset feature selection method is shown in Algorithm 2.

Algorithm 2: Subset feature selection

S ← All subsets {}
For each subset $s \in S$
Evaluates (s)
Return {subset}

2.3 Recursive Feature Elimination [3]

Recursive feature elimination method is based on the concept that the features are eliminated recursively till the optimal set of features are not selected from the whole set. Random forest, backword subset selection algorithm using caret, Boruta is one of the well-known techniques in R [8].

3. PROPOSED WORK

In this section we give the framework of recommended approach.

Definition 1 (Cluster): Clusters are group of similar objects that helps to discover distribution of patterns and interesting co-relation in large dataset.

Example 1 (Formation of Cluster and Initialization). Illustrate of k-means clustering for feature selection is shown in shown in Figure 1. Initialize the random features as seeds is called centroid of feature. The difference from other features with all cetnroid are computed. The feature is assigned to the cluster which have minimum distance. After each features are assigned to cenntroid, the centroid is updated. The process terminates when no more changes occurs based on grouping of features. The details of process is shown in Figure 1 and Algorithm 2.

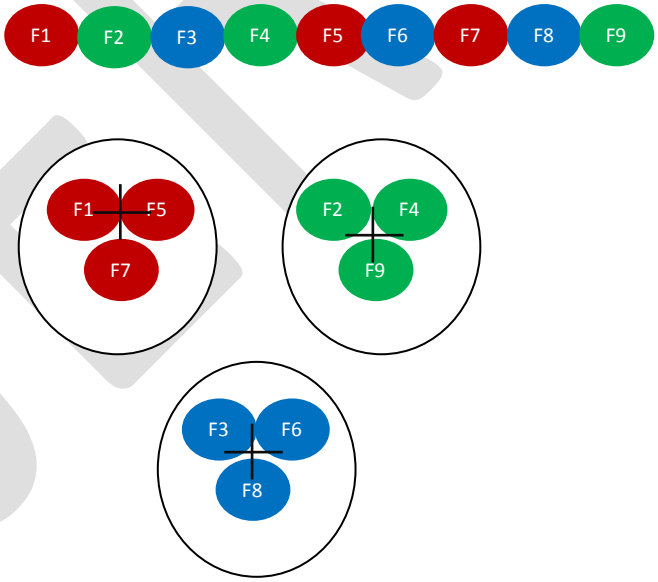

Figure 1 : Clustering based approach for feature selection

Algorithm 2 K-means algorithm for feature selection

Input : Dataset D.

1. D_{new} → transpose(D)// Feature becomes horizontal
2. Select K feature as initial centroid
3. **repeat**
4. Form k cluster by assigning each feature to closest centroid
5. Recompute the centroid of each cluster

6. **Until centroid do not change**
7. F ← representative of each cluster

---

4. Experimental Results

The experiments were performed in Windows 7 operating system, MATLAB 2012 in windows environment with 4 GB RAM and 500GB Hard disk 2.8 GHz intel processor.

Pollard et. al. [12] has defined silhouetee width which used to measure the strength of clusters using equation 1.

$$SWi = (b(i)-a(i)) / \max(a(i),b(i))$$

The concept of silhouette width involves the difference between the within-cluster tightness and separation from the rest. Specifically, the silhouette width s(i) for entity where a(i) is the average distance between i and all other entities of the cluster to which i belongs and b(i) is the minimum of the average distances between i and all the entities in each other cluster. The silhouette width values lie in the range from—1 to 1. The valid clusters are shown in Figure 2. The extracted and clustered features are shown in Table 2.

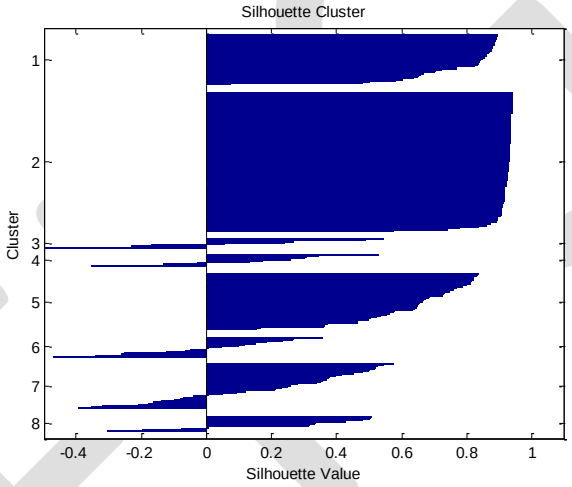

Figure 2.: Silhouetee Cluster Validation

Table 2. Clustered features based on homogeneity

Cluster 1	Cluster 2	Cluster3	Cluster 4	Cluster5	Cluster 6
18, 31,196, 197,198	14	1	8	10	7
199	57	5	13	23	12
	61	11	24	28	15
	260	16	26	36	20
	261	17	30	40	48
		21	32		55
		54	33		
		58			
		448,500			

5. CONCLUSION

In this paper we proposed a new method of feature reduction by creating the cluster of features. The proposed method reduced the number of feature based on user defined k arbitrary number. In order to find the optimal value of k we use silhouette [2] algorithm.

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An Efficient Turbo Decoder for Wireless Sensor Networks

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Abstract— Error correcting codes are an unavoidable part in digital communication such as data encoding, data decoding and data storage systems. Turbo codes are a class of error correcting codes that have recently been considered for energy constrained wireless communication applications. This paper focuses on the simulation of efficient turbo encoder and decoder for wireless sensor networks. Simulation of turbo encoder and decoder is done using Model Sim. The turbo encoder is simulated using flip flop method. Turbo decoder decodes the data using various MAP algorithms. The algorithms such as LUT Log MAP algorithm and Constant Log MAP algorithm are compared for simulating turbo decoder. The simulation results shows that turbo decoder simulated using constant Log MAP algorithm requires lesser area and hence lesser power consumption. The simulation of turbo encoder using flip flop method and decoder using constant Log MAP algorithm makes this decoder more efficient.

Keywords— Decoder, Energy efficient, Error correcting code, Log MAP algorithm, Soft information, Turbo codes, Wireless sensor networks.

INTRODUCTION

Over the years, there has been an increase in the use of digital communication in the field of computer communication, cellular and wireless sensor networks (WSN). In digital communication, error correction codes are an essential component. To ensure robust operation of digital applications like data encoding, decoding and data storage systems require error correction. Wireless communications require highly reliable data transfer in the presence of data corrupting noise. All these require good error correcting codes. There are different types of forward error correcting codes like block codes, convolutional codes, linear codes and turbo codes. Forward error correction (FEC) or channel coding is a technique which is used for controlling errors in data transmission over unreliable or noisy communication channels. The main idea is the sender encodes his message in a redundant way by using an error-correcting code (ECC).

In the last years, wireless communication systems coped with the problem of delivering reliable information while granting high throughput and better efficiency. In telecommunication, error detection and correction are the techniques that enable reliable delivery of digital data over unreliable communication channel. Among the different error correcting codes like block codes, convolutional codes and linear codes, turbo codes are found to be less complex and more efficient. The superior performance of turbo codes is due to a combination of parallel concatenated coding, iterative decoding, large interleaver size, etc. The large frame size of turbo codes and the iterative decoding process results in large decoding latency and more area consumption. The decoding latency and area has to be reduced and efficiency need to be increased in order to make Turbo-based systems acceptable for real-time voice communication and other applications that require instant data processing, like optical transmission and hard disk storage.

Turbo codes are a class of error correcting codes that come closer to Shannon's limit than any other type of error correcting codes. It has been recognized as a milestone in the channel coding theory. Due to their outstanding error correcting capabilities, turbo codes are highly appreciated in wireless communications as well as in encoding and decoding algorithms. These codes are a recent development in the field of forward-error-correction channel coding. The codes make use of some ideas like interleaving to provide better weight distribution, soft decoding to enhance decoder decisions and maximize the gain from decoder interaction**.**

Wireless sensor networks are more energy constrained, since the sensors are operated for extended periods of time and relying on batteries that are small, in expensive and light weight. In environmental monitoring WSNs for example, even though employing low transmission duty cycles and low average throughputs of less than 1 Mbits/sec the sensor energy consumption is dominated by the transmission energy E_b^{tx} [1],[2]. For this reason, turbo codes have recently found application in these scenarios, since their near-capacity coding gain facilitates reliable communication when using reduced transmission energy E_b^{tx}. Even if the transmission energy of turbo codes is less, it is offset by turbo encoders and turbo decoder energy consumption. Therefore, turbo codes designed for energy constrained scenarios have to minimize the overall energy consumption.

In 1974, Bahl, Cocke, Jelinek and Raviv presented the decoding algorithm based on a posteriori probabilities which was later known as the BCJR, Maximum a Posteriori (MAP) or forward-backward algorithm. The MAP algorithm was not used in practical

implementation for the last 20 years. The situation changed with the advent of turbo codes in 1993. The process of turbo code decoding starts with the formation of a posteriori probabilities (APPs) for each data bit, which is then followed by choosing the data-bit value that corresponds to the MAP probability for that data bit. Upon receiving a corrupted code-bit sequence, the process of decision making done with APPs allows the MAP algorithm to determine the most likely information bit to have been transmitted at each bit time.

RELATED WORK

Robertson P et al (1997) presented a comparison between log-MAP, max-log MAP and soft output Viterbi algorithm (SOVA) [3]. The comparison shows that SOVA is 0.7dB inferior to log-MAP and max-log-MAP lying in between SOVA and log-MAP. The comparative analysis is done for these algorithms in terms of number of additions, multiplication and look-up tables required.

Gross W J et al (1998) developed a simplified MAP algorithm suitable for the implementation of turbo decoder [4]. The simplification eliminates the need for a ROM or multiplexor-tree lookup table and replaces it with a constant value. The results show that the performance of turbo decoders is not adversely affected by this simplification.

Worm A et al (2000) presented a VLSI high speed MAP architecture with optimized memory size and power consumption for decoding the turbo codes [5]. The log-MAP and max log-MAP algorithm is used in the process. Memory size is reduced by minimizing the FIFO memory size. For maximum throughput a fully pipelined architecture is considered. The area decreases by up to 11% and power consumption by up to 15% in case of a Log-MAP decoder and for a Max Log-MAP decoder, even an 18% area decrease and a 20% power decrease.

Wang Z (2002) introduced variety of area efficient parallel turbo decoding schemes [6].Turbo decoders inherently have large decoding latency and low throughput because of iterative decoding. To reduce the latency and increase the throughput, high-speed decoding schemes are employed. Thus the techniques like segmented sliding window approach and two other area-efficient parallel turbo decoding schemes are used .The comparison on storage requirements; number of computation units and overall decoding schemes are made. Also in order to reduce the storage bottleneck partial storage of state metrics approach is also presented.

In 2003, Elassal M et al proposed a method to decrease the power consumption of turbo decoder [7]. In turbo decoder, decoding is done by iteratively exchanging the extrinsic information. In this proposed method the iteration is terminated when the extrinsic information exceeds a particular threshold and then a predefined value is terminated. This reduced memory access for inter leaver and state metrics and thus power was reduced. 25% reduction of power consumption with energy per bit to noise power spectral density ratio E_b/N_o= 1.5 dB is achieved compared to conventional architecture.

Elmasry M et al (2004) designed rate 1/3, 8-state log-MAP turbo decoder architecture [8]. The simplified log-MAP algorithm is used for the component soft-in soft-out decoder (SISO). Several logic and architectural level techniques are applied through the design process to reduce power consumption, area and increase throughput of the turbo decoder Parallelism, quantization, resource sharing, logic reduction and normalization are applied to reduce area, power and throughput. 0.18µ CMOS technology is used. The developed turbo decoder has a core area of 0.6mm^2, clock frequency of 100MHz, power consumption of 63mW and energy efficiency of 2.5n J/b/iteration.

Atluri I et al (2005) formulated the implementation of a low power Log-MAP decoder with reduced storage requirement and based on the optimized MAP algorithm that calculates the reverse state metrics in the forward recursive manner [9]. The new low power derivatives of this decoder through a variation in the percentage of memory savings are presented. Three low power architectures of the Log-MAP decoder not employing the sliding window technique have been developed and post layout power savings of approximately 44%, 40% and 36% with respect to the conventional implementation have been observed.

In 2008, Shah S presented a comparison between viterbi decoder and turbo decoder. It shows that iteration decoders perform better than Viterbi decoders [10]. The trade-off between bit error rate (BER) and energy per bit to noise power spectral density ratio (E_b/No) will always exist in the wireless communication. This helps in reducing the transceiver power. The modulation techniques and BER performance of viterbi and turbo decoders are compared. The BER for Viterbi algorithm is 1.36 x 10^{-5}; and turbo decoder the values are 3.09 x 10^{-8}, 8.00 x 10^{-8}, and 4.35 x 10^{-8} for number of iteration = 2, block size = 512; number of iteration = 8, block size = 512; and number if iteration = 8, block size = 2048 respectively. The results show that turbo decoder is more powerful than viterbi decoder with ~10^3 times improvements in BER.

Reddy P et al (2010) proposed a low power technique for turbo decoding implementation [11]. The digital base band implementation, high performance, energy efficiency, flexibility and low power are major requirements for channel decoding. The proposed techniques

help meet the major requirements. The optimization techniques show an interesting gain in normalized energy efficiency between 4% and 54%. This approach can be extended for turbo decoder implementations in terms of area and throughput.

Li L et al (2013) proposed a framework that can be employed at an early design stage to estimate the processing energy consumption of the turbo decoder architecture [12]. This method reduced overall energy consumption that is transmission energy and processing energy. BCJR algorithm is used. By considering both the transmission energy consumption E_b^{tx} and the decoding energy consumption E_b^{pr} have to be considered right from the commencement of the design .The importance of optimizing the turbo codes at an early design stage is discussed.

Li L et al (2013) proposed low-complexity energy-efficient Turbo decoder architecture [13]. Turbo codes have recently been considered for energy-constrained wireless communication applications, since they have low transmission energy consumption. However, for reducing the overall energy consumption, Look-Up-Table-Log-BCJR (LUT-Log-BCJR) architectures having low processing energy consumption are required. The proposed architecture achieves a low area and hence a low energy consumption. In this approach the LUT-Log-BCJR algorithm is decomposed into its most fundamental ACS operations. The architecture was validated by implementing an LTE turbo decoder and 71% energy reduction was achieved.

Martina M et al (2014) proposed a simplified n-input max* approximation algorithm for very low complexity turbo decoder hardware architectures [14]. The results show that the proposed architecture is simpler by 30%, on average, than the constant Log-MAP in terms of chip area with the same delay. However, when applying scaling to the extrinsic information, the proposed algorithm achieves almost same Log-MAP turbo code performance for both binary and double-binary turbo codes, without increasing the implementation complexity.

MATERIALS AND METHODS USED

Reliable data transmission in wireless communication systems requires sophisticated channel coding schemes and corresponding high-throughput, low-area, and energy-efficient decoder implementations. Forward-error-correcting (FEC) channel codes are commonly used to improve the energy efficiency of wireless communication systems. FEC encoder on the transmitter side will add redundancy to the data in the form of parity information. Then at the receiver, an FEC decoder is able to exploit the redundancy in such a way that a reasonable number of channel errors can be corrected. There are different types of error correcting codes like linear codes, convolutional codes and turbo codes. The significance of turbo codes are its features, like less complexity and better efficiency compared to other error correcting codes. In information theory, turbo codes are a class of high-performance forward error correction codes developed during 1993, which were the first practical codes to closely approach the channel capacity, the theoretical maximum for the code rate at which reliable communication is still possible given a specific noise level.

The decoding algorithm employed in the decoders is the maximum a posteriori probability (MAP) algorithm. The MAP algorithm provides a reliability metric, known as the log-likelihood ratio (LLR), on the transmitted code symbols. The LLR output is employed by other constituent decoders, which attempt to improve their LLR estimates iteratively.

PROPOSED METHODOLOGY

In wireless sensor networks, for reliable data transmission, the data need to be encoded at the transmitter and then decoded at the receiver. The input data first enters the turbo encoder. From the turbo encoder the encoded data passes through the noisy channel, then to the turbo decoder. The turbo decoder produces the decoded output.

Block Diagram of Turbo Encoder

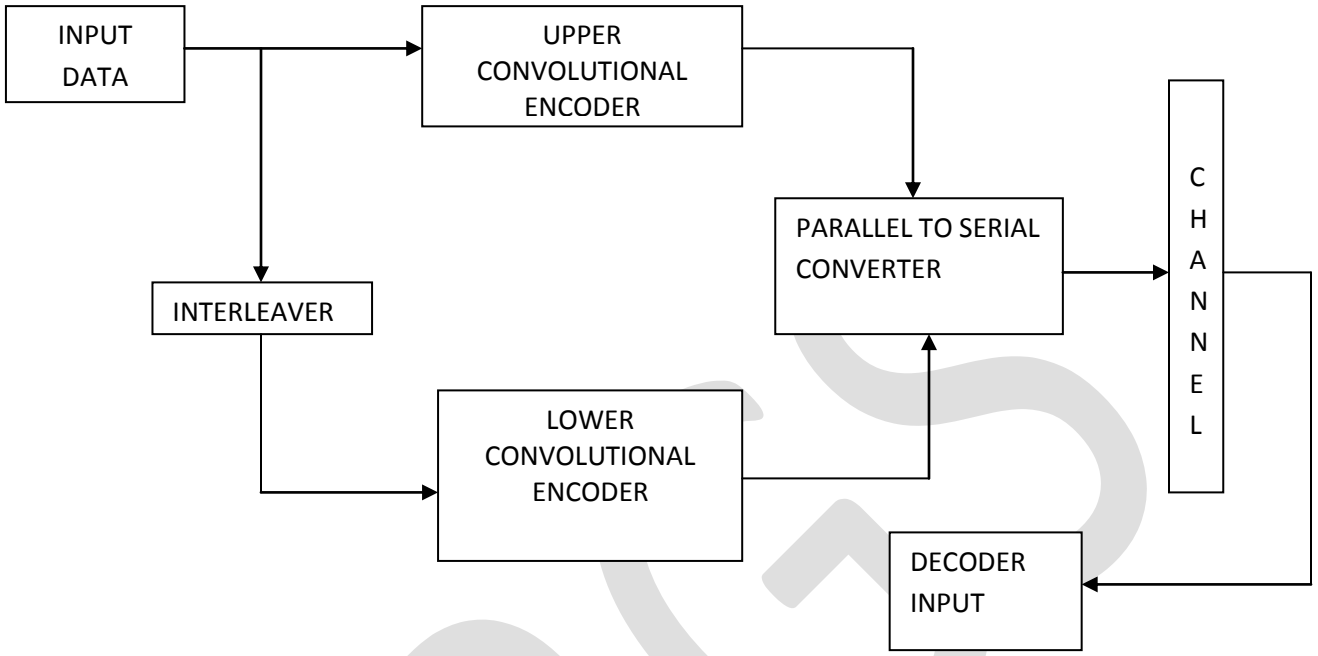

Fig 1: Block Diagram of Turbo Encoder

Fig 1. shows block diagram of turbo encoder. It mainly consists of 4 blocks such as upper convolutional encoder, lower convolutional encoder, interleaver and parallel to serial converter. The input data is binary values. The input data enters the upper convolutional encoder. At the same time information bits enter the interleaver module. The interleaver output is then fed to lower convolutional encoder. The output of upper convolutional and lower convolutional encoder's are passed through a parallel to serial converter and then through the channel.

Each input bit entering the turbo encoder is encoded as 4 bits. The convolutional encoder consists of number of memory elements. It can be considered to be made of flip-flops. The input data that enters the upper convolutional encoder produces two encoded bits and they are system bit 1 and parity bit 1. The input data at the same time enters the interleaver. Interleaver module is the one that rearrange the order of input bits. The interleaved bits are then made to enter the lower convolutional encoder. In lower convolutional encoder, corresponding to each bit entering into it, the encoder produces two encoded bits and they are system bit 2 and parity bit 2. Both the encoders produce completely different sequence. Thus for each input bit, there will be 4 encoded bits. These sequence of encoded data is passed through a parallel to serial converter and then through the channel.

Block Diagram of Turbo Decoder

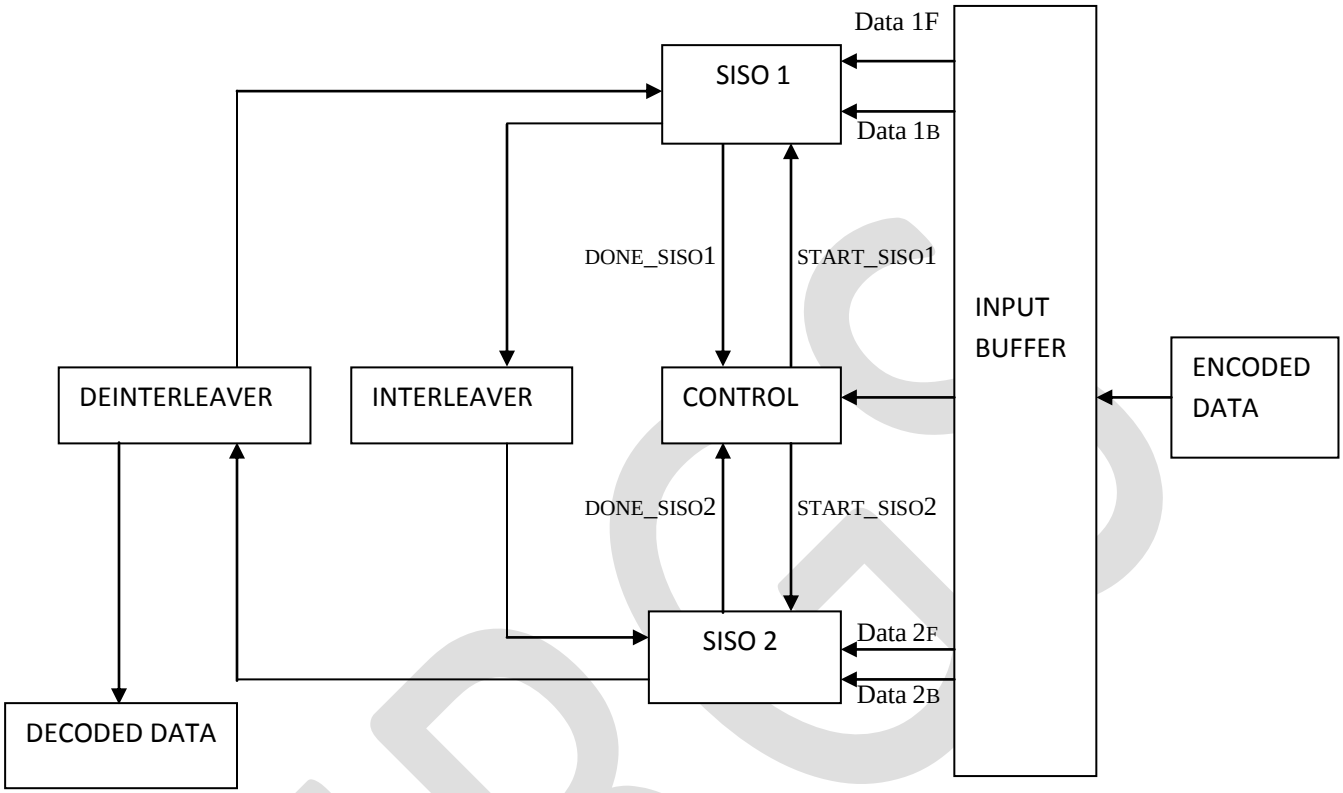

Fig 2: Block Diagram of Turbo Decoder

Fig 2. shows the block diagram of Turbo decoder. It consists of 6 modules such as input buffer, SISO 1, SISO 2, Control, interleaver and deinterleaver

The turbo decoder always works with Log likelihood ratios (LLR). This means ratio of probability that the received bit is 0 or 1. Input buffer is the module that stores the received data's. SISO 1 and SISO 2 are soft input soft output modules. The algorithm used is performed in these modules. The soft input soft output module (SISO) works with soft information. Soft information means the probability that the bit is 0 or 1. The interleaver module is used to interleave the data. Interleaver works by storing the data using interleaved address and reading it using normal address. The deinterleaver module stores the data using normal address and read it back using interleaved address. The controller module controls all other modules.

The encoded data that passes through the noisy channel enters the input buffer. Input buffer stores the received information. The 2 blocks of data enters SISO 1 and SISO 2. Data 1F and data 1B enter SISO 1. Each of the data blocks is 8 bit wide. In data 1F the 4 bits MSB is filled by the system bit 1 and 4 LSB bits are filled by parity bit 1.The data 1B is just reverse order of data 1F. Data 2F and data 2B enter SISO 2. The 4 MSB bits in data 2F is system bit 2 and 4 LSB bits are parity bit 2. When the control module sends the signal START_SISO1, SISO 1 starts the iteration. Inside SISO 1 the LLR value corresponding to each bit is calculated using the algorithm. Once it completes the first iteration, it sends back DONE_SISO1 signal to control module. This makes control module to send the START_SISO2 signal and SISO 2 starts the iteration. The input of SISO 2 is data 2F and data 2B from input buffer and the output of SISO 1 after passing through the interleaver. Once SISO 2 completes the iteration, it sends DONE_SISO2 signal to the control module. Similarly the input to SISO 1 is data 1F and data 1B from input buffer and the output of SISO 2 after passing it through deinterleaver. The SISO 1 and SISO 2 modules perform the iteration using the algorithm. During the iteration, parameters like α, β, γ are calculated. The final output is taken from the deinterleaver after a particular number of iteration. The final output will also be LLR values. If this LLR value obtained is negative then it will be decoded as 1 and if it is positive it is decoded as 0.

Algorithm

The algorithm that is used in turbo decoder is maximum a posteriori (MAP) algorithm. There are different versions of MAP algorithm. Based on the algorithm used, the area required and power consumed by the turbo decoder varies.

In turbo decoder, the SISO modules undergo a number of iteration using the algorithm. During the iteration certain parameters like α, β, γ are calculated. γ is branch metrics. α and β are node metrics. Using γ, the node metrics α and β are calculated.

For example:

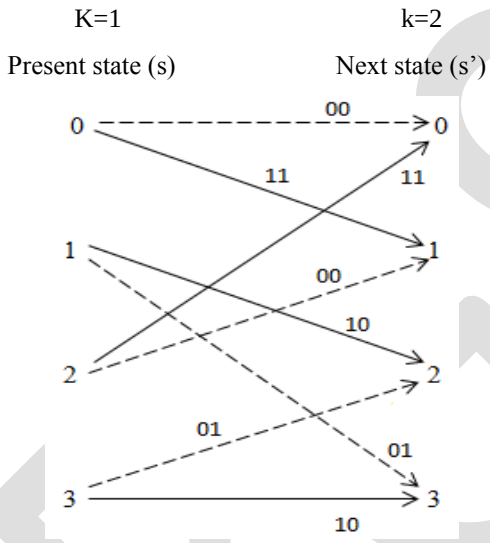

Fig 3: State Diagram

This is a state diagram with present state s and next state s'. The dashed arrow shows the transition from one state to another when 0 input is given. The bold arrow shows the transition for 1 input. Using branch metrics, the node metrics are calculated as follows:

$$\gamma_k^{i,m} \gamma = 0.5 \exp (x_k u_k + y_k v_k) \quad (1)$$

where 'm' is the state and 'i' is the input 0 or 1. u_k and v_k are the outputs when moving from one state to another. x_k and y_k are the input values that enter into the SISO modules. γ is branch metrics.

$$\alpha_{k+1}(s') = \max^*_{s \text{ to } s'} (\alpha_k(s) + \sum_{i=1 \text{ to } 2} \gamma(s,s')) \quad (2)$$

$$\beta_{k-1}(s) = \max^*_{s \text{ to } s'} (\alpha_k(s') + \sum_{i=1 \text{ to } 2} \gamma(s,s')) \quad (3)$$

where α is calculated in the forward direction of state diagram. β is calculated in backward direction. In (2) and (3), to obtain the values of α and β max* operation is required. This operation is performed using MAP algorithm. Using the node metrics and branch metrics, the iteration is performed.

LUT Log MAP Algorithm

This is a MAP algorithm. In turbo decoder, when SISO modules perform iteration, parameters like α, β, γ need to be calculated. α, β are called node metrics and γ is branch metrics. For determining the values of node metrics (α, β), max* operation is required. The max* operation associated with look-up table Log MAP (LUT Log MAP) algorithm is as follows.

$$\text{Max*}(x,y) = \max(x,y) + \begin{cases} 0.75, \text{ if } |y-x| = 0 \\ 0.5, \text{ if } |y-x| = (0.25, 0.5, 0.75) \\ 0.25, \text{ if } |y-x| = (1, 1.25, 1.5, 1.75, 2) \end{cases} \quad (4)$$

In this max* operation, maximum of x and y is determined and then based on the range where |y-x| lies, correction factors like 0.75, 0.5 or 0.25 is added.

Constant Log MAP Algorithm

This is another version of MAP algorithm. To determine node metrics (α, β) during SISO iteration, max* operation is required. The max* operation associated with constant Log MAP algorithm is as follows.

$$\text{Max*}(x,y) = \max(x,y) + \begin{cases} 0, \text{ if } |y-x| > T \\ C, \text{ if } |y-x| <= T \end{cases} \quad (5)$$

where T is the threshold value = 1.5,C=0.5

In this max* operation after obtaining maximum of x and y, based on the range of |y-x| correction factor 0.5 is added.

SIMULATION RESULTS

The simulation work has been done in ModelSim. ModelSim is a powerful simulator that can be used to simulate the behaviour and performance of logic circuits. The simulator allows the user to apply inputs to the designed circuit, usually referred to as test vectors, and to observe the outputs generated in response. The user can use the waveform editor to represent the input signals as waveforms.

Simulation Results of Turbo Encoder

Turbo encoder using 2 flip-flops

Input given: 111110
Output obtained: ex1 system bit 1 -111110

ey1 Parity bit 1-110001

ex2 System bit 2- 110111

ey2 Parity bit 2 - 111010

System bit 1 and parity bit 1 are the encoded bits from upper convolutional encoder and system bit 2 and parity bit 2 are the encoded bits from lower convolutional encoder. So for 6 bits of input data, total 24 encoded bits are produced.

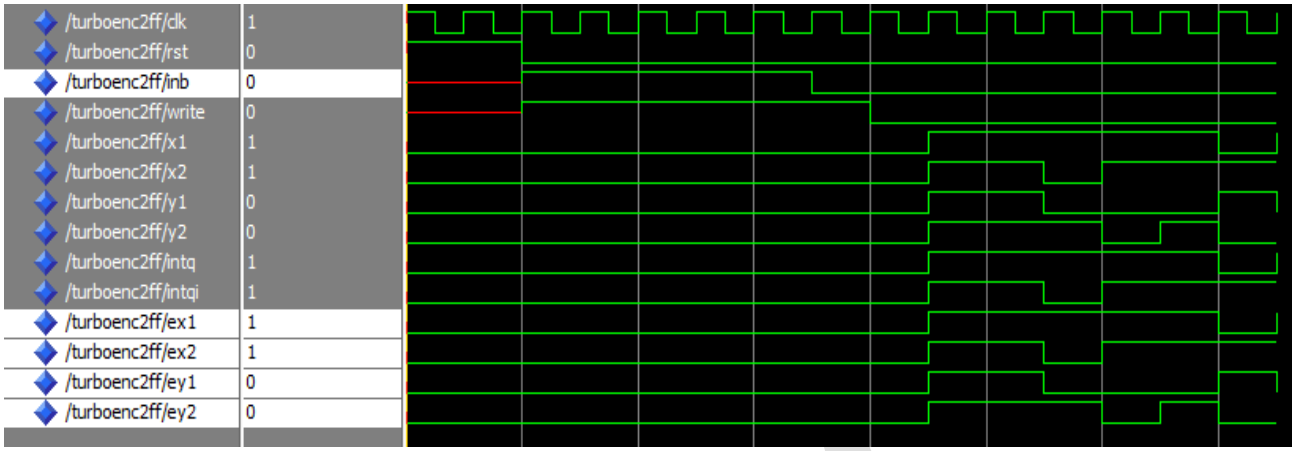

Fig 4: Output waveform of turbo encoder using 2 flip-flops

LUT Max* operation in LUT Log MAP Algorithm

Input given: a=000100010
b=000011100
Output obtained: z=000100011

The output z is obtained from Max*(a,b) calculated based on equation(4).

Fig 5: Output waveform of LUT Max* operation

Constant Max* operation in constant Log MAP Algorithm

Input given: a=000011010
b=000010110
Output obtained: z=000011100

The output z is obtained from Max*(a,b) calculated based on equation(5).

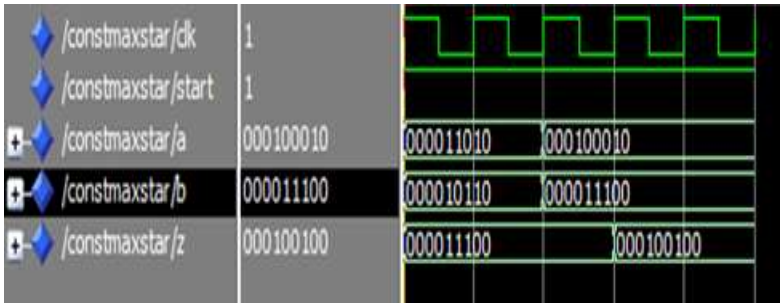

Fig 6: Output waveform of Constant Max* operation

Comparison of LUT Log MAP and Constant Log MAP algorithm

In order to determine the best algorithm, LUT Log MAP algorithm and constant Log MAP algorithm are synthesized using Xilinx ISE and device utilization values are estimated.

The below tables shows the estimated number of components required for both the algorithms.

Table 1: LUT Log MAP algorithm

Device Utilization Summary (estimated values)		
Logic Utilization	**Used**	**Available**
Number of Slices	22	2448
Number of 4 input LUTs	40	4896
Number of bonded IOBs	29	92
Number of GCLKs	1	24

Table 2: Constant Log MAP algorithm

Device Utilization Summary (estimated values)		
Logic Utilization	**Used**	**Available**
Number of Slices	20	2448
Number of 4 input LUTs	37	4896
Number of bonded IOBs	29	92
Number of GCLKs	1	24

The design summary of LUT Log MAP algorithm and constant Log MAP algorithm shows that constant Log MAP algorithm requires lesser number of components. The number of 4 input LUTs required in constant Log MAP algorithm is 37 and that required in LUT Log MAP algorithm is 40. Number of slices in constant Log MAP algorithm is 20 and that in LUT Log MAP is 22. So using Constant Log MAP algorithm in turbo decoder will be more efficient.

Simulation Results of Turbo Decoder

The input to the decoder is encoded data. The decoder reads encoded data bits from the data file when write signal (writeout) = 0. The decoded output is obtained when write signal (writeout) =1.

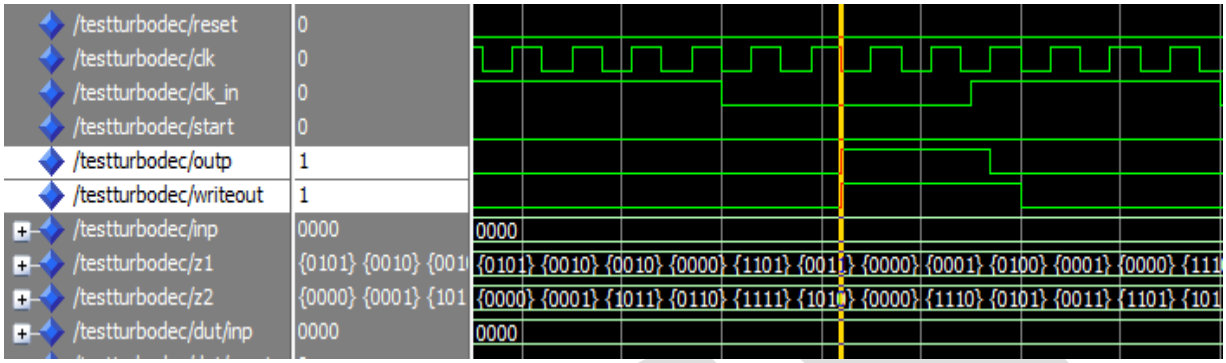

Fig 7 : Output waveform of decoder output when write signal (writeout) = 1

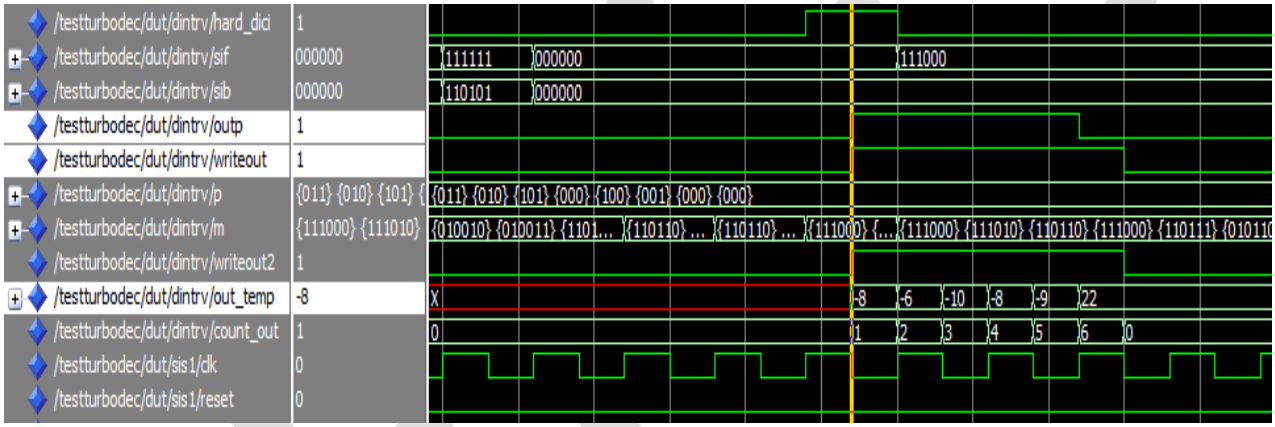

Fig 8: Output waveform of decoder output in decimal format

The out_temp signal in figure 8 is the final output of deinterleaver. These are the LLR values. Here the LLR values are shown in decimal format. When LLR value is negative, it is decoded as 1 and when LLR value is positive, it is decoded as 0. The LLR values obtained are -8, -6, -10, -8, -9 and 22. So the decoded bits are 111110 as shown by outp signal.

Comparison of Turbo decoder simulated using LUT Log MAP and Constant Log MAP algorithm

The turbo decoder was simulated using LUT Log MAP algorithm and constant Log MAP algorithm. The turbo encoder using both the algorithms were synthesised using Xilinx ISE to obtain their estimated device utilisation values and its was compared.

Table 3: Turbo decoder using LUT Log MAP algorithm

Device Utilization Summary (estimated values)		
Logic Utilization	**Used**	**Available**
Number of Slices	9823	14752
Number of Slice Flip Flops	1897	29504
Number of 4 input LUTs	18829	29504
Number of bonded IOBs	10	250
Number of MULT18X18SIOs	8	36
Number of GCLKs	3	24

Table 4: Turbo decoder using Constant Log MAP algorithm

Device Utilization Summary (estimated values)		
Logic Utilization	**Used**	**Available**
Number of Slices	9590	14752
Number of Slice Flip Flops	1182	29504
Number of 4 input LUTs	18058	29504
Number of bonded IOBs	10	250
Number of MULT18X18SIOs	8	36
Number of GCLKs	3	24

The design summary shows comparison of the LUT Log MAP algorithm and Constant Log MAP algorithm used for the simulation of turbo decoder, there is a large variation in number of components in both algorithms. The total number of slice required for turbo decoder using LUT Log MAP algorithm is 9823 and that using constant Log MAP algorithm is 9590. The number of slice flip flop used in LUT Log algorithm is 1897 and that using constant Log MAP algorithm is 1182. These differences in logic utilisation in turbo decoders using both the algorithms bring a large difference in its power consumption. This shows that an efficient turbo decoder can be developed using constant Log MAP algorithm.

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CONCLUSION

This paper mainly focuses on simulating an efficient turbo encoder and decoder for wireless sensor networks. By using the ideas perceived from literature survey it was found that turbo decoder has better performance than viterbi decoder for its application in wireless sensor networks. The turbo encoder can be simulated using different methods. The turbo encoder was simulated by two flip flops method. For the simulation of turbo decoder, LUT Log MAP algorithm and constant Log MAP algorithm was compared. The result shows that turbo encoder using constant Log MAP algorithm was more efficient than turbo encoder using LUT Log MAP algorithm. An energy efficient turbo encoder and decoder were simulated successfully using ModelSim. The turbo decoder is used in digital communications like computer, 3G mobile communication, telemetry and deep space exploration.

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A Study on Service Oriented Network Virtualization convergence of Cloud Computing

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Abstract - Networking plays vital role in cloud computing for holistic that allows control, management and optimization of both networking and cloud resources in a cloud environment leads to a convergence of networking and cloud computing. Virtualization is used in telecommunication and the internet as a key attribute for the networking as a potential enabler of changes in both communication and computing domains. Service oriented architecture applied in network virtualization knows as the Network-as-a-Service that may greatly convergence of networking and cloud computing. Our work presents the study in service oriented network virtualization for supporting cloud computing from a perspective of network. Survey overviews the cloud convergence virtualization focusing on art of network service discovery brought by network cloud convergence.

Ke**ywords –** Network Security, Cloud Computing, Virtualization, Service-Oriented Architecture

Introduction I

The developments in the field of information technology are cloud computing, significantly change the way of people do computing and manage information. Cloud computing is a large-scale distributed computing paradigm that is driven by economies of scale in which a pool of abstracted, virtualized, dynamically scalable computing functions and services are delivered on demand to external customers over the Internet [1]. Networking plays a crucial role in cloud computing. Cloud services normally represent remote delivery of computing resources, whether hardware or software, most often via the Internet. This is especially relevant in public cloud environments where customers obtain cloud services from a third-party cloud provider. Usually this means data crosses multiple networks before it is delivered to the end user. From a service-provisioning perspective, cloud services consist of not only computing functions provided by the cloud infrastructure, but also data communications functions offered by the

Internet. In addition, networking is also a key element of the cloud infrastructure that provides data communications both inside a cloud data center and among data centers distributed at different locations. Performance have indicated that networking performance has a significant impact on the quality of cloud services, and in many cases data communications become a bottleneck that limits clouds from supporting high-performance applications. Therefore networks with quality-of-service (QoS) capabilities become an indispensable ingredient for high-performance cloud computing.

The significant role that networking plays in cloud computing calls for a holistic vision of both Computing and networking resources in a cloud environment. Such a vision requires the underlying networking infrastructure to be opened and exposed to upper-layer applications in clouds, thus enabling combined control, management, and optimization of computing and networking resources for cloud service provisioning. This leads to a convergence of networking and cloud computing systems toward a composite network–cloud service provisioning system. Because of the complexity of networking technologies and protocols, exposure of network functionalities in a cloud environment is only feasible with appropriate abstraction and virtualization of networking resources.

On the other hand, telecommunication and networking systems are facing the challenge of rapidly developing and deploying new functions and services for supporting the diverse requirements of various computing applications. In addition, fundamental changes are also required in the Internet architecture to allow heterogeneous networking systems to coexist and cooperate for supporting the wide spectrum of applications. A promising approach that the networking research community takes for addressing these challenges lies in virtualization of networking resources, namely decoupling service provisioning from network infrastructure and exposing underlying network functionalities through resource abstraction. Such an approach, in general, is described by the term network virtualization, which is expected to become a fundamental attribute of the future networking paradigm and play a crucial role in next-generation networks. SOA provides effective architectural principles for heterogeneous system integration is essentially, service orientation facilitates virtualization of computing systems by encapsulating system resources and capabilities in the form of services and provides a loose-coupling interaction mechanism among these services. SOA has been widely applied in cloud computing via the paradigms of infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service and applying the SOA in the field of networking supports encapsulation and virtualization of networking resources in the form of SOA-compliant network services. Service-oriented network virtualization enables a network-as-a-service paradigm that allows network infrastructure to be exposed and

accessed as network services, which can be composed with computing services in a cloud computing environment. Therefore, the network-as-a-service paradigm may greatly facilitate a convergence of networking and cloud computing.

SECTION II

2. Related Work: Several essential characteristics of a high performing private cloud can automatically provision their own computing resources as needed and without requiring human intervention typically through an interactive portal that enables them to configure and manage services themselves. Resources are available via the network and can be accessed by multiple devices including smart phones tablets, laptops and desktops. Resources can be quickly and transparently expanded or contracted depending on demand and scaling is automatic to users and provisioning what they need is transparent. Usage is measured and can be monitored controlled and reported for transparency. Compute storage and networking resources are pooled to serve multiple user groups with different physical and virtual resources that can be dynamically assigned and reassigned according to user demand. Users generally have no control of the exact location of the resources there is a sense of location independence although location may be specified at a higher level abstraction.

Cloud infrastructure is the collection of hardware and software that enables the essential collection of hardware and software that enables the essential characteristics of the cloud to self-provision these resources in order to run platforms and applications. Platform as a service enables users to adapt legacy applications to a cloud environment or develop cloud aware applications using programming languages services libraries and other developer tools. User can run applications via multiple devices on cloud infrastructure.

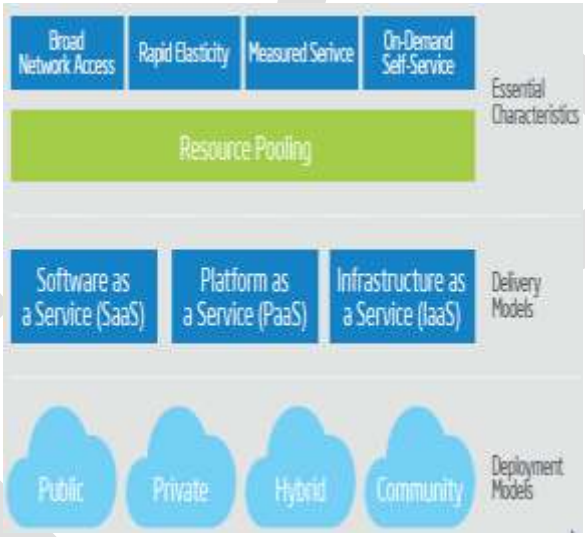

Figure 1 Cloud Computing Network Topology

Cloud infrastructure is provisioned for use by a single organization that comprises multiple tenants private clouds may be operated on or off premises and are behind the company firewall. A cloud service provider offers services to multiple businesses academic institutions government agencies and other organizations with access via the internet. Hybrid clouds combine two cloud delivery models for example private public that remain unique as entities but are bound together by technology that enables data and application portability. Cloud bursting is an example of one way enterprises use hybrid clouds to balance loads during peak demand periods, cloud infrastructure is provisioned for the exclusive use of a specific community of user organizations with shared computing requirements such as security policy and compliance.

SECTION III

3. Problem Definition: Todays technology grows very fast, developing a product with individuals needs make a success end product. Monitor all the software needs in as one input makes a efficient end product known as virtualization, this virtualization is a combination of software hardware that creates virtual machines which allows a single machine to act as many machines.

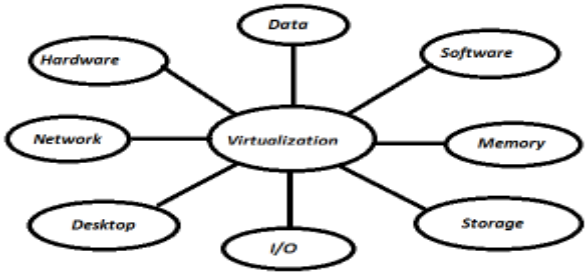

Figure 2 All in one Cloud Virtualization End product

Cloud icon represents background makes the network work, cloud computing is an architecture for storing data and accessing available anytime user friendly and scalable service models and deployment models. Users can take provision on demand services computing capabilities and network storage as needed automatically without requiring interaction with each service provider.

3.1. Cloud Virtualization Technology: Virtualization compute resources typically as virtual machines with associated storage and networking connectivity cloud determines how those virtualized resources are allocated delivered. Virtualization is not necessary to create a cloud environment but it enables rapid scaling of resources in a non-virtualized environment find hard to achieve.

Virtualization has been in data centers for several years as a successful information technology for consolidating servers used more broadly to pool infrastructure resources also provide the basic building blocks for you cloud environment to enhance agility and flexibility. Virtualization continues to be on servers storage and networks is emerging as a general strategy data center mangers worldwide reports that planned or in-process virtualization of infrastructure workloads will increase from 60 percent.

A cloud strategy clearly articulates the benefits approach and expected outcomes for technology investment across organization helps get senior management buy in and manage expectations. High-level business case describes the benefits to both information technology and the business and the expected return on investment. Implementation define short-term mid-term and long-term goals for delivering services with related benefits for example intel IT implemented infrastructure to enable broader enterprise use cases. Workloads identify the workloads plan to move to the cloud and the associated user groups, cloud architecture including the components of infrastructure platform and software as well as security and related systems such as backup and disaster recovery. Client devices define users will access the cloud and integrate with enterprise wide mobile strategy, monitoring determined how will manage cloud health and performance and define success. IT business relationships define how IT will partner effectively with the business to specify business process requirements and request services.

Business process changes are pervasive in a cloud implementation to succeed must collaborate with process owners to accurately document the processes and tasks affected and determine how to minimize the number of required human control points. Need management cooperation to implement any changes to existing processes that might benefit from the automation and developing new processes such as user's access and specify the cloud resources need. Cloud obviously affects IT- specific processes as well capacity management for instance becomes radically different in a cloud environment.

Many users in large companies are already familiar with the concept of consuming IT services around cloud service delivery options for organization from the IT perspective reduces organization risk improves resources utilization and monitors demand from the perspective of users they get the right solution to meet their needs made easy with self-provisioning and automation. Ultimately gain experience delivering cloud services that can be extended later to brokering public services in hybrid cloud model.

Right technology priorities based on the implementation phases and milestones described cloud strategy short-term priorities would typically include implementation pervasive virtualization to integrate compute storage network and physical resources and then offering infrastructure by implementing end-to-end on-demand self-service capabilities automation orchestration and security.

End-to-end health and performance monitoring of the environment is essential for cloud management without data collection and analytics have the information need to benefit from system efficiencies or measure success. Integrated operational analytics that encompass facilities network storage compute and applications can help assess whether meeting availability and performance goals inform decisions to add capacity troubleshoot problems and comply with security.

SECTION IV

4.1. Service Oriented Architecture: Cloud service oriented computing is facing various issues but combination can overcome issue they are facing individually provides on demand access and elasticity service oriented architecture provides low cost and reliable access consists of software applications which refers to the set of rules and methods that represents computing in service oriented architecture, model in an IT environment which provides loose coupling of services interoperability of current and emerging business

service. Network virtualization made significant progress to face various challenges solutions to these challenges can be overcome by service oriented architecture.

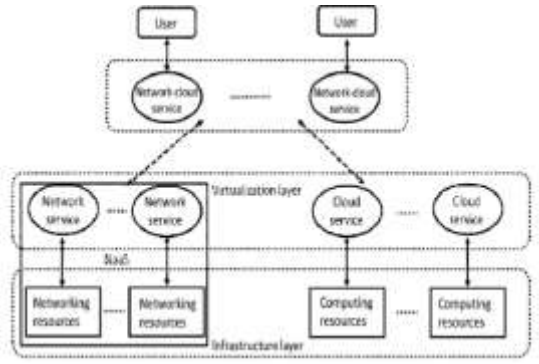

Figure 3 Service Oriented Architecture Virtualization

Network as service framework enabling the convergence of networking and cloud computing discovers the services required by the user and then enables matching cloud service requirements with networking capabilities, loose coupling feature of SOA provides flexibility in network cloud convergence.

4.2. Cloud/SOA Virtualization: Virtualization is a technology that allows resource to be viewed as logical and physical application are run on logical resource and assigned to an optimum physical resource based on a variety of cost performance and availability. Virtualization is a technology that allows a physical server to appear to applications as multiple logical servers, challenge of virtualization lies in the issue of utilization if a server truly has excess memory disk and CPU resources available then virtualization can provide for server consolidation.

Cloud is harmonization of SaaS and virtualization into a much broader and flexible model for IT infrastructure cloud computing provides a way for enterprises to structure their data centers to efficiently user server storage and network resources cloud computing can extend virtualization across a wide network to build a single virtual cloud data center. Public cloud can offer companies a way to host applications for back-up or as an overflow capacity resource in periods of peak demand, public cloud can host SaaS applications more cost effectively too, cloud computing architecture provides a way to link the public resources with private cloud resources to create a hybrid cloud enabling cloud computing to build a seamless applications across virtualized servers.

Service oriented architecture is software design and development that componentizes applications into modular services that are assembled in various ways to promote customization to worker needs and reuse of common software elements, service oriented architecture facilitates cloud computing by making software easier to distribute in the cloud alternative to virtualization in server sharing or it can use virtualization to improve performance and reliability. Finally service oriented architecture makes everything a service and thus supports the SaaS model not only for complete applications but also for components of applications. Service oriented architecture may be transforming but from the user's perspective cloud computing is harmonizing many would argue that cloud computing is the unification of virtualization and SaaS but its more complicated.

Conclusion V

Cloud virtualization enables converged infrastructure, this paper discuss survey on cloud virtualization and technique. Cloud is a transformative technology with significant potential to solve data problems. Virtualization flexible elastic and minimizes complexity user friendly and access of data offers integration of services Network-as-a-service in cloud based virtualization. This paper presents service oriented cloud virtualization combined together to form an end-product study of virtualization it can be concluded that by merging such clouds.

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An Effective Strategy for Trusted Information Scheme for Location Privacy in VANETs

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Abstract— VANET can be formed by connecting vehicles with internet access by drivers. Vehicles running with different speed, directions and locations can form ad-hoc network to solve various problems in human life such as traffic management, safety in transportation, utilization of transport resources and many ad-hoc applications for mobile users. Method used for protecting such as clustering, anonymization, fake point location privacy etc. are proposed by different authors. It is important to see that the vehicle's or group of vehicle's location privacy needs to be protected. In this paper we are retracing the technique used for location privacy in VANET and propose the novice Ad-hoc Trusted Information Exchange method for location privacy.

Keywords— VANET, location privacy, ad-hoc trust, mobile security, LOR

INTRODUCTION

Basically VANET is an application of MANET which can be formed by connecting vehicles with internet access by drivers. It plays important role in traffic management and safety driving. In VANET, each vehicle is embedded with OBU (on board unit) and AU (application unit) as shown in fig.1. Where OBU has communication capability and AU is used to execute a program made for OBU's communication capability. Road Side Unit (RSU) can be attached to the infrastructure network which is connected to the internet. VANET provides two types of communication:

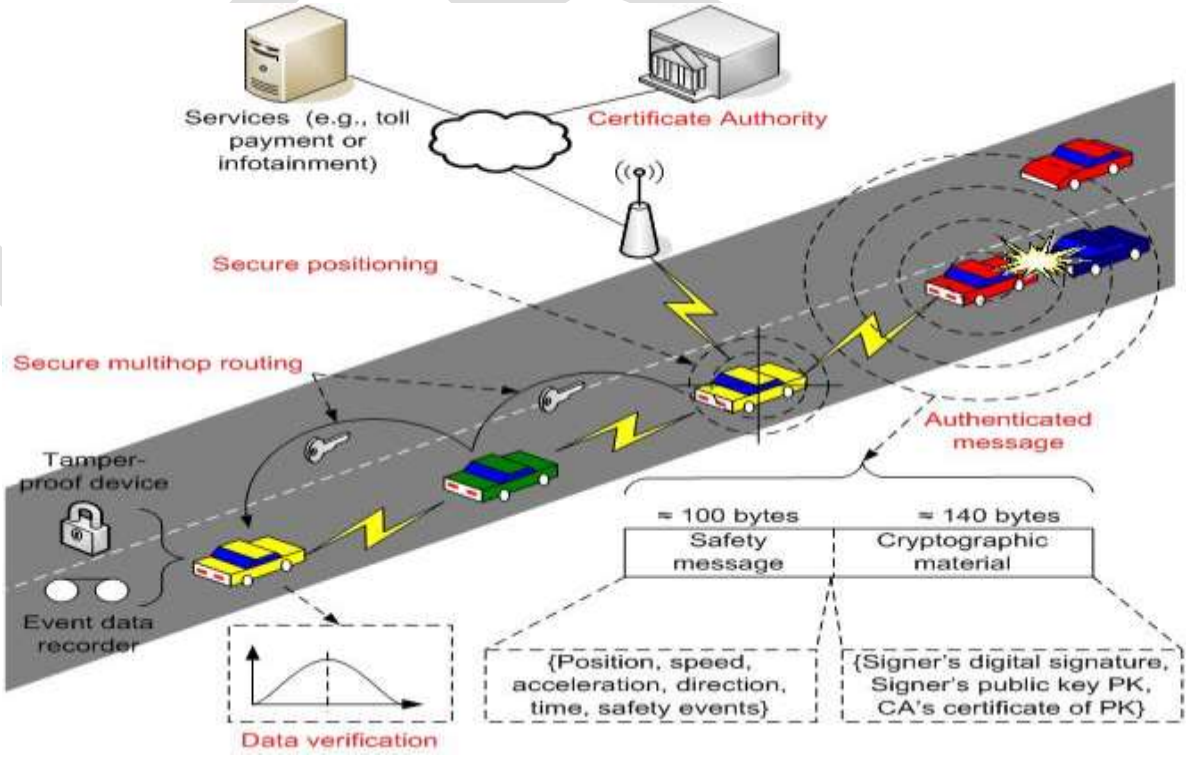

Fig 1: VANET Architecture

1] Pure wireless ad hoc network- vehicle to vehicle. And
2] Communication between fixed infrastructure (i.e. RSU) and vehicle

Location Privacy is nothing but the special type of information privacy which concern the claim of individuals to determine for themselves when, how, and what extent location information about them is communicated to others. Location is inextricably linked to personal safety. Unrestricted access to information about an individual's location could potentially lead to harmful encounters, e.g. physical attacks. Hence location privacy is an important issue in vehicular ad-hoc network.

In this paper we discuss the Trusted Information Exchange Scheme for location privacy in vehicular ad-hoc network. The rest of the paper is structured as follows. Section II describes the related work of VANET's location privacy. Section III describes the threat model and proposed location privacy scheme and section IV presents conclusion.

OVERVIEW OF VANET

Intelligent transportation systems (ITSs) In intelligent transportation systems, each vehicle takes on the role of sender, receiver, and router [4] to broadcast information to the vehicular network or transportation agency, which then uses the information to ensure safe, free-flow of traffic. For communication to occur between vehicles and RoadSide Units (RSUs), vehicles must be equipped with some sort of radio interface or OnBoard Unit (OBU) that enables short-range wireless ad hoc networks to be formed [5]. Vehicles must also be fitted with hardware that permits detailed position information such as Global Positioning System (GPS) or a Differential Global Positioning System (DGPS) receiver. Fixed RSUs, which are connected to the backbone network, must be in place to facilitate communication. The number and distribution of roadside units is dependent on the communication protocol is to be used. For example, some protocols require roadside units to be distributed evenly throughout the whole road network, some require roadside units only at intersections, while others require roadside units only at region borders. Though it is safe to assume that infrastructure exists to some extent and vehicles have access to it intermittently, it is unrealistic to require that vehicles always have wireless access to roadside units. Figures 1, 2 and 3 depict the possible communication configurations in intelligent transportation systems. These include inter-vehicle, vehicle-toroadside, and routing-based communications. Inter-vehicle, vehicle-to-roadside, and routing-based communications rely on very accurate and up-to-date information about the surrounding environment, which, in turn, requires the use of accurate positioning systems and smart communication protocols for exchanging information. In a network environment in which the communication medium is shared, highly unreliable, and with limited bandwidth [6], smart communication protocols must guarantee fast and reliable delivery of information to all vehicles in the vicinity. It is worth mentioning that Intra-vehicle communication uses technologies such as IEEE 802.15.1 (Bluetooth), IEEE 802.15.3 (Ultra-wide Band) and IEEE 802.15.4 (Zigbee) that can be used to support wireless communication inside a vehicle but this is outside the scope of this paper and will not be discussed further.

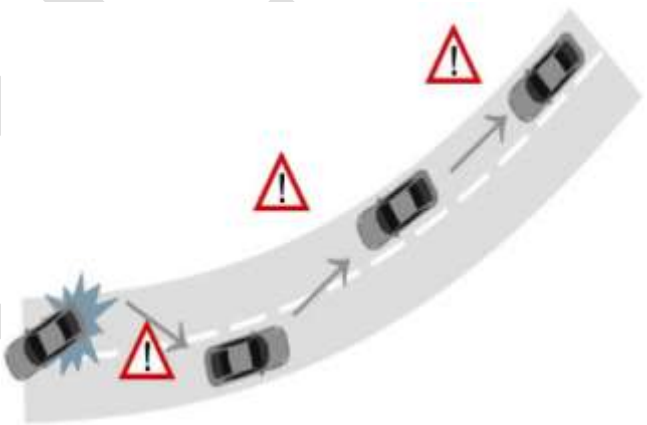

Fig 2: Inter-vehicle communication

A. The inter-vehicle communication configuration (Fig. 2) uses multi-hop multicast/broadcast to transmit traffic related information over multiple hops to a group of receivers. In intelligent transportation systems, vehicles need only be concerned with activity on the road ahead and not behind (an example of this would be for emergency message dissemination about an imminent collision or dynamic route scheduling). There are two types of message forwarding in inter-vehicle communications: naïve broadcasting and

intelligent broadcasting. In naïve broadcasting, vehicles send broadcast messages periodically and at regular intervals. Upon receipt of the message, the vehicle ignores the message if it has come from a vehicle behind it. If the message comes from a vehicle in front, the receiving vehicle sends its own broadcast message to vehicles behind it. This ensures that all enabled vehicles moving in the forward direction get all broadcast messages. The limitations of the naïve broadcasting method is that large numbers of broadcast messages are generated, therefore, increasing the risk of message collision resulting in lower message delivery rates and increased delivery times. *Intelligent broadcasting* with implicit acknowledgement addresses the problems inherent in naïve broadcasting by limiting the number of messages broadcast for a given emergency event. If the event-detecting vehicle receives the same message from behind, it assumes that at least one vehicle in the back has received it and ceases broadcasting. The assumption is that the vehicle in the back will be responsible for moving the message along to the rest of the vehicles. If a vehicle receives a message from more than one source it will act on the first message only.

B. The vehicle-to-roadside communication configuration (Fig. 2) represents a single hop broadcast where the roadside unit sends a broadcast message to all equipped vehicles in the vicinity. Vehicle-to-roadside communication configuration provides a high bandwidth link between vehicles and roadside units. The roadside units may be placed every kilometer or less, enabling high data rates to be maintained in heavy traffic. For instance, when broadcasting dynamic speed limits, the roadside unit will determine the appropriate speed limit according to its internal timetable and traffic conditions. The roadside unit will periodically broadcast a message containing the speed limit and will compare any geographic or directional limits with vehicle data to determine if a speed limit warning applies to any of the vehicles in the vicinity. If a vehicle violates the desired speed limit, a broadcast will be delivered to the vehicle in the form of an auditory or visual warning, requesting that the driver reduce his speed.

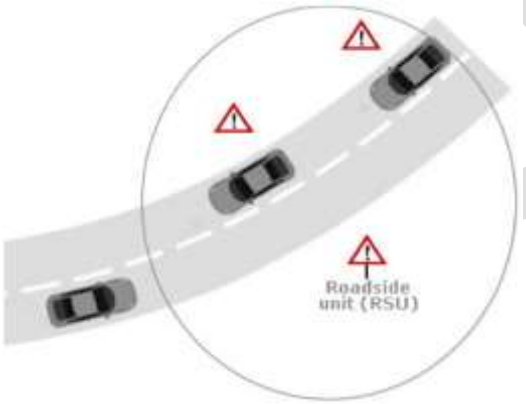

Fig 3: Vehicle-to-roadside communication

C. The routing-based communication configuration (Fig. 3) is a multi-hop unicast where a message is propagated in a multi- hop fashion until the vehicle carrying the desired data is reached. When the query is received by a vehicle owning the desired piece of information, the application at that vehicle immediately sends a unicast message containing the information to the vehicle it received the request from, which is then charged with the task of forwarding it towards the query source.

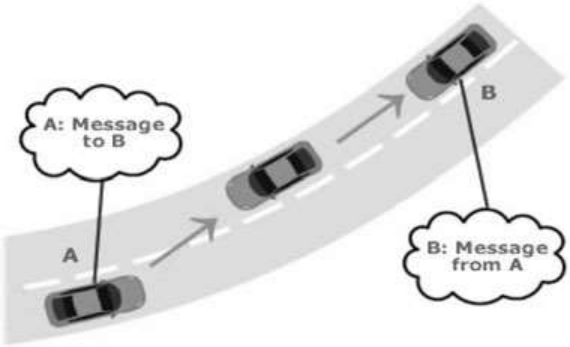

Fig 4: Routing-based communication

LITERATURE SURVEY

There are many solutions provided to achieve location privacy in VANET. We have taken some of them and following are their descriptions:

A. Endpoint Protection Zone (EPZ)

In [1] George Coser et al proposed location based services (LBSs) and designed it in such a way that all the LBS users are clustered by spatial location into endpoint protection zone. Login credentials are shared by all the users from the same EPZ and users remain transmission silent in their EPZ. That means they won't send any query to LBS or send safety message to other vehicles until they left their own EPZ. As no any information is sent through that region adversary or LBS admin cannot identify the user's location. If the LBS admin can correlate source and destination's coordinates, they can easily find the real identity and location of vehicle. This is not possible if a vehicle remains transmission silent in their respected EPZs. Disadvantage of this model is, it is not effective in sparsely dense areas.

B. Fake Point Location Privacy Scheme

[2] Presents the idea of concealment and power variability named Fake Point for the purpose of location privacy. The main concept is to choose a location among the available hotspot. These fake points are considered by mobile devices (MNN) while calculating their transmission signal power. Hence, if one of the attacker's mobile devices is placed at the fake point, then its Received Signal Strength will be same for those mobile devices who selected that FP. In such a way error in mobile network nodes distances, estimated at this FP, increases and made deviations in the adversary's estimation of location and hence the MNN's location privacy is ensured.

C. Clustering Anonymization

In [3] Bidi Ying et al proposed a method called Protecting Location Privacy with Clustering Anonymizatiom (PLPCA) for location based services in vehicular ad hoc network. This PLPCA algorithm converts road network to edge-cluster graph for hiding traffic and road information. It will also offer the clocking algorithm to conceal a target vehicle's location. Clocking algorithm is based on k-anonymity and l-diversity. As per simulation analysis PLPCA has good performance in hiding the road information.

D. Efficient Pseudonym Changing Schemes

In [6] Pseudonym changing schemes considers three factors i.e. age of pseudonym, speed and moving direction of vehicles. Based on these parameters Yeong-Sheng Chen et al developed four mechanisms AD, AD, SD, ADS. Age of pseudonym means the time interval for which pseudonym is used. Vehicle will try to change its pseudonym over a specific time interval. Longer the pseudonym name, less the location privacy. Pseudonym change should be performing while changing the direction of vehicle. All the above mechanisms have better performance.

E. Privacy by Decoy

George Corser et al presents a privacy protocol [9] named PARROT i.e. Position Altered Requests Relayed over Time and Space. It protects the information about location of LBS users. In this method, helper vehicles are called as parrots and the vehicle who wants privacy is known as pirate. Parrot transmits the request to LBS on the behalf of pirate using pirate's login credentials and their own location. In short, parrot sends encrypted message of pirate along with the parrot's location. Therefore, LBS admin cannot identify which location is the location of pirate. The disadvantage of above method is, network congestion overhead increases because of multiple duplicate transmissions of parrots.

F. Pseudonym Changing at Social Spot (KSDP model)

Rongxing Lu et al introduce Pseudonym changing at social spot [4]. Social spots are nothing but the areas where vehicles gather together, for example parking at shopping malls or road intersection when traffic light becomes red. They present the KSDP model in which OBU device in the vehicle has number of anonymous short time keys. These keys are authorized by trusted authority (TA). Keys have not been directly preloaded in the vehicle by TA; instead of that TA provides keys to user- owner of the vehicle. User keeps these keys at home. Whenever user wants to go outside the home for traveling e.g. for fueling, he will supposed to install keys in his vehicle's OBU device. After that when vehicle runs in urban area, these short term keys can be used for transmitting the messages. As authorized keys are not installed in vehicle itself, vehicle thieves cannot generate short term keys and thus mitigate the vehicle theft.

PROPOSED WORK

In this section, we are describing and formalizing different techniques to demonstrate how privacy threat can occurs and our ad-hoc trusted exchange protocol for location privacy. In this paper firstly we are going to design the inference modules as shown in fig.2, and then we will propose the protocol for privacy against these inference modules.

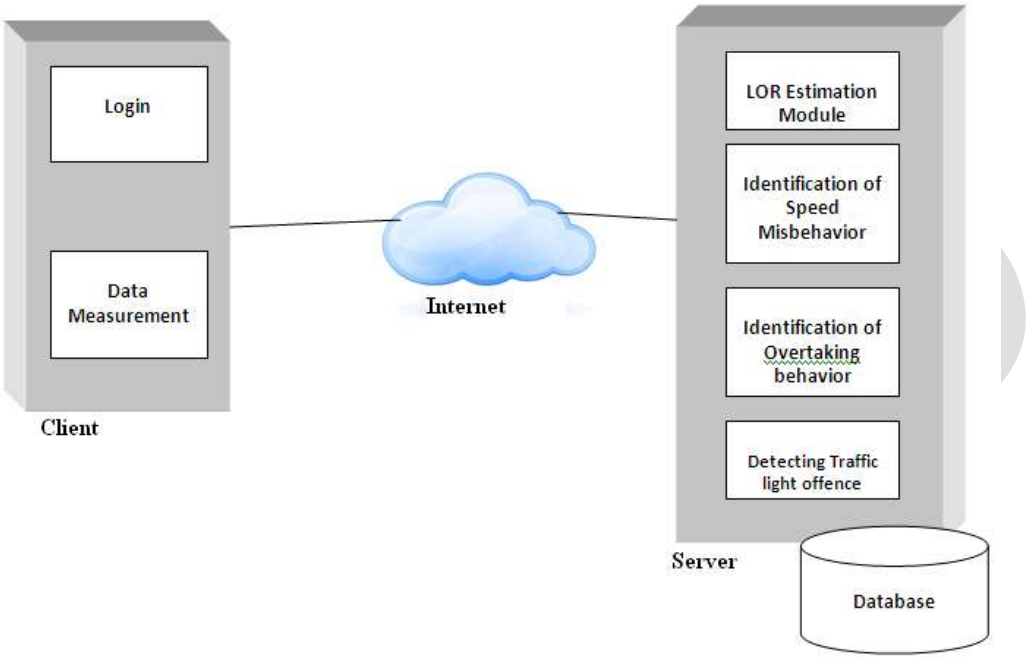

Fig 5: Threat model in our scheme

Whenever LBS user (client) sends request to LBS administrator (which might be the attacker), LBS admin can find the LOR (locality of reference) based on the number of request send by the particular user within a specific time of interval. Attacker also can find the speed of vehicle using monitoring devices and using this information he can try to attempt the attack on vehicle.

A. LOR Based Threat

This module is for estimating the locality of reference. We can find the locality of reference based on number of requests sent by LBS user. We first divide the total time of monitoring T into some time intervals, say where i=1,2,….n. Within the t1 time interval which location is frequently asked by user is calculated and the sampling rate of this can be estimated. Here Sampling rate is nothing but the frequency of changing the location request by the user. If sampling rate will be more than threshold value, user's location is difficult to find whereas if sampling rate will be less i.e. if user requests for the same location multiple times, it will be easy to find his location. LOR based threat is shown in fig. 6.

B. Speed Misbehavior Threat

Once we get coordinates of user sending query and his time to reach the desire location, we can get the speed of that user. As VANET is self organized network, we assume all vehicles should travel cooperatively by setting up same speed. If vehicle appears moving with dissimilar speed, it means it might be an adversary. We can examine the variations in vehicle's speed to uncover the adversary.

C. Threat by Overtaking Behavior

Overtaking behavior of vehicle can be computed by continuous verification of changing coordinates of vehicle. If the vehicle's coordinates move towards left it will be ok but if they moves towards right, it indicates the overtaking misbehavior of vehicle.

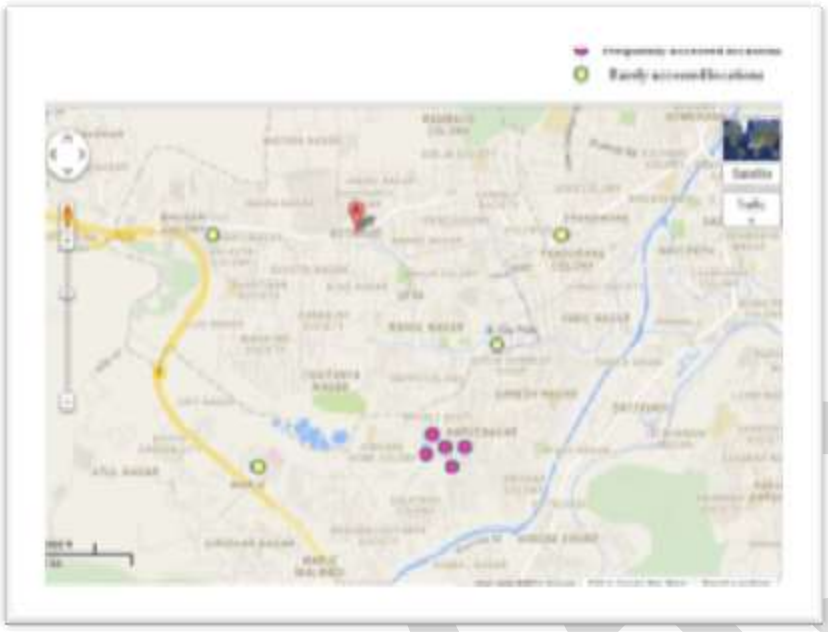

Fig 6: LOR based threat

D. Ad-hoc Trusted Information Exchange

This system consists of ITS (Identity & trust server) and TAS (Trusted Authority Server). ITS is used for verification of vehicle's and user's identity and trust level. As we discussed we can achieve location privacy of the person or the node or the system using this algorithms in VANET.VANET has very huge application area and so the threat to the system. Let us discuss the scenario. This VANET can be used by the daily commuter to get private car providing as well as professional cab service (TSP i.e. Transport service provider). Although there is no need of sharing exact location. The devices in the close proximity will have the share of the information. The request for the commute will be routed through identity and trust verification server to the cars or whatever needed vehicle in nearby vicinity. The identity of both parties will be introduced to one another only when those are in 100 meters of close proximity. All the devices get authenticated by the identity and trust verification. Services are the trusted services who has verified and reliable database of the all users so as to verify users and give trustworthy communication in between the two parties.

CONCLUSION

VANET is an application of MANET which can be formed by connecting vehicles with internet access by drivers. It plays important role in traffic management and safety driving. Location Privacy is nothing but the special type of information privacy which concern the claim of individuals to determine for themselves when, how, and what extent location information about them is communicated to others. VANET has very huge application area and so the threat to the system. As we have discussed we can achieve the location privacy of the person or node using the above method in VANET. As in proposed method a person won't share the location with the service provider hence achieve the location privacy.

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SECURE E-PAY USING TEXT BASED STEGANOS AND VISUAL CRYPTOGRAPHY

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ABSTRACT— A high-speed prosperity in E-Commerce market has been witnessed in recent time throughout the world. With ever increasing popularity of online shopping, Debit or Credit card fraud and personal information security are major concerns for customers, merchants and banks. The main motive of this project is to provide high level security in E-Commerce applications and online shopping. This project minimizes detailed information sharing between consumer and online merchant but enable successful fund transfer thereby safeguarding consumer information and preventing misuse of information at merchant's side. This is achieved by the introduction of Central Certified Authority (CA) and combined application of Steganography, Visual Cryptography and Digital Signature for this purpose .

KEYWORDS—E-Commerce, Online Shopping, Identity Theft, Phishing, Steganography, Visual Cryptography, Digital Signature

I. INTRODUCTION

Online shopping is the retrieval of product information via the Internet and issue of purchase order through electronic purchase request, filling of credit or debit card information and shipping of product by mail order or home delivery by courier. Identity theft and phishing are the common dangers of online shopping.

Identity theft is the stealing of someone's identity in the form of personal information and misusing that information for making purchase and opening of bank accounts or arranging credit cards. In 2012 consumer information was misused for an average of 48 days as a result of identity theft. Phishing is an illegitimate mechanism that employs both social engineering and technical subterfuge to steal consumers' personal identity data and financial account credentials. Payment Service, Financial and Retail Service are the most focused industrial sectors of phishing attacks. Secure Socket Layer (SSL) encryption inhibits the interference of consumer information in transit between the consumer and the online merchant. However, one must still trust merchant and its employees not to use consumer information for their own purchases and not to sell the information to others. In this paper, a new method is proposed, that uses text based steganography and visual cryptography, which minimizes information sharing between consumer and online merchant but enable successful fund transfer from consumer's account to merchant's account thereby safeguarding consumer information and preventing misuse of information at merchant side.

The method proposed is specifically for E-Commerce but can easily be extended for online as well as physical banking. Steganography is the art of hiding of a message within another so that hidden message is indistinguishable. The key concept behind steganography is that message to be transmitted is not detectable to casual eye. Text , image , video , audio are used as a cover media for hiding data in steganography. In text steganography, message can be hidden by shifting word and line , in open spaces , in word

sequence . Properties of a sentence such as number of words, number of characters, number of vowels, position of vowels in a word are also used to hide secret message. The advantage of preferring text steganography over other steganography techniques is its smaller memory requirement and simpler communication .Visual Cryptography (VC), is a cryptographic technique based on visual secret sharing used for image encryption. The main motive of the proposed system prescribed in this paper is to handle applications that require a high level of security, such as E-Commerce applications, core banking and internet banking. This can be done by using combination of two applications: BPCS Steganography and Visual Cryptography for safe online shopping and consumer satisfaction.

The rest of the paper is organized as follows: Section II gives brief description of experimental/ simulation i.e. methodologies, algorithms, architecture, work flow and use case diagrams. Section III contains results/discussions i.e. results of text based steganography and visual cryptography algorithms. Section IV concludes the paper

II. EXPERIMENTAL/ SIMULATION

In the proposed solution, information submitted by the customer to the online merchant is minimized by providing least information that will only verify the payment made by the said customer from its bank account. This is achieved by the introduction of a central Certified Authority (CA) and combined application of BPCS Steganography and Visual Cryptography. The information received by the merchant can be in the form of account number related to the card used for shopping. The information will only validate receipt of payment from authentic customer.

FEATURES OF PROPOSED SYSTEM

- Proposed method minimizes customer's detailed information sent to the online merchant. So even if a breach takes place in merchant's database, customer doesn't get affected.
- Certified Authority acts as a fourth party thereby enhancing customer's satisfaction and security further.
- Usage of BPCS Steganography ensures that the CA does not know customer authentication password thus maintaining customer privacy. It provides a higher level of security and a high information hiding capacity.
- Since customer data is distributed over 3 parties, a breach in single database can easily be contented. Linkguard Algorithm is efficient for phishing prevention.
- The 2-out-2 feature of visual cryptography provides effective collaboration of images at the Certified .

METHODOLIGIES

TO PREVENT PHISHING

- Microsoft Phishing Filter uses a combination of Microsoft's URL Reputation Service (URS) and local heuristics built into the IE 7 browser.
- Netscape Browser 9.0 includes a built in phishing filter which relies solely on a blacklist, which is maintained by AOL and updated frequently.
- McAfee's Site Advisor product is a free stand-alone anti phishing product. Suspect or blocked sites are identified by a popup balloon and by color and text changes in the button.

STEGANOGRAPHY

- **Text-Based Steganography**: It makes use of features of English Language like inflexion, fixed word order and use of periphrases for hiding data rather than using properties of a statement .
- **BPCS Steganography**: The information hiding capacity of a true color image is around 50% . A sharpening operation on the dummy image increases the embedding capacity quite a bit. Randomization of the secret data by a compression operation makes the embedded data more intangible. The steganography program for each user is easy. It further protects against eavesdropping on the embedded information. It is most secured technique and provides high security.

VISUAL CRYPTOGRAPHY

- **Halftone visual cryptography**: This novel technique achieves visual cryptography via half toning. Based on the blue-noise dithering principles, this method utilizes the void and cluster algorithm to encode a secret binary image into halftone shares (images) carrying significant visual information.
- **2-0ut-2 Visual Cryptography**: Every secret pixel of the original binary image is converted into four sub pixel of two share images and recovered by simple stacking process. This is equivalent to using the logical OR operation between the shares .

ALGORITHMS

BPCS (Bit-Plane Complexity Segmentation) STEGANOGRAPHY ALGORITHM

The algorithm can be described in concise steps as follows .

- Convert the carrier image (of any file-format) from PBC (Pure Binary Code) to CGC (Canonical Grey Code) system and in png format.
- Perform the histogram analysis.
- After that bit-plane analysis is performed.
- Perform size-estimation i.e. calculate the places where we can store the secrete image.
- Perform bit plane complexity segmentation on image i.e. embed secrete blocks into carrier image.
- After embedding mail that image to another user.
- For extracting the embedded image performs de-steganography which is exactly opposite to steganography.

VISUAL CRYPTOGRAPHY ALGORITHM

- Visual cryptography is a type of cryptography which allows the visual information to be encrypted in such a way that their decryption can be performed by human visual system.
- Every secret pixel of the original binary image is converted into four sub pixel of two share images and recovered by simple stacking process.
- This is equivalent to using the logical OR operation between the shares .

LINKGUARD ALGORITHM

- LinkGuard works by analyzing the differences between the visual link and the actual link.
- It also calculates the similarities of a URI with a known trusted site.

ARCHITECTURE

EXISTING SYSTEM

The traditional method of online shopping involves customer or end-user selecting items online shopping portal and directing it to the payment gateway. Different payment gateways have different mechanism of storing detailed information of consumer. There have been recent high profile breaches such as in Epsilon, Sony's PlayStation Network and Heartland Payment Systems show that card holders' information is at risk both from outside and inside.

DRAWBACK

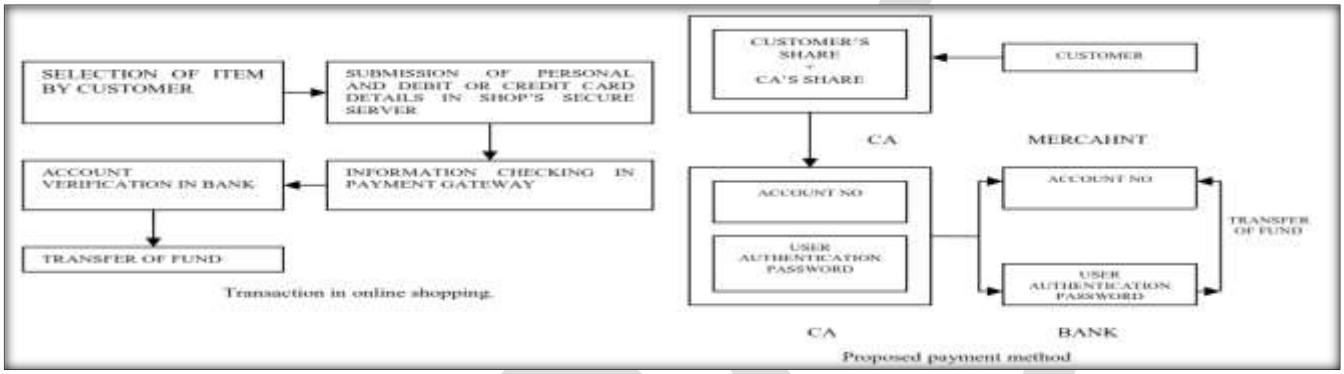
In the traditional system mentioned above, customer is not sure whether his PIN No and CVV No is sent to the merchant. One still has to trust the merchant and its employees to use card information for their own motives. This representation doesn't show high level security. In these traditional systems, there is no additional non-functional requirement of phishing mechanism which can be harmful and might lead to employment of social engineering and technical subterfuge. Thus, in the proposed system mentioned later in this paper would ensure better security and satisfaction of consumer or other transaction stakeholders.

PROPOSED SYSTEM

In the proposed solution, information submitted by the customer to the online merchant is minimized by providing only minimum information that will only verify the payment made by the said customer from its bank account. This is achieved by the introduction of a central Certified Authority (CA) and combined application of steganography and visual cryptography. The information received by the merchant can be in the form of account number related to the card used for shopping. The information will only validate receipt of payment from authentic customer.

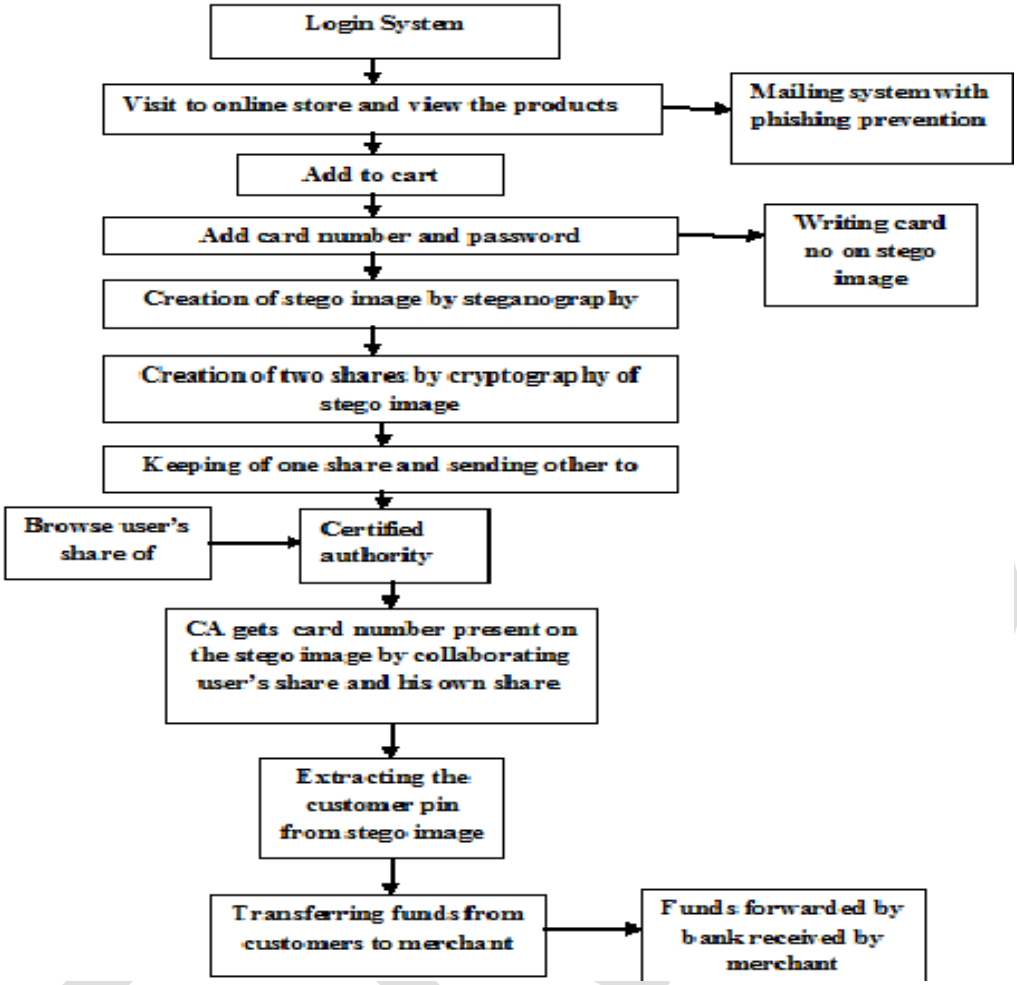
In the proposed method, customer unique authentication password in connection to the bank is hidden inside a cover text using the text based steganography method as mentioned in section IV. Customer authentication information (account no) in connection with merchant is placed above the cover text in its original form. Now a snapshot of two texts is taken. Fromthe snapshot image, two shares are generated using visual cryptography.

Now one share is kept by the customer and the other share is kept in the database of the certified authority. During shopping online, after selection of desired item and adding it to the cart, preferred payment system of the merchant directs the customer to the Certified Authority portal. In the portal, shopper submits its own share and merchant submits its own account details. Now the CA combines its own share with shopper's share and obtains the original image. From CA now, merchant account details, cover text are sent to the bank where customer authentication password is recovered from the cover text. Customer authentication information is sent to the merchant by CA. Upon receiving customer authentication password, bank matches it with its own database and after verifying legitimate customer, transfers fund from the customer account to the submitted merchant account. After receiving the fund, merchant's payment system validates receipt of payment using customer authentication information.



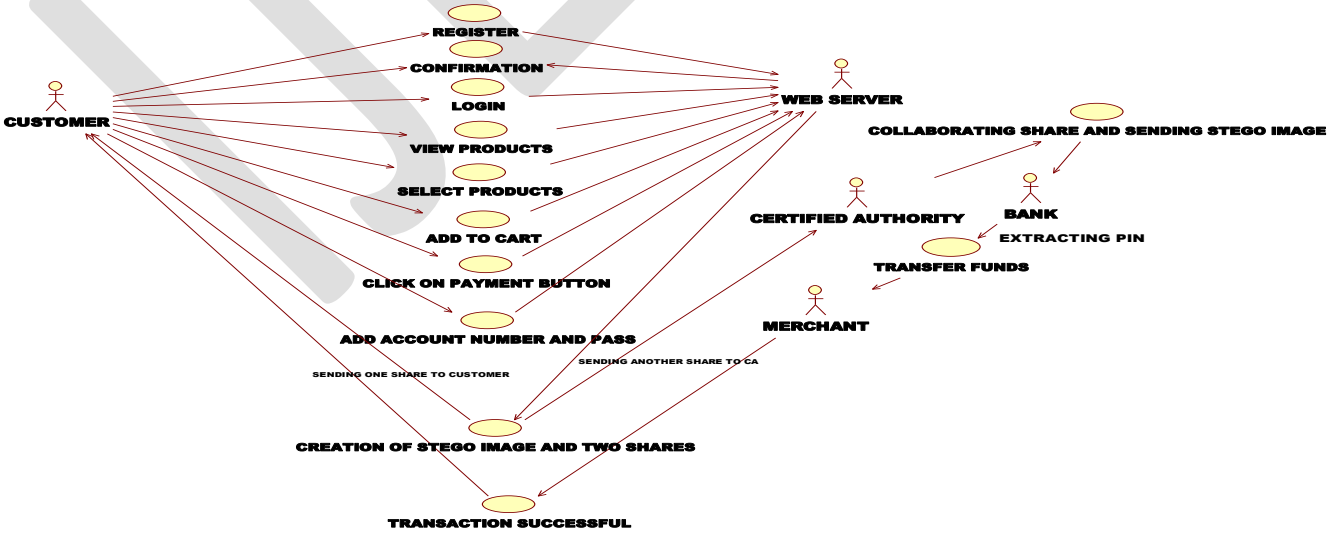
WORKFLOW DIAGRAM

In our system of online shopping, user logs in and enters into the online store to view the products. When he/she adds the item to the cart, he/she will be entering the card no and unique authentication password. This information will be created as a stego or stegno image using BPCS Steganography. 2-out-2 algorithm of visual cryptography will create two shares out of the stegno image. (Customer's share and CA's share). CA browses user's share and generates the card no which is sent to the bank so as to extract the customer's PIN (de-steganography). Finally fund will be transferred from the bank to the merchant.

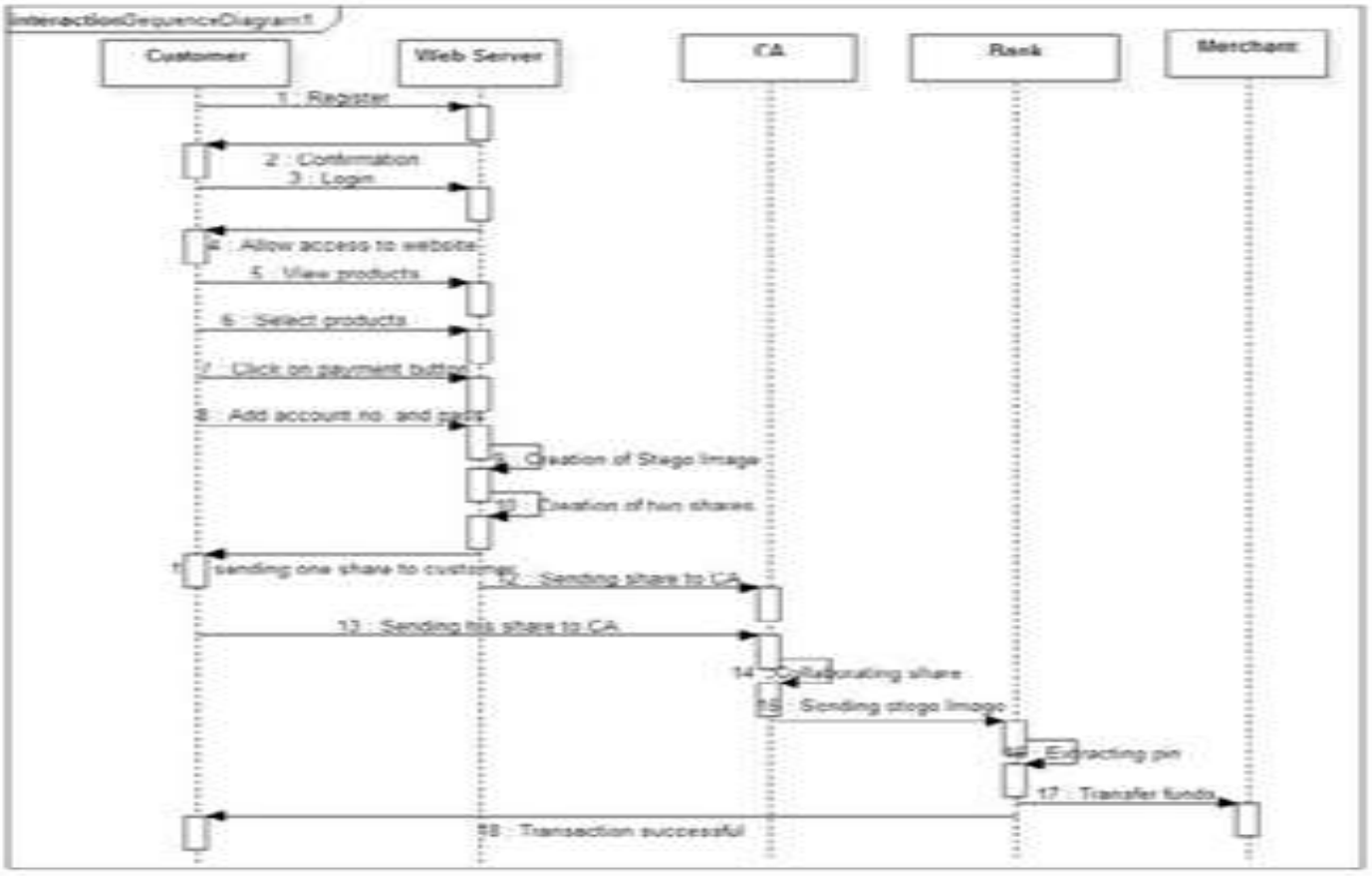


USE CASE DIAGRAM

The Use Case Diagram shows the interaction between the elements.



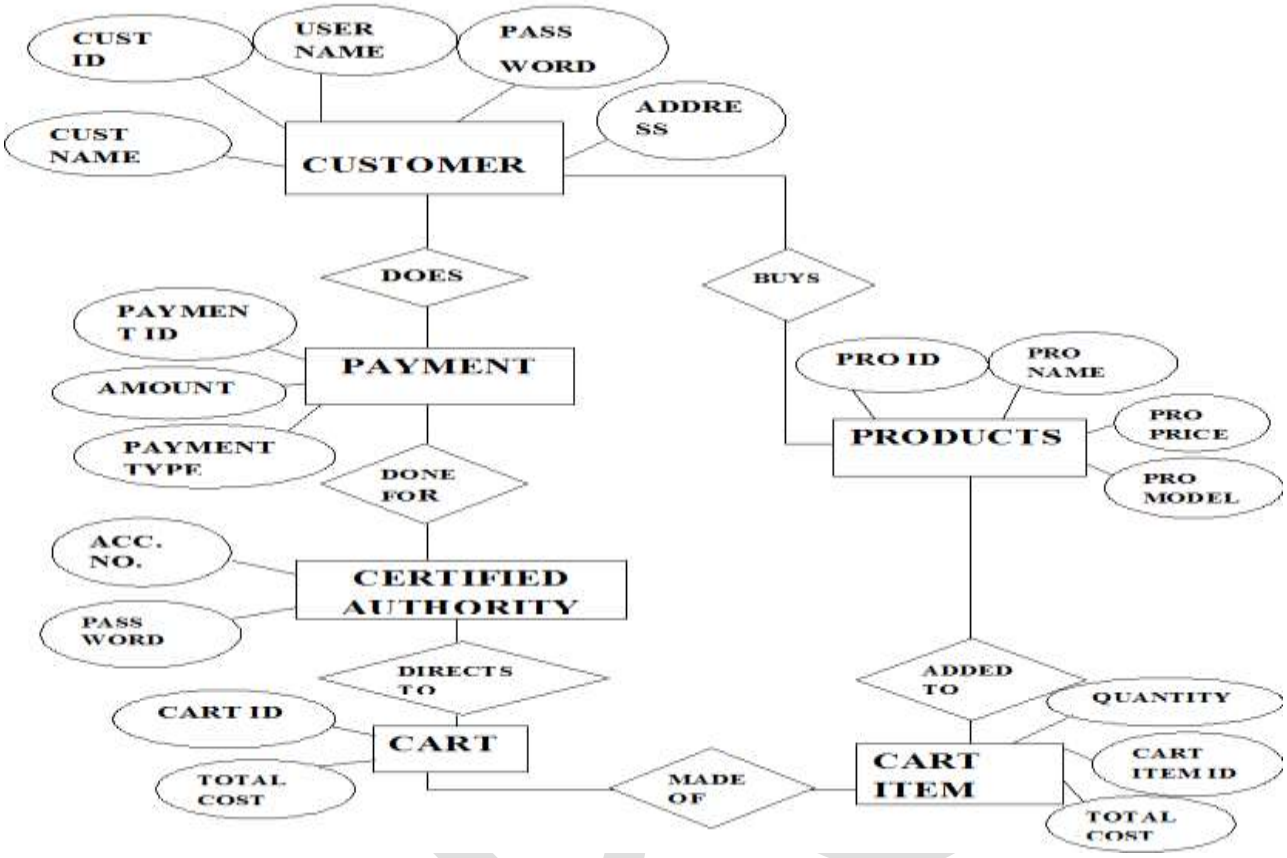
SEQUENCE DIAGRAM



The Sequence is as follows: The user registers with the web server and gets the confirmation.Now the user logs in views and selects the available products. The user then clicks on Add To Cart button.After clicking on the payment button the web server takes a snapshot of customer unique authentication password and customer authentication information.Stego image and Two shares are created by using Visual Cryptography algorithm. One share is sent to customer and another share is sent to Certified Authority. The Certified Authority collaborates the share and sends the stego image to the bank. The bank extracts the pin and performs successful fund transfer between the customer and the merchant.

ENTITY RELATIONSHIP DIAGRAM

The ER Diagram depicts the graphical relationship between the entities and their relationships among them. The entities contains number of attributes. Customer, Products, Cart Item, Cart, Certified Authority and Payment acts as entities. Two entities are connected by using the relationship symbol. Customer acts as the entity and the attributes of Customer are CUST NAME, CUST ID, USER NAME, PASSWORD, ADDRESS. The Customer after filling the registration form buys products and adds to cart. The add to cart items will be directed to Certified Authority.



III. RESULTS AND DISCUSSIONS

TEXT BASED STEGANOGRAPHY METHOD

- Proposed text based steganography uses characteristics of English language such as inflexion, fixed word order and use of periphrases for hiding data rather than using properties of a sentence.
- Number assignment method is used to maximize no of letters in a particular assigned number group which in turn gives flexibility in word choosing and ultimately results in suitable sentence construction**.**

A. ENCODING:

- Representation of each letter in secret message by its equivalent ASCII code
- Conversion of ASCII code to equivalent 8 bit binary number.
- Division of 8 bit binary number into two 4 bit parts.
- Choosing of suitable letters from table 1 corresponding to the 4 bit parts.

TABLE I. NUMBER ASSIGNMENT

Letter	*Number assigned*	*Letter*	*Number assigned*
E	**15**	**M**	**7**
A	**14**	**H**	**7**
R	**13**	**G**	**6**
I	**13**	**B**	**5**
O	**12**	**F**	**4**
T	**11**	**Y**	**4**
N	**11**	**W**	**3**
S	**10**	**K**	**3**
L	**10**	**V**	**3**
C	**9**	**X**	**2**
U	**8**	**Z**	**2**
D	**8**	**J**	**1**
P	**7**	**Q**	**0**

- Meaningful sentence construction by using letters obtained as the first letters of suitable words.
- Encoding is not case sensitive.

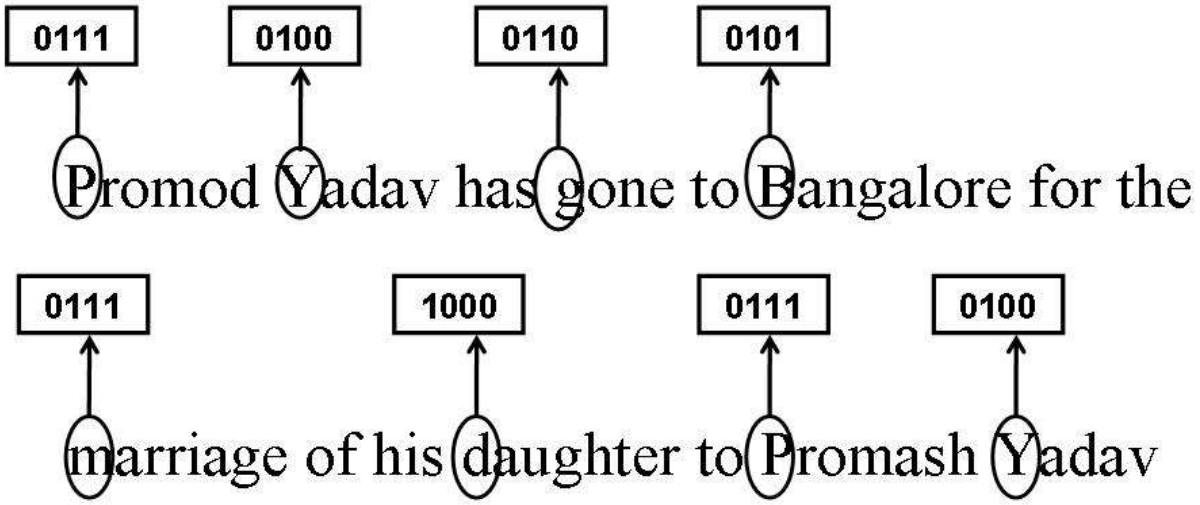
B. DECODING

- First letter in each word of cover message is taken and represented by corresponding 4 bit number.
- bit binary numbers of combined to obtain 8 bit number.
- ASCII codes are obtained from 8 bit numbers.
- Finally secret message is recovered from ASCII codes.

C. RESULT

To implement the above text based steganography method, a secret message is considered as “text”.

Text = 01110100011001010111100001110100



VISUAL CRYPTOGRAPHY ALGORITHM

- Visual cryptography is a type of cryptography which allows the visual information to be encrypted in such a way that their decryption can be performed by human visual system.
- Every secret pixel of the original binary image is converted into four sub pixel of two share images and recovered by simple stacking process. The two apparently random images can now be combined using an exclusive-or (XOR) to re-create the original image.

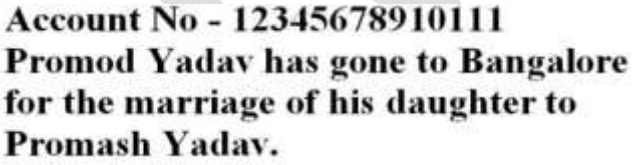


FIGURE 3.2.1 SNAPSHOT ACCOUNT NO AND COVER TEXT

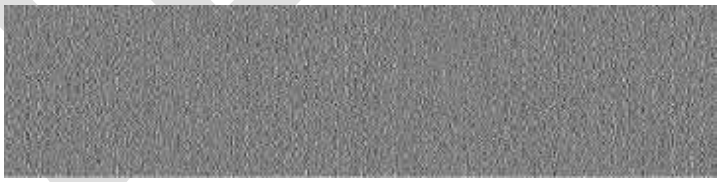


FIGURE 3.2.2SHARE 1 KEPT BY CUSTOMER

FIGURE 3.2.3 SHARE 2 KEPT BY CA

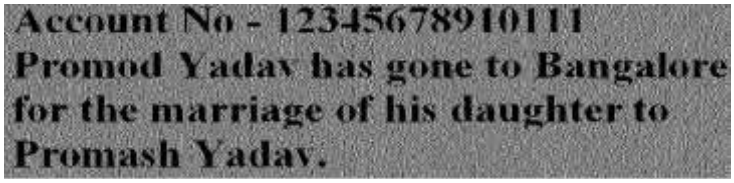


FIGURE 3.2.4 OVERLAPPING OF SHARE 1 AND SHARE 2

IV. CONCLUSION

In our project, a payment system for online shopping is proposed by combining BPCS steganography and 2-out-2 visual cryptography that provides customer data privacy and prevents misuse of data at merchant's side. BPCS Steganography is really effective against eavesdropping and has a high information hiding capacity as compared to traditional steganography approach. The method is concerned only with prevention of identity theft and customer data security. The main aim is consumer satisfaction and authorized merchant-bank interaction for fund transaction. In comparison to other banking application which uses steganography and visual cryptography are basically applied for physical banking, the proposed method can be applied for E-Commerce with focus area on payment during online shopping as well as physical banking.

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A Review On Implementation of Neuro-fuzzy PID Controller Using FPGA

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Abstract-Neuro Fuzzy (NF) computing is a popular framework for solving complex problems. The combination of neural networks with fuzzy knowledge base helps to reduce the searching space and time for achieving optimal solution. While Proportional-Integral-Derivative controllers are universal control structure and have widely used in Automation systems, Conventional PID controllers are not well for time-delayed linear and nonlinear systems. Thus Neuro-Fuzzy PID Controller is designed to enhance its performance evaluation parameter**.** This paper describes the design of Neuro-Fuzzy PID Controller using Field Programmable Gate Array. The implementation of Neuro-Fuzzy PID controller using FPGA will help for compactness to improve its speed and accuracy.

Keywords- Neuro-Fuzzy System, PID controller, FPGA, ANN, Fuzzy system, ANFIS, VHDL.

INTRODUCTION

The Fuzzy Logic is closer as to human thinking and in language than conventional logical systems [1]. Fuzzy hardware systems have been developed, including fuzzy rules bonds, fuzzy interface devices, and optical fuzzy inference devices [1]. Fuzzy logic is one of the successful applications in the control engineering field which can be used to control various parameters of the real time systems. The main problem to overcome in applications is the difficulty or uncertainty in fuzzy modeling of the linguistic structure for process [1]. While Artificial Neural Networks are mathematical models inspired from our understanding of biological nervous system [2]. They are attractive as computation devices that can accept a large number of inputs and learn solely from training samples [2]. As mathematical models for biological nervous system, artificial neural networks are useful in establishing relationships between input and out of any kind of the system [2]. That is neural network is collection of artificial neuron. Neural network can learn from data. However, the knowledge learned by neural networks has been difficult to understand .While; it is easy to understand the fuzzy rule based models because it uses linguistic terms and the structure of IF-THEN rules. However, fuzzy logic by itself cannot learn. Since neural networks can learn, it is natural to hybrid fuzzy system and neural network.

Hybrid neuro-fuzzy system (NFS) combines artificial neural network and fuzzy logic in a synergetic way [3]. Fuzzy system provide a framework to represent imprecise information and to reason with this kind of information, while neural networks enhance fuzzy systems[3] with the capability of learning from input-output samples; learning is used to adapt parameters of the fuzzy system as a membership function or rule[3]. Integrating these two methodologies, in control can lead to better technologies that take advantage of the strengths of each methodology and at the same time overcome some limitations of individual techniques [2].

Conventional proportional-integral-derivative (PID) controllers are well known and have been extensively used for industrial automation and process control. PID controllers are simple, easy to understand and implement in hardware and software, and do not require a process model for initialization [5] or operation [5]. Many nonlinear processes can satisfactory controlled using PID controllers provided that controller parameters are tuned well. The implementation of PID controllers using microprocessors and DSP chips is old and well known, whereas very little works can be found in the literature on how to implement PID controllers using FPGAs.

The Field Programmable Gate Array (FPGA) is one of the most powerful chips among the programmable electronic devices. The preparation and execution of the code with such elements is unique. In the case of FPGA hardware reconfiguration is realized, and during the implementation of an algorithm, the connection of logic elements is changed in the structure of a chip. Thus programming of the FPGA means hardware configuration of the chip. In result parallel calculations are possible. Low costs and high performance lead to many applications of FPGAs in industrial systems.

LITERATURE REVIEW

The literature survey carried out related to impact in the study of Fuzzy system, neural network, Neuro-Fuzzy system and PID controller.

Amit Kr. Singh, Manjari Mehrotra and AK Pandey[1],This paper describes the Self Tuning Fuzzy PID controller developed to improve the performance of the plants having 2nd order, 3rd order and 5th order system. Here, the methodology of the fuzzy logic controller appears very useful when the processes are too complex for analysis by conventional quantitative techniques or when the available sources of information are interpreted qualitatively, inexactly. The performance of the plants has improved significantly as compared to conventional PID controller.

Ines del Campo, Javier Echanobe, Guillermo Bosque, and Jose Manuel Tarela [3], here the design of two different on-chip approaches are presented: a high-performance parallel architecture for offline training and a pipelined architecture suitable for online parameter adaptation. This approach is suitable for developing efficient implementations for already known application areas of embedded NFS.

Abdesselem Trimeche, Anis Sakly, Abdelatif Mtibaa, and Mohamed Benrejeb [4], in this paper a digital PID controller implemented in FPGA technology is a configurable controller in terms of latency, resolution, and parallelism. Implementing PID controllers on FPGAs features speed, accuracy, power, compactness, and cost improvement over other digital implementation techniques.

Emad Ali [5], here an online tuning method based on time-domain performance specification is proposed to determine the parameters of standard PI controllers. The method uses a process model to predict the future output and to detect the specification violation. Numerical testing of the algorithm on a CSTR and on an evaporator example shows that better performance can be achieved for both set point change and load disturbance.

J.J Blake ,L.P. Magurie,T.M Mc Ginnity,B. Roche,and L.J. McDaid[6], This paper discuss the implementation of fuzzy system, neural network and fuzzy neural network[FNN] comparatively using FPGA.The drawback of this approach is cost effective for high volume applications.

.Daijin Kim [7], implemented fuzzy logic controller on the reconfigurable FPGA system where the FPGA chip is consequently reconfigured with one module at a time by using the run time configuration method. The FPGA implementation for proposed FLC can be applicable to the real time control because it can compute fuzzy operation very quickly.

Chuen Chain Lee [8], here general methodology for constructing an FLC and assessing its performance is described here fuzzy control is based on a fuzzy logical system which is much closer in the spirit of human thinking and natural language than traditional logic system. The consistency of rules may be improved through the use of fuzzy clustering of fuzzy control rules.

Ronald R. Yager, and Dimitar P. Filev[9], here correspondence addresses the problems of structure and parameter identification of fuzzy models, This allows us to simplify the problem of structure identification by replacing identification of membership functions of input variables with identification of the centers of cluster-like regions. The unified approach to fuzzy modelling developed in correspondence combines the problems of structure and parameter identification of fuzzy models.

Vikram Chopra, Sunil K. Singla, Lillie Dewan[10] , This paper presents the intelligent methods based on fuzzy logic, artificial neural network (ANN), adaptive neuro fuzzy inference system (ANFIS) and genetic algorithms (GA) for tuning a PID controller. Simulation results show that the best performance has been achieved by ANFIS in terms of settling time and overshoot while the moderate performance has been given by ANN tuned PID controller as it reduces the overshoot and undershoot to a great amount in comparison to the Zeigler Nichols method.

Supah sahin, Yasar Becerikli, and Suleyman Yazici [11], implemented neural network in hardware using FPGA, Digital system architecture is presented using Very High Speed Integrated Circuits Hardware Description Language (VHDL) and is implemented in FPGA chip. The resultant neural network are modular,compact,and efficient and the number of neuron, no. of hidden layers and no. of inputs can be easily changed.

A.Muthu ramalingam, S Himavathi, and E Srinivasan [12], here neural network is implemented with its issues and applications. Using the proposed method of implementation a neural network based application,a Space vector modulator for a vector-controlled drive is presentedThe NN based SVM is designed to be independent for inverting switching frequency & bit precision is investigated.

Al-Kazzaz, S.A, and Khalil, R.A [13], This paper proposes three different architectures for implementing an artificial neuron model, with three types of processing techniques: serial, partial parallel, and full parallel. A H/W implementation results in a higher performance with lower flexibility, while the hardware/software Co-design Implementation shows a moderate performance, flexibility, and usage area.

Prof. Vikas Gupta,Dr Kavita Khare , Dr R. P. Singh[14],This paper explains a method for the design and implementation of multiplierless digital PID controller based on Field Programmable Gate Array (FPGA) device. Implementing the multiplierless PID controller on FPGA gives better rise time as well as settling time as seen in the results. Also implementing PID controller on FPGA features speed, accuracy, power, compactness, and cost improvement.

Azar,and Ahmad Taher[15], here different methods are presented that used for structure and parameter identification in neuro-fuzzy systems, fuzzy system that is constructed by expert knowledge alone will usually not perform as required when it is applied because the expert can be wrong about the location of the fuzzy sets and the number of rules. By supporting these various levels of transparency, the proposed neuro-fuzzy modelling methodology significantly aids the process of knowledge discovery and model validation.

Jyh-Shing Roger Jang, and Chuen-Tsai Sun [16], This paper introduces the design method for ANFIS for both fuzzy system and neural network in modeling and control application with addressing the future approaches for neuro-fuzzy system. The modeling problem includes structure determination problem.

Hideyuki Takagi[17], This works proposes the ease of fusing NN+FS technologies based on the similarities of the data flow network structures and the non-linearity realization strategies of NNs and FSs.This technology has become a mainstay feature in product development.

S.R. Khuntia, K.B. Mohanty, S. Panda and C. Ardil [18], here two Fuzzy logic based controllers namely; Fuzzy control and Neuro-fuzzy control are proposed and the performance these controllers are compared with both P-I and I-P controllers.A Neuro-Fuzzy controllers can replace P-I, I-P and Fuzzy controllers for the speed control of dc motor drives.

Rajesh Nema, Rajeev Thakur,and Ruchi Gupta[19] , In this paper, work is focused in designing on building a multi-channel PID controller by Field Programmable Gate Arrays (FPGAs). To overcome the hardware complexity by the use of more processors for multi channel, we are using single PID controller for multi channel.It Minimize the cost of overall system by eliminating the PWM Modulator and A/D Convertor which give advantages over Power Consumption and Delay.

Rahib Hidayat Abiye [20], This paper presents the development of recurrent neural network based fuzzy inference system for identification and control of dynamic nonlinear plant. The learning capability of RNFIS allows automatically construct itself and to deal with non-stationary plants. The simulation result of identification and control systems based on RNFIS are compared with other types of neural network based system. The performance of RNFIS system is better than NFIS and RNN system. Result of comparative estimation demonstrates the efficiency of presented approach.

James G. Eldredge, and Brad L. Hutchings [21], Here it implements the popular back propagation training algorithm as three distinct time-exclusive FPGA configurations: feed-forward, back propagation and update which has been successfully implemented on FPGA. The run-time reconfiguration can be used to implement practical systems that use FPGA resources more effectively and with more exibility .

A.Manzoul, and D.Jayabharathi [22], This paper explores the use of FPGA technologies to implement FLCs with two methodologies logic synthesis of the boolean equations describing the controller I/O, O/P relations. The second is hardware to implement the fuzzy algorithm with CAD tools. The implementation will be free of design errors.

Nazeih M. Botros, and M.Abdul-Aziz [23], This paper describes hardware implementation of a fully digital and fully interconnected feed forward back propagation artificial network using Xilinx FPGAs. Reconfigurability and adaptability are the main features of this hardware.

Fares Sassi , Mehdi Abbes, Abdelkader Mami [24], This paper proposes an implementation of a synthesizable Very High Speed Integrated Circuits Description Language program of Proportional-Integral-Derivative controller on a map XC3S700A Xilinx Starter Kit using the Xilinx ISE 10.1 software. In the current investigation, an implementation of PID controller on a map XC3S700A, FPGA-based, is performed by writing a synthesizable VHDL integer program. The use of integer type provides good results because it solves the over flow problems during the computations.

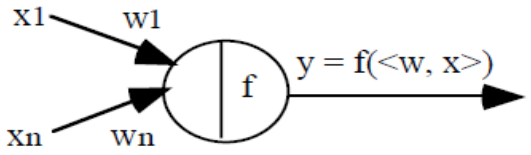
Ansgar P. Ungering, Dieter Herbst, Anselm Weyergraf,and Karl Goser[25], This paper presents an architecture of a mix mode fuzzy controller architecture with new idea to use the pointers instead of analog values and the prototype has been implemented using FPGA. The advantages are that there is no need for A/D and D/A converters and that the controller is fully programmable.

From the survey of the available literature,it would be concluded that FPGA have become an alternative solution for the realization of digital control systems, previously dominated by the general purpose microprocessor systems and DSP chips.

METHODOLOGY

Neuro-Fuzzy System:-

Consider a simple neural net in shown in Figure below:-



All signals and weights are real numbers. The input neurons do not change [26] the input signals so their output is the same as their input. The signal xi interacts with the weight [26] wi to produce the product pi = wixi, i = 1, . . . , n. The input information pi is aggregated, by addition, to produce the input [26]

net = p1 + · · · + pn = w1x1 + · · · + wnxn,

to the neuron. The neuron uses its transfer function *f*, which could be a sigmoidal function,

$$f(t) = \frac{1}{1+e^{-t}}$$

to compute the output

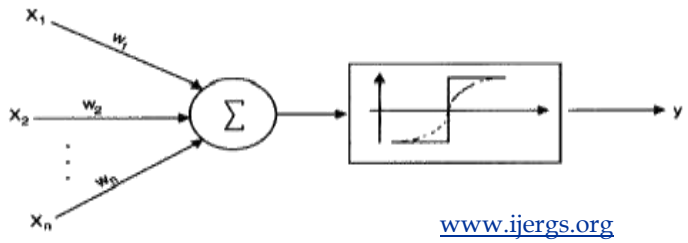
y = f(net) = f(w1x1 + · · · + wnxn).

This simple neural net, which employs multiplication, addition, and sigmoidal *f*, will be called as regular (or standard) neural net.[26]

A hybrid neural net is a neural net with crisp signals and weights and crisp transfer function. However, (i) we can combine xi and wi [26] using some other continuous operation; (ii) we can aggregate the pi's with some other

other continuous function; (iii) f can be any continuous function from input to output.[26] We emphasize here that all inputs and outputs and the weights of a hybrid neural net are real numbers taken from the unit interval[26]. A processing element of a hybrid neural net is called fuzzy neuron.

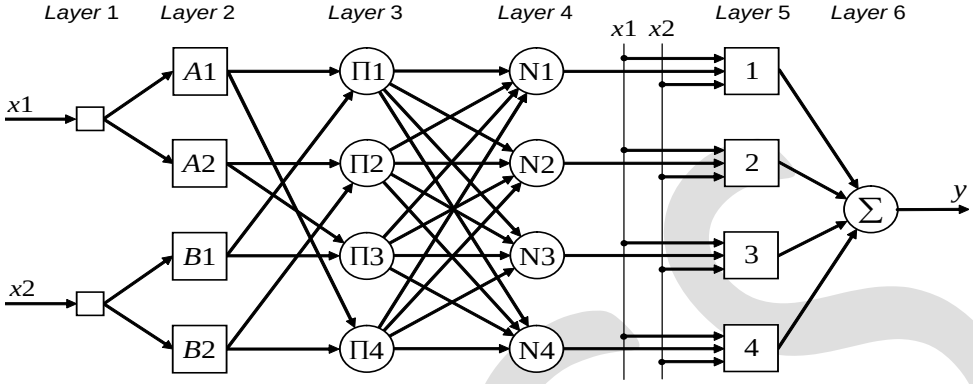
Fuzzy model of artificial neuron [27] can be constructed by using fuzzy operations at single neuron level [27]



y= g(w.x)

x = (x1, x2,… xn); w= (w1, w2,… wn [27]

ANFIS: Adaptive Neuro-Fuzzy Inference System [26]



Layer 1 is the input layer. Neurons in this layer simply pass external crisp signals to Layer 2.

Layer 2 is the fuzzification layer [28] neurons in this layer perform fuzzification while for Jang's model fuzzification neurons have a bell activation function [28].

Layer 3 is the rule layer. Each neuron in this layer corresponds to a single Sugeno-type fuzzy rule [28]. A rule neuron receives inputs from the respective fuzzification neurons and calculates the firing strength of the rule it represents [28]. In an ANFIS, the conjunction of the rule antecedents is evaluated by the operator product [28]. Thus the output of neuron i in Layer 3 is obtained as [28],

$$y_i^{(3)} = \prod_{j=1}^{k} x_{ji}^{(3)} \qquad y_{\Pi 1}^{(3)} = \mu_{A1} \times \mu_{B1} = \mu_1,$$

where the value of μ_1 represents the firing strength or the truth value of Rule 1[28].

Layer 4 is the normalisation layer each neuron [28] in this layer receives inputs from all neurons in the rule layer and calculates the normalised firing strength of a given rule [28].

The normalised firing strength is the ratio of the firing strength of a given rule to the sum of firing strengths of all rules [28]. It represents the contribution of a given rule to the final result. Thus, the output of neuron i in Layer 4 is determined as [28],

$$y_i^{(4)} = \frac{x_{ii}^{(4)}}{\sum_{j=1}^{n} x_{ji}^{(4)}} = \frac{\mu_i}{\sum_{j=1}^{n} \mu_j} = \bar{\mu}_i \qquad y_{N1}^{(4)} = \frac{\mu_1}{\mu_1 + \mu_2 + \mu_3 + \mu_4} = \bar{\mu}_1$$

Layer 5 is the defuzzification layer here each neuron in this layer is connected to the respective normalisation neuron and also receives initial inputs x_1 and x_2 where defuzzification neuron calculates the weighted consequent value of a given rule as[28],

$$y_i^{(5)} = x_i^{(5)} \left[k_{i0} + k_{i1}\, x1 + k_{i2}\, x2\right] = \bar{\mu}_i \left[k_{i0} + k_{i1}\, x1 + k_{i2}\, x2\right]$$

Where $x_i^{(5)}$ is the input and $y_i^{(5)}$ is the output of defuzzification neuron *i* in Layer 5, and k_{i0}, k_{i1} and k_{i2} is a set of consequent parameters of rule i [28].

Layer 6 is represented by a single summation neuron this neuron calculates the sum of outputs of all defuzzification neurons and produces the overall ANFIS output y [28],

$$y = \sum_{i=1}^{n} x_i^{(6)} = \sum_{i=1}^{n} \bar{\mu}_i \left[k_{i0} + k_{i1}\ x1 + k_{i2}\ x2 \right]$$

A proportional integral derivative (PID) controller is the most commonly used controller in controlling industrial loops due to its simple structure, robust nature and easy implementation. Tuning a PID controller is an important task. Hence PID controller is used with neuro-fuzzy rules to enhance its evaluation parameters.

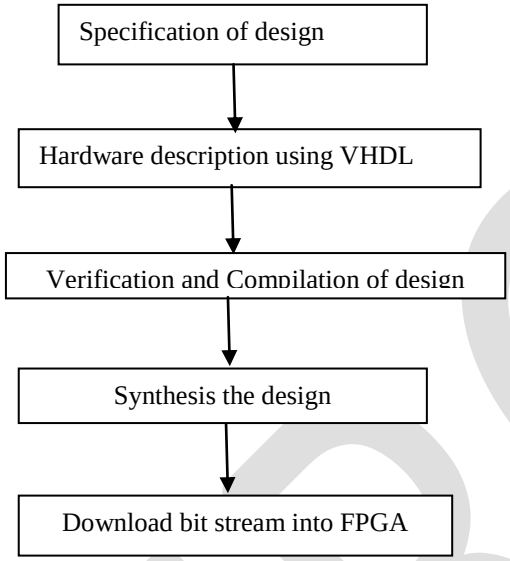


Fig:-Design flow of Project.

In the flow graph above Specification of design shows the specification of PID controller and neuro-fuzzy system design .And Hardware description using VHDL presents the VHDL code of the PID controller and neuro-fuzzy system. After that in Verification and Compilation of design the VHDL code of the PID controller and neuro-fuzzy system will be compiled in Model Sim software. The next step id Synthesis the design where the code will be synthesis in Xilinx FPGA. While in next step which is Download bit stream into FPGA will done in Xilinx ISE ISE design suite.

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CONCLUSION

This paper presents a survey on various implementation techniques of fuzzy systems, neural network, neuro-fuzzy system, PID controller and FPGA. This overview of various information about Neuro-Fuzzy system, PID Controller and FPGA Prototype focuses on its usability and challenges. It also gives conceptual overview of methodology. The Future development of Neuro-Fuzzy PID controller using a particular application using FPGA will improve its flexibility and re-usability.

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Analysis of Metal Enclosed Gas Insulated Switchgear Tank for Deflection

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Abstract: Making pressure vessels has been a challenging process for many manufacturers and researchers to produce products meeting requirements at the lowest cost. We will be optimizing the pressure vessel to suit our application i.e. using it for Gas Insulated Switchgear. We also intend to take in to consideration, the aspect of Design for Manufacturing (DFM). During designing, numerous parameters/ variables are to be considered. Hence we need to use a tool that can represent us the effects of various parameters on our requirements (output). We will manufacture the pressure vessel as per the output of our experiment. Then we will compare the output of Computer generated Simulation and actual physical manufactured vessel. Faced with challenge of delivering new product in short time, using the trial and error approach to determine the optimum parameters is no longer good enough. We therefore use advanced tools like Taguchi Method and Virtual Prototyping to reduce our lead time for development.

Keywords: Design and Development of Medium Voltage Gas Insulated Switchgear, Pressure Vessel, Taguchi Method DOE, Virtual Prototype, Analysis.

INTRODUCTION

Designing pressure vessels depending on application has been a challenging task for researchers. It is mainly because of the various parameters which are to be considered to deliver a specific output. In this instance we have to optimize a design of a pressure vessel for a Gas Insulated Switchgear. The output is deflection of pressure vessel. The deflection should not be more than 5mm for a rated pressure of 1.2 bar (Absolute).

Switchgear- In an electric power system, switchgear is the combination of electrical disconnects switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Switchgear is used both to de-energize equipment to allow work to be done and to clear faults downstream. This type of equipment is important because it is directly linked to the reliability of the electricity supply. Switchgear is a large switch used to turn on or cut off the power in various parts of an electricity distribution network. We use switchgear to isolate a fault in the network to minimize the effects of interruptions. Once a fault has been repaired, the switchgear is operated to turn the power back on.

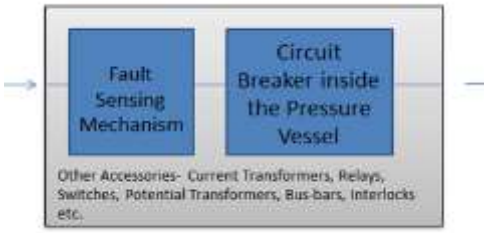
Types:

A. By voltage class:
- Low voltage (less than 1kV)
- Medium Voltage (11kV to 52kV)
- High voltage (more than 52kV)

B. By insulating medium:
- Air
- Gas (SF6 or mixtures)
- Oil
- Vacuum

C. By construction type:
- Indoor (further classified by IP (Ingress Protection) class or NEMA enclosure type)
- Outdoor

Construction and Working:



Switchgear

Switchgear is the combination of electrical disconnects switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Switchgear is used both to de-energize equipment to allow work to be done and to clear faults downstream. This type of equipment is important because it is directly linked to the reliability of the electricity supply.

The very earliest central power stations used simple open knife switches, mounted on insulating panels of marble or asbestos. Power levels and voltages rapidly escalated, making opening manually operated switches too dangerous for anything other than isolation of a de-energized circuit. Oil-filled equipment allowed arc energy to be contained and safely controlled. Switchgear line-up would be a metal-enclosed structure with electrically operated switching elements, using oil circuit breakers. Today, oil-filled equipment has largely been replaced by air-blast, vacuum, or SF6 equipment, allowing large currents and power levels to be safely controlled by automatic equipment incorporating digital controls, protection, metering and communications.

Typically, the switchgear in substations is located on both the high voltage and the low voltage side of large power transformers. The switchgear on the low voltage side of the transformers may be located in a building, with medium-voltage circuit breakers for distribution circuits, along with metering, control, and protection equipment. For industrial applications, a transformer and switchgear line-up may be combined in one housing, called a unitized substation or USS.

The power distribution grid delivers electricity from a power plant. The electric charge moves in a large circuit, which is composed of many smaller circuits. One end of the circuit, the hot wire, leads to the power plant. The other end, called the neutral wire, leads to ground. Because the hot wire connects to a high energy source, and the neutral wire connects to an electrically neutral source (the earth), there is a voltage across the circuit -- charge moves whenever the circuit is closed. The current is said to be alternating current, because it rapidly changes direction.

The power distribution grid delivers electricity at a consistent voltage. All of the different light bulbs and electrical appliances offer a certain amount of resistance, also described as the load. This resistance is what makes the appliance work. A light bulb, for example, has a filament inside that is very resistant to flowing charge. The charge has to work hard to move along, which heats up the filament, causing it to glow.

In building wiring, the hot wire and the neutral wire never touch directly. The charge running through the circuit always passes through an appliance, which acts as a resistor. In this way, the electrical resistance in appliances limits how much charge can flow through a circuit (with a constant voltage and a constant resistance, the current must also be constant). Appliances are designed to keep current at a relatively low level for safety purposes. Too much charge flowing through a circuit at a particular time would heat the appliance's wires and the building's wiring to unsafe levels, possibly causing a fire.

This keeps the electrical system running smoothly most of the time. But occasionally, something will connect the hot wire directly to the neutral wire or something else leading to ground. For example, a fan motor might overheat and melt, fusing the hot and neutral wires together. Or someone might drive a nail into the wall, accidentally puncturing one of the power lines. When the hot wire is connected directly to ground, there is minimal resistance in the circuit, so the voltage pushes a huge amount of charge through the wire. If this continues, the wires can overheat and start a fire.

The circuit breaker's job is to cut off the circuit whenever the current jumps above a safe level. In the following sections, we'll find out how it does this.

Applications:

- Nuclear power plants
- Thermal power plants
- Hydraulic power plants
- Transformer stations and substations
- Mining industry
- Shipbuilding industry
- Petroleum industry
- Chemical industry
- Steel Industry

II. NEED AND SCOPE

As seen from the introduction, the Tank is a very critical component in the sound working of the Gas Insulated Switchgear. The evolution of Gas Insulated Switchgear has come out of the purpose of shrinking space requirements. The per capita power consumption is on the increasing. Hence there is an ongoing increment in power generation and hence distribution. With population growing, especially in the cities, the area of cities is to be utilized effectively and in a better manner for all the activities including power distribution. In order to perform the same function in lesser space, GIS is being developed. Another aspect of evolution of GIS technology is the reduced maintenance costs. It has become increasingly necessary that power distribution be done in least operational costs. The operational costs are directly proportional to maintenance costs. Hence making switchgear more compact and keeping at least some parts isolated in hermetically sealed vessel may serve the purpose. Hence it is a challenge to design the same.

In order to reduce space and maintenance there are other options available in switchgear that can be worked upon. However our scope is to take up one of the most prominent component of Gas Insulated Switchgear – Tank/ Pressure Vessel.

We also restrict ourselves to the mechanical aspects of the design. The electrical aspects have suggested only about the material that should be used for tank. The material to be used for tank is Stainless Steel. It is however important to note that it is in our scope to select the grade of the Stainless Steel to be used.

III. PROBLEM STATEMENT

Current practice of designing of pressure vessel requires experience and knowledge. With increase in number of input factors/ variables it becomes more challenging to design a pressure vessel due to many combinations. One person cannot work with all the options practically. Hence the help of advanced tools for optimization like Taguchi Method (DOE) has been considered. Also considering the fact that this is a real life problem in an industry, the product development has to be faster in order to save time, cost of development and gain a strategic advantage amongst competitors. In order to meet the above said criteria we take the help of software.

Hence the title of our Project is 'Analysis of metal enclosed Gas Insulated Switchgear for deflection'.

IV. LITERATURE SURVEY

Evolution of Switchgear-
The main application of switchgear is in the protection of circuits against damage caused by faults and the restoration or preservation of supplies to as large a part of the system as possible following a fault. In this function they must add reliability to the system rather than contribute to system problems.
Summary of 1960's Switchgear
- Oil and air interrupting technologies dominate LV and MV switchgear
- Interrupting devices require contact maintenance/oil change after a number of interruptions
- Powerful solenoid operating mechanisms with delicate trip latches required settings, adjustment and maintenance
- Withdraw able circuit breakers, added complexity and increased depth of switchboard
- Large and heavy switchgear, also large, heavy battery supply for high power solenoid mechanisms

Summary of 1970's switchgear
- Vacuum and rotating arc SF6 interrupters enable low energy, maintenance free interrupting devices
- Reduced energy solenoid operating mechanisms designs still require settings, adjustment and maintenance
- Fixed vacuum designs introduced but did not catch on due to lack of service experience with vacuum interrupters

Summary of 1980's switchgear
- Oil and air circuit breakers go out of production, vast majority of new switchgear put into service are vacuum or SF6
- Emphasis on production engineering to produce cost reduced designs
- Motor-wound spring mechanisms and withdraw able designs become the order of the day

Summary of 1990's switchgear
Vacuum circuit breakers have emerged during this decade as by far the most preferred technology for primary substation medium voltage switchgear as field service experience shows almost zero failure rate of vacuum interrupters and interrupter prices fall.
The fixed switchgear concept has made a comeback with SF6 insulated vacuum switchgear and air insulated SF6 switchgear with conventional mechanisms in the low voltage compartment driving the interrupters through linkages.
2000's Switchgear
New designs of switchgear has evolved, designed from scratch with every component as simple and reliable as possible to capitalize on the potential of the magnetic actuator mechanism to be as trouble free as the latest interrupter technology. This concept should has been applied to low voltage switchgear, finally replacing the old technology air circuit breakers at this voltage and later to EHV switchgear.

Gas Insulated Switchgear-

Although the first prototypes of Gas insulated Switchgears were made in late 1980's, the technology has evolved from early 1990's in Europe and the USA. However the technology of Gas Insulated Switchgear in Medium Voltage Segment is very new in India.

Pressure Vessel Design optimization has evolved through the years and abundant literature is available. Various optimization techniques and software (like ANSYS, Mixed integer optimization using the quasi-chaotic optimization, Hybrid algorithm for ant colony optimization etc.) have been put in to practice to optimize pressure vessel depending on the applications.

However, there has not been any major literature on optimization of Pressure Vessel for the application in Gas Insulated Switchgear.

V. SELECTION OF RESEARCH METHODOLOGY

Taguchi Method

Taguchi's philosophy is an efficient tool for the design of high quality manufacturing system. Dr. Genichi Taguchi, a Japanese quality management consultant, has developed a method based on orthogonal array experiments, which provides much-reduced variance for the experiment with optimum setting of process control parameters. Thus the integration of design of experiments (DOE) with parametric optimization of process to obtain desired results is achieved in the Taguchi method.

Classical experimental design methods are time consuming. Many experiments must be performed when the number of control factors is high. Taguchi methods use a special design of orthogonal arrays to study the entire factor space with only a small number of experiments. In general usage, design of experiments (DOE) or experimental design is the design of any information-gathering exercises where variation is present, whether under the full control of the experimenter or not. However, in statistics, these terms are usually used for controlled experiments. Formal planned experimentation is often used in evaluating physical objects, chemical formulations, structures, components, and materials. Other types of study, and their design, are discussed in the articles on opinion polls and statistical surveys (which are types of observational study), natural experiments and quasi-experiments (for example, quasi-experimental design).

In the design of experiments, the experimenter is often interested in the effect of some process or intervention (the "treatment") on some objects (the "experimental units"), which may be people, parts of people, groups of people, plants, animals, etc. Design of experiments is thus a discipline that has very broad application across all the natural and social sciences and engineering. There are mainly three principals of Design of Experiments (DOE) methods in practice today. They are the Classical or Traditional methods, Taguchi methods, and Shainin methods. Sir Ronald Fisher, who applied DOE to agricultural problem in 1930, applied the traditional method to his work. Dr. Taguchi of Japan refined the technique with the aim of achieving robust product design against sources of variation. The Shainin method was designed and developed by consultants. Dorian Shainin used a variety of techniques with major emphasis on problem solving for characterizing product development. Experimental design techniques are a powerful approach in product and process development, and they have an extensive application in the engineering areas. Potential applications include product design optimization, process design development, process optimization, material selection, and many others. There are many benefits gained by many researchers and experimenters, from the application of experimental techniques.

In our project, DOE can be applied in identifying the parameters that have significant influence in the deflection of pressure vessel/ Tank i.e. output. The easiest way to do find the parameters and their effect is to use the designers/ researcher's experience, or trial and error method. This trial and error method is unacceptable because it is time consuming and not cost effective. The objective of this seminar/paper is to obtain the optimal method of performing this experiment using Taguchi Method (DOE).

Virtual Prototyping:

To verify system concepts, to optimize the design or just to present the system in an extensive way, virtual prototyping can be used. Virtual prototype is a computer simulation of the system containing a 3D-model. It should provide human-product interaction and ways to test the product properties and behavior in different perspectives. Wang (Wang, 2002) has studied and compared different definitions of virtual prototyping (VP) and summarizes VP as follows:

"Virtual prototype, or digital mock-up, is a computer simulation of a physical product that can be presented, analyzed, and tested from concerned product life-cycle aspects such as design/engineering, manufacturing, service, and recycling as if on a real physical model. The construction and testing of a virtual prototype is called virtual prototyping (VP)." Virtual prototyping is a technique in the process of product development. It involves using computer-aided design (CAD) and computer-aided engineering (CAE) software to validate a design before committing to making a physical prototype. This is done by creating (usually 3D) computer generated geometrical

shapes (parts) and either combining them into an "assembly" and testing different mechanical motions, fit and function or just aesthetic appeal. The assembly or individual parts could be opened in CAE software to simulate the behavior of the product in the real world.

Software Selection:

For our experiment we will be using the AutoDesk Inventor Software. Autodesk Inventor, developed by U.S.-based software company Autodesk, is 3D mechanical solid modeling design software for creating 3D digital prototypes used in the design, visualization and simulation of products. Autodesk Inventor competes directly with SolidWorks and SolidEdge.

In this work use of the latest version of the same. It is called 'Autodesk Inventor 2013'.

VI. USE OF TAGUCHI METHOD

Design consideration for a pressure vessel to be used in switchgear.

The pressure vessel is to be designed in such a way that it complies with the guidelines laid by International Electro technical Commission (IEC) - IEC 60694. Accordingly, all active medium voltage components, including the busbar system, are enclosed in a hermetically sealed, gas insulated, metal compartment and should thus be insensitive to humidity, corrosive atmosphere, dust, insects etc. The value of Pressure in Pressure Vessel/ Tank is 1.2 bar (Absolute),There are various input parameters that can be used to for designing the Pressure Vessel.

The Taguchi method attempts to optimize a process or product design and is based upon three stages, as follows:
1. Concept Design or System Design
2. Parameter Design
3. Tolerance Design

The concept design is considered to be the first phase of the design strategy. This phase gathers the technical knowledge and experiences to help the designer to select the most suitable one for the intended product. In parameter design, the best setting of the control factors is determined. This is perhaps the important step, as it does not affect the unit manufacturing cost of the product. The third step is performed only after completion of the parameter design step and is exercised when further improvements are required for the optimized design. This phase focuses on the trade-off between quality and cost. However, designers in this stage consider only tightening tolerances, upgrading material standards and components, if any, having a significant impact on quality through parameter design experiments. The Taguchi method uses the signal-to-noise (S/N) ratio instead of the average to convert the trial result data into a value for the characteristic in the optimum setting analysis. The S/N ratio reflects both the average and the variation of the quality characteristic. The standard S/N ratios generally used are as follows: Nominal is best (NB), lower the better (LB) and higher the better (HB). The optimal setting is the parameter combination, which has the highest S/N ratio. Taguchi methods are statistical methods developed by Genichi Taguchi to improve the quality of manufactured goods, and more recently also applied to engineering, biotechnology, marketing and advertising. Professional statisticians have welcomed the goals and improvements brought about by Taguchi methods, particularly by Taguchi's development of designs for studying variation, but have criticized the inefficiency of some of Taguchi's proposals. Taguchi's work includes three principal contributions to statistics:
A specific loss function i.e. Taguchi loss function;
The philosophy of off-line quality control; and Innovations in the design of experiments.

We will now identify and develop the methodology for performing this experiment.
The input parameters are
Design of Tank/ Pressure Vessel (3 levels)
Material (3 levels)
Tank/ Pressure Vessel thickness (3 levels)
Stiffener Thickness (3 levels)
Weldment Length (3 levels)

The output is Deflection.
After studying the above input-output relationship we can conclude that we need to use the Taguchi DOE method having 5 Factor- 3 Level experiments.
The orthogonal Array generated using the software of Minitab is as follows.

Table no.6.2 Orthogonal Array generated using the software of Minitab

Sr. No.	Tank Thickness (mm)	Stiffener Thickness (mm)	Design Layout (Number)	Material	Weldment Length (%)
1	2	2	1	J4	10
2	2	2	1	J4	20
3	2	2	1	J4	30
4	2	3	2	SS304	10
5	2	3	2	SS304	20
6	2	3	2	SS304	30
7	2	4	3	SS316	10
8	2	4	3	SS316	20
9	2	4	3	SS316	30
10	3	2	2	SS316	10
11	3	2	2	SS316	20
12	3	2	2	SS316	30
13	3	3	3	J4	10
14	3	3	3	J4	20
15	3	3	3	J4	30
16	3	4	1	SS304	10
17	3	4	1	SS304	20
18	3	4	1	SS304	30
19	4	2	3	SS304	10
20	4	2	3	SS304	20
21	4	2	3	SS304	30
22	4	3	1	SS316	10
23	4	3	1	SS316	20
24	4	3	1	SS316	30
25	4	4	2	J4	10
26	4	4	2	J4	20
27	4	4	2	J4	30

VII. VIRTUAL PROTOTYPING

Virtual prototyping is a technique in the process of product development. It involves using computer-aided design (CAD), computer-automated design (CAutoD) and computer-aided engineering (CAE) software to validate a design before committing to making a physical prototype. This is done by creating (usually 3D) computer generated geometrical shapes (parts) and either combining them into an "assembly" and testing different mechanical motions, fit and function or just aesthetic appeal. The assembly or individual parts could be opened in CAE software to simulate the behavior of the product in the real world.

The product design and development process used to rely primarily on engineers' experience and judgment in producing an initial concept design. A physical prototype was then constructed and tested in order to evaluate its performance. Without any way to evaluate its performance in advance, the initial prototype was highly unlikely to meet expectations. Engineers usually had to re-design the initial concept multiple times to address weaknesses that were revealed in physical testing.

Today, manufacturers are under pressure to reduce time to market and optimize products to higher levels of performance and reliability. A much higher number of products are being developed in the form of virtual prototypes in which engineering simulation software are used to predict performance prior to constructing physical prototyping. Engineers can quickly explore the performance of thousands of design alternatives without investing the time and money required to build physical prototypes. The ability to explore a wide range of design alternatives leads to improvements in performance and design quality. Yet the time required to bring the product to market is usually reduced substantially because virtual prototypes can be produced much faster than physical prototypes.

End-to-end prototyping accounts fully for how a product or a component is manufactured and assembled and links the consequences of those processes to performance. Early availability of such physically realistic virtual prototypes allows testing and performance confirmation to take place as design decisions are made; enabling the acceleration of the design activity and providing more insight on the relationship between manufacturing and performance than can be achieved by building and testing physical prototypes. The benefits include reduced costs in both design and manufacturing as physical prototyping and testing is dramatically reduced/eliminated and lean but robust manufacturing processes are selected.

The research firm Aberdeen Group reports that best-in-class manufacturers that make extensive use of simulation early in the design process hit revenue, cost, and launch date and quality targets for 86% or more of their products. Best-in-class manufacturers of the

most complex products get to market 158 days earlier with $1.9 million lower costs than all other manufacturers. Best-in-class manufacturers of the simplest products get to market 21 days earlier with $21,000 fewer product development costs.

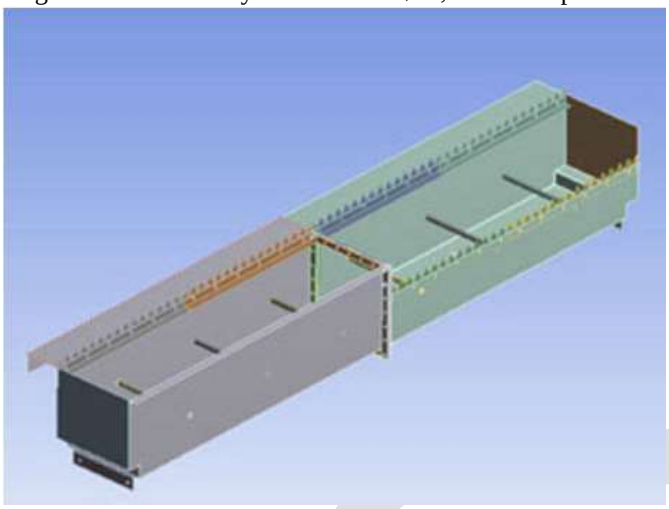


Fig: 3D modeling of tank.

The similarly 3D models are developed with all results of taguchi method and then proceed for simulation.

VIII. COMPUTER ANALYSIS

A computer model refers to the algorithms and equations used to capture the behavior of the system being modeled. By contrast, a computer simulation refers to the actual running of the program that contains these equations or algorithms. Simulation, therefore, refers to the result of running a model. In other words, you would not "build a simulation". You would "build a model", and then either "run a model" or "run a simulation".
Computer simulation developed hand-in-hand with the rapid growth of the computer, following its first large-scale deployment during the Manhattan Project in World War II to model the process of nuclear detonation. It was a simulation of 12 hard spheres using a Monte Carlo algorithm. Computer simulation is often used as an adjunct to, or substitute for, modeling systems for which simple closed form analytic solutions are not possible. There are many types of computer simulations; their common feature is the attempt to generate a sample of representative scenarios for a model in which a complete enumeration of all possible states of the model would be prohibitive or impossible.

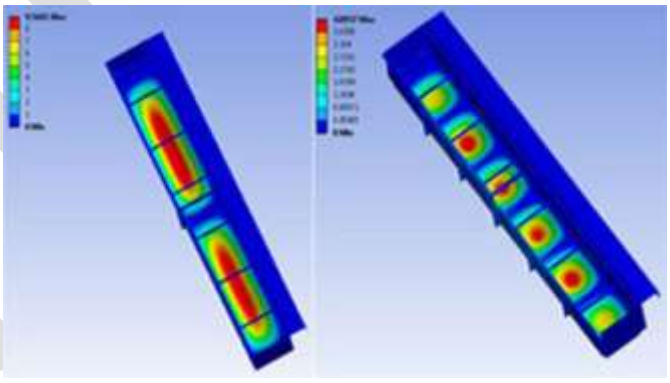


Fig: Result of analysis.

Similarly, simulation of all models for displacement is in process to optimize the solution for minimum deflection of gas insulated switchgear tank.

CONCLUSION

- After performing the simulation, we get the optimum combination of the 5 variables/ factors for the required output of deflection.
- According to the results of our experiment physical prototype made and found 2mm deflection.
- Physical prototype is matching result 80% that to our experiment.
- New product Development cycle time reduced by 70%
- New product Development cost reduce by 75%

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Determination of Expected loss and credit risk using Basel II's Internal Rating Based Approach (IRB)

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Abstract: This study analysis the credit assessment procedures followed by a bank (in south India) to determine the potential borrowers. A complete Study of Risk Assessment Model which is currently being used by thatBank (in south India). Moreover the study identifies the potential borrowers in of Loan limit above one crore and makes an assessment on their creditworthiness by using the financial performance, industry performance and management performance. Further the study evaluates the expected loss which may occur when the borrower defaults using Basel II's Internal Rating Based Approach (IRB).

Keywords: Risk Assessment Model, Basel II, Internal Rating Based Approach, credit risk, Expected loss(EL), Exposure Amount at Default (EAD), Loss Given Default (LGD).

Introduction: There have been several instances in recent years of large companies defaulting on bank loans of vast amounts like the Kingfisher airlines case. This gives us a view that doing business with micro, small and medium companies is less risky than funding big companies. Recently one of the banks in South India has identified 19 big accounts to be sold to asset reconstruction companies. Each account would have an outstanding of Rs.5 crore and above. Approximately the total outstanding to that bank on these accounts will be around Rs.300 crore. Thus analyzing and assessing the credit risk of Large Corporate borrowers is highly essential due to their high default rate.

But there are some drawbacks in the credit risk assessment of large corporate borrowers. Audited Financial statements and internal rating is intended to provide greater transparency but in some cases it is not so. At the same time credit decisions have gone wrong when they are strictly based on financial statements. This is because the financial statements are subjective and they don't consider the other risk factors such as Market Risk, Industry Risk, and Management Risk. The financial statements represent the historical performance of the company but the sanctioned loan will rely on the future performance of the company. The borrower probability to default a credit cannot be measured only by analyzing the past performance. Thus there is a need for developing a risk assessment model where quantitative and qualitative measurements are used to measure the borrower's probability of default.

Methodology and data

Type of Research

The research is a Descriptive and Analytical type of research. Where both qualitative and quantitative data are collected and quantified. Suitable scores are assigned to determine the probability of default and expected loss.

Objectives of the Study

The study aimed at learning the expected loss using Internal Rating Based Approach (IRB) for analyzing credit Risk Assessment and to understand existing credit risk assessment method adopted by one of the Bank in south India.Further this study assesses the expected loss and risk's associated in sponsoring large loans by that Bank and to provide requirement based suggestion for the Bank to overcome defaulting Issues.

Data and Sources of Data

The data used in this study are secondary data. The Company (borrower) Profit and Loss statement and Balance Sheet was the Source for the Quantitative analysis.

Management risk was measured through Qualitative statements. The Bank credit officer who has analyzed the borrowers past performance has rated the management performance. A set of questions pertaining to the management performance was rated in a scale ranging from highest score of 5 to the lowest score of 1. The question which evaluates the management performance were such as past payment record, working capital management, managerial competence, experience in Industry etc. The data for industry risk is taken from Index of Industrial Production for the month of January 2014.Totally ten borrowers whose loan amount above one crore was used for this study. The details such as total loan amount sanctioned, value of the collateral were also used for this study. To maintain confidentiality the name of the Corporates' are camouflaged for the study purpose.

Time Period Covered

Period of this study was 53 days. The study was done in one of the Bank in south India situated in Chennai.
During the period of 2013-2014 the Bank has given loan to 10 large corporate borrowers of limit above Rs 1 Crore and 87 SME's, MSME borrowers.

Statistical tool Used

Determination of expected loss requires the evaluation of the amount exposed when the borrower defaults, the probability or the likelihood that the loan gets defaulted and the amount that can be recovered using collateral. First we need to determine the various credit risks which can affect the repayment of loan by the borrower. Credit risk can be classified into financial risk, Industry risk and the Management risk.The amount of credit exposure that will be lost when a borrower suddenly defaults a loan can be measured using expected loss(EL). It is the amount that is expected to be lost when the borrower defaults.

$$EL = PD * EAD * LGD$$

LGD measures the amount of credit loss relative to the amount that can be recovered. The amount that is recovered has to be estimated in percentage.

Thus LCG = (1 – recovery rate) in percentage.

Margin % is the amount that the borrower has to contribute. The percentage differs from one loan to the other. Thus the amount that the bank will gets exposed when the borrower defaults will be calculated as (1 – margin %).

Credit risk can be classified into financial risk, Industry risk and the Management risk. The traditional method of evaluating the creditworthiness of potential borrower was by checking the balance sheet and profit & loss statement of the borrower.Since the past performance can only tell how the borrower has performed in its past it cannot be fully trusted to predict the future performance of the borrower.The future performance will be determined by various other factors like the Industry performance, management performance,

The Credit Scoring model was used to identify the default risk of the borrowers. The basic concept behind this model is to calculate the default risk from key financial risk factors by using the data(scores) that intended to separate good credit risk from the bad ones. Borrowers are sorted into different risk classes based upon the likelihood of future default. A Key is prepared in order to measure the performance of financial risk, management risk, and industry risk.

The default probability of an Individual borrower can be estimated using logistic regression model. The reason for using logistic regression is because the input value can be positive as will as negative but the output will always take the value between 0 and 1.A borrower who is likely to default will have negative values while a borrower who doesn't default will have positive value.

For using logistic regression odds ratio is calculated to know the likelihood of default.It shows an association between and exposure and outcome. If p is the probability of default then (1- p) is the likelihood of not to default.The probability of default (P) is taken as 0 and the probability of not to default (Q) is taken as 1. To create a relationship between this two variables i.e 0 probability to default and 1 not to default requires a probability model.

First binomial distribution was tried to link the two variables but it was not possible since it required and error distribution. Therefore logitfunction (log of odds) was used to link the two variables which proved to be convenient and simple. Using odds ratio the likelihood of borrower becoming default can be calculated.

$$\text{Logit}(P) = \log \frac{P}{1-P} = \beta_0 + \beta_1 x$$

In logistic regression, the dependent variable is a logit, (means log base e(log) of odds) which is the natural log of the odds, that is, When a logistic regression is calculated, the regression coefficient (b1) is the estimated increase in the log odds of the outcome per unit increase in the value of the exposure. In other words, the exponential function of the regression coefficient (e^{b1}) is the odds ratio associated with a one-unit increase in the exposure.

$$F(x) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x)}}$$

From the ten large corporate borrowers which were used in the study the probability of default was ascertained using logistic regression. To find the expected loss of individual borrowers next step is to determine the Exposure Amount at Default (EAD). The exposure amount at default is estimated internally based upon the outstanding amount that will be lost when default occurs. The value is dependent on the amount the borrower has already repaid when default occurs. The Suitable suggestions were given which was based on the findings. For calculation purpose the EAD or outstanding liability amount is measured in percentage. For example consider an X borrower who availed for OCC type loan of Rs 98 lakhs then the margin is 25% whereas the total exposure is 75% then the exposed amount is 73.5 lakhs.

Once the probability of default and EAD are calculated the next step is to ascertain Loss Given Default (LGD) which is 1- recovery rate in percentage. Thus the expected loss for the ten large corporate borrowers was calculated and suitable suggestion was given to the Bank.

Findings

- The credit risk assessment ultimately measures the expected loss of individual borrower. Based on the calculated expected loss the bank (lender) can determine the loan limit of the potential borrowers. From the study among the ten large corporate borrowers the highest expected loss is Rs69.65 lakhs and the lowest is Rs 7.81 lakhs the difference is around Rs 65 lakhs.
- The Probability of default ranges from 39.37% - 42.81% this shows that the Bank has given loans to the borrowers whose probability of default is not below 43 percent level.
- The Financial risk score has a variation of lowest of 1 to highest 5 level whereas the management risk score for all the borrowers is at above average score. This shows Bank has sanctioned loans to the Potential borrowers with good management performance.

Suggestions

- The accuracy of the expected loss entirely depends upon the accurate information provided by the borrowers. Since the measurement of past performance of the company purely depends upon the financial statements.
- The Internal rating should not be borrower biased, if the rating is done in favor of the borrower then its defeats the purpose of credit risk assessment.
- There are various instruments to transfer the credit risk of an individual borrower know as credit derivatives or provisioning techniques. Like credit default swaps(CDS) where the buyer of the CDS makes a series of payments (the CDS "fee" or "spread") to the seller and, in exchange, receives a payoff if the loan defaults.

Conclusion

The objective was to calculate the expected loss using the Internal Rating Based Approach (IRB). The data collected for this study is purely secondary in nature. Ten large corporate borrowers have been chosen for this study. This is because in recent times large

corporate borrowers are the ones who have highest default rate compared to Small Medium Enterprises (SME's) and Micro, Small and Medium Enterprises (MSME). The expected loss of the borrowers was calculated by probability of default, exposure amount at default and loss given default. The probability of default is calculated using the logistic regression. The key finding is that this particular Bank has a pattern of sanctioning loans to the borrowers who has good management records. This bank has given loans to the borrowers whose probability of default is not below 43 percent level. The key suggestion is that the credit risk can be transferred or reduced when credit derivatives and provisioning techniques like the credit swaps are used. Moreover the accuracy of the expected loss entirely depends upon the accurate information provided by the borrowers.

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LBG IMAGE COMPRESSION BY VHDL SIMULATION

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Abstract— Compression as name implies deals with technique for reducing storage require to save an image. Compression to makes file storage and transmission over any communication media. Image compressions address the problem of reducing amount of data to represent digital image with no significant loss of data. In this paper LBG algorithm used for image compression. These algorithms require as codebook generation. The codebook is the collection of codeword. The compress image will be stored into VHDL simulation. The performance of compression ratio will be measure in compression ratio and peak signal to noise ratio.

Keywords— Image Compression, LBG Algorithm, Codebook, Vector Quantization.

INTRODUCTION

Image compression is the art of science, which reducing the amount of data to represent image. Image compression is the most useful technology in the field of digital image processing. To reducing the amount of data requires to represent given quality of information is called as data compression. The compression technique represent image data using fewer bits than what is required for original image. The main purpose of these paper is to compress image by using LBG algorithm. Image compression fall under two techniques: Lossless Compression and Lossy Compression. If amount of data error introduced is zero, without any loss of data called as lossless compression or error free compression. In lossless process image compression and decompression is identical to original image. Lossless compression can be exactly recovered from its compress representation. In case of lossy compression is irreversible process because perfect recovery of original image is not possible. There are small amount of redundancy represent .On the other hand, the amount of data reduction is usually more in case of lossy compression than that of lossless compression. The LBG algorithm in community of vector quantization(VQ) for purpose of data compression. Vector quantization is widely used in image compression owing to it's simple structure and low bit rate. Vector quantization works by divided n overlapping block of size then image is store as set of pixel values within each block. The encoding procedure divided into several k-dimension vectors and each vector encoded by index of codeword by simple table look-up operation and decoding procedure will compress image getting output in decoder.

Literature Survey

The multimedia gadgets generates of large amount of data and images. These service require higher speed and high transfer rate. Image compression can solve this problem by using LBG algorithm. LBG algorithm is to reduce the computation cost in codebook training process. A significant reduction in computation cost is obtained reduction [1]. Vector quantization is an essential tool in signal processing compression achieved by forming vectors from training data sequence grouping similar vectors into cluster represents single vector [2]. The performance of the standard LBG algorithm highly depended on choice of initial codebook [3]. The methodology of vector quantization is also called "block quantization" is often used in lossy image compression [4]. One of the key roles of vector quantization is how to generate a good codebook such that distortion between the original image and reconstruct image is the minimum [5]. Image pixels that are highly correlated and VQ performs better if it's input vector have components that are more highly correlated. Therefore vector in image domain are formed as compact little connect of adjacent pixels. Quality or efficiency can

attained by size of the block [6]. To acquire new initialization technique known for LBG algorithm. The main idea in VQ is to find a codebook which minimizes the quantization mean error reconstructed images [7].

Vector Quantization Scheme

Vector quantization done three steps (1) codebook design (2) encoding process (3) decoding process. In LBG algorithm an initial codebook is chosen at random from the training vectors. The codebook and the index-table is nothing but the compressed form of the input image. The encoding process, any arbitrary vector corresponding to a block from the image under consideration is replaced by the index of the most appropriate representative codeword. In decoding process, the codebook which is available at the receiver end too, is employed to translate the index back to its corresponding codeword. Figure shows schematic diagram of VQ encoding and decoding process.

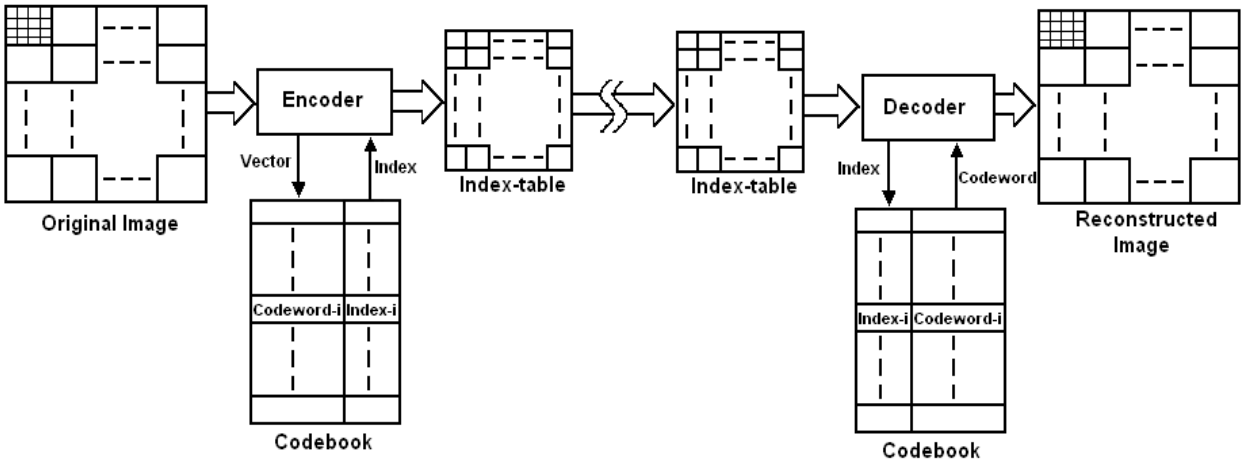

Fig. The Schematic diagram of VQ Encoding and Decoding Process.

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CONCLUSION

In this paper image compression technique by which image information can be represented by less number of bit's. The image can be compressed by using LBG algorithm. Vector quantization is an established lossy compression technique that has been used successfully to compress signals.

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Over Speed Violation Management and Control of Vehicle Based on Zigbee

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Abstract— an intention to work on the topic of this nature is emanated from the interest to explore alternative technological solution to achieve effective speed control. Objective of the study is to design and develop a new system that can effectively detect speed violations on the road and supports the driver to obey traffic rules while driving by maintaining the speed according to the speed limit prescribed. In the present day scenario traffic rules are frequently violated by the drivers and over speeding occur due to bad driving behavior. So, a driver assistance system is provided to prevent over speeding, violation of road rules and also to display alert messages. The proposed system has an alerting, recording and reporting system for over speed violation management. The Zigbee transmitter sends the speed limit of the particular lane entered by the vehicle and also gives alerts like "road works", "steep slopes", "school zone" in the form of acoustical messages and also in LCD. The receiver unit placed in the vehicle receives the messages and sends to the microcontroller. When speed of the vehicle nears the speed limit it displays the warning and if exceeds the limit, the microcontroller records the violated speed and time. The LCD displays the lane speed limit and shows the number of times, speed was violated. At the same time our system will control the speed, if vehicle user does not slows down the speed to that of particular zone speed limit. System will keep on counting the no. of times speed exceeded, record of which sent to the control room. Increase in the count of violation increases the penalty amount which can be collected in toll gates located nearby. Ultimately driver's behavior can be improved here. A GSM module sends message to the nearest traffic personnel immediately after a violation occurs. An authenticated device is also provided, which can be operated only by the traffic police in whom he can retrieve the data stored at any time.

Keywords—Detecting speed, monitoring, Automatic speed control, violation management, Zigbee, GSM, PIC microcontroller (16F877A)

INTRODUCTION

Traffic management on the road has become severe problem of today's society because of growth of the urbanization, industrialization and population; there has been a tremendous growth in the traffic. With growth in traffic, there is occurrence of bundle of problems too; these problems include traffic jams, accidents and traffic rule violation at the heavy traffic signals. This in turn has an adverse effect on the economy of the country as well as the loss of lives [1]. So problem given above will become worst in the future. Traffic congestion and tidal flow management were recognized as major problems in modern urban areas, which have caused much thwarting for the ambulance. Moreover road accidents in the city have been incessant and to bar the loss of life due to the accidents is even more crucial [2]. Increasing the capacity of the roadways is expensive and, in some areas where land is scarce, is not an option. Improving the efficiency of the current transportation system through the implementation of advanced technologies may alleviate traffic congestion and decrease the vehicle crash-related fatality rate. Real-time traffic surveillance is one of the most important components of this approach [3]. Road accidents can be prevented by adopting measures such as Traffic management, improving quality of road infrastructure and safer vehicles. To Ensure decline in accidents and to improve road safety, speed control techniques such as speed control in school and college zones by using RF transceiver, automatic braking systems, Camera based detection, RFID technology based detection are implemented. The existing techniques still doesn't able to reduce the number of accidents. Hence there is a need to implement Intelligent Speed Adaptation (ISA) in which violation management provides efficient monitoring, registering and reporting system of speed of the vehicle which exceeds the limit. The driving behavior of the driver is monitored based on which penalty amounts are calculated. A message is sent to the remote station where an immediate action can be taken. Speed limit information is sent with the help of Zigbee which uses wireless mode of communication, proves to be effective [4].

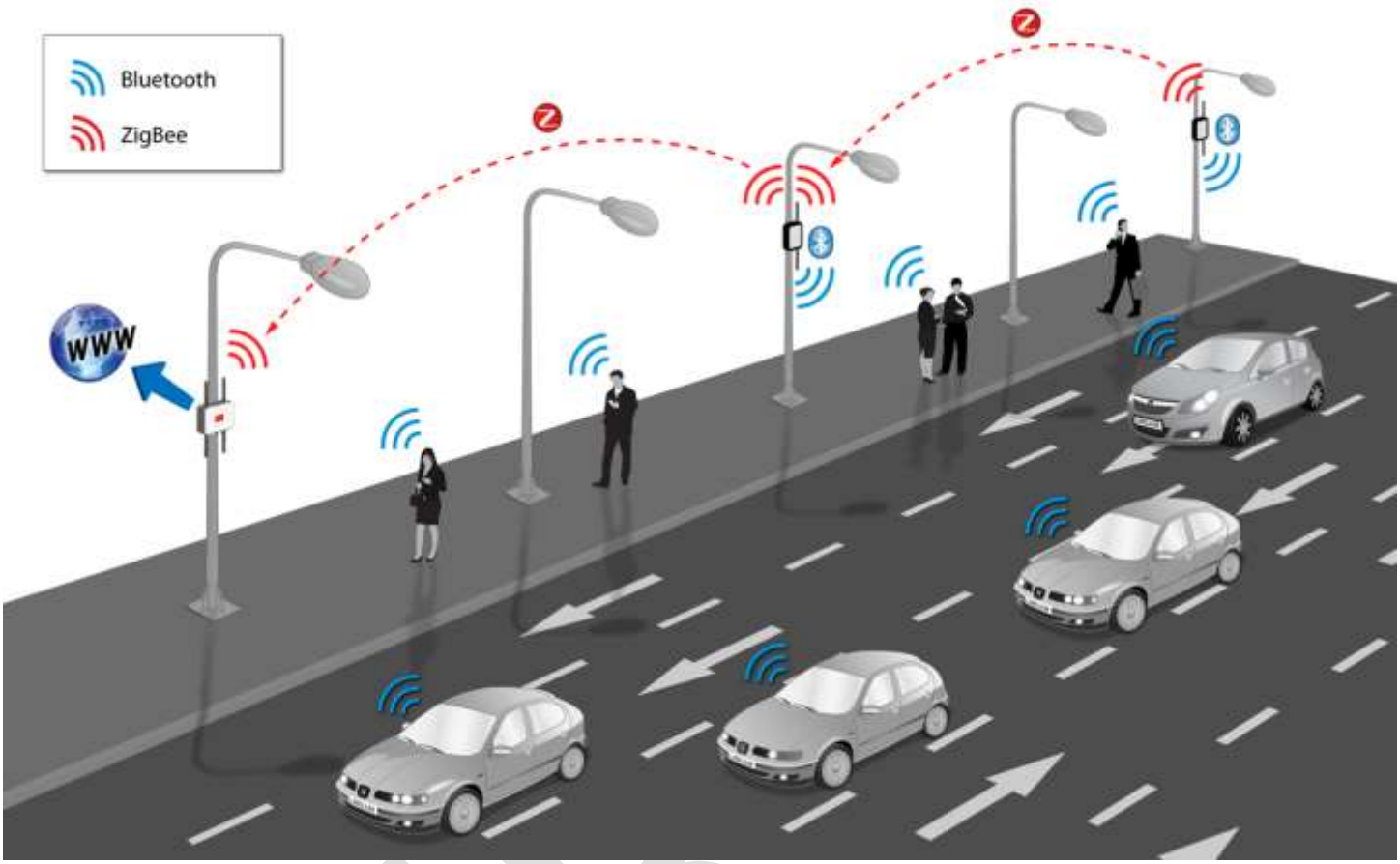

Figure 1. Speed violation management and control of vehicle

Key features of this design includes

1. The Zigbee transmitter sends the speed limit of the particular lane, present speed of vehicle is compared with the speed limit, and if it's exceeded then it should be controlled by the user.

2. If it's not controlled manually then our system itself will control over speeded vehicle automatically by reducing the no of revolutions of dc motor.

LITERATURE SURVEY

Through out the earlier years many devices and technologies has been utilized to provide road safety and accordingly to reduce accidents occurring due to speed violation for example Radar technology, average speed safety cameras etc. After doing literature review in the area of accident detection and prevention of traffic rules' violation, various applications provided a solution i.e. we get to know that there are various techniques available for detection of speed violation and accident, like RF transceiver, Automatic braking systems, Camera based detection, RFID technology, GPS module. One project presented system comprising two major design units i.e. Drivers are warned by sending traffic messages to them as loud speaker messages. Speed of vehicle, finding location by GPS & other parameters are stored in a database. The routes are represented as a Google map. It has a system which consists of traffic sign detection and recorder for managing violations The use of GPS and GSM interfacing with microcontroller shortens the alarm time to a large extent and locate the site of accident accurately. When a vehicle meets with an accident immediately vibration sensor will detect the signal or if a car rolls over, and Micro electro mechanical system (MEMS) sensor will detects the signal and sends it to controller. Microcontroller sends the alert message through the GSM MODEM including the location to police control room or a rescue team. By means of satellite navigation system, first aid rescuers can accurately locate the place with maximum error controlled by 10 meters, so that they can save the injured people as soon as possible [5]. One more paper discussed a kind of vehicle accident detection system. RF transceiver is also used to send the accident information. The RF transmitter module interfaced with the microcontroller will transmit the accident information to the nearby Emergency Service Provider. This information is received by the RF receiver module

at the 'service provider' control room in the locality. 1862. The service provider can use this information to arrange for ambulance and also inform police and hospital [6]. The limitation of this method is that the installment of repeated receivers on the road at a very short interval because the RF transceiver module used has a range up to 100 meters under ideal conditions. RFID based system prevent road accidents. In RFID based embedded system for prevention of road accidents, the system uses N number of RFID tags to transmit general area information and RFID reader in vehicle. Whenever vehicle meets with an accident, the system reads the area information from RFID tags placed on the road and transfers this information to the specific numbers stored in database using GSM module [7][8]. NHTSA, 1992-"Beyond the limits a law enforcement guide to speed enforcement [9].The limitation of this method is that the installment of N number of RFID tags on the road to transmit general area information. System even detects when GPS satellites lose its satellite communication [10].The smart display and control is composed of two separate units: Zone status Transmitter unit and Receiver (speed Display and Control) Unit. According to this system, whenever a person sits in driver seat of the vehicle, the system checks for various parameters with the driver [11].

SYSTEM ARCHITECTURE

The system consists of a transmitter and a receiver as shown in figures. The transmitter module is fixed at pre-determined lanes/areas. Speed limit and traffic signs are pre-programmed in microcontroller. This information is transmitted as wireless signals through Zigbee. This module is experimented with zones namely: School zone, University zone, Hospital Zone, Steep Curves Ahead , Bridge Works Ahead ,Accident Prone Area Ahead. The speed limit of different zones may range from 30 km/hr to 50 km/hr.

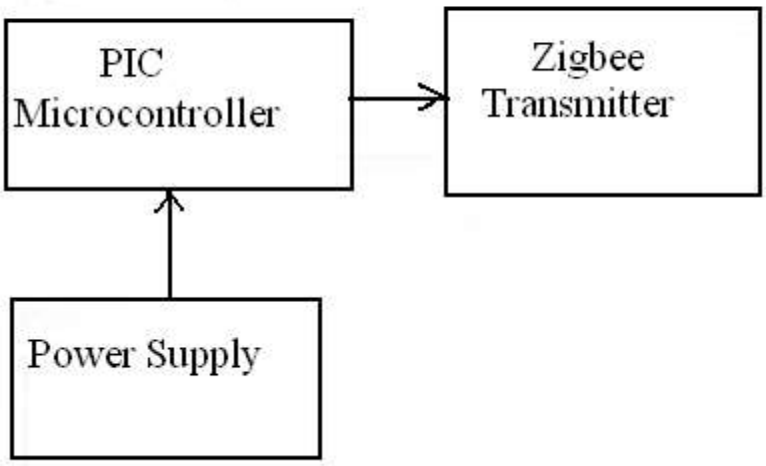

Figure 2. Block diagram of Transmitter section

The receiver module is placed inside the vehicle. The receiver module is divided into two sub-modules; because the heat generated inside vehicle near dash board can be dangerous to the sensitive components like Zigbee, GSM. Since CAN controller can withhold a temperature up to 125 degree Celsius, communication between two CAN controllers as separate modules are implemented. First sub-module is kept near the rear view mirror, which consists of the microcontroller, Zigbee receiver and the CAN controller. Wireless signals are received by the Zigbee and sent to microcontroller, which in turn sends to the CAN controller. This CAN controller communicates with another CAN placed in the second sub-module kept near the dash board. Data obtained by the CAN controller is sent to the microcontroller. The current speed of the vehicle is obtained from the speedometer by the CAN controller and this speed data is also sent to the microcontroller. The microcontroller compares the current speed with speed limit and a decision is taken here. The difference between the speed limit and the current vehicle speed is monitored continuously and a warning is displayed in LCD as shown in figure 3 and also a warning is given to reduce speed when it's about to exceed the limit. If driver still doesn't reduce the speed, speed is controlled here automatically by our system and number of times speed violated and controlled is registered and the microcontroller keeps track of all violations stored in it. If the count of violation and thereby control reaches to more than three then

penalty amount will got increasing again .Reporting system is implemented for speedy action. SMS is sent to the traffic police by the GSM, which contains the details of the vehicle number and the violated speed difference made by them. Penalty amount is decided by the traffic personnel and it may be collected in nearby Toll gates or in other places.

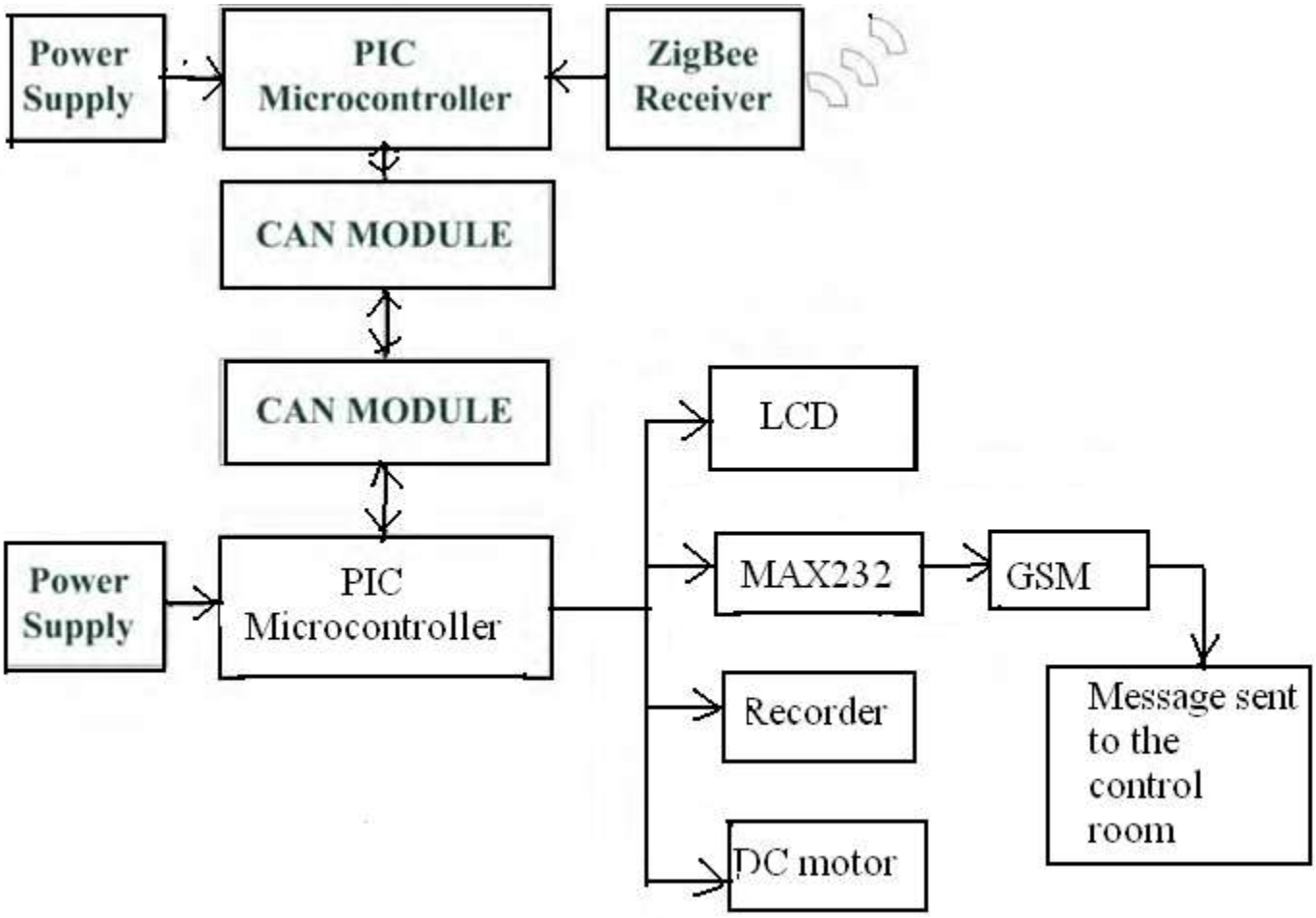

Figure. 3. Block Diagram of Receiver section

COMPONENT DESCRIPTION

1. PIC microcontroller - 10-bit, up to 8-channel Analog-to-Digital Converter (A/D) Analog Comparator module with Two analog comparators Programmable on-chip voltage reference(VREF) module Programmable input multiplexing from device inputs and internal voltage reference Comparator outputs are externally accessible
2. GSM Module (GSM) – Its a popular wireless standard for mobile phones in the world. GSM module allows transmission of Short message service (SMS) in text mode.
3. ZigBee- It is based on an IEEE 802.15.4 standard. Though its low power consumption limits transmission distances to 10–100 meters line, depending on power output and environmental characteristics, ZigBee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. ZigBee is typically used in low data rate applications that require long battery life and secure networking ZigBee networks are secured by 128 bit symmetric encryption keys
4. High-Speed CAN Transceiver- Supports 1 Mb/s operation Implements ISO-11898 standard physical layer requirements Suitable for 12V and 24V systems

SYSTEM SOFTTWARE DESIGN

The software used for the development of system is Proteus 7.8 with the C program language been used. The Flow Chart of the system is shown in the figure. If the speed of the vehicle exceeds the reference speed limit, the system will display some warnings for the rider on a screen which can be modified and processed to give sound messages. If the speed of the vehicle is not reduced under the speed limit, the system will send a message to a control room through GSM which will be a computer containing a database.SMS message contains the name of zone, vehicle number, date ,time and speed of the vehicle. If speed is not controlled manually then it will get controlled automatically.

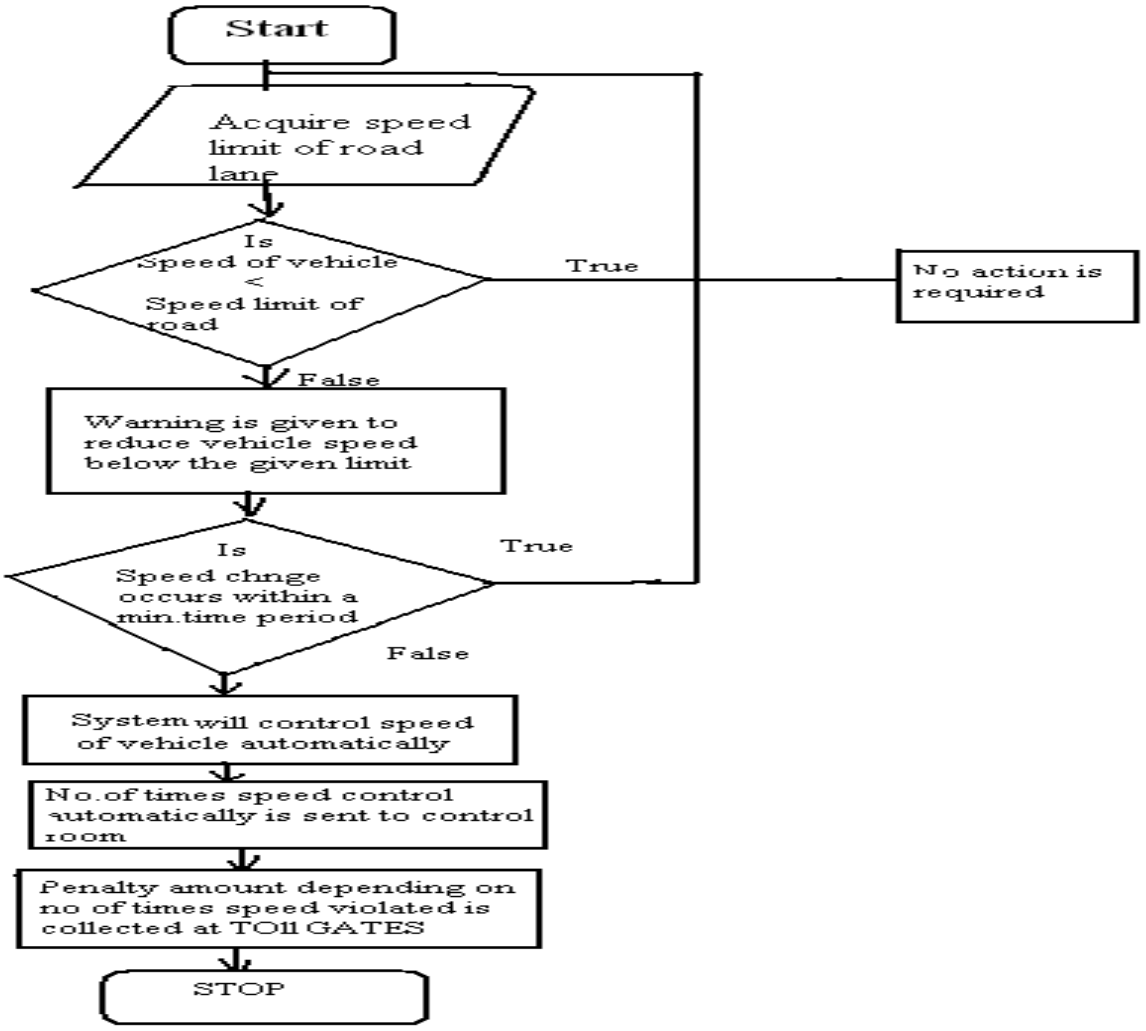

Figure 4. Flow of system

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CONCLUSION

This project is designed to solve the problem of over speeding of vehicles due to bad driving behavior at university campus, Hospital zones, or any private sectors. This device measures a speed of vehicle and gives warning to the driver when the speed is near the upper speed limit. Then user should reduce the vehicle speed to that of particular lane speed, but if he/she don't do so then our system will automatically reduce the speed by decreasing the no of revolutions of dc

motor automatically and at the same time no. of times speed exceeded will get recorded, if count reaches to three then extra penalty amount will get received at toll gates by police men who is having all related information of the driver got through GSM. It will ultimately help us to improve bad driving behavior of driver, Traffic management, road safety, violation management. A solution is provided here to monitor cars everywhere without assigning a policemen and wasting man force on such issues. The Drivers are made aware of their driving behavior and violations made so that careful and conscious driving can be achieved. Repeated violations results to increase in penalty amount which will help in reduction of violations by the vehicle user. Wireless transmission is achieved with the help of zigbee, which provides low cost transmission of data.

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Review on Effect of Fuel Magnetism by Varying Intensity on Performance and Emission of Single Cylinder Four Stroke Diesel Engine

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ABSTRACT— The aim of this study is to investigate the effect of the fuel magnetisation on the performance of diesel engine. It has been observed that on magnetisation viscosity of hydrocarbon fuel decreases due to declustering of the Hydrocarbon fuel molecules which results in better atomization of the fuel and efficient combustion of air fuel mixture. This enhances thermal efficiency and improves the fuel economy of I.C engine. The magnetic field applied along the fuel line immediately before fuel injector. The magnetic field of different intensity (E.g. 2000, 3000, *4000 Gauss)* is applied with the help of permanent magnet or Electro-magnetic coil and its effect on fuel consumption as well as on exhaust gas emission will be studied and compared with performance without application of magnetic field. At different load conditions the experiments are conducted to analyse the fuel consumption, thermal efficiency and exhaust gas analyser is used to measure the exhaust gas emission such a NO_X, HC, CO and CO_2.

Keywords: - Efficiency, Emission, Exhaust gas analyser, Magnetic coil, Magnetic intensity, Fuel economy, Fuel magnetization

1 INTRODUCTION

In recent days due to exhaustive use of fossil fuel in a vehicular and industrial purpose its stock will almost come to end within few decades. Hence there are so many efforts towards the improving power output and emission of internal combustion engines per fuel, so that the products of combustion exhausted from internal combustion (IC) engines environmental friendly, and also beneficial for cost. In terms of emission, for every 1kg of fuel burnt, there is about 1.1kg of water vapour and 3.2kg of carbon dioxide produced. Unfortunately, there is no automobile engines have 100% combustion and so there is also a small amount of products of incomplete combustion and these are carbon monoxide (denoted CO), unburned hydrocarbons, oxides of nitrogen, commonly called NOx and sulphur dioxide. This gaseous lead to hotter exhaust gas emission .Recent studies suggests that magnetic field has positive effect on the performance of the system.

Effect of magnetism on hydrocarbon fuel

The fuel of I.C. engine mainly consists of hydrocarbons. Fuel molecule consists of a number of atoms made up of number of nucleus and electrons, which orbits about their nucleus. Magnetic movements already exist in their molecules and therefore they already have positive and negative electrical charges. However these molecules have not been realigned, hence the fuel is not actively inter- locked with oxygen during combustion so that the fuel molecule or hydrocarbon chains must be ionized and realigned.

Hydrogen particle in fuel occurs in two distinct isomeric forms Para and Otrho. It is characterized by the different opposite nucleus spins. The ortho state of hydrogen has more effective than Para state for maximum complete combustion. The ortho state can be achieved by introducing strong magnetic field along the fuel line [6]. Hydrocarbon molecules is in the form of clusters, and it has been technically possible to enhance van der Waals' discovery due to the application of the Magnetic field. As high power, permanent magnetic device strong enough to break down, i.e. de-cluster these HC associations, so maximum space acquisition for oxygen to combine with hydrocarbon.

Magnetic movements already exist in their molecules. In normal condition molecules have not been realigned, the fuel is not actively interlocked with oxygen during combustion, thus for efficient combustion the fuel molecule or hydrocarbon chains must be ionized and realigned. At the same time inter molecular force is considerably reduced or depressed. These mechanisms are believed to help disperse oil particles and to become finely divided. This has the effect of ensuring that fuel actively interlocks with oxygen producing a more complete burn in the combustion chamber. The result is better fuel economy and reduction in hydrocarbons, carbon monoxide and oxides of nitrogen that are emitted though exhaust.

The ionization fuel also helps to dissolve the carbon build-up in carburettor, jets, fuel injector and combustion chamber, thereby keeping the engines clear condition. The ionization and realignment is achieved through the application of magnetic field, as said by **P**aul (1993), Park K *et al* (1997) [1].

Thus when the fuel flows through a magnetic field, created by the strong permanent magnets, the hydrocarbon change their orientation (Para to Ortho) and molecules of hydrocarbon change their configuration, at the same time inter molecular force is considerably

reduced. This mechanism helps to disperse oil particles and to become finely divided. [2] This has the effect of ensuring that the fuel actively interlocks with oxygen and producing a more complete burn in the combustion chamber. Figure below the clusters of hydrocarbons changed with the influence of magnetic field and they are more dispersed.

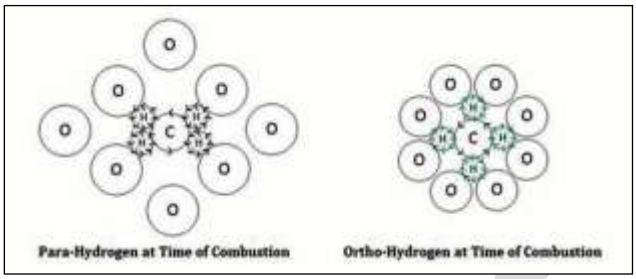


Figure [a]

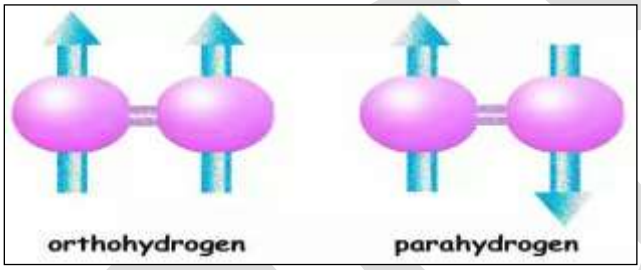


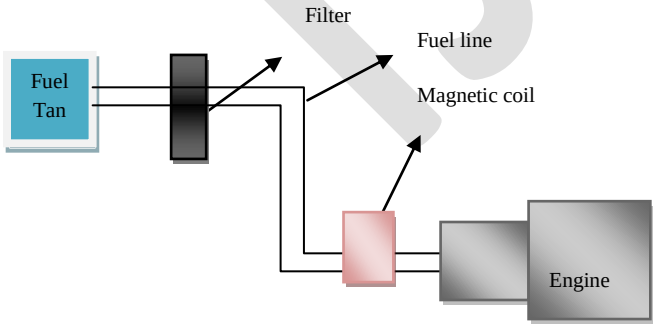
Figure [b]

Spin Isomer of Molecular Hydrogen

2 METHODOLOGY

The four stroke single cylinder diesel engine test rig will be prepared to run for all test. The setup consists of an engine, an eddy current dynamometer, and an exhaust gas analyser. Magnetic coil just installed before the injector on inlet pipe or housing for maximum alignment & maximum effect [8].Two types of magnetic coils were used to magnetize the fuel before entering the engine cylinder. This was done with aid of electric magnetic coil which is placed on the pathway of fuel, approximately at one meter before the carburetor system, to ensure that magnetizing takes place.

The fuel system is designed to facilitate for accurate measurement of the fuel flow rate. The fuel consumption is measured directly by using the burette method. The fuel consumption will be measured at different engine loading conditions and exhaust gas measured by Exhaust gas analyzer. Engine performance including brake power, brake specific fuel consumption and thermal efficiency are studied using leaded gasoline with magnetic effect and without magnetic effects. This procedure was done twice one for without magnet installation and other for with magnetic coil installation and results will be compared.

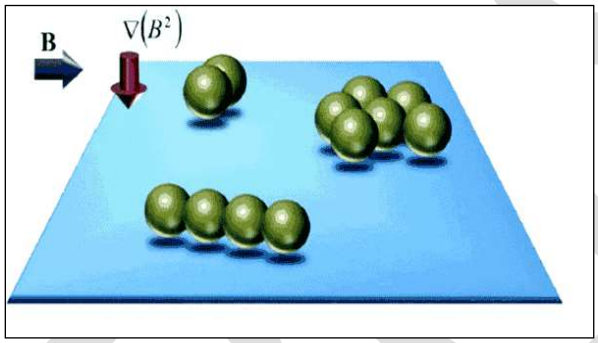


Figure[3] Schematic diagram for magnetic coil installation [3]

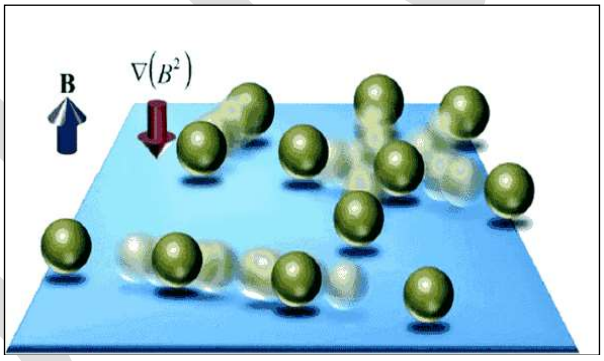
The magnet for producing the magnetic field is oriented so that its South Pole is located adjacent the fuel line and its North Pole is located spaced apart from the fuel line. [13]

Magnetic fuel conditioner is used to maximize the mileage by using less diesel fuel. In other words, magnetic fuel saver able to reduce the diesel consumption in the diesel engine. Diesel fuels is in the form of liquid when it's in the oil tank and the important point is fuel will only combust when they are vaporized and mixed with the air. Thus, something has to be done to break the particles into finer tiny particles to improve the combustion. Magnets help to ionize the fuel [12]. Fuel is basically from the groupings of hydrocarbons. When the molecules of hydrocarbon flowing through a magnetic field, it changes their orientation in the direction opposite to the magnetic field. Thus this results in changes of molecule configuration and weakens the intermolecular force between the molecules [9].

In other words, magnetic field actually disperses the molecules into more tiny particles and making the fuel less viscous [7]. Figure below shows how magnets help to disperse the molecules. Emission is another hot topic of diesel engine. Emission of dangerous gaseous such as oxides of nitrogen and oxides of sulphur is the result of incomplete combustion in the combustion chamber Magnetic field can improve the combustion level. Thus, automatically the amount of dangerous gaseous can be reduced. The amount of unburned hydrocarbon also can be reduced as the combustion rate improved [5].



Fuel structure before passing through magnetic field



Fuel structure after passing through magnetic field

Figure [2]

3 MAGNET SPECIFICATION

There are two types of magnets

1) Permanent magnet
2) Electromagnet

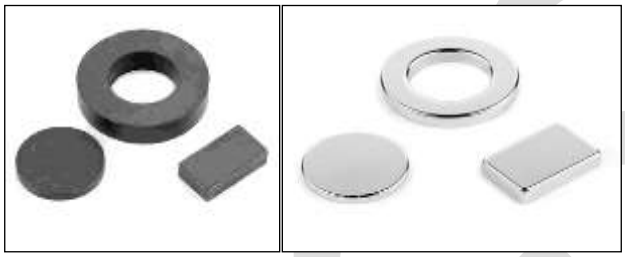
Permanent magnets are basically classified as

Neodymium Magnets

This magnet also known as Neo magnet which is most widely used type of rare earth magnet and in bright silver colour. This is a permanent magnet which made from alloy of neodymium, iron and boron and this magnet considered to be the strongest magnet type among other permanent magnet.

Ferrite Magnets

Ferrite magnet is the compound of ceramic and Iron oxide. This is an example of permanent magnet and used as ferrite cores in the transformer. Generally, ferrite magnets are carbon black in colour and brittle because the present of ceramic particle in the chemical compound. Ferrite magnets also considered as strong magnets but not as strong as neodymium magnets.



Ferrite Magnets **Neodymium Magnets**

Figure [4]

Toroidal core magnetic coil

Toroidal core are widely used since the magnetic fields are largely confined within the volume of the form.

Figure [5] Magnetic coil in Toroid Shape

4 EXPERIMENTAL SETUP

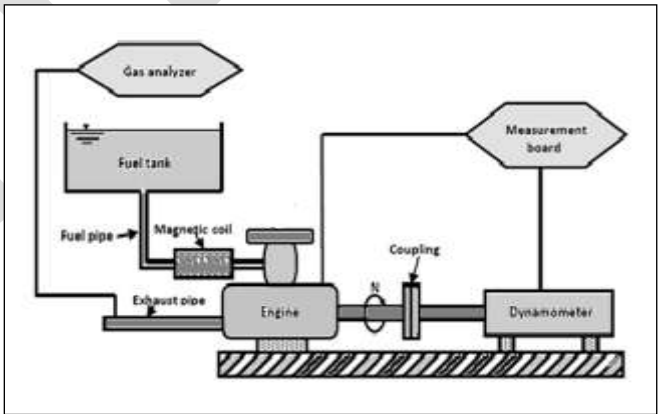


Figure [6] Experimental set-up diagram

The four stroke single cylinder diesel engine test rig will be prepared to run for all test. The magnetic flux density to be imparted to fuel widely varies depending upon fuel, air or steam, and combustion equipment and conditions. In general, the preferred

range of magnetic flux density is from 1000 to 3500 Gauss, and the most preferred range is from 1400 to 1800 Gauss when fuel oil is used in combination will be determined through experimental runs. The field strength is a function of the engine size based on fuel consumption. [11].The Ferrite magnets are the most cost effective for treating fuel. When high energy Neodymium Iron Boron Magnets are applied, we can obtain a decrease in the fuel mileage and unburned hydrocarbons and carbon monoxide.

The magnetizing apparatus is located on the pipe between pumping means and the burner, carburetor or fuel injectors, because it is unnecessary for any other parts to be magnetized [10]. A portion of the fuel feeding system extending from a point downstream of the magnetizing apparatus to the burner must be made of non-magnetic material. In this case, magnetized fuel is directly fed to burners or atomizing nozzles with a minimum reduction of magnetism. The magnets are embedded in a body of non-magnetic material, such as plastic, copper or aluminium, to secure them to the fuel line. No cutting of the fuel line and no hose and clamps are necessary to install this device, outside a fuel line without disconnection or modification of the fuel or ignition system for producing magnetic flux in the flow path of combustible fuel within the pipe. These units have been installed without other fuel line or ignition adjustments to treat vehicles failing required emission tests as an inexpensive retrofit accessory to give substantially immediate improvements of up to the order of 80 % reduction in hydrocarbon and carbon monoxide emissions.

5 CONCLUSION

The study of fuel magnetism got importance in recent year due to its effect on decreased fuel consumption and reduced exhaust emission. It also shows improvement in brake Thermal efficiency and Indicated power. Hence by varying strength of magnetic field better result can be obtained.

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Optimization of process parameter in electrochemical machining Of Inconel 718 by Taguchi analysis

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Abstract— Electrochemical machining (ECM) is a non-contact, electrochemical dissolution process that is used to shape the anode metal, namely the work piece, the cathode, namely the tool, is normally moved toward the anode at constant feed rate, and the electrolyte flows at high speed through the gap to carry away the dissolved metal . ECM is mainly used to cut hard or difficult to cut metals, where the application of a more traditional process is not convenient. Being a complex process, it is very difficult to determine optimal parameters for improving cutting performance. Proper selection of manufacturing conditions is one of the most important aspects in the Electrochemical Machining process, as these conditions determine important characteristics such as Material Removal Rate and Surface Roughness. The material used in the Study was Inconel 718. Four parameters were chosen as process variables: Voltage, Feed rate, Pressure and electrolyte concentration. Experiments have been carried out to establish an Empirical relationship between process parameters and responses in ECM process using Taguchi Methodology. The contour plots are generated to Study the effect of process parameters as well as their interactions. MRR is influenced by applied Voltage and tool feed rate rather than other parameters. There is no single optimal combination of cutting parameters, as their influences on the metal removal rate are quite opposite.

KEY WORDS: ELECTROCHEMICAL MACHINING, TAGUCHI METHOD, OPTIMIZATION, MRR, INCONEL 718

1. INTRODUCTION

Electrochemical Machining (ECM) has tremendous potential because of versatility of its applications, and it is expected that it would be a promising, successful, and commercially viable machining process in the modern manufacturing industries. ECM was developed initially to machine the hard alloys, although any metal can so be machined [1]. It is an electrolytic process and its basis is the phenomenon of electrolysis, whose laws were established by Faraday in 1833. ECM has more advantages over other machining processes such as no tool wear, absence of stress/burr, high material removal, smooth surface finish and the ability to machine complex shapes in materials regardless of their hardness. ECM is an imaging process, where the cathode tool moves with a certain feed rate (0.1 to 2 mm/min) towards the work piece and its negative mirror shape is reproduced in the work piece [1]. The purpose of this work is to investigate the optimum process parameter in the material removal rate of electrochemical machining of Inconel718 by using Taguchi method. The effect of Voltage, Feed rate, Pressure and electrolyte concentration on Inconel 718 is also presented.

2. WORKING PRINCIPLE OF ECM

ECM is a controlled anodic dissolution process which is shown in fig. 1. Here, workpiece & tool are anode and cathode respectively, separated by an electrolyte [4]. When an electric current of high density and low voltage is passed through the electrolyte, the anode work piece dissolves locally. So the final shape of the generated work piece is approximately a negative mirror image of the tool.

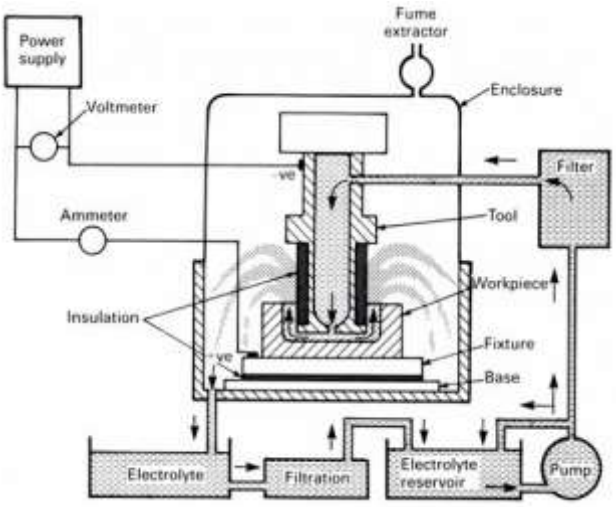

Fig. 1 Principle of ECM

The electrolyte, which is generally a concentrated salt solution flows through the inter electrode gap with high velocity to intensify the mass transfer through the sub layer near anode and to remove the sludge, heat and gas bubbles generated in the gap. Machining performance in ECM is governed by the anodic behavior of the work piece material in a given electrolyte. When a potential difference is applied across the electrodes, several possible reactions can occur at the anode and cathode. The salt is not consumed in the electrochemical processes; therefore, for keeping constant concentration level of electrolyte, it may be necessary to add more water. With this metal-electrolyte combination occurs, due to electrolysis the dissolution of iron from the anode, and the generation of hydrogen at the cathode. No other action takes place at the electrodes [4]

3. EXPERIMENTATION

The experimental setup includes an electrochemical machining unit, control panel and electrolyte tank. The power is supplied to the machining unit through a control panel. The control panel consists of LED's showing current, voltage, feed rate and time. The electrolyte used is NaNO3 aqua solution. The electrolyte is filled in the electrolytic tank and is supplied to the machining unit through a pump. A rotameter is employed to measure the discharge rate of the electrolyte. Copper tool has been used as an electrode and the pressurized electrolyte passes through the electrode. The arrangement is shown in fig. 2.

Fig.-2 Experimental setup of electrochemical machine

The machining unit includes a spindle through which the electrode is inserted. The work piece is fixed in a vise and moved to the appropriate position using hand wheels. The maximum permissible current is set and the inter electrode gap is accurately set by touching the electrode and then feeding the electrode in reverse direction for a specified time [3]. The performance of ECM is observed in terms of material removal rate with respect to Voltage, feed rate, Pressure and electrolyte concentration [4]. IEG of 0.3mm and a tool of dia.2 mm were set throughout the experiments. Then the machining was done for the set values. The chemical composition of work material is presented in Tab.1.The experiments were conducted by seating different level of parameters and the results were recorded. Sartorius electronic weighing machine with1 mg accuracy was used for measuring the metal removal(g). The complete working environment of the experiments shown in Tab. 2.

3.1 Design of Electrode:

The material to be used as tool or electrode should posse's desirable properties like easily machinable, low wear rate, good conductor of electricity and heat, cheap and readily available. In this experiment we have taken cupper as electrode material at cathode. It is designed in circular shaped so as to cut the cavity in workpiece in the similar profile.

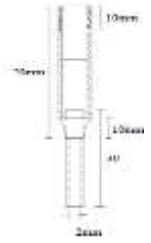

Fig.-3. Design of electrode

Work piece material: Inconel 718

Table-1. Material Composition

Elements	Ni	Co	Cr	Mo	Fe	Al	Nb+T
Weight %	52.50	1.00	19.00	3.05	17.00	0.900	5.125

3.2 Design of Experiment Using Taguchi Approach:

Taguchi parameter design is based on the concept of fractional factorial design. The two major goals of parameter design are
(1) To minimize the process or product variation and
(2) To design robust and flexible processes or products that is adaptable to environmental conditions.

3.3 Control factors and levels

The factors affecting are defined thus:
Controllable factors:

1. Voltage(V)
2. Tool Feed rate (f)mm/min
3. pressure (kg/cm^2)_1
4. Electrolyte conc (mMhos/cm

Table 2 Factors and level combination

Factor / Level	**Voltage (V) A**	**Feed rate mm/mn B**	**Pressure (kg/cm2) C**	**Electrolyte conc . (g/L) D**
1	9	0.7	0.8	85
3	14	0.8	0.9	105
3	20	0.9	1.0	125

3.4 Experimental observation:

Experiments were conducted according to Taguchi method by using the machining set up and the designed circular-shaped electrodes. The control parameters like applied voltage, feed rate, electrolyte concentration, and pressure, were varied to conduct nine different experiments and the weights of the work piece were taken for calculation of MRR. MRR is calculated as given by the following formula**: MRR = (initial weight-final weight) / Time**
During each drilling operation based on Taguchi L9 orthogonal array, the machining time was noted down. The weight of the work pieces were measured by the digital weighing machine before and after each drilling operation. Based on Taguchi L9 orthogonal array the values of input factors are placed in design matrix and each experiment was conducted twice to get the response more correctly and it is shown in table 3.

Table3. Experimental observations and calculation based on L9 array

S N	**Voltage (V)**	**Feed rate mm/min**	**Pressure (kg/cm^2)**	**Electrolyte conc.(mMhos/cm**	**MRR Response 1st**	**MRR Response 2st**
1	1	1	1	1	0.028	0.036

2	1	2	2	2	0.032	0.052
3	1	3	3	3	0.036	0.042
4	2	1	2	3	0.028	0.036
5	2	2	3	1	0.062	0.074
6	2	3	1	2	0.052	0.056
7	3	1	3	2	0.04	0.038
8	3	2	1	3	0.043	0.053
9	3	3	2	1	0.070	0.058

4. RESULT ANALYSES

From the result table 3, two responses are taken for further analysis to find out the optimum combination, which can yield into higher MRR. Statistical analysis was performed on the calculated values and the mean change in strength and signal to noise ratio values were calculated for the 9 experiments conducted.

Determination of S/N Ratio:

S/N Ratio = -10 $\log_{10}$ (1/n$\sum$ 1/y_i2)

Table 3.4 Calculation of Signal to Noise ratio for various Response Factors:

Sr. No	MRR Response		Total Test Response	Mean MRRG (g/min)	S/N Ratio
	1st	2st			
1	0.028	0.036	0.064	0.032	-30.10
2	0.032	0.052	0.084	0.042	-28.28
3	0.036	0.042	0.078	0.039	-28.25
4	0.028	0.036	0.064	0.032	-30.10
5	0.062	0.074	0.136	0.068	-23.45
6	0.052	0.056	0.108	0.054	-25.36
7	0.04	0.038	0.078	0.039	-28.18
8	0.043	0.053	0.096	0.048	-26.51
9	0.070	0.058	0.128	0.064	-23.99

Table 4.the response table for mean change for material removal rate (MRR) is shown

Level	A	B	C	D
1	0.0376	0.0343	0.0446	0.053
2	0.0523	0.0526	0.0453	0.045
3	0.049	0.047	0.0486	0.0396
Delta	0.0147	0.0183	0.004	0.0134
Rank	**2**	**1**	**4**	**3**

The response table for signal to noise ratio for material removal rate (MRR) is shown in table ….

Table 5. Taguchi analysis response table for signal to noise ratios:

Level	A	B	C	D
1	28.87	29.46	27.32	25.84
2	26.30	26.07	27.45	27.27
3	26.22	25.86	26.62	28.28
Delta	2.65	2.84	0.7	2.44
Rank	**2**	**1**	**4**	**3**

Calculation of Delta:

Delta = (Maximum S/N Ratio – Minimum S/N ratio)

Rank is ordered on the basis of delta, higher the delta; greater is the influence of that parameter on material removal rate. Thus the material removal rate is highly influenced by feed rate then voltage, pressure and electrolyte concentration.

Also after calculating the S/N ratio of three levels of voltage, feed rate, pressure and electrolyte concentration the optimum parameter setting for MRR is obtained for those levels having higher S/N ratio value.
The optimum parameter setting for MRR is shown in table

Table 5. Optimal combination for MRR

	Voltage (V)	**Feed rate)mm/min**	**Pressure (kg/cm^2)**	**Electrolyte concn. (mMhos/cm)**
Max. MRR	14	0.8	1.0	85

5. RESULTS AND DISCUSSION

5.1 Effect of Machining Parameters on Material Removal Rate (MRR):

The machinability of ECM depends on the voltage, feed rate of electrode, pressure of the electrolyte, electrolyte concentration.

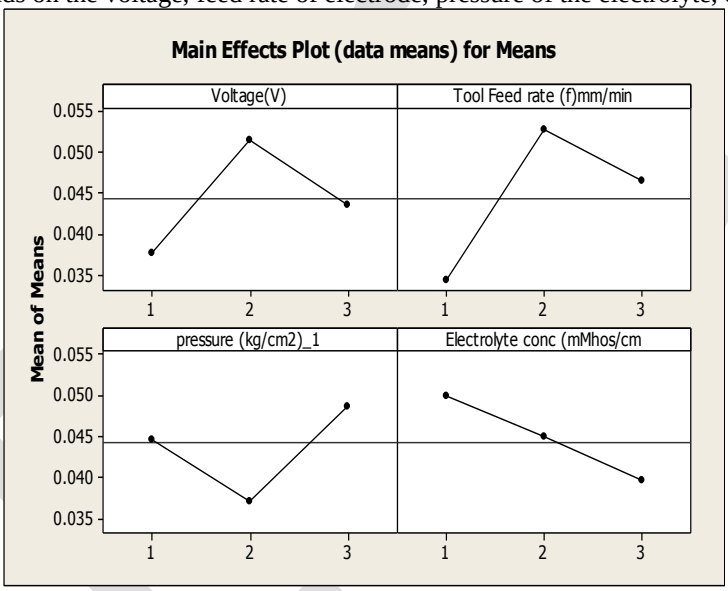

Fig. -3 Main effects plot for MRR (mean)

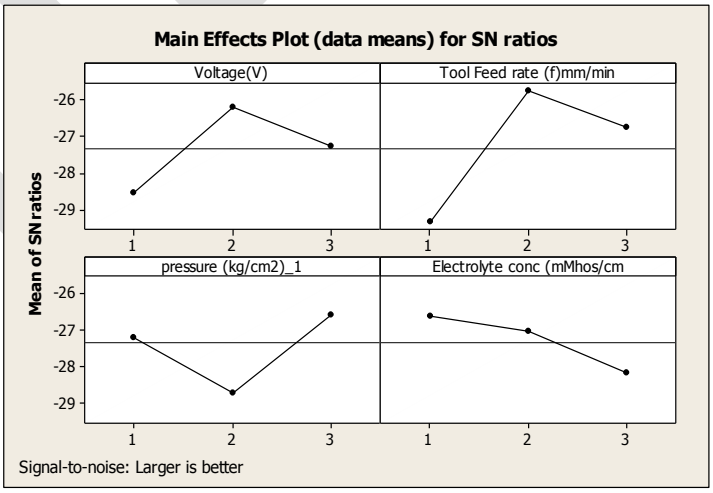

Fig.-4. Main effects plot for S/N Ratio

From the figure it is observed that the MRR increases as the voltage increases from first to second level (i.e. From 9 to 14 volts) but it decreases as it further increases to third level (20 volts). Similar trends are shown by the plot of main effects for SN ratios on MRR. The applied voltage has considerable contribution in affecting the material removal rate; also from the graph it is clear that the optimum cutting parameter for applied voltage is 14 volts (A2).

Similarly From the figure it is observed that the electrode feed rate has enormous effect on MRR and it increases with increase in feed rate up to second level (0.8 mm/sec) and then decreases as the feed rate increases to the third level .
The feed rate has larger contribution in affecting the material removal rate Larger the contribution of any factor, larger is the ability of the factor to influence material removal rate (MRR). Also from the graph it is clear that the optimum cutting parameter for feed rate is 0.8 mm/sec (B2).

Also, it is observed that the electrolyte Pressure has little effect on MRR. MRR increases from second level to third level (i.e. from 0.9 to 1 kg/cm^2) pressure of electrolyte; however, it decreases from first to second level (i.e. from 0.8 to 0.9 kg/cm^2). Similar trends are shown by the plot of main effects for SN ratios on MRR.

Also from the figure it is observed that the MRR decreases as the electrolyte concentration increases from first to second to third level (i.e. From 85 to 125 mMhos/cm) similar trends are shown by the plot of main effects for SN ratios on MRR. The electrolyte concentration has considerable contribution in affecting the material removal rate; also from the graph it is clear that the optimum cutting parameter for applied voltage is 85 mMhos/cm (D1).

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CONCLUSIONS

The paper presented the optimization of the electrochemical machining of Inconel 718 by using Taguchi analysis. The optimal process parameters that have been identified to yield the best combination of process variables are (A2,B2,C3,D1) i.e. voltage at 14 V feed rate at 0.8mm/min, Pressure 1.0 kg/cm^2 and. electrolyte concentration at 85 mMhos/cm, As a result, the target performance characteristics, i.e. material removal rate can be maximized through this method. The effectiveness of this approach is verified by experiment and analysis of variance.

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PRIORITY BASED PATH DETOUR AND MOBILE ROBUST DATA COLLECTOR IN WDN

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Abstract To obtain reliable and efficient communication underneath noise channels is one in all the challenges in wireless detector networks (WDNs), particularly in industrial WDNs (IWDNs) with dynamic and harsh environments. Here we have a tendency to gift the Routing efficiency to extend the strength to link dynamics for WDNs/IWDNs. R3E is meant to boost existing reactive routing protocols to produce reliable and energy-Efficient packet delivery against the unreliable wireless links by utilizing the native path diversity. We have a tendency to introduce a biased back down theme the route-discovery section to search out a robust guide path, which may offer a lot of cooperative forwarding opportunities. On this guide path, information packets are covetously progressed toward the destination through nodes' cooperation while not utilizing the situation information. Through extensive simulations, we have a tendency to demonstrate that compared to different protocols, reactive path routing protocols improves the packet delivery quantitative relation, whereas maintaining high energy efficiency and low delivery latency.

Index terms – Industrial wireless detector Networks (IWDNs) , Routing Efficiency, Mobile Robot Cooperative forwarding.

I. Introduction

Industrial applications of Wireless Sensing element Networks need timeliness in exchanging messages among nodes. Though it provides an excellent frame structure time period communication,
a time period message planning algorithmic program remains needed to schedule an outsized variety of real time messages to fulfill their temporal arrangement constraints. We have a tendency to propose a distance affected time period off-line message planning algorithmic program that generates the quality specific parameters and allocates every periodic time period message to super frame slots for a given message set. The proposed planning algorithmic is evaluated and analyzed extensively through simulations. Additionally, a secured time service is enforced in a very typical industrial sensing element node platform to verify the feasibility of the secured time service with the schedule generated by the proposed planning algorithmic program. Through experiments, we have a tendency to prove that the real system runs accurately in line with the schedule calculated by the proposed algorithmic program [1].

Increasing age of the many industrial systems and also the dynamic industrial producing market, intelligent and cheap industrial automation systems are needed to enhance the productivity and efficiency of such systems. The cooperative nature of industrial wireless detector networks (IWDNs) brings many benefits over ancient wired industrial observance and management systems, together organization, rapid deployment, flexibility, and inherent intelligent-processing capability. During this regard, IWDN plays a significant role in making a extremely reliable and self-healing industrial system that rapidly responds to period of time events with acceptable actions. Specifically, radio technologies, energy harvest techniques, and cross-layer style for IWDNs are mentioned. Additionally, IWDN standards are presented for the system owners, who plan to utilize new IWDN technologies for industrial automation applications. Security ought to be a necessary feature within the style of IWDNs to form the communication safe from external denial-of-service attacks and intrusion. IWDNs have special characteristics that alter new ways in which of security attacks. Passive attacks are carried out by eavesdropping on transmissions together with traffic analysis or disclosure of message contents. Active attacks contain modification, fabrication, and interruption that in IWDN cases could embrace node capturing, routing attacks, or flooding. Additionally, since sensing element are usually time sensitive, e.g., alarm notifications for the commercial facilities, its vital to receive the data at the sink in an exceedingly timely manner. Data with long latency attributable to process or communication may be outdated and cause to wrong decisions within the observance system. Compact and low cost sensing element devices are essential to accomplish large scale deployments of IWDNs. Throughout installation of IWDNs, the system owners should be ready to confirm the system what a sensing element is observance and wherever its once readying within the field, network management and authorization tools are essential [2].

Wireless industrial detector networks are wireless detector networks that are adapted to industrial applications. Most techniques for wireless detector networks are often applied to wireless industrial detector networks. However, for industrial applications of wireless industrial detector networks, new necessities like time period, reliable delivery ought to be considered that may be a novel routing protocol for wireless industrial detector networks. It provides time period, reliable delivery of a packet, whereas considering energy awareness and a node estimates the energy cost, delay and reliabilities of a path to the sink node, based mostly solely on data from neighboring nodes. Then, it calculates the chance of choosing a path, victimization the estimates. Once packet forwarding is needed, it randomly selects consequent node. A path with lower energy cost is probably going to be selected, as a result of the chance is inversely proportional to the energy cost to the sink node. To attain time period delivery, solely methods which

will deliver a packet in time are selected. To attain reliableness, it's going to send a redundant packet via an alternate path, but only if it is a source of a packet. There are two types of messages: beacon messages and data packets. A beacon message is changed among neighboring nodes to construct and maintain a routing table. Upon receiving a beacon message, a routing table is made or updated by hard expected values of energy cost, delay and reliability. Once a path to the sink node becomes identified to a node, the node begins to send a periodic beacon message. The source node sends data packets to the sink when constructing the routing table. Every intermediate node forwards a data packet to a neighboring node that may deliver the packet in time [3].

Opportunistic routing to boost the network output by permitting nodes that catch the Transmission and nearer to the destination to participate in forwarding the packet, i.e., in forwarder list. The nodes in forwarder list are prioritized and therefore the lower priority forwarder can discard the packet if the packet has been forwarded by the next priority forwarder. One difficult downside is to pick out and place forwarder list such a definite network performance is optimized. Here we tend to target choosing and prioritizing forwarder list to attenuate energy consumptions by all nodes. We study both cases wherever the transmission power of each node is fastened or dynamically adjustable. The suitable forwarding list to attenuate the energy cost is formed by the transmission power of every node is fastened and every node will change its transmission power for every transmission. Optimum algorithms to pick out and place forwarder are presented and analyzed. Its value to say that our analysis doesn't assume any special energy models [4].

Gradient routing with two-hop information for industrial wireless sensing element networks to reinforce period of time performance with energy efficiency. Two-hop information routing is adopted from the two-hop velocity-based routing, and also the proposed routing rule is predicated on the amount of hops to the sink rather than distance. In addition, an acknowledgment management theme reduces energy consumption and process complexness. The simulation results show a reduction in end-to-end delay and increased energy efficiency [5].

Traditional wired field devices have dominated industrial automation for many years. Nowadays, as a consequence of the evolution of wireless communication along electronics technology, wireless detector networks (WDNs) are exhibiting their benefits over traditional wired counterpart for industrial automation. As a result of the turning away of cabling, installation price is considerably reduced. Estimation is formed by Emerson method Management that up to ninetieth of cost saving is achieved by applying Industrial Wireless Detector Networks (IWDNs) in industrial automation. Supported totally different classification strategies, routing protocols in WDNs is sorted into classes. Generally, routing protocols for WDNs constitute four primary classes. Those are flooding-based, dynamic routing table-based, cluster-based, geographical routing protocols. Packet transmissions during this class are usually supported unicast. To forward data packets, every sensing element node ought to maintain a forwarding table containing the data of subsequent hop. A typical WDN is constructed of spatially distributed sensing element nodes and gateways. Traditional WDNs are characterized as low power consumption, low data rate and self-organizing capability and generally used for observation physical or environmental conditions. Instead of reliability and communication latency, power consumption is a lot of important for traditional WDNs, since battery powered sensing element nodes usually are deployed in places off the beaten track, like volcanoes, forests, deserts, etc. Frequently dynamic batteries for sensor nodes could be a challenge [6].

A novel forwarding technique supported geographical location of the nodes concerned and random choice of the relaying node via competition among receivers. We have a tendency to specialize in the multihop performance of such an answer, in terms of average range of hops to achieve a destination as a operate of the distance and of the typical range of accessible neighbors [7].

II. Existing System

Reactive routing protocols apply the on-demand procedures to dynamically build the route between a source and a destination. Routes are usually created and maintained by 2 completely different phases, namely: route discovery and route maintenance. Route discovery typically happens on-demand by flooding an RREQ (Route Request) through the network, i.e., once a node has data to send, it broadcasts an RREQ. Once a route is found, the destination returns an RREP (Route Reply), that contains the route information (either the hop-by-hop information or complete addresses from the source to the destination) traversed by the RREQ. Detector networks have emerged as a practical solution for several detection and surveillance applications. The concept given in distributes the sensors supported the region of interest and with the assistance of those sensors sight targets. Remedial actions were in step with the target/phenomena. However the detection performance of such detector networks powerfully trusted many factors like the supply of range of sensors, the surrounding factors, and therefore the detector deployment strategy, that will increase the communication overhead. Throughout the communication process, the energy reduction of a detector node leads to a dead mode and doesn't with efficiency communicate with alternate nodes and end in bottleneck during a WDN. As a result, the detected data collected by the partitioned off WDNs are discarded. Therefore, the base station collects only part of the detected data. To supply solution to this, a mobile robot (MR) is utilized to support data collection in partitioned off WDNs and to bring collected detected data back to the sink and reducing the hop count. Autonomous robots have broad vary of applications together with security guards and museum management to house cleaning.

The main issue for autonomous robots is that the accuracy of their navigation systems that during configuration errors can predictably accumulate attributable to factors like autonomous units which act independently without the consent of the opposite sensors increasing the communication overhead. First, wireless communications, notably long-range, may consume restricted on-board energy provide by sensing element nodes owing to super linear path loss exponents. Second, even if shorter range, multi hop

wireless communications are adopted, owing to the data collection toward the sink, nodes around the Sink still got to consume far more energy than others owing to denser volumes of traffic transmitted by them that affects overall network lifetime.

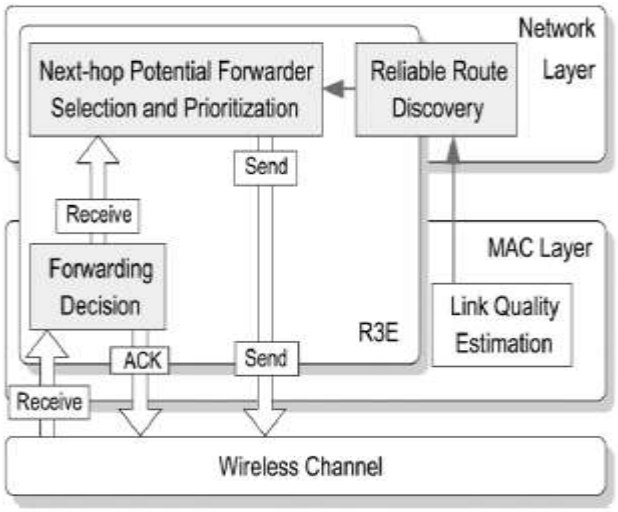

Fig 1. Functional architecture overview

The functional block diagram that could be a middle-ware style across the MAC and also the network layers to extend the resilience to link dynamics for WDNs/IWDNs. The R3E improvement layer consists of 3 main modules, the reliable route discovery module, the potential forwarder selection and prioritization module, and the forwarding decision module. The reliable route discovery module finds and maintains the route information for every node. Throughout the route discovery section, every node concerned within the cooperative forwarding method stores the downstream neighborhood information, that's to mention, once a node is a forwarder, it already knows the next-hop forwarding candidates on the discovered path. The other 2 modules are responsible for the runtime forwarding phase. Once a node successfully receives a data packet, the forwarding decision module checks whether it is one of the intended receivers. If yes, this node can cache the incoming packet and begin a backoff timer to return an ACK message, where the timer value is related with its ranking within the intended receiver list. If there is no alternative forwarder candidate with higher priority transmitting an ACK before its backoff timer expires, it will broadcast an ACK and deliver the packet to the higher layer, i.e., trigger a receiving event within the network layer. Then, the potential forwarder choice and prioritization module attaches the ordered forwarder list within the data packet header for consequent hop. Finally, the outgoing packet are going to be submitted to the MAC layer and forwarded towards the destination.

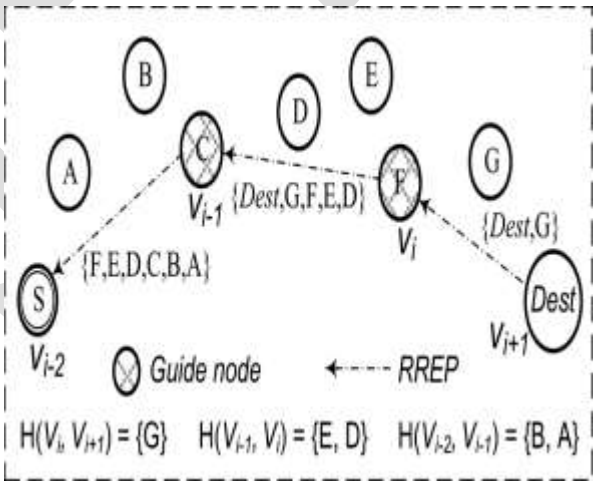

Fig 2. RREQ path during route discovery phase

The source node broadcasts associate data packet, which contains the list of forwarding candidates (helper nodes and the downstream guide node) and their priorities. Those candidates follow the assigned priorities to relay the packet. Each candidate, if having received the data packet properly, will begin a timer whose value depends on its priority. The higher the priority, the shorter is that the timer value. The candidate whose timer expires will reply with an ACK to notify the sender, as well as to suppress other

contenders. Then it rebroadcasts the data packet toward its downstream link. If no forwarding candidate has successfully received the packet, the sender will retransmit the packet if the retransmission mechanism is enabled. We denote t(k) as a result of the backoff timer value of the kth candidate.

III. Proposed system

Each sensing element node in WDN has battery however the capability is taken into account to be restricted in terms of energy. The mobile sink idea is introduced here to realize source to destination route path without causing any data loss. Mobile sink collects data from the fault node thus it has the advantages of cost saving and reducing the hop count. To provide solution to this a mobile sink is employed for data collection to realize reliable and efficient communication whereas forwarding messages that analyze AODV-ETX (Expected Transmission Count) the route discovery part finds a least-ETX and retransmission is enabled. REPF (Reliable and Efficient Packet Forwarding) finds an efficient primary path. GOR (Geographic Opportunistic Routing) minimizing the number of end-to-end data transmissions.

IV. Data Collection Using Mobile Robot

Sensor networks have emerged as a practical solution for several detection and surveillance applications. The idea presented in distributes the sensors supported the region of interest and with the help of those sensors notice targets. Remedial actions were consistent with the target/phenomena. However the detection performance of such sensing element networks powerfully trusted on several factors such as the availability of range of sensors, the environment factors, and also the sensing element preparation strategy, that will increase the communication overhead. Throughout the communication overhead, the energy reduction of a sensing element node leads to a dead mode and does not efficiently communicate with alternative nodes and lead to bottleneck during a WDN.As a result, the sensed data collected by the partitioned off WDNs are going to be discarded. Therefore, the base station collects only part of the sensed data. To provide solution to this, a mobile robot (MR) is utilized to support data collection in partitioned off WDNs and to bring collected sensed data back to the sink and reducing the hop count. However as given in, the partitioned/islanded WDNs need to be noticed in advance. Autonomous robots have broad vary of applications together with security guards and museum management to deal with house cleaning. The most issue for autonomous robots is that the accuracy of their navigation systems, in which configuration errors can predictably accumulate due to factors like autonomous units which acts severally without the consent of the opposite sensors increasing the communication overhead. One feasible solution for autonomous robots is to design a network of localization sensors, such as cricket devices as presented in, that provided location references but the scalability issues were not provided. Most of the researches on sensing element preparation have considered only sensor and environment models. Typically, data collection depends on wireless communications between sensing element nodes and also the sink node, which may suffer from the subsequent issues. First, wireless communications, significantly long-range, may consume restricted on-board energy supply by sensing element nodes owing to super linear path loss exponents. Second, even though shorter range, multi hop wireless communications are adopted, owing to the data collection toward the sink, nodes around the Sink still got to consume much more energy than others owing to denser volumes of traffic Transmitted by them that affects overall network lifetime. Alleviation has appeared within the literature but the intrinsic high and unbalanced energy consumption still remains as a main challenge.

V. Experimental Results

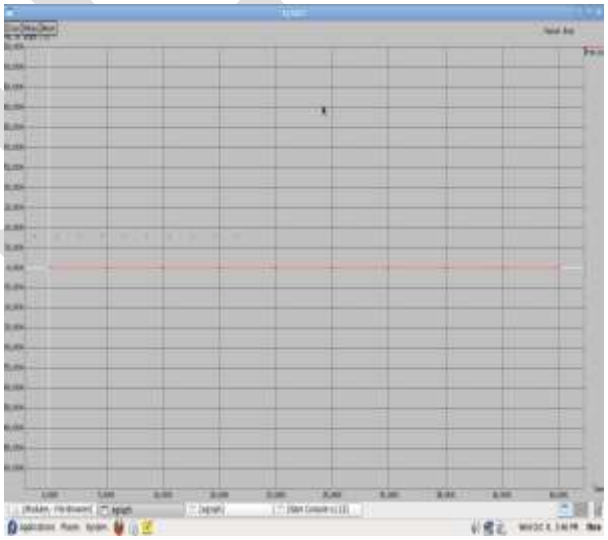

Fig 3. Packet drop

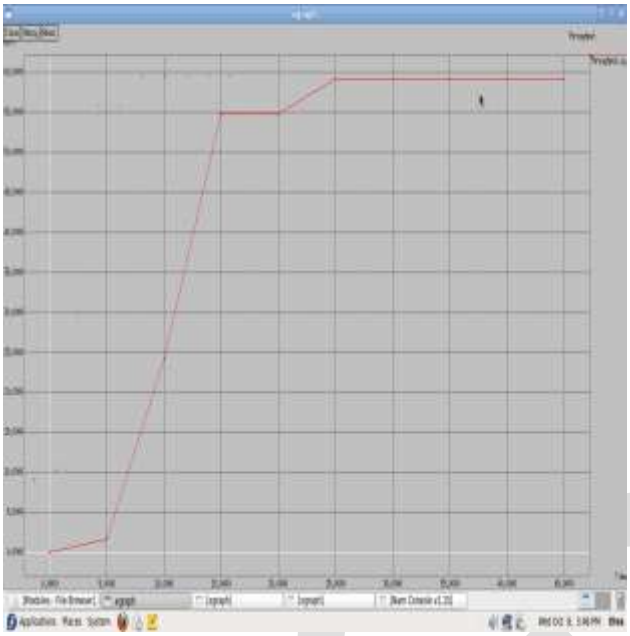

Fig 4. Throughput

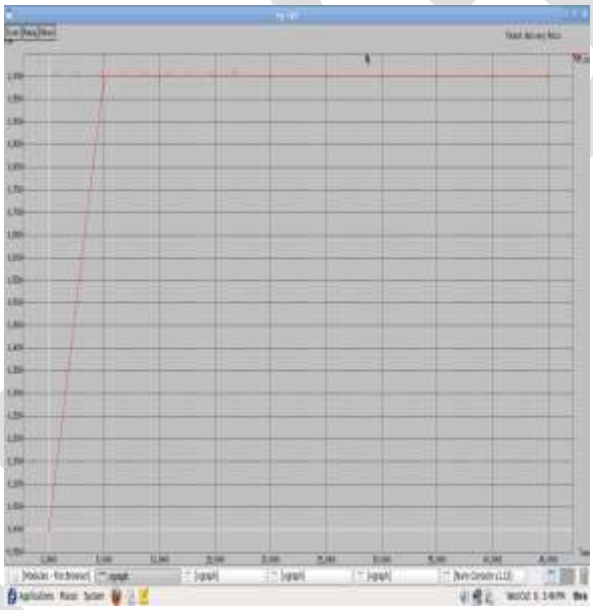

Fig 5. Packet delivery ratio

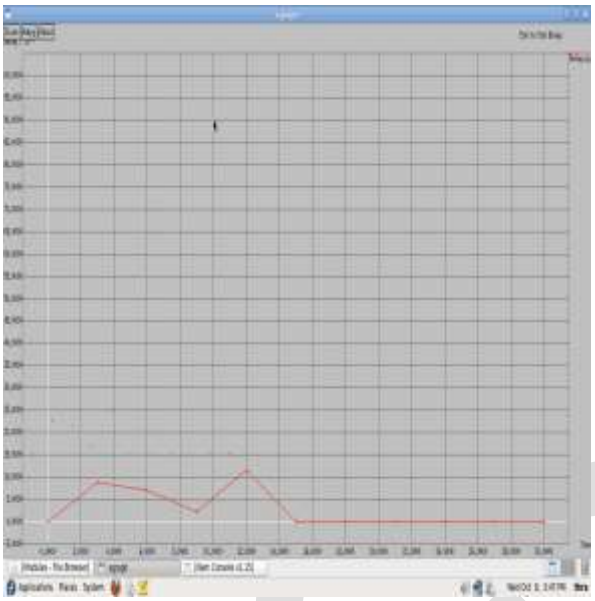

Fig 6. End to End delay

VI. Conclusion

In this work, we presented reactive path routing protocols to produce reliable and efficient data delivery against the unreliable wireless links. A strong virtual path is found by route discovery section to send packets to the destination. We tend to compared several reactive routing protocols to demonstrate its reliability and effectiveness. This reactive path provides very close routing performance to the geographic opportunistic routing protocol. As compared with different reactive protocols AODV will improve end-to- end energy efficiency and latency.

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GLAUCOMA SCREENING USING SUPER PIXEL CLASSIFICATION BASED ON OPTIC DISC AND OPTIC CUP SEGMENTATION

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Abstract-Fundus imaging could be a common clinical procedure used to record a viewing of retina. The manual examination of optic disk (OD) could be a standard procedure used for detecting glaucoma. During this project, we have a tendency to describe a process to automatically locate the optic nerve in a retinal image. The optic nerve is one of the most important organs in the human retina. Locating the OD position in fundus image is sort of vital for several reasons. Abundant vital retinal pathology may affect the optic nerve. Since the OD could also be simply confounded with large exudative lesions by image analysis techniques. The method is predicted on the preliminary detection of the main retinal vessels. All retinal vessels begin from the OD and their path follows an analogous directional pattern (parabolic course) in all images. Glaucoma detection typically considers the medical history, intra-ocular pressure and field of vision loss tests of a patient together with a manual assessment of the OD, through ophthalmoscopy. Since enlargement of the cup with regard to OD is an vital indicator of glaucoma progression, various parameters are estimated and recorded to assess the glaucoma stage.

I INTRODUCTION

Glaucoma is one of the normal explanations for visual deficiency with concerning 79 million in the world likely to be afflicted with glaucoma by the year 2020. It is characterized by the progressive degeneration of optic nerve fibres and ends up in structural changes of the optic nerve head, which is additionally referred to as optic disk, the nerve fibre layer and a simultaneous functional failure of the visual field. Since, glaucoma is asymptomatic in the early forms and therefore the associated vision loss cannot be restored. Early detection and treatment of retinal diseases are crucial to avoid preventable vision loss. Digital colour fundus (retinal) image (CFI) has emerged as a most well-liked imaging modality for large scale eye screening programs due to its non invasive nature. The optic disk (OD) one among the most component of retina, is an crucial indicator for *glaucoma* which is one of the most common causes of blindness.

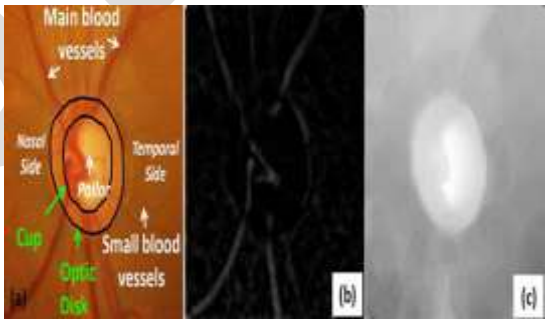

Fig 1: Retina image a) A sample cropped CFI region, b) A max image obtained by morphological closing, c) A vessel-free smooth image.

However, several glaucoma patients are unaware of the disease until it has reached its advanced stage. In Singapore, quite ninetieth of patients are unaware that they have this condition. In Australia, regarding five hundredth of individuals with glaucoma are

undiagnosed. Since glaucoma progresses with few signs or symptoms and also the vision loss from glaucoma is irreversible, screening of people at high risk for the malady is vital.

The glaucoma are classified by the appearance of the iridocorneal angle. There are open-angle, closed-angle, and developmental categories, which are further divided into primary and secondary types. Primary open angle glaucoma can occur with or while not elevated intraocular pressure; the latter is typically known as normal- tension glaucoma. Primary open-angle glaucoma includes each adult onset disease (occurring after 40 years of age) and juvenile-onset disease (occurring between the ages of 3 and 40 years of age). Samples of secondary open-angle glaucoma's embody those associated with exfoliation or pigment dispersion syndrome. Closed-angle glaucoma are often primary (e.g., papillary block) or secondary (e.g., inflammatory or neovascular causes). Developmental forms of glaucoma include primary congenital glaucoma and glaucoma associated with syndromes (e.g., aniridia or the AxenfeldRieger syndrome). Primary open-angle glaucoma, the predominant form of glaucoma in Western countries, most likely comprises several clinically indistinguishable diseases.

There are three methods to detect glaucoma:

(1) Assessment of raised intraocular pressure (IOP),

(2) Assessment of abnormal visual field,

(3) Assessment of damaged optic nerve head.

The IOP measurement using non- contact tonometry (also known as the"airpufftest") is neither specific nor sensitive enough to start effective screening tool because glaucoma can be present with or without increased IOP. Color fundus imaging (CFI) is another modality that may be used for glaucoma analysis. It has risen as a favoured modality for large-scale retinal disease screening and has already been established for large-scale diabetic retinopathy screening. It is possible to acquire fundus images in an exceedingly non invasive manner which is suitable for large scale screening. To handle this, morphological based pre processing step is employed to suppress the vessel prior to template matching. Assessment of the damaged optic nerve head is each extra guaranteeing, and higher than IOP estimation or visual field testing for glaucoma screening.

Fig 2: Retinal fundus image with vessels and OD (bright round shape on the right-hand side).

The optic disc (OD), which in fundus images typically appears as a spherical region brighter than the surrounding, is the image of the optic nerve. From it, the central retinal artery and vein emerge, to cover, with most branching, most of the retinal region. Locating the OD position in fundus images is quite vital reasons. Much important retinal pathology might have an affect the optic nerve. Since the OD could also be easily confounded with large exudative lesions by image analysis techniques, its detection is additionally important to exclude it from the set of potential lesions. Moreover, OD detection is fundamental for establishing a frame of reference inside the retinal image and is, thus, important for any image analysis application.

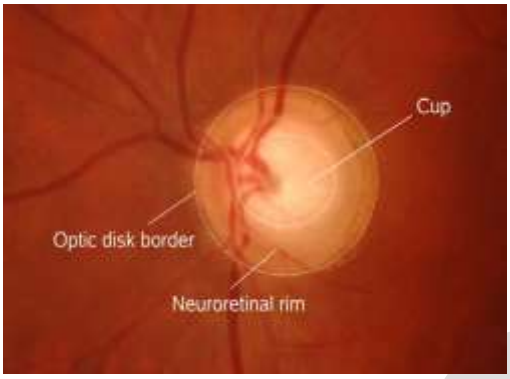

Fig 3: Major structures of the optic nerve head that are visible in color fundus photographs

The optic disk is margined by the optic disk border and may be divided into major zones:

(i)The neuro retinal rim is consist of astrocytes and nerve fibres whereas

(ii) The brighter cup or excavation completely consists of supporting tissue.

One strategy for automatic optic nerve head assessment is to use image features for a binary classification between glaucomatous and healthy subjects. These features are usually computed at the image-level. In these ways, choice of features and classification strategy is difficult and challenging [10]. The opposite strategy is to follow the clinical indicators. Several glaucoma risk factors are thought-about, such as the vertical cup to disc ratio (CDR) disc diameter], ISNT rule, peri papillary atrophy (PPA), notching, etc. Though different ophthalmologists have different opinions on the quality of those factors, CDR is well accepted and commonly used. A larger CDR indicates a better risk of glaucoma. There has been some analysis into automatic CDR measurement from 3-D images. Moreoever, because 3-D images are not easily available, 2-D color fundus images are still referred to by most clinicians.Moreover, the high cost of obtaining 3-D images makes it inappropriate for a large-scale screening program. This paper focuses on automatic glaucoma screening victimization CDR from 2-D fundus images. The optic nerve head or the optic disc (in short, disc) is the location wherever ganglion cell axons exit the attention of the eye to form the optic nerve, through which visual information of the photo receptors is transmitted to the brain. In 2-D pictures, the disc may be divided into two distinct zones; specifically, a central bright zone called the optic cup (in short, cup) and a peripheral region referred to as the neuroretinal rim.

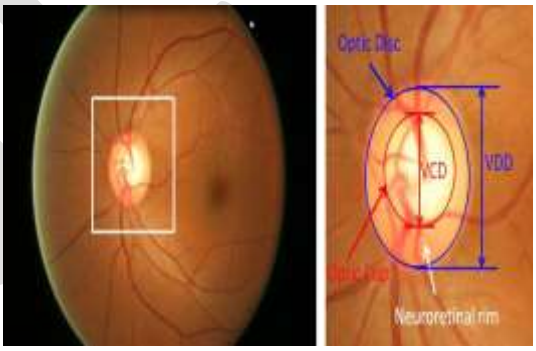

Fig4: Major structures of the optic disc.

Figure1.4 shows the foremost structures of the disc. The region fencelike by the blue line isthat the optic disc; the central bright zone enclosed by the red line is that the optic cup; and also the region between the red and blue lines is the neuroretinal rim.

The CDR is computed because the quantitative relation of the vertical cup diameter (VCD) to vertical disc diameter (VDD) clinically. Accurate segmentations of disc and cup are essential for CDR measurement. Several methods have been proposed for

automatic CDR measurement from 2-D fundus images. This paper proposes super pixel classification based disc and cup segmentations for glaucoma screening. Aidentcal concept has been used for vessel segmentation.

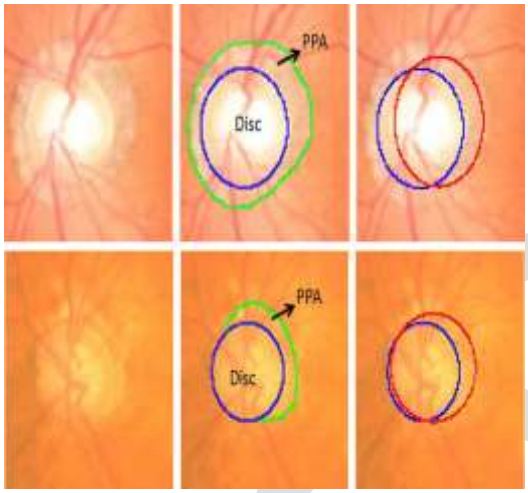

Fig 5: Challenge in disc segmentation.

Blue lines: manual disc boundary; red lines: automated disc boundary within the first and second example, respectively; green lines: the PPA boundary.

We compute center surround statistics from super pixels and unify them with histograms for disc and cup segmentation. We tend to incorporate previous information of the cup by including location information for cup segmentation. Based on the segmented disc and cup, CDR is computed for glaucoma screening. In addition, the proposed method computes a self-assessment reliability score for its disc segmentation result. Self-assessment is an crucial issue that has previously seldom been discussed in disc segmentation. In practice, an automated segmentation method might work well for most images whereas operating poorly for the rest. Therefore, it is important to have self-assessment where users are warned of cases with potentially large errors.

II. PROPOSED SYSTEM

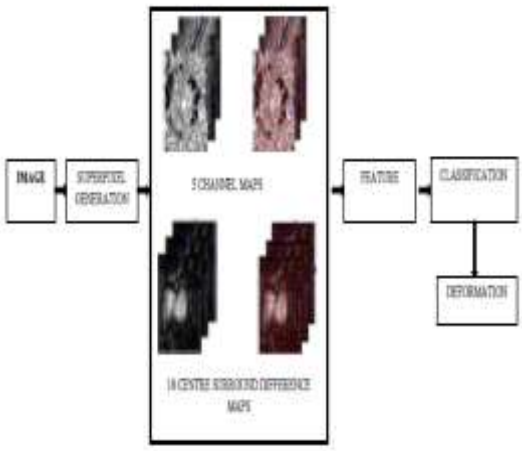

Fig 6: Superpixel based optic disc segmentation. Each image is divided into superpixels. From 18 center surrounded difference maps and five channel maps the features computed are used to classify the superpixels as disc or non-disc. In the feature map the jth column corresponds to the feature for the jthsuperpixel.

III. IMAGE SEGMENTATION

The next stage deals with segmentation. Segmentation partitions associate degree input image into its small constituent parts or objects. In general, autonomous segmentation is one among the foremost difficult tasks in digital image processing. On the one hand, a rugged segmentation procedure brings the process a long way towards the successful solution of an imaging drawback. On the other hand, weak or erratic segmentation algorithms virtually guarantee eventual failure. In terms of character recognition, the key role of segmentation is to extract individual characters and words from the background.

IV.SUPER PIXEL GENERATION

This paper uses the simple linear iterative clustering algorithm (SLIC) to aggregate nearby pixels into super pixels in retinal fundus images. Compared with other super pixel methods, SLIC is fast, memory efficient and has excellent boundary adherence. SLIC is additionally easy to use with just one parameter, i.e., the quantity of desired super pixels. Here we give a brief introduction of the SLIC algorithm while more details of the algorithms will be found within the SLIC.

SLIC uses the similar compactness parameter for all super pixels within the image. If the image is smooth in certain regions but highly rough-textured in others, SLIC produces smooth regular-sized super pixels in the smooth regions and highly irregular super pixels in the textured regions. So, it become tough choosing the right parameter for every image. The benefits of high boundary recall and low under segmentation error over SLIC super pixel on small numbers super pixels.

V. OPTIC DISC SEGMENTATION

The localization focuses on finding a disc pixel, very often the center. It has been extensively studied for applications in diabetic screening [23], [24]. Our work focuses on the segmentation drawback and therefore the disc is located by our earlier method in which works well in our data set for glaucoma screening as there are few white lesions to confuse disc localization as compared to diabetic screening. The segmentation estimates the disc boundary, that been a challenging task due to blood vessel occlusions, pathological changes around disc, variable imaging conditions, etc. The deformable model technique through reduction of the energy function:

- Image intensity,
- Image gradient, and
- Boundary smoothness.
- A level set is employed to estimate the disc followed by an ellipse fitting to smooth the boundary.

A) TEXTURE FEATURES

- Edge detection and
- Circular Hough transform are combined with an active shape model to extract the disc.

In addition, we have a tendency to conjoint a super pixel classification based approach using histograms.

- Super pixel Generation

B) FEATURE EXTRACTION

CONTRAST ENHANCED HISTOGRAM

Many features like color, appearance, gist, location and texture will be extracted from super pixels for classification. Since color is one of the main differences between disc and non-disc region, color histogram from super pixels is an intuitive alternative.

CENTER SURROUND STATISTICS

As we tend to delineated earlier, the PPA region appearance to be close to the disc. It is vital to incorporate features that reflect the distinction between the PPA region and the disc region.

The histogram of each super pixel does not work well because the texture variation within the PPA region is often from a larger area than the super pixel. This is because the super pixel often consists of a group of pixels with similar colours. Inspired by these observations, we tend to propose center surround statistics (CSS) from super pixels as a texture feature.

The center surround statistics (CSS) consists of the

- Mean and
- Variance

C) FINAL FEATURE

Since the texture feature from the PPA region is usually involved in a large region, the features from neighbouring super pixels are also considered in the classification of the present super pixel.

V. OPTIC CUP SEGMENTATION

Detecting the cup boundary from 2-D fundus images without depth information is a difficult task as depth is that the primary indicator for the cup boundary. In 2-D fundus images, one landmark to determine the cup region is that the pallor, defined as the area of maximum color contrast inside the disc.

A) FEATURE EXTRACTION

The feature extraction method is summarized above. After obtaining the disc, the minimum bounding box of the disc is employed for cup segmentation. The histogram feature is computed similarly to that for disc segmentation, except that the histogram from the red channel is not any longer used. This is because there is little information regarding the cup in the red channel.

B) SUPER PIXEL CLASSIFICATION FOR OPTIC CUP ESTIMATION

A mean filter is applied on the decision values to calculate smoothed decision values. Then the smoothed decision values are used to acquire the binary decisions for all pixels. The largest connected object is obtained and its boundary is used as the raw estimation.

VI. CUP TO DISC RATIO

After obtaining the disc and cup, various features can be computed. We have a tendency to follow the clinical convention to compute the CDR. As mentioned in the introduction, CDR is a very important indicator for glaucoma screening computed as.

$$CDR = \frac{VDD}{VCD}$$

The computed CDR is employed for glaucoma screening. When CDR is greater than a threshold, it is glaucomatous.

VII. RESULT

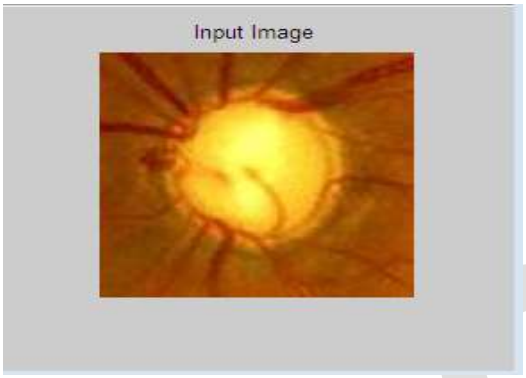

Fig 7: Input Image

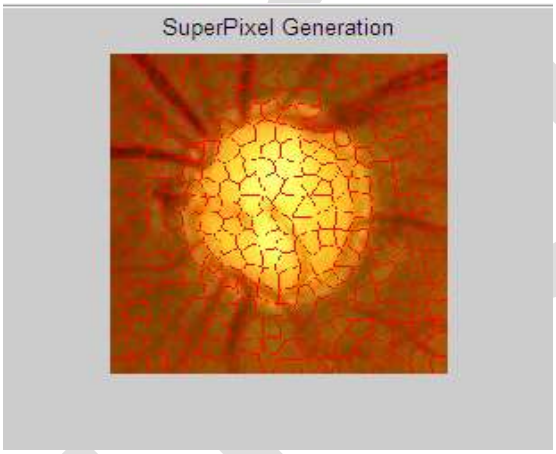

Fig 8: Superpixel Generation

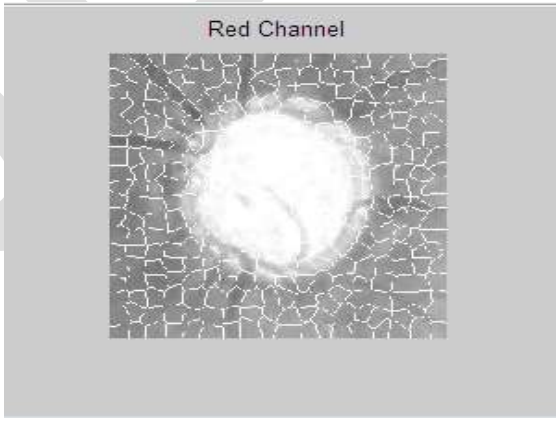

Fig 9: Red Channel

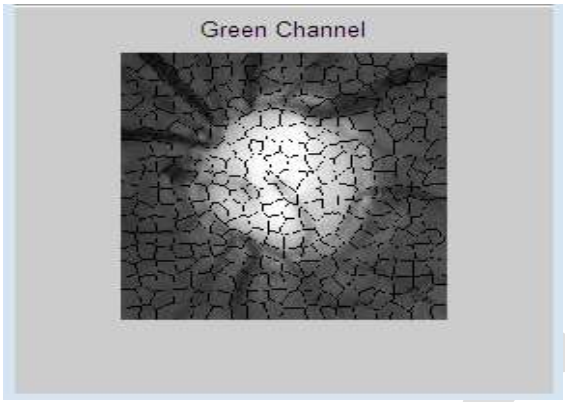

Fig 8: Green Channel

Fig 9: Blue Channel

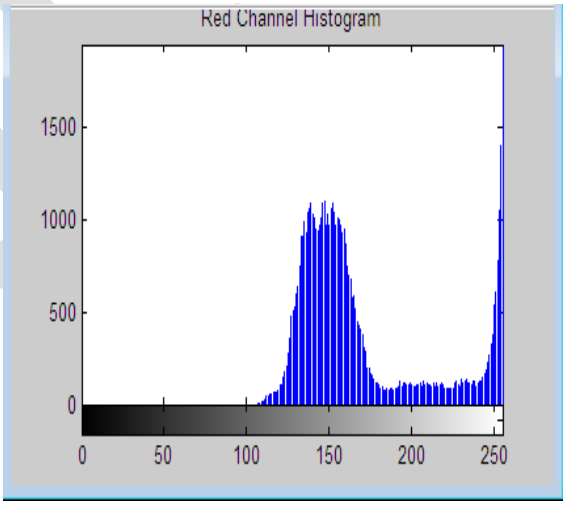

Fig 10: Red Channel Histogram

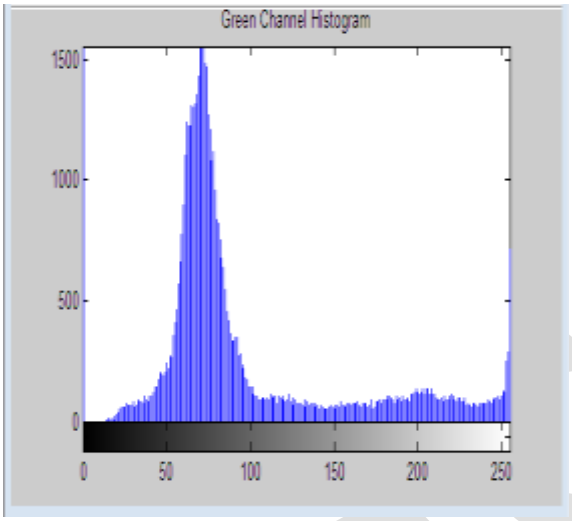

Fig 11: Green Channel Histogram

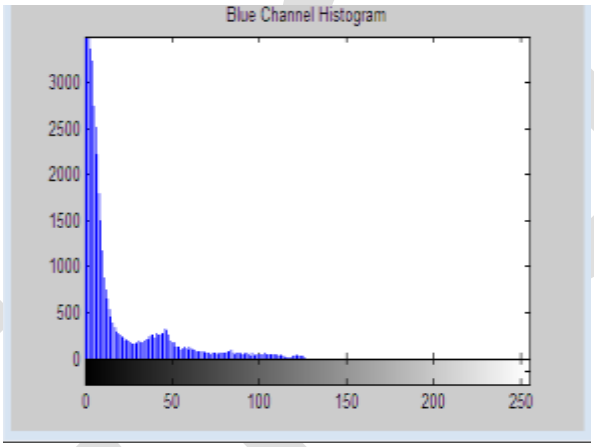

Fig 12: Blue channel Histogram

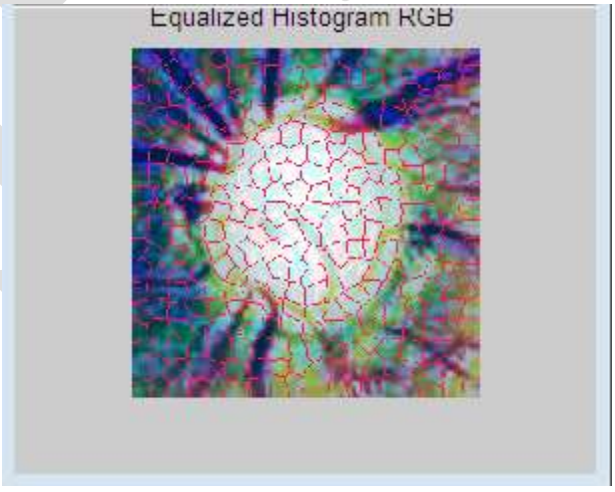

Fig 13: Equalized Histogram RGB

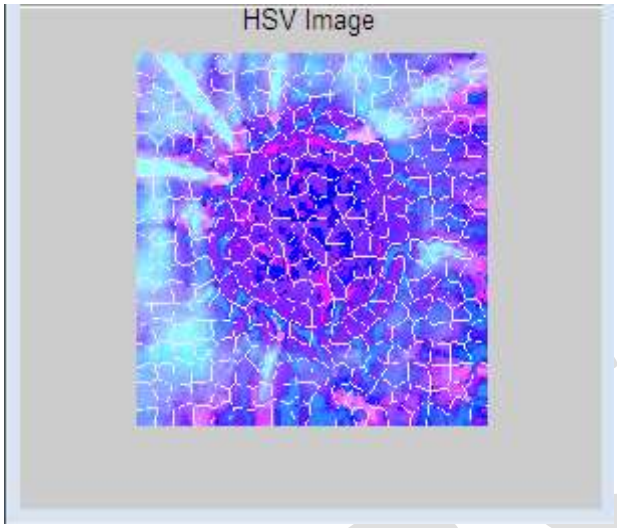

Fig 14: HSV Image

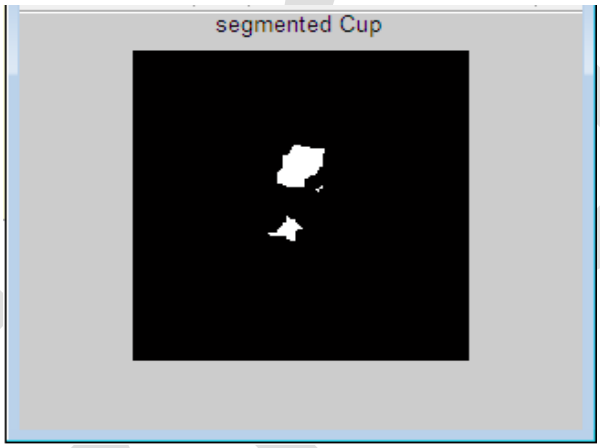

Fig 15: Segmented Cup

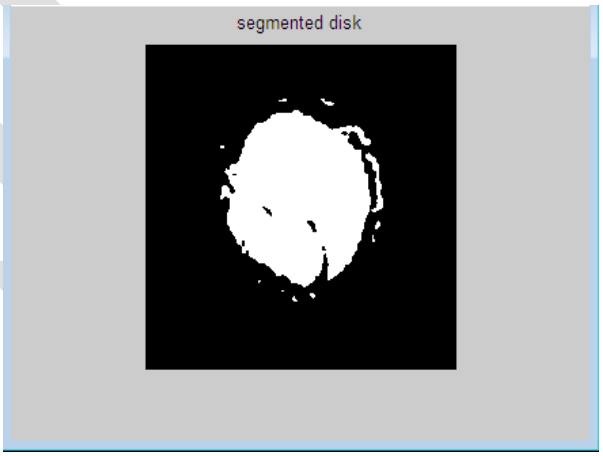

Fig 16: Segmented Disk

VIII. CONCLUSION

Based on the super pixel classification Optic disc and Optic cup are segmented for Glaucoma screening. Thus the image is segmented and equalized to determine the Optic disc and Optic cup value. To find the optic disc and optic cup value from the optic disc segmentation and optic cup segmentation respectively. Using optic disc value and optic cup value cup to disc ratio are going tol be evaluated and the glaucoma disease will be determined automatically.

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PTS PRECODING TECHNIQUE FOR PAPR REDUCTION IN MOBILE WIMAX

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ABSTRACT- Many precoding techniques are used to reduce PAPR in mobile WiMAX. Those techniques are nonlinear companding technique, OFDM supported low complexness transform to extend multipath Resilience and cut back PAPR. However it's the disadvantages like higher modulation order, degradation of BER and SNR performance, increasing of average power. However here PTS technique is employed. It overcomes the disadvantages of higher than techniques. The Mobile WiMAX interface adopts Orthogonal Frequency Division Multiple Access (OFDMA) as multiple access technique to enhance signal performances even once the signal is tormented by multipath distortion. However it's the matter of high PAPR. By victimization PTS technique based RI OFDMA it overcomes the higher than disadvantages. It is analyzed with root-raised-cosine pulse shaping filter to stay out of band radiation low and to meetl the spectrum mask needs.

Index Terms Orthogonal frequency division multiple access (OFDMA), Mobile WiMAX, Hadamard transform, Root-raised-cosine (RRC), Partial Transmit Sequence (PTS) I INTRODUCTION

The mobile worldwide ability for microwave access (Mobile WiMAX) is a third Generation broadband wireless technology that allows the convergence of mobile and glued broadband networks through a typical wide area radio-access (RA) technology and versatile specification. Since Jan2007, the IEEE 802.16 unit (WG) has been developing a new amendment of the IEEE 802.16 standard i.e. IEEE 802.16m as a complicated air interface to fulfill the requirements of ITU-R/IMT Advanced for 4G systems. The mobile WiMAX air interface adopts orthogonal frequency division multiple access (OFDMA) a multiple access technique for its transmission (UL) and downlink (DL) to enhance the multipath performance. OFDMA system splits the high speed data stream into variety of parallel low data rate streams.

The key distinction among OFDM and OFDMA is that, rather than allocating all the offered subcarriers to users, the base station assigns solely a set of carriers to every user so as to accommodate many transmissions synchronic. An inherent gain of the OFDMA primarily based systems is its ability to use multiuser diversity through sub channel allocation. OFDMA additionally has the advantage of being simply decoded at the receiver side, due to the absence of inter-carrier-interference. There are two different approaches for subcarrier mapping in OFDMA systems, namely

- Localized subcarrier mapping and
- Distributed subcarrier mapping.

The distributed subcarrier mapping are be often classified in two modes,

- Interleaved mode and
- Random interleaved mode.

Multiplexing a serial data symbol stream into an oversized range of orthogonal sub channel makes the OFDM signals spectral bandwidth efficient. It's been shown that the performance of OFDM system over frequency selective attenuation channels is best than that of the only carrier modulation system. The high PAPR brings on the OFDM signal distortion with the nonlinear region of high power amplifier (HPA) and also the signal distortion induces the degradation of bit error rate (BER). Moreover, to prevent spectral growth of the multicarrier signal within the style of intermodulation among subcarriers and out-of-band radiation, the transmit power amplifier should be operated in its linear region (i.e., with an oversized input backoff), where the power conversion is inefficient. This could have a deleterious resultt on battery life in mobile applications. In several cheap applications, the drawback of high PAPR could outweigh all the potential advantages of multicarrier transmission systems [1].

In terms of PAPR reduction, generally there are two classes of PAPR reduction techniques: techniques with distortion and techniques without distortion . About our approach, proposed a method for PAPR reduction in an OFDM system by combining selective mapping (SLM) and dummy sequence iteration (DSI) with the Walsh-Hadamard transform (WHT). The researchers achieved PAPR reduction, however at the expense of the high complexness of victimization several inverse fast Fourier transforms (IFFTs) and WHTs, and data rate losses through redundant SI. Though these techniques reduced the peak power of the transmitted signals, the complexness was high due to the use of IFFT and therefore the WHT one by one. Relating BER performance improvement, several techniques are investigated to reduce the injurious resultt of multipath dispersion. Moreover, subcarrier spreading by employing a WHT-OFDM system may be a lot of convenient approach to exploiting broadband channel diversity potential than using an adaptive system. Furthermore, WHTOFDM has lower complexity, better bandwidth efficiency, and a better data rate compared to adaptive

systems . Additionally the advantages of adding WHT to an OFDM system to reduce the influence of the selective fading channel on system performance. this improvement is barely achieved at the expense of an increase in the computational complexity of using WHT and therefore fast Fourier transform separately in a cascaded form[2].

To solve this high PAPR, several solutions are given within the literature, which can be divided in two categories—One category is to reduce the probability of generating high PAPR signals before doing multicarrier modulation, such as coding, Selective Mapping (SLM) and Partial Transmit Sequence (PTS). The other category is to manage with the signals when multicarrier modulation, like clipping and therefore companding transform, among which, the best and most generally used for reducing the PAPR of OFDM signals is clipping. It causes further clipping noise. Additionally, this clipping noise becomes very significant with high modulation orders and seriously degrades the system performance, which makes companding more suitable for high data rates applications.

II EXISTING SYSTEM

The existing systems are

- Random Interleaved OFDMA
- Hadamard transform
- Discrete-Sine-transform

2.1 RANDOM INTERLEAVED OFDMA

There are two different approaches for subcarrier mapping in Orthogonal frequency division multiple access systems are

- Localized subcarrier mapping and
- Distributed subcarrier mapping.

The distributed subcarrier mapping can be further categorized in two modes,

- Interleaved mode and
- Random interleaved mode.

The random interleaved mapping is used for mobile WiMAX because it increases the capacity in frequency selective fading channels and offers maximum frequency diversity.

2.2 HADAMARD TRANSFORM

The Hadamard transform (also known as the Walsh–Hadamard transform, Hadamard–Rademacher–Walsh transform, Walsh transform, or Walsh–Fourier transform) is an example of a generalized category of Fourier transforms. It performs an orthogonal, symmetric, involutional, linear operation on real numbers (or complex numbers, although the Hadamard matrices themselves are strictly real).The Hadamard transform are often considered being designde out of size-2 discrete Fourier transforms (DFTs), and is in fact equivalent to a multidimensional DFT of size . It decomposes an arbitrary input vector into a superposition of Walsh functions.The Hadamard transform H_m is a $2^m \times 2^m$ matrix, the Hadamard matrix (scaled by a normalization factor), that transforms 2^m real numbers x_n into 2^m real numbers X_k. The Hadamard transform are often outlined in two ways: recursively, or by using the binary (base-2) representation of the indices *n* and *k*. The Hadamard transform is additionally employed in data encryption, as well as many signal processing and data compression algorithms, such as JPEG XR and MPEG-4 AVC. In video compression applications, it is usually used in the form of the sum of absolute transformed differences. It is also a crucial part of Grover's algorithm and Shor's algorithm in quantum computing.

Computational complexity:

The Hadamard transform are often computed in $n \log n$ operations ($n = 2^m$), using the fast Hadamard transform algorithm.

2.3 DISCRETE-SINE-TRANSFORM

The **discrete sine transform** (DST) is a Fourier-related transform similar to the discrete Fourier transform (DFT), however employing a purely real matrix. It is equivalent to the imaginary parts of a DFT of roughly double the length, in operation on real information with odd symmetry (since the Fourier transform of a real and odd function is imaginary and odd), where in some variants the input and/or output data are shifted by half a sample.

A related transform is the discrete cosine transform (DCT), which is equivalent to a DFT of real and *even* functions. See the DCT article for a general discussion of however the boundary conditions relate the varied DCT and DST varieties.

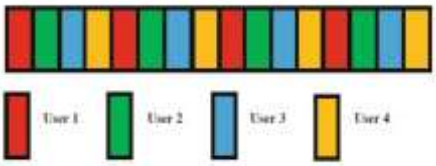

Fig .1. Interleaved OFDMA

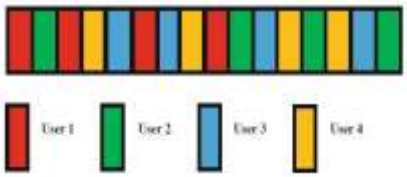

Fig.2. Random interleaved OFDMA

Fig.1. shows subcarrier mapping within the interleaved mode, wherever's subcarriers are mapped equidistant to each other. Fig 2 explains subcarrier mapping in random interleaved mode, where the subcarriers are mapped indiscriminately based on a permutation formula.

In data block generation the input data of size 128 is generated and the generated input is given to the next block. The next block is precoder,it produces the data of size 128. The precoder output is given to subcarrier mapping block.

In subcarrier mapping block a separate analog or digital signal carried on main radio transmission, which carries extra information such as voice or data.

The so produced analog or digital signal is given to Inverse Fast Fourier Transform block. The Inverse Fast Fourier Transform performs opposite to that of Fast Fourier Transform. The Inverse Fast Fourier transform block produces the data of size 512.It is given to filtering block.

Here the Up sampling process is carried first and then filtering process takes place. The filter used is Pulse The so produced analog or digital signal is given to Inverse Fast Fourier Transform block. The Inverse Fast Fourier Transform performs opposite to that of Fast Fourier Transform. The Inverse Fast Fourier transform block produces the data of size 512.It is given to filtering block.
Here the Up sampling process is carried first and then filtering process takes place. The filter used is Pulse shape filter. It is a process of changing the waveform of transmitted pulse. Its purpose is to make the transmitted signal better suited to meet its requirements by limiting the bandwidth of transmission by filtering the transmitted pulse. This way the ISI caused by the channel can be kept in control. Finally it is given to PAPR calculation and the PAPR is calculated.

Transmitter

The computer file is fed to the mapper block is shown in fig 4. The mapper block generates the information and it's fed to the serial-to-converter block.The baseband modulated information is passed through serial-to-parallel converter to generate a complex vector. The information from the previous block is given to the seperate Discrete Sine Transform block. Then the result from the above block is given to subcarrier mapping. The subcarrier mapping produces analog or digital signal and conjointly carries further data like voice or information. It is given to IFFT block. The result is given to pulse shaping. It will scale back the bandwidth due to the absence of Inter symbol interference. It produces the result without changing the waveform of the signal.

The result from the above block is given to the channel and therefore the noise is added by the additive white Gaussian noise. Here the digital to analog method is carried out.

Receiver

In receiver aspect the analog to digital method is administered. The result is given to the Fast fourier transform. It operates to the inverse of IFFT. It is then fed to the subcarrier De-mapping and in this block it will produce the reverse operation to that of subcarrier mapping. And the output is given to parallel-to-serial block.It will produce the signal in serial fashion. The result of the above block is fed to the Demapper. Then the output data stream is produced. In receiver aspect it will perform the operation simply opposite to that of in transmitter side.

BLOCK DIAGRAM

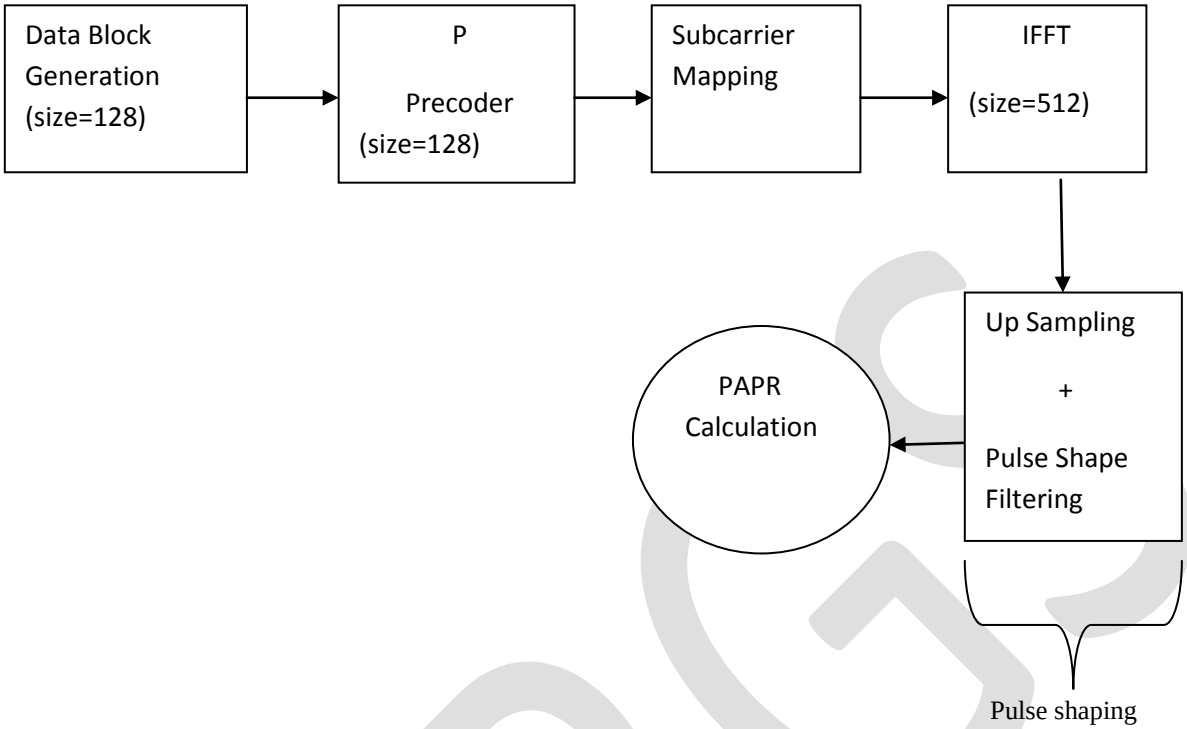

Fig. 3Blog Diagram of PAPR calculation for ZCMT-OFDMA uplink systems

Effects of DST

All the elements of the precoding matrix should have an equivalent magnitude. The DST precoding matrix should be non-singular. The primary criterion ensures that every output symbol has the same amount of information of each input data.

The second requirement preserves the power at the precoder output. The third requirement ensures the recovery of the initial information at the receiver.The three autocorrelation functions have totally different sidelobe values. If the sidelobes of autocorrelation have higher values, then the input sequence is highly correlated and its PAPR is high.

Disadvantages of Existing system

- The elements are not having the similar magnitude.
- The autocorrelation of input sequence is not reduced.
- Due to high autocorrelation the PAPR is high and it is not reduced.

Table 1 System parameters to evaluate PAPR

Channel bandwidth	5 MHz
Oversampling factor	4
Modulation	QPSK,X-QAM(where X=16,64,128,256 and 512)
Precoder type	ZCMT,WHT and DHT

User sub-carriers	128
Precoder size	128
Sub-carrier mapping	Interleaved, random-interleaved or distributed and localized

DST PRECODING MODEL

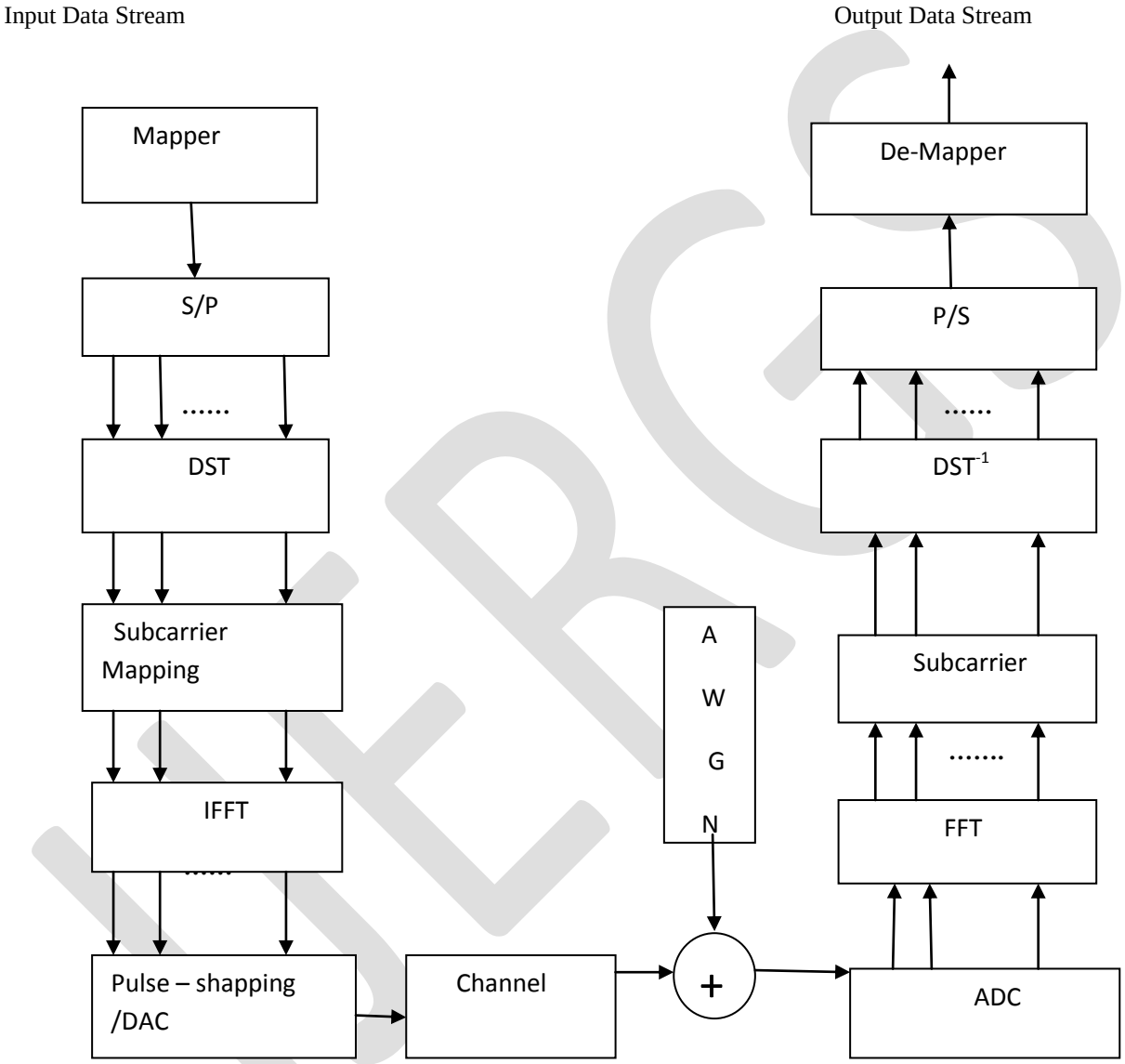

Fig .4.DST precoding based random interleaved OFDMA

III PROPOSED SYSTEM

To overcome the disadvantages within the existing system the proposed system uses a technique called Partial Transmit Sequence. OFDM systems have the inherent problem of a high peak to average power ratio (PAPR). OFDM Suffers because the no of Subcarriers operating in the large dynamic range operates in the non-linear region of amplifier due to OFDM suffer the PAPR problem Application of high power amplifiers results in increased component cost. In general, there has been a trade-off between PAPR reduction and computational complexity in partial transmits sequence (PTS) OFDM. The complexness reduction of PTS PAPR reduction scheme in OFDM systems by reducing the complexity of the IFFT design is investigated. In the IFFT design of PTS OFDM scheme, there are a lot of additions and multiplications with zero, which are obviously unnecessary. We can efficiently reduce the computational complexity without changing the resulting signal or degrading the performance of PAPR reduction by

eliminating the additions and multiplications with zero. Linear and non liner techniques are used. It includes Tone Injection, clipping, companding, Dummy sequence insertion and Partial Transmit sequence. Partial Transmit sequence is a distortion less method but it is a time-consuming process and has large number of computations. To avoid high PAPR, PTS technique is used. PTS is a distortion less phase optimization scheme which provides excellent PAPR reduction. In this technique, an input data sequence is divided into number of dis-joint sub blocks and then it is weighted by a set of phase factors.

To produce the PAPR output using PTS technique, the equation can be given as

PAPR{X(t)}=max|x(t)|^2 / E[x(t)^2]

where

max|x(t)|^2 is maximum power

E[x(t)^2] is average power

E{.} denotes expected value

PAPR (dB)=$10\log_{10}$PAPR

IV EXPERIMENTAL RESULT

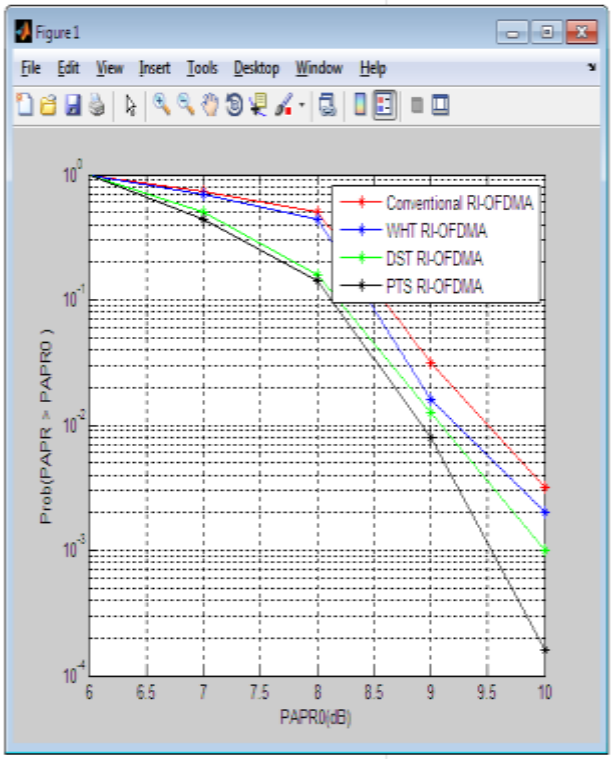

Fig 5 CCDF based comparision of PAPR of ZCMT,DHT,WHT and PTS precoding techniques using 16-QAM

V CONCLUSION

More number of simulations can be produced by using 64-QAM, 125-QAM. DST precoding based RI-OFDMA transmission system is employed to reduce high PAPR.But the PAPR is not reduced as much as possible as compared to the proposed system. Using PTS technique the PAPR reduction is economical. It is efficient, distortion less and signal freelance. It does not need advanced optimization. PTS technique has the advantage of frequency variation of the communication channel and will increase the performance gain in fading multipath channels.

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Robotic Control using Speech Recognition and Android

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Abstract— Speech processing is becoming more and more popular these days providing immense security. Also, many of the projects undertaken by engineers are based on various platforms neglecting security and authentication. The MFCC method used for speech processing is practically acclaimed and provides better results than its other counterparts namely HMM, LPC, WT etc. Furthermore, Android, a largely popular platform providing powerful capabilities and an open architecture is commonly used to have control over a device. The Development of Radio Frequency transmission has led to carving a new technology "Bluetooth". Bluetooth converges with android to provide a far better controlling platform. This paper aims to brief and use the practical approach of robotics through a popular platform android and the speech recognition method Mel Frequency Cepstral Coefficients (MFCC). Also, it gives the industry an optimized method for basking in information regarding temperature, humidity, gas leakage in challenging surroundings and provides security with voice authentication.

Keywords— MFCC, Android, Bluetooth, Cepstrum, Smartphone, RF module, Sensors, Speech Recognition, Linde-Buzo-Gray, Fourier Transform

INTRODUCTION

A robot is a mechanical or may be virtually artificial envoy, mostly an electro-mechanical machine that is influenced by a computer program and an electronic circuitry. Robots have replaced human activities in the support of performing those repetitive and dangerous tasks which humans sometimes choose not to do, or are incapable to do due to some inhibitions and size conditions, or even those such as in industries where humans could not survive the extreme environments that may be produced. For such requirements of the industry, this project has aimed to withstand the atmosphere and complete the tasks given by the means of simple control using speech and smartphone. Speech recognition is the process of automatically recognizing the spoken words of person based on information in speech signal. Recognition technique makes it possible to the speaker's voice to be used in verifying their identity and control access to services. The most popular spectral based parameter used in recognition approach is the Mel Frequency Cepstral Coefficients called MFCC [2, 3]. The speech input is processed using MFCC. Commands are assigned using MFCC. Android smartphones are undoubtedly the most popular gadget these days. You will find various applications on the internet that exploit inbuilt hardware in this mobile phone such as Bluetooth, Infrared, NFC and Wi-Fi, to control and manipulate other devices. Presented here is an assignment applying technology to control a robot by using application running on android smartphone. The control commands are dispatched from Bluetooth of the smartphone. The controlling device of the whole system is a microcontroller, Bluetooth module and a pair of DC motors that are interfaced to the microcontroller. The data collected by this Bluetooth module from the Android smartphone is fed as input to the microcontroller. The Microcontroller acts accordingly on the DC motors of the robot. [5] The robot assembly in this venture can be made to maneuver in all four directions using the android smartphone. [6]

WORKING

The working of the whole system can be divided into two parts –

(A) Control Unit (B) Robot Unit

These two units consist of the main working of the project and are divided based on the main function carried out.

Control Unit

At first, an input of speech is taken through the microphone on the computer/laptop. This input is then processed through computing software. [2] A programming code is written to assign a command to the taken input speech signal. These signals which have been assigned commands are then exported from the PC to a wireless RF module (in this case a Zigbee module) using a RS 232 to TTL converting IC (MAX 232). The signals that are in analog nature are converted to digital nature so as to be compatible with the RF

module. This RF module is used to have a wireless control; containing a transmitter on one end and a receiver to the other. The main function of this unit is to have a control over the Robot Unit.

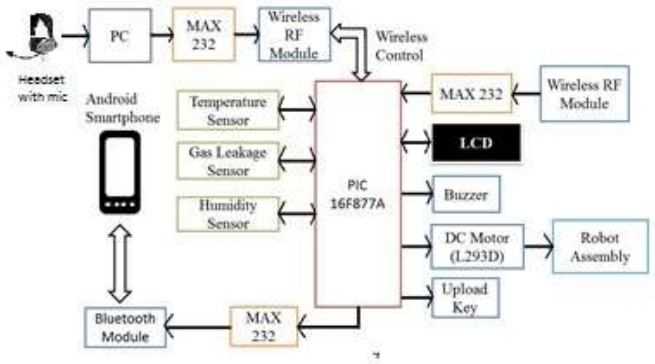

Figure 1: Block Diagram

Robot Unit

The Robot Unit consists of a main device – The Microcontroller (in this case PIC 16F877A).The main function of this unit here is to drive the robot assembly. The secondary function is to acquire information through the sensors and upload it. Sensors are also interfaced on one side of the microcontroller as shown in figure 1.

The other components interfaced are LCD, RF module (Receiver), Bluetooth module, Robot assembly, buzzer. The signals are received at the RF module which is interfaced to the Microcontroller. According to the signal (command), the sensors work. There are three sensors namely (1) Humidity sensor, (2) Temperature sensor and (3) Gas Leakage sensor. The humidity sensor is used to acquire the information regarding the humidity in atmosphere. The temperature sensor gives the temperature of the surrounding. The gas leakage sensor is used in gas leakage detecting and is suitable for detecting of LPG, iso-butane, propane, LNG, to avoid the noise of alcohol and cooking fumes and cigarette smoke. It alerts if there is any gas leakage through a buzzer which is interfaced to the microcontroller on the other side. The Bluetooth module interfaced to the microcontroller is used to transfer and receive data to/from the smartphone. For android smartphone to have control over the robot, Bluetooth module is used. An android application can be used to control the robot on the smartphone like 'Blueterm' or an application can be programmed using android for a specific use. The info can be uploaded to the PC and to the smartphone by using a switch key called 'Upload Key' in the figure which is again interfaced to the microcontroller. The data is uploaded by the working of Bluetooth and RF module. The signals are given to the motor driver IC that drives the DC motor. The DC motor is used as the legs of the robot. In short, the robot assembly is driven by the motor driver IC. The LCD displays information acquired by the sensors.

Study of MFCC

The study of MFCC was necessary to start the initialization of the project. Mel-frequency Cepstral coefficients (MFCC**s**) are coefficients that collectively make up an MFC (Mel-Frequency Cepstrum). They are derived from a type of Cepstral representation of an audio clip. Cepstral representation is a type of representation of a signal in which the spectrum of a signal is obtained. First, the Fourier transform (FFT) of this spectrum is obtained. Second, its logarithm is calculated which then finally results in calculating direct cosine transform (DCT) of this logarithm. The Cepstrum is then acquired in the form of coefficients from the calculated DCT. The difference between the Cepstrum and the Mel-frequency Cepstrum is that, the frequency bands are uniformly spaced on the Mel scale, which approximates the human auricular system's response more closely than the linearly-spaced frequency bands used in the normal cepstrum. These MFCCs are then used in programming for further representation. MFCC is an optimized technique for speech processing than its less efficient counterparts like HMM, DWT, LPC. In speech processing we generally use the real cepstrum, which is obtained by applying an inverse Fourier Transform of the log spectrum of the signal. In fact, the name "cepstrum" comes from inverting the first syllable of the word "spectrum". It can be shown that the real cepstrum is the even part of the complex cepstrum [1]. In digital signals, we replace the Fourier Transform by the Discrete Fourier Transform. MFCCs are derived as follows:

1. Take the Fourier Transform of (a windowed excerpt of) a signal.
2. Map the powers of the spectrum obtained above onto the Mel-Scale, using triangular windows which overlap.
3. Take the log of the powers at each of the Mel frequencies.
4. Take the Direct Cosine Transform (DCT) of the list of Mel log powers, assuming it were a signal.

5. The MFCCs are the amplitudes of the resulting spectrum.[4]

Consider a sample speech signal. We represent the 'Spectrogram' of this signal. A spectrogram of a signal is the Time-Frequency representation of a signal. We take a sample speech spectrum which we have to record and play shown in fig 2. From this signal, we have to remove the silent part (including noise) which is considered to be the error from the signal.

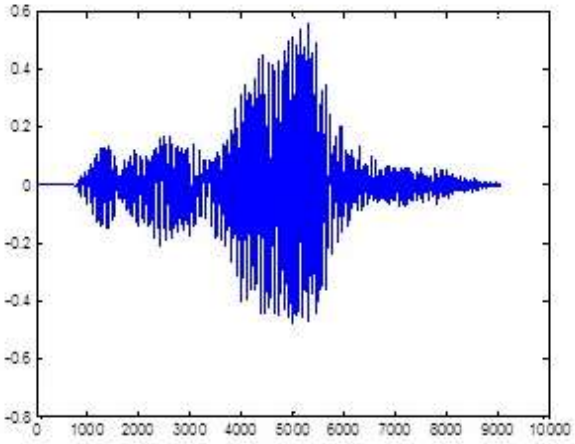

Fig 2: Spectrum of recorded Signal

Our goal is to separate the spectral envelope and the spectral details from the spectrum such that the sum of the former and the latter one is the silence part; an example of this removed error is shown in fig 3. To achieve this separation we use FFT. An FFT on spectrum referred to as Inverse FFT (IFFT). We are dealing with spectrum in log domain. IFFT of log spectrum would represent the signal in pseudo frequency axis. We've captured the spectral envelope. Yet, perceptual experiments have said that a human ear concentrates on certain regions rather than using whole of the spectral envelope.

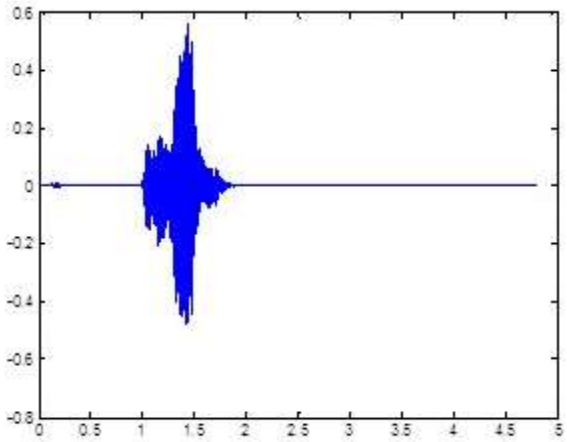

Figure 3: Spectrum of recorded signal w/o silence (noise)

Mel-Frequency analysis of speech is based on human perception experiments. Mel-Frequency Analysis is more closely concentrated on the human auditory system. It is observed that human ear acts as a filter. It focuses on only some particular frequency components. These filters are unevenly spaced on the frequency axis with higher number of filters in the low frequency area and vice-versa. Cepstral coefficients obtained for Mel spectrum are referred to as Mel-Frequency Cepstral Coefficients often denoted by MFCC. MFCC are mostly used features in state-of-art speech recognition system.

Noise Sensitivity

MFCC values are not very robust in the presence of additive noise, and so it is common to normalize their values in speech recognition systems to lessen the influence of noise. Some researchers propose modifications to the basic MFCC algorithm to improve robustness, such as by increasing the log-Mel-amplitudes to a suitable power (around 2 or 3) before accounting the DCT, which reduces the leverage of low-energy components.

PREPARATION OF DATABASE

Here, in this project, we have to prepare a database. This database is for the voice signals. The idea behind voice recognition is that firstly, we prepare a database of voice signals in a (.wav) format. Then, finally when we record the voice signals for recognition, they are compared with the database produced. For example, we first record a voice command through a mic in the PC and save them in (.wav) format. While coding, we prepare a loop which will continue comparing the signals recorded with the signals in the database till the distance is approximately met.
Following is the code used to compare the signals:

```
“fopen(comp);
ifstrcmp(nm,'forward.wav')
fprintf (comp,'F')
end
ifstrcmp(nm,'reverse.wav')
fprintf(comp,'B')
end
ifstrcmp(nm,'left.wav')
fprintf(comp,'L')
end
ifstrcmp(nm,'right.wav')
fprintf(comp,'R')
end
ifstrcmp(nm,'stop.wav')
fprintf(comp,'S')
end
ifstrcmp(nm,'temperature.wav')
fprintf(comp,'T')
end
ifstrcmp(nm,'humidity.wav')
fprintf(comp,'H')
end
ifstrcmp(nm,'mode.wav')
fprintf(comp,'M')
end”
```

When the comparing approximates a value nearer to the voice signal saved in the database, it’ll round it off and then make a conclusion of the signal recorded. Example, if a “Forward” voice command is saved in the database, the code written will compare the “Forward” signal from user with the signal in database. After it compares, the value of distance is approximated and then it recognizes that the signal is “Forward”. This signal is now coded in a short English alphabet which can be received by the robot with the help of Wi-Fi or Bluetooth. The robot recognizes this with the alphabet sent.

SPEECH RECOGNITION

Recognition System has two algorithms namely:

(1) Feature Extraction
(2) Feature Matching

Feature Extraction Algorithm

The process of Feature Extraction Algorithm can be stated as follows:

1. First, we block the speech signal into frames of N samples, with adjacent frames having a separation of M (M<N).
2. Second, is to windowing each individual frame resulting in minimization of signal discontinuities i.e. spectral distortion.
3. Third, convert these frames of N samples from Time domain to Frequency domain using FFT.

$$X_k = \sum_{n=0}^{N-1} x_n e^{-j2\pi kn/N}, \text{ k = 0, 1, 2… N-1}$$

4. Fourth, use a filter bank of triangular band pass frequency response to subjectively simulate the linear scale into mel-scale.
5. Finally, we convert the log mel-spectrum back into time domain resulting in acquiring of MFCCs. These MFCCs are collectively called Mel Frequency Cepstrum.

$$C_n = \sum_{k=1}^{K} (\log S_k) \cos\left[n\left(k - \frac{1}{2}\right)\frac{\pi}{K} \right]$$

Mathematical Representation

Suppose the spectrum of the signal is denoted as x[k]. The Spectral envelope as h[k] and the spectral details as e[k].
Our Goal is to obtain the separation of the spectral envelope and spectral details such that, log X[k] = log H[k] + log E[k].
To achieve this separation, we take the FFT of the spectrum. An FFT of a spectrum referred to as Inverse FFT (IFFT). We are representing the spectrum in the log domain so as to simplify the process.
Now, the IFFT of the log spectrum can be represented as in the pseudo- frequency axis.
On this axis we consider two low and high frequency regions. And these spectrums are now represented as a peak lines on the axis giving a result of what we have desired.
So, summing up all, X[k] = H[k] E[k].
|X[k]| = |H[k]| |E[k]|
Where, |. | - denotes the magnitude of the expression.
Taking log on both sides, we get,
Log | X[k] | =Log (| H[k] | + | E[k] |)

Also, taking IFFT now, we get, x[k] = h[k] + e[k].
For Mel-Frequency Analysis, Spectrum when implies Mel- Filters, we have Mel- Spectrum.
Now say, Log X[k] = Log (Mel-Spectrum)
We perform Cepstral analysis on Log X[k], and obtain
x [k] = h[k] + e[k] after taking IFFT.
Cepstral Coefficients h[k] calculated for Mel-Spectrum are referred to as Mel-Frequency Cepstral Coefficients often denoted by MFCC. [9]

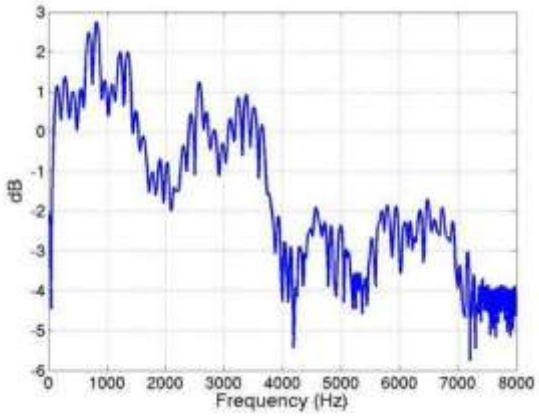

Figure 3: Mel-Filters (Filters in frequency region)

Feature Matching

Feature matching is the technique of recognition like some of the popular methods – Dynamic Time Warping (DTW), Hidden Markov modeling (HMV), and Vector Quantization (VQ). Here, we're using the VQ method for matching purpose. As, we recall that a

database has been prepared for the need of comparison in order to completely recognize the speech. VQ is a process of mapping vectors from an expanded, large space of vectors to a finite number of regions in that space. This particular region is individually called as a "cluster" and can be represented by its center known as a "codeword", and so, the collection of these codewords is called a "Codebook". This region may also be called as a Voronoi region, and it is stated by:

$V_i = [x \in R^k : \| x\text{-}y_i \| \leq \| x - y_j \|, for\ all\ j \neq I]$

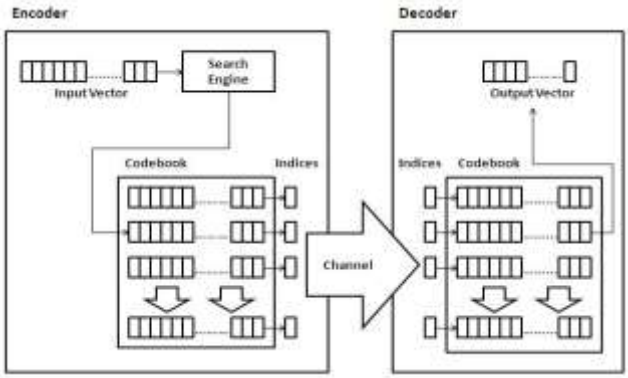

Fig 4: Schematic of Vector Quantizer (Encoder as in a PC and the Decoder as in the Microcontroller)

The size of the codebook is K, input vector which is of dimension L. In order to notify the decoder of which code vector is been selected, we use $[log_2 K]$ / *L* (each code vector will contain the reconstruction value of *L* source samples, the number of *bits per sample*.) i.e. 8 bits to represent 256 code vectors.

LBG (Linde-Buzo-Gray Algorithm) is a vector quantization algorithm used to derive a good codebook. The steps are as follows:

1. Determine the number of codewords i.e. N, or size of the codebook.
2. Select N codewords at random (from the set of input vectors), and let that be the initial codebook.
3. Apply the Euclidean distance formula to calculate the distance between the input vector in the cluster and each codeword.
4. Calculate new set of codewords by obtaining the average of each cluster.
   $y_i = \frac{1}{m}\sum_{j=1}^{m} x_{ij}$
   Where, *i* is the component of each vector (in x, y, z,..n directions), *m* is the number of vectors in the cluster.
5. Repeat the steps 2 and 3 until one of the two happens – (a) codewords have not changed or (b) the change is them is infinitesimal. [8]

ANDROID APPLICATION

The wireless-networking standard technology called Bluetooth has subtly become an innovative way to control a robot and a technology to replace the cables. Using an Android device to control a robot over Bluetooth is another step forward in remote robotics control by sending commands with the flick of a wrist. With an opened architecture and powerful proficiency, Android has become popular operating system among intense hobbyists able to build remote control applications with small development resources. They use smartphones or tablets that run Android OS and build applications feasible of developing remote controlled robots by sending some sort of signals wirelessly and at simple movements of the device or touching the screen. Based on the Java programming language, a built-in Bluetooth module, and a series of useful sensors already integrated and having permanent Internet connectivity, almost any Android device is categorized as a perfect tool for remote robotics control over Bluetooth. The idea of this paper is to use an Android application that allows you to communicate with a robot over the Bluetooth technology. The robot can respond to button, and swipes on the touch screen. In this way, you can control the robot to transport from one place to the other using commands forward, reverse, left and right.

Bluetooth Technology

Every technology is bounded by some imperfections, and the Bluetooth technology is feasibly the best way for remote control as long as the robot is in the range of the Android device. The wireless communication is between multiple devices. One device runs the

Android OS, while the second device is the robot with a Bluetooth module. On the Android device, the control system is simple and uses an application to control the Bluetooth service on Serial Port Profile (SPP) connection. The application has to have error-free data transmission using Bluetooth module according to the sensors, actuators, UIs, touchscreen, and the traits of the application. On the robot side, you have to add a Bluetooth module connected to the robot controller. The Bluetooth module is a mini device designed for data transfer between peripheral devices. Moreover, we can say this mini device is able to synchronize the I/O data between the robot and the Android device.

Android OS

Android is a mobile operating system (OS) based on the Linux kernel and currently developed by Google. With a user interface based on open architecture and having full independence over development, Android is designed primarily for touchscreen mobile devices such as smartphones and tablets. As of 2015, Android has the largest installed base of any mobile OS.It is a great platform for a robotic system control because it's much cheaper than any other ARM-based processing unit. Android platform is the widest used in the word and runs the largest number of smartphones worldwide. This is the reason why here we have used android as a platform to control the movements of the robot.

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CONCLUSION

This paper successfully explained the working of speech recognition using MFCC. It showed a unique feature extraction method for performing speech recognition. This speech based control had problems for recognizing due to noise and inadequate sound pitch level but, it is truly secure for controlling robots and is an excellent method in modern robotics and Speech processing.

It was also seen that android is a great platform to establish control over robots. It is also simple to use. The Bluetooth module helped to have a smooth connection between the robot and the smartphone. Information about the environment was sent to the Robot through RF module and the transmission was observed to be without glitches, error free and fast. Also, the collected data was stored and sent to the user mobile using Bluetooth module.

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VHDL based Sobel Edge Detection

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Abstract — Edge detection of an image is the primary and significant step in lower level image processing. This edge detection technique finds significant applications in various fields which mainly includes object tracking, image analysis, image segmentation etc. This paper mainly focuses on sobel operator based edge detection for real time applications using FPGA. Due to the better noise sensitivity as compared to other operator sobel operator is mainly used. The proposed architecture is coded using VHDL; synthesis is done using Xilinx ISE 13.1 and targeted for Xilinx vertex 5 FPGA platform. There is much reduction in the FPGA resources which reduces the area of the FPGA. The proposed model precisely detects edges of an image.

Keywords — FPGA , Gradient operator, Image processing, Matlab, Sobel edge detection, VHDL, Xilinx system generator.

INTRODUCTION

Real-time image processing is widely used in different applications such as video surveillance, traffic management and medical image processing. These operations frequently require digital signal processing (DSP) algorithms for numerous vital operations [2]. The processing of two dimensional images via computer is called as Digital Image Processing. Sampling and quantization is used to obtain a digital image from real image. The process of locating edges of an image is termed as Edge detection. Edge detection of an image is a very significant step for understanding features of images. Edges consist of noteworthy features and contained important information. It reduces the size of the image and filters out information that is treated as less relevant, preserving the important properties of an image [4]. So this edge detection proposal can be used in image processing field for motion detection and object tracking. Edges can be classified depending upon their intensity values like Ridge Edge, Step edge, Ramp Edge. The four basic steps used for edge detection are smoothing, Enhancement, Detection and localization. There are several edge detection algorithms such as canny, Robert, Prewitt and Sobel but the proposed work is designed by using Sobel Edge detection. FPGA hardware is widely used for implementing image processing algorithms because it can be easily used to implement nearly all digital logic function. Logic functions can be designed by writing VHDL/Verilog code. Then this VHDL code is converted into bit file and targeted on FPGA. The proposed design is implemented on Vertex 5 Xilinx FPGA because Xilinx provides most resourceful devices. FPGAs are the RAM Based Devices with some special routing resources to implement competent arithmetic functions like comparators, counters, adders whereas CPLDs are EEPROM based devices and do not have routing resources. Microcontrollers are considered to be not much useful when we implement image processing algorithms on embedded platform. With the arrival of Field Programmable Gate Arrays it becomes an alternative option for the efficient realization of algorithms of image processing on ASIC as it offer speed compared to an ASIC and is easy to reconfigure [6]. Look up tables (LUTs), registers and flip flops can be used for area optimized implementation. The proposed designs is implemented by using serial architecture by taking better benefit of look up tables, flip flop and shift registers present on the target device. The fully-parallel design is not able to share much hardware and consume more amounts of resources. Hence to minimize hardware requirement an efficient implementation of such filters has very much importance.

SOBEL EDGE DETECTION

For the detection of edges the Sobel operator is extensively used. The proposed algorithm is briefly explained below. In Sobel operator two filters Hx and Hy are mainly used

$$Hx=\begin{bmatrix}-1 & 0 & 1\\ -2 & 0 & 2\\ -1 & 0 & 1\end{bmatrix} \text{------(1)} \quad \text{and} \quad Hy=\begin{bmatrix}-1 & -2 & -1\\ 0 & 0 & 0\\ 1 & 2 & 1\end{bmatrix} \text{------(2)}$$

The gradient components across the neighboring lines or columns are computed by these filters correspondingly. This gradient magnitude defines local edge strength and is given by equation (3).

$$GM(x,y)=\sqrt{Hx^2 + Hy^2} \text{ - - - - - - - - - (3)}$$

Due to square root and square operations for each and every pixel this expression (3) is computationally expensive. So the square and square root operations are approximate by absolute values.

$$GM(x , y) = | Hx | + | Hy | \text{ - - - - - - -(4)}$$

This expression (4) can be easily computed and helps in preserving the edges in images/video. The above mentioned process is applied separately for each and every pixel of an image and the final edge plot is calculated by aggregating the edge maps of all channels.

PROPOSED MODEL

The proposed model for Sobel Edge Detection by using XSG is shown in Fig. 1. The Input and Output Image are blocksets of simulink where the block can read/write image from/into Matlab workspace. The Pre-processing unit and Display Controller Unit that transfer the image into the appropriate standard for next entity are also present in simulink blocksets. Here the Sobel Edge Detection algorithm is designed by using blocksets of Xilinx.

Figure 1: Proposed Model

DESIGN METHODOLOGY

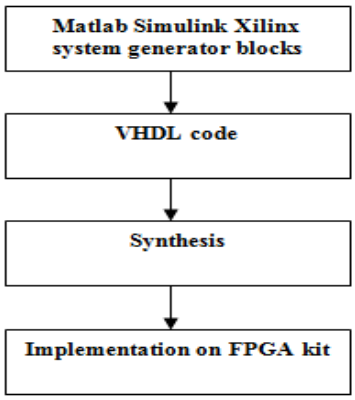


Figure 2: Design Methodology

Design methodology consists of designing of 2D filter in Matlab. Synthesis and optimization is done using VHDL Programming using Xilinx ISE design suite 13.1 and vertex 5 FPGA platform is used for the hardware implementation as shown in figure 2.

SYSTEM IMPLEMENTATION

1.BLOCK DIAGRAM FOR IMAGE PRE-PROCESSING

Figure 3 represents image pre-processing operation. Most important implication of image pre-processing is data serialization with appropriate data rate for the hardware implementation purpose.

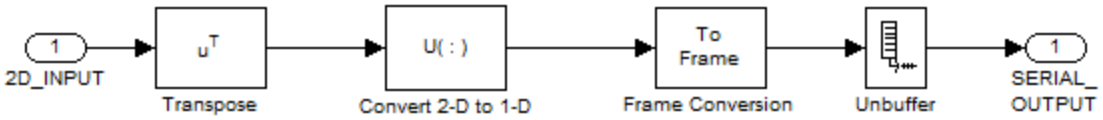


Figure 3: Image pre-processing

2. BLOCK DIAGRAM FOR IMAGE POST-PROCESSING

Figure 4 represents image post-processing operation. Most important implication of image pre-processing is to make data available for displaying in Matlab workspace with proper data rate.

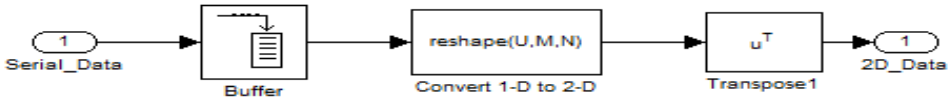


Figure 4: Image post-processing

3. HORIZONTAL GRADIENT FILTER FOR SOBEL OPERATOR

Figure 5 represents horizontal filter required for sobel edge detection. By moving horizontal kernel of 5×5 over an image horizontal gradient of an image is computed for sobel edge detection.

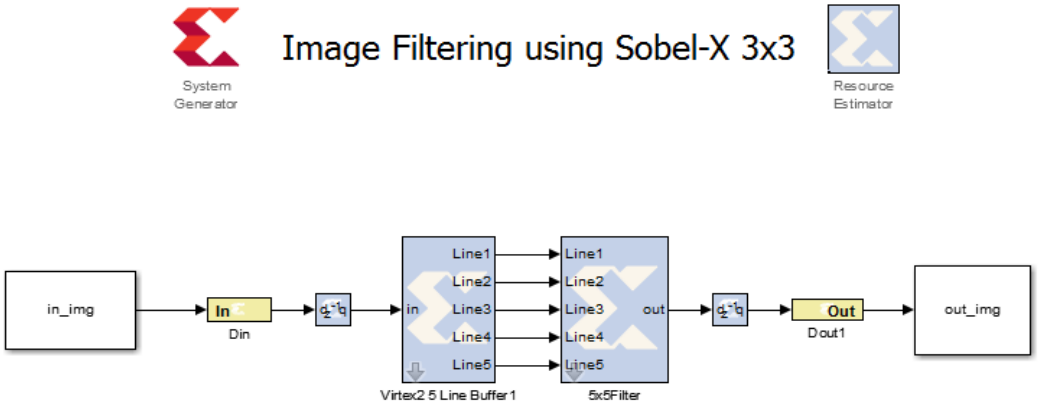


Figure 5: Horizontal Gradient Filter

4. VERTICAL GRADIENT FILTER FOR SOBEL OPERATOR

The vertical filter for sobel edge detection is shown in figure 6. By moving vertical kernel of 5×5 over an image vertical gradient of an image is computed for sobel edge detection. Here the same blocksets of Xilinx are used as that of horizontal gradient but we have to select vertical gradient by double clicking on 5×5 filter.

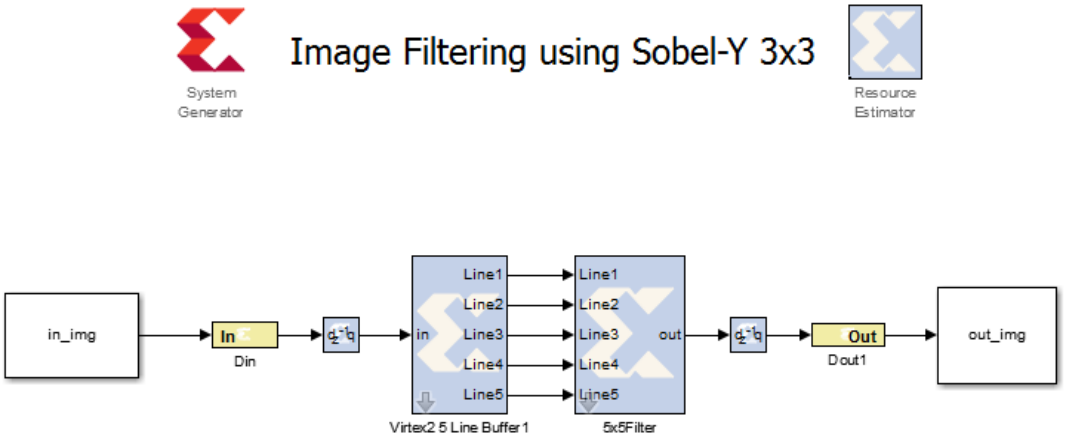


Figure 6: Vertical Gradient Filter

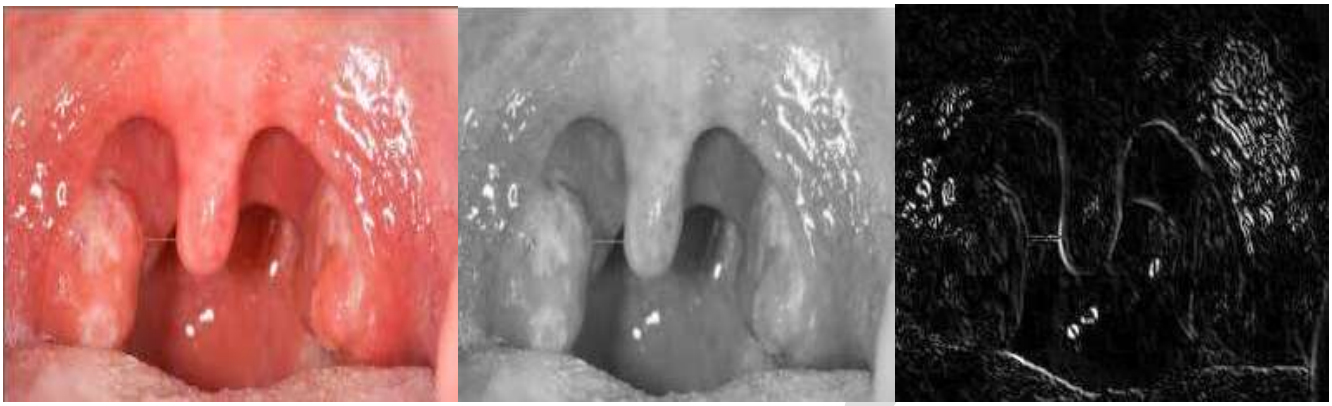
5. VHDL CODE GENERATION

Figure 6 indicates how the VHDL code is generated for the entire sobel edge detection model. The system generator is a token that serves as a control panel for controlling the system and parameters during simulation. Every Simulink design should contain at 1least one System Generator token.. This VHDL code is stored in the target directory.

Figure 7: VHDL code generation

RESULT AND ANALYSIS

The proposed design is implemented by using Matlab Simulink and Xilinx System Generator with blocksets of Xilinx. The method is tested on tonsillitis image as shown in figure 8. The output results show an edge detected image using Xilinx system generator and FPGA platform. The generated system is targeted for VIRTEX 5 FPGA kit. System Generator token is used for VHDL code generation. The generated code is synthesized using xilinx ISE 13.1 design Suit. After synthesis the device utilization summary is obtained for the targeted device.



(a) (b) (c)

Figure 8: (a) Input Image; (b) Converted grayscale image; (c) Edge detected output image

Further this sobel edge detection algorithm is tested on staircase Railings image and the result obtained is shown in figure 9.

(a) (b) (c)

Figure 9: (a) Input Railing Image; (b) Converted grayscale image; (c) Edge detected output image

Table 1 shows the device utilization summary generated for virtex 5 FPGA kit.

Logic utilization	**Used**	**Available**	**Utilization**
Number of slice Register	524	32,640	1%
Number of slice LUTs	297	32,640	1%
Number used as logic	193	32,640	1%
Number used as Memory	95	12,480	1%
Number used as shift Register	95	12,480	1%
Number with an unused Flip Flop	14	538	2%

Number of fully used LUT-FF pairs	283	538	52%
Number with an unused LUT	241	538	44%

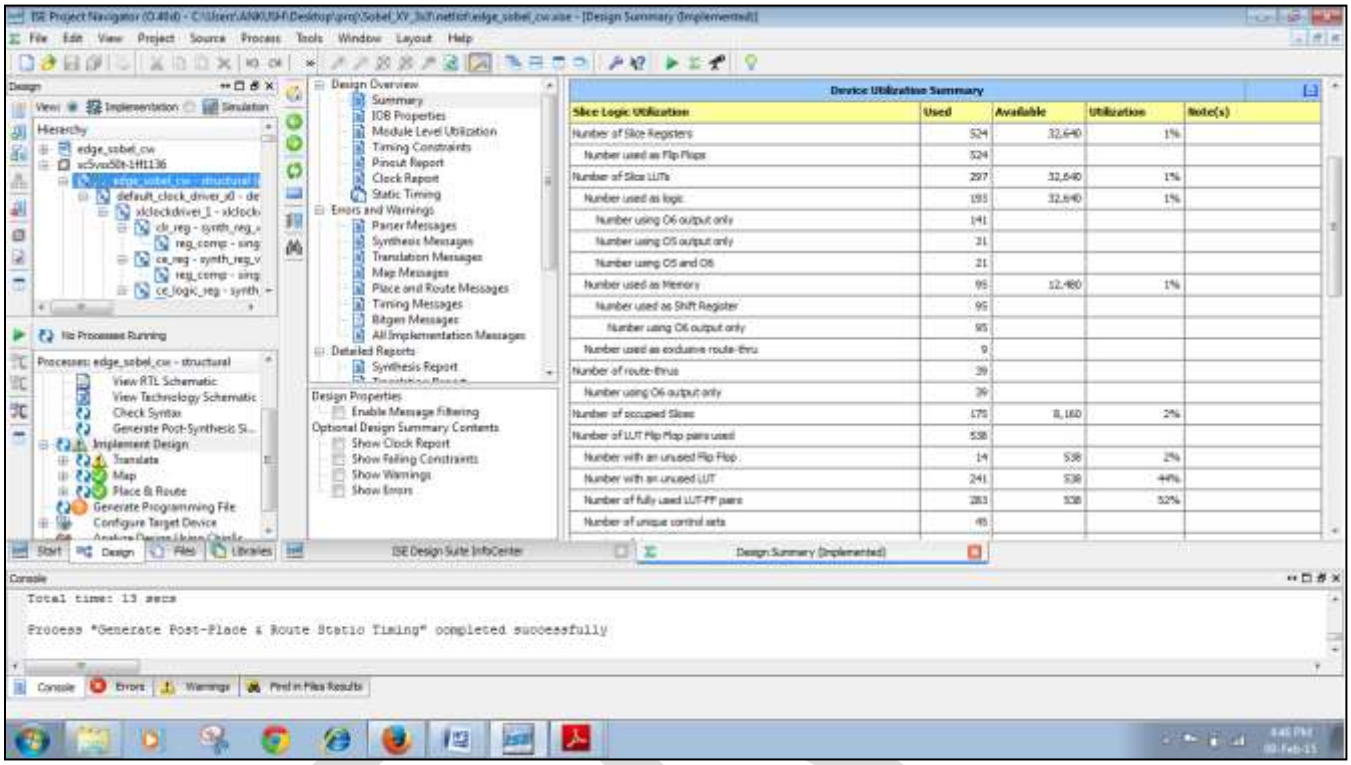


Figure 10: Device Utilization Summary for Virtex 5 FPGA kit

CONCLUSION

This paper presents the hardware and software architecture for the Sobel operator based edge detection which is designed for Xilinx vertex 5 FPGA platform. This architecture significantly reduces the FPGA resources usages (area). There is much reduction in the FPGA resources. This method reduces the complication of the system and thus the processing time. The time required for the execution of complete model for edge detection of a picture size 256×256 is only some seconds. The edges of the given gray image can be located rapidly and powerfully through this approach. Since this approach is free of multiplier, area is optimized. Pipelining can be used in order to improve the speed and effectiveness.

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Design & Implementation of MQAM based zigbee Transceiver using HDL

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Abstract— The present paper reports the Physical Layer implementation of 2.4 GHz-band MQAM digital transceiver for a Zigbee Application. A novel design method is proposed using Verilog HDL through Xilinx ISE 13.1. The digital transmitter is designed using Verilog. The Transmitter model is then implemented on Xilinx Spartan3E XC3S200E field-programmable gate array (FPGA). Simulations and Measurements verify the functionality of the designed transmitter. With the frequencies of 1 MHz and 8 MHz, the digital transmitter design matches theoretical expectation

Keywords— Zigbee, FPGA, Transceiver, HDL, Verilog.

INTRODUCTION

The development of wireless interface devices has made a strong demand for short-range low-data-rate wireless networking. This is the main motivation of development of Zigbee standard. The standard Zigbee is developed by the Zigbee Alliance [1]. It has hundreds of member companies, from the software developers and semiconductor industry to original equipment manufacturers (OEMs) and installers. In 2002 the Zigbee Alliance was formed as a nonprofit organization [2]. The Zigbee standard has accepted IEEE 802.15.4 Medium Access Control (MAC) and Physical Layer (PHY) protocols [3]. The Physical layer PHY supports three frequency bands: 2.45 GHz band with 16 channels, 915 MHz band with 10 channels and 868 MHz band with 1 channel.

In this research we will only focus on used 2.45 GHz band which is worldwide acceptable with data rate 250 kbps. The MAC layer supports two types of nodes; one is Reduced Function Devices (RFDs) nodes and another is Full Function Devices (FFDs). RFDs can only behave as end-devices and are comprised of actuators or sensors like lamps, light switches and transducers. They can interact only with a single FFD [4]. FFDs are comprised of a full set of MAC layer functions, by which they can act as a network end-device or a network coordinator [4].

The Zigbee networking topologies are classified into mainly two types: peer-to-peer and star. In the peer-to-peer topology, if the devices are close enough to establish a successful communication link, each device can directly communicate with any other device. In the star topology, every device can communicate only with the central personal area network (PAN) coordinator in the network. The central node or PAN coordinator is FFD and other nodes can be RFDs or FFDs. [2].

The IEEE 802.15.4 defines four MAC frame structures: MAC command frames, data, beacon and acknowledgment. The MAC command frame carries MAC commands. The data frame carries data to be transmitted .The coordinator use beacon to transmit beacons. The beacons are used for synchronizing the clock of all the devices which are in the same network. In the meantime, the acknowledgement frames are used to confirm successful frame reception [3].

LITERATURE ANALYSIS

There are many wireless control and monitoring applications for home and industrial environments which need less complexity, lower data rates and longer battery life than those from existing standards. What the world requires is a globally designed standard that meets the requirement for low power, security, reliability and low cost. Zigbee defines a set of communication protocols for low data rate, short range wireless networking. Since Zigbee and its underlying standard IEEE 802.15.4 are recent, there has been little research investigating the power and area consumption, speed of operation and performance. The broad area of problem is that designing a Zigbee transmitter in order to attain improvements in terms of area, power and performance.

The Zigbee standard is designed by Zigbee Alliance, which has adopted IEEE 802.15.4 as its Physical layer (PHY) and Medium Access Control (MAC) protocols. Zigbee standard is developed to address the need for implementation of low data rate, very low cost wireless networks with ultra-power consumption. The Zigbee standard reduces the implementation cost by reducing the data rate and simplifying the communication protocols. The minimum requirements to meet IEEE 802.15.4 and Zigbee specifications are relatively relaxed than other standards such as IEEE 802.11, which reduces the cost of implementation and complexity of Zigbee Transceivers.

The digital part of transmitters can be designed either with Matlab, schematic or hardware description language (VHDL, VERILOG). However, schematic approach is suitable for large designs, where usually more logic functionality is involved. Shuaib et al. [5] developed and simulated the zigbee transmitter using Matlab. Unfortunately, this design has not been implemented yet.

In contrast, Meng et al. [6] has designed, tested and implemented the Zigbee receiver with Harris SIP transceiver. The receiver was

designed by using VHDL and tested on Xilinx Virtex-4 FPGA. The receiver consists of IF down-conversion, carrier synchronization, chip synchronization and dispreading blocks, filtering quadrature demodulation. The implementation results showed that the slices used are up to 11%, with 6% flip-flops and 7% look-up-tables (LUTs) usages.

Another Zigbee transmitter is modeled by Rahmani [7] using VHDL on Spartan-2 FPGA board. The transmitter architecture comprises of bit-to-symbol encoder, symbol-to-chip mapper and offset quadrature phase-shift keying (OQPSK) modulator. The Design utilization summary showed 150,000 gates have been used. Above two papers prove that the VHDL instruction requires large number of slices. Therefore, it leads to a large design size.

In present paper, Using Verilog a novel design approach for the digital Zigbee transmitter is proposed, and is then implemented on FPGA. FPGA is an integrated gate array developed to be configured by the designer or customer at Field. Fig.4 shows the FPGA board which is used in this research work. The Spartan3E family is designed specifically for high-volume and cost-sensitive needs of consumer electronic applications and it's combined with advanced 90 nm technology process [8]. The combine usage of Verilog and FPGA enable the transmitter developed in a shorter timeframe. In comparison with schematic and VHDL, The implementation is also more efficient.

The rest of the paper is organized as follows. Section III discusses the transmitter architecture. Section IV highlights results and discussion. Finally, Section V presents the conclusion.

TRANSCEIVER ARCHITECTURE

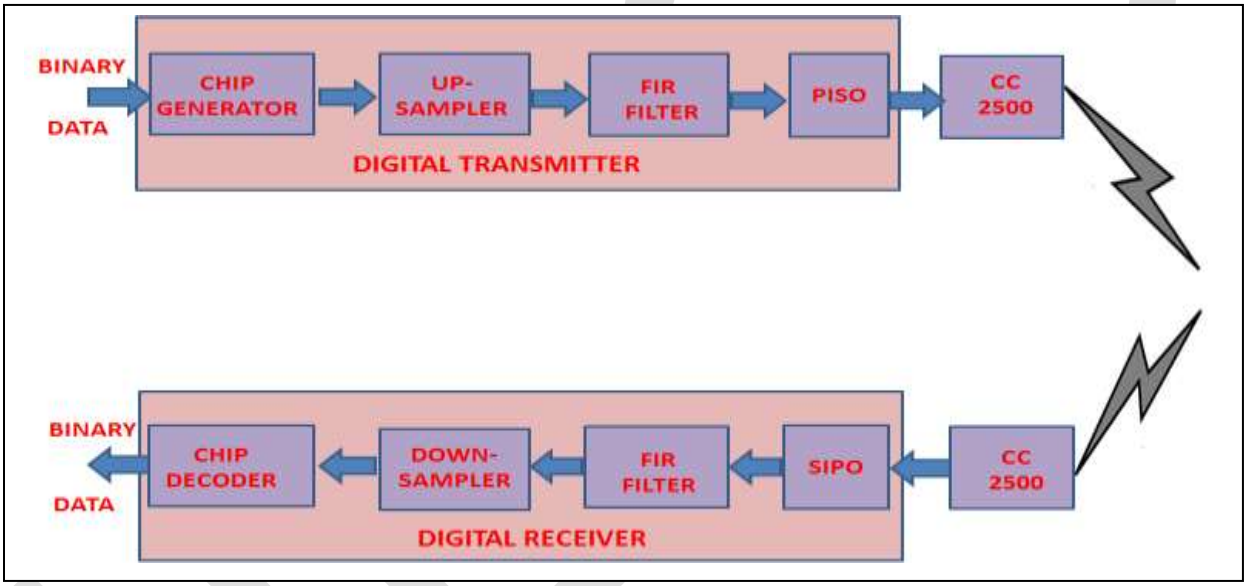

Figure: 1. Block diagram of zigbee transceiver.

For 2.4 GHz band zigbee applications, sixteen channels are available with 5 MHz ample channel spacing .The Transceiver architecture is shown in fig.1. The binary data is first applied to chip generation block which first maps each four bits into one symbol .Then each symbol is mapped into eight bit p-n chip sequence.as shown in table 2. After that each bit of p-n sequence is up sampled to match nyquist criteria .The even bits are up sampled by "up sampler-I", and odd bits are up sampled by "up sampler- Q".

These up sampled bits are passed through separate Fir filters. The output of up sampler-I is passed through filter Fir-I and output of up sampler-Q is passed through filter Fir-Q.

These filters are nothing but half cosine pulse shaping filter's which is reduces the digital noise. The output of FIR is 10bit block which is then transmitted to "CC2500" module serially by parallel in serial out (PISO) block. "CC2500" module transmits incoming packets to wireless channel.

At receiver side "CC2500" receiver module receives the packets serially & serial in parallel out (SIPO) converts the serial packets into parallel blocks. These parallel packets are the applied to FIR filter. The output of FIR filter is then down sampled by down sampler. The output of down sampler is the applied to chip decoder. The chip decoder decodes incoming chip signal and at output

gives corresponding four bit symbol. This data is then applied to parallel to serial convertor which gives serial stream of original binary data sent by transmitter.

RESULT AND DISCUSSION

SIMULATION AND WAVEFORM

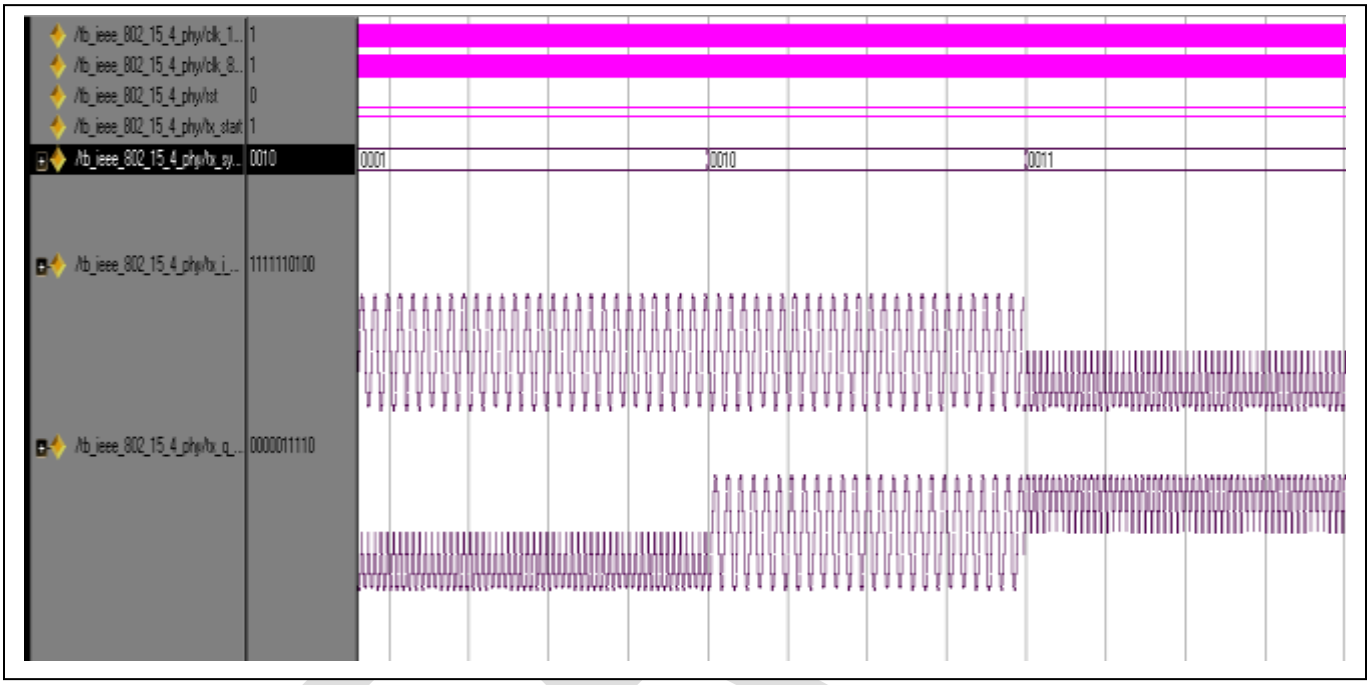

Figure: 2. Output Simulation Waveform on Modelsim 6.2 C simulator.

Fig.2. shows the simulation waveform for zigbee transmitter. The waveforms for I-channel & Q-channel for various symbols are shown in figure. For simulation Mentor Graphics "modelsim 6.2 C" tool is used .The 1 MHz & 8 MHz clocks are applied to transmitter, Logic high is applied to the "start" bit of transmitter. Then negative edge trigger is applied to "reset" bit.

RTL SCHEMATIC

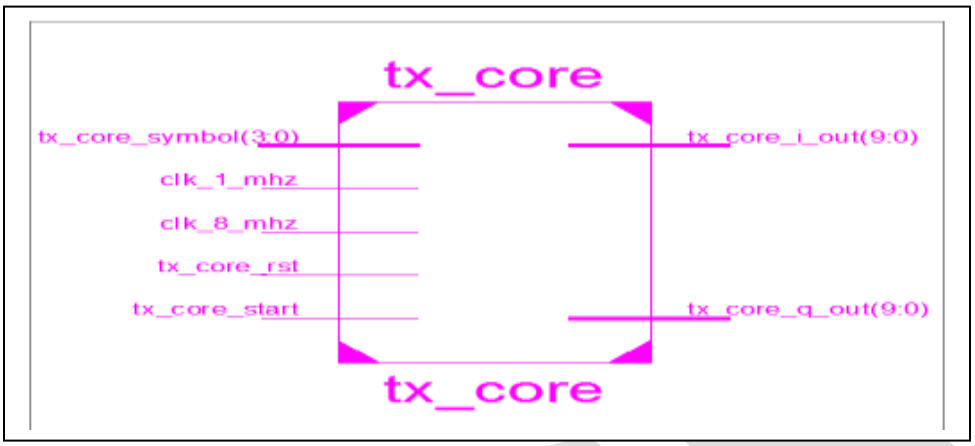

Figure: 3. RTL schematic of Zigbee Transmitter.

The digital transmitter structure is shown in Fig.3. The "clk_1_mhz" and "clk_8_mhz" are the clock frequencies of 1 MHz and 8 MHz, respectively. The input ports are comprised of "tx_core_symbol(3:0)", "tx_core_rst", "tx_core_start". The "tx_core_i_out (9:0)" and "tx_core_q_out (9:0)" are the output ports of I-phase and Q-phase signal, respectively.

DESIGN UTILIZATION SUMMARY

Device Utilization Summary (estimated values)			[-]
Logic Utilization	**Used**	**Available**	**Utilization**
Number of Slices	272	1920	14%
Number of Slice Flip Flops	102	3840	2%
Number of 4 input LUTs	509	3840	13%
Number of bonded IOBs	28	141	19%
Number of GCLKs	2	8	25%

Figure: 4. Design Utilization Summary of Zigbee Transmitter.

CONCLUSION

The Transmitter Block of Zigbee Transceiver is developed on Xilinx 13.1 ISE and tested successfully. The implementation of transmitter is done on Xilinx Spartan 3E XC 3S200 FPGA. The data transmission is also verified by receiving packets at computer. The simulation has been performed using modelsim 6.2 C simulator .The waveform matches with theoretical expectations. The

remaining part of the transceiver will be designed and synthesized in future

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Prediction of Financial Performance Using Genetic Algorithm and Associative Rule Mining

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Abstract— The proposed system introduces a new genetic algorithm for prediction of financial performance with input data sets from a financial domain. The goal is to produce a GA-based methodology for prediction of stock market performance along with an associative classifier from numerical data. This work restricts the numerical data to stock trading data. Stock trading data contains the quotes of stock market. From this information, many technical indicators can be extracted, and by investigating the relations between these indicators trading signals can discovered. Genetic algorithm is being used to generate all the optimized relations among the technical indicator and its value. Along with genetic algorithm association rule mining algorithm is used for generation of association rules among the various Technical Indicators. Associative rules are generated whose left side contains a set of trading signals, expressed by relations among the technical indicators, and whose right side indicates whether there is a positive ,negative or no change. The rules are being further given to the classification process which will be able to classify the new data making use of the previously generated rules. The proposed idea in the paper is to offer an efficient genetic algorithm in combination with the association rule mining algorithm which predicts stock market performance.

Keywords— Genetic Algorithm, Associative Rule Mining, Technical Indicators, Associative rules, Stock Market**, Numerical Data, Rules**

INTRODUCTION

Over the last decades, there has been much research interests directed at understanding and predicting future. Among them, to forecast price movements in stock markets is a major challenge confronting investors, speculator and businesses. How to make a right decision in stock trading extracts many attentions from many financial and technical fields. Many technologies such as evolutionary optimization methods have been studied to help people find better way to earn more profit from the stock market. And the data mining method shows its power to improve the accuracy of stock movement prediction, with which more profit can be obtained with less risk.

Applications of data mining techniques for stock investment include clustering, decision tree etc. Moreover, researches on stock market discover trading signals and timings from financial data. Because of the numerical attributes used, data mining techniques, such as decision tree, have weaker capabilities to handle this kind of numerical data and there are infinitely many possible ways to enumerate relations among data.

Stock prices depend on various factors, the important ones being the market sentiment, performance of the industry, earning results and projected earnings, takeover or merger, introduction of a new product or introduction of an existing product into new markets, share buy-back, announcements of dividends/bonuses, addition or removal from the index and such other factors leading to a positive or negative impact on the share price and the associated volumes. Apart from the basic technical and fundamental analysis techniques used in stock market analysis and prediction, soft computing methods based on Association Rule Mining, fuzzy logic, neural networks, genetic algorithms etc. are increasingly finding their place in understanding and predicting the financial markets.

Genetic algorithm has a great capability to discover good solutions rapidly for difficult high dimensional problems. The genetic algorithm has good capability to deal with numerical data and relations between numerical data. Genetic algorithms have emerged as a powerful general purpose search and optimization technique and have found applications in widespread areas.

Associative classification, one of the most important tasks in data mining and knowledge discovery, builds a classification system based on associative classification rules. Association rules are learned and extracted from the available training dataset and the most suitable rules are selected to build an associative classification model. Association rule discovery has been used with great success in

domains such as market basket analysis but it finds an even wider domain of applications when used in combination with other classification and predictive approaches.

Classification is a well-known task in data mining that aims to predict the class of an unseen instance as accurately as possible. While single label classification, which assigns each rule in the classifier the most obvious label, has been widely studied, little work has been done on multi-label classification. Most of the work to date on multi-label classification is related to text categorization. In existing associative classification techniques, only one class label is associated with each rule derived, and thus rules are not suitable for the prediction of multiple labels. However, multi-label classification may often be useful in practice.

Although associative classification has better prediction accuracy than traditional classification approaches, it has a weak capability of handling numerical data and its relations. To improve the capability of handling numerical data in associative classification, there are two issues that must be addressed, including constructing a suitable relation representation method of numerical data and building associative classifiers from numerical data with suitable relation representations. The major contributions of this study are to propose a simple yet powerful structure for relation representation of numerical data in associative classification problem and to improve the capability of handling numerical data in associative classification.

Constructing fast and accurate classifiers for large data sets is an important task in data mining and knowledge discovery. There is growing evidence that merging classification and association rule mining together can produce more efficient and accurate classification systems than traditional classification techniques.

LITERATURE SURVEY

Dow Jones Industrial Average

The Dow Jones Industrial Average also called the Industrial Average, the Dow Jones, the Dow Jones Industrial, the Dow 30, or simply the Dow, is a stock market index, and one of several indices created by Wall Street Journal editor and Dow Jones & Company co-founder Charles Dow. It was founded on May 26, 1896, and is now owned by Dow Jones Indexes, which has its majority owned by the CME Group.The Dow Jones Industrial Average is simply the average value of 30 large, industrial stocks. It is an index that shows how 30 large publicly owned companies based in the United States have traded during a standard trading session in the stock market. It is the second oldest U.S. market index after the Dow Jones Transportation Average, which was also created by Dow.

Technical Indicators in Stock Market

A Technical Indicator [1] is a series of data points that are derived by applying a formula to the price data of a security. Price data includes any combination of the open, high, low or close over a period of time. Some indicators may use only the closing prices, while others incorporate volume and open interest into their formulas. The price data is entered into the formula and a data point is produced. A technical indicator offers a different perspective from which to analyze the price action. Indicators serve three broad functions: **to alert, to confirm and to predict.**

The Technical Indicators used in this papers are:

SMA--Simple Moving Average: A simple, or arithmetic, moving average that is calculated by adding the closing price of the security for a number of time periods and then dividing this total by the number of time periods. A simple moving average is formed by computing the average price of a security over a specific number of periods

EMA--Exponential Moving Average Calculation: EMA reduce the lag by applying more weight to recent prices. The weighting applied to the most recent price depends on the number of periods in the moving average. There are three steps to calculating an exponential moving average. First, calculate the simple moving average.

MACD--Moving Average Convergence-Divergence: MACD indicator is one of the simplest and most effective momentum indicators available. The MACD turns two trend-following indicators, moving averages, into a momentum oscillator by subtracting the longer moving average from the shorter moving average. As a result, the MACD offers the best of both worlds: trend following and momentum.

CCI: The Commodity Channel Index (CCI) is a versatile indicator that can be used to identify a new trend or warn of extreme conditions. In general, CCI measures the current price level relative to an average price level over a given period of time. CCI is relatively high when prices are far above their average. CCI is relatively low when prices are far below their average.

Williams %R: Williams %R is a momentum indicator that is the inverse of the Fast Stochastic Oscillator. Also referred to as %R, Williams %R reflects the level of the close relative to the highest high for the look-back period.

Stochastic Oscillator: The Stochastic Oscillator is a momentum indicator that shows the location of the close relative to the high-low range over a set number of periods. It doesn't follow price, it doesn't follow volume or anything like that. It follows the speed or the momentum of price. As a rule, the momentum changes direction before price.

RSI- Relative Strength: Relative Strength Index (RSI) is a momentum oscillator that measures the speed and change of price movements. RSI oscillates between zero and 100.

ROC—Rate of Change: The Rate-of-Change (ROC) indicator, which is also referred to as simply Momentum, is a pure momentum oscillator that measures the percent change in price from one period to the next. The ROC calculation compares the current price with the price "n" periods ago. The plot forms an oscillator that fluctuates above and below the zero line as the Rate-of-Change moves from positive to negative.

LIBOR: The London Interbank Offered Rate is the average interest rate estimated by leading banks in London that they would be charged if borrowing from other banks. It is usually abbreviated to Libor or LIBOR, or more officially to BBA Libor (for British Bankers' Association Libor) or the trademark bba libor. It is the primary benchmark, along with the Euribor, for short term interest rates around the world.

Genetic Algorithm

The Genetic Algorithm was proposed in 1975 and its framework is based on a direct analogy to Darwinian natural selection and mutations in biological reproduction [2]. It belongs to a category of heuristics known as the stochastic method, which employs randomized choice operators in the search strategy [3]. The appeal of GAs comes from their simplicity and elegance as strong search algorithms, as well as their ability to discover good solutions rapidly for difficult high-dimensional problems. The genetic algorithm is a popular method which has been applied in different data mining tasks, such as clustering [4]. Selection, crossover, and mutation are the three major GA operations.

The genetic algorithm can be summarized as:

```
Randomly generate Initial population;
Evaluate fitness of each chromosome in the population;
While (result doesn't achieve the goal)
{
    Perform selection operation;
    Perform crossover operation;
    Perform mutation operation;
    Evaluate fitness of each chromosome in the population;
}
```

RELATED WORK

Ya-Wen Chang Chien, Yen-Liang Chen [5] presented a GA-based algorithm used to build an associative classifier that can discover trading rules on stock trading data with many numerical technical Indicators. Associative classifiers are a classification system based on associative classification rules. The main goal is to build associative classifiers from numerical data. This paper employs a GA-

based method to mine from stock trading data the best k associative classification rules, and to build a classification system with high trading prediction accuracy from the best k associative classification rules. The GA–ACR algorithm incorporates the static capital allocation method to build an automatic stock trading system. Within this automatic stock trading system, trading signals for each stock can be discovered using the GA–ACR algorithm. The major contributions of this study is to propose a simple yet powerful structure for relation representation of numerical data in associative classification problem and to improve the capability of handling numerical data in associative classification.GA with phenotype encoding structure was employed to express relations between numerical data. To simplify the relationship between two numerical data and to express the common relations in stock trading problems, three relations were used to discover associative classification rules. Semantic roles (SR) were used to pre-prune rules with infeasible comparisons with technical indicators and the best k rules strategy was used to make the GA–ACR algorithm more efficient. The prediction accuracy of GA-ACR was extremely comparable to the data distribution method.

Ya-Wen Chang Chien , Yen-Liang Chen[6] proposed a phenotypic genetic algorithm (PGA) to overcome the weaknesses of Inductive Logic Programming (ILP) like: (1) weak capabilities in numerical data processing, (2) zero noise tolerance, and (3) unsatisfactory learning time with a large number of arguments in the relation and to strengthen the numerical data processing capabilities, a multiple level encoding structure is used that can represent three different types of relationships between two numerical data. To tolerate noise, PGA's goal of finding perfect rules is changed to finding top-k rules, which allows noise in the induction process. Finally, to shorten learning time, the semantic roles constraint were incorporate into PGA, reducing search space and preventing the discovery of infeasible rules. Stock trading data from Yahoo! Finance Online was used for the experiments. The results indicate that the PGA algorithm can find interesting trading rules from real data.

B. Manjula, R. Lakshman Naik and S.S.V.N. Sarma [7] presented a paper to track the trends of financial applications using genetic algorithm. The First stage is classifying the prone direction of the price for India cements stock price index (ICSPI) futures with several technical indicators using artificial intelligence techniques. And second stage is mining the trading rules to determined conflict among the outputs of the first stage using the evolve learning. This study intends to find good sets of rules which would have made the most money over a certain historical period. To mine reasonable trading rules using genetic algorithms for ICSPI future. They found trading rule which would have yield the highest return over a certain time period using historical data. These groundwork results suggest that genetic algorithms are promising model yields highest profit than other comparable models and buy-and-sell strategy. Experimental results of buying and selling of trading rules were outstanding. Although the trading systems that have worked well in the past seem to have a reasonable chance of doing well in the future, a more extensive validation process is required.

Preeti Paranjape-Voditel and Dr. Umesh Deshpande [16] presented a paper on Association Rule Mining (ARM) based Recommender system for the stock markets which deals with the prediction of individual stocks. The method uses ARM, fuzzy ARM, weighted fuzzy ARM, ARM with time lags, fuzzy ARM with time lags and weighted fuzzy ARM with time lags to predict relationships between stocks. The authors have used Association Rule Mining along with fuzzy classification methods to develop a Recommender system for the stock markets. Recommender System deals with the generation of Association Rules. The Recommender System handles inter-day as well as intra-day associations.

The system mines relationships between items or scrips. It does not recommend the scrips in isolation but in relation to the other existing scrips. The objective is to show good returns. The transaction files for this system were created by finding out the percentage rise/fall of certain scrip from its previous trading day's close. Thus a transaction will contain all the scrips which have risen/fallen by more than some minimum amount. The scrips of relevance are generated from the database by finding the frequent itemsets and then discovering the rules for all itemsets above some minimum support threshold. The association rules between scrips are positively or negatively correlated. These rules recommend to buy stock2 if stock1 is bought, if stock1 and stock2 exhibit positive correlation. If a negative correlation exists between them a rise in stock1 can trigger a sell stock2. Rules are generated on the individual frequent itemsets and only the strongest rules are chosen. The days on which the strongest rules occur gives the time lag for that particular rule.The system can be used for portfolio management, assumed that a portfolio has to be managed with the obvious intention of making a profit. The portfolio already contains scrips which can be replaced and the portfolio restructured or the portfolio can be created by initializing it with the scrips from different sectors. Then a time frame for monitoring is considered which is fixed. After periodic intervals association rules are generated and loss making stocks can be replaced by corresponding negatively correlated rising stocks of the same amount.

B. Liu, W. Hsu, Y. Ma [18] proposed the CBA (Classification based on association) algorithm which was one of the first associative classification algorithms that used an Apriori-based candidate generation step to build complete classification models from association

rules. In the CBA algorithm, all class-association rules are extracted from the available training dataset, i.e. all the association rules containing the class attribute in their consequents. The most suitable rules are selected to build an associative classification model, which uses a default class to complete it. It relies on a single rule to classify data. This classifier builder uses a brute-force exhaustive global search, and yields better results than the C4.5 [19]. This framework integrates classification and association rule mining algorithm to build an accurate classifier for prediction from the set generated rules.

X. Yin, J. Han [22] proposed the CPAR (Classification based on Predictive association rules) algorithm was proposed after the CBA and CMAR algorithms. Using ideas taken from traditional rule-based classification methods (such as Quinlan's FOIL [23]), the CPAR algorithm avoids generating a large number of candidate rules by generating candidate rules directly from the training data. It is a compromise between exhaustive and greedy algorithms and combines the advantages of both. CPAR uses the best k rules, rather than all of a group's rules, to predict the class label of a new tuple. This avoids the influence of lower ranked rules and is much more efficient with large sets of training data. CPAR uses expected accuracy to evaluate each rule.

PROPOSED SYSTEM

The diagram below gives the overview of the project. The numerical Stock Market data: DJIA is being used. Stock trading data contains the quotes of stock market. From this information, many technical indicators can be extracted, and by investigating the relations between these indicators trading signals can discovered. Genetic algorithm is being used to generate all the relations among the technical indicator and its value. Along with genetic algorithm association rule mining algorithm is used for generation of association rules among the various Technical Indicators. Associative rules are generated whose left side contains a set of trading signals, expressed by relations among the technical indicators, and whose right side indicates whether there is a positive negative or no change. The rules are being further given to the classification process which will be able to classify the new data making use of the previously generated rules.

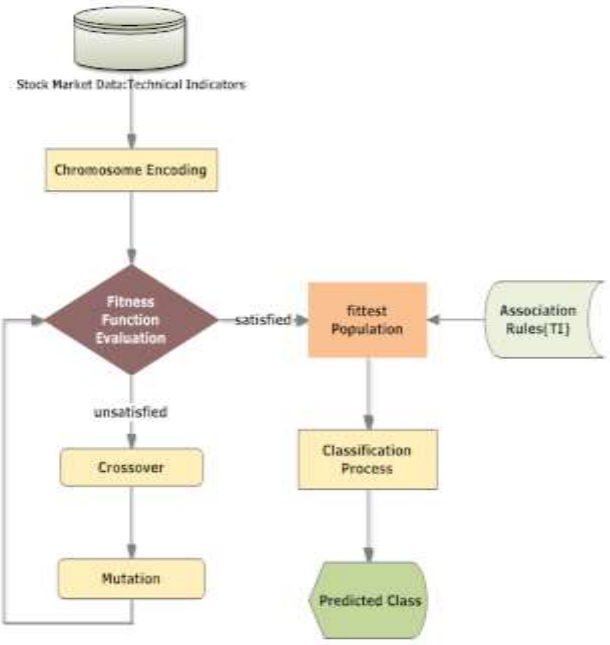


Figure 1 Flow of the system

Data Preprocessing

The first module deals with the collection of stock market data quotes of DJIA. The data is being collected from yahoo finance. After the data is being made available the technical indicators are being calculated using the stock market data quotes. The technical indicators used for the project are: RSI, EMA, MACD, k, ROC, CCI, William %R and LIBOR. In order to apply genetic algorithm to

the data first the technical indicators are investigated and various relations are being generated between them which will help to discover trading signals. The three types of relations commonly used are:

- The value of attribute A < continuous value (eg: RSI<70)
- The value of attribute A > value of attribute B
- $A_t < A_{(t+1)}$ where t is the time

These relations are being used and various relations among the technical indicators are being generated. Now the data is being ready for the input to the next module.

Genetic Algorithm

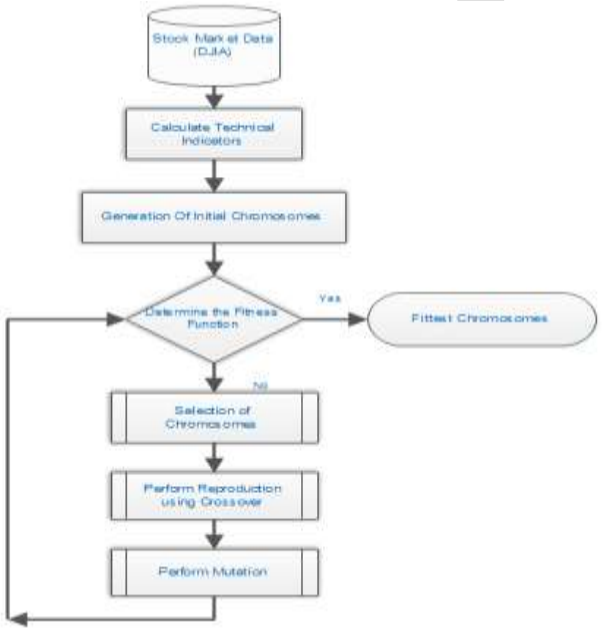


Figure 2 Genetic Algorithm

The genetic algorithm starts with the generation of initial chromosomes. Here, the chromosomes are represented as 64bits. The chromosome structure is as mentioned below:

RSI	EMA	MACD	K	ROC	CCI	William%R	LIBOR

Where each of the technical indicators mentioned is assigned 8bits each.

Relations generated from the technical indicators are

Technical Indicators	Rules
RSI	RSI>70 , RSI <30

EMA	EMA12>adj close, EMA26>adj close, EMA12>EMA26, EMA26>EMA12, EMA12(t)>EMA26(t-1), EMA26(t)>EMA12(t-1), EMA12 (t) > adj close (t-1), EMA26 (t) > adj close (t-1)
MACD	MACD>0, MACD>100, MACD>K, MACD>ROC, MACD(t) > K(t-1), MACD(t)>ROC(t-1), MACD>adj close, MACD(t)>adj close(t-1)
K	K>70, K(t-1)>70, K<30, K(t-1)<30, K(t-1)>K(t), K(t)>D(t-1), K(t-1)>D(t), K(t-1)>D(t-1)
ROC	ROC>3, ROC<-1, ROC>K, ROC(t)>k(t-1)
CCI	CCI>100, CCI>high, CCI>Low, CCI>adj close, CCI(t)>Adj close(t-1), CCI<-100
Williams %R	%R >ROC, %R>ROC(t-1), %R>-30, %R<-70, %R>adj close, %R>adj close(t-1)
LIBOR	LIBOR>0.7

Table 1 Technical Indicators relations

Each bit of the chromosome represents to the relations generated from the technical indicator. While generation of initial chromosome each bit in the chromosomes are assigned to either 1/0 depending upon the rules satisfy the data or not. Thus the initial chromosome is being generated.Now, the fitness function of each of the chromosomes is being calculated. And the chromosomes which are fit are being given to the next step. The next step is crossover function wherein the two chromosomes are randomly being selected and a crossover site is being chosen randomly and then the contents of the two chromosomes are being swapped forming two new chromosomes. If the chromosomes already exists they are deleted or otherwise the added to the final chromosome list.

The last step is the mutation function wherein specific amount of chromosomes which are being determined by mutation rate are undergone mutation where one random bit of the chromosome is being flipped if this results in a new chromosome then its being added to the final chromosome list. Now the final new chromosomes list in turn gives us the rules or relations of various technical indicators. This is being given as an input to the next module.

Association Rule Mining Algorithm

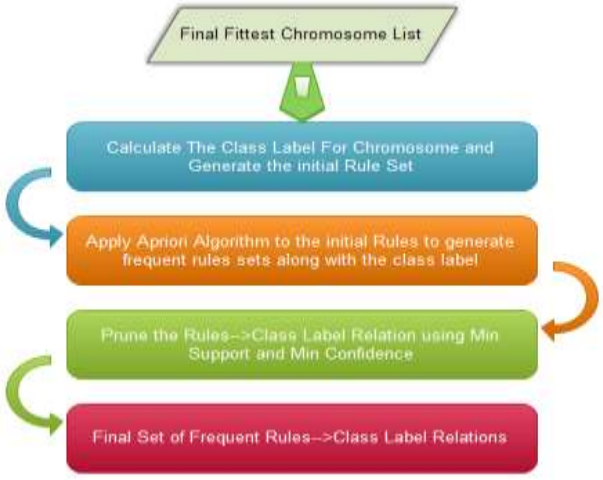


Figure 3 Flowchart for Association Rule Mining Algorithm

In this Module, the chromosomes generated are being assigned to the date and the class label. The class label is calculated using the stock market data.

Change = (Close-Open)

If Change>0 then class label is Positive

Change<0 then Negative and if Change=0 then the class label is No Change

The rules obtained from the Genetic Algorithm are being given to the Apriori Algorithm.

The Apriori Algorithm takes in the rules and generates all possible combination of frequent rules sets. During each iteration rules are being assigned to each of the class label and then the support count of the rule along with the class is being calculated. All the rules→class label set is being pruned which are below the Support and confidence threshold.

The support and confidence is being calculated as below:

Support (rule→class) = count (rule→class) / |total number of chromosome| *100

Confidence = support (rule→ label) / support (rule)

At the end of the module we are left with the all possible frequent combination of the rule set along with the class label. These sets of frequent rule will help us in classification of the new test data.

Prediction

In the Classification step, the new test data is being collected and is being given to the genetic algorithm to generate the initial set of chromosome. The chromosomes obtained will help us in obtaining the rules which can be used to predict the class label. The rules obtained from the new set of chromosomes are mapped against the rules obtained from the previous step i.e. association rule mining algorithm.

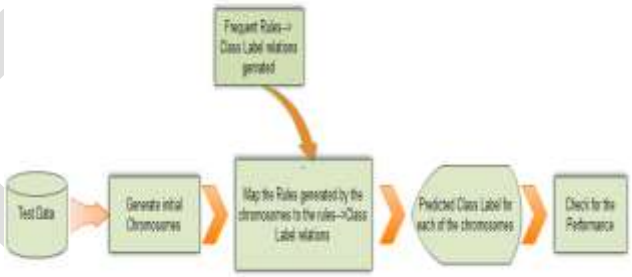
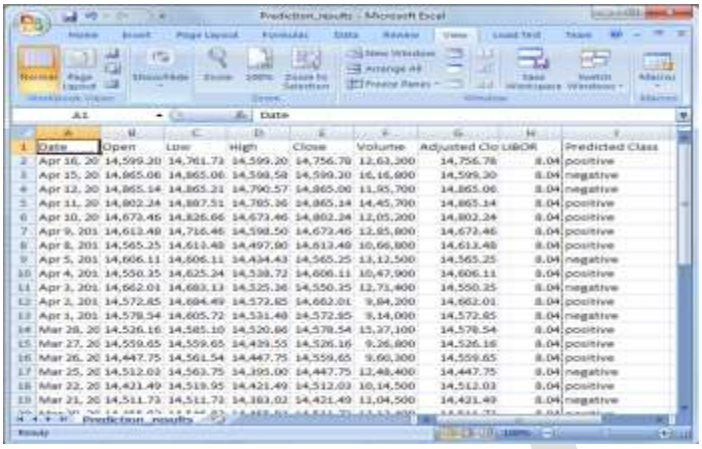


Figure 4 Flowchart for Prediction Process

The rule set which match the rules from the chromosomes are sorted out and checked against their class label. The prominent class label is being assigned to the new set of chromosome thus predicting the new class label for the test data.

RESULTS AND OBSERVATION

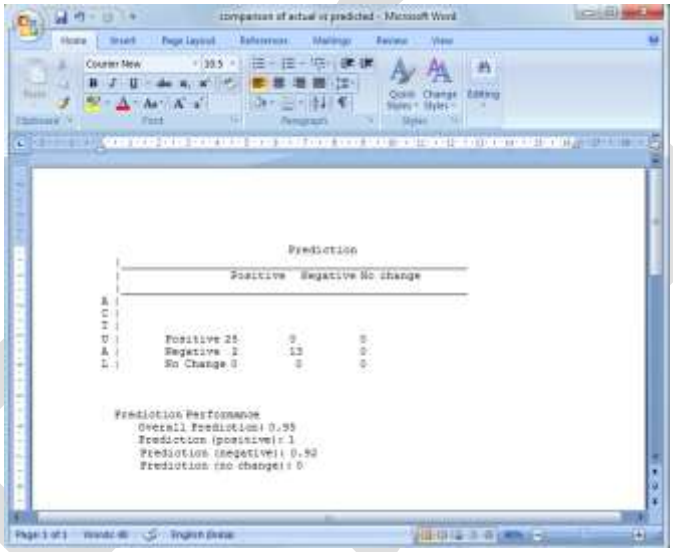
Training Data Set: DJIA from 30th December 2011 to 19th February 2013
Number of Chromosomes generated by the genetic Algorithm: 463
Association rule mining Algorithm generated 5-ruleset frequent rules with threshold of Support count as 40 and Confidence as 0.5
Total number of unique rule combination generated: 710
Test data set: 20st February 2013 to 16th April 2013 (40days)



Date	Open	Low	High	Close	Volume	Adjusted Clo	LIBOR	Predicted Class
Apr 16, 20	14,599.20	14,761.73	14,599.20	14,756.78	12,63,200	14,756.78	0.04	positive
Apr 15, 20	14,865.06	14,865.06	14,598.59	14,599.20	16,16,800	14,599.20	0.04	negative
Apr 12, 20	14,865.14	14,865.21	14,790.57	14,865.06	11,95,700	14,865.06	0.04	negative
Apr 11, 20	14,802.24	14,897.51	14,765.36	14,865.14	14,45,700	14,865.14	0.04	positive
Apr 10, 20	14,673.46	14,826.66	14,673.46	14,802.24	12,05,200	14,802.24	0.04	positive
Apr 9, 201	14,613.48	14,716.46	14,598.50	14,673.46	12,85,800	14,673.46	0.04	positive
Apr 8, 201	14,565.25	14,613.48	14,497.90	14,613.48	10,66,800	14,613.48	0.04	positive
Apr 5, 201	14,606.11	14,606.11	14,434.43	14,565.25	13,12,500	14,565.25	0.04	negative
Apr 4, 201	14,550.35	14,625.24	14,538.72	14,606.11	10,47,900	14,606.11	0.04	positive
Apr 3, 201	14,662.01	14,683.13	14,525.36	14,550.35	12,73,400	14,550.35	0.04	negative
Apr 2, 201	14,572.85	14,684.49	14,572.85	14,662.01	9,84,200	14,662.01	0.04	positive
Apr 1, 201	14,578.54	14,605.72	14,531.48	14,572.85	9,14,000	14,572.85	0.04	negative
Mar 28, 20	14,526.16	14,585.10	14,520.86	14,578.54	15,37,100	14,578.54	0.04	positive
Mar 27, 20	14,559.65	14,559.65	14,429.55	14,526.16	9,26,800	14,526.16	0.04	positive
Mar 26, 20	14,447.75	14,561.54	14,447.75	14,559.65	9,60,300	14,559.65	0.04	positive
Mar 25, 20	14,512.03	14,563.75	14,395.00	14,447.75	12,48,400	14,447.75	0.04	negative
Mar 22, 20	14,421.49	14,519.95	14,421.49	14,512.03	10,14,500	14,512.03	0.04	positive
Mar 21, 20	14,511.73	14,511.73	14,383.02	14,421.49	11,04,500	14,421.49	0.04	negative

Figure 5 Prediction Results

The Prediction performance is being calculated by comparing the actual results to the predicted ones.



Prediction

Actual	Positive	Negative	No change
Positive	25	0	0
Negative	1	13	0
No Change	0	0	0

Prediction Performance
Overall Prediction: 0.95
Prediction (positive): 1
Prediction (negative): 0.92
Prediction (no change): 0

Figure 6 Prediction Performance Results

The above figure gives the prediction performance of the application as compared to the actual results. From this it can be concluded that the overall prediction performance was 95%. Individually, The Positive Class Label showed 100% accuracy while Negative Class Label had 98% accuracy.

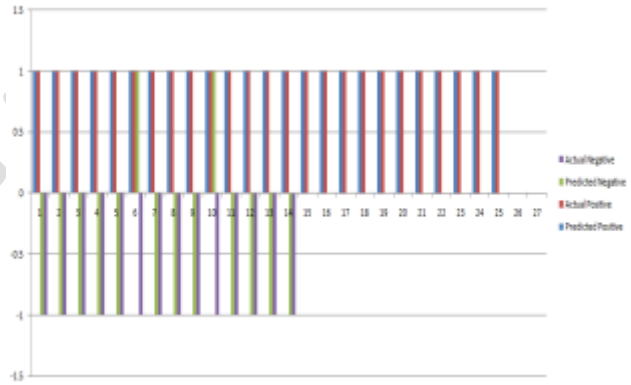


Figure 7 Prediction Performance Graph

The above Figure shows the prediction performance graph, which shows the predicted positive to the actual positive results and the predicted negative to the actual negative.

The x-axis of the graph shows the number of days and y axis represents the positive or the negative value. From the graph it can be concluded that twice the predicted negative result differed from the actual one.

CONCLUSION

A detailed Study was conducted on the DJIA stock market and the various technical indicators being used for Stock Market data which help in analysing the Stock Market.The Literature survey was conducted on Genetic Algorithm and Association rule Mining Algorithm and a combine approach was being implemented. As Association Rule Mining Algorithms cannot handle numerical data efficiently a modified Genetic Algorithm was being used for the representation of the stock market data and to generate rules among the various technical indicators. Association rule mining Algorithm help in generation of the frequent rule set along with the class label and then predict the class label for the new test data i.e. if it is positive, negative or no change.

Overall a new method was proposed for Stock Market Prediction using a combination of Genetic and Association rule Mining Algorithm which can handle numerical data.

The Prediction Performance was also being calculated and a comparison was carried out with the actual performance. The overall prediction process had 95% of accuracy.

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NOVEL ALGORITHM FOR GRAPE LEAF DISEASES DETECTION

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Abstract-Early and reliable detection of leaf diseases has important practical relevance, especially in the context of precision agriculture for localized treatment with fungicides. Techniques that can significantly identify leaf diseases would assure fruit quality and minimize losses for Grape fruit farms. Procedures for selecting useful texture features were developed based on a stepwise analysis.. This paper presents approach for integrating image analysis techniques into diagnostic expert systems. The result of applying this approach is presented through the use of grape diseases as a case study

Keywords – Hue, Energy, homogeneity, contrast, cluster prominence and cluster shade.

Introduction

India is an agricultural country; wherein about seventy percentage of the population depends on agriculture .Farmers have wide range of diversity to select suitable Fruit and Vegetable crops. However, the cultivation of these crops for optimum yield and quality product is highly technical. It can be improved with the aid of technological support. The management of perennial fruit crops requires close monitoring especially for the management of diseases that can affect production significantly and subsequently the post-harvest life. Grape fruit enjoys a pre-eminent status among all cash crops in the country and is the principal raw material for flourishing wine industry. It provides livelihood to about sixty million people and is an important agricultural commodity providing remunerative income to millions of farmers both in developed and developing countries. Country 70 per cent of the grape cultivated area in India is under rain fed conditions. Water stressed seed or plant, will have poor growth leading to low yield as well as exposure to diseases.

Producing Grape is a daunting task as the plant is exposed to the attacks from various microorganisms ,bacterial diseases and pests .The symptoms of the attacks are usually distinguished through the leaves ,stems or fruit inspection . This proposed system discusses the effective way used in performing detection of grape diseases through leaf feature inspection. Leaf image is captured and proposed to determine the health status of each plant. Plant disease diagnosis is an art as well as science. The diagnosis process (i.e. recognition of symptoms and signs) , is inherently visual and requires intuitive judgment as well as the use of scientific methods. Photographic images of symptoms and signs of plant's diseases used extensively to enhance description of plant diseases are invaluable in research, diagnostics etc.

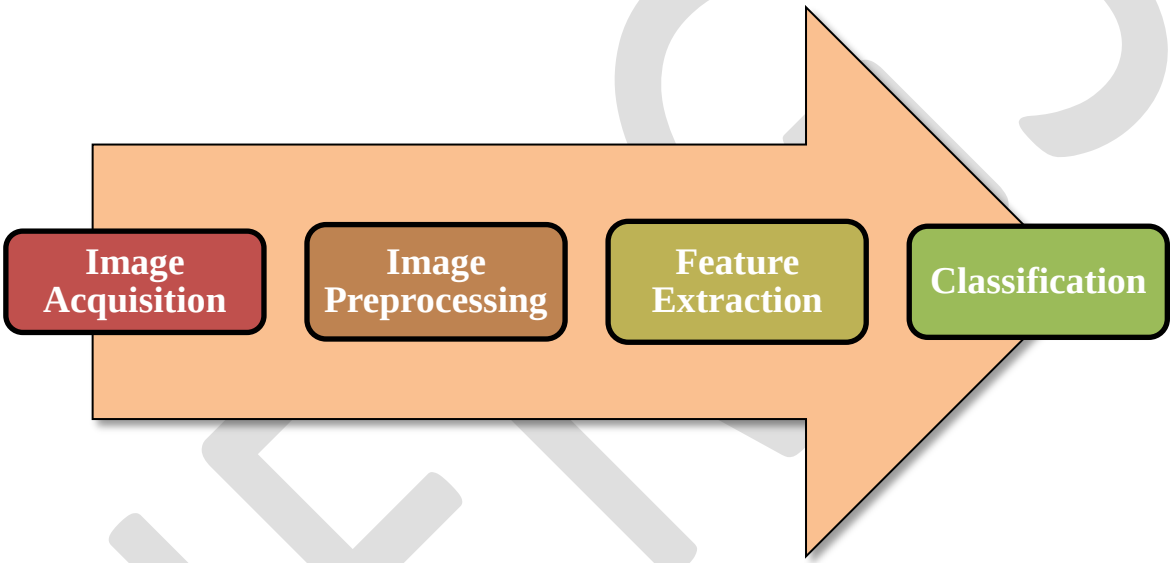
At certain times, it becomes a very high demand in the market because supply is limited. Business grape indeed belongs in the high-risk plants. Therefore, strategies and technical knowledge and the field became an important matter to be mastered. The systematic and structured should be developing so that it will use by operators to increase the overall production. Many farmers refused to cultivate grape in the rainy season due to the increase of grape disease to become high risk for the quality control and productivity. In general, there are two types of factors which can bring death and destruction to grape plants; living (biotic) and nonliving (a biotic) agents. Living agent's including insects, bacteria, fungi and viruses. Nonliving agents include extremes of temperature, excess moisture, poor light, insufficient nutrients, and poor soil pH and air pollutants. Diseased plants can exhibit a variety of symptoms and making diagnosis was extremely difficult. Common symptoms are includes abnormal leaf growth, colour distortion, stunted growth, shriveled and damaged pods. Although pests & diseases can cause considerable yield losses or bring death to the plants and it's also was directly affect to human health. However, crop losses can be minimized, and specific treatments can be tailored to combat specific pathogens if plant diseases are correctly diagnosed and identified early. These need-based treatments also translate to economic and environmental gains.

Materials and methods

Kim et.al, have classified the grape fruit peel diseases using colour texture features analysis. The texture features are calculated from the SGDM and the classification is done using squared distance technique. Grape fruit peel might be infected by several diseases likecanker, copper burn, greasy spot, melanose and wind scar [1]. In [2] the authors have worked on the development of methods for the automatic classification of leaf diseases based on high resolution multispectral and stereo images. Leaves of sugar beet are used for evaluating their approach. Sugar beet leaves might be infected by several diseases, such as rusts (Uromyces betae), powdery mildew (Erysiphe betae). Zulkifli Bin Husin and Abdul Hallis Bin Abdul Aziz developed fast and accurate method in which the chilli leaf diseases are detected using colour clustering method. Here graphical user interface is used [3]. Yinmao Song et al, developed feature extraction methods of crop disease based on computer image processing technology. Based on colour, texture and shape feature extraction method in three aspects features and their respective problems were introduced start from the perspective of lesion leaves[4]. Keru Wang et al [5] created a model of cotton leaf chlorophyll determination based on using the machine vision technology

for the colour features of cotton leaf. The research showed that the BIR values of RGB colour system, the b and b\r values of chromaticity coordinate and the S values of HIS colour system were all significantly correlated with chlorophyll content of cotton leaf. These values could be used to determine the concentration of chlorophyll. Libo Liu et al [6] studied the identification method of rice leaf disease according to the colour characteristics of leaf lesion area. Al-Bashish, Braik and Bani Ahmed developed a fast and accurate method in which the leaf diseases are detected and classified using k-means based segmentation and neural networks based classification [7]. Automatic classification of leaf diseases is done based on high resolution multispectral and stereo images [8]. Sugar beet leaves are used in this approach. Segmentation is the process that is carried out to extract the diseased region and the plant diseases are graded by calculating the quotient of disease spot and leaf areas. An optimal threshold value for segmentation can be obtained using weighted Parzen-window [9]. This reduces the computational burden and storage requirements without degrading the final segmentation results. In [10], a fast and accurate new method is developed based on computer image processing for grading of plant diseases. For that, leaf region was segmented by using Otsu method [11, 12, & 13]. After that the disease spot regions were segmented by using Sobel operator to detect the disease spot edges. Finally, plant diseases are graded by calculating the quotient of disease spot and leaf areas.

Basic Procedure



Above figure shows the basic procedure of grape leaf disease classification.

Image Acquisition

Here first we captured the image. Image must be stored in the ('.jpg') format. Size of the image is 259*194 pixcels. We open this image using imread command in MATLAB software

Image Pre-processing

We convert the image into HSV format using rgb2hsv command. After this transformation we consider only Hue component. We neglect saturation and intensity component. Because it does not provide any useful information.

$$Hue\ (H) = \begin{cases} \emptyset & if\ B \le G \\ 360 - \emptyset & if\ B > G \end{cases}$$

$$\emptyset = \cos^{-1}\left\{\frac{1/2[(R-G)+(R-B)]}{[(R-G)^2+(R-G)(G-B)]^2}\right\}$$

$$\boldsymbol{Saturation\ (S)\ =\ 1\ -\ \frac{3}{R+G+B}[min(R,G,B)]}$$

$$\boldsymbol{Value\ (V)\ =\ \frac{1}{3}(R+G+B)}$$

Masking of green pixels of hue component take place. Because green pixcels are nothing but healthy region of the leaf. It can not give any additional information for disease classification. Here we concentrate only on infected region. The infected portion of the leaf is extracted.

Feature Extraction

Then we extract the features of diseased area and classify the disease according to the features. For this we use Spatial Gray-level Dependence Matrices (SGDM matrix) method. By using SGDM matrix method we get five features like Energy , homogeneity, contrast, cluster prominence and cluster shade. But only cluster prominence and cluster shade give significant difference in their value . Value of Energy, homogeneity, contrast of all the diseases is almost same. We are focusing on cluster prominence and cluster shade component. .Here we avoid the segmentation process. Due to this we classify the black rot and downy mildew or black rot and powdery mildew diseases successfully but we cannot classify downy mildew and powdery mildew disease successfully. Because the value of the component of these two diseases nearly same for this we have to use segmentation process.

$$\text{Cluster Shade} = \sum_{i=0}^{G-1}\sum_{j=0}^{G-1}\{i+j-\mu_i-\mu_j\}^3 \times P(i,j|\Delta x,\Delta y)$$

$$\boldsymbol{Cluster\ Prominence} = \sum_{i=0}^{G-1}\sum_{j=0}^{G-1}\{i+j-\mu_i-\mu_j\}^4 \times P(i,j|d)$$

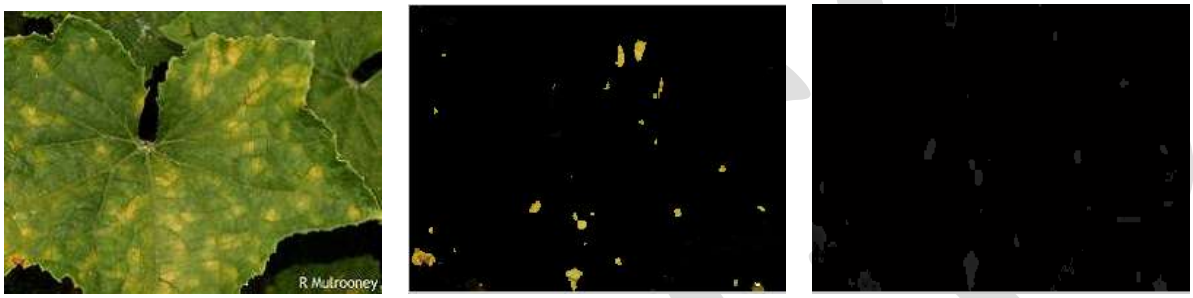
Black Rot

RGB Image Mask Image Hue Image

Powdery Mildew

RGB Image Mask Image Hue Image

Downy Mildew



RGB Image Mask Image Hue Image

Above figure shows different images during processing. After taking RGB image we mask infected region and then extract features of that infected portion.

Experimental Result

About 100 plant leaves of different native plant species of Maharashtra state have been collected for analysis Without Segmentation

Sr. No.	Disease	Accuracy
1	Black Rot	95%
2	Powdery Mildew	40%
3	Downy Mildew	40%

Conclusion

This approach provides technical hand to agriculture field. The proposed approach is verified with real time plant leaf data base. To improve the accuracy of classification we must add Segmentation block in the main procedure also time required for the same is also less. This approach is useful for farmers for early detection of grape leaf disease which improve the production cost.

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Improving Cloud Security Using Data Partitioning And Encryption Technique

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Abstract- Cloud computing is Internet based computing where virtual shared servers provide software and other resources and hosting to customers on a pay-as-you-use basis. Cloud storage is nothing but the storing data on third party cloud servers. Advantages of cloud computing are almost unlimited storage and backup and recovery. Disadvantages of cloud computing are technical issues, cost and lack of support. But main disadvantage is security. As we store our data on third party cloud service providers our data is not completely safe. It impose a great risk. Many cloud servers are curious servers i.e., they try to read the data which is stored on it. In this paper our goal is to build an application for improving cloud security using partition and encryption method which will help to improve the cloud security. In this first we take file from client and divide it into number of parts. After partition we encrypt the all file parts. Then we send file parts to different cloud servers. When client want that data back we took that data from cloud servers and decrypt that data. After decryption we merge that data and give it to client. Our goal is that the application should have simple user interface for users flexibility.

Keywords - AES, Cloud Computing, Data Partition, Decryption, Encryption, Security.

I. INTRODUCTION

In this era of technology, the Internet access becomes available in the recent years, Cloud computing is an internet based technology, being used widely nowadays to enable the end user to create and use software without worrying about the execution of the technical information from anywhere at any time.

In order to store the large volume of data, cloud storage systems use many small-scale independent storage systems. These systems together form the entire cloud storage. To store the data using cloud storage has multiple advantages. Few of them are data stored using an account can be synced in multiple devices using the same account. There are lot of conflicting replicas are available in cloud storage. Users can use minimal amount of storage space by avoiding the replicas. The cloud computing has many features to the users like communication media, file storage and computations, keep mirroring of highly important information, etc., Basically, user data are stored in various storage locations like local servers and cloud. An overview of cloud storage system is shownin Fig [1].

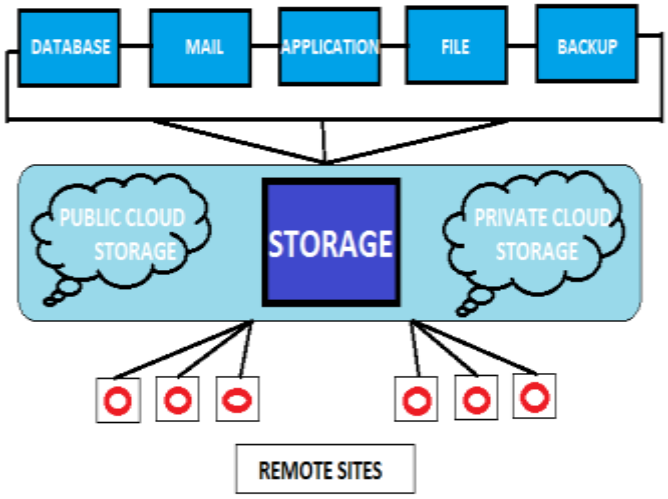

Fig. 1 Overview of cloud storage

Now computing technologies have attracted more and more people to store their private data on third party servereither for ease of sharing. When people enjoy the advantage of these new technologies and service, their concerns about data security also arise. Naturally, people would like to make their private data only accessible toauthorized users only. So we are trying to secure clients data using some algorithms.

II. LITERATURE SURVEY

In the Partitioning Technique literature review isdone for data integrity checking, data storagemechanisms and encryption mechanism. The dynamic data storage withtoken pre-computation and AES algorithm how it is storedin cloud is analyzed [1], [10] Integrity checking isused to detect and avoid misbehaving serverconsidering data correction and localizing errors.Distributed scheme is used to achieve theavailability, data quality,integrity of dependable storage services[2],[6]. Thedata storage using dynamic data operation method is usedto perform various operations. Security analysis is encode the data by RSA. Distributed storage system is alsoused to support the forwarded data in cloud.

Data integrity in cloud storage devices are analyzed in theresearch oriented works [8],[10]. PublicAuditability and dynamic data operation are used for supporting the integrity of data. Theobjective of this work is to havequality in services and independent perspective evaluating with the third partyauditor. Storage model is also devised here to supportmultiple auditing tasks to improve efficiency. In the works[3], [4], [5], author considers generating signature methodsfor ensuring the cloud storage security. Dynamic operationsare supported by using the RSA method supports dynamic operations[7]. This methoddiscussesdata correctness stored in cloud and data integrity.

III. PROPOSED SYSTEM

Our goal is to build a Java application for improving cloud security using partition method which will help to improve the cloud security. In this application we encrypt the client's data. After encryption we divide that data and send to different cloud servers. When client want that data back we took that data from cloud servers and decrypt that data. After decryption we merge that data and give it to client. The application should have simple user interface.

Concept :

We propose an efficient data storage security in cloud computing. The partitioning of data makes storing of the data in easy and effective. It also gives way for flexible access and there is less cost in data storage. The space and time is also effectively reduced during cloud storage. Dynamic operation is another important concept where, encryption and decryption process secures data, when storing into cloud. Also the remote data integrity checking detects the threats and misbehaving server while storing the data in cloud ensuring data security.

In this application the partitioning method is proposed for the data storage which avoids the local copy at the user side by using partitioning technique. This technique ensures high cloud storage integrity, improve error localization and identification of

misbehaving server. In nature the data are dynamic. Hence in cloud this work aims to store the data in reduced space with less time and computational cost.

In this application we encrypt the client's data. After encryption we divide that data and send to different cloud servers. When client want that data back we took that data from cloud servers and decrypt that data. After decryption we merge that data and give it to client.

In this application we are providing a TPA [Third Party Administrator].

Actual flow of system:

- User selects file to upload on cloud server.
- Sends file to TPA.
- TPA receives file.
- TPA partitions file.
- TPA extracts digital signature of each file partition.
- TPA generates secrete keys for each partition.
- TPA encrypts each partition using respective secrete key.
- TPA stores partition sequence, signature, keys and file attributes on its own server.
- TPA sends partition to respective cloud storage.
- Storage server receive file partition.
- Storage server stores partition.

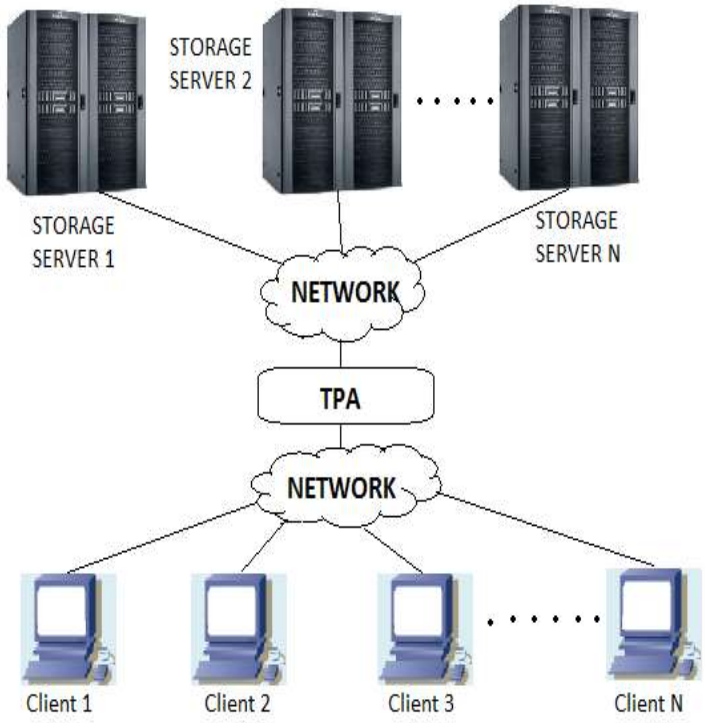

Fig. 2 Flow Of System

IV. METHODOLOGY

Partition Algorithm

- Load the Input file and size.
- Check size of file
- If file size is invalid then declare as Invalid size.

- Else
  - Count size = S
  - Split file into n partitions with extension and index value.
  - Return files.

Merging Algorithm

- Collect all decrypted file partitions
- Check file status
- If (file!) then File is missing.
- Else
  - Count the index value
  - Merge files.
  - Return file.

AES Algorithm

Advanced **E**ncryption **S**tandard (AES) is a symmetric key block cipher published by the NIST in December 2001. AES encrypts and decrypts a data block of 128 bits. The key size can be 128, 192, 256 bits.

The number of round: 10 rounds for 128 bits
12 rounds for 192 bits
14 rounds for 256 bits

Internal Structure of AES

AES is a byte-oriented cipher.
The state A (i.e., the 128-bit data path) can be arranged in a 4X4 matrix:

A_0	A_4	A_8	A_{12}
A_1	A_5	A_9	A_{13}
A_2	A_6	A_{10}	A_{14}
A_3	A_7	A_{11}	A_{15}

withA0,…, A15 denoting the 16-byte input of AES

Encryption

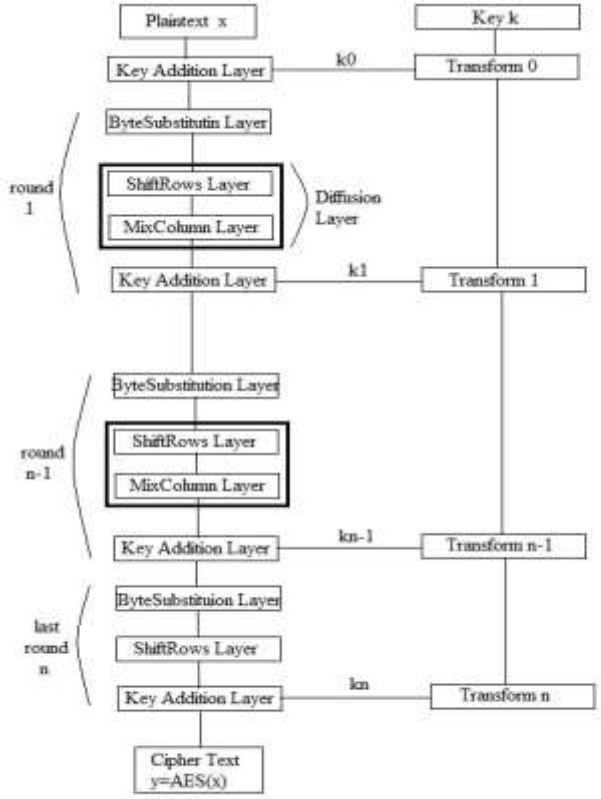

Fig. 3 Rounds of Encryption Process

For 128 bits AES each round contains four steps.

- Byte Substitution
- Row shift
- Column Mixing
- Round Key Addition

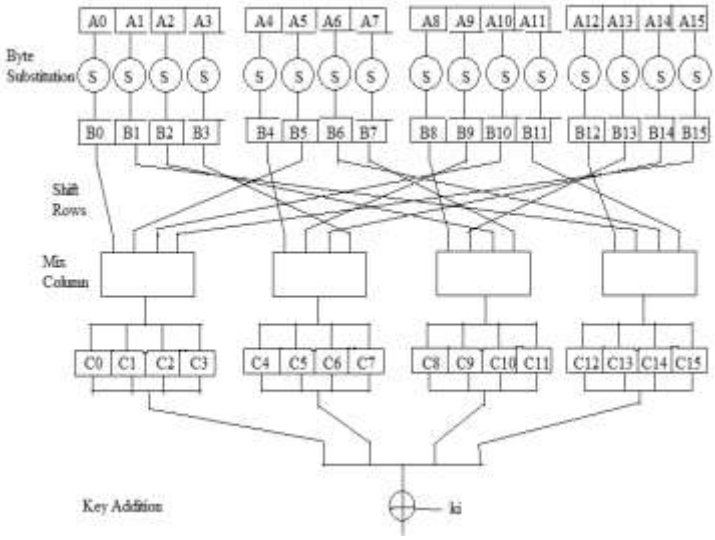

Fig. 4 Flow of algorithm

Byte Substitution

The Byte Substitution consists of 16 **S-Boxes**
In software implementations, the S-Box is usually realized as alookup table

Row shift

Input matrix =>

B_0	B_4	B_8	B_{12}
B_1	B_5	B_9	B_{13}
B_2	B_6	B_{10}	B_{14}
B_3	B_7	B_{11}	B_{15}

Output matrix =>

B_0	B_4	B_8	B_{12}	no shift
B_5	B_9	B_{13}	B_1	← one position left shift
B_{10}	B_{14}	B_2	B_6	← two positions left shift
B_{15}	B_3	B_7	B_{11}	← three positions left shift

Column Mixing

Linear transformation mixes each column of thestate matrix.
In column mixing 4-byte column is considered as a vector and multiplied by a 4*4 matrix, e.g.

$$\begin{pmatrix} C_0 \\ C_1 \\ C_2 \\ C_3 \end{pmatrix} = \begin{pmatrix} 02 & 03 & 01 & 01 \\ 01 & 02 & 03 & 01 \\ 01 & 01 & 02 & 03 \\ 03 & 01 & 01 & 02 \end{pmatrix} \cdot \begin{pmatrix} B_0 \\ B_5 \\ B_{10} \\ B_{15} \end{pmatrix}$$

where 01, 02 and 03 are given in hexadecimal notation

Round Key Addition

- In encryption the key is provided as input is expanded into an array of forty four 32 bit words, w(i).
- In AES four different stages are used, one of permutation and three of substitution.
- For encryption, the cipher begins with an AddRoundkey stage, followed by nine rounds that each includes all four stages, followed by a tenth round of three stages.
- Only the AddRoundkeystage make use of the key.

Decryption

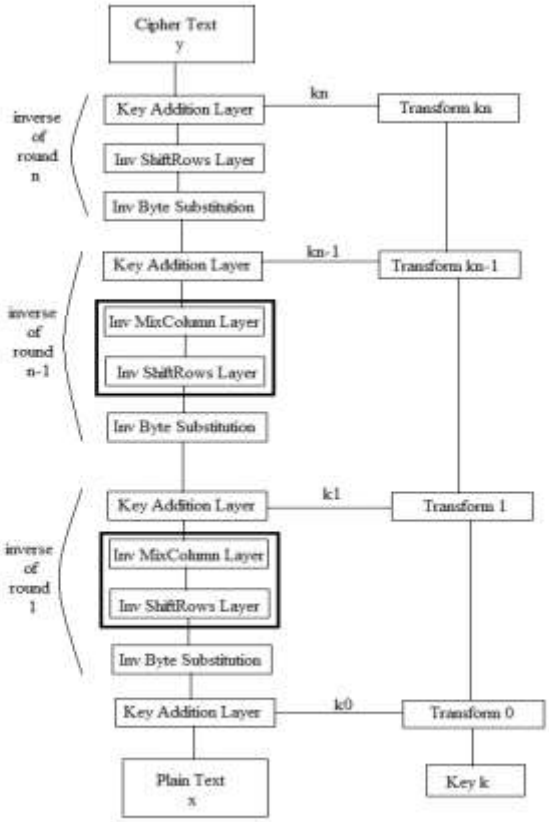

Fig. 5 Rounds of Decryption Process

InvMixColumn

$$\begin{pmatrix} B_0 \\ B_1 \\ B_2 \\ B_3 \end{pmatrix} = \begin{pmatrix} 0E & 0B & 0D & 09 \\ 09 & 0E & 0B & 0D \\ 0D & 09 & 0E & 0B \\ 0B & 0D & 09 & 0E \end{pmatrix} \cdot \begin{pmatrix} C_0 \\ C_1 \\ C_2 \\ C_3 \end{pmatrix}$$

InvShiftRows

Input matrix =>

B_0	B_4	B_8	B_{12}
B_1	B_5	B_9	B_{13}
B_2	B_6	B_{10}	B_{14}
B_3	B_7	B_{11}	B_{15}

Output matrix =>

B_0	B_4	B_8	B_{12}	no shift
B_{13}	B_1	B_5	B_9	→ one position right shift
B_{10}	B_{14}	B_2	B_6	→ two positions right shift
B_7	B_{11}	B_{15}	B_3	→ three positions right shift

V. CONCLUSION AND FUTURE WORK

The proposed work aims in the design of secured data storage and error tolerance in cloud storage. The data storage security is provided by the way of storing data using partitioning technique and encryption decryption technique. The small units of files that are split is encrypted which provides more security. The data loss analysis has taken care during this process by proctor. It also gives way for flexible access and there is less cost in cloud data storage. The space and time is also effectively reduced during cloud storage. Dynamic operation is another important concept where, encryption and decryption process secures data, when storing into cloud. Also the remote data integrity checking detects the threats and misbehaving server.

In Future we planned to provide higher level of security by using advanced encryption and decryption algorithm and searching mechanisms for outsourced computations in cloud services.

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Speech Enhancement through Elimination of Impulsive Disturbance Using Log MMSE Filtering

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Abstract— The purpose of speech is communication, i.e., the transmission of messages. A message represented as a sequence of discrete symbols can be quantified by its information content in bits, and the rate of transmission of information is measured in bits/second (bps). In speech production, as well as in many human-engineered electronic communication systems, the information to be transmitted is encoded in the form of a continuously varying (analog) waveform that can be transmitted, recorded, manipulated, and ultimately decoded by a human listener. In the case of speech, the fundamental analog form of the message is an acoustic waveform, which we call the speech signal. Speech signals can be converted to an electrical waveform by a microphone, further manipulated by both analog and digital signal processing, and then converted back to acoustic form by a loudspeaker, a telephone handset or headphone, as desired. Signals are usually corrupted by noise in the real world. To reduce the influence of noise, two research topics are the speech enhancement and speech recognition in noisy environments have arose. It provided that better results in terms of performance parameters, processing time and speech signal quality rather than prior methods.

Keywords— Inventory-style speech enhancement, modified imputation, uncertainty-of-observation techniques.

INTRODUCTION

The project presents an enhancement of the speech signal by removal of impulsive disturbance from noisy speech using log minimum mean square error filtering approach. Impulsive noise has a potential to degrade the performance and reliability of Speech signal. To enhance the speech component from impulsive disturbance we go for emphasis, signal segmentation and log MMSE filtering. In pre processing of audio signals start with pre-emphasis refers to a system process designed to increase the magnitude of some frequencies with respect to the magnitude of other frequencies. Emphasis refers to a system process designed to increase the magnitude of some frequencies with respect to the magnitude of other frequencies in order to improve the overall signal-to-noise ratio. Then the signal samples are segmented into fixed number of frames and each frame samples are evaluated with hamming window coefficients. Mean-Square Error Log-Spectral Amplitude (MMSE), which minimizes the mean-square error of the log-spectra, is obtained as a weighted geometric mean of the gains associated with the speech signal. The performance of the filtering is measured with signal to noise ratio, Perceptual Evaluation of Speech Quality (PESQ), Correlation.remaining contents.

The fundamental purpose of speech is communication, i.e., the transmission of messages. A message represented as a sequence of discrete symbols can be quantified by its information content in bits, and the rate of transmission of information is measured in bits/second (bps). In speech production, as well as in many humanengineered electronic communication systems, the information to be transmitted is encoded in the form of a continuously varying (analog) waveform that can be transmitted, recorded, manipulated, and ultimately decoded by a human listener. In the case of speech, the fundamental analog form of the message is an acoustic waveform, which we call the speech signal. Speech signals can be converted to an electrical waveform by a microphone, further manipulated by both analog and digital signal processing, and then converted back to acoustic form by a loudspeaker, a telephone handset or headphone, as desired. Signals are usually corrupted by noise in the real world. To reduce the influence of noise, two research topics are the speech enhancement and speech recognition in noisy environments have arose. For the speech enhancement, the extraction of a signal buried in noise, adaptive noise cancellation (ANC) provides a good solution. In contrast to other enhancement techniques, its great strength lies in the fact that no a priori knowledge of signal or noise is required in advance. The advantage is gained with the auxiliary of a secondary input to measure the noise source. The cancellation operation is based on the following principle. Since the desired signal is corrupted by the noise, if the noise can be estimated from the noise source, this estimated noise can then be subtracted from the primary channel resulting in the desired signal. Traditionally, this task is done by linear filtering. In real situations, the corrupting noise is a nonlinear distortion version of the source noise, so a nonlinear filter should be a better choice. In the typical speech enhancement methods based on STFT, only the magnitude spectrum is modified and phase spectrum is kept unchanged. It was believed that the magnitude spectrum includes most of the information of the speech, and phase spectrum contains little of that. Furthermore, the human auditory system is phase deaf. For above reason, in typical speech enhancement algorithms, such as Spectral subtraction (SS), MMSE-STSA or MAP algorithm, the speech enhancement process is on the basis of spectral magnitude component only and keep the phase component unchanged.

WAVELET TRANSFORM

Whether we like it or not we are living in a world of signals. Nature is talking to us with signals: light, sounds… Men are talking to each other with signals: music, TV, phones…

The human body is equipped to survive in this world of signals with sensors such as eyes and ears, which are able to receive and process these signals. Consider, for instance, our ears: they can discriminate the volume and tone of a voice. Most of the information our ears process from a signal is in the frequency content of the signal.

Scientists have developed mathematical methods to imitate the processing performed by our body and extract the frequency information contained in a signal. These mathematical algorithms are called transforms and the most popular among them is the Fourier Transform.

The second method to analyze non-stationary signals is to first filter different frequency bands, cut these bands into slices in time, and then analyzes them.

The wavelet transform uses this approach. The wavelet transform or wavelet analysis is probably the most recent solution to overcome the shortcomings of the Fourier transform. In wavelet analysis the use of a fully scalable modulated window solves the signal-cutting problem. The window is shifted along the signal and for every position the spectrum is calculated. Thenthis process is repeated many times with a slightly shorter (or longer) window for every new cycle.

In the end the result is a collection of time-frequency representations of the signal, all with different resolutions. Because of this collection of representations, we can speak of a multiresolution analysis. In the case of wavelets, we normally do not speak about time-frequency.

The discrete wavelet transform (DWT) was developed to apply the wavelet transform to the digital world. Filter banks are used to approximate the behavior of the continuous wavelet transform. The signal is decomposed with a high-pass filter and a low-pass filter. The coefficients of these filters are computed using mathematical analysis and made available to you.

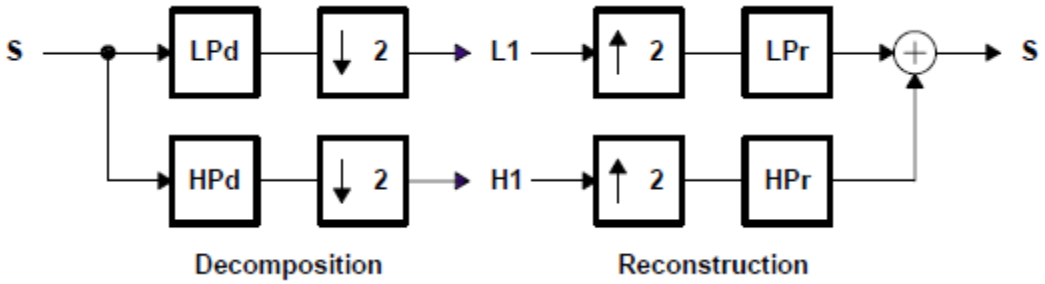

Figure 1. Discrete wavelet transform

Where
LPd: Low Pass Decomposition Filter
HPd: High Pass Decomposition Filter
LPr: Low Pass Reconstruction Filter
HPr: High Pass Reconstruction Filter

The hp[n] coefficients are used as the low-pass reconstruction filter (LPr).
The coefficients for the filters HPd, LPd and HPr are computed from the h[n] coefficients as follows:

- High-pass decomposition filter (HPd) coefficients

$g[n] = (-1)^n h[L-n]$ (L: length of the filter)

- Low-pass reconstruction filter (LPr) coefficients

$h[n] = h[L-n]$ (L: length of the filter)

- High-pass reconstruction filter (HPr) coefficients

$g[n] = g[L-n]$ (L: length of the filter)

The Daubechies filters for Wavelets are provided in the C55x IMGLIB for $2 \leq p \leq 10$. Since there are several sets of filters, we may ask ourselves what are the advantages and disadvantages to using one set or another.

First we need to understand that we will have perfect reconstruction no matter what the filter length is. However, longer filters provide smoother, smaller intermediate results. Thus, if intermediate processing is required, we are less likely to lose information due to necessary threshold or saturation. However, longer filters obviously involve more processing.

4.1.4 Wavelets and Perfect Reconstruction Filter Banks:

Filter banks decompose the signal into high- and low-frequency components. The low-frequency component usually contains most of the frequency of the signal. This is called the approximation. The high-frequency component contains the details of the signal.

Wavelet decomposition can be implemented using a two-channel filter bank. Two-channel filter banks are discussed in this section briefly. The main idea is that perfect reconstruction filter banks implement series expansions of discrete-time signals.

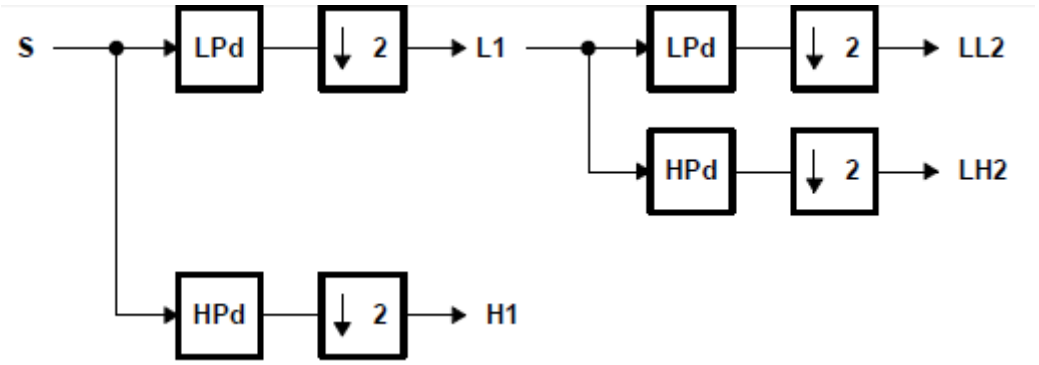

Figure 2. Two level wavelet decomposition

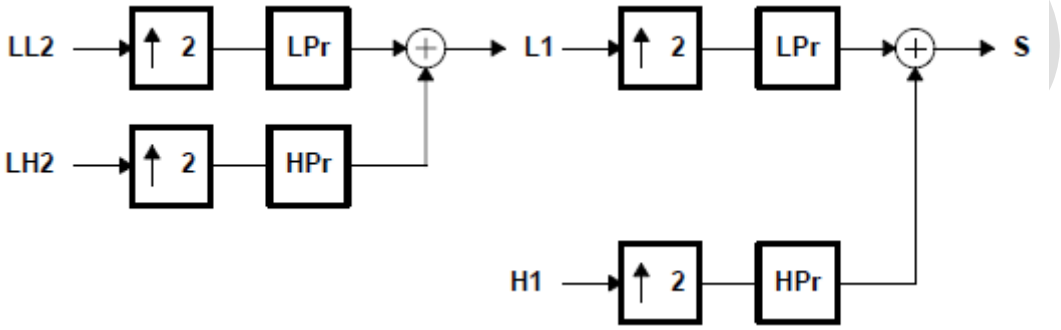

Figure 3. Two level wavelet reconstruction

The input and the reconstruction are identical; this is called perfect reconstruction. Two popular decomposition structures are pyramid and wavelet packet. The first one decomposes only the approximation (low-frequency component) part while the second one decomposes both the approximation and the detail (high-frequency component).

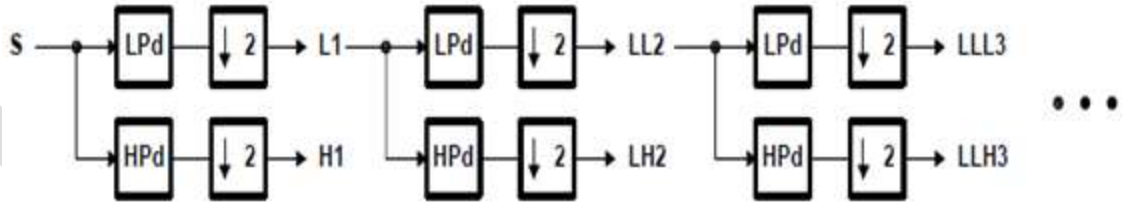

Figure 4. Pyramid packet

Wavelet denoising is considered a non-parametric method. Thus, it is distinct from parametric methods in which parameters must be estimated for a particular model that must be assumed a priori.

$X(t) = S(t) + N(t)$

Assume that the observed data contains the true signal S(t) with additive noise N(t) as Functions in time t to be sampled. Let $W(\cdot)$ and $W^{-1}(\cdot)$ denote the forward and inverse wavelet transform operators. Let $D(\cdot,\lambda)$ denote the denoising operator with soft threshold λ. We intend to wavelet denoised X(t) in order to recover $\hat{S}(t)$ as an estimate of S(t).

Threshold Detection

The threshold will be selected for shrinking high frequency subband coefficients to remove the noise.

The wavelet threshold will be determined by bayesian shrinkage method and it is given by,

sigmax = sqrt(max(sigma-sigmahat.^2))

Where,

sigma = sum(Coeff.^2)./L ; L = Number of coefficient.

sigmahat = Med(abs(C(var:length(C))))/0.6745

Where,

var=length(C)-S(size(S,1)-1,1)2+1
C - Coefficient Matrix,
S – approximation and detailed coefficient details

Finally , the threshold is based on,

T = max(abs(X)) if sigmax = 0
T = sigmahat.^2 /sigmax is sigmax ~= 0

The threshold is calculated based on the sigmax value and then soft thresholding is used for noise removal.

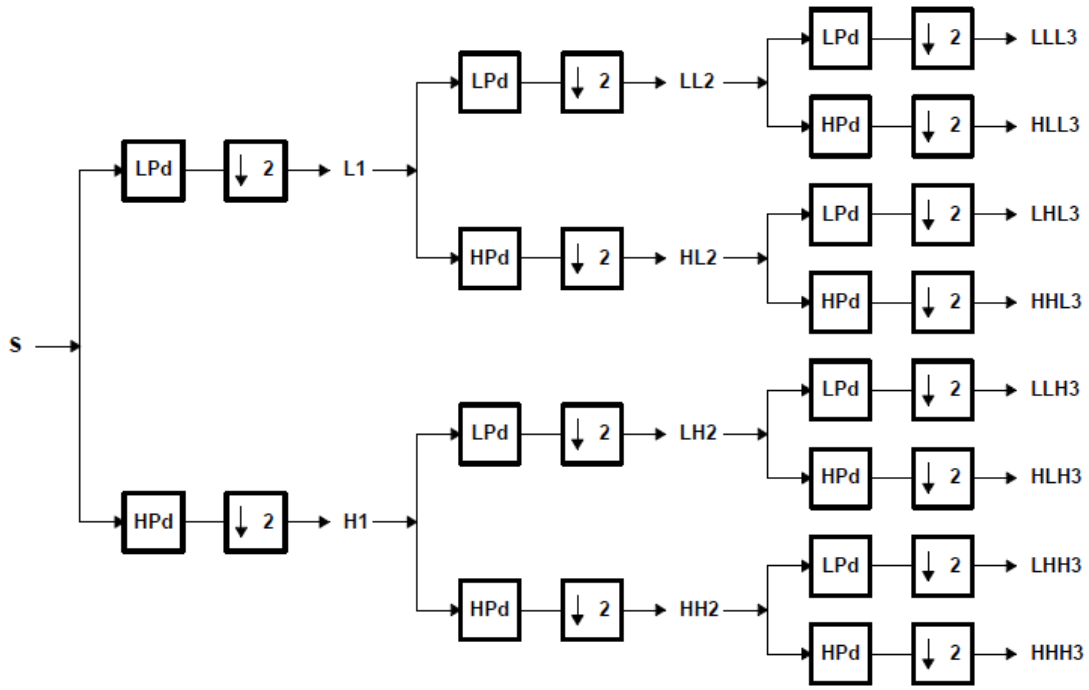

Figure 8 . Wavelet Packet Decomposition

BLOCK DIAGRAM

The proposed system consists of following steps:

1.INPUT SIGNAL:

Input signal is applied to the system which is in .wav format from the database of the system.Input signal is any sample of noisy speech signal which is stored by.wav file.

2. PREPROCESSING:

In preprocessing of audio signals start with pre-emphasis refers to a system process designed to increase the magnitude of some frequencies with respect to the magnitude of other frequencies in order to improve the overall signal-to-noise ratio by minimizing the adverse effects of such phenomena as attenuation distortion or saturation of recording media in subsequent parts of the system. The mirror operation is called de-emphasis, and the system as a whole is called emphasis.

Pre-emphasis is achieved with a pre-emphasis network which is essentially a calibrated filter. This network composed of two resistors and one capacitor. The frequency response is decided by special time constants. The cutoff frequency can be calculated from that value.

Pre-emphasis is commonly used in telecommunications, digital audio recording, record cutting, in FM broadcasting transmissions, and in displaying the spectrograms of speech signals.

De-emphasis is the complement of pre-emphasis, in the anti noise system called emphasis. Emphasis is a system process designed to decrease, (within a band of frequencies), the magnitude of some (usually higher) frequencies with respect to the magnitude of other (usually lower) frequencies in order to improve the overall signal-to-noise ratio by minimizing the adverse effects of such phenomena as attenuation differences or saturation of recording media in subsequent parts of the system.

3.SIGNAL SEGMENTATION:

The signal samples are segmented into fixed number of frames and each frame samples are evaluated with hamming window coefficients.

The total frames are calculated by,

Fn = (Ls – Ns)/ (Ns*Sp) +1

Where, Ls = length of signal, Ns = Length of each frame

Sp = Shift Percentage

Finally the samples of each frames are separated from input signal using Fn and Sp and its scaled by the hamming window coefficients.

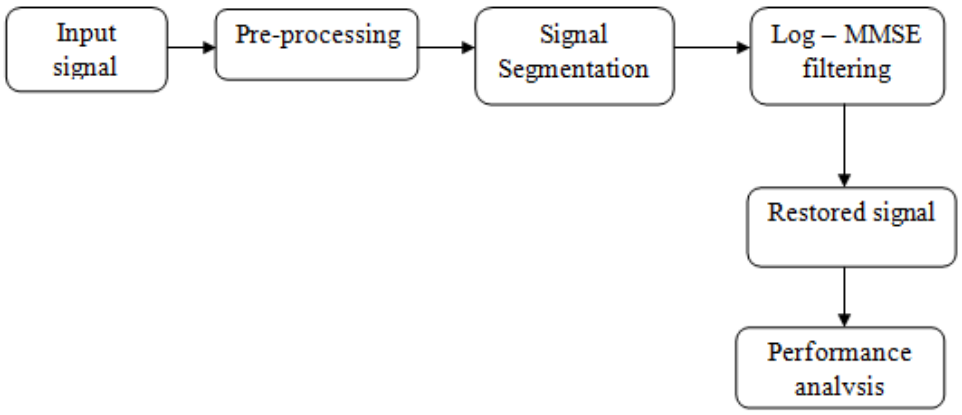

Figure 9. Block Diagram

4. LOG-MMSE FILTERING:

The problem is discussed in more generality than in many other expositions specifically we allow for general filter delays (to accommodate the pitch filtering problem, for instance) and cover both the stochastic case and block-based analyses with a single formalism. For mean-square error computations, we will only need to use at most second order statistical properties (correlations and means). For the case of stochastic signals, these notes look at the derivation of the correlation values required for a minimum mean-square error solution. We also examine systems which involve cyclo stationary signals (interpolation filter, for instance).

The important linear prediction problem is examined in detail. This includes the setup for non-equally spaced delay values. For the equally spaced delay case, we can develop a rich set of results. For the least-squares problem, these notes give a generalized view of windowing: windowing the data and/or windowing the error. This view subsumes the traditional special cases, viz the auto correlation and covariance methods. These notes present a number of examples based on "real" signals. With the background developed, the results are obtained with relatively straightforward MATLAB scripts. The results illustrate the useful insights that can be obtained when minimum mean-square error theory is appropriately fleshed out.

After the signal segmentation, the magnitude and phase spectrum from noisy signal are computed by applying fast fourier transform. The magnitude of noisy signal spectrum are further utilized for filtering process and signal phase kept same.

The restored signal magnitude spectra is obtained by,

Rs = G .* Y

Where, G – Log spectral amplitude Gain function

Y – magnitude response of noisy signal

The log spectral gain function is defined by,

G = x./(1+x) exp(eint (v))

Where, v = x./(1+x) * r

x and r– priori and posteriori signal to noise ratio

eint – exponential integral

The posteriori snr is defined by, r = (Y.^2)/ lamda

lamda = E[(Y).^2]

Where, lamda - noise power spectrum variance

E – Mean value

Complex spectrogram obtained by Filtered magnitude spectrum is combined with noisy signal phase spectrum. The restored signal is reconstructed by applying inverse fast fourier transform to this complex spectrogram.The performance of filtering is measured with SNR evaluation and it is defined by,

SNR = 10log10(Msig^2./(sum((inp - output).^2)./Ls))

Where, Msig = Maximum amplitude of signal

inp, output = Noisy input signal and restored output

5.PERFORMANCE ANALYSIS:

The performance of log spectral filtering will be measured based on,

Correlation

Perceptual Evaluation of Speech Quality

Log Likelihood ratio

Correlation Coefficient: It is used to find the similarity between two different speech signals. It will be described by,

```
Cor_coef = [sum(sum(u1.*u2))] /
           [sqrt(sum(sum(u1.*u1))*sum(sum(u2.*u2)))];
```

Where, u1 = F1 – mean of F1, u2 = F2 – mean of F2

F1 – Original signal and F2 – Restored signal

PESQ: Perceptual evaluation of speech quality predicts with high correlation subjective mean opinion score listening tests and it is computed by,

PESQ = 4.5 – 0.1Dind – 0.0309Aind

Where, Dind and Aind are known as the average disturbance and the average asymmetrical disturbance values.

LLR: Log likelihood ratio expresses that how many times more likely the data are under one model than the other and is the ratio of the likelihood function varying the parameters over two different sets.

EXPERIMENTAL RESULTS

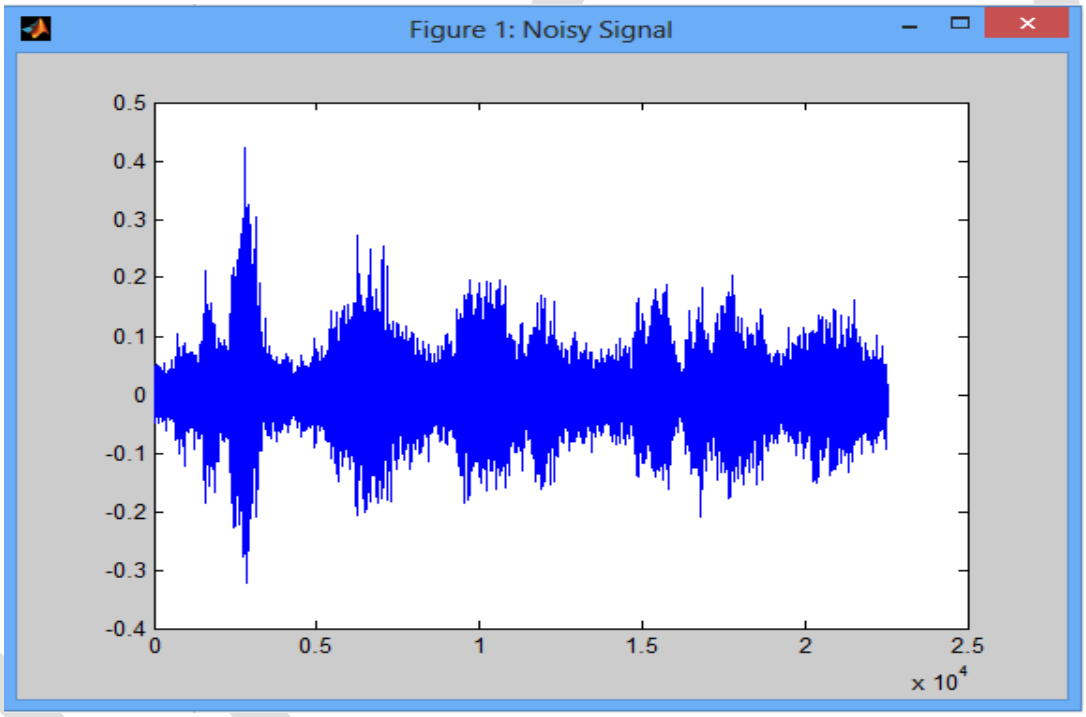

Figure 10. Noisy signal

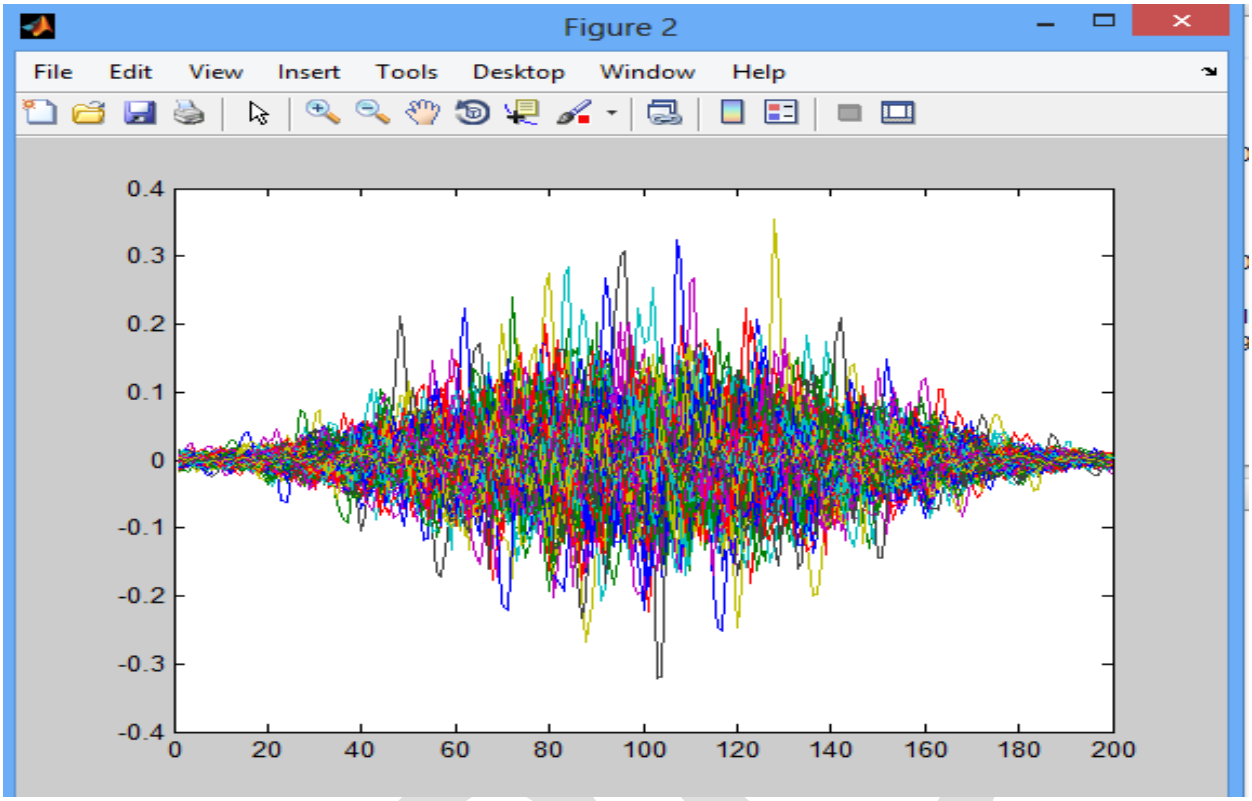

Figure 11. Segmented signal

1. Select any input signal:input signal is any sample of noisy speech signal which is stored by.wav file.
Given specifications of input signal:
Sample frequency:Fs=8000Hz,
Number of Samples:Ns=200,
Length of Input signal:Ls=22529 samples.

2. Create symmetric Hamming window in a column vector.
The Hamming window coefficients are expressed as:

$$w[n] = 0.54 - 0.46(1 - \cos(\frac{2\Pi n}{N-1}); 0 \le n \le N-1$$

N=Ns=Number of samples,
Wcoefficients={1,2,.....upto 200}
Wcoefficients values={.0800,.0802,.809,.....,.0800}.

3. Signal segmenting into Frame:
The total number of frames are calculated by,

Nframes = (Ls – Ns)/ (Ns*Sp) +1

Where, Ls = length of signal, Ns = Length of each frame

Sp = Shift Percentage=0.4

Nframes = {(22529 – 200)/ (200*0.4)} +1
Nframes =280.11

CONCLUSION

The paper present that an enhancement of the speech signal by removal of impulsive disturbance based on log spectral gain filtering approach. Here, Mean-Square Error Log-Spectral Amplitude is used to minimize the mean-square error of the log-spectra, is obtained as a weighted geometric mean of the gains associated with the speech signal effectively. It provide that better results in terms of performance parameters, processing time and speech signal quality rather than prior methods. This system will be enhanced with a modified filtering method to restore signals with better accuracy rather than Log spectra.

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Fuzzy Logic Based Vehicle Edge Detection Using Trapezoidal and Triangular Member Function

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Abstract—Edge detection is considered to be fundamental step in the field of image processing and computer vision. There are 3 types of discontinuities in a digital image: point, line, edge. The most common way is to use spatial masks which have properties to detect these discontinuities .More than isolated points and lines detecting edges are important because they form an important part of image segmentation. Edge detection is basically a method of segmenting an image into regions based on discontinuity, enhancing the presence of these discontinuities in the image allows us to improve the perceived image quality under certain conditions. Edge detection makes use of differential operators to detect changes in the gradients of the grey or color levels in the image. Edge detection is divided into two main categories: first-order edge detection, example for first order edge detection are Sobel, Robert, Perwitt and second-order edge detection, example for second order edge detection are Laplacian and Canny. Image edge is often buried by noise, so it's necessary to research edge detection algorithm. Since traditional edge detection like Sobel, Perwitt, Robert operator are sensitive noise, to overcome that problem, some new algorithm is applied in edge detection such as Canny, Morphology, Neural network and Fuzzy logic. This paper presents the implementation in MATLAB, of a simple, very flexible and efficient fuzzy logic based algorithm to detect the edges of vehicle in an input image by scanning it through the 2*2 mask. Fuzzy logic is one of the new methods and it was based on set theory. The main benefit of fuzzy set theory is the able to model the ambiguity and the uncertainty. In the proposed method trapezoidal and triangular membership function of mamdani type FIS is used for four inputs containing two fuzzy set and one output containing one fuzzy set. The 2*2 masks is slide over entire vehicle image, and then pixels values of masks are examined through various ten rules which are defined in FIS rule editor. Based on these set of rules the output of fuzzy is decided that particular pixel is edge or not. For getting better results Gaussian filtering is used. Experimental result shows the ability of the proposed method in finding the thin edges of vehicle image.

Keywords— Edge, Edge detection operators, Fuzzy logic

INTRODUCTION

Edge detection is a well developed field on its own within image processing. Edge is the important characteristic of image. Edges come in an image because of variation of the discontinuities of the scene features, usually brightness, and give rise to edges. In other words, edges are representation of the discontinuities of the scene intensity function. There could be various reasons such as type of materials, surface texture, lighting conditions, which play important role in forming these discontinuities. An edge is a set of connected pixels that form a boundary between two disjoint regions. Edge can be described based on edge strength, edge direction and edge position. And different types of edges are step edge, ramp edge, roof edge, ridge edge. The quality of edge detection can be measured from several criteria. The five criteria for edge detection are: Good detection, Noise sensitivity, Good localization, Orientation Sensitivity, Speed and efficiency. Edge detection aims to mark sharp intensity changes in an image and is a basis for a large number of image analysis and machine vision applications. Many edge detection techniques have been developed for extracting edges from digital images, each designed to be sensitive to certain type of edges. There are two different edge detection operators: first order edge detection or gradient based classical operators as their names suggest, first order edge detection is based on the use of first-order image derivatives, example for first order edge detection operator are Robert, Prewitt, Sobel operator and second order edge detection or Laplacian based operators is based on the use of second-order image derivatives example for second order edge detection operator are canny detection. Nowadays fuzzy techniques plays main role in image processing and in its applications. It seems that fuzzy approaches produce more efficient results than existing techniques.

Edge detection techniques:

Traditional edge detection methods employ small convolution masks to approximate either the first derivative or the second derivative of an image; for example, Roberts filter, Sobel filter, Prewitt filter, and Laplacian filter [7]. They focus on the edge enhancement part of edge detection, with none or very little smoothing. A threshold is then applied to the output of these filters to identify the edge points. These filters, though easy to implement and generally with the advantage of speed over later edge detectors, provide very little control over smoothing and edge localization, by which noise is reduced. Therefore, these filters are very noise-sensitive.

The **Robert operator** is the gradient operator. The simple 2*2 Robert operators were one of the earliest methods used to detect edges. It responds maximally to edges running at ±45º to the edge pixel grid. The advantage of Robert operator is its simplicity and its disadvantage is that it is very sensitive to noise because of its small kernel and inaccurate. It is not compatible with today's technology.

The **Sobel operator** is also gradient operator. It uses 3*3convolution mask for estimating gradient in X and Y direction. The Sobel operator responds maximally to edges running in vertical or horizontal direction to the pixel grid. The advantage of using Sobel operator is computationally cheap and disadvantage is that edge detection is poor in the presence of noise. Sobel operator detects the noisy area as edge.

The **Prewitt operator** is same as Sobel operator. It uses 3*3 convolution masks to detect edges in X and Y direction. The advantage of using Prewitt operator is its robustness in finding edges. It is only suitable for well-contrasted noiseless images.

The **second order or Laplacian method** searches for zero crossing in the second derivative of the image to find edges. In general, first-order edge operators are not commonly used as a means of image enhancement. Rather, their main use is in image segmentation procedures. A much more common means of image enhancement is through the use of a second-order derivative operator: - the Laplacian. Laplacian edge detection is a very popular second-order derivative operator. This can easily be implemented in a 3*3 kernel filter. The most well known conventional methods like Laplacian edge detection and canny operators are belong to second order based edge detection.

Another example for second order edge detection is **canny edge detection [6][8].** Although research into reliable edge-detection algorithms continues, the canny method is generally acknowledged as the best 'all-round' edge detection method developed to date**.** The disadvantages with first order edge detection technique are sensitive to noise and directional can be solved by canny edge detection for some extent. Even though it gives better performance it still suffers from detecting weak edge along with strong edge.

The following are **disadvantages of first and second order edge detection technique:** The first order and second order edge detection like Robert , Sobel operators are Directional, Sensitive to noise, because many small local maxima will be generated by noise and Corners are often missed due to the smallness of 1D gradient at the corners. The magnitude of lapalcian operator produces double edges, an undesirable effect because complicates image segmentation. Lapalcian method is unable to detect edge directions. Canny edge detection is sensitive to weak edges and complex process. Having small kernel is highly sensitive to noise.

RELATED WORK

There are lot of works are being carried out on edge detection techniques. This section reviews the few of the related works to this paper.

Mrs.Abhradita Deepak Borkar et al [1] proposed a technique to detect the edges of images by using fuzzy logic in MATLAB environment without determining threshold value. In this paper , developed fuzzy inference system with nine input pixel containing two fuzzy sets one for white and another for black range from [0 0 255] for black colour and range from [0 255 255] for white colour pixel and one output pixel containing three fuzzy sets first for white second for black and third for edge range from [0 20 40 60] for black color and range from [100 120 140 160] for edge value and range from [195 215 235 255] for white color of the output pixel . In this paper 33 if then rules are set for various conditions that can occur. They concluded that the Fuzzy inference system developed is successfully which can detect edges of images for fuzzy set and apply defuzzification of the output generated by fuzzy inference system.

E. Boopathi Kumar et al [2] proposed a fuzzy logic based edge detection using trapezoidal membership function of mamdani type FIS to get effective results. In this paper they make use of 2*2 masks with 16 rules to detect edges and they concluded that the results of trapezoidal membership function are better than ones that have been found out by triangular edge detection method.

Shikha Bharti [3] proposed a novel edge detection algorithm based on fuzzy inference system. The proposed approach uses a 3x3 sliding window with eight inputs and the center pixel as the output, and then the pixel values of window are subjected to various fuzzy rules designed. Based on these set of rules the output of fuzzy is decided whether that particular pixel is an edge or not .Moreover the developed algorithm is compared with sobel ,prewitt etc to find the respective mean square error and peak signal to noise ratio of images containing noise.

Nanjesh B.R et al [4] proposed a implementation of edge detection algorithm that uses fuzzy logic. In this paper they use the median filtering to remove the Pepper noise or black dots present over the image. This results in blurring effect of the image. When this smoothened or blurred image is given as an input to the fuzzy logic based edge detection method, the resultant edge detected image will not be clear due to blurring effect in input image. Instead of giving the blurred image directly to the fuzzy logic based edge detection module as an input, increase the quality of blurred, noise removed image (image enhancement) by using Gaussian high pass filtering method. Finally they concluded that the results of fuzzy logic based edge detection can be optimized by using Gaussian high pass filtering.

Madhavi Arora et al [5] proposed the way to overcome traffic problems in large cities through the development of an intelligent traffic control system which is based on the measurement of traffic density on the road. They presented techniques with which this problem of traffic is solved. They also discussed the morphological edge detection for detecting vehicle edges that helps in finding traffic density and fuzzy logic technique to solve this problem and comparison between two techniques is presented.

Ritesh Vyas et al [9] proposed a method based on fuzzy logic for edge detection in digital images without examining threshold value. The proposed approach uses 2*2 masks for segmenting the image into regions. The edge pixels are mapped to a range of values distinct from each other.

Er Kiranpreet Kaur et al [10] proposed a efficient fuzzy logic based algorithm to detect the edges of an input image by scanning it throughout using a 2*2 pixel window. The proposed FIS has four inputs, which corresponds to four pixels of instantaneous scanning matrix, one output that tells whether the pixel under consideration is “black”, “white” or “edge” pixel. Sixteen rules are defined, which classify the target pixel. To reduce noise, the noise removal algorithm has been implemented at different levels of processing. The proposed method make use of smallest mask i.e. 2*2 mask. The results of proposed method are compared with ‘Canny’, ‘Sobel’, ‘and Prewitt’ and ‘Roberts’ edge detection operators.

Suryakant et al [11] proposed the implementation of a very simple but efficient fuzzy logic based algorithm to detect the edges of an image without determining the threshold value. The proposed approach begins by scanning the images using floating 3x3 pixel window. Fuzzy inference system designed has 8 inputs, which corresponds to 8 pixels of instantaneous scanning matrix, one output that tells whether the pixel under consideration is “black”, “white” or “edge” pixel. Rule base comprises of sixteen rules, which classify the target pixel. The proposed method results for different captured images are compared to those obtained with the linear Sobel operator.

Bijuphukan Bhagabati et al [12] proposed a very simple but novel method for edge detection without determining threshold value. The technique uses the smallest possible 2*2 mask that slides over the whole image pixel by pixel. This fuzzy inference system highlights edge pixels using fuzzy rules. It has 4 inputs corresponding to 4 pixels of instantaneous scanning matrix and has one output identifying the pixel under consideration whether it is “edge” pixel. The rule base includes only ten fuzzy rules to classify the pixels. The results obtained by this method are compared with those of the existing standard algorithms and comparatively found better results.

This paper presents fuzzy logic based edge detection for detecting vehicle edges in day time. Fuzzy inference system is developed with four input containing two fuzzy sets one for white and another for black and one output pixel containing one fuzzy sets for edge and 10 if then rules are set for various conditions that can occur. For better optimization of results obtained by fuzzy logic, Gaussian high pass filtering is used.

FUZZY LOGIC

Fuzzy logic is one of the new methods introduced in 1960 by Lutfi Zadeh at University of California. Fuzzy logic provides a simple way to arrive at a definite conclusion based upon vague, ambiguous, imprecise, noisy, or missing input information. Fuzzy logic is a mathematical representation of human concept formulation and reasoning. Fuzzy logic is a widely used tool in image processing since it gives very efficient result. It can be implemented in hardware, software, or a combination of both. Fuzzy reasoning is nothing else than a straightforward formalism for encoding human knowledge or common sense in a numerical framework. Fuzzy Logic has been applied to problems that are either difficult to face mathematically or applications where the use of Fuzzy Logic provides improved performance and/or simpler implementations. At present, the application of Fuzzy Logic exceeds the control domain since it is also

employed for other knowledge based decision making tasks. It involves medical diagnosis, business forecasting, traffic control, network management, image processing, signal processing, computer vision, geology and many more.

SYSTEM DESIGN

The following block diagram [figure 1] shows the methodology of fuzzy logic based edge detection. First the color vehicles image is given as input and converted to gray scale image than for getting better results and to highlight edges Gaussian filtering is applied for gray scale image, since the Fuzzy Logic Toolbox software operates on double-precision numbers so, filtered image, is converted to a double array next is the main step that is fuzzy logic based edge detection to detect vehicle edges .The fuzzy logic edge detection can performed by using FIS ,the block diagram of FIS is shown in figure 2.

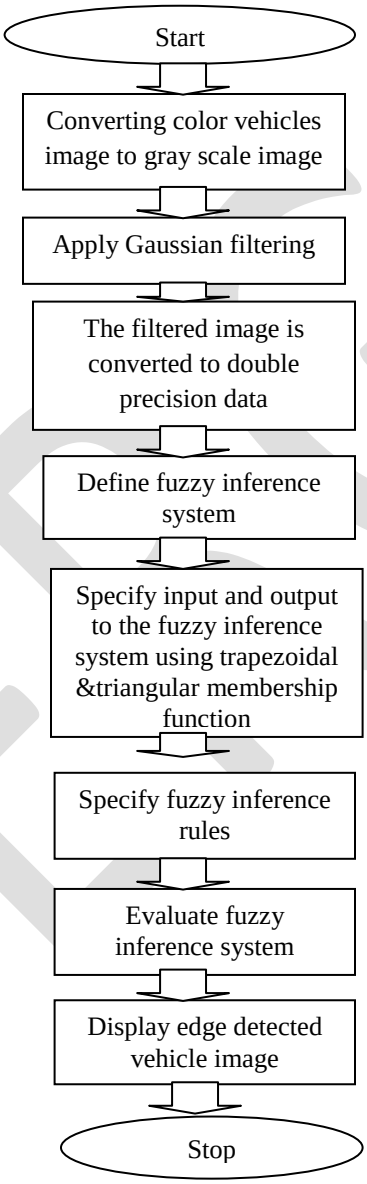

Figure1. Steps involved in fuzzy logic based edge detection

Gaussian filtering:

Edges and fine detail in images are associated with high frequency components. High pass filters – only pass the high frequencies, drop the low ones. High pass frequencies are precisely the reverse of low pass filters.

The Gaussian high pass filter is given as: $H(u,v) = 1 - e^{-D^2(u,v)/2D_0^2}$ where D_0 is the cut off distance.

FUZZY INFERENCE SYSTEM

Fuzzy inference is the procedure of transmitting a given input value to an output based on fuzzy inference rules. The fuzzy inference operation involves membership functions, fuzzy logic operators, and fuzzy inference if-then rules. There are two types of FIS: Mamdani type and Sugeno type. Mamdani's fuzzy inference scheme is a more compact and computationally efficient representation of fuzzy approach and it expects the output membership functions to be fuzzy sets. The output membership functions are either linear or constant in which any inference system can be used to Sugeno-type systems.

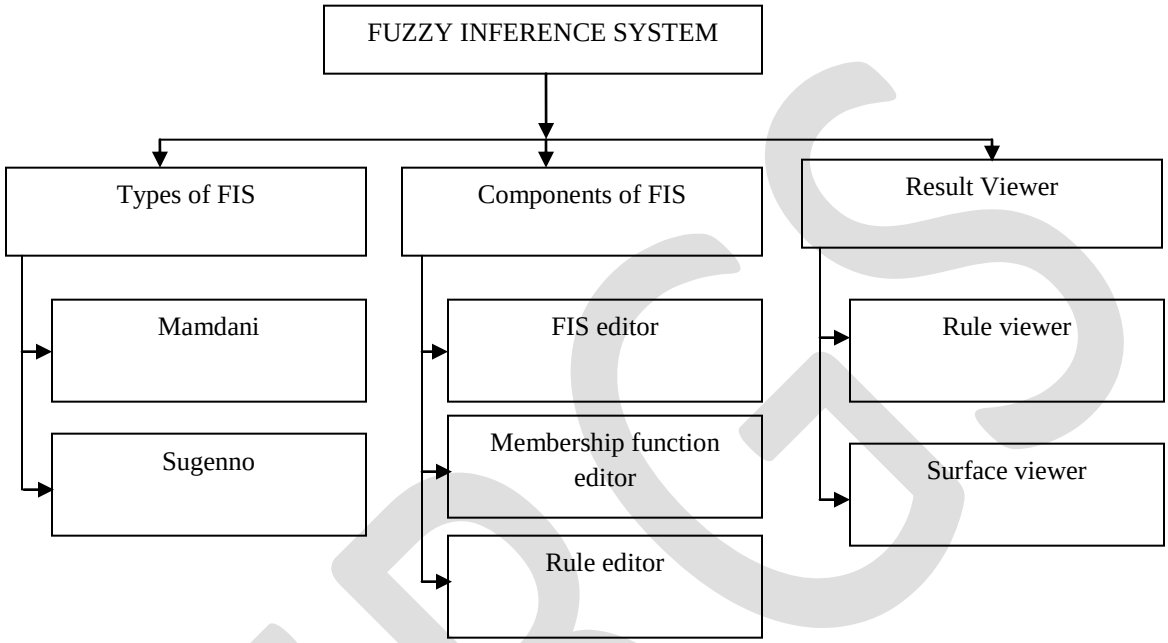

Figure2. Block diagram of fuzzy inference system

The block diagram of FIS is discussed below.

FIS Editor:

The FIS Editor which allows us to provide number of input and output variables and their names, there's a simple diagram [figure 4] that shows the FIS editor. FIS editor it displays name of each input and output variable. It also displays the type of FIS used. There are two types of FIS i.e. mamdani and sugeno, the proposed method uses mamdani type FIS. FIS editor also includes some pop-up menus which helps in modifying the inference operation. That is Applying Fuzzy Operators: After inputs have been fuzzified, if the antecedent of a rule has more than one part, the fuzzy AND method is set to MIN and OR method is set to MAX is applied to obtain the result. Applying Implication Method :Implication method is the process of determining the output of each fuzzy rule's consequent that is it is set to MIN. Aggregating All Outputs: All defined rules are aggregated by using MAX operator. Defuzzifying: It is desirous that the output is a single number, so the output fuzzy set of aggregation process is converted into a single number using the centroid method.

Membership function editor:

The shape of membership function associated with all variables can be defined by using membership editor. The Membership Function Editor lets you display and edit all of the membership functions associated with all of the input and output variables for the entire fuzzy inference system. There are 11 different shapes of membership functions; Triangular, Trapezoidal, Piecewise-linear, Gaussian, Generalized bell-shaped, Sigmoidal, etc. The sample trapezoidal and triangular membership functions in figure 5.

Rule editor:

The rule editor is used for editing list of rules that defines the behavior of the system. The proposed system is implemented using 10 if-then rules; table 1 shows the possible if-then rules for four pixels of 2*2 masks. Example **If p1 is black AND If p2 is black AND If p3 is black AND If p4 is white Then p4 is edge.** The if part of the rule is called "premise" while then part of the rule is called "conclusion".

Rule viewer and surface viewer:

Rule viewer is used to view the fuzzy inference diagram. The Rule Viewer allows you to interpret the entire fuzzy inference process at once. The Rule Viewer also shows how the shape of certain membership functions influences the overall result.
Surface viewer to view the dependency of one of the outputs on any one or two of the inputs i.e it generates and plots an output surface map for the system. The Surface Viewer has a special capability that is very helpful in cases with two (or more) inputs and one output.

Each fuzzy logic system can be divided into three elements [Figure 3]: fuzzification, define membership function or inference operation and defuzzification.

Fuzzification: Fuzzy logic system input data are most often crisp values. During fuzzification crisp inputs are translated into the fuzzy domain through membership functions. Each crisp value is assigned a membership value to a fuzzy concept as defined by the membership functions. The fuzzifier decides the degrees of membership from the crisp inputs.

Fuzzy set: A fuzzy set is represented by a membership function which expresses the degree that an element of the universal set belongs to the fuzzy set: larger values denote higher degrees of membership, smaller values indicate lower degrees of membership. The most commonly used range of values of membership functions is the unit interval [0,1].

Inference operation or define membership function: The resulting fuzzy values after fuzzification are then entered into the fuzzy inference engine. Fuzzy inference is based on a fuzzy rule base which contains a set of If-then fuzzy rules and different types of membership functions. Fuzzy if-then rules will combine and manipulate the input variables to produce one or more fuzzy outputs. The membership function is a graphical representation of the magnitude of participating of each input. There are 11 different shapes of membership functions are available in fuzzy inference system; Triangular, Trapezoidal, Piecewise-linear, Gaussian, Generalized bell-shaped, Sigmoidal, etc.

Defuzzification: This is the process of calculating single-output numerical value for a fuzzy output variable on the basis of the inferred resulting membership function for this variable. The input in the defuzzification process is a fuzzy number and the output is a crisp number. Membership functions are used to map fuzzy consequences back to the crisp domain. There are five defuzzification methods: Centroid , Bisector , Middle of Maximum ,Smallest of Maximum, Largest of Maximum .

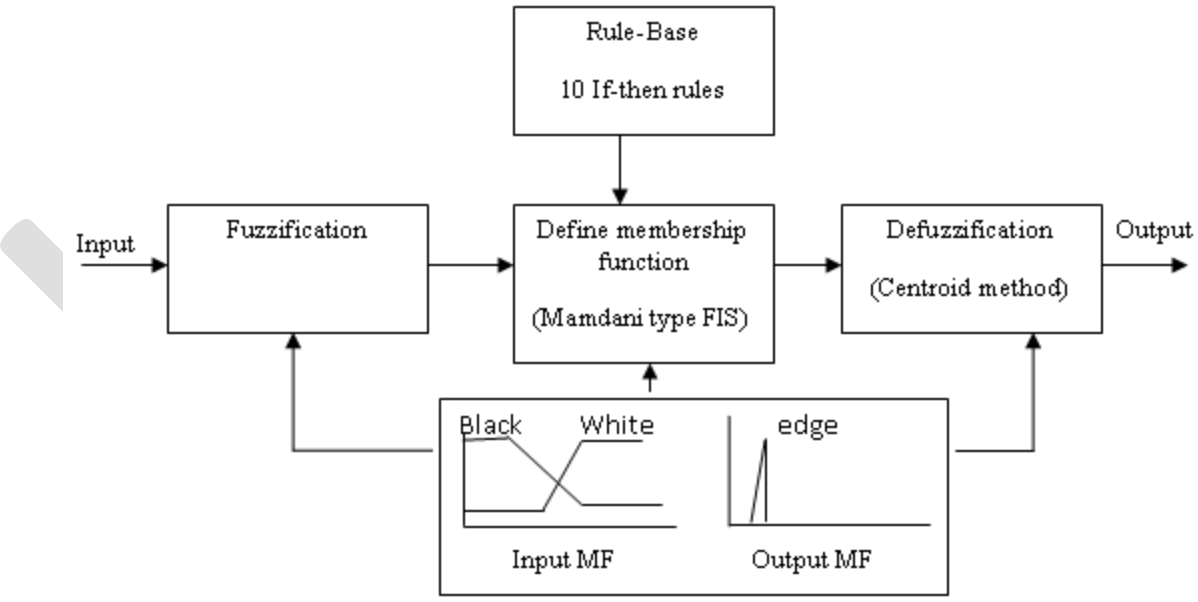

Figure 3. Steps involved in fuzzy image processing

The proposed approach is concerned with the development of a fuzzy logic algorithm for the detection of vehicle edges. Here mamdani type fuzzy inference system is adopted to detect the vehicle edge. The algorithm detects edges of an input image by using a window mask of size 2*2 .The 2*2 mask is slid over an entire input image and process continues till the whole image is scanned. In the proposed system four inputs with two fuzzy set and one output with one fuzzy set is given to FIS is shown in below figure 4. The four inputs are the four pixels of the 2*2 mask window [p1 p2 p3 p4]. Here pixel values of image are used as fuzzy set. Two fuzzy sets are used for input – black and white and one fuzzy set are used for output –edge.

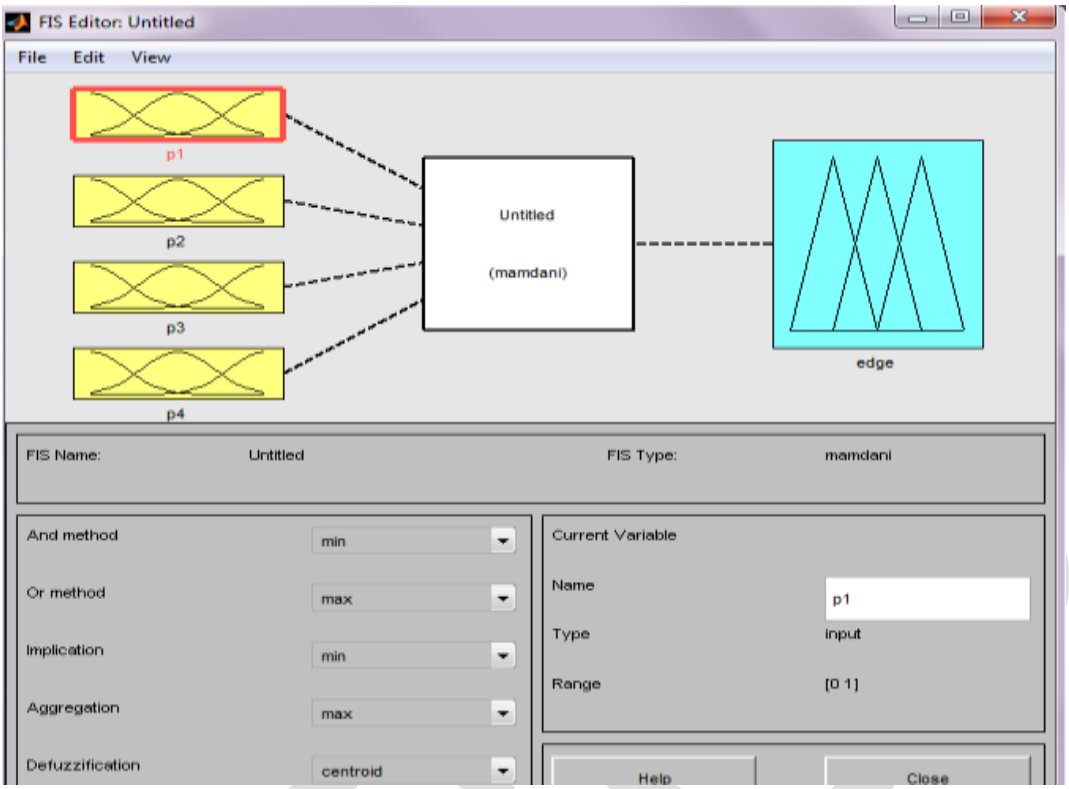

Figure 4. FIS editor

Membership function is a curve that defines how each point in the input space is mapped to a degree of membership between 0 and 1. Fuzzy sets are created to represent each variables intensities and elements of fuzzy set exposes membership values between 0 and 1 , these set are associated with linguistic variables “black” and “white” for input and “edge” for output in the membership function. The degree of which an element belongs to given set is called grade of membership. Based on membership grade, input variables check the pixels of the image which is black ,white or edge and output are fetched based on the rules. Here trapezoidal membership function is adopted for 4 inputs p1 p2 p3 p4 and triangular membership function for one output which is shown in below figure 5 . The functions adopted to implement the AND and OR operations are the MIN and MAX functions respectively.

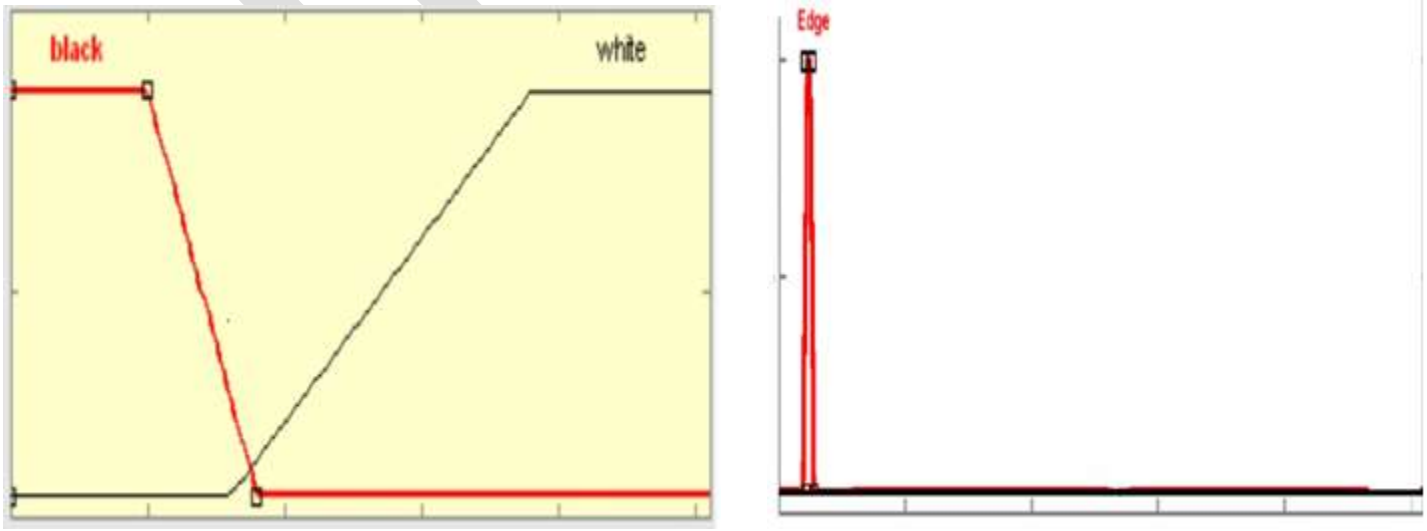

Figure 5. Sample of trapezoidal MF based input with triangular MF based output

The inference rules depend on the weights of the 3 neighbor in the 2*2 mask i.e p1 p2 p3 ad p4 itself, if the neighbor’s weights are degree of blacks or degree of whites. The defined rules are combined using AND operator in rule editor .The powerful of these rules is the ability to extract all edges in the processed image directly. The condition of each pixel is decided by using the 2*2 mask which can

be scanning the all grays. In this paper 10 if then rules are set for various conditions that can occur. B=black value of pixel, W=white value of pixel, E=edge output.

Fuzzy inputs				Fuzzy output
P1	P2	P3	P4	Edge
B	B	B	W	E
B	B	W	B	E
B	B	W	W	E
B	W	B	B	E
B	W	B	W	E
B	W	W	B	E
W	B	B	W	E
W	B	W	B	E
W	W	B	B	E
W	W	W	B	E

Table 1. 10 If- then rules

The Mamdani method is chosen as the defuzzification procedure. During defuzzification the output of all rules are combined into a single fuzzy set by aggregating them with the OR operation. As mentioned earlier there are so many methods for defuzzification in this paper defuzzification operation is performed by calculating centroid in order to get single crisp value from the aggregated fuzzy output set.

EXPERIMENTAL RESULTS

In this paper fuzzy logic based edge detection is mainly used to detect vehicle edges which are a standing at traffic light. In MATLAB environment the fuzzy inference system can be read by using readfis( ) function and Output is evaluated by using evalfis function. The proposed method has been applied in MATLAB environment on the image of "original image " in Figure 7, "Gaussian filtered image" in Figure 8 and "fuzzy logic without filtering" in Figure 9 and "fuzzy logic with filtering" in Figure 10 . It can be seen from the results that the proposed method fuzzy logic based edge detection is able to find out thin, clear edges with Gaussian filtering

Figure7. Original image

Figure 8. Gaussian filtered image

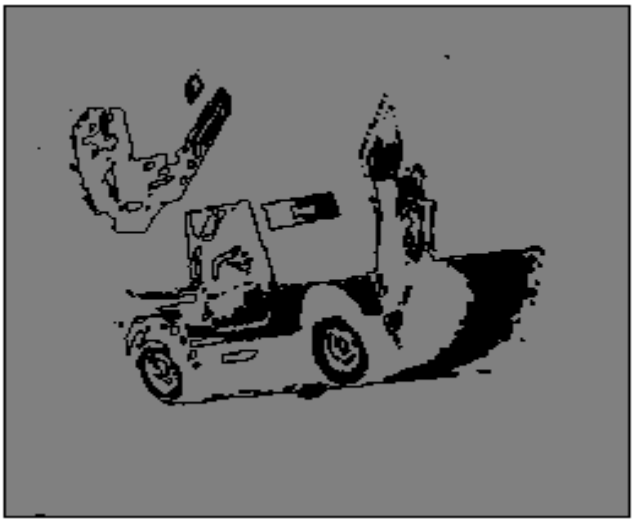

Figure9. Fuzzy logic without filtering

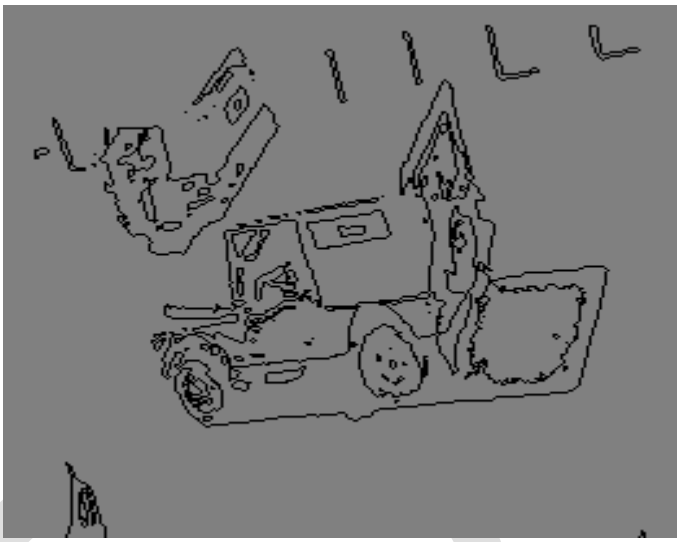

Figure 10. Fuzzy logic with filtering

CONCLUSION

Edge detection is well known research topic in image processing since it supports wide range of application. Edge detection can be performed by two techniques that are gradient based and Laplacian based edge detection, gradient based edge detection like Sobel, Robert, Perwitt operators are more sensitive to noise where as Laplacian based edge detection like canny edge detection is less sensitive to noise. Even though canny edge detection gives better performance it still suffers from detecting weak edge along with strong edges. The disadvantages of first order and second order edge detection can be overcome by using fuzzy logic based edge detection. This paper mainly discussed about fuzzy logic based edge detection for detection vehicle edges during day time using trapezoidal and triangular membership function. By observing results can conclude that fuzzy logic based edge detection are able to detect thin and clear vehicle edges with Gaussian filtering.

As future work, rather than using trapezoidal and triangular membership function can try different membership function. And Gaussian high pass filtering can be replaced by other filtering method for getting better result. The proposed method is implemented for detecting vehicle edges in day time, the same method can be used for detecting vehicle edges in night time with some proper filtering technique

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CONTROLLING THE TORQUE OF THREE PHASE INDUCTION MOTOR WITH GENETIC ALGORITHM

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Abstract— The induction motor, known for its robustness, relatively low cost, reliability and efficiency, is the vital part in many research works. The advancement in power semiconductor devices, digital data processing and control has led to great improvements in torque response control of AC motors. Direct Torque control principle has been used for Induction Motor (IM) drives with fast dynamics. DTC has been widely recognized for its fast and robust torque and flux control.
Novel approach of the Genetic algorithm scheme for direct torque control (DTC) of an Induction Motor (IM) AC drive is the recent area of research. To improve the performance of conventional DTC, artificial intelligence like neural networks, fuzzy[1][2] are implemented. Though DTC has high dynamic performance, it has few undesirable contents like high ripple in torque, output current and deviations in switching frequency of the inverter. The Z-source converter employs a unique impedance network to couple the converter main circuit to the power source. This provided unique features that cannot be obtained in the traditional voltage-source or current-source converters where a inductor and capacitor are used, respectively.

Keywords— Direct Torque control, Flux Control, Genetic Algorithm, Z-Source Inverter, Speed , Torque independent Control, Optimization.

INTRODUCTION

Direct torque control was presented by Manfred Depenbrock 1984. Today DTC uses hexagon flux path only when full voltage is required at high speeds. Despite its simplicity, DTC is able to produce very fast torque and flux control. Stator flux and torque can be controlled directly and independently by properly selecting the inverter switching.
DTC provides very quick response with simple control structure and hence, so this method is gaining popularity in industries. The use of GA methods in the determination of the different controller parameters is practical due to their fast convergence and reasonable accuracy. Genetic algorithm is recently getting increasing emphasis in soft computing applications in the recent days. Genetic Algorithm methods have been widely used in control applications. The GA methods have been employed successfully to solve complex optimization problems. This methodology for AC drive systems is intended for an efficient control of the torque and flux without changing the motor parameters. The Z-source converter overcomes the conceptual and theoretical barriers and limitations of the traditional voltage-source converter and current-source converter and provides a novel power conversion concept. A genetic algorithm is one of a class of algorithms that searches a solution space for the optimal solution to a problem. The population evolves for many generations; when the algorithm finishes the best solution is returned. Genetic algorithms are specially useful for problems where it is extremely difficult or impossible to get an exact solution or for difficult problems where an exact solution may not be required.

DIRECT TORQUE CONTROL

There are many different ways to drive an induction motor. The differences in those methods are the motor's performance and the viability and cost in its real implementation. The most popular method, vector control was introduced more than 25 years ago in Germany by Hasse, Blaske and Leonhard. Under a constant rotor flux amplitude there is a linear relationship between the control parameters and output torque[10]. Transforming Induction motor equations into field coordinates makes the FOC method resemble the decoupled torque production[5]. Over the years, FOC drives have achieved a high degree of maturity in a wide range of applications. Their innovative studies depart from the idea of coordinate transformation and the analogy with DC motor control. The researchers proposed a technique that relies on a decoupling control which is the characteristic of vector control. After the innovation of the DTC method it has gained much momentum. The basic concept behind the DTC of induction motor drive, is to control the electromagnetic torque and flux linkage directly and independently by the use of six or eight voltage space vectors found in lookup tables[7]. As it can be seen from, if the load angle, δ, is increases then

the torque error is also increases. To increase the load angle, δ, the flux of stator vector must rotate faster than rotor flux vector. In Fig .2. shows the Stator flux and rotor flux space vectors.

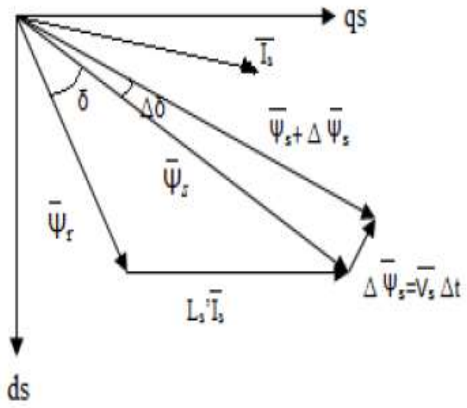

Fig. 1. Stator flux and rotor flux space vectors

$$\Delta T_e = \frac{3}{2}\frac{P}{2}\frac{Lm}{LrLs}\left|\Psi r\right|\left|\Psi s+\Delta\Psi\right|\sin\delta \qquad (1)$$

To achieve the above concept, accurate voltage vectors are applied to the terminal of motors. For counter-clockwise operation, if the actual torque is lesser than the reference value, then the voltage vectors that keep the stator flux vector, Ψ_S, rotating in the same direction are selected. When the load angle, δ, between Ψ_r and Ψ_S increases the actual torque increases as well[13].

GENETIC ALGORITHUM

In 1950, Alan Turing proposed a "learning machine" which would parallel the principles of evolution Computer simulation of evolution started as early as in 1954 with the work of Nils Aall Barricelli, who was using the computer at the Institute for Advanced Study in Princeton, New Jersey.Field of artificial intelligence, a Genetic Algorithm (GA) is a search that minimize the process of man-made selection. It is frequently used to generate useful solutions to optimization and search problems. It belong to the class of evolutionary algorithms (EA), which generate solutions to optimization problems using techniques inspired by natural evolution, similar as inheritance, mutation, selection, and crossover.

In a genetic algorithm, a population of candidate solutions. to an optimizing problem toward most accurate solutions. Each solution has a set of properties that can be mutated. The process usually begins from a population of randomly generated individuals of population, it is an iterative process, with the population in each iteration called a generation. In every generation, the fitness of solution in the population is evaluated; The fitness is usually the value of the objective function in the optimization problem being solved. The newly generated candidate solutions is then used in the next iteration of the algorithm.

The algorithm terminate when maximum number of generations has been produced, We consider how to determine the fitness of each individual. There is generally a differentiation between the ***fitness*** and ***evaluation*** functions. The evaluation function that returns an absolute measure of the individual. During each successive level of generation, a part of the existing population is selected to breed of a new level generation. Fitness based process is used in individual solution. Other methods rate only a random sample of the population, the olden processing methods are very time-consuming.

Z-SOURCE INVERTER

The input voltage, frequency and output voltage , and power handling capacity based on the design of the specific device. The power is provided by the DC source. Inverter can't produce power by itself. The Z-source converter employs a unique impedance network to couple the converter main circuit to the power source, This unique features cannot be obtained in the traditional voltage-source where a capacitor and inductor are used, respectively[4]. The unique feature of the Z-source inverter is that the output ac voltage can be any value between zero and infinity. That is, the Z-source inverter is a buck–boost inverter that has a wide range of obtainable voltage. The traditional V- source inverters cannot provide such feature. Fig .3. shows Generalized Z-Source Inverter.

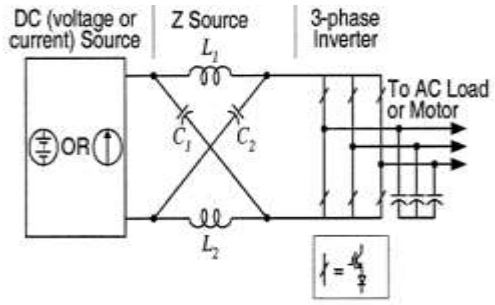

Fig . 2. Generalized Z-Source Inverter

The equivalent switching frequency viewed from the Z-source network is six times the switching frequency of the main inverter, which greatly reduces the required inductance of the Z-source network.

EXPERIMENT PRINCIPLE

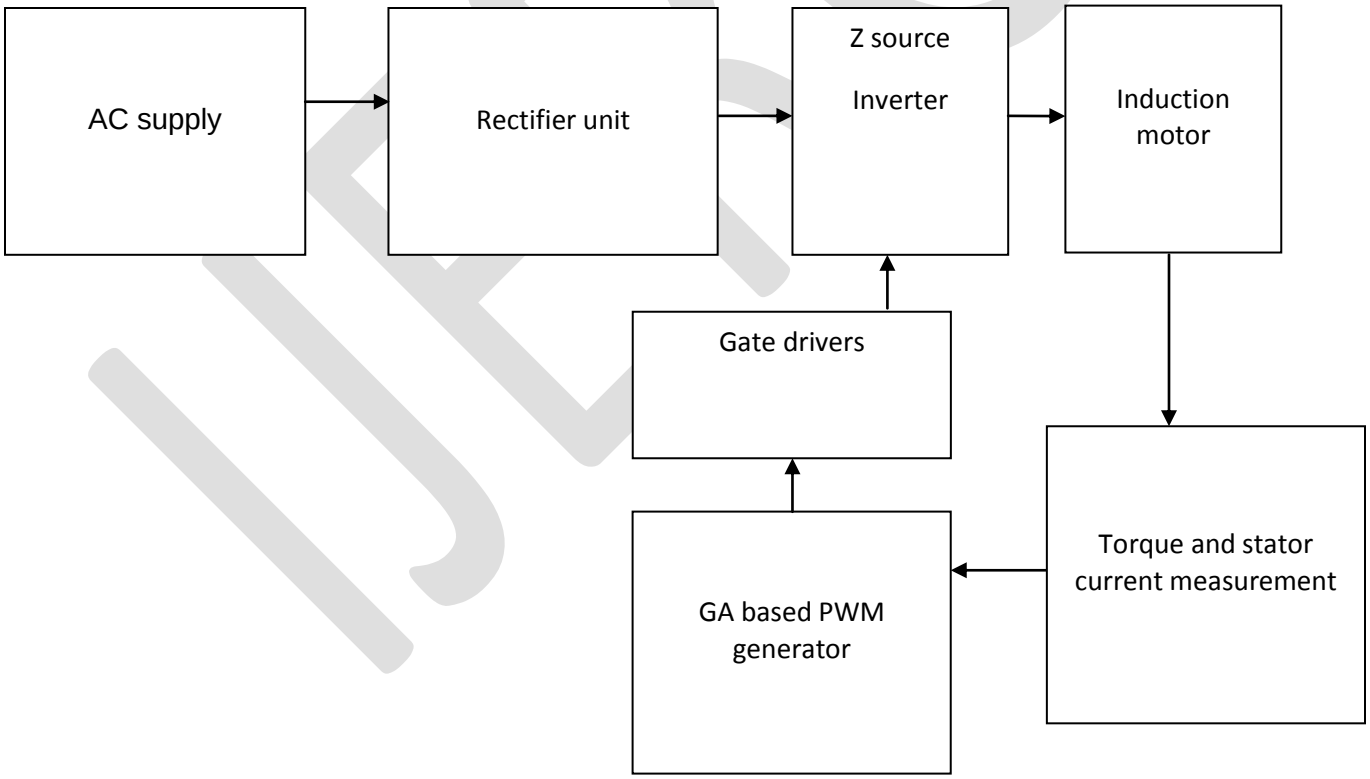

Fig .3 The Proposed Block Diagram

Here the AC Supply 440V 50 HZ Three Phase Supply is fed to the rectifier Unit for the conversion of AC to DC. After Converting to the Dc voltage is fed to the Z-Source Inverter and that AC Supply is again fed to the Induction Motor. From the Help of Ammeter and Tachometer the current and the Speed of the machine is measured. Fig .3. Shows Block Diagram of Proposed System. And that pulse is fed to GA Based PWM generator. And the pulse is fed to the gate driver that attached to the inverter. Due to closed loop the output

is feedback to the input. It reduces the error in the output. As per the pulse from the inverter the Induction Motor will be rotate. In the simulation the torque can be directly measured. And the stator current can also be measured. Here the GA helps to identify the how the pulse to be generates. And that value will be fed to the inverter. And the Genetic Algorithm will calculate the various pulse that to be fed to the inverter[9][11].

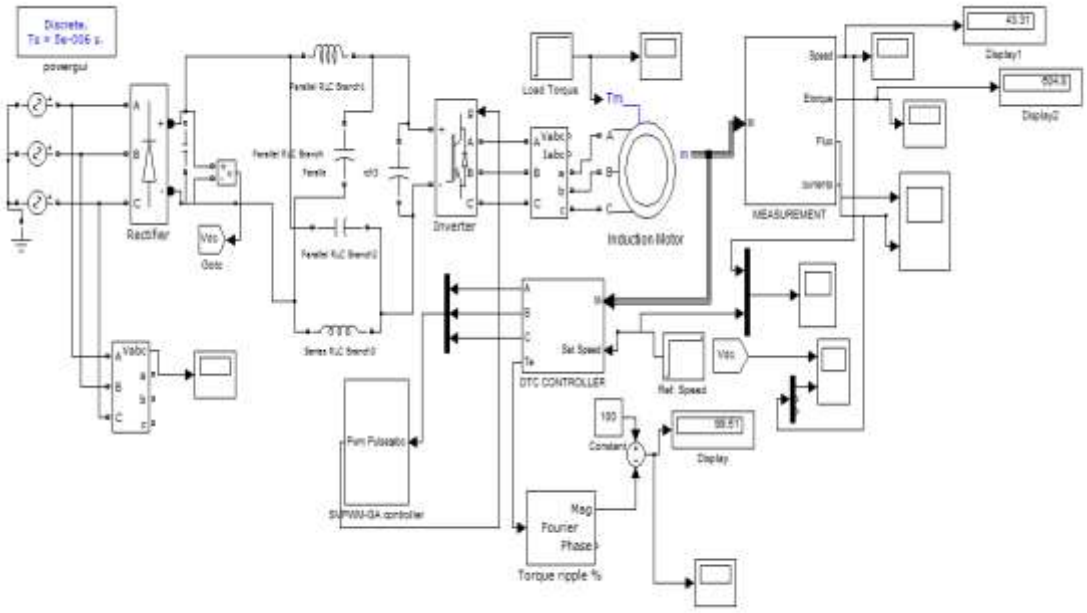

Fig . 4 Show the simulation Diagram of the DTC of Induction Motor with GA and Z-Source Inverter

The pulse to the inverter is obtained from SVPWM-GA Controller in the circuit. The output of the machine is given input to the measurement section, And the Scope is connected to see the simulation Result. The reference torque value is given to the Tm Section of the Induction Motor. The Simulation Diagram of the Proposed System is shown in the Fig. 4

The value of m i.e Stator Current Ia, Ib, Ic is given to the A-B-C to Alpha-Beta Conversion Section. , Park transformation Convertion is taking place in this section. Three Dimensional components is changing to 2D (Two Dimensional) Components (Alpha, Beta). Because in Park Transformation it is clearly mentioned that we can generate the signal on when the components are two in number. That's why we are going for Park transformation. From a-b-c Component to Alpha-Beta Conversion is take place block .The signal goes from the Parameter Estimation Section to the control section with the Set Speed Constant Value. And for applying to the inverter we again converting the Alpha-Beta Conversion to again 3 Components. The generated 3 components is given as the input to the SVPWM-GA Controller[3][6].

The signal form the DTC controller is given input to the SVPWM-GA Controller. From the input the three separate GA Controller is operated. For Each Phase Each GA Block will functioned. And the Error signal from the GA block is amplified With help of gain. From the error signal the signal is given input to software coding part. Where three voltage from the GA Controller and One reference DC Voltage. In this software coding section we provide the quadrant selection. When the quadrant selection is over the three switching pulse will be created. And that three signal is given as the input to the DISCRETE PWM GENERATOR[8]. Here the three pulses converted to six pulses and that pulse we fed to the gate of the inverter as the input.

From the DTC-Controller the Torque ripple percentage is measured and it is displayed using display. From the Output diagram Fig.5 Shows the percentage of ripple removed in the output torque. And Fig. 6 shows output actual torque. we can clearly note the set speed is achieved and torque is achieved with less amount of ripples.

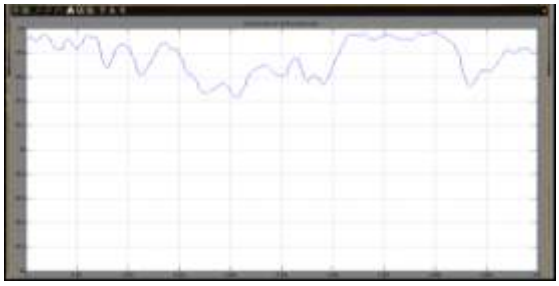

Fig .5. Percentage of ripple removed from the Output Torque

Fig .6 Actual Output torque.

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The author would like to thank first to his parents for constant motivation, and staff members of my college and like to extend his thanks to all his friends.

CONCLUSION

As concluding the project, the induction motor is the vital part in all the industry and its application is speechless. For the proper performance of the machine its controlling is important, especially its torque and speed. By controlling this both character then only the machine will give maximum efficiency. And project design is fewer ripples and required torque will obtain in the correct stage. Due to fewer ripples the machine centre of axis rotation will not deviate so that machine rotation speed will not change. Due to simultaneously and independent of speed and torque of the motor is very awesome when considering to the industry application. As the performance of the machine is increased the product and product quality will increase. So that as the industry production is increased, the total GDPA (GROSS DOMESTIC PRODUCT) will increase. And the workers strain and work load is decreased, as the production increase the salary and remuneration will increase.

Due to genetic algorithm is new artificial intelligence the performance of the existing will increase more so due to that the overall performance of the system is increased. This system is enhanced the torque response with the controller controlling it, this give good response to the user with who handling this system. I assure that Genetic Algorithm is giving the best situation pulse to the inverter at the right time. The system designed is having wide range of opportunities in commercial as well as residential.

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MECHANICAL PROPERTIES OF METAL MATRIX COMPOSITES (Al/SiC_p) PARTICLES PRODUCED BY POWDER METALLURGY

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Abstract
Metal matrix composites (MMCs) have become attractive for engineering structural applications due to their excellent specific strength property and are increasingly seen as alternative to the conventional materials particularly in the automotive, aerospace and defence industries. Al/SiC MMC has aluminium matrix and the silicon carbide particles as reinforcements and exhibits many desirable mechanical properties. In the present study, an attempt has been made to fabricate Al/SiC composite by powder metallurgy route as it homogenously distributes the reinforcement in the matrix with no interfacial chemical reaction and high localized residual porosity. SiC particles containing different weight fractions (10 and 15 wt. %) and mesh size (300 and 400) is used as reinforcement. The paper presents the processing of Al/SiC by powder metallurgy method to achieve desired properties and also the results of an experimental investigation on the mechanical properties of Al/SiC are determined.

Keywords - MMC; Al/SiC_p; Powder metallurgy; Mechanical properties; Density; Hardness; XRD ; Microstructure.

1. INTRODUCTION
Aluminum has played and continuous to play a key role in the development of metal matrix composites (MMCs) reinforced with a variety of ceramic materials including Al_2O_3, TiC, B_4C, and SiC. From the wide range of MMCs systems studied thus far and on account of the attractive properties of SiC. Al/SiC composites have drawn the attention of a plethora of research scientists and technologists. Like with any other composite material, the materials behavior lies much in the matrix characteristics as in the reinforcement properties. Several aspects are to be considered with regard to the metallic matrix namely composition, response to heat treatments, mechanical and corrosion behavior. Since aluminum offers flexibility in terms of these aspects accordingly, a number of aluminum alloys have been used in studies intended for research and technological applications. The combination of light weight, environmental resistance and useful mechanical properties such as modulus, strength, toughness and impact resistance has made aluminium alloys well suited for use as matrix materials [1-4]. Moreover, the melting point of aluminium is high enough to satisfy many application requirements. Among various reinforcements, silicon carbide is widely used because of its high modulus and strengths, excellent thermal resistance, good corrosion resistance, good compatibility with the aluminium matrix, low cost and ready availability.
The main objective of using silicon carbide reinforced aluminum alloy composite system for advanced structural components to replace the existing super alloys The choice, however, for one or another alloy depends also on other factors as the composite processing route, which in turn can be dictated by the volume fraction of the reinforcement in the composite. Another important factor for selection of the aluminum alloy is the composites application and specific requirements in service. For instance, one composite may behave better under certain loads or in corrosive environments. In the present investigation aluminium (commercially pure having an assay of >99% of Aluminium) and SiC particulates have been used for the MMC fabrication. In the recent researches particle reinforced metal matrix composites have been extensively investigated. Usually, this kind of composites is produced by stir casting methods and also there are some investigations on generating them by powder metallurgy techniques. Powder metallurgy has got a great influence of producing net-shape components that minimizes the machining process particularly in case aluminium silicon carbide composite rapid tool wear rate takes place due to abrasiveness of the hard SiC particles and also machining process causes cracking of SiC particles [5].The main advantage of using powder metallurgy method to generate MMC (Al/SiC_p) is as it produces a uniform distribution of reinforcement in the matrix where as other manufacturing methods fail to satisfy, also the production methods such as spray co-deposition followed by rolling and In Situ process is very expensive which render its application [6].

2. EXPERIMENTAL METHOD

2.1 MATERIALS
It is indispensable to select pure metal powder and optimal processing parameters for the preparation of specimens. The specifications/ composition obtained is presented below. The aluminium alloy contains Al-99.0%, Fe-0.5%, Mn-0.01%, Zn- 0.0053%, Cu-0.05%, Pb-0.03% of other materials and Particle sizes 200 mesh (74μm).SiC_p containing assay 99% (metal basis) and particle sizes of 300 mesh (50μm), 400 mesh (36 μm) are applied.

2.2 PRE-TREATMENT OF SIC PARTICULATES

The pre-treatment of SiC particulates is heated in presence of air at a temperature of 700°C in a muffle furnace (TEXCARETM, max.temp. 1000° C) as shown in Fig. 1 & Fig 2 and kept at the temperature for 1hour preceding to using it for fabrication of MMC samples As it is done to shape a thin layer of SiO_2 on the surface of SiC particulate to aluminium so that immediate reaction between aluminium and SiC particulates is prevented. [3-7].

Fig.1. Muffle furnace

Fig.2. Heating of SiC_p at 700° C

2.3 POWDER METALLURGY METHOD

The investigation specimens (Al/SiC_p) are made-up by using powder metallurgy technique by following steps.

2.3.1 Mixing of Powders

Total four categories of mixture were prepared.

- 90% Al + 10% SiC - 300 mesh
- 90% Al + 10% SiC - 400 mesh
- 85% Al + 15% SiC - 300 mesh
- 85% Al + 15% SiC - 400 mesh

Blending is performed in ball planetary mill which consists of two cylindrical containers made of chrome steel rotating about its axis and inside which 10 balls made up of chrome steel of sizes 10 mm. To get a uniform degree of fineness in the mixture the blending machine is allowed to rotate about 2-3 lakh of revolutions.

2.3.2 Compaction of the powder mix

The compaction is done with a powder mixture of about 50 gm in a cold uniaxial press in a die-punch arrangement.

2.3.3 Cold uniaxial pressing

A die composed of stainless steel of 30 mm internal diameter was utilized for this purpose. In this the powder sample is pressed in the cold isostatic pressing machine (Shenzhen of hydraulic type) is used to provide the green circular test by applying a load of 18 ton, with 3600 bar pressure. In order to prevent the specimen from sticking on to the walls of die and also to allow the powder flow freely stearic acid was used as a lubricant. The operation of pressing machine and compacted green samples with average diameter and thickness of pallets are 30 mm and 15 mm.are shown in the Fig .3 & 4.

2.3.4 Sintering of the green samples

It is carried out in a horizontal tubular furnace (Make: HIGHMECHTHERM) in which the green compacts are parched at an elevated temperature but kept below the melting point of the base metal for sufficient time. A total of four samples from each of the two mixtures containing 10, 15% SiC were sintered for 1 hour at a temperature of 650° C respectively. Due to high temperature in the sintering process proper bonding between metallic matrix and ceramic particles at interface and the morphology and distribution of pores and carbides in the matrix are achieved. The existence of SiC_p also holdup the aluminium melts from one particle to join melts from another. So increasing silicon carbide content increase the sintering temperature needed to achieve high strength composite.

Then furnace is allowed to cool to room temperature for a span of 24 hours. Then the specimens are removed from the furnace and dipped in concentrated H_2SO_4

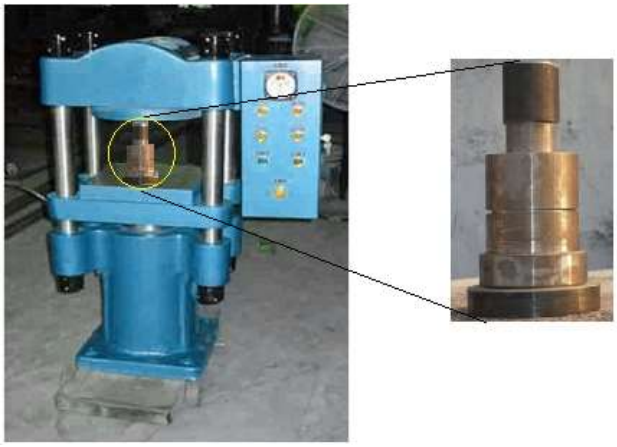


Fig.3.Cold Isostatic pressing machine

Fig.4. Green samples

2.3.5 Heat treatment

The heat treatment is given to the specimens to refine the grain structure inside a material part and increase its mechanical properties. Quenching was carried in a heat treatment furnace at 500°C for one hour and then quenched in iced water**.** After quenching in order to avoid natural ageing, all the specimens were artificially aged at 200°C holding a time of 8 hour in a closed muffle furnace and left cooled in it. The sintered samples prepared by the above discussed process are shown in Fig.5. These green samples are ready for further use. The properties of the samples were then measured by different equipments.

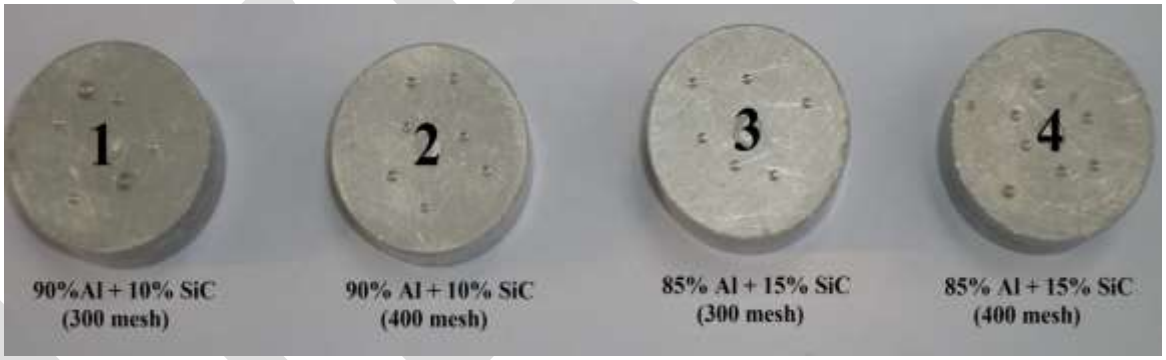


Fig.5. Sintered Samples

3. RESULTS AND DISCUSSIONS

3.1 XRD ANALYSIS

The XRD analysis is performed to confirm the constituents present in the blended powder. The peaks obtained after XRD analysis is shown in the Fig.6. which confirms that there is presence of only two phases i.e. Al and SiC crystals and also it shows aluminium is 99.7% pure and the left over contains aluminium alloys such as aluminium manganese, aluminium silicon and aluminium titanium. The XRD test is also performed on silicon carbide particulates of mesh size (300, 400) and it is observed that SiC mostly contains moissanite-6H i.e. SiC and extremely minute traces of Paladium Oxide and $Al_2Si_3O_{12}$.It was also found that the specimen is free from chrome steel crystals which is used during blending in a chrome steel crucible. These outcomes prove the appropriateness of the specimens in terms of uniform distribution of particles and prove that they are accurate for advance investigation.

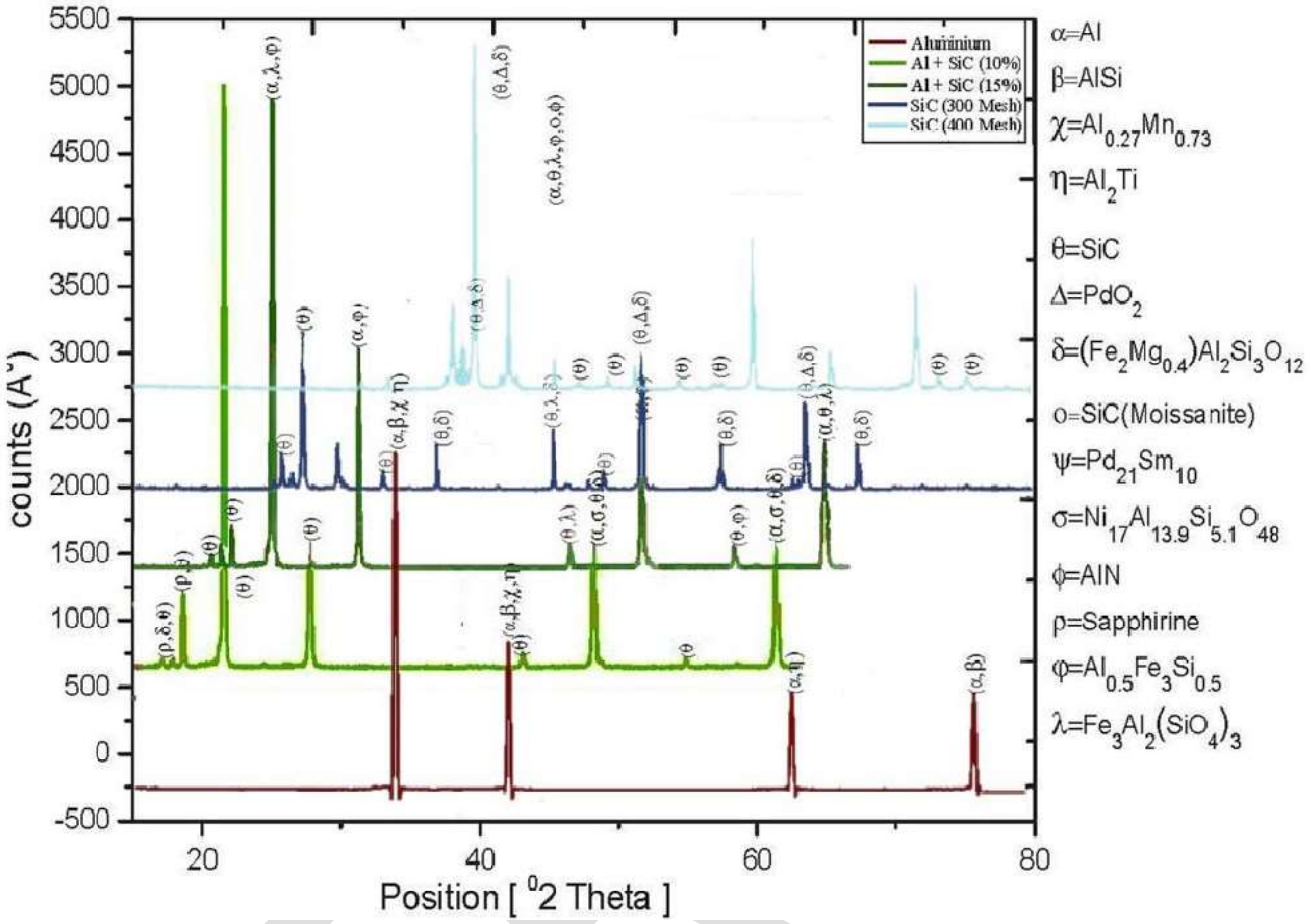


Fig.6. XRD Graphs

3.2 DENSITY

The actual densities of the samples are obtained through water immersion method shown in Table 1.Theoretically; the densities of the composites are measured using the following relation. Using the below equation, the theoretical density of the MMC is found to be 0.00268 g/mm^3. The average actual density is found to be 0.00230 g/mm^3. The difference in density is attributed to presence of voids in the samples.

$$\rho_c = \frac{1}{\left(\frac{W_{Al}}{\rho_{Al}}\right) + \left(\frac{W_{SiC}}{\rho_{SiC}}\right)}$$

Where

ρ_c = Composite density, g/mm^3
W_{Al} = Weight fraction of aluminium
ρ_{Al} = Density of aluminium (0.00262 g/mm^3)
W_{SiC} = Weight fraction of Silicon Carbide
ρ_{SiC} = Density of Silicon Carbide (0.0032 g/mm^3)

From Table 1, it is observed that maximum of 67.63% increase in density occurs after sintering the green samples due to filling up of the voids between particles with melted aluminium and also Fig.7 tell us about the result of density increases with wt% of SiC after sintering. Finally this graph confirms that MMC depend on both, the wt. % as well as mesh size of SiC_p.

%SiC	MESH	DENSITY (g/mm^3)		%INCREASE
		BEFORE SINTERING	AFTER SINTERING	
10	300	0.001716	0.00203	18.29
10	400	0.001736	0.00244	40.55
15	300	0.001726	0.00266	54.11
15	400	0.001730	0.00290	67.63

Table.1. Density values of AlSiC before and after sintering

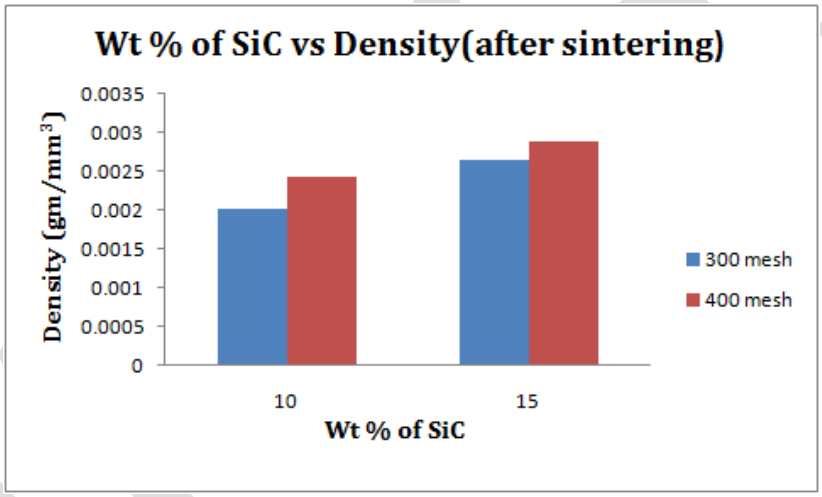


Fig.7. Variation of density with Wt% of SiC (after sintering)

3.3 HARDNESS

Hardness of the green and sintered samples is measured by the equipment Rockwell hardness measuring machine (Wilson Hardness Tester, USA Model: LM 2481T) From Table 2, it is observed that hardness increases by at least 20% after sintering.

%SiC	MESH	LOAD APPLIED (kgf)	HARDNESS(HRC)		%INCREASE
			BEFORE SINTERING	AFTER SINTERING	
10	300	150	62.3	75	20.38
10	400	150	57.4	72.6	26.47
15	300	150	63	76.5	21.35

15	400	150	56.6	73.1	28.26

Table.2. Hardness values of AlSiC before and after sintering

The average hardness for samples is found to be 73.82 and 74.80 HRC for SiC weight percentage of 10 and 15 respectively whereas hardness for aluminium is 22 HRC.Fig 8 shows the variation of hardness after sintering and it is observed that the percentage of hardness is increasing with increasing wt. % but decreasing with increasing in mesh size of SiC after sintering.

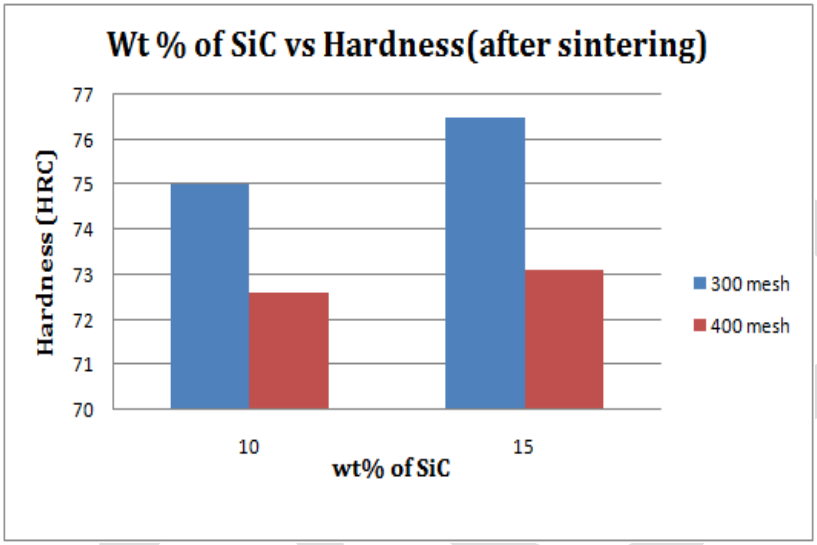
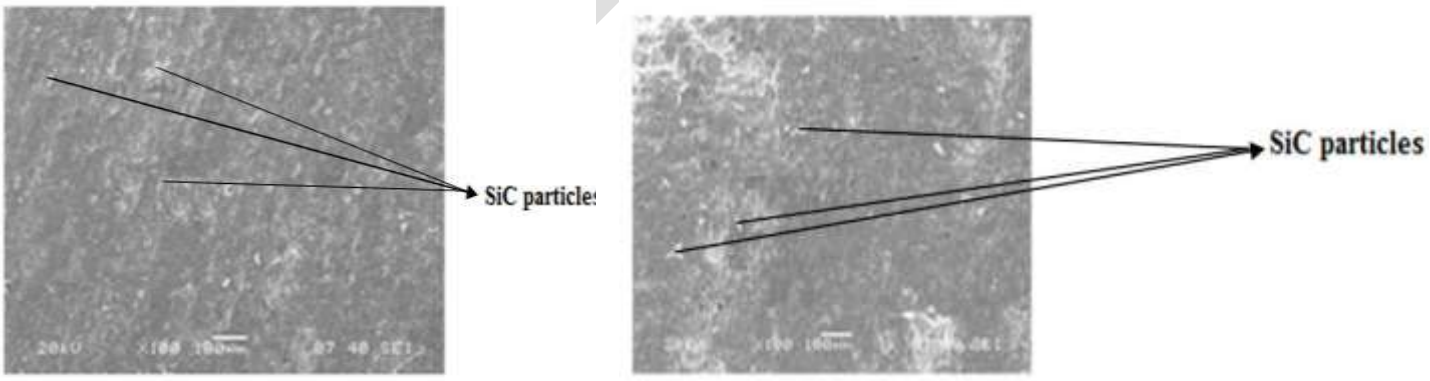


Fig.8. Variation of hardness with Wt% of SiC (after sintering)

3.4 MICROSTRUCTURE

The morphology of raw powders having 10 and 15 weight percentage of silicon carbide before sintering was made with Scanning Electron Microscopy (SEM), JSM-6480 Model (JOEL) shown in Fig.9 (a).Green samples it is observed that SiC particles are equivalently distributed in the matrix. A few clustering of the reinforcement is observed in both the micrographs and increases with the percentage of reinforcement and mesh size increases

.

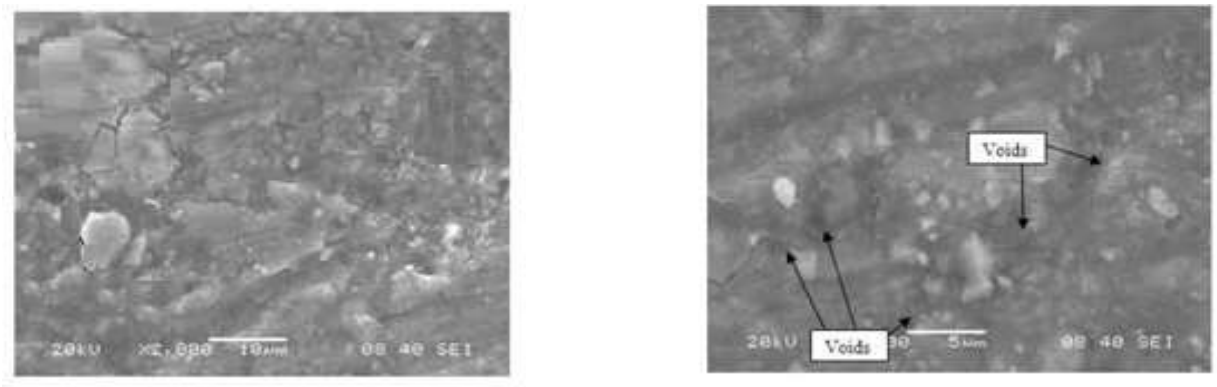


(a) **(b)**

10% SiC (300 Mesh size) **15% SiC (400 Mesh size)**

Fig. 9(a).Micrographs showing the distribution of the reinforcement in the green samples

From the Fig.9 (b) Sintered samples it is observed that silicon carbide particles enclosed by melted aluminium particles and also compared with 10% weight of silicon carbide more number of voids is observed in the samples of 15% weight of silicon carbide



(a) **(b)**

10% SiC (300 Mesh size) **15% SiC (400 Mesh size)**

Fig 9(b) Micro-graphs showing aluminium and voids in the composite (sintering samples)

4. CONCLUSION

- In this experimental study it is found that both density and hardness properties of the MMC is increasing with increasing sintering temperature.
- The mechanical properties like density and hardness of MMCs under investigation depend on both, the weight percentage and mesh size of SiC_p.
- Heat treatment after sintering is increasing hardness as well as density. After heat treatment the percentage of density is increasing as the SiC_p reinforcement, weight % and mesh size increasing.
- The percentage of hardness is increasing with increasing wt. % but decreasing with increasing in mesh size of SiC_p after heat treatment.
- It is concluded that heat treatment after sintering is influencing the properties. The density is increasing when SiC_p is increasing.
- The hardness of MMC is increasing with increasing weight % of SiC_p in the composite and mesh size.

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SURVEY ON APPLICATIONS OF ONTOLOGY IN VARIOUS DOMAINS

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Abstract— Ontology is a term in philosophy and its meaning is "theory of existence". Ontology is an explicit specification of conceptualization. Ontology is a body of knowledge describing some domain, typically common sense knowledge domain. This paper presents a survey of fifteen papers based on ontology. Discussion is made about ontologies used in web, mining and multi agent systems.

Keywords— ontology, Haptics, service oriented, multiagent, multilingual, web retrieval, mining

INTRODUCTION

After an ontology is developed, it is used, reused, and related to other ontologies, and also needs to be maintained. These tasks may be easier when ontology is designed with these tasks in mind. For example, building ontology on an shared upper ontology and using a modular design usually means easier use and maintenance. In this chapter we describe operations on ontologies, relations between ontologies, and a classification of ontologies.

OPERATIONS ON ONTOLOGIES

It is possible that one application uses multiple ontologies, especially when using modular design of ontologies or when we need to integrate with systems that use other ontologies. In this case, some operations on ontologies may be needed in order to work with all of them. We will summarize some of these operations. The terminology in this areas is still not stable and different authors may use these terms in a bit shifted meaning, and so the terms may overlap, however, all of these operations are important for maintenance and integration of ontologies.

- Merge of ontologies means creation of a new ontology by linking up the existing ones. Conventional requirement is that the new ontology contains all the knowledge from the original ontologies, however, this requirement does not have to be fully satisfied, since the original ontologies may not be together totally consistent. In that case the new ontology imports selected knowledge from the original ontologies so that the result is consistent. The merged ontology may introduce new concepts and relations that serve as a bridge between terms from the original ontologies.
- Mapping from one ontology to another one is expressing of the way how to translate statements from ontology to the other one. Often it means translation between concepts and relations. In the simplest case it is mapping from one concept of the first ontology to one concept of the second ontology. It is not always possible to do such one to one mapping. Some information can be lost in the mapping. This is permissible, however mapping may not introduce any inconsistencies.
- Alignment is a process of mapping between ontologies in both directions whereas it is possible to modify original ontologies so that suitable translation exists (i.e., without losing information during mapping). Thus it is possible to add new concepts and relations to ontologies that would form suitable equivalents for mapping. The specification of alignment is called articulation. Alignment, as well as mapping, may be partial only.
- Refinement is mapping from ontology A to another ontology B so that every concept of ontology A has equivalent in ontology B, however primitive concepts from ontology A may correspond to non-primitive (defined) concepts of ontology B. Refinement defines partial ordering of ontologies.
- Unification is aligning all of the concepts and relations in ontologies so that inference in one ontology can be mapped to inference in other ontology and vice versa. Unification is usually made as refinement of ontologies in both directions.
- Integration is a process of looking for the same parts of two different ontologies A and B while developing new ontology C that allows to translate between ontologies A and B and so allows interoperability between two systems where one uses ontology A and the other uses ontology B. The new ontology C can replace ontologies A and B or can be used as an interlingua for translation between these two ontologies. Depending on the differences between A and B, new ontology C may not be needed and only translation between A and B is the result of integration. In other words, depending on the

number of changes between ontologies A and B during development of ontology C the level of integration can range from alignment to unification.

- Inheritance means that ontology A inherits everything from ontology B. It inherits all concepts, relations and restrictions or axioms and there is no inconsistency introduced by additional knowledge contained in ontology A. This term is important for modular design of ontologies (see later) where an upper ontology describes general knowledge and a lower application ontology adds knowledge needed only for the particular application. Inheritance defines partial ordering between ontologies.

LITERATURE SURVEY

"Applying Evolutionary Computation for Evolving Ontologies"

In this paper [1] introduced a new genetic operator, called repair, which is needed in order to make the offspring viable. Experiments for the generation of user centered automatically generated scenes demonstrate the performance of the proposed approach. However, we consider that a new genetic operator - repair - is needed to making the offspring viable. Otherwise the risk of having no viable individuals after only a few epochs is high. The evolutionary ontologies have been applied for automatically generating scenes. The concept has been applied on a specific ontology built in this scope. The advantage of using scene for researching evolutionary ontologies is that the ontologies as well as the results of the genetic operators have a visual equivalent.

" Focused Crawling with Ontology using Semi- Automatic Tagging for Relevancy"

The process of focused crawling is being enhanced by the semi-automatic tagging done using ontology in this paper [2]. As a result the values of semantic relevance increased for the same search topic with and without semi-automatic tagged resources. Also the harvest rate for the focused crawlers improved over the classical focused crawlers for two different relevance thresholds. The ontology plays an important role in the tagging as well as the crawling process. The process is done on single domain of social bookmarking site but this process can be enhanced to multiple social bookmarking sites to accumulate all the tags from various sites.

"A Graph Derivation Based Approach for Measuring and Comparing Structural Semantics of Ontologies"

Paper [3] have presented a GDR derivation based approach to stably measure and compare ontologies. By theoretical analysis of the properties of GDR, we show that the GDR of an Ontology is semantic-preserving and "unique" in terms of labels, connecting structure and isomorphism, which guarantees stable semantic ontology measurement. We analyze and evaluate the usefulness of our GDR approach and compare our GDR with conventional graph models (GM). We draw two important conclusions. First, the GDR approach Offers stable and reliable semantic measure of ontologies and provides a feasible solution for automated ontology comparison and measurement. Second, the measurement and comparison based on GDRs are more useful and meaningful for the ontologies with a large number of complex concepts. Thus, our GDR based approach can also be used as a complementary mechanism by the existing ontology measurement approaches. Our work on stable and reliable semantic measurements of ontologies continues along three directions. First, the GDR-based ontology comparison assumes that concepts have the same semantics if their names are the same, which is not always true in real life ontology comparison. We will explore comparing the similarity between ontologies with polysemy and toponomy. Second, by the GDR-based ontology comparison, the candidate ontologies that are most similar to a given ontology can be selected from the ontology repositories. The selected ontologies can be further used to help users enrich the ontology design and improve its quality for specific application domain of interest. Three, we can further explore new methods for ontology reuse by utilizing the semantically clean and enriched structures in GDRs.

"A Novel Architecture of Ontology Mapping System for Hidden Web Retrieval"

Paper [4] Choosing the right strategy for Ontology mapping in terms of resource consumptions as well as effectiveness will lead to the conceptualization and implementation of an intelligent Hidden Web Retrieval System. Much concern 67 in any ontology mapping system regarding efficiency is then number of concept-pairs to be matched. Taking efficiency consideration in mind, only relevant concept-pairs has been examined for mapping. Selecting only relevant pairs for mapping, results in higher precision rate as compared to some other prevalent system. Precision in turns offer more accurate results in a more efficient manner. Also there is a scope of dynamically creation of ontology corresponding to a given query interface form. Secondly there should not be a restriction the domain by the proposed model and it should be adaptable to any domain. Dynamic nature of mapping is also required, so that whenever necessary, predefined Ontology database is updated. These additional information are vital in making the mapping process more accurate and efficient.

"Building profiles based on ontology for career recommendation in E-Leaming context."

Paper [5] described a method enabling system to classify students depending on their school levels and also their personal and professional tendencies. This semantic classification integrated within ontology will help the system to build students' profiles. Then, our system will be able to guide them in an optimal and personalized career pathway (CP) and make a decision about interface content recommended to each profile. To evaluate the effectiveness of the proposed approach, an experiment was conducted on students from middle school.

However, simulations of abilities together with a previous preparation become necessary. Although if student decide he have chosen the wrong 'Cpt, he can always switch to a different plan. Indeed, a RCS method based on students' previous school marks (psm) and Holland results is proposed to simulate their abilities. The system will propose the most appropriate career pathway to student and will personalize student's interface with pedagogical content belonging to this same career pathway. The goal is to provide to student the opportunity to be proactive in his choice. Future work involves the prediction of the chosen career pathway depending on student-system interactions.

"SODHO: Service Oriented Development of Haptics Ontology"

Paper [6] look towards the future of Human Computer Interaction, this paper presented an ontology for Haptics. It introduced a design of Haptics Ontology Platform including and illustrated some key concepts. As general conclusions, we can summarize the presented work as follows: The HIS attributes were classified into three categories: Physical, spatial and temporal attributes (for each actuators and sensors). SODHO was developed, using the SUMO model instead of BFO as in HASM ontology, in which the vocabulary that describes human-haptic system interaction was formalized, providing a formal categorization of the haptics domain that can serve users and applications. Second, in adding the "attributes classes" in SODHO, the developed ontology for the haptics will help in designing better software for tactile interfaces, this is due to the fact that, with the proposed unified ontology, we will be working with a global interface that will be the adapter between the soft service layer and the HIS components. This will make easier, the implementation of the service layer. Third, due to SWRL rules, data was inferred and treated. Fourth, by integrating "Actuators" and "Sensors" in one unified ontology, we tried to answer the question of how to integrate the "real world" and computational media, for future Augmented Reality, HAVE and IOT applications.

" Multi-Agent-Based System for Multilingual Ontologies Maintenance"
This workin paper [7] is part of a project where we are developing a framework for semantic manipulation of health and nutrition information. In this paper, we present an automatic ontology maintenance system using multi-agent based approach for multilingual ontologies related to food and health domains. The paper also highlights the challenges and complexities that may occur in multi-agent based systems which are being utilized for the purpose of maintenance of multilingual ontologies.In this paper, we present multi-agent-based system to maintain multilingual ontologies using of Wikipedia and WordNet. The constructed ontology consists of parallel monolingual ontologies and a Language-Agnostic ontology connecting them together. The Language-Agnostic ontology acts as a bridge between the monolingual ontologies. Each monolingual ontology consists of the concepts that exist in that language. The number of concepts differs from each other largely due to the concept diversity in each language. It also reflects the culture for each language based on the available concepts for each language.

" ONTOSSN: Scientific Social Network ONTOlogy"

In this paper [8], the author has proposed a scientific social network ontology which includes definitions of main entities and describes main attributes of : Scientific social network concepts aiming to share common understanding of this domain and to reflect the academic career paths. Social network data currently increasingly emerges everywhere. Particularly, scientific social network which describes the scientific interaction between researchers. After a deep study of ontological modeling of scientific social network, we introduce a new ontology for an enhanced scientific social network representation. Currently, we are studying two main issues: (1) the scrutinize of the impact of the social network evolution on our proposal [5] and (2) the consideration of uncertainty on handling advanced social network mining.

"Detecting and Correlating Video-based Event Patterns: An Ontology driven Approach"

In this paper [9], we have presented an unsupervised trend discovery approach for identifying Temporal and Geographical trends corresponding to an input video. Initially, we are forming the Document Set associated to a video. This facilitates in establishing the complete information that builds around the video. The temporal trend analysis basically identifies the probability distribution of concepts present in Document Set over a given time. To classify the documents, statistical modeling approach is used. To fill the gap between syntactic patterns and semantic meanings, an E-MOWL based ontology has been utilized. A document can then be seen as a probability distribution over concepts. This approach assists in detecting and correlating the event patterns as evolved over time. For geographical trend analysis, initially the geographic named entities are extracted using Stanford NLP Parser. The geographic entities are then mapped onto the geo-ontology concepts to identify the relation between them. This is required for deducing the inter-

relationships between various geographical locations associated with an event. This further helps in detecting and correlating event patterns showing the relatedness between various locations as associated to an event.

"A Pattern-Based Approach to Semantic Relation Extraction Using a Seed Ontology"

In this paper [10] we presented our experiment on Badea system, which is a system designed to enable the automated enrichment of ontological lexicons. The system uses a pattern based method to extract pairs of words with the antonym semantic relation, and enrich the ontology with newly discovered pairs. The system was evaluated an Arabic seed ontology and two sets of Arabic language corpora. Results from the experiment indicate that the system was useful for extracting useful antonym pairs and yielded a 400% increase in the size of the ontology. Moreover, our experiment also show that even though a large number of patterns were identified (over 900), only 2.7% of these patterns were useful in extracting correct antonym pairs. Although the pattern score computed does indicate the reliability of the pattern, it is not a very good indicator of pattern usefulness or generality, the total number of unique antonyms it retrieves. This implies that another measure should be introduced which is the pattern usefulness or generality score. Our recommendation is that the usefulness score should include the number of unique antonyms retrieved in the pattern.

Shortcomings from this experiment highlight areas for improvement and further work. Results from computing the pattern score highlights an interesting question for further research in this area: what constitutes a good value for the pattern score? Can such measure be computed accurately? What other factors influence the pattern effectiveness in eliciting a semantic relation between words? Another interesting area open for research and exploration is to investigate how to use Badea system to elicit other types of semantic relations between the two extracted words.

"An Ontology-Based Text Mining Method to Develop D-Matrix from Unstructured Text"

A novel ontology-based text mining methodology has been proposed in [11] to construct the D-matrices by automatically mining the unstructured repair verbatim data collected during fault diagnosis. In real-life, the manual construction of a D-matrix diagnostic model corresponding to the complex systems is not practical as it would involve significant effort to integrate the knowledge from SMEs and represent it in a D-matrix. In many cases the SMEs may not even be able to realize all the dependencies between failure modes and symptoms resulting into partial support to perform fault diagnosis. Our approach overcame these limitations where natural language processing algorithms were proposed to automatically develop the D-matrices from the unstructured repair verbatim. We compared the testability and diagnosability metrics of the historical data-driven D-matrix and the text-driven D-matrix.

"An Ontology based Recommendation Mechanism for Lighting System Design"

The proposed method in [12] was constructed with reusable project analysis and term-based ontology analysis. By examining an ontology-based design for lighting control system, designer can observe ranks of and similarities among alternatives by system requirements or system schemas, iteratively select historical project, and adjust system schemas for developing new projects.

This study has described a framework of the reusable project analysis and the term-based ontology analysis for applying to lighting system designs. The proposed ontology based recommendation mechanism can help designer to construct a newly added engineering schematics efficiently from reusing the historical designs. By examining the recommendation mechanism, designer can observe ranks of similarities among alternatives, iteratively select historical projects, and adjust schematic designs for developing new projects. There are still many issues can be studied in this area. The ports of a device provide an interface demarcating devices within a lighting system, and they facilitate the negotiation of interface constraints among different devices. In connections between ports, need to be considered within the context of their attributes.

"An ontology evolution method based on folksonomy"

This paper [13] presented our 3E Steps technique to review and enhance ontologies and our approach to build and use a folksonomies ontology (FO) in this context. A FO is a hybrid entity fusing folksonomies and ontologies. It is a symbiotic combination, taking advantage of both semantic organizations. Ontologies provide a formal semantic basis, which is contextualized by folksonomic data, improving operations over tags based on ontologies. Conversely, the FOs were used as tools to analyze the ontology and to support the process of ontology evolvement, showing the discrepancies between the emergent knowledge of a community and the formal representation of this knowledge in the ontology. In this paper, we described the 3E Steps : Extraction, Enrichment, and Evolution. Extraction is the step where the semantic information is collected from the folksonomies and processed. In the Enrichment step, we combine the two entities, building a third one, with the best of both worlds. Finally, Evolution is the step where the folksonomized ontology is used to support the review and enhancement in the original ontology, closing the circle.

"An Empirical Study of Ontology-Based Multi-Document Summarization in Disaster Management"

In this paper [14], we gave an empirical study on several approaches that utilize the ontology to solve different multidocument summarization problems in disaster management domain. For generic summarization, we employed different vector space models to represent sentences in the document collection, and explored the feasibility of different combinations of the VSMs. Then the centroid-based methods were utilized to cluster the sentence set and the important sentences close to the centroids of the sentence clusters are extracted. The final summary was subsequently generated by reducing information redundancy and ranking sentences. For queryfocused summarization, we delved into the effect of query expansion in summarization tasks. The ontology is rich in conceptual information related to the specific domain. We will keep working on the issue of ontology-based multidocument summarization, particulary, on some other document summarization tasks, i.e., update summarization and comparative summarization.

"Developing a Framework for Ontology Generalization"

In this paper [15], we have developed a framework for ontology generalization that can easily generalize two or more similar type ontologies into one ontology. The proposed system first checks the similarity among the ontologies . It then merges the similar ontologies into one more general ontology. We have tested our developed ontology generalization approach with several ontologies. We have found that our system can perform the generalization of ontologies with a certain level of accuracy. we have developed and implemented an ontology generalization tool that can generalize two ontologies into one. Though our tool is efficient enough to generalize ontologies to a more general one, it only supports ontologies those are written in English. Moreover, current framework just considers the class-subclass relationships for ontology.

CONCLUSION

Different paper based on ontology and its application has been reviewed. Based on this new methods can be proposed or existing methods can be combined

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Software Testing in Cloud

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Abstract— Cloud computing has developed as another figuring standard that effects a few diverse exploration fields, including programming testing. Testing cloud applications has its own characteristics that interest for novel testing routines and devices. Advancement of more compelling and adaptable programming testing strategies are being provided. This paper gives an account of an efficient review of distributed papers. We give a diagram with respect to fundamental commitments, patterns, crevices, opportunities, difficulties and conceivable Research headings. We give an audit of programming testing over the cloud writing and sort the assortment of work in the field.

Keywords - exploration fields, routines, adaptable, patterms, assortment.

Cloud computing with Software Testing

Cloud computing is Internet computing. Cloud computing can be defined as utilizing the internet to provide technology enabled services to the people and organizations. Cloud computing empowers purchasers to get to assets online through the web, from anyplace at any time without stressing over specialized/physical administration also support issues of the first assets. Moreover, Assets of distributed computing are alert and adaptable. Cloud computing is free processing it is completely not quite the same as framework and utility figuring. Google Apps is the central illustration of Cloud figuring, it empowers to get to administrations by means of the program and conveyed on a great many machines over the Internet. Assets are available from the cloud at any time and from wherever over the globe utilizing the web.

Cloud computing is less expensive than other figuring models; zero support expense is included since the administration supplier is in charge of the accessibility of administrations and customers are free from support and administration issues of the asset machines. Because of this gimmick, distributed computing is otherwise called utility registering, or _IT on interest'. Adaptability is key quality of distributed computing and is accomplished through server virtualization. This new, electronic era of registering uses remote servers set in greatly sheltered and secure server farms for capacity of information and administration, so associations don't have to pay for and look after their inner IT arrangements. After production of a cloud, Sending of distributed computing contrasts with reference to the prerequisites and for the reason it will be utilize The principal service models being deployed are:

Software as a Service (SaaS): Software‘s are provided as a service to the consumers according to their requirement, enables consumers to use the services that are hosted on the cloud server.

Platform as a Service (PaaS): Clients are provided platforms access, which enables them to put their own customized software‘s and other applications on the clouds.

Infrastructure as a Service (IaaS): Rent processing, storage, network capacity, and other basic computing resources are granted, enables consumers to manage the operating systems, applications, storage, and network connectivity.

Cloud Testing uses cloud framework for programming testing. Organizations seeking after testing all in all and burden, execution testing and generation administration observing specifically are tested by a few issues like constrained test plan, meeting due dates, high expenses every test, substantial number of experiments, and practically no reuse of tests and topographical appropriation of clients add to the difficulties. Besides guaranteeing superb administration conveyance and evading blackouts obliges testing in one's datacenter, outside the server farm, or both. Cloud Testing is the answer for all these issues. Compelling boundless stockpiling, speedy accessibility of the foundation with adaptability, adaptability and accessibility of conveyed testing environment lessen the execution time of testing of substantial applications and lead to savvy arrangements.
This paper is a survey on collection of fifteen papers on software testing on cloud computing and has explained in the way the authors has proposed.

SURVEY

"Cloud Chamber: A Self-Organizing Facility to Create, Exercise, and Examine Software as a Service Tenants"

This work [1] describes the Cloud Chamber testbed to investigate autonomic resource anagement of web services in a cloud environment. Cloud Chamber is a virtualized environment which provides web servers as services,facilities to apply loads to the tenant services,algorithms for autonomic organization and reconfiguration of service assignments as demand changes, and sensors to capture resource consumption and performance metrics. The testbed inserts sensors into web servers to collect the resource utilization of CPU cycles, memory consumption, and bandwidth consumption of the individual web services, the web server, and the operating system. This high resolution performance data generates profiles of the resource usage of each web service and the resource availability of each server. The testbed, as described in this work, utilizes these profiles to efficiently place services on servers, thus balancing resource consumption, service performance, and service availability. Once services have been placed, the testbed monitors changes such as traffic levels, server churn, and the introduction of new services. The information gathered is used to calculate configurations of service placement which better meet the changing requirements of the environment. In conclusion the Cloud Chamber meets all the requirements described in the introduction. The Cloud Chamber creates a facility to create, exercise, and examine the behavior of tenants in a Software as a Service environment. Services of various shapes and sizes can be deployed onto a heterogeneous set of nodes providing different amounts of resources. These services can be executed with any size of prescribed load for any length of time. The nodes self-organize autonomously finding and implementing tenant assignments in response to changes in the environment. The authors are unaware of any such facility.

"A Parallel Genetic Algorithm Based on Hadoop MapReduce for the Automatic Generation of JUnit Test Suites"

In this paper [2] we proposed the use of a Parallel GeneticAlgorihtm (PGA) for test suite generation exploiting Hadoop MapReduce and showed a preliminary evaluation of its use on a small cluster. The obtained results highlighted that using PGA allowed us to save over the 50% of time. Since the use of parallel SBST approaches is still in its early phases, several directions can be prospected as future work. First of all a deeper empirical evaluation of the proposed approach is needed to asses on other subjects its strength or weakness, as well as to assess its actual scalability employing different GA settings, numbers of maps, and larger clusters. Also the use of Hadoop MapReduce should be assessed running it not only on standard clusters, but also exploiting cloud computing and graphic cards. Moreover, it can be interesting to realize and compare higher levels of parallelization, such as by parallelizing the genetic operations other than the fitness evaluation. It would be also interesting to verify how other approaches for test suite generation could be take advantages of parallel/distributed computation as the one described in this paper. Finally, as a long-term research goal, it will be desirable to integrate these SBST approaches within a whole Validation-as-a-Service platform, available in the Cloud, to support the entire software testing process.

"A Whitebox Approach for Automated Security Testing of Android Applications on the Cloud"

In this paper [3] we provide an overview of a multi-faceted project targeted at automatically testing the security and robustness of Android apps in a scalable manner. We describe an Android-specific program analysis technique capable of generating a large number of test cases for fuzzing an app, as well as a test bed that given the generated test cases, executes them in parallel on numerous emulated Androids running on the cloud. We have presented a novel framework for automated security testing of Android applications on the cloud. The key contributions of our work are (1) a fully automated test case generation, (2) iterative feedback loop to generate and guide our input in an intelligent manner that ensures code coverage and uncovers potential security defects, and (3) highly scalable *fuzzing* by leveraging the cloud. In our on going work, we are exploring two approaches for improving the test case generation facet of our framework. First, we are developing an evolutionary algorithm for generating tests, as part of which we are modeling the problem of testing an Android app as a genetic problem and developing an appropriate fitness function to evaluate the quality of test cases. Second, we are developing an Android-specific symbolic execution engine for automatically generating test cases. We are extending *Java Pathfinder*, which is capable of symbolically executing pure Java code, to work on Android. In addition, we are creating a graphical reporting environment that would allow the security analyst to visually explore the results of the testing, and in particular obtain metrics (e.g., achieved code coverage, bugs per KSLOC) that could then be used for making decisions as to the overall security and robustness.

"Benefits and Limitations of Automated Software Testing: Systematic Literature Review and Practitioner Survey"

This paper [4] makes three contributions. First, we performed a systematic review of software test automation benefits and limitations in academic literature. We collected 24.706 papers, which were reduced to 25 research works (see Table II). Thus, the amount of evidence on these matters is quite shallow as many benefits and limitations are backed up by only one or two sources. Furthermore, we found that while benefits often came from stronger sources of evidence (experiments and case studies), limitations were more frequently reported on experience reports. We think that this is caused by publication bias regarding the benefits. We believe that important further work on this area is to assess the limitations of test automation with rigorous empirical studies, i.e. case studies and

experiments. Second, we conducted a survey of the practitioners' view of software test automation benefits and limitations. The results showed that the main benefits of test automation are reusability, repeatability and effort saved in test executions.These results support the superiority of test automation when several regressions testing rounds are needed. Furthermore, the practitioners indicate that automation improves test coverage, which means that automation has benefits even when excessive regression testing is not needed. Regarding the limitations, we found that automation bares a high initial cost in designing the test cases, buying a test automation tool,and training the staff. Non-surprisingly, the maintenance of automated test cases was also perceived as problematic. Also45% of the practitioners think that current test automation tools offer a poor fit for their needs. The limitations of test automation perceived by the practitioners should outline important future research directions.

"Expertus: A Generator Approach to Automate Performance Testing in IaaS Clouds"

We address some of these challenges in [5] through Expertus—a flexible code generation framework for automated performance testing of distributed applications in Infrastructure as a Service (IaaS) clouds. Expertus uses a multi-pass compiler approach and leverages template-driven code generation to modularly incorporate different software applications on IaaS clouds. Expertus automatically handles complex configuration dependencies of software applications and significantly reduces human errors associated with manual approaches for software configuration and testing. To date, Expertus has been used to study three distributed applications on five IaaS clouds with over 10,000 different hardware, software, and virtualization configurations. The flexibility and extensibility of Expertus and our own experience on using it shows that new clouds, applications, and software packages can easily be incorporated. More generally, our evaluation results show the feasibility, extensibility and usefulness of our approach in cloud testing. We have also identified several limitations of our tool and continue our research work to address them. Our final goal is to make Expertus available for public use. Our tool can significantly reduce the deployment and configuration cost of running distributed test scenarios in today's production cloud environments, which indicates great promise for the future.

"A Survey of Software Testing in the Cloud"

This paper [6] reports on a systematic survey of published results attained by the synergy of these two research fields. We provide an overview regarding main contributions, trends, gaps, opportunities, challenges and possible research directions. We provide a review of software testing over the cloud literature and categorize the body of work in the field. Cloud computing and software testing are likely to be active and popular research fields in the near future. Traditional software testing techniques are being adapted for the cloud. On the other hand, cloud computing itself is under constant evolution, continuously bringing in new opportunities and challenges for software testing research. In this paper, we have presented a classification of current research studies, identified gaps in the literature and investigated the correlation of software testing with different deployment models of cloud computing. Researchers in this field can benefit from the results in selecting their research direction and identifying new research opportunities for future work. We have observed that acceptance testing is an open research area for testing over the cloud. Test task management is also among the potential areas for further research. Finally, we believe that interoperability testing needs more emphasis as a research area to ensure reliable service composition by means of integrating services from different service delivery models. Our future research will be focusing on filling these gaps for achieving a comprehensive verification and validation model in cloud computing. We will specifically work on issues that facilitate cloud as a platform for acceptance and unit testing, and we will also focus on optimizing existing automated test tools for more proliferated use over the cloud.

"Path Coverage Testing in the Cloud"

The aim of this paper [7] is to present a new method for automated software esting as a cloud computing service. Unlike actual testing services, our goal is to provide a fully automated testing without human involvement from the service user's or provider's side. We use a program modeling allowing an easy symbolic execution and a scalable parallelization of the testing. Programs are divided into several parts assigned to different nodes (Workers) of the cloud. A particular node (Coordinator) allocates tasks to Workers and collects the final results. In this paper we have presented a new approach for path testing in the cloud. We have first defined the backward symbolic execution method performed to compute path formulas. Then we have proposed a distributed version of our solution allowing to take advantage of cloud infrastructures and to overcome the problem of path explosion. Our solution presents several advantages: It is a backward method: So instead of executing the entire program as in the other methods, it just captures the impact of each statement on the considered predicates. Our solution in the cloud does not require a great preparation, nor dynamic partitioning. No communication is required between workers and the amount of communication between the workers and the coordinator is minimal. Each worker is required to have just the information concerning the paths it computes.

"Emulation of Cloud-Scale Environments for Scalability Testing"

We use an emulation approach in [8], whereby endpoints are modelled and then executed in an emulation environment, which we call "Kaluta". The key aspect is to balance the modelling of the endpoint systems such that it is rich enough to "fool" an unmodified application-undertest into thinking that it is talking to real systems, but lightweight enough such that tens of thousands of instances of

model systems can be executed simultaneously in the emulation engine. We present an industry case study – CA IdentityMinderTM-as-a-
Service – to demonstrate the effectiveness of using emulation to validate the scalability of a cloud hosted application.We have shown that emulation is a feasible approach for large scale testing which fills a gap which is not easy to achieve with other tools. Software systems are becoming increasingly connected with other systems in their environment, and in a large enterprise this can involve connections to tens of thousands of other systems. It is important that software components are tested for the limits of their scalability before being deployed in production. With the increasing trend of cloud computing, software will be exposed to new scales. Giving developers the tools to measure performance at these extremes will be essential to delivering high quality cloudenabled software.

"Testing as a Service (TaaS) on Clouds"

In [9] Cloud computing leads an opportunity in offering testing as a service (TaaS) for SaaS, clouds, and cloud-based applications. This brings new business opportunities, challenges, and demands in innovative service models, testing techniques, QoS standards, and requirements. This paper provides a comprehensive tutorial on testing as a service in a cloud environment. It answers the common questions raised by engineers and managers, and provides clear conceptual discussions about testing as a service (TaaS), including its scope, objectives, motivations and values, distinct features, required techniques, as well as testing environments. It not only presents a classification of different types of testing services in TaaS, but also offers a clear comparative view and perspectives between conventional software testing service and cloud-based testing as a service. In addition, it examines underlying issues, challenges, and emergent needs.Testing as a service (TaaS) is becoming a hot research topic in both cloud computing and software engineering research communities. As the advance of cloud technology and testing as services, more research results are needed to address the open issues and challenges on TaaS infrastructures, techniques, and automation solutions. More innovative testing techniques and solutions, and QoS standards are needed to support on-demand testing services in a scalable cloud infrastructure, for example, SaaS testing adequacy and standards for multi-tenancy. This paper provides a comprehensive review and in-depth tutorial on cloud-based TaaS for SaaS applications. It offers essential tutorial concepts on TaaS definitions, scope, motivations and benefits, as well as classified testing services and test environments. In addition, it discusses in details about TaaS requirements, distinct features, issues, challenges, and needs. Moreover, it highlights the major differences between conventional software testing and cloud-based TaaS.

"Exploiting Cloud Computing for enabling distributed testing of complex systems: the SELEX-SI roadmap"

In [10] Cloud computing represents the most promising way for allowing the seamless access to distributed testbed from any site and for allowing remote testing activities, either at system and integration level. A cloud based infrastructure in charge of connecting all the company premises would allow to run testing experiments from anywhere and, more important, the possibility of reproducing distributed systems deployment scenarios to run integration testing in a pre-installation phase thus dramatically reducing company costs. This paper aims to
describe the cloud research roadmap that SELEX-SI has been designing, the architectural design of the cloud infrastructure and the real ROI that the company expect from introducing such an innovation into the traditional software production process.To conclude, the results gained and illustrated in this work show that KVM is a valuable Open Source alternative to build up a CC environment against both the performance and application requirements exposed by SELEX-SI scenarios. This paves the way to the actual development of a CC platform aimed at supporting the company V&V processes and optimizing costs.

"The Application and Development of Software Testing in Cloud Computing Environment"

Paper [11] Software testing is an important part of software engineering and it's very important to enhance software quality. In the cloud computing environment, it is an unchangeable trend that the traditional software testing turns to "cloud testing". The article discusses the advantages processes and procedures of software testing and cloud computing . Based on those procedures discussed, the intersection between software testing and cloud computing is pointed out. At last, the advantages and development trend of cloud testing is analyzed.

Cloud computing is the next key point of information technology in the cloud environment and the applications of information technology will be changed greatly. The effective combination of the software testing and cloud computing technology is not only the innovation of software testing model, but also extension of the cloud computing in the application field. This paper introduces some knowledge of the cloud computing and software testing , expounds the advantages and developing trend of software testing in the cloud computing environment, and provides certain reference for diversifying the software testing method and developing the cloud computing applications.

" Mechanism for On Demand Tag-Based Software Testing in Virtualized Environments"

In this paper [12] we provide a generic way to manage the tests and provide an efficient mechanism to run the tests selectively. In our approach we make use of well-known build management tool called Jenkins for running the tests on-demand. One unique benefit of our approach is that the input is a single comma-separated-value (CSV) file and it is very easy to add/modify existing tests. The tests

are tagged using well known keywords (viz. database-layer, configuration, regression). When some particular tests need to be run, the user enters 'Tag' in the job parameter and testsuite will be generated dynamically. In this paper we also describe an end-to-end test management system that supports running selective tests with help of jobs created in Jenkins environment. The proposed model of Tests execution is highly useful in high demanding environments like agile software development model, Test driven development model where feature development is many times faster than traditional water fall model. The approach suggested in this paper makes optimum use of cloud resources by distributing the jobs, so this can be utilized specially for testing under virtualized environment. The proposed model can be leveraged for model-based testing (MBT) also called as Mind-mapping tools which naturally extend Tag-based testing. One more interesting enhancement which can be done in cloud environment is to use identity based encryption techniques (IDE) for user authentication. The test management system when deployed on cloud need to be secured from unauthenticated access and traditional encryption techniques like PKI doesn't prevent from unauthorized access. So user authentication and authorization part can be implemented using IDE techniques such as key-policy attribute based encryption (KP-ABE) and cipher-text-policy attribute based encryption (CP-ABE).

"Migrating Load Testing to the Cloud: A Case Study"

In this paper [13] , we focus on migrating conventional load testing tools to the cloud, for which the two significant issues are about multitenancy and load simulating resource management.We propose a four layer model for cloud-based load testing, along with the approach of test request admission control and scheduling to solve these issues. We carried out a concrete case study on our proposed approach and made the efficiency of cloud-based load testing shown successfully by two contrast experiments. In this paper, we propose some techniques of migrating load testing software to the cloud. We present the challenges for load testing to be a cloud service, including requirements for multi-tenancy and the load simulating resource management issue. In our case study of migrating Bench4Q tool to the cloud, a four layer cloud-based load testing model (portal Layer, business Layer, test infrastructure Layer and IaaS Layer) is introduced to meet these requirements. Also, an innovation admission control and scheduling algorithm taking use of the distributed Agent component and the technology of virtualization is proposed to solve the load simulating resource management issue. In the future, we are going to add a multi-protocol support, such as DNS, TCP and FTP. Also, testing for Web service is supposed to be available. We are thinking of reimplementing the Script Recorder to be an automatic one
by analyzing the workflow of Web applications. Moreover, we are going to put the cloud-based Bench4Q platform to the public cloud after improving its robustness.

"A Cloud-Based TaaS Infrastructure with Tools for SaaS Validation, Performance and Scalability Evaluation"

This paper [14] proposes a testingas- service (TaaS) infrastructure and reports a cloud-based Taas environment with tools (known as CTaaS) developed to meet theneeds in SaaS testing, performance and scalability evaluation. The paper presents TaaS concepts and CTaaS, including their infrastructure, design and implementation. In addition, the paper demonstrates the application results of our previously proposed graphic models and metrics for SaaS performance and scalability evaluation. Moreover, the paper reports one case study for a selected SaaS (OrangeHRM) using the developed TaaS environment. Although there are numerous papers discussing testing services for software applications, only a few of them focus on special features, issues, and needs on cloud-based TaaS. This paper first presents our vision and distinct features of TaaS in cloud computing, and then proposes an infrastructure of TaaS in cloud computing. This paper presents its initial prototype and application experiments. Currently, we are extending CTaaS by adding a SaaS tracking server (known as SaaS-Watcher) into the infrastructure to support different types of SaaS program tracking.The future extension of this research includes two folds. The first is to work on multitenancy testing service for SaaS in cloud-based TaaS. The next is to provide continuous testing techniques and tools for SaaS vendors to support testing services.

"SaaS Testing on Clouds – Issues, Challenges, and Needs"

This paper [15] provides a tutorial to discuss SaaS testing, including its concepts, focuses and objective, test process, test environments, and requirements. Moreover, the paper discusses the special SaaS features, and examines the related issues and challenges and needs in SaaS testing. With the advance of cloud computing and SaaS engineering, people begin to realize the importance of SaaS testing, and have encounter many open issues and challenges. This paper provides a tutorial to cover the different perspectives of SaaS testing at the conceptual level. It highlights special testing features, challenges, and needs in SaaS testing and its future research and practices. We believe there is an urgent need in the near future to develop new
test standards, techniques, platforms, solutions for SaaS testing and automation.

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Wireless Node Control and Monitoring System for Emergency Ad-Hoc Networks

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Abstract— In the recent times it has been seen that wireless network is established with the help of nodes and used them as a monitoring system. But the problem arises that the traffic each node handles is of great extent. Also the security and efficiency in working in emergency situations is very low. It has a limitation over worldwide access everywhere due to non-standardized communication between multiple mobile service provider in the emergency conditions .Hence we are proposing a system for wireless modem control and statistics monitoring in such networks. In this the different nodes will be the intermediate between the user and the mobile service provider. So In this model a user will send its data through a message generator node which will further carried by data forwarder node and at last to the GSM node. A sleep scheduling algorithm is used for efficient energy consumption and avoiding congestion and collision of the messages. So this paper discusses about the technology used for fruitful, reliable and secured communication and monitoring in emergency ad hoc networks.

Keywords— Sleep Scheduling Algorithm, Advanced Encryption Standard(AES), Congestion Control, Collision control, Data Forwarder Node, Message Generator Node , GSM Node.

I. INTRODUCTION

Wireless ad hoc networks have long been proposed to enable communication in the absence of any infrastructure terminals, effectively infrastructure offering a truly mobile experience to the users. Due to their broad applicability in various settings (including Sensor and vehicular networks), a plethora of data forwarding/ dissemination strategies have been conceived to meet the needs of the various different services envisioned. However, while highly efficient communication strategies have been designed for popular networking scenarios (with sensor networks being the prevalent example) little work has been documented for the study of ad hoc networks to support public safety solutions. Noticeably, unlike traditional ad hoc networks where each source node knows apriority the set of destination nodes to whom to deliver data to, in emergency response networks such an assumption is not valid. The traditional problems of routing and congestion control must now be jointly optimized with control of and allocation rate at the physical layer. Moreover, the inherent distributed behavior of wireless networks dictates that distributed network algorithms requiring less communication overhead can be developed to implement the optimization. In this paper, we present a unified analytical framework within which power control, congestion control and collision control for wireless networks can be optimized in an integrated and coherent manner. These algorithms work to adapt the changes in network topology and traffic patterns. The algorithm shows superior performance relative to existing wireless network protocols ,system for monitoring and controlling wireless node remotely also implementing cluster head as middle ware between wireless network and user application using web technology

II. RELATED WORK

There are various technologies which have been used for monitoring and controlling of wireless sensor network. But the problem is

that every technology are used to show the result on simulation. The analysis of network optimization began with the study of data dissemination. An efficient data spreading method is discussed in paper [1] where a explore and exploit strategy is purposefully envisioned to stringent requirement for efficient data dissemination in emergency ad hoc networks. Paper [2] describes about an efficient data collection method which is used to improve data receiving efficiency, to protect data and to avoid malicious data selective forwarding in large scale mobile monitoring application. A integrated mechanism using advertisement from the nodes with good connectivity and reduces the traffic for sharing information in paper[3].Paper[4] describes about the monitoring and controlling of the wireless sensor network. Here the node will be the inter ware between the user and the mobile service provider. Paper [5] has explained different network algorithms used for power control, routing and congestion control for wireless network. Paper [6] describes about a QWB algorithm which seeks an active queue management for optimal for optimal target detection. There methods has proved better congestion control which can meet the QOS need of the wireless transmission .In paper [7], author controls the data sending rate of the sender by finding the available bandwidth. The proposed approach is simulated in network simulator [NS-2]. Paper [8], tells about the protection of nodes and guarantees network connectivity and desired converge level. The method enables each node to decide that it is eligible to turn off to save energy to prevent data sharing with its neighbors .In paper [9], the author proposed a design for sleep scheduling that minimizes the expected cost value and energy consumption. In paper [10], the reliability of the network is increased by hop by hop method. The method which the author used increases the reliability without adding control overhead thus increasing the good put as well. Simulation result shows the proposed technique is viable solution for secure inter node communication network and secure connection for broadcasting messages.

III.PROPOSED MODEL

Message broadcast node, data forwarder node and the SMS forwarder node (GSM node) are designed. Here the message generator will have a display and keyboard attached to it. The message generator node in particular will have many codes encoded into it. A microcontroller will be programmed such that after pushing the button again and again, each time it will generate different codes as per need. These codes will be seen on the display screen. The message generate will be forwarded to the data forwarder node. [1]- [3]. Data forwarder node will be a simple node compromising of the basic node components. It will just forward the message received by them to the next data forwarder node or the GSM node. The GSM node will be located on the mobile base station from where it will send a message to the required mobile handset.

A program will be written to send the particular message to the next node, also at the GSM node or the SMS forwarder node a program will be made to forward a message. The problems like congestion control [5]-[7], power optimization and collision avoidance arises. For them a specialized algorithm is written down known as the sleep scheduling algorithm [8]-[9], which can control power usage and the collision among the data messages. Related software will be use used for dumping the code into the microcontroller.

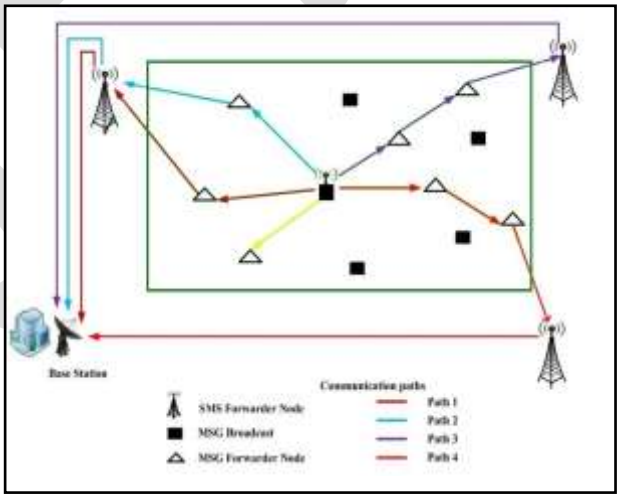

Fig 1: Proposed Work

Phases/Modules involved in the development system are:

i. Built hardware to send and receive messages and control the device called as node.

ii. Nodes will of three types (i) Message generator node (ii) data forwarder node (iii) GSM node or the SMS forwarder node.

iii. Build transceiver module for data transfer between multiple data forwarder nodes. [1]
iv. Write embedded software program to make the message forwarder node to forward the message. [2]- [3].
v. Write a sleep scheduling algorithm in network simulator-2[NS-2] for power optimization and collision control. [5]- [10]
vi. Write another embedded software program for the GSM node to generate/ forward the SMS to required mobile Handset. [4].

Sleep Scheduling Algorithm:

For a wireless networks, the devices operating on battery try to pursue the energy efficiency heuristically by reducing the energy they consumed, while maintaining acceptable performance of certain tasks. However, for multi-hop routing, which is typical for ad hoc networks, this is not the optimal strategy. It is obvious that using the power consumption is not a good enough metric for energy efficiency. Actually, energy efficiency can be measured by the duration of the time over which the network can maintain a certain performance level, which is usually called as the network lifetime.

Recent technological advances have enabled the emergence of tiny, battery-powered modules with limited on-board signal processing and wireless communication capabilities. Wireless networks may be deployed for a wide variety of applications. A typical wireless network may contain thousands of small module. If these modules are managed by the base station directly, communication overhead, management delay, and management complexity could make such a network less responsive and less energy efficient.

Measurements show that idle listening consumes a significant amount of energy. An effective approach to conserve energy is to put the radio to sleep during idle times and wake it up right before message transmission /reception .This requires precise synchronization between the sender and the receiver, so that they can wake up. In this paper, sleep scheduling is tested by NS-2 and practically implemented on the hardware. Practical implementation is done by programing in the microcontroller. Once the node goes in the sleep mode, it is made active by just waking it up. Awaking of a node is done by a wake up bit. Until and unless a wakeup bit is not introduced, the desired node will not be in active mode.
Implementation of sleep scheduling algorithm introduces two advantages to the project as it avoids congestion and collision both.

Congestion control:

When the message generator node transmits its messages to all data forwarder node then it is of great possibility that the messages get repeated as the network is connected in mesh fashion. So making some of the nodes to sleep reduces repetition of messages thus helping in reduction of traffic at each node. Hence avoids congestion.

Collision control:

Sleep scheduling reduces the repetition of messages. Less number of messages introduces less data traffic towards a node. This situation can avoid collision between messages.

A. Message generator node:

The message is generated by message generator node. It compromises of RF transceiver a microcontroller, a keyboard and a display. When the user wants to send a message , it send it by typing a message on the keyboard and transmit it. The message sent is in encrypted form. Here the encryption method used is AES. The message is being sent to the data forwarder node for further transmission.

B. Data forwarder node:

The message when sent by the message generator node it is then received by the data forwarder node. This node is more in number in this particular network. Data forwarder node compromises of a transceiver a power supply and a microcontroller. Data forwarder node forwarders the message to the other nodes of the same type and also to the GSM node for further broadcasting.

C. GSM node:

The message received from the data forwarder is received by the GSM node. It is placed at the top of the mobile tower away from the desired area. It consist of a GSM module, Display screen, a transceiver and a micro-controller. It converts the data send to the text message which is to be sent to a mobile phone. GSM node sends the message to the headquarter.

Encryption method:

The method used in this paper is AES (Advanced Encryption Standard). AES is a cryptographic algorithm that is used to safeguard electronic data. Precisely, AES is an iterative symmetric key block cipher that uses keys of128, 192, 256 bits, and encrypts and decrypts in blocks of 128 bits (16 bytes). It is not like public ciphers, which uses pair of keys, symmetric key ciphers uses the single key for encryption and decryption data. Encrypted data which is returned by block ciphers have the equal number of bits as the input data. Iterative ciphers use a loop structure that repeatedly does performs combinations and permutations with substitutions of the input data.

Power Supply:

As the modules are situated in the emergency areas, hence a permanent and continuous supply of power to the installed modules is must. So in this paper, a dual power supply is designed such that the each module will get power by a chargeable battery. And if time comes that the battery power is exhausted then the node will take its power from the solar panel. The solar panel along with supplying power to the module will also charge the battery simultaneously. After the battery is completely charged, the solar power is discontinued and the module will get its power from the chargeable battery.

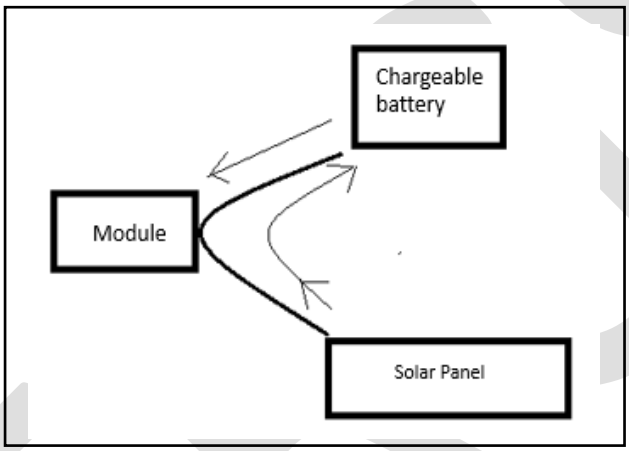

Fig: Power Supply

Here, transceivers are used for communication between multiple nodes. A transceiver is a device having both a receiver and transmitter are combined and share common circuitry on the same board. The RF Transceiver uses RF modules for high speed data transmission.

CONCLUSION

So this paper described about the technology used for fruitful, reliable and secured communication and monitoring in emergency ad hoc networks. The platform developed has been generic and application domain independent and enables anywhere, anytime connectivity to field deployed wireless nodes. The future work will be hardware design of the proposed architecture.

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A Survey on Location Management Strategies in Cellular Networks

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Abstract— Now-a-days wireless networks have become very popular as they support mobility. Mobile users can access services irrespective of their locations. Wireless networks use cellular architecture for better efficiency. To support mobility the networks must have some mechanism to find terminal's current position. Location management in cellular network is related to keeping track of mobile terminals. It consists of two operations: Location updating and paging. There is a cost associated with each operation and total location management cost is sum of update cost and paging cost. There is always a trade-off between the two costs, so it is required to define a strategy which can minimize total location management cost. The paper reviews different location update and paging strategies.

Keywords— Location management, cellular network, location management cost, location updating, paging, location areas, reporting centers.

INTRODUCTION

Today mobility has become very important. There is tremendous growth in the number of people having access to mobile phones. So, wireless communication and wireless networks have become very popular as they support mobility. They provide a wide range of services like voice calls, video calls, data and many others to the users irrespective of their locations. To support such a large number of users and efficiently utilize wireless resources, wireless networks use cellular architecture. In cellular architecture whole coverage area is divided into a number of sub areas. Each sub area is called a cell. For each cell there is a fixed base station. Terminals can access network via base station of the cell in which it is currently residing. As the terminals are free to move anywhere from one cell to another, to provide services to a terminal network must have information about its current location i.e. the cell where the terminal is currently residing. So suppose a call arrives for a terminal it can be forwarded to the base station and it can provide service to the terminal.

Thus, location management [8, 11] is an important issue in cellular networks. It consists of two operations: location updating and paging. In update operation, when a terminal moves from one location to another it needs to inform the network about the change and in paging operation, when a terminal require any service, network will page a number of cells depending upon the last update operation, so that it can find the exact location or cell of the terminal and provide required services.

LOCATION MANAGEMENT COST

Each of the location update and paging operations has a cost associated with it [8, 11]. Total location management cost is the sum of both the costs. Suppose update operation is performed more frequently, then update cost will be more. At the same time network will have better knowledge about the terminal so paging requires less effort and paging cost will be lower. There are two extremes: Always-Update and Never-Update. In always update, when terminal moves from one cell to another location update is performed. So, update cost will be high but there is no paging cost because network always knows current location of each terminal. While in never update, terminal never performs location update. Network will have to page all cells in the network to find out exact location of the required terminal. Thus update cost is negligible while paging cost is very high. Thus there is always a trade-off between update cost and paging cost. So, some strategy is required which can balance both the costs and in turn minimize the total cost.

LOCATION MANAGEMENT STRATEGIES

Location update schemes can be classified as global and local [8]. In global scheme, all terminals are required to perform update operations at same set of cells and it is based on aggregate mobility pattern of all terminals while in local schemes each terminal is free to decide when and where to perform update operation. A local scheme is also called per user based scheme and it is based on mobility of each terminal. In Another way, location update schemes can be categorized as static and dynamic [8, 9]. In static scheme,

terminal is required to perform update operation at predetermined set of cells irrespective of its mobility. In dynamic update each terminal can perform update operation at any cell depending upon its mobility.

Location areas [12] and reporting centers [11] schemes are global and static. Time-based, distance-based and movement-based schemes [8, 15] are the example of per user based dynamic schemes. A global scheme can be dynamic, like time-varying location areas. Also per user based scheme can be static, e.g. individualized location areas.

A. LOCATION AREAS

The approach is global and static. In Location Area [12], the whole coverage area is divided into number of sub areas, called location area. Each location area consists of a number of contiguous cells. Update operation is performed when terminal crosses location area boundary. Here every cell broadcasts location area identity (ID) of the location area to which it belongs. So, every terminal can determine its current location area and check where it has moved to a new location area or not by comparing its own location area ID with the broadcast one. A terminal performs location update when terminal moves from one cell to another cell which is in a different location area. Suppose there is a service area with three location areas as shown in Figure 1. If a terminal moves from cell B to cell D update is required. In paging, all the cells of the location area, which was last updated by the terminal, are required to be paged.

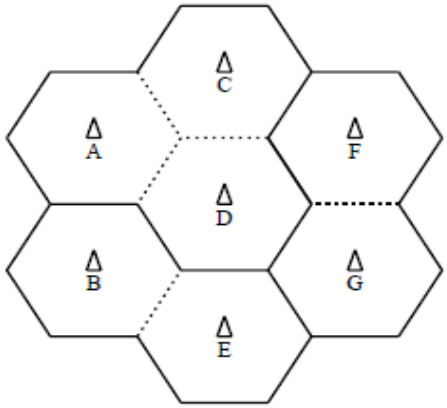

Figure 1: A Service Area with Three Location Areas [7]

The whole service area should be divided in such a way that both the location update cost and paging cost are minimized. With the size of network, it becomes computationally difficult to check for every possible solution and find the best one is an NP-complete problem.

Javid Taheri, Albert Y. Zomaya [3] proposed simulated annealing method to identify optimal location area configuration so that total cost can be minimized. Simulated annealing is based on annealing process of physics. This method can be applied to many optimization problems. This paper applies the same method. Here some parameters are required to be defined carefully for better result. One is initial solution. Here method used is: First a cell is selected randomly, and LA is formed with this cell then neighbor of the cell is added to the LA with probability 0.5. This process is repeated until all cells are not assigned to a LA. Another parameter is modifying a solution. Here approach used is: Any random boundary cell is selected, then any neighbor cell of the selected cell which does not belong to the same LA is selected and the randomly selected boundary cell is moved to the LA area of the neighbor cell selected. This method considers mobility weight and call-arrival weight of cells to identify optimal configuration and tries to minimize total location management cost. The experimental results on different network configurations show that the method creates LA configuration such that total location management cost is much less as compared to always update and never update strategies.

Ki-Dong Kim, Sung Soo Kim, Eui-Seok Byeon, Hwan Kim V. Mani, Jae-Ki Moon and Si-Hwan Jang [4] proposed a method that uses simulated annealing method with a new parameter called compact index (CI) to find optimal configuration of location areas. The given method uses compact index to select starting solution and neighbor solution. The compact index is given by the ratio of number of adjacent boundaries and the total number of boundaries in the given network. The value of compact index varies between 0 and 1. Now, suppose we have two randomly generated solutions and we need two determine which solution to use as initial solution which could lead to better final solution. For this the given method calculates compact index of the two solutions and chose the solution with minimum compact index. In the same way the compact index is used to determine whether to accept or reject the new solution generated. If the compact index of new solution is less than the current solution then it is accepted as a current solution otherwise the solution is rejected. These methods provide cost efficient location area configuration. Also evolutionary algorithms like genetic algorithm, taboo search, ant colony optimization etc. algorithm have been proposed [14, 16] to find optimal configuration.

B. REPORTING CENTERS

Reporting cell scheme is also global and static. In reporting cell approach, certain cells are selected from all cells and these cells are considered as reporting cells. Other cells are called non reporting cells. Here base station of each cell broadcasts whether it is a reporting cell or not so that mobile terminal can determine whether it is in a reporting cell or not.

Vicinity of every reporting cell includes those non-reporting cells that can be reached from the reporting cell without crossing any other reporting cell. Also each cell is in its own vicinity. Vicinity of a non-reporting cell is the maximum of vicinity values of all the reporting cells to which the non-reporting cell belongs. Figure 2 shows a service area with four reporting centers B, C, D and G. Vicinity of D is A, E, F and D.

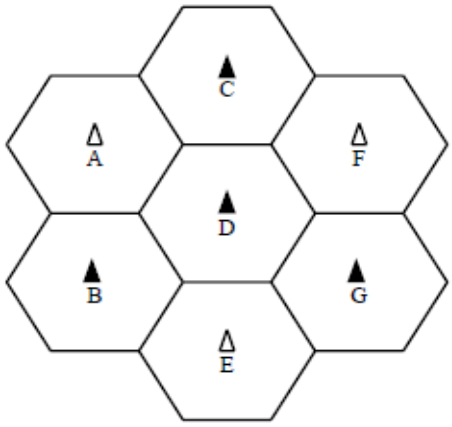

Figure 2: A Service area with Four Reporting Cells [7]

In this approach update is performed when a terminal enters a new reporting cell. When network has to find a terminals current location it will page all cells within the vicinity of reporting that was last reported by the terminal through update operation.

Here some way is required to identify optimal reporting cell configuration and determine set of reporting cells such that total location management cost is minimized. As the size of network increases, it becomes difficult to try out all solutions and select the best and it is an NP-complete problem.

Falguni Mehta, Prashant Swadas [5] proposed simulated annealing approach to select reporting cells in order to minimize the total cost. It uses generic simulated annealing method which is modified to solve the given problem of reporting cells. Here important parameters are initial solution, generate new solution and initial temperatures are considered. To generate initial solution the methods uses mobility and call-arrival weight of cell. If mobility weight is less than call-arrival weight than the cell considered as reporting cell otherwise it is non-reporting cell. To modify solution, n out of total N is selected randomly and their status are randomly selected. To select initial temperature, Z solutions are selected randomly and average of cost and average of cost difference is calculated which are used to calculate initial temperature. The simulation result shows that the given approach produces much better result than always update and never update strategies.

C. TIME-BASED LOCATION UPDATE

In this scheme [8, 15] every terminal updates its location periodically, say every t unit of time. Whenever system requires locating a terminal first it will page the cell last reported by terminal, let the cell is c. Next it will page cell c+i and c-i, here ring topology is considered. Here the cells where to perform update are not predetermined so the scheme is dynamic. Also value of t can be determined on individual basis. The scheme is very easy to implement but each terminal performs update irrespective of its mobility or call arrival rate so the performance is not that good as other schemes. It is inefficient when terminal has travelled a very small distance or not changed its position at all from last updated location.

D. MOVEMENT-BASED LOCATION UPDATE

In this scheme [8, 15] basic idea is to perform update when a terminal crosses certain number of boundaries between cells, say m. For this a counter may be used which is increased by 1 as terminal crosses a boundary. When it reaches m, update is performed and counter is reset to 0. Here there is no predetermined set of cells so the method is dynamic and value of m can be determined on the basis of individual's mobility. When a call arrives system will page the cells at distance m from last reported call. It is easy to

implement. Suppose given threshold value is 2. So, terminal will perform update operation when it crosses two boundaries. Here paging requires searching in neighbor cells only.

E. DISTANCE-BASED LOCATION UPDATE

In this scheme [8, 15] location update is performed when a terminal covers a certain distance, say d from last reported cell. Value of d can be determined on individual basis using mobility pattern. In paging operation network will page all cells within the distance d from the last reported cell. The method may perform better than time or movement based but difficult to implement. Here every user is required to keep information about its last updated location and also some coordinate system so that it can calculate the distance between current and last updated location.

F. PROFILE-BASED LOCATION UPDATE

In this scheme [15, 18] network uses each individual user's mobility pattern for location update and paging. The network and terminal maintains information about locations where a terminal is more likely to be found based on history of the terminal. If user moves according to the pattern no location update is required. This method can efficiently reduce the total cost but it is difficult to implement.

Alok Sahelay, Ramratan Ahirwal, and Y. K. Jain [1] proposed a method which uses a fact that user activities are normally fixed at particular location and for particular time period. This scheme uses a special table called mobility data table (MDT), which is stored at visitor location register (VLR). This table stores information about user's locations for every time slots and this information are used to find the user's current location.

Here time is divided into slots of one hour. Every mobile terminal has cache memory. Mobile terminal maintains an MDT table and at the starting of each time slot it enters its current cell ID in MDT. Then the terminal can send this MDT to VLR database whenever channel is idle e.g. at midnight. This control signal is transferred when channel is idle and is not being used by actual data transmission, otherwise location management cost could increase. Initially network has no information about user mobility so when call arrives whole area is paged as per convention method. When network finds the terminal the cell ID is stored in MDT at corresponding time interval. When next time call arrives and network has non empty MDT for that time interval, network first pages the cells present in MDT in given order. If terminal is found at cell more than once then entry in MDT is swapped with leftmost cell and if terminal is not found in the cells then conventional paging is used. This method reduces the paging cost significantly.

PAGING SCHEMES

After location update, network has to determine exact location of a terminal to forward call intended for it. So, it requires paging a number of cells. Here the cells to be paged i.e. paging area should be small to reduce cost associated with paging.

A. SIMULTANEOUS PAGING

The scheme [15, 18] is also known as blanket paging scheme. Here whenever paging is to be performed all cells in the location area when user was last reported, are paged simultaneously. This does not require any extra information but it involves paging a large area. So this method is useful if call rates are low.

B. SEQUENTIAL PAGING

In sequential paging [15, 18] all cells are not required to be paged. It divides the location area into paging areas and each paging area is searched one by one. As extreme case, each cell forms a paging area which is to be paged one by one according to the probability of finding user in every cell, but it may involve large delays, so a paging area size is used more than one. Here determining size of paging areas and order of paging are crucial tasks.

Madhubanti Maitra, Partha S. Bhattacharjee, Debashis Saha and Amitava Mukherjee [17] proposed a rule based paging scheme which with movement based location update which efficiently reduces paging cost and total location management cost.
Pragyan Acharya, Sudhansu Sekhar Singh [2] proposed a different approach called bloom filtering for paging operation. It uses two components: Bloom Filter Identity Vector (BFIV) for each terminal and Cell Vector for each cell. Here every terminal is assigned an n-bit identity vector called BFIV. Each terminal periodically sends the identity vector to the cell in which it is currently residing. This is performed periodically. On the other side each base station receives BFID of different terminals periodically and maintains combination of these BFIDs as cell vector.

When location of terminal is to found the BFID of the terminal and last updated Cell Vector of each cell are used. Suppose a call arrives for a terminal, to find out its current cell bit by bit comparison of BFID of the terminal and Cell Vector of each cell is performed. Suppose i^{th} bit of BFID is 1. If the i^{th} bit of cell vector is also 1 it shows that the cell contains at least one terminal with BFID having 1 at i^{th} bit and so the cell may have the required terminal. If the i^{th} bit of cell vector is 0 it shows that all terminals in the cell are having BFIDs with 0 values at i^{th} bit. So that cell is not required to be paged. Mathematically a cell is paged if bit by bit

multiplication of BFID and Cell Vector is same as BFID of terminal. Experimental results show that compared to sequential and simultaneous paging, paging cost incurred in the scheme is much less. Also the method doesn't involve any overhead related to storage and processing requirement of terminal.

CONCLUSION

Because of the mobility requirement in today's world, location management in wireless networks has become an important and interesting area of research. The paper reviews different location update and paging related schemes which are the two operations involved in location management in cellular networks. Various static and dynamic update strategies and many paging strategies have been proposed in past years with the aim of reducing total location management cost, each having its advantages and disadvantages. Taking into consideration various aspects like time, feasibility, complexity, quality of result etc. research in this direction will remain active and further research can be carried out with new and improved techniques.

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Design and Fabrication of Pedal Powered Washing Machine

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Abstract— The PADDEL OPERATED WASHING MACHINE is a project, which is under taken to solve the problem of electric supply of people. At village, to run washing machine source of power is electricity. In India most of village is suffering from shortage of electricity. So to overcome above problem we select the washing machine, which is operated manually. It required no power supply or diesel supply. This project is low weight & portable can be easily transported. We use simple cycling mechanism to run the washing machine shaft.

Keywords— Pedal Power, Washing machine, Design, Fabrication

INTRODUCTION

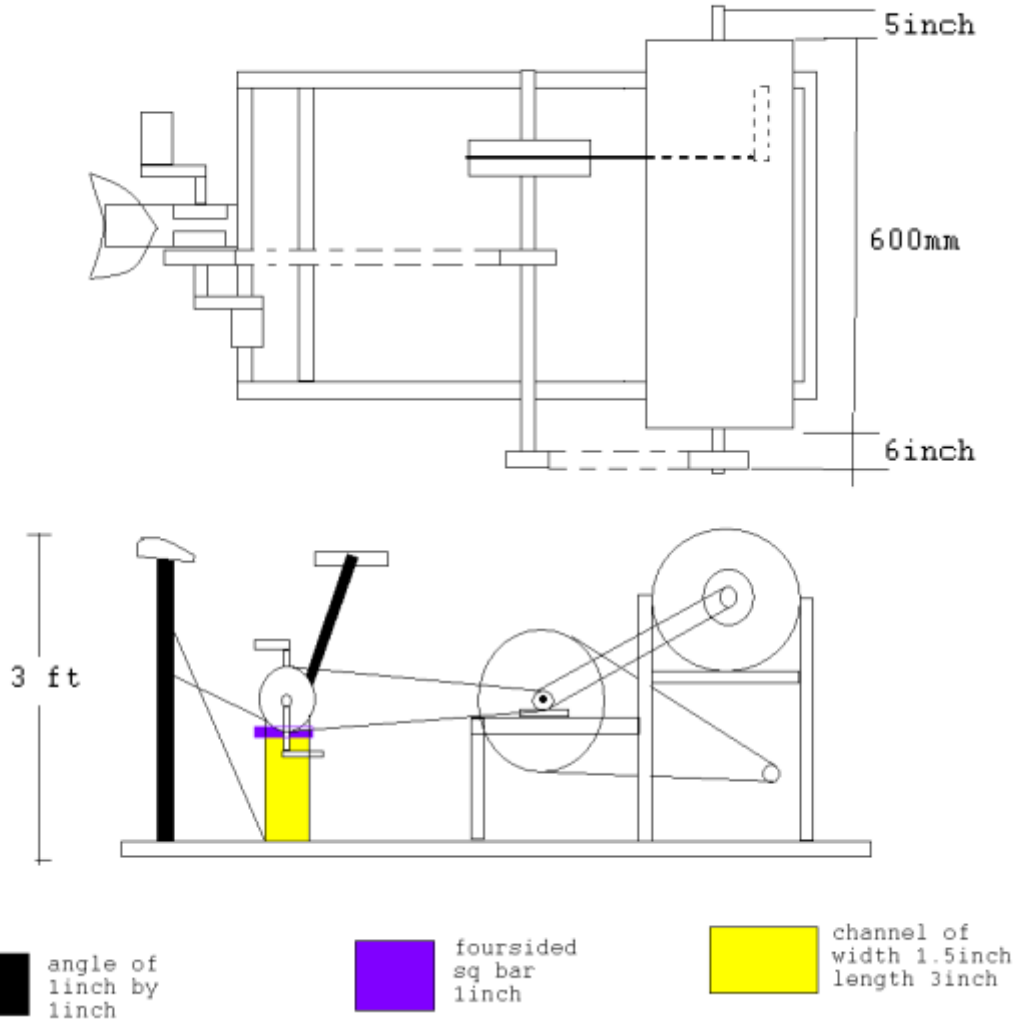
A **washing machine**, **clothes washer**, or simply **washer**, is a machine designed to wash laundry, such as clothing, towels and sheets. The term is mostly applied only to machines that use water as the cleaning solution, as opposed to dry cleaning (which uses alternative cleaning fluids, and is performed by specialist businesses) or even ultrasonic cleaners. All washer machines work by using mechanical energy, thermal energy, and chemical action. Mechanical energy is imparted to the clothes load by the rotation of the agitator in top loaders, or by the tumbling action of the drum in front loaders. Thermal energy is supplied by the temperature of the wash bath. The spin speed in these machines can vary from 500 to 1600rpm.

The machine "PADDEL **OPERATED WASHING MACHINE**" is innovative to manufacture and it requires skill to manufacture. The parts can be manufacture in our college. Its subcomponent price is also less, but its manufacturing requires sort of skill. This project gives us knowledge, experience skill and new ideas of manufacturing. It is a working project and having guarantee of success. This project can be made in less time; hence we have selected this project.

Principle

The machine entitled " PADDEL OPERATED WASHING MACHINE" Works on the principle of rotating impeller by paddling and causes to washing cloths. The basic idea is to use a stationary bicycle stand as the power source, and use an assembly of chain drive to connect it to an old, salvaged washing machine tub.

Project Setup



Operating Procedure

In paddle rotates the rotor of washing machine. A two set of chain is fixed on washing machine shaft is rotated by means of peddling. The paddle sprocket is attached with heavy flywheel which store energy and transmit it when required.

There are several benefits to this system, in addition to the electricity savings. The grey water from this washing can be recycled for filling toilet tanks or for watering plants. It puts moisture into the air, which is especially good in the wintertime. It also provides an aerobic workout for the rider, which also puts heat (and some additional moisture) into the air, which is also a good thing in the wintertime.

Selected Materials

SR.NO.	NAME OF THE COMPONENT	specification	MATERIAL	qty
1	ANGLE FRAME	40 X40 X4	MS	01
2	CHAIN	½ INCH PITCH	CARBON STEEL	2
3	SPROKET	½ INCH PITCH	MS	4 NOS
4	SHAFT	20 MM DIA	M.S.	4 NOS
5	BEARINGS –	P 204	CI	8
5	WASH TUB	300 X 350 X 700 MM	MS	1
6	FLYWHEEL	350 MM DIA	MS	1
7	HANDLE		MS	1
8	PADDLE			1
9	GEAR	260 DIA	M S	2
10	GEAR BOX	1:1	AL	1
11	LOB	8 INCH DIA	PVC	2
12	SEAT			1

GENERAL ASSUMPTION IN DESIGN OF MACHINE

- Output rpm of washing machine is 800 rpm
- Load of person sitting on machine = 100 Kg = 100 X 9.81 =980 = 1000 N
- Normal paddling RPM = 100 rpm
- Force applied at paddling = 50 kg = 5 x 9.81 = 49.05 = 50 N

As we know a normal person can apply 100 rpm in normal working condition. As per this assumption we design transmission of system

$$\frac{N_{\text{big sprocket}}}{N_{\text{small sprocket}}} = \frac{D_{\text{small sprocket}}}{D_{\text{big sprocket}}}$$

$$\frac{100}{x} = \frac{80}{170}$$

$$x = \frac{100 \times 170}{80}$$

$$x = 212 \text{ rpm}$$

N small sprocket = 212 rpm

The flywheel is rigidly fixed with small sprocket shaft flywheel increase rpm of wash drum so resultant rpm of wash drum is magnify. The resultant rpm of washing mc is

N washing machine shaft = 800 rpm

As design washing machine rpm is sufficient to run the machine .

Rpm of dynamo

$$\frac{N_{\text{fly wheel}}}{N_{\text{dynamo}}} = \frac{D_{\text{dynamo}}}{D_{\text{flywheel}}}$$

$$\frac{212}{x} = \frac{20}{410}$$

$$x = \frac{212 \times 410}{20}$$

$$x = 4346 \text{ rpm}$$

N dynamo = 4346 rpm

As design washing machine rpm dynamo rpm is sufficient to run the machine and power generation.

Conclusion

The machine must be inexpensive and easy to build if it will be adopted into the community. We recognized this need and designed the machine from the start with low cost in mind. The machine will only contain parts that are readily available in rural areas. This eliminates the need to order or import components just for the washing machine. The machine also uses bicycle parts for all the precision parts. These parts are very inexpensive because rural areas have a surplus of unused bicycle parts. The pedal-powered washing machine is quite different from the community's current method of washing clothes; the community may be reluctant to try the new machine. To help encourage the adoption of the washing machine, we will run multiple trials with local women so we can adjust the design to meet their needs. We will run the trial periods with groups like the women's cooperative who are already familiar with pedal powered machines; they have already proved they are willing to try new technologies. If women in the cooperative accept and use the machines, then they will serve as spokes-people for the new machine in their local community. Their support will greatly increase the credibility of the machine so that local people will be willing to try it. We achieved what we desired i.e. to build a manually driven pedal powered low cost washing machine using locally available materials and performing necessary function of washing and rinsing with ease. Our washing machine doesn't consume electricity. The washing machine can be used by the urban people also while workout and exercises. It can serve dual purposes. While cycling, the clothes can be washed utilizing the pedaling of the human being. If the production of this washing machine is done at commercial scale then the total production cost of the machine can be reduced to 40% of estimated cost.

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DEVELOPMENT OF A ROBOTIC COMPANION: A SURVEY

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ABSTRACT- Making life easier, safer and efficient has been always a constant thrust of innovative minds. From healthcare and homecare, to military use and emergency response, robots are fast becoming a fixture in our lives. When it comes to the development of an autonomous robot, the first step is to study the methods for developing one. A robot consists of sensors to perceive the environment and the own movement, on-board computers, and actuators for vehicle control. The Kinect sensor is an advanced computer vision component with a variety of useful features that makes it suitable as the vision system for an autonomous robot. In this paper, the approach taken for the development of the autonomous robot is discussed.

Keywords: Robotics, 3D Sensing, Depth vision, Autonomous companion, Kinect, Human Recognition, neural network

INTRODUCTION

Innovative ideas along with sophisticated new technologies has been always a boost to mankind in developing new and improved systems to reduce human effort in day to day life making life easier at every point. At our present world, Shopping centers have grown up into one of the busiest business points where anything and everything is available. People gather up at such easy shop away spots for convenience but most of the time it is observed customers struggles to carry around their chosen products and have to face long queues just to get billed for the products chosen. It is in one such situation, an innovative mind thought about a robot to assist the customer in shopping. The thought, along with the desire to realize it was the starting point of this project**.** His quest for implementing the project led to Microsoft Kinect which was the stepping stone to Autonomous Robotic companion.

A robotic companion, with ability of user, voice and gesture recognition, capable of accompanying you wherever you move, avoiding all obstacles that hinders its path. It sounds like a science fiction movie, but that is exactly what our project aims to achieve. When I say user recognition, the robot should be able to identify you when you come in front of the robot. And it should be able to recognize you as the primary user. The ability to understand what you are saying and replying back accordingly will make the robot to be a friend to you when you are alone at home. With the wave of your hand or with a voice command, the robot should follow your instructions. When guests are at home, a robot assisting you to carry the tray for you, instead of you going back and forth will surely catch the attention. When you want to shop online, it would add to your confidence if you can see exactly how the dress will look on you. The robot can act as a virtual trial room for you. Or may be in a retail shop, you need not wait for the trial room to be free. The robotic companion can be your shopping companion to carry the items when you are going for your routine grocery shopping.

An autonomous robotic companion is a good solution for a whole class of problems for the elderly too: a robotic butler that helps on carrying heavy objects; a robotic assistant to remind the time to take medicine; an automatic walking aid that should support elderly people and so on.

LITERATURE SURVEY

For developing an autonomous robotic system, the sensory perception of the robot and the kinematics for the robot movement are two important factors. The environment, in which the robot moves, has to be perceived accurately for the efficient utilization of the robot and to avoid any mishap. A robot which can be used as a companion for a human requires the robot to identify the person and interact with him. A sensory system capable of doing this efficiently and the movement of the robot is the focus of this study. Microsoft Kinect, launched in November 2011 for the Xbox 360 gaming console, is a motion sensing input device capable of tracking the user and takes audio data also.

As the first step to develop a robot, some of the recent autonomous robots were studied

ROBOTS IN HUMAN LIFE

'Rachkham' developed by Clodic et al [1] is an interactive robotic tour guide developed based on visual human robot interaction. Kirby et al [2] designed 'Grace' in 2007 to accompany a person side-by-side and engage him like a human would do, while maintaining a minimum space between the human and robot. A laser based tracking method was implemented in using direction following and path following. If the user goes out of the sensor range, it was informed by the robot. But it was found that the robot responds only to the person's speed and location, ignoring aspects such as the person's identity or personality, spoken or gestured commands from the person. 'Minerva' is tour guide robot developed by Thrun et al[3] to escort visitors in the Smithsonian Museum of American History. Johnny developed in 2012 by Breuer et al [4], based on the RoboCup@Home challenge [5], was designed to serve in a restaurant-like environment, where it received seat reservations, waited on guests, and delivered orders to them. Another well-known service robot is 'BIRON', developed in 2004 by Haasch et al. [6], and designed to actively interact with its user by means of natural user interface. MKR is an omni-directional mobile transfer robot system, developed in 2010 by Takahashi et al [7], for hospital applications. Using virtual potential field methods, the robot could transfer luggage, specimens and other important materials to its goal avoiding obstacles in the path.

The area of service robotics is broadening from robotic vacuums, bomb retrievers, exoskeletons and drones, to robots used in surgery, space exploration, agriculture and construction. A useful robotic system can be created by integrating various modules. Care-o-bot, a highly integrated and compact service robot**,** developed in 2009, by Reiser et al [8], is equipped with laser range scanners, a vision system and a 7 DOF manipulator arm. The sophisticated software for navigation, manipulation and vision, created a solid basis for the development of challenging manipulation tasks in everyday environments. As a typical application, the robot can act as a robotic butler, where a customer may ask for a drink using a touchscreen on the robot. The robot identifies the requested bottle using an object recognition module. The robot then lifts the bottle, places it in a tray and gets a cup from adjacent room to be placed along with the bottle to be served to the customer.

A robot can be used in domestic environments to serve in the everyday task or to assist the elderly. Taking care of elderly or a chronically ill person can be a challenge which can be simplified with a service robot. 'Flo', developed in 2000 by Roy et al. [9] is a service robot designed with a touch-sensitive display, a laser range finder, an array of 16 sonar sensors, and two on-board PCs. Its navigation system enables the robot to navigate safely in the indoor environment. It is equipped with, a telepresence software which would allow remote medical consultation, a speech interface for communicating with the user and neural network based face recognition system. In the present world, with a growing number of elderly people living alone, robots can be used to care this section of the population. 'Hector', developed by Gross et al. [10], under the 'CompaniAble' project, was designed to assist the elderly who

suffer from mild cognitive impairment, in home environments. Hector can work collaboratively with a smart home and remote control center to better support older people living at home. As the field of socially assistive robots is maturing into useful technology, the next step is to study the different ways in which the task of making a robotic companion can be accomplished.

3D SENSING AND DEPTH RESOLUTION

For being a companion to a human, a robot must be capable of perceiving the environment as humans do. The sensory system of the robot must be capable of perceptual abilities like humans. In addition to standard capabilities like obstacle avoidance, and navigation, the robotic perceptions have to be optimized for interacting with humans on a human level. The robot should be equipped with sensors, to track human features, user's motion and at the same time detect any obstacle that hinders its path.

The complexity involved in human motion and its structural appearance makes the human motion analysis a challenging task. Aggarwal et al [11] gives an overview on the human motion analysis focusing on three major areas for motion analysis 1) motion analysis involving human body parts, 2) tracking of human motion using single or multiple cameras, and 3) recognizing human activities from image sequences. After successfully matching the moving human image from one frame to another in image sequences, understanding the human movements or activities comes naturally, which leads to a discussion of recognizing human activities.

Paola et al [12] uses a multisensory platform equipped with a monocular camera, a laser scanner, and an RFID device for autonomous mobile robot. Three layer architecture is used for the surveillance of the environment using a reconfigurable approach. Each of the three main components, i.e. controller, executor, and supervisor, is connected with the sensory input. This information is used in different ways: at the highest level, sensory data are converted into events, which are used to control task executions; at the middle level, sensory data are used to monitor and control the execution of the task in progress; finally, at the lowest level, sensory inputs are used by active behaviors to perform the associated actions. The limitation with this approach is for people and obstacle detection, the robot has to stop and stay there to process the data.

Visual camera can provide dense 3D information of a scene, but lacks depth information. Laser range finder can be used to provide accurate distance measurements from object in the environment. Maria et al [13] integrates a 2D laser range finder to obtain depth information from the environment. Main advantages of laser systems are a broad bandwidth and small beam divergence and footprint. They also offer a high immunity to atmospheric effects in opposition to the visual cameras. Laser range finder gives a sparse, but accurate map of the environment in a 2D plane. They use an infrared light beam of 905 nm, which receives directly the reflected signal from the objects, in polar coordinates. The laser operation mode is based on a time-of-flight (TOF) measurement principle: a single laser pulse is sent out and reflected by an object surface. The elapsed time between emission and reception allows the calculation of the distance between laser unit and object. The laser pulses sweep a radial range in front of the laser unit, via an integrated rotating mirror.

Chen and Birchfield [14] uses a stereo pair present the Binocular Sparse Feature Segmentation (BSFS) algorithm for vision-based person following. To determine the location of the person in the image, two images of a stereo pair as well as successive video frames are matched. The motion and stereo information are fused to handle difficulties like dynamic backgrounds; out of plane rotation etc. The system is subject to distraction by other objects with similar motion and disparity to the person being tracked.

When the robot moves in an environment populated with humans, following a leader while avoiding static and dynamic obstacles poses multiple challenges to the robot. Marchetti et al[15] describes how data fusion algorithm is utilized to combine both

information, from the laser and the RGB-D camera to provide more reliable information to the robotic trajectory control system and ensure a smooth and precise execution of detection and follow of user overcoming all challenges in path.A data fusion algorithm has been developed using a particle filter, augmented with a k-clustering step to extract person estimations. The result on a real mobile platform verifies the effectiveness of the approach.

The advent of Microsoft Kinect, opened up new possibilities for human detection and tracking. Kinect was designed for natural interaction between the user and computer in the gaming environment. However, the characteristics of the data captured by Kinect have attracted the attention of researchers and developers in the field of retail, healthcare, medical, robotics etc.

KINECT

The Microsoft Kinect, with RGB camera, IR sensor and microphone array, is a revolutionary product that can sense human motion, location as well as their voices. These features plus the ability to control the user's console or computer with gesture or spoken commands opened up entirely new commercial experiences in multiple industries. Even though Kinect was developed for the Xbox 360 gaming console, drivers were developed for connecting it to a laptop. And Microsoft launched its own SDK for the Kinect in 2012. The Kinect v1 sensor can track skeleton of two people completely and 20 joints of each person. In October 2014, Microsoft launched the Kinect v2 sensor, with the ability to track as many as six people and 25 skeletal joints per person. The enhanced fidelity of the depth camera, combined with improvements in the software improved body tracking and the ability to see smaller objects.

Khoshelham [16] performs an accuracy analysis on the depth information obtained from the kinect sensor. Based on the mathematical model of depth measurement by the sensor a theoretical error analysis is presented, which provides an insight into the factors influencing the accuracy of the data. Compared to a laser data, a properly calibrated Kinect sensor has less systematic errors in the point cloud. With increasing distance from the sensor, the depth error increases quadratically and reaches 4cm for maximum range. The density of the points also decreases when the distance from the kinect sensor increases.

Shotton et al [17] proposes a new method to quickly and accurately predict 3D positions of body joints from a single depth image. This method implemented by Microsoft SDK for person detection and tracking, takes an object recognition approach, and runs at 200 frames per second. To detect the human body parts, it uses a deep randomized forest classifier. A pixel wise labeling is used to infer the 3D position of each joint.

The capability of the Kinect sensor to detect joints of the human body can be utilized to track a human being and follow him. But the robot should be able to detect and avoid any obstacles in its path during navigation. Peasley et al [18] proposes a novel approach for obstacle detection and avoidance.3D points are projected onto a ground plane and a 2D map is then used to detect the obstacles. This is then used to compute the translational and rotational velocities which are required to avoid the obstacle. An infinite pole approach and a control strategy are used to overcome the limitations of the sensor. The results obtained from experimenting in a variety of indoor environments display the robust obstacle avoidance in real time.

The Kinect can be used as the sensor for the robot navigation. Once a user comes into the field of view of the Kinect, it will be able to detect the presence of the user. In certain scenarios, it may be required to recognize who is the user and face recognition is suitable for identifying the user. Artificial neural networks are electronic models based on the neural structure of the brain, with neuron as the fundamental processing element. Dendrites, soma, axon and synapses are the four basic components of neurons. Dendrites act like input channels receiving input through the synapses of other neurons. The soma processes the incoming signals and turns the processed value into an output which is sent out through axon and synapses to other neurons. The artificial neural network simulates the behaviour of these four components. Pattern recognition can be accomplished very well with artificial neural network.

Neural networks are structured to provide the capability to solve problems without the benefits of an expert and without the need of programming. They can seek patterns in data that no one knows are there [19].

Face recognition from the images is challenging due to the wide variability of face appearances and the complexity of the image background. Nandini et al [20] proposes a facial recognition approach using Neural Network. It has Face localization part, where mouth end point and eyeballs will be obtained. In feature Extraction, Distance between eyeballs and mouth end point will be calculated. The recognition accuracy achieved by the method was very high.
Yang et al [21] uses image detection using ANN to classify the presence of weeds in cornfields. Images were taken from cornfields and given as input to the ANN. Many backpropagation ANN models were developed with different numbers of PEs in their hidden and various output layers. The performance of the ANNs was compared and the success rate for the identification of corn was observed to be as high as 80 to 100%, while the success rate for weed classification was as high as 60 to 80%.

CONCLUSION

For the robot to be used in different scenarios as an autonomous companion, the main aim is recognizing and tracking a human target using avoiding obstacles. The problems that have to be tackled are:

- Identifying a certain person and tracking only the identified person.
- The robot should be capable of understanding the commands of the user
- Once a user is identified, the robot should only follow the commands given by the primary user.
- The robot should be able to communicate with the user.
- Human target tracking while keeping a minimum distance to the target
- While following it should be able to detect any obstacle which may obstruct its path.
- Once an obstacle is detected, the robot should stop moving and then move again avoiding the obstacle.

For meeting these objectives, different mechanisms were explored. The Microsoft Kinect sensor is the best solution for this scenario. It helps to track the human and at the same time, the robot can follow the user avoiding obstacle.

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Comment Based Grading and Rating System in E-Commerce

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Abstract: In this paper we are presenting comment based Grading and Rating algorithms are best known for their use on e-commerce Web sites,[1] where they use input about a customer's interests to generate a list of recommended items. It is a technique based on the integration of comment mining, sentimental analysis, and the records of customer historical behaviours. The overall process of Comment-Grading can be separated into 5 key steps: 1.Extracting overall comment set of a group category of commodities; 2.Extracting modifier set and negative words set; 3.Acquiring specific comment set; 4.Acquiring specific positive weight set; 5.Acquiring overall item grade set. After these 5 steps, we are able to grade and rank all the items with an acquired grading equation. Then the needed as well as top ranking items can be recommended. Moreover, we utilize the real information of mobiles and their reviews from the famous e-commerce website Amazon.in as our experimental data and discuss some important results which reveal that the Comment-Grading really works well. At last, we also briefly introduce the prototype recommendation system we developed on the basis of Comment-Grading.

Keywords:Comment-Grading;Commentmining;SentimentalAnalysis; Historical behaviours; Recommendation Query Optimization.

1. INTRODUCTION

In the e-commerce, there are two major approaches for customers to meet items face to-face. One is called "Customer-active" which is achieved by customers themselves through some search engines. The other way is accomplished by merchants with a kind of recommendation system to recommend commodities [2]. We call it "Items-active". For "Customer-active", what a customer enters in search engines reveals what he/she wants. Existing search engines for commodities utilizes the similar techniques as those for normal web pages which is based on keywords matching, meaning that items saved in the database should be tagged with enough key words. Most of such key words, however, are manually appended by merchants. This mechanism is very low-efficient. It is easy to neglect some vital features as well. If there is a system which can automatically mine out the key features, (i.e. the key words), of a group category of items, then it is possible to complete the marking process with less manual operation so as to improve comprehensive efficiency. This should be our first mission, since the mining of features not only benefits the existing "Customer-active" searching approaches, but also acts as the fundamental of our proposed recommendation algorithm. As for "Item-active", we have more words to say because it executes the function of a recommendation system better. Since the birth of e-commerce, there has arose many recommendation algorithms. A latest and popular method is called Collaborative Filtering It has two typical types, one is user-based and the other is item-based. The main idea of user-based is that many users may have similar purchasing behaviours so that they are put into a same group. Once a member has bought a certain item, this item will be recommended to other members in the same group. However, the item-based approach connects similar commodities rather than users together. If an item is purchased then a similar one may be recommended. The integration of such two approaches achieves relatively good performance, resulting in the widely use of Collaborative Filtering algorithm [2] in contemporary large e-commerce websites However, such algorithm fails to consider diverse assessments and reviews after each item. Therefore sometimes many low rating items are recommended, merely because they are similar to what user has purchased [3]. Hence, a better system should understand how to rank recommended commodities and provide both related and highly appreciated items. Apparently, it involves evaluation, which can only be done by customers in common sense. Therefore, our task is to analyse on the customer reviews then extract their sentimental orientation to accomplish the final grading and ranking process [6]. Besides, we also believe the current general model of recommendation will gradually become more personalized. That's why we further proposed an improved algorithm which can make personal recommendation towards a specific customer based on his/her historical behaviours [6]. Thus, a more complete, reliable and personalized recommendation algorithm has been proposed in this paper on the basis of practical business demands and existing systems' drawbacks. We call it Comment Based-Grading algorithm. Meanwhile, we also developed its corresponding prototype system. Our Chinese experimental dates of multi-brand mobiles and their reviews come from Amazon.cn [5].

2. PROPOSED SYSTEM

2.1 Overview

This project deals with developing an ecommerce website for Online Electronics. It provides the user with a catalog of different products available for purchase Recommendation is done according to rank i.e. top ranking items are recommended to customer. This grades/rates the products according to the reviews analysis. In order to facilitate online purchase a shopping cart is provided to the user. It is a technique based on the integration of feature mining, sentimental analysis, and the records of customer historical behaviours. Bezier Algorithm and Frequency Count Algorithm are used in this project. Technologies like HTML and PHP are used for developing front end and MySQL is used for back end.

2.2 Methodology

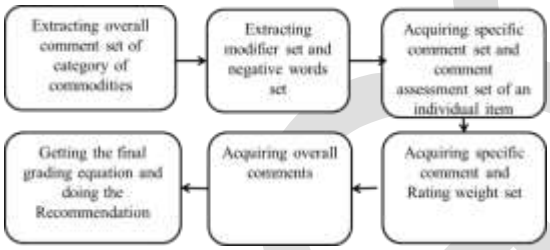

Fig.3.1 Block diagram Comment Based system for E-Commerce

We work within our own eight-stage e-commerce development methodology.
Stage 1 - E-commerce project initiation meeting - to broadly define the scope of the requirements, identify the key players and subject-matter experts, and specify the deployment technologies.
Stage 2 - Subject-matter expert workshop - to define the precise content of the course, as outlined within the scope-definition document. The output from this meeting is an e-commerce program blueprint.
Stage 3 - E-commerce design meeting.
Stage 4 - Lesson prototype –we will create e- commerce design.
Stage 5 - We will develop e-commerce web application.
Stage 6 - We will implement comment based-grading system.
Stage 7 - We will do alpha and beta testing of project.
Stage 8 - Launch - We deploy the final version of the e-commerce course and assist in the launch process.

2.3Algorithm

Algorithm for system

1 Collect the reviews of the customer.
2 Split the reviews in the independent word.
3 Extract the feature set using Bezier Algorithm and Word Frequency Count Algorithm.
4 Create seeds which contain positive and negative modifiers.
5 Extract modifiers X using sentimental analysis.
6 If modifier X is seed then go to step 8
7 If modifier X is not seed Find synonyms of X in the word Net.
8 Check orientation of X i.e. positive or negative
9 If X is positive modifier Define X as a MOD and go to step 11
10 If X is negative modifier Define X as NEG
11 Add X to seed
12 Create individual Feature set F by feature set N
By using sentimental analysis we make assessment set
If assessment set is positive then Make it as a positive feature set
go to step 16
If assessment set is negative then Make it as a negative feature set
Calculate value of E(Assessment set),Feature Weight Set W, overall feature weight set Cni=1/Tni,Item weight set Gi=1/Ki
Calculate grade.
Result is used for feature grading

13 Split the reviews in the independent word.
14 Extract the feature set using Bezier Algorithm and Word Frequency Count Algorithm.
15 Create seeds which contain positive and negative modifiers.
16 Extract modifiers X using sentimental analysis.
17 If modifier X is seed then go to step 8
18 If modifier X is not seed Find synonyms of X in the word Net.
19 Check orientation of X i.e. positive or negative
20 If X is positive modifier Define X as a MOD and go to step 11
21 If X is negative modifier Define X as NEG
22 Add X to seed
23 Create individual Feature set F by feature set N
24 By using sentimental analysis we make assessment set
If assessment set is positive then Make it as a positive feature set
go to step 16
If assessment set is negative then Make it as a negative feature set
Calculate value of E(Assessment set),Feature Weight Set W, overall feature weight set Cni=1/Tni,Item weight set Gi=1/Ki
Calculate grade.
Result is used for feature grading recommendation of the product.

Algorithm for user

1 Home page
2 Search product by category or direct search
3 The list of recommended product will get by the proposed system.
4 If user want to search again then go to step 2
5 If search is finish then add a product to cart to buy product
6 If customer is registered already then go to step 8
7 If customer is not registered customer then Register first
8 Login into website
9 If customer want to review the previous product then go to step 19
10 If want to buy a product then go to step 11
11 Reconfirmed the product recommendation of the product.
12 If want to buy another product then go to step 2
13 If don't want to buy another product then go to step 14
14 Confirm product
15 Payment successful
16 If want to give review then go to step 17
17 Give reviews
18 If don't want to give review then go to step
19 Logout from website and go to step 1

3. Aims and objectives

This system is basically aimed to provide customer the more complete, reliable, and personalized recommendation algorithm in on the basis of practical business demands and existing system's drawbacks. We call it Feature-Grading algorithm.

The objective of this project is to develop a general purpose e-commerce store where recommendation of product (such as books, CDs, computers, mobile phones, electronic items, and home appliances) is done to the customer and product can be bought from the comfort of home through the Internet.

Additionally we provide SQL Injection And Query Optimization

4. Scope of the Project

1. To provide anytime anyplace service for the customer.
2. To provide a right product to the customer.
3. To do a recommendation of the product according the rank with the help of user reviews.

4. To increase the profit.
5. To provide a easy and perfect way of shopping to the customer.

5. CONCLUSION AND FUTURE SCOPE

This project has many applications in forthcoming years. It will work more efficiently when the processing speed of memory will increase further. It possibly may do the set of tasks within fraction of second, with powerful servers. Also it will be more useful for constructing user friendly interface that will lead to attract online buyers towards electronic shopping.

This web application can simplify the user's life by making it easy selection of product on the basis of review. So it minifies the buyers efforts and time in this fast growing life where time is as valuable as money. Also it makes more secure while online transaction since this project has introduced new and improved security tricks.

Our future efforts will be spent on the improvements of sentimental analysis of reviews. We plan to expand the handle range from simple sentence to compound sentence, including transitional sentence, comparative sentence, and imperative sentence and so on.

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STATUS OF ICT IN EDUCATION AND SUPPORT OF GOVT. OF INDIA

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ABSTRACT :

Information and Communications Technologies (ICT) education is basically our society's efforts to teach its current and emerging citizens valuable knowledge and skills around computing and communications devices, software that operates them, applications that run on them and systems that are built with them.

What are these things? How do they work? How do you use them productively? How are they deployed, assembled, managed and maintained to create productive systems? How they are used in specific business and industry settings? What are the underlying science and technologies behind them and how might those be developed to advance ICT fields? ICT is complex and quickly changing, and it is confusing for many people. It is so pervasive in the modern world that everyone has some understanding of it, but those understandings are often wildly divergent.

ICT is used strategically in almost all businesses and industries. Many have developed specialized systems and uses of ICT, and many have specialized legal and regulatory requirements; quality control systems; integrations with production and research equipment and systems; security requirements; and software applications. For example:

Bioscience industries rely on specialized ICT systems and applications to conduct research, analyze organic materials, produce biotech products and do required reporting;

Financial services industries rely on ICT to maintain customer records, do business, conduct trades, do financial reporting, secure proprietary information and comply with regulations; Manufacturing industries use specialized computer controlled systems and robotics to design, produce and test products.

Property management operations use ICT to network and control heating and cooling, lighting and building access systems. Electric utilities use ICT to monitor and manage electricity distribution, customer billing and smart metering systems. Telecommunications, cable TV and other entertainment industries use ICT to store content, manage customers and deliver their services.

We need to develop a competent workforce that understands not only relevant technologies, but also specialized business and industry environments and operations, to meet these specialized needs.

KEY WORDS :

ICT- Information and Communication Technique, **NMEICT**-National Mission on Education through-ICT,

IDI-ICT Development Index, **SWAYAM**-Study Webs of Active-earning for Young Aspiring Minds,

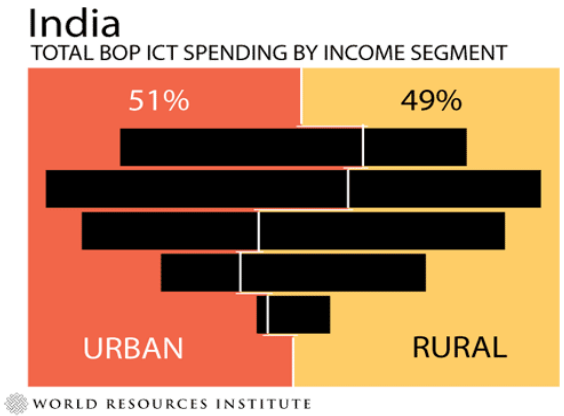
ITU- International Telecommunication Union, **OLPC**-One Laptop per Child, **CAI**-Computer Aided (or Assisted) Instruction,

NPICT-National Policy on Information and Communication Technology, **VPN**-Virtual Private Network,

INTRODUCTION :

Worldwide research has shown that ICT can lead to improved student learning and better teaching methods. A report made by the National Institute of Multimedia Education in Japan, proved that an increase in student exposure to educational ICT through curriculum integration has a significant and positive impact on student achievement, especially in terms of "**Knowledge ▪ Comprehension**" · "**Practical skill**" and "**Presentation skill**" in subject areas such as mathematics, science, and social study.

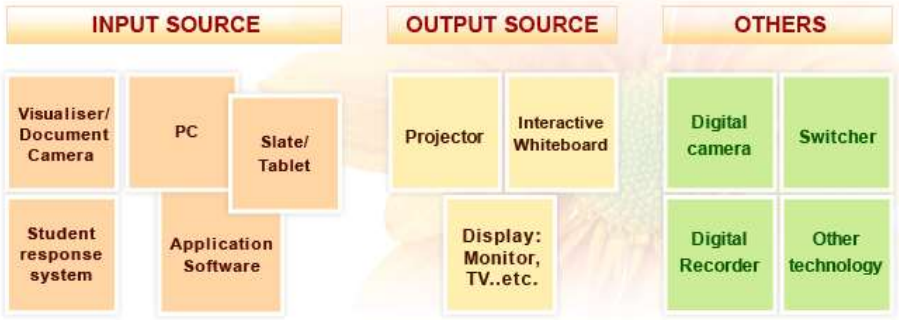
In India students strength is increasing day by day due to growth of population, awareness about advantages of education and govt. policies & facilities to promote education. Indian govt. is providing free education, free books, free dress, free mid day meal and scholarship etc. it is not easy to do all these because of geographical structure, infrastructure and economic problem of country. ICT can play an important roll in achieve them.



India has the third largest system of education in the world, next only to USA and China, with more than 500 universities and around 30000 colleges. To introduce ICT-enabled education in such a large system one needs to have high quality multi-media enriched content in different disciplines for various courses including its multilingual conversion, capacity building of teachers and students in ICT skills and state-of-the-art infrastructure along with networking and internet connectivity via Virtual Private Network (VPN) / broadband connectivity for disseminating the content and affordable access devices so that it reaches the doorsteps of the learners. The ongoing National Mission on Education through ICT (NMEICT) is a major initiative of the Govt. of India in this direction with an aim to leverage the potential of ICT in providing high quality personalized and interactive content, free of cost, to all the learners.

In order to use technology to help achieve the goals of education in a better and more effective way, one has to be first of all clear about what our expectations are from the education system, what and how do we want our students to learn and what type of individuals our classrooms should produce - rote learners or those with an analytical mind having an in-depth understanding of the subject?

Educational ICT tools can be divided into 3 categories: Input source, Output source and Others.



ICT RANKING OF INDIA :

Mobile phones are playing a big role in improving ICT access across the world. India's efforts to capitalise on the information and communication technology revolution are far from spectacular when it comes to numbers, going by the latest country rankings and associated data released by the International Telecommunication Union. The basis for the ranking is an ICT Development Index (IDI).

India has been ranked 121st among 157 countries in terms of progress in the realm of information and communication technology (ICT) in a newly-released report of the International Telecommunication Union (ITU), which makes an annual assessment based on a wide range of parameters and data.

It comes in the wake of the Broadband Commission for Digital Development, in a recent report, ranking India 145th among nearly 200 countries in terms of the percentage of individuals using the Internet and 106th in the case of mobile broadband penetration.

"Out of a total of 145 million young Internet users in the developed countries, 86.3 per cent are estimated to be digital natives, compared with less than half of the 503 million young Internet users in the developing world. Within the next five years, the digital native population in the developing countries is forecast to more than double," the report said. And that will make a difference to these countries.

POLICIES & PLANS OF GONT. OF INDIA TO PROMOT ICT IN EDUCATION:

SWAYAM PROJECT :

The Union Cabinet chaired by the Prime Minister, Shri Narendra Modi, today gave its approval for signing of a Joint Declaration of Intent between the Ministry of Human Resource Development (MHRD) and the U.S. Department of State for cooperation in the field of higher education for Study Webs of Active-earning for Young Aspiring Minds (SWAYAM), a programme for online education. Under the cooperation, the SWAYAM platform server will be based in India and US universities will be invited to offer post-graduate academic programs with certification on the SWAYAM platform.
The new Indo-US Partnership for Online Education (IUPOE) programme will comprise a mechanism that will enable the top universities of the US (top 100 in global ranking) to create and share post graduate online courses (and associated assets) on the Indian "SWAYAM" platform. SWAYAM is an online platform of the Ministry of HRD through which online programmes/courses will be offered to students in India. Each American University will share courses created by its top educators. The cooperation programme will be integrated to strengthen the National Mission on Education through the use of ICT (NMEICT) in India.

AAKASH PROJECT

It is not first time, initiation and actions were taken already by govt. of India. In INDIA govt. has started to distribute TAB & LAPTOPS to students to promote education with ICT.

Before Turkey, and before Thailand, it was the Aakash project in India which excited the imagination of many proponents of putting huge numbers of tablet computers into the hands of students in a developing country. That project has moved forward in fits and starts, but is only one of numerous efforts to introduce tablets at laptops across the continent-sized South Asia country. Large efforts in Rajasthan have recently been announced, following on efforts which began earlier in states like Uttar Pradesh. Initiatives across India will be particularly interesting to monitor, given the scale at which they will be occurring, and the fact that there is already a

great deal of local knowledge about various approaches that have worked, and that haven't, based on earlier educational technology programs in the country.

The aspiration to create a "Made in India" computer was first reflected in a prototype "Simputer" that was produced in small numbers. Bangalore based CPSU, Bharat Electronics Ltd manufactured around 5,000 Simputers for Indian customers from 2002–07. In 2011, Kapil Sibal announced an anticipated low-cost computing device to compete with the One Laptop per Child (OLPC) initiative, though intended for urban college students rather than the OLPC's rural, underprivileged students. A year later, the MHRD announced that the low-cost computer would be launched in six weeks. Nine weeks later, the MHRD showcased a tablet named "Aakash", not nearly what had been projected.

Aakash a.k.a Ubislate, is an Android-based tablet computers promoted by Government of India as part of an initiative to link 25,000 colleges and 400 universities in an e-learning program. It is produced by the British-Canadian company DataWind. It is manufactured by the India-based company Quad, at a new production centre in Hyderabad, with a planned trial run of 100,000 units. The tablet was officially launched as the *Aakash* in New Delhi on 5 October 2011. The Indian Ministry of Human Resource Development announced an upgraded second-generation model called Aakash 2 in April 2012.

The Aakash is a low-cost tablet computer with a 7-inch touch screen, ARM 11 processor and 256 MB RAM running under the Android 2.2 operating system. It has two universal serial bus (USB) ports and delivers high definition (HD) quality video. For applications, the Aakash will have access to Getjar, an independent market, rather than the Android Market.

While it was once projected as a laptop computer, the design has evolved into a tablet computer. At the inauguration of the "National Mission on Education Programme" organized by the Union HRD Ministry in 2009, joint secretary N. K. Sinha had said that the computing device is 10 inches (which is around 25.5 cm) long and 5 inches (12.5 cm) wide.

India's Minister of Human Resource Development, Kapil Sibal, unveiled a prototype on 22 July 2010, which was later given out to 500 college students to collect feedback. After the device was unveiled, OLPC chairman Nicholas Negroponte offered full access to OLPC technology at no cost to the Indian team.

The Indian Ministry for Human Resource Development announced the launch of a new low cost educational tablet the "***Aakash"***. Developed by the London-based company DataWind with the Indian Institute of Technology Rajasthan, the Aakash has been described by some as potentially heralding a new 'Internet revolution' within India education, doing for educational computing what the mobile phone has done for personal communications over the past decade. Following on a visit by Indian HRD Minister Kapil Sibal in October, DataWind CEO Suneet Singh Tuli stopped by the World Bank yesterday to talk about the Aakash, and more broadly, about sustainable business models to drive the broad adoption of computing and Internet devices in the developing world.

India's finally got its much hyped ultra-low-cost tablet, Aakash.
"*The rich have access to the digital world, the poor and ordinary have been excluded. Aakash will end that digital divide,"* Telecoms and Education Minister Hon. Kapil Sibal said.

The tablet runs on Android 2.2 (Froyo) and comes with a 7-inch resistive touch screen with 800x480 resolution and weighs 350 grams. The tablet has a 256MB of RAM, a 32GB expandable memory slot and two USB ports.

As part of an initiative by the Chhattisgarh Chief Minister Raman Singh, one lakh final year students in degree colleges will be given tablets by June of this year. The state's government has tied up with Ricoh India for the supply of these tablets. In addition, 14,000 laptops will also be given to students in medical and engineering college.

In a statement to PTI, Chhattisgarh Infotech and Biotech Promotion Society (CHiPS) CEO AM Parial said, *"It is an initiative of our Chief Minister. Under the project we will distribute around 1 lakh tablets to students in final year of their graduation in any stream. For tablets, we have given contract to Ricoh India."*

Same way other state governments are also taking initiation for education through technology.

Free laptop distribution scheme of Uttar Pradesh Government was the scheme of the Government of U.P. headed by Hon. Chief minister Akhilesh Singh Yadav . Under the scheme 1.5 million laptops to Class 12-pass students of the state were distributed. The laptops, which operates in Hindi, English and Urdu. The beneficiaries included students passing high school and intermediate examination conducted by Uttar Pradesh Secondary Education Board, Poorva Madhyama and Madhyama of Sanskrit Education Board, Munshi/Maulvi and Alim of Madrasa Board. CBSE, ICSE and ISC, besides students of recognized ITI and polytechnics where minimum eligibility for admission is high school or equivalent, are also eligible for the benefit.

The Odisha state government announced that it would start distributing free laptops to meritorious students, who have passed the +2 examinations, from August 15. This in line with the commitment made by chief minister Naveen Patnaik while unveiling the state youth policy in April this year.

The ambitious free laptop scheme of the Tamil Nadu government, under which 68 lakh laptops are to be distributed to government-aided higher secondary school and college students, is all set to roll this week.

Under the scheme, Tamil Nadu Chief Minister J. Jayalalithaa that will be launched on September 15, the govt. will distribute 9.12 lakh laptops this year and the balance in the next four years. While the whole project will entail a cost of Rs. 10,200 crore, the government has allocated Rs. 912 crore for the distribution of the 9.12 lakh laptops in the first year, a senior government official told PTI.

ADVANTAGES OF ICT FOR STUDENTS :

"We are preparing our children to grow up in the 21st century where they are going to have to deal with a wide variety of different devices, software packages and platforms, Android, Linux, Microsoft, Apple, Google, open-source, and so on. If we don't prepare them for that we are failing in our job."

Cell phones and especially smart phones that can access online dictionaries and Wikipedia and the social media are useful though unacknowledged tools for language development.

Following are points where good sign can be seen among the students.

The positive impact of ICT use in education has not been proven In general, and despite thousands of impact studies, the impact of ICT use on student achievement remains difficult to measure and open to much reasonable debate.

Positive impact more likely when linked to pedagogy It is believed that specific uses of ICT can have positive effects on student achievement when ICTs are used appropriately to complement a teacher's existing pedagogical philosophies.

'Computer Aided Instruction' has been seen to slightly improve student performance on multiple choice, standardized testing in some areas.

Computer Aided (or Assisted) Instruction (CAI), which refers generally to student self-study or tutorials on PCs, has been shown to slightly improve student test scores on some reading and math skills, although whether such improvement correlates to real improvement in student learning is debatable.

TEACHERS ROLL FOR EDUCATION BY ICT :

Teachers feel confident about how to use technology, and how to integrate it into their teaching and assessment. "Just because a teacher can do it does not mean they can teach it." They must be equipped to plan and structure their lessons using technology efficiently and effectively.

Involve as many people as possible. Not all teachers will have the same level of commitment. Young teachers are often more aware of the possibilities than management. Keep tabs on enthusiastic and reluctant adopters. Publish a road map on the staff notice board of expected key outcomes and learning milestones. Communications are important. Help teachers understand the advantages and differences of digitization and how it will improve teaching and learning. Help teachers overcome their fears of technology. Help them overcome fears of being shown up as technologically incompetent in class. Teachers often feel isolated. Support: moral, technological and professional is vital. Failure breeds failure; success, success. Make sure everyone has the technology they need to do their job, or teachers may see the effort as a failure. Applying new technologies to the same old way of doing things is not the pathway to success. Create learning communities/support groups within the institution to provide technological understanding and help, and to foster new ideas for using technology in the classroom.
Digitization in education is a rapidly evolving field and teachers need to be kept abreast of the latest developments in order to feel in command. But, as already mentioned, training must not be haphazard but matched to individual needs.

SOME BARRIERS :

Avoiding nature of peoples:-

In general the attitude of peoples is not of acceptance of ICT. Peoples are ignoring the importance and need of ICT. When peoples are having problems with themselves mentally or technically, they put the blame on technology.

Peoples think technology means solution for all problems in magic way, which is not practically possible. Peoples have to develop themselves also.

Economic problems:-

Developing countries like INDIA and other asian countries have financial problems also. Economic positions of common peoples are not good, so it is difficult to afford for computer, tab, and android phone.

Lack of good quality infra support:-

In developing countries like INDIA, electricity, network, and other facilities are not available. Peoples are not getting proper power supply if they are getting that not in proper standard. Same is with the network, telecommunication companies are just making money not providing proper network.

Gadgets maintenance problems:-

In developing countries, all gadgets like laptop, tab, and android mobile have the maintenance problems. Technology is changing very fast, next morning we can see new model in market, and there is no service facilities for old models. Govt. don't have any clear cut policy on service part or customers education for proper use of gadgets.

Social and culture scenario:-

Social and culture structure of INDIA and Asian countries is different from western culture. Using technology among the common people is not easily acceptable. Society raises the voice even against the use of mobile by girls.

Browsing internet is not safe this is one of the reason that society is concern with cultural and social loss of children's. It is very difficult to safe guard the children's from porn sites.

Computer skill and English language problem:-

Even now a day's computer and English is not common among the common peoples in INDIA. Still 70% of rural school don't have facility of computer and English is also a problem to students, and both are necessary for education with ICT.

FEAR & LIMITATIONS OF MISSUSE OF GAZETTS :

In the Asia-Pacific countries studied, a range of factors were seen as inhibiting the use of new ICTs. These factors include:

- high cost of the ICTs leading to restriction of access to the new technologies;
- conservative attitudes – people are comfortable maintaining the status quo, doing things the way they are used to;
- lack of deregulation and government legislation which gives monopoly to a few information technology companies;
- poverty and harsh economic climate;
- infrastructural problems such as inadequate telephone lines and lines cutting off when someone is logged onto the Internet;
- lack of basic education and computing skills;
- political culture which discourages open sharing of information

The history of electronic technologies in schools is fraught with failures.

Computers are no exception, and rigorous studies show that it is incredibly difficult to have positive educational impact with computers. Technology at best only amplifies the pedagogical capacity of educational systems; it can make good schools better, but it makes bad schools worse.

Technology has a huge opportunity cost in the form of more effective non-technology interventions.

Many good school systems excel without much technology.

The inescapable conclusion is that significant investments in computers, mobile phones, and other electronic gadgets in education are neither necessary nor warranted for most school systems. In particular, the attempt to use technology to fix underperforming classrooms (or to replace non-existent ones) is futile. And, for all but wealthy, well-run schools, one-to-one computer programs cannot be recommended in good conscience.

Technology doesn't cure all educational ills or technology alone is insufficient as a solution.

First, in those cases where directed student motivation is assured, technology may lessen the burden of teaching. Some cases of tertiary or adult education may fall into this category.

Second, targeted use of computers in schools, for example, as an aid to teach computer literacy, computer programming, or video editing, etc., are important as long as those uses are incorporated only as a small part of a well-rounded curriculum.

Third, technology can help with the administration of schools – record keeping, monitoring, evaluation, etc. – as long as the school system is able to fully support the technology.

Fourth, in richer environments, where the cost of educated labor is relatively high, careful use of well-designed software may have value in fundamental education, particularly for remedial or drilling purposes. Solutions offered by, for example, Carnegie Learning fall into this category, although it should be noted again that effective use of these kinds of technologies must occur in the context of an otherwise well-run school system.

Fifth, again in rich environments, where the basics of education are assured, where teachers are facile with technology, and where budgets are unconstrained, widespread use of technology, even in a one-to-one format, might benefit students. Warschauer does find that certain uses of computers enhance computer literacy and writing skills, but these outcomes are limited to well-run, well-funded schools; they are notably absent in underperforming schools, even in the United States.

SURVEY REPORTS OF SCHEMES OF GOVT.OF INDIA :

A survey done by a private company has revealed that eight of 10 students across Chennai and Madurai seemed to be happy with the quality of the free laptop provided by the Tamil Nadu government.

The report also says that 100 per cent of students perceive that there had been significant improvement in their technical and academic skills.

IMRB international, a research and insights organization, did the survey sponsored by Intel and was released by state IT secretary T.K. Ramachandran during the Digital India Summit 2014 organized by ICT Academy of Tamil Nadu on.

Explaining the objectives of the survey, Biswapriya Bhattacharjee, group director, IMRB, said that they wanted to determine the impact of the Tamil Nadu government's free laptop distribution scheme on the youth of the state by way of their technical knowhow, attitude to laptop usage and spill over impact of computer usage on the society at large.

The survey conducted in five arts and science colleges in Chennai and Madurai pointed out that about half the girl students spent more time with the laptop, besides 75 per cent of the time spent being for education related activities. The final outcome of the report was that the students were able to identify and utilize the device for multiple purposes.

Releasing the report, Mr Ramachandran said that the survey augurs well for the state that the laptop scheme had reached the students and provides positive results. "We have distributed over two million laptops to students in the state. The report shows how students have welcomed the scheme and how it had made a big impact in their lives," he said. Listing the various initiatives taken by the state government, the IT secretary said his department had plans to come up with an SMS gateway and e-payment mechanism soon.

In field surveys with 450 students across 13 schools in Hyderabad, India, we looked at 14-year-old student access to and use of technology, including mobile phones. One of the largest trends we found in our survey was the divide in access to technology between male and female students. We found that while 41% of males are cell phone users, only 35% females are. More strikingly, we found that only 15% of females access Internet via mobile phones, compared to 45% of males. Of note, few students own cell phones, and the majority use their parent or a relative's phone.

it found that 37% of APS students play games on mobile phones, 29% listen to music, 13% make phone calls, 15% send and receive text messages, and 6% view videos. This revealed that the majority of these students prefer using phones for entertainment, as only 28% of the children opt to use phones for communication purposes.

One problem seen in not only in UP but also all over India is as follows';

The Uttar Pradesh government's 'free laptop' scheme may have been launched to uplift the education standard in the state, but its beneficiaries seem to have a different goal in mind. It has been found that students have been trading these laptops on e-marketing portals for easy money.

The incident came to light when it was found that a mathematics teacher of the private Munda Panday inter college sold a laptop for Rs 14,000 to a Rampur resident through an e-tailing site. On further investigation, it was found that he had purchased the laptop from the father of one of his female students who had received it under the scheme.
District inspector of school, Sarwan Kumar Yadav said, "The chief minister wants to make the students more tech savvy and laptops are the best equipment for imparting e-education. We are saddened to hear that the students are selling their laptops." He said that the matter of this teacher of a private inter college selling a laptop distributed under the scheme will be looked into and action will be taken accordingly.
As per earlier news reports, some such laptops had also been sold earlier in other parts of the state.
Free laptops given to Govt. school students being sold online

India -*Tamil Nadu*-*Coimbatore*

Dealers of used laptops are purchasing from students and selling them,

In a serious misuse of the incentives provided by the government to encourage education, several instances of students selling the free laptops issued to them have come to light in Coimbatore.

The laptops, which are specially manufactured for the Government scheme, were being purchased by computer dealers and they put these up for ssale in online classifieds companies such as 'quikr' and 'olx.'

The Aam Aadmi Party (AAP) on Monday sent a petition to the Chief Minster's Cell seeking the State Government's intervention in stopping this practice.

A petition was also submitted to the district administration at the grievances meeting.

The AAP district secretary, S. Mohamed Rafi, told *The Hindu* that this was a flagrant misuse of taxpayer's money. Purchase of these laptops was equivalent to buying stolen goods.

Mr. Rafi suggested that to prevent such diversion, beneficiaries of the free laptop schemes must be told to show it to their school headmasters periodically and also providing the laptops only to those from economically weaker sections of the society.

Also, the specification of the free laptop given to the student must be recorded in the board examination marks sheets or the

transfer certificates.

CONCLUSION AND RECOMMENDATION :

The result of study shows that students and teachers are ready to use ICT in education. Computer, laptop, tabs, etc are just gadgets, need is of pedagogy to use ICT.

Although still a small percentage of the most frequently students used apps (10.4 percent), search engines, online encyclopedias, and libraries are used by undergraduate students. Furthermore, a significant number (76 percent) disclose using apps to find academic information. The apps they use are familiar and allow mobile access to popular academic web sites they can find on their desktop computers. Most of the students are using these for playing games, listening music, watching moving etc. These sources are those which are online representatives of traditional sources of information such as encyclopedias, dictionaries, translators, or libraries, or they are open-ended resources such as search engines where the user looks for information that either does not have an app or the user does not know that it exists.

Most of the majority of the students in this study is part of the so-called millennial generation. Having grown up using mobile, computers and the internet, they are digital natives and have their own views and expectations of information. They want information fast, are comfortable with non-linear information seeking, and have little tolerance for delays or limited.

Studies of the use of electronic sources corroborate the importance of convenience as a factor in searching for information. The search engine is perceived as an "easy" tool and requires little specialized knowledge or skills. Google searching produces immediate results with instant access to documents whereas others imply wait time, delays, and the need to have a specific skill set.

Govt. of INDIA is investing money on projects; ignoring teacher's capacity building is creating some problems. Students should provide proper training how and why they should use ICT.

Govt. Should approach to schools primary, secondary and tertiary organise clubs for a start. We can call them computer clubs in which we teach people the fundamentals of computer appreciation, even how to use a telephone properly because... many people don't know how to use them.

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Remove Noise and Reduce Blurry Effect From Degraded Document Images Using MATLAB Algorithm

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Abstract— Digital images are subjected to blurring due to many hardware limitations such as atmospheric disturbance, device noise and poor focus quality. In order to reveal the detailed information carried in the digital image, image de-blurring or restoration is necessary. Image de-blurring have wide applications, from consumer photography, e.g., remove motion blur due to camera shake, to radar imaging and tomography, e.g., remove the effect of imaging system response. This research is aimed to provide a basic knowledge of image degradation and restoration process. Offline handwriting recognition approaches proceed by segmenting characters into smaller pieces which are recognized separately. The recognition result of a word is then the composition of the individually recognized parts. Inspired by results in cognitive psychology, researchers have begun to focus on holistic word recognition approaches. Here we present a holistic word recognition approach for degraded documents, which is motivated by the fact that for severely degraded documents a segmentation of words into characters will produce very poor results. The quality of the original documents does not allow us to recognize them with high accuracy - our goal here is to produce transcriptions that will allow successful retrieval of images, which has been shown to be feasible even in such noisy environments. We believe that this is the first systematic approach to recognizing words in historical manuscripts with extensive experiments. Our experiment is to clear the degraded documents using some filter approach. We will use wiener filter for removing noise partials from different images using wiener filter algorithm.

Keywords— Degraded documents, noise, de-noising, Wiener filter algorithm, Mean Square Error, PSNR.

I. INTRODUCTION

FILTERS

There are a number of filters used in image processing for adding and removing noise from images like photographs, hand-written images, scanned images etc. Filters used in image processing are Prewitt, Sobel, Roberts, canny and wiener filter. We choose wiener filter to clear the de-graded documents scanned images, Wiener filter is itself an algorithm for clearing scanned documents, and rest all filters are used for edge detection.

WIENER FILTER

Wiener filters are a class of optimum linear filters which involve linear estimation of a desired signal sequence from another related sequence. In the statistical approach to the solution of the linear filtering problem, we assume the availability of certain statistical parameters (e.g. mean and correlation functions) of the useful signal and unwanted additive noise. The problem is to design a linear filter with the noisy data as input and the requirement of minimizing the effect of the noise at the filter output according to some statistical criterion. A useful approach to this filter-optimization problem is to minimize the mean-square value of the error signal that

is defined as the difference between some desired response and the actual filter output. For stationary inputs, the resulting solution is commonly known as the Weiner filter. Its main purpose is to reduce the amount of noise present in a signal by comparison with an estimation of the desired noiseless signal.

DEGRADED IMAGES

Degradation in scanned document images result from poor quality of paper, the printing process, ink blot and fading, document aging, extraneous marks, noise from scanning, etc. The goal of document restoration is to remove some of these artifacts and recover an image that is close to what one would obtain under ideal printing and imaging conditions. The ability to restore a degraded document image to its ideal condition would be highly useful in a variety of fields such as document recognition, search and retrieval, historic document analysis, law enforcement, etc. The emergence of large collections of scanned books in digital libraries has introduced an imminent need for such restorations that will aid their recognition or ability to search. Images with certain known noise models can be restored using traditional image restoration techniques such as Median filtering, Weiner filtering, etc.

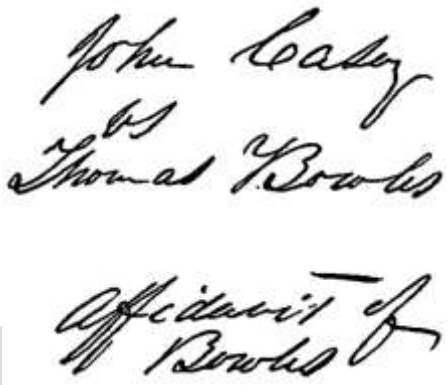


Figure 1: Degraded document (1)

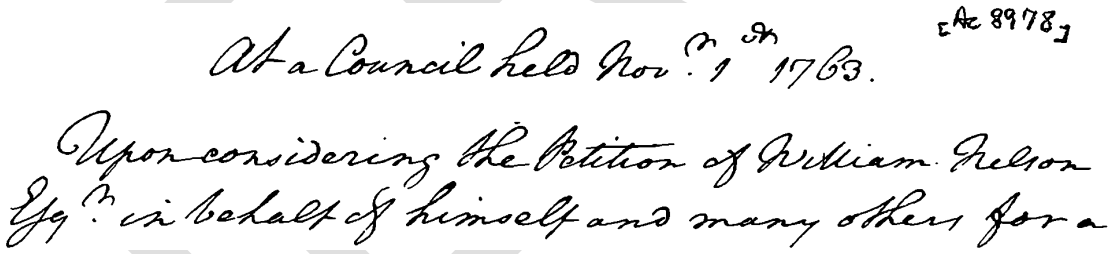


Figure 2: Degraded document (2)

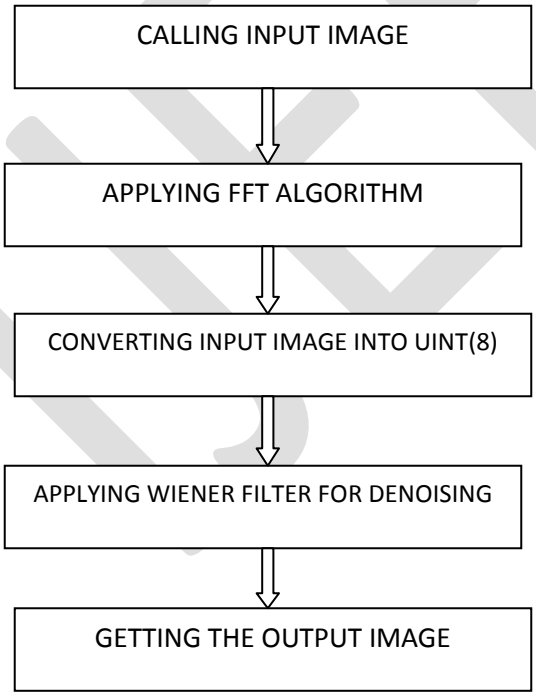
However, in practice, degradations arising from phenomena such as document aging or ink bleeding cannot be described using popular image noise models. Document processing algorithms improve upon the generic methods by incorporating document specific degradation models and text specific content models. Approaches that deal with highly degraded documents take a more focused approach by modeling specific types of degradations. For instance, ink-bleeding or backside reflection is one of the main reasons for degradation of historic handwritten documents. In this paper, we approach document restoration in a different way, and useful setting. We consider the problem of restoration of a degraded 'collection of documents' such as those from a single book. Such a collection of documents, arising from the same source, is often highly homogeneous in the script, font and other typesetting parameters. The availability of such a uniform collection of documents for learning allows us to:

- To reduce the noise from the scanned de-graded document images area by using wiener filter algorithm degraded images.
- To reduce Mean Square Error and calculate Peak Signal to Noise Ratio.
- To calculate execution time for our final implemented code.

II. RELATED WORK

Srinivasa G. Narasimhan and Shree K. Nayar [1] et. al. stated that the images of outdoor scenes captured in bad weather often suffer from poor contrast. Under bad weather conditions, the light reaching a camera is severely scattered by the atmosphere and the resulting decay in contrast varies across the scene and is exponential in the depths of scene points. Deepak, Vikas Mittal [2] designed speech recognition system using cross-correlation and FIR Wiener Filter. The algorithm is designed to ask users to record the words three times. The first and second recorded words are different words which will be used as the input signals. The third recorded word is the same word as one of the first two recorded words. The recorded signals corresponding to these words are then used by the program based on cross-correlation and FIR Wiener Filter to perform speech recognition. Bolan Su, Shijian Lu, and Chew Lim Tan [3] et. al. concluded that Segmentation of text from badly degraded document images in a very challenging task due to the high inter/intravariation between the document background and the foreground text of different document images. He proposes a novel document image binarization technique that addresses these issues by using adaptive image contrast. The adaptive image contrast is a combination of the local image contrast and the local image gradient that is tolerant to text and background variation which are caused by different types of document degradations. The proposed methodology for efficient filtering of historical and degraded document images is illustrated in Fig. 3. It consists of many different steps. At the first step, at the run time GUI will execute and preprocessing based on Wiener filtering is applied. At the next step, several binarization results are combined in order to produce a binary (b/w) image taking into account the agreement in the majority of binarization methodologies. The work related to our work done so far is as, Niranjan Damera-Venkata, Thomas D. Kite, Wilson S. Geisler, Brian L. Evans and Alan C. Bovik [4] proposed model a for degraded image as an original image that has been subject to linear frequency distortion and additive noise. he develop a distortion measure of the effect of frequency distortion, and a noise quality measure of the effect of additive noise. Mohammed M. Siddeq Dr. Sadar Pirkhider Yaba [5] et. al. stated an algorithm for image de-nosing based on two level discrete wavelet transform and Wiener filter. At first The DWT transform noisy image into sub-bands, consist of low-frequency and high-frequencies and then estimate noise power for each of the sub-band. The noise power is computed through two important computations, compute square of variance for each sub-band then compute the mean of the variance.

FLOW CHART



At the next step, the edge information of the grey level image is combined with the binary result of the previous step. From all edge pixels, only those are selected that probably belong to text areas according to a criterion, number of pixels in output image and input

image is calculated. Smoothing algorithm is then applied in order to fill text areas in the edge map. Finally, different parameters are calculated using different formulas.

EVALUATION MEASURES

I Size of I/O image. By calculating the row and column pixels, it is used to find the total size of original and restored image.

II MSE is **Mean Square Error**, f (i,j) is pixel value of output image, F(i,j) is pixel value of input image. Given by Formula:
MSE= ((no_pixels_in_output_image - no_pixels_in_input_image).^2)./((Size_Of_Image).^2)

III PSNR (peak signal to noise ratio) is used to measure the quality of restored image compared to the original image. Larger is the value, better will be the quality of image. It is calculated using equation as follow:
PSNR=20 log10(255 / MSE)

where MSE defined in II refers to mean square error.
The quality of the image is higher if the PSNR value of the image is high. Since PSNR is inversely proportional to MSE value of the image, the higher the PSNR value is, the lower the MSE value will be. Therefore the better the image quality is the lower the MSE value will be.

IV Time calculation: - To use MATLAB command CLOCK to calculate time for our code to be executed, CLOCK is inbuilt command to show the real time, we use this command twice to calculate time consuming parameter.

III. RESULTS AND DISCUSSION

In proposed algorithm, are used to provide more clarity than in previous work. In this, results of all the intermediate steps of the proposed methods are highlighted. Implementation is done on MATLAB Experimental results of intermediate steps show the efficiency of the proposed approach. Results includes following steps:

Figure 3: Degraded document

The input image for de-graded document is taken from IEEE data set. Wiener filter is applied on the input image to remove its blurry effects. The output of the wiener filter is shown below.

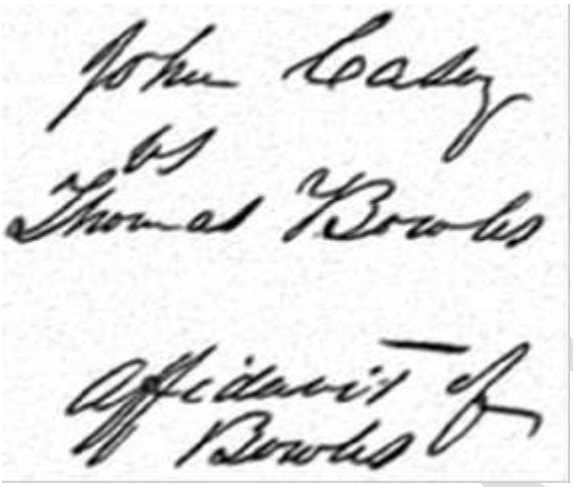


Figure 4: Restored image

The restored image after applying wiener filter is given above, wiener filter clears the input image by removing the homogenous noise.

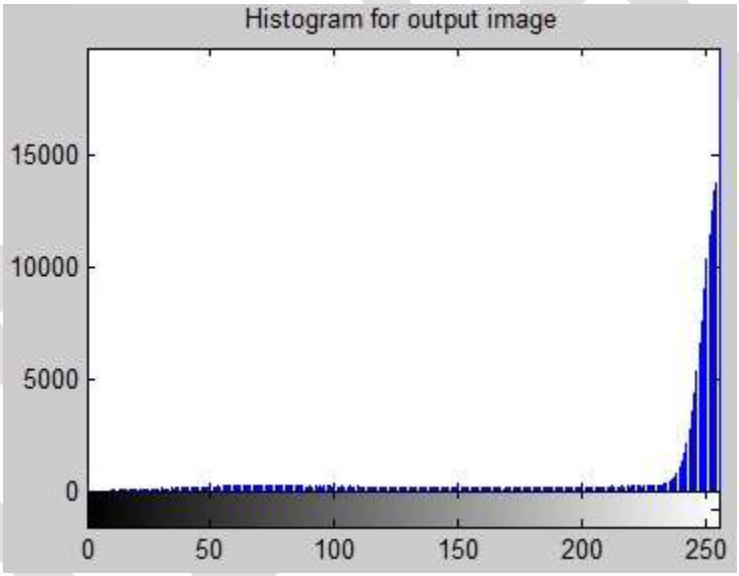


Figure 5: Histogram for input image

In the above figure graphical representation of input image is shown. A *histogram* is a display of statistical information that uses rectangles to show the frequency of data items in successive numerical intervals of equal size. In the most common form of *histogram*, the independent variable is plotted along the horizontal axis and the dependent variable is plotted along the vertical axis.

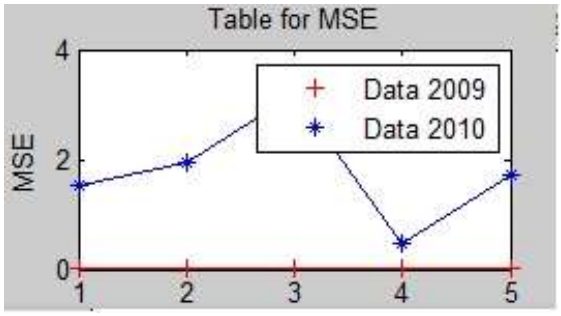


Figure 6: Graph for Mean Square Error

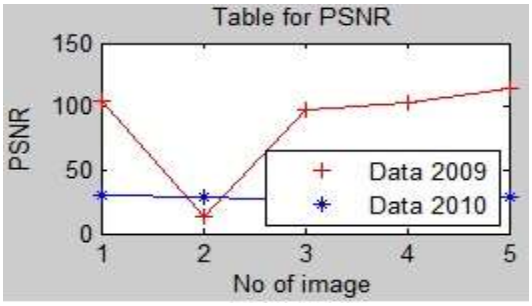


Figure 7: Graph for PSNR

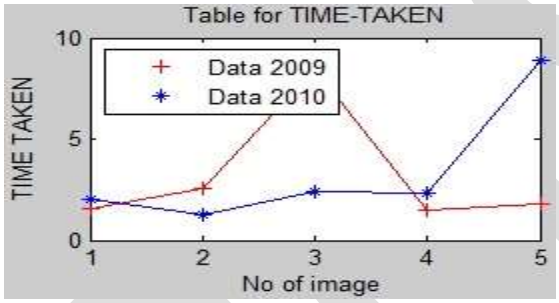


Figure 8: Graph for Time-Taken

Different graphs for various values calculated are shown above. MSE, PSNR and Time Taken are calculated and shown in the form of graphs.

S.NO.	NO.OF PIXELS OF I/P IMAGES	NO. OF PIXELS OF O/P IMAGES	SIZE OF I/O IMAGES	MSE	PSNR	TIME TAKEN(*10-3)
1	528721	560153	565820	0.0031	49.1715	1.919000
2	1283804	1317755	1320370	0.0066117	55.8623	2.964000
3	318176	332435	332478	0.0018	51.4189	1.373000
4	476790	501494	502095	0.0024	50.2258	1.747000
5	650976	673892	674866	0.0012	53.4470	2.028000

Table 1: Evaluation parameters

IV. CONCLUSION

This research work is based on removing noise from degraded images (handwritten documents). Our implemented algorithm is Wiener Filter Algorithm. This method includes histogram equalization and de-blurring. This paper develops a system which is used to clear the degraded documents. We formulate number of parameters for our output and input images. We used to reduce the noise in homogenous areas, implement wiener filter algorithm for removing the blurry effect from degraded images, Evaluating various parameters for studying percentage of improvement and calculate execution time for taking our final output from our code. We reduce the amount of computation by not including other filters to our algorithm from which the execution time for our code gets very small.

V. FUTURE SCOPE

To develop an image technique that will become efficient for de-noising degraded images, blur effects and other noisy images. In this research work we took number of images for our thesis work, we calculate various parameters like MSE, PSNR and Time to implement our design. One could use some other technique to implement same design with reduced time and could also calculate some other parameters and some improved GUI design.

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Research and Development of ERS Cutting Machine

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Abstract— It is observed that garment elastic cutting methods are not fully successful due to the given measurement for elastic length was not cut properly. And also no such machine in an Indian make. The main objective of this proposed system is to avoid elastic shrinkage problem and reduces the machine cost and also save the machine importing cost. This machine is particularly useful for small and medium size serial productions, where flexible and automated cutting solutions for Elastic and VELCRO tape are required. This ERS (Elastic, Rope, and Shoe lace) cutting machine provides a best cutting solution for garment technology with cheapest price.

Keywords— VELCRO,garment elastic cutting,shrinkage

INTRODUCTION

The purpose of this research is to design, fabricate, test, and evaluate the prototype of a semi-automatic ERS cutting machine. The design concept is that ERS cutting is accomplished by pneumatic press on an ERS sitting on a sharp knife in a horizontal plane. The machine consists of 5 main parts:1) machine frame, 2) cutting base, 3) sensing unit, 4) pneumatic system, and 5) stacker receiving cutting pieces. In operation, Elastic is placed on the cutting base and the pneumatic control is switched on. The Elastic is automatically moved to the sensing unit and by a knife set. The cutting piece flows down to the stacker. The machine is found to operate safely without damage to the pieces. Easy to load new elastic using elastic feed roller for the selected elastic length. Elastic length can be programmed and managed offline on. Equipped with an IR sensor virtually eliminates shrinkage mistakes. Easy insertion of the Elastic, cycle start by means of an automatic sensor, and the ability to clearly view the entire operation through the safety shield further add to the user-friendliness. Precision mechanics coupled with new generation electronics guarantee repeatable cutting quality. The cutting head accepts different blade types. Blades can be changed quickly and easily without any tools.

Draw backs of Existing System

1) Output Accuracy

Today's Existing System are all not provide correct measurement in given length, because of he Elastic shrinkage problem

2) Cost

Machine cost is so high for all garment exporters. No Such a brand in India, therefore machine importing cost and duty clearance charges also included

3) Optional Devices

Optional Devices like twisting bar, Stacker are extra charges as per the customer requirement

4) Thickness of the Cutting material

Existing System are all not suitable when thickness of the cutting material is greater than 3.5mm

PROPOSED SYSTEM

The automatic cutting machine ERS Cutting Machine is useful whenever Elastic/Velcro tape is used (e.g. safety wear, medical products, and bags). ERS Cutting Machine has an automatic material feed system. Depending on the cutting length it is

possible to have up to 60-80cuts/min. The cutting is done by a customized cutting tool, which can handle a material width of 100mm maximum. The cutting tool is individualized and can be designed for various patterns (e.g. rounded arrow shape, semi-circles, and other customized shapes). Additionally, it is possible to employ a compound-cutting die in order to cut two tapes parallel resulting in a higher productivity.

In order to increase the flexibility of the cutting machine, it is possible to easily swap cutting tools. It is also very simple to set up the machine by entering the cutting length and the quantity. These features make it easy to respond to changes in the final product design. Due to the very easy handling of the machine, small quantities of a certain tape length can be cut efficiently. This helps to reduce the stock of pre-cut material. The device is also equipped with a roll holder as well as an integrated auto-stop function in case the tape material runs out.

The ERS Cutting Machine is a compact-designed and portable cutting machine for any kind of Elastic and VELCRO tape. A regular 220V power connection, very little space required, and no compressed air make it easy to employ it at any production site.

The machine is particularly useful for small and medium size serial productions, where flexible and automated cutting solutions for Elastic and VELCRO tape are required. . Easy insertion of the Elastic, cycle start by means of an automatic sensor, and the ability to clearly view the entire operation through the safety shield further add to the user-friendliness.

WORKING PRINCIPLE

Initially user will set the elastic length in measurement unit then Elastic from box is fed into twisting device that will be used to produce the neat flow of elastic to elastic feeder. Two Elastic feeders are used to avoid the elastic shrinkage problem that allows free of elastic flow. If elastic reaches the given measuring length then IR sensor sense it and send the signal to control unit. This is explained by following functional block diagram of front end, Fig.1

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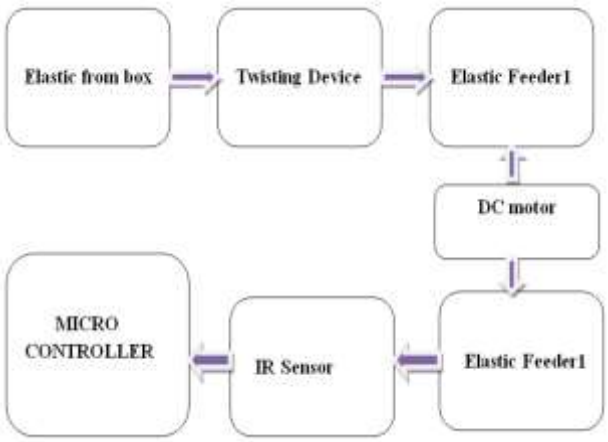

Fig .1. Functional block front end

Controller unit send the signal to Pneumatic System that uses compressed air to transmit and control energy to solenoid valve. If solenoid valve is open then the cutter device is cut the elastic once at a time, Elastic cutting information like number of elastics are cut, and elastic length are to be displayed with the help of LCD display .That can be explained by the following functional block diagram of back end,Fig.2.

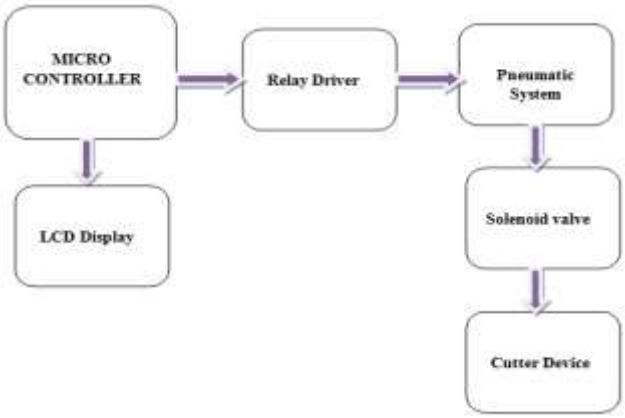

Fig.2. Functional block diagram of back end

SPECIAL FEATURES

1) Cutting length: 25-1000mm
2) Max cutting width: 80mm
3) Voltage, frequency: 220V/50Hz
4) Power: 0.22KW
5) High speed: It can cut 100~120 cut per minute. (50mm long)
6) Accuracy: Cut-length is accurate swing to a stepping motor
7) Cutting type: Cutting is neat due to using a cold cutter which is durable because they are made of high-speed steel.
8) Automatic operation: It works automatically only by setting length and quantity
9) Automatic stopper: It stops automatically if materials run out during operation.
10) Memory: Set-length, set-q'ty & set-speed are not erased even if power off & on.
11) Additional device: For cutting elastic band from box or ground, it prevents twisting of the band.

Entire operating function is described in the following functional flow chart Fig.3.

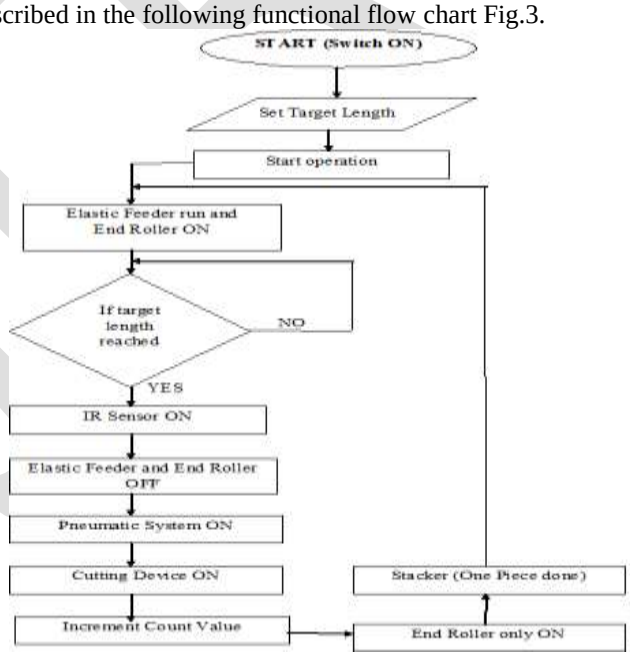

Fig.3. Functional flow chart of proposed System

APPLICATION OF PROPOSED SYSTEM

Specialized for Elastic material (rubber tape)

- ✓ Can also be used for:
- ✓ Velcro (hook & loop),
- ✓ Tape, Belt loop,
- ✓ Plastic Zipper,
- ✓ Elastic band,
- ✓ String and Shrink tube.

ADVANTAGES OF PROPOSED SYSTEM

1) This system is more safety to operator
2) Quick in response
3) Simple in Construction
4) It is very useful in all garment industries
5) Machine cost is low

EXPERIMENTAL RESULT

The system specifications include the software requirements for the simulation of the project. The project is simulated with the help of a desktop computer or laptop. The development tool used for the simulation of this project is Proteus 7.2 shown in Fig 4

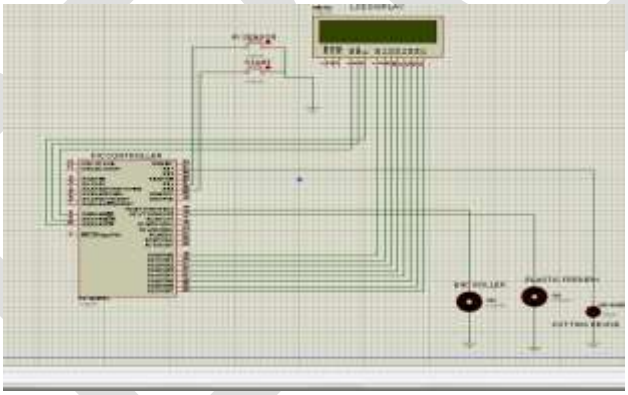

Fig.4.Simulation circuit diagram of proposed system

Press start button then the display will show “ELASTIC CUTTING MACHINE” Fig.5.

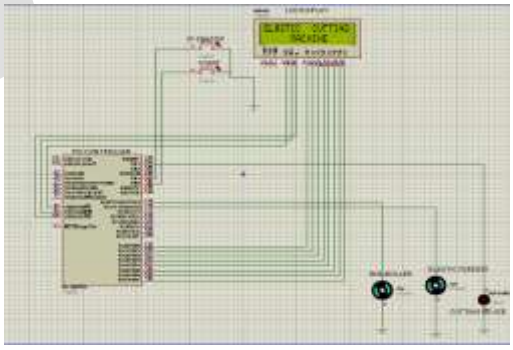

Fig.5. Switch ON the Machine

If motor will ON then rotate the Elastic feeder and End roller for elastic movement after that IR sensor is sense the elastic (given target length which was set manually as per requirement) means cutting device will ON and cut the elastic with accurate length, and also count value will be displayed shown in Fig.6.

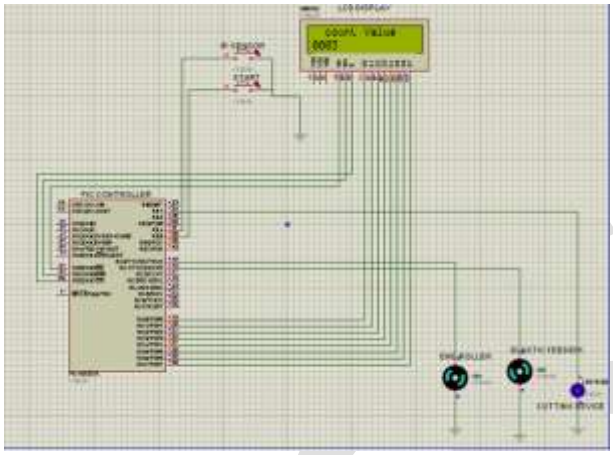

Fig.6. Elastic cut operation and display count value

Elastic feeder doesn't rotate in particular delay but End roller is continuously run to pull out the cut elastic shown in Fig.7.

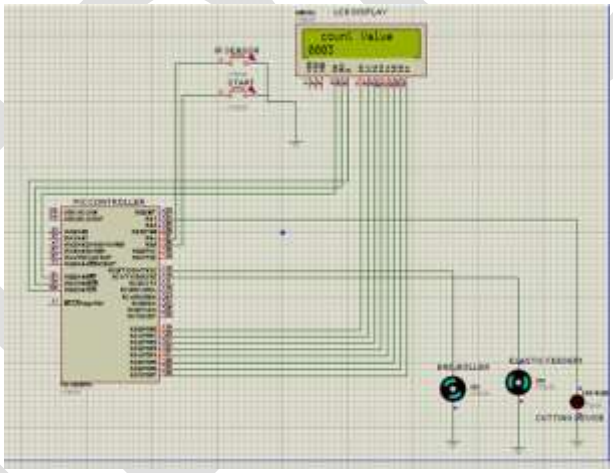

Fig.7.Elastic pullout operation end roller only ON

CONCLUSION

This proposed system provides a best cutting solution for garment technology with cheapest price. This project eliminates the disadvantages of the already existing system such as shrinkage problem and cost.

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Implementation of splitter based multiplier for unsigned and signed number

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Abstract — Multiplier is one of the key arithmetic operations used in most of the high performance digital systems including FIR filters, digital signal processors and microprocessors. With advances in technology, many researchers have tried and are trying to design multipliers which offer either high speed or low power consumption. The proposed multiplier is finding out the best trade off solution between high speed and low power consumption. The splitter based multiplier produces n/2 partial products and overcome many disadvantages of look-up table multiplier, Wallace tree multiplier and booth multiplier.

Keywords — key arithmetic, FIR filter, digital signal processor, microprocessor, high speed, low power, partial products

INTRODUCTION

Design of efficient Multipliers is an active research topic because recent applications demand technologies to employ Digital Signal Processors (DSPs) rather than Microprocessors. In the DSPs the basic building block is the Multiply and Accumulate (MAC) unit. The MAC unit performs two processes namely multiply the multiplicant with multiplier and Accumulate (Add) the partial products to produce the desired result. Though by doing these two processes there may be time complexity to produce the result. So still there is research going on regarding MAC unit to reduce the time complexity. While discussing about the reduction of time the Booth Multiplier will reduce the partial products by assigning weights to the Multiplier and uses overlapping Method which will produce the result faster than the traditional Binary Multiplier. Even though Booth Multiplier reduces the time complexity, use of overlapping method in Booth Multiplier will be more time consuming because of the use of 2's complement. The speed of multiplication operation is of great importance in digital signal processing as well as in the general purpose processors today.

In the past multiplication was generally implemented via a sequence of addition and shift operations. Multiplication can be considered as a series of repeated additions. The number to be added is the multiplicand, the number of times that it is added is the multiplier, and the result is the product. Each step of addition generates a partial product. In most computers, the operand usually contains the same number of bits. When the operands are interpreted as integers, the product is generally twice the length of operands in order to preserve the information content. This repeated addition method that is suggested by the arithmetic definition is slow that it is almost always replaced by an algorithm that makes use of positional representation. It is possible to decompose multipliers into two parts. The first part is dedicated to the generation of partial products, and the second one collects and adds them. The basic multiplication principle is twofold i.e. evaluation of partial products and accumulation of the shifted partial products. It is performed by the successive additions of the columns of the shifted partial product matrix

EXISTING MULTIPLIERS OVERVIEW

look-up table multiplier

Look-Up Table multipliers are simply a block of memory containing a complete multiplication table of all possible input combinations. The large table size will needed for even higher inputs, which make these impractical for FPGAs. For example 2 X 2 multiplication sixteen memory elements are needed to store all possible value of products whereas for 3 X 3 multiplication totally sixty four memory elements are needed to store all possible value of product result.

Wallace tree multiplier

The Wallace tree multiplier is considerably faster than a simple array multiplier because its height is logarithmic in word size, not linear. However, in addition to the large number of adders required, the Wallace tree's wiring is much less regular and more complicated. As a result, Wallace trees are often avoided by designers, while design complexity is a major concern to them. Wallace tree styles are generally avoided for low power applications, since excess of wiring is likely to consume extra power. While subsequently faster than Carry-save structure for large bit multipliers, the Wallace tree multiplier has the disadvantage of being very

irregular, which complicates the task of coming with an efficient layout. The summing of the partial product bits in parallel using a tree of carry-save adders became generally known as the Wallace Tree.

Booth multiplier

There are two algorithms used in booth multiplication They are radix 2 and radix 4 algorithm. To perform radix-2 booth algorithm following steps to be followed

Step 1: Making the Booth table

- From the two numbers, pick the number with the smallest difference between a series of consecutive numbers, and make it a multiplier.
- Let X = multiplier & Y = multiplicand
- Load the X value in the table.
- Load 0 for X_{-1} value it should be the previous first least significant bit of X
- Load 0 in U and V rows which will have the product of X and Y at the end of operation.

Step 2: Booth Algorithm

Booth algorithm requires examination of the multiplier bits, and shifting of the partial product. Prior to the shifting, the multiplicand may be added to partial product, subtracted from the partial product, or left unchanged according to the following rules

Table 1 partial product rules for Radix-2

X	**X_{-1}**	**Operation performed**
0	0	Shift only
1	1	Shift only
0	1	Add Y to U, and shift
1	0	Subtract Y from U, and shift

Similarly to perform radix-4 booth algorithm the following steps should be followed

- **Radix number conversion** → First of all the multiplier had to be converted in to radix number
- **Partial product array formation** → The multiplicand is multiplied with five different weights and are stored in an array
- **Partial product selection** → Based on three bit combination of multiplier the partial product is selected from the array.
- **Wallace tree addition** → After selecting the partial products added them using Wallace tree adder to produce product result

Drawbacks Of Existing Multipliers

By analyzing the functionality of three basic multipliers namely Look-Up Table Multiplier, Wallace Tree Multiplier and Booth Multipliers the following disadvantages are founded, they are as follows

- Memory Requirements
- Circuit Complexity
- Radix Number Conversion
- Overlapping Concept
- Number Of Weights Used
- Signed Number Multiplication

PROPOSED ARCHITECTURE

The block representation of the splitter based multiplier comprises of three blocks namely

- Multiplier splitter
- Multiplier Splitter Based Partial Product Generator (MSBPPG)
- Wallace Tree Adder
- Sign detector

In which MSBPPG is the main building block of Splitter Based Multiplier. This block also comprises of two sub blocks such as partial product array and 4-1 Multiplexer. This proposed multiplier is designed to reduced number of partial products that is n/2 partial products are generated for n inputs and also it computes the product comparatively faster than the existing multiplier.

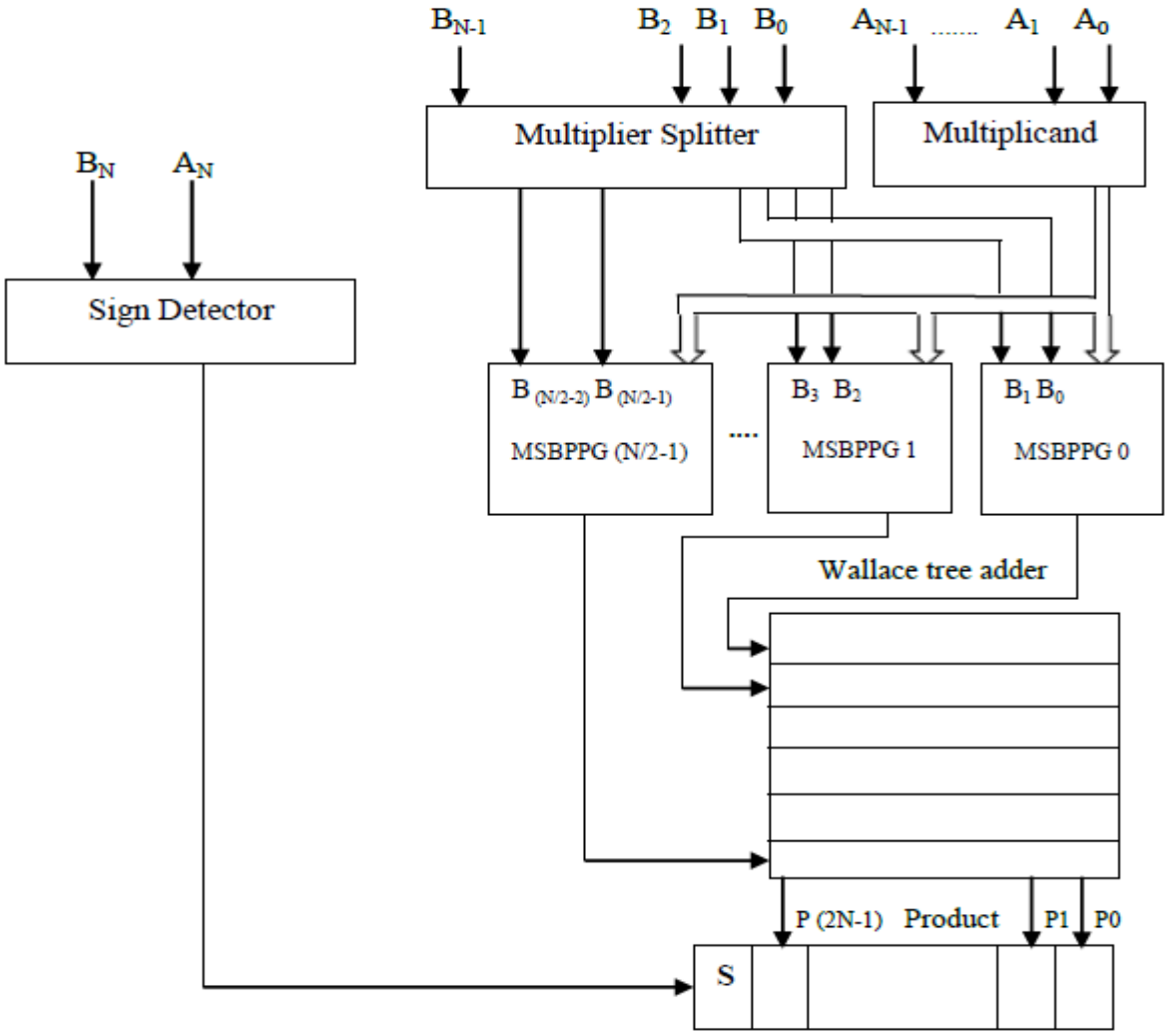

Figure 1 splitter based multiplier

Multiplier splitter

The function of multiplier splitter block is to splitting given multiplier in to two bits respectively. For multiplying 8 X 8 binary numbers the Multiplier (B) has been divided into 4 Partitions such that 4 Partial Products will be generated using this Multiplier instead of 8 Partial Products in conventional multipliers.

Multiplier Splitter Based Partial Product Generator (MSBPPG)

Multiplier splitter based partial product generator (MSBPPG) is the basic building block of splitter based multiplier, this block comprises of two sub-blocks namely, partial product array and 4-1 multiplexer. The multiplicant (A) is directly given as the

input of partial product array. The partial product array is designed to produce the number of feasible partial products by multiplying the multiplicant (A) with 4 different weights such as 0,1,2,3 based on the multiplier splitter.

In this Partial Product Array multiply by '0' means is multiplied by '0'.Multiply by '1' means the Product still remains the same as the Multiplicant value. Multiply by '2' means Left shift the Multiplicand once. Multiply by '3' means addition of multiply by 1and multiply by 2. Multiplier splitter is used to split the multiplier into 2 bit (N/2) sequence which acts as the selection lines of the 4-1 multiplexer. The Partial Product will be chosen based on the selection table given in table 3. Finally the partial product which corresponds to the assigned weight is manipulated from the selection line (B_1 and B_0) by employing a 4 -1 multiplexer.

Table 2 Partial Product Selection table

$\mathbf{B_{N+1}}$	B_N	PARTIAL PRODUCT
0	0	0 X Multiplicand
0	1	1 X Multiplicand
1	0	2 X Multiplicand
1	1	3 X Multiplicand

Wallace Tree Arrangement

Wallace tree has been used in the proposed architecture in order to accelerate multiplication by compressing the number of partial products. This design is done using half adders, Carry save adders and the full adder to speed up the multiplication. In the Wallace tree addition the second partial product had to be shifted left by two bits before adding to the first partial product. Hence the third will be shifted left by four whereas for fourth will be shifted left by six. Hence after proper arrangement all the four partial products will be added.

Sign Detector

The proposed architecture depicted in figure 1 is only able to multiply unsigned numbers. By including the additional block called sign detector to the figure 1 which will able to multiply both signed and unsigned numbers. Sign detector is used to detect the sign bit of the product for the corresponding inputs. Initially MSB of the multiplicand and multiplier is dispatched to the sign detector where the EX-OR operation takes place.

Table 3 Performance Comparison

Parameter	Wallace tree multiplier	Booth multiplier	Splitter based multiplier
Number of Slices	19	18	17
Number of 4 input LUTs	33	32	31
Number of IOs	16	25	23
path delay	21.129ns	17.366ns	11.642 ns

CONCLUSION AND FUTURE ENHANCEMENT

The proposed Splitter Based Multiplier is designed and synthesized to produce the product in a faster manner and also overcomes the limitation of the other basic multipliers. The Synthesis Report shows that the computational time of Splitter Based Multiplier for Unsigned numbers is 11.642 ns and it is lesser than Wallace Tree Multiplier and Booth Multiplier respectively. In the future the proposed SBM can also be implemented using CMOS Technology and the hardware and time requirement of the same can be compared with the existing multipliers. The SBM can also act as MAC unit when it combined with an accumulator.

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DESIGN AND IMPLEMENTATION OF HIGH SPEED LFSR USING MCML LOGIC

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Abstract— LFSR, Linear Feedback Shift Register is one of the key element in the high speed VLSI testing to generate pseudo random bits. In this paper, High speed 5GHz LFSR is implemented using MOS current mode logic. Cadence virtuoso 0.18um technology is used to implement the proposed logic. Simulated results of the proposed logics are presented.
Keywords— LFSR, MCML, Pseudo random bits, Virtuoso

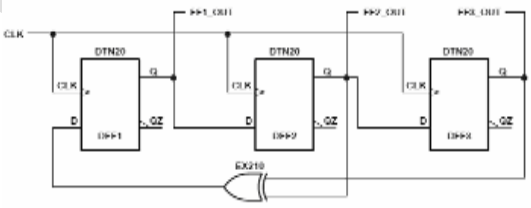
INTRODUCTION

In large scale integration, millions of transistors can be placed on a single chip for implementation of complex circuitry. As a result of placing so many transistors in such a small space, major problems of power consumption had come into the picture. Research has been conducted to solve these problems. Solutions have been proposed to decrease the power supply voltage, switching frequency and capacitance of transistor [1]. Linear Feedback Shift Register LFSR is a Pseudo Random Sequence Generator used in a variety of applications such as Built-in-self test (BIST) [2], cryptography, error correction code and in field of communication. In cryptography it is used to generate public and private keys. Today LFSR's are present in nearly every coding scheme as they produce sequences with good statistical properties, and they can be easily analyzed. Moreover they have a low-cost realization in hardware. Counters such as Binary, Gray suffer problem of power consumption, glitches, speed, and delay because they are implemented with techniques which have above drawbacks. They produce not only glitches, which increase power consumption and design complexity. The propagation delay of the existing techniques is more which reduces speed and performance of system. In this paper 5GHz LFSR is designed using MOS Current Mode Logic (MCML). The speed of the testing device in BIST can be increased by using high speed LFSR.

LFSR

A **linear feedback shift register** (LFSR) is a shift register whose input bit is a linear function of its previous state. The initial value of the LFSR is called the seed, and because the operation of the register is deterministic, the stream of values produced by the register is completely determined by its current (or previous) state. Likewise, because the register has a finite number of possible states, it must eventually enter a repeating cycle. However, an LFSR with a well-chosen feedback function can produce a sequence of bits which appears random and which has a very long cycle. Applications of LFSRs include generating pseudo-random numbers and fast digital counters. LFSR is basically, a shift register configuration that propagates the stored patterns from left to right. The modification that provides the Pseudo Random Sequence Generator which generates the output due to the XOR feedback of the selected flip-flop outputs, named taps. When the taps are chosen properly, the LFSR will traverse through all possible states except for the all 0s state and will produce a maximum length pseudo random bit sequence (PRBS) named M-sequence. In order for the desired operation, the LFSR should be first initialized to a well-known stage, as seed. For an n stage LFSR, there are 2n-1 states, and the M sequence is 2n-1 bits long. Hence, the M-sequence is periodic, and after the 2n-1 distinct values, it repeats itself in the next samples. Block diagram of 3-bit LFSR is depicted in fig 1.

Figure:1



Linear Feedback Shift Registers

List of bits that effects the next state are called tap sequence that is the outputs that influences the input are called taps. The tap sequence of an LFSR can be represented as a polynomial mod 2 that is coefficients of polynomial is either 0 or 1 this is called feed back polynomial or characteristics polynomial. If (and only if) this polynomial is a primitive, then the LFSR is maximal. The LFSR

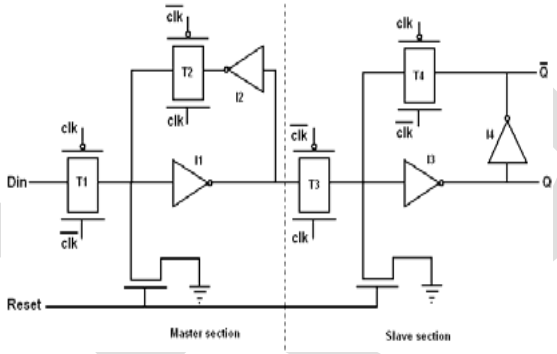
will only be maximal if the number of taps are even. The tap values in a maximal LFSR will be relatively prime. There can be more than one maximal tap sequence for a given LFSR length. Its output for the various condition of input is expressed in Table1.

Table 1. Truth table for LFSR

Clock pulse	FF1	FF2	FF3
1	1	1	1
2	1	1	0
3	1	0	0
4	0	0	1
5	0	1	0
6	1	0	1
7	0	1	1

In literature each D-FF of LFSR is implemented by using either transmission gates or pass transistor. Circuit diagram of D-FF using transmission gates are depicted in fig.2.

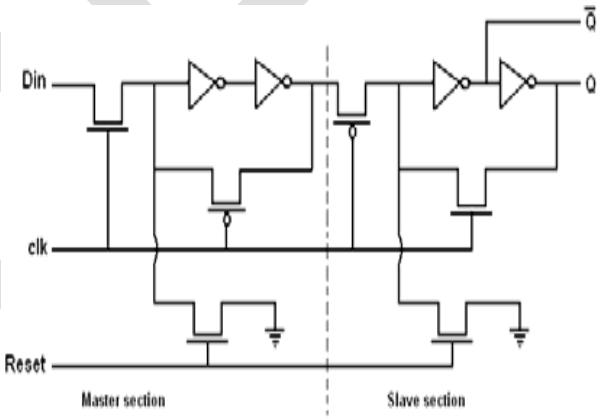
Figure:2



LFSR using TG

Totally it requires 18 transistor to implement the above design. One more is implementation of D-FF using pass transistor logic is implemented in fig.3.

Figure:3



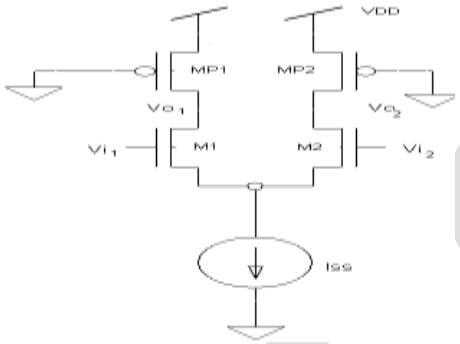
LFSR using pass transistor

In this design DFF using pass transistor logic requires 14 transistors. For both transmission gate and pass transistor based techniques the maximum frequency of operation is 1.7GHz.

MCML

MCML circuits are based on current steering logic where in current is ideally steered by a one of the branches depending on the inputs at the NMOS transistor. Advantages of MOS current mode logic have high noise immunity due to its differential nature. It achieves high speed by consuming less power and high supply noise rejection.

Figure:4



MCML inverter

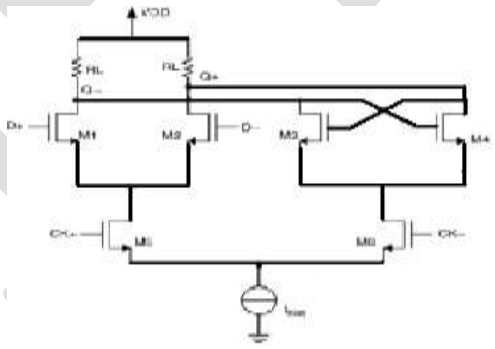
PMOS load is forced to work in linear region of operation resistance of PMOS along with current flowing through it determines voltage swing at the output. The NMOS input transistors are employed to perform the required logic operation. Current source is used to provide a constant current through the circuit so as to reduce the fluctuations from the power lines and maintain constant power consumption irrespective of frequency of operation. For better and faster operation NMOS transistor of MCML circuit forced to operate in saturation region.

DIFFERENT MCML TOPOLOGIES

MCML D Latch

MCML D latch is depicted in fig.5. It consist of two parts one is MCML inverter and second is latch circuit. During positive half cycle data from transistor M1 and M2 are inverted and during negative cycle inverted data is latched.

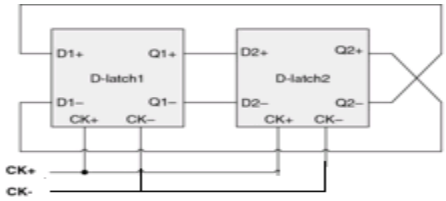
Figure:5



MCML D latch

Circuit diagram of master slave D flip flop is depicted in fig .6

Figure:6

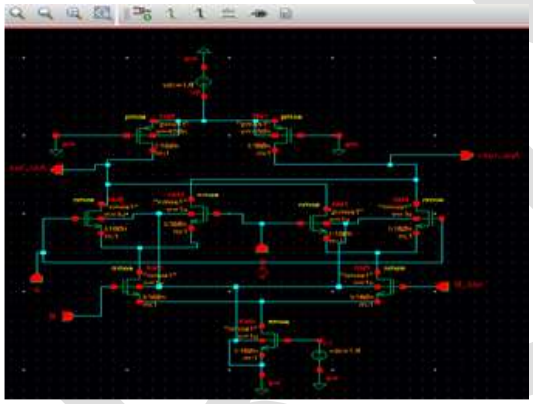


MS D flip flop

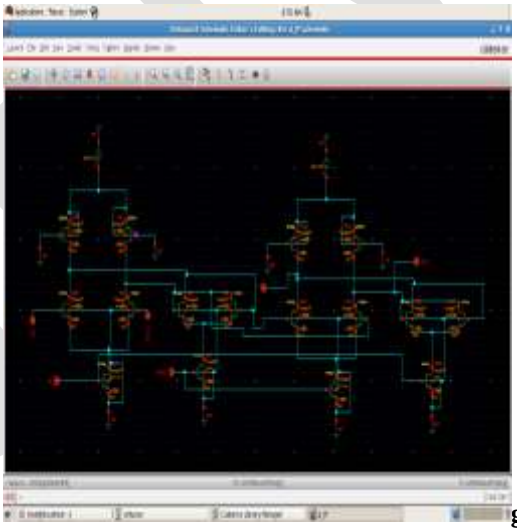
EXPERIMENTAL RESULTS

Circuit diagram of MCML XOR gate is depicted in fig.7

Figure:7



MCML XOR gate

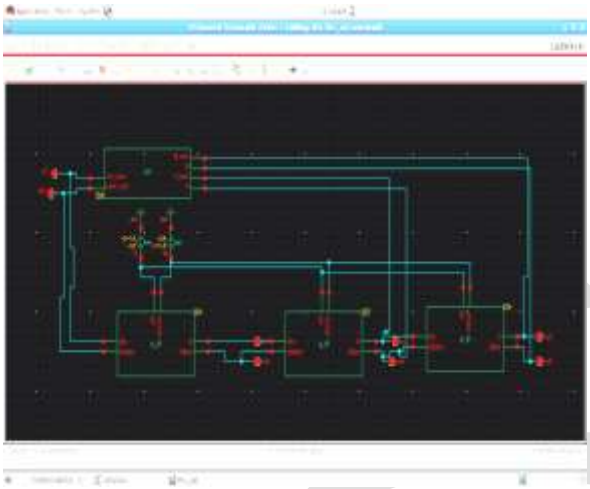


gure:8

MS D flip flop

The circuit diagram of master slave D flipflop is depicted in fig.8

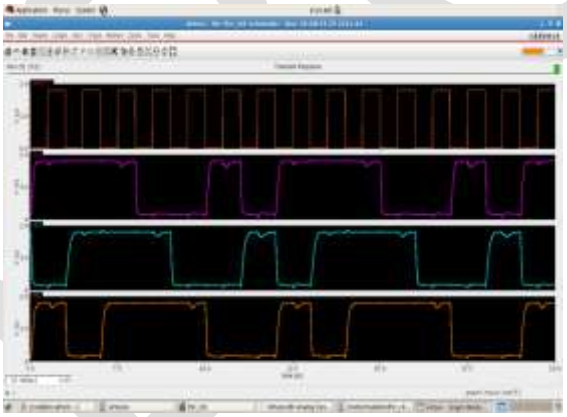
Figure:9



LFSR using MCML XOR and MCML MS D- FF

The circuit diagram of LFSR with a polynomial X^3+X^2+1using MCML XOR gate and MCML master slave D FF is depicted in fig.9.The pseudo random sequences are generated using MCML LFSR. The proposed LFSR works until 5 GHz with out any distortion. Waveforms of the proposed LFSR for 5 GHz is depicted in fig.10

Figure:10



Waveforms of the proposed LFSR for 5 GHZ

CONCLUSION

In Table II indicates different LFSR for different parameters such as number of transistors, power dissipation, maximum frequency of operation and area required to construct the LFSR. Table II indicates that proposed LFSR is optimized in all the parameters.

LFSR	Number of transistor	Power (uW)	Maximum frequency (GHz)	Area mm^2
Transmission Gate	86	99.6	1.7	270
Pass Transistor	68	28.188	1.4	321
Proposed	**56**	**21.12**	**5**	

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Survey on Data Mining Techniques Used in IT Business Development

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Abstract— Information Technology is a part and of every organization currently. From past two decades, IT has grown *humongously*. All companies collects their day to day transactional business information using Information technology tools and perform analysis on data to run their business smoothly, sustain and grow in the competitive market environment. Information gathering, analysis and prediction is very crucial or organizations profit. Data mining is the area where large analysis of data can be performed and future prediction can be done by statistical techniques. For an IT service company to grow, the human resources, technology, market and innovation play an important role. The following paper explains various researches being done in the factors affecting an IT business growth and how data mining using existing data can help business to grow.

Keywords— Data mining, Business development, Strategic Planning, Customer Relation Management, Project Management, Human Resources Management, Innovation

INTRODUCTION

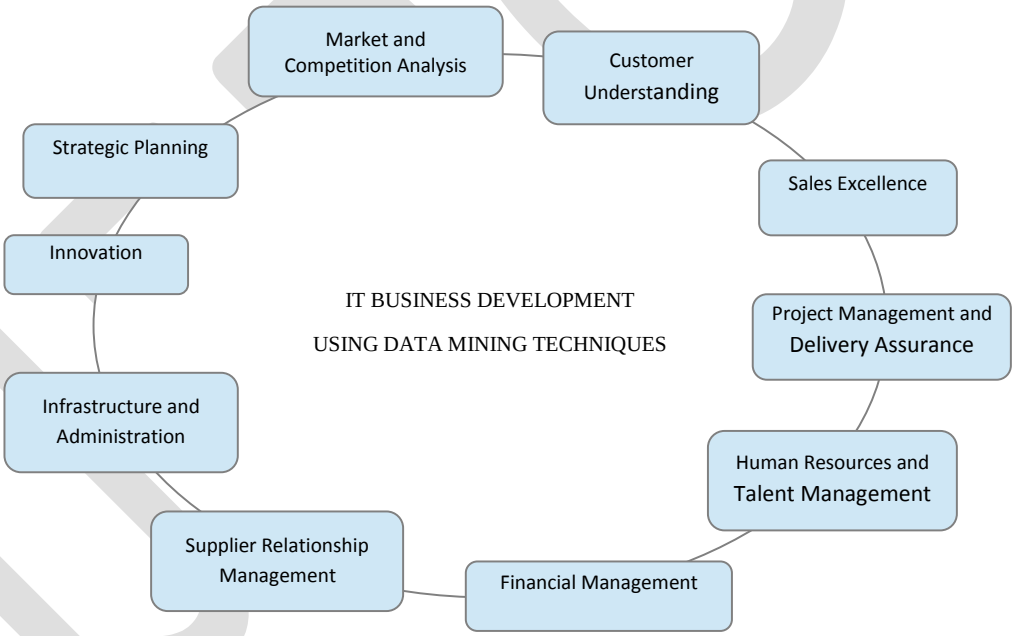

Fig.1 Data mining Techniques Used in IT Business development

From Fig.1 shows the various research organizations have published papers on factors such as Customer relationship management, Sales Excellence, Financial management, Employee Human resources management, partners and vendor management, project management, research, development and innovation.

RELATED WORKS:

Strategic Planning

Strategy planning is an organization's process of defining the goals, determining the actions to achieve the goal and mobilizing resources to achieve the goal. The senior management team in the organization is responsible for setting up the strategy goals. Now-a-days each function in an organization has a strategy leader called by various names - Chief Executive Officer (CEO), Chief Operating Officer (COO), Chief Technology Officer (CTO), Chief Information Officer (CIO), Chief Financial Officer (CFO) and Chief Strategy Officer (CSO). Each of these leaders responsible for laying out a plan to achieve the organization's goal. According to Prof. Manjeet Kumar, data mining can be used to analyse the data in different perceptive and summarize an information for increase revenue, cut costs or both by finding correlations or patterns among dozens of fields in large relational databases.

Their five step process involves below activities:

[6] Mission, Vision and Goal analysis through business understanding
[7] Environmental analysis through the activities:
  a) Data understanding
  b) Data preparation
  c) Modeling
  d) Evaluation
  e) Deployment
[8] Strategy formulation
[9] Strategy implementation
5. Strategy evaluation

Marketing Intelligence

Marketing intelligence is the process of gathering and analyzing information in order to under the current and future market behavior, needs and preferences and to access the changes needed in the business in order to sustain and grow in the competition. Market analysis, segmentation and penetration by communicating the value of the product or service to clients are part of the marketing intelligence team. Marketing research involves interpreting conducting research into above activities and statistical interpretation of data into information which is used by managers to plan marketing activities, gauge the nature of a firm's marketing environment and attain information from suppliers. Using statistical methods to analyse the strategy of marketing based on quantitative research, qualitative research, hypothesis tests, Chi-squared tests, linear regression, correlations, frequency distributions, poisson distributions, binomial distributions, etc. to interpret their findings and convert data into information. The task of marketing research is to provide management with relevant, accurate, reliable, valid and current information as represent in fig.2. It is also the function of the marketing team to brand the product, showcase demos, intellectual properties and skilled resources to client.

According to Michael J. Shaw [2], knowledge-based marketing can be used for customer profiling like frequency, size, frequency and life time of purchases, deviation analysis like fraud detection and trend analysis like evaluating the performance of products and marketing programs, forecasting future sales.

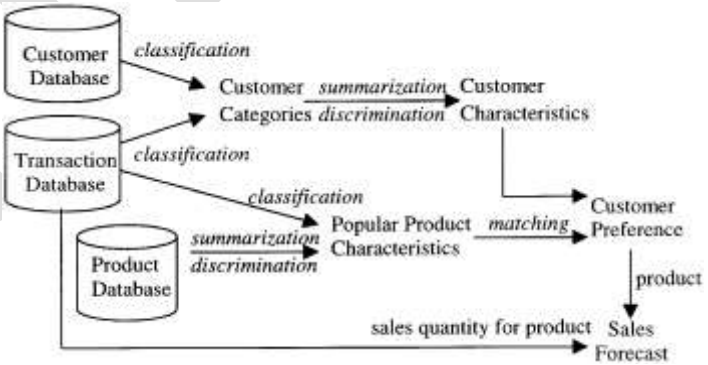

Fig.2 Marketing Research Based on Datamining

Customer Relation Management

Customer relationship management (CRM) is a system for managing a company's interactions with current and future customers. It involves using technology to organize, automate and synchronize sales, marketing, customer service, and technical support.

According to E.W.T. Ngai, dimensions of Customer Relation Management include Customer identification, Customer attraction, Customer retention and Customer development. Data mining techniques can perform one or more of the following types of data modeling: Association, Classification, Clustering, Forecasting, Regression, Sequence Discovery and Visualization using the widely used algorithms of association rule, decision tree, genetic algorithm, neural networks, K-nearest neighbor and Linear/logistic regression.

Sales Excellence

Sales excellence is the process of identifying the right opportunities at the right time. It involves planning for opportunities from existing and new clients, technology and domain and also predicting the future. For example, an organization may be providing production support activities for a client. Penetration can be in the form of obtaining new projects pertaining to enhancements of current product or development of new products not related to the existing support for the client. Currently support may be for reporting, penetration can be in the form of new technologies like reporting on mobile, analytics, enterprise data integration, master data management, web applications development, cloud computing using a different technological stack. Bagging an outsourcing opportunity and acquisitions are all planned activities that can increase the sales of an organization drastically.

Data mining techniques is applied on parameters pertaining to obtaining new projects from existing clients, getting new clients, outsourcing offers, acquisitions and predicting future needs and growth. Organizations set up strategic goals based on the sales growth visualized.

Michael J.A. Berry and Gordon S. Linoff [4] state that the data mining methodology has 11 steps:

1. Translate the business problem into a data mining problem.
2. Select appropriate data.
3. Get to know the data.
4. Create a model set.
5. Fix problems with the data.
6. Transform data to bring information to the surface.
7. Build models.
8. Asses models.
9. Deploy models.
10. Assess results.
11. Begin again.

By defining parameters relating to sales like client business, budget, spending potential, growth and government policies and applying data mining techniques to increase growth, an organization can achieve the expected sales, revenue and profit.

Project Management and Delivery Assurance

Project management is the process of initiating, planning, executing, monitoring and controlling and closure of software projects. From fig.3 represents for project management activities include estimating effort, size, schedule, cost, resources and infrastructure and ensuring that project deliverables meet organization and clients standards. Delivery assurance ensures that reviews and testing is conducted as per plan through audits.

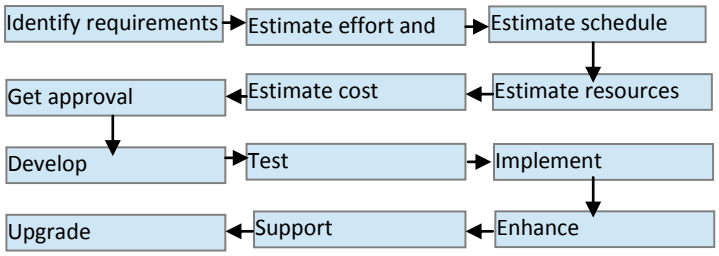

Fig.3 Project Management and Delivery Assurance

Metrics creation and submission is a very important activity of project management. There are lot of project management failures like unrealistic goals of metrics, inaccurate estimates, badly defined system requirements, poor status reporting, unmanaged risks and issues, poor communication among customers, developers and business users. Data mining is used to analyze the existing data on various parameters and arrive at a prediction formula on what factors positively and negatively impact project performance. Data mining techniques can also be used in project proposal creation, project selection, accurate estimation of time and cost to project completion, resolving risk and issues. A company's business development lies largely on delivering successful projects.

PROJECT LIFE CYCLE:

According to Roger Atkinson [5], success factors of delivering code with optimal cost, time and quality, called as Iron Triangle of an Information system that is Maintainable, Reliable and Valid results in organization benefits of improved efficiency and effectiveness, Increased profits, Organizational learning and Reduced waste and Stakeholder benefits of Satisfied Users, Social and Environmental Impact, Personal Development, Contracts Profit, Capital Suppliers.

Human Resources and Talent Management

Human Resource management involves acquiring resources for project execution, laying performance goals for various streams, setting up salary bands according to industrial standards, defining rating criteria and appraise employees of the organization. Human resource management also involves satisfying employees through rewards and reorganization programs. Human resources management also requires identifying training requirements and executing the same for the organization's growth. Talent management focuses in retaining talent within the organization and improving the same. There are various factors that affect employee performance and productivity. Factors like age, sex, marital status, number of kids, university type, specialization, degree, grade, country, years of experience, prior companies worked, job title, rank, service period, technological and domain expertise, certifications, process knowledge play a crucial role in an organization's development. Sangita Gupta and Suma V [6] have arrived at a 5-step process to arrive at selection of personnel for projects.

Step 1: Training data is obtained based on parameters related to software project personnel like General Percentile aggregate, Domain knowledge assessment, Programming skills, General proficiency, Communication skills, Time efficient, reasoning skills, Performance.
Step 2: An Attribute Selection Measurement Function (ASMF) is calculated based on the parameters.
Step 3: An average maximum occurrence for each attribute is calculated as $\Sigma ai/CiD$.
Step 4: Basis of sorted values of ASMF, given training set is divided into subsets and move to another level of tree.
Step 5: The process is repeated on each subset iteratively and a decision tree is derived. The result and rules obtained can classify project members into three classes of performance- good (should be deployed), average (can be deployed with training) and poor (should not be deployed).

Similar process can be applied to obtain the effectiveness of training programs, campus recruitments, employee retention rates, etc.

Financial Management

Financial Management is the Operational Activity of a business that is responsible for obtaining and effectively utilizing the funds necessary for efficient operation of the organization. The goal of Financial Management is to optimize the cost of IT Services while taking into account quality and risk factors. Budgeting, IT accounting and Charging are 3 major sub-processes in Financial Management. Managing customer contracts, budgeting, project costing, profitability calculation based on global outsourcing, resource grades, account level, geography, industry trends, cost cutting, dollar fluctuations are all functions of financial management. Planning of acquisitions and calculating their profitability, loan management, forecasting stock market and money laundering analysis also form part of financial management.

According to Abhijit A. Sawant and P. M. Chawan [7], Bayes Classification can be used to classify data, Decision Tree can be used for decision making, boosting applied to predictive data mining, bagging and random forest algorithm improves classification of data. Using available data and applying the various data mining algorithms to the available data, it is possible to manage the finances for above said areas.

Supplier Relationship Management

Supplier relationship management is a comprehensive approach to managing an enterprise's interactions with the organizations that supply the goods and services it uses. Suppliers can be vendors who provide human resources and partners with whom the organization has a tie up. Supplier management drives cost accountability and innovation through active management of supplier performance and ensures sustainability through compliance and measurement. They have also reaped significant potential benefit in being able to prepare against any supplier-related performance issues or risks through a deeply cooperative ongoing supplier relationship.
According to Suhong Li, Bhanu Ragu-Nathan, T.S. Ragu-Nathan, S. Subba Rao [8], the five dimensions of Supply Chain Management (SCM) practice are strategic supplier partnership, customer relationship, level of information sharing, quality of information sharing, and postponement. Higher levels of SCM practice can lead to enhanced competitive advantage in terms of price, quality, delivery dependability, product innovation and time to market and improved organizational performance in terms of market and financial performance.

Infrastructure and Administration

Infrastructure for an IT firm includes the building, facilities and hardware equipment. Location of the firm and proximity to resource availability plays a vital role in development of a firm. Special Economic Zone (SEZ) is a geographical region within a country in which tax and investment incentives are implemented to attract foreign businesses and investments. IT Companies are moving to SEZ in order to benefit the exemptions provided by government like exemption from central sales tax, service tax, etc. Servers, Desktop computers, laptops, virtual machines, phones lines, cubicles, video conferencing and meeting rooms, pantry all these need to be planned to suit organization's goals and vision. Administrative services focus on transportation facilities, food and beverages, client visit management, housekeeping, event and hospitality services and security services. Security is a basic necessity for an organization to grow. Security covers security to infrastructure, data security and human security.

According to Leonard Jessup and Joseph Valacich [9], ensuring availability, reliability and security of the facilities infrastructure, managing the human resources and services infrastructure, outsourcing, disaster planning and information system auditing are key for an organization's growth. Based on the organization's vision, data mining techniques can be applied to obtain the right location, infrastructure, services and security for the organization.

Research, Development and Innovation

Research and development focus on identifying new areas for an organization to grow from technical, functional and process perspective. Innovation is identifying new methodologies and products to provide customer delight and satisfaction. According to Andrew Kusiak [10], there are three different types of innovation intermediaries – Invention Capitalist, Innovation Capitalist and Venture Capitalist. Invention Capitalist operates on Lost Cost and High Risk Innovation Cycle. Venture Capitalist operates n High Cost and Low Risk Innovation Cycle. Invention Capitalist connects with companies with ideas but not market ready. Venture Capitalist connects with companies with market-ready products. The innovation capitalist optimizes the trade- off between cost and risk brining market-ready ideas to companies. Generic process for innovation is to search new methods, evaluate them, refine them, develop prototypes and connect with market. The level of innovation can be expressed as a Function of requirements X, I = F(X). For example, in an IT company, innovation can be a function of requirements like quality deliverables, cost effectiveness and long-term reliable relationship for customer delight. Thus research, development and innovation play a key role in an organization sustenance and growth.

GENERAL FRAMEWORK:

For every business process below would be the framework on implementing data mining techniques to improve business by representing in fig.4. As a rule of thumb, identify success and failure factors in each business process, implement the success factors, take corrective and preventive action for failure factors and bring the business to success.

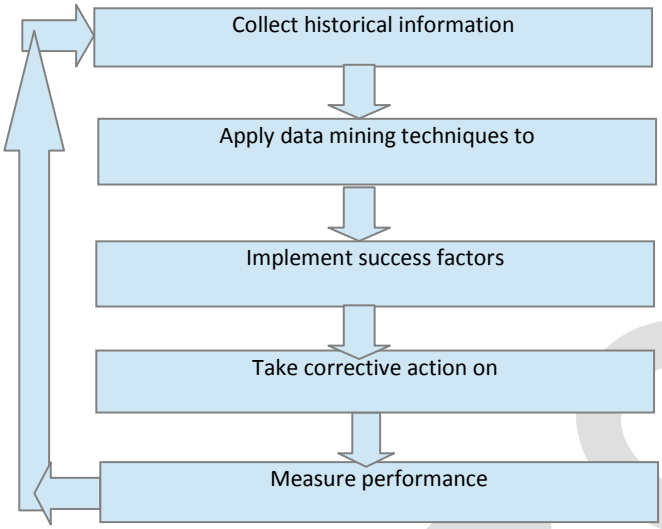

Fig. 4 General framework

CONCLUSION

In this paper the research can be focused on issues that companies face in sustenance and growth, best practices that growing and grown companies have adopted with respect to technology, management, process and employees. In future work, it will be presenting the relation between the various factors and how each and every function needs to perform in the overall organization growth.

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ADVANCED SECURITY ENHANCEMENT OF DATA BEFORE DISTRIBUTION

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Abstract— Security is an important issue in the field of communication. During storing or transmission of data we have to take care of the confidentiality. The proposed work mainly deals with data hiding to enhance the security of data transmitted in a network. The Steganography which hides the existence of the message and the Cryptography which distort the message are combined. It is mainly employed for sending vital information in a secret way. Here we are discussing Adaptive Pixel Value Differencing technique as image Steganographic scheme whereas Advanced Encryption Standard is discussed as the Cryptographic scheme to encrypt the message. In APVD the image is divided into blocks and then data will be hidden. If we use simple pixel value differencing as embedding algorithm then there is a possibility that the resultant stego image may exceed the grey scale range of 0 to 255.This can affect the quality of stego image which in turn causes the observer to identify that a hidden communication is happening. The main objective of this proposed work is to enhance the quality of stego image and to increase the embedding capacity.

Keywords— Data hiding, Steganography, Cryptography, AES, Adaptive pixel value differencing, Stego Image, PVD

1. INTRODUCTION

Information security and privacy has become a growing concern since ancient times. Humans have continually sought new efficient secret ways to protect information. In the initial stage of communication numerous methods were used to protect the confidentiality of data. It includes usage of ink or chemicals, changing space or fonts etc. With the development of technology information hiding techniques came into existence to protect the secrecy of data. It involves techniques like Steganography, Encryption, and Watermarking. During data exchange, it is a basic request that only the intended recipient should be able to decipher the contents of the transmitted data.

The word Steganography is derived from the ancient Greek words '*steganos'* and '*graphia'*[3]. The word Steganos means covered, whereas graphia means writing. Steganography is the field that gives a meaningful way of secure data being transmitted through an open channel without the attention of eavesdroppers.The word Cryptography is derived from the Greek word kryptos which means hidden. The Cryptography scrambles the data. As a result only authorized people can access it. The specific requirement of Cryptography includes authentication, privacy and integrity non-repudiation.

The data hiding using the combination of Steganography and Cryptography includes mainly involve two processes. They are Embedding process and Extracting process. The embedding process uses a cover image to embed the secret text data. The result thus obtained after embedding is then subjected to encryption. The extracting process is used to recover the secret text data from the stego image. Here we require an extraction algorithm. The mathematical formulas are given below:

For embedding Process:

Cover Image +Secret text data+ Encryption algorithm=Stego Image

For Extracting Process:

Encrypted Stego Image+ Decryption algorithm+ Extraction Algorithm=Secret Text Data

Steganography can be used in a wide range of application areas such as, in defense organizations for safe circulation of secret data, in military and intelligence agencies and in smart identity cards where personal details are embedded in the photograph itself for copyright control of materials [2]. In medical imaging, patient's details are embedded within image providing protection of information and reducing transmission time and cost. The Cryptography also has got a wide range of applications including mp3 protection in the networks, military applications etc.

2. EXISTING METHOD

Many Steganographic schemes and Cryptographic schemes are there. The classification of the Steganography depends on the cover object used. The cover object can be an image, audio, video etc. The common audio Steganographic schemes include Parity

coding, Phase encoding, Echo data hiding etc. If the cover object is an image the LSB insertion technique, PVD technique etc. is used. One of the most advanced Steganographic scheme is Adaptive Pixel value Differencing. It is an enhanced version of Pixel Value Differencing and so it overcomes the pitfalls of PVD technique. Various Cryptographic schemes are also there. It is generally classified as Public Key Cryptography and Private Key Cryptography.

3. PROBLEM DEFINITION

Steganography enable us to hide messages in the cover of something else. The embedding phase determines how the data can be embedded. This algorithm can be more or less advanced, ranging from simple least-significant bit (LSB) embedding in the spatial domain to bit scattering in the frequency domain. The actual hiding process starts with embedding bits of the message into the cover image. Most methods in use today are invisible to an observer's senses. But as the number of bits embedded increases the quality of stego image decreases. These expose the fact that hidden communication is happening. So, there are two important issues that must be considered during the embedding process. They are:

(i) the decision of the number of bits that each pixel uses to embed message, and
(ii) quality of the stego image

Due to the above two reasons we can state that the Steganography simply cannot provide a secure data hiding. So we go for the combination of Steganography and Cryptography.

4. PROPOSED METHOD

The proposed method is a combination of two information hiding techniques. That is Steganography and Cryptography. The Adaptive Pixel Value Differencing which is an enhanced version of Pixel Value Differencing is used as the Steganographic scheme whereas Advanced Encryption Standard is used as the Cryptographic Scheme. Since encrypted messages are more difficult to differentiate effective private communication can be done easily. The Implementation involves mainly embedding and extracting process.

The block diagram of the proposed method is as shown below.

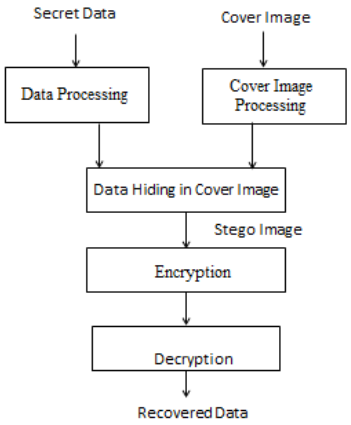

Fig 1: Block Diagram

The important operations involve secret data processing, cover image processing, data hiding, encryption and decryption. The information that the sender want to keep confidential is known as secret data. In such cases to keep it confidential some sort of security actions should be provided. The data can be in the form of a letter, word or character etc. The data processing involves processing of this secret data. It involves calculating the number of bits in the input data and converting it into binary. This binary data is used for embedding purpose.

The cover image is one in which the secret data is hidden. The cover image should be a grey scale image. So the pixel size should be 256×256.If the pixel size is high we have to first bring it to this range. If the input image is a color image we have to first convert it into the grey scale range to use it as cover image.

The data hiding is the process of hiding the data into the cover image and is done by APVD algorithm. The resultant image obtained after hiding the data is the stego image. This image is encrypted using AES. The AES scrambles the image. If unauthorized

people try to access it, they will get only stego image. As the quality of stego image is higher in APVD the existence of the data cannot be easily identified which in turn makes recovery difficult.

5. RESULTS & ANALYSIS

To implement the process an input image is taken. If the image that we are taking is color then we have to convert it into grey scale. We have to take care of the size of the input image. Generally if the image exceeds the grey scale range the quality of stego image get affected and there is a chance of improper visualization. So in order to avoid such situations the range of the input image is limited. The input image is as shown below. The actual size is 160×160.We have to first convert this image into 256 × 256. For performing this operation we have an image resize function in MATLAB.

Fig 2: Original Image

In order to convert the input image into the greyscale range we have rgb2grey function in the MATLAB. After the execution of this command our image will be converted into grey scale range. This image is again splitted into blocks for embedding purpose. The resultant image is the cover image in which we are embedding the data. If we take a grey scale image as cover image the processing operations will be rather simple.

Fig 3:rgb2grey converted image

The image that is used for embedding purpose is known as cover image or cover object. Here we are obtaining the secret data from the user. After receiving the data which is to be kept secret we have to first find out the number of bits in it. This data is converted into their corresponding binary values. Data which is in binary format is embedded into the cover image along with the hamming codes. The hamming codes enable us to reduce the error that occurs during embedding process. The resultant image obtained after embedding is known as stego image.

Fig 4: Stego Image

After data embedding process encryption is done with AES algorithm. This enables as to scramble the stego image. The main characteristics of AES algorithm is its flexibility, simplicity and the reasonable cost. If intruders try to decrypt the resulting image, they will only get the stego image. To get the secret data they again have to make effort so that they can obtain it from the stego image.

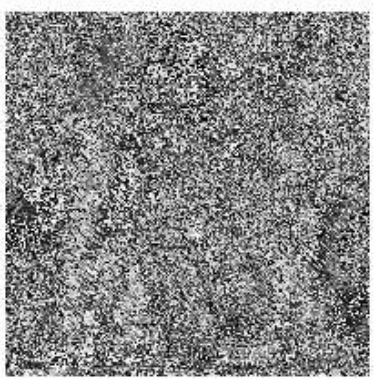

Fig 5: Encrypted Stego Image

Even though the encryption reveals the existence of secret communication, it is difficult to obtain the data as we are employing a combination of Steganography and cryptography.

6. CONCLUSION

A combination of Steganographic scheme using Adaptive Pixel Value Differencing and Cryptographic scheme using AES is implemented using MATLAB The main disadvantage of pixel value differencing is that if the image exceeds grey scale range then it will result in the improper visualization of the stego image. This problem is also avoided here. The quality of stego image is also ensured. In other Steganographic schemes, as the number of bits that are to be embedded increases, the error also increases abruptly. In this approach the error does not increase that much as the number of bits increases. Since the stego image is encrypted the intruder cannot easily obtain the data. The method presented here is applicable to all the image formats and is the one of the great success of this work.

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Simulation Of WiMax Model Using AWGN Channel

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Abstract— WiMax(Worldwide Interoperability for Microwaves Access) is a promising technology which can offer high speed voice, video and data service up to the customer end. The development of 802.16 standards for BWA (Broadband Wireless Access) technologies was motivated by the rapidly growing need for high-speed, ubiquitous and cost effective access. The WiMAX can also be considered to be the main technology in the implementation of other networks like wireless sensor networks. Developing an understanding of the WiMAX system can be best achieved by looking at a model of the WiMAX system. This paper discusses the model building of the WiMAX System using simulink in Matlab R2013a version. This model is a useful tool for BER (Bit Error Rate) performance evaluation. . In this paper, transmitter and receiver model are simulated to evaluate the performance.

Keywords— WiMAX, OFDM, QAM, AWGN, Matlab, RS Decoder, BWA.

INTRODUCTION

The growth in the use of the information networks lead to the need for new communication networks with higher data rates. The telecommunication industry is also change, with a demand for a greater range of services, such as video conferences, or applications with multimedia contents, wireless communication has permeated nearly all facts of human life. Example home, offices, car etc. WiMAX (Worldwide Interoperability for Microwaves Access) is a 4G technology. [1]

The increased reliance on computer networking and the Internet has resulted in a wider demand for connectivity to be provided "anywhere, anytime", leading to a rise in the requirements for higher capacity and high reliability broadband wireless telecommunication systems. WiMAX is one of the most promising techology which has changed the scenario of the industry completely. WiMAX is considered today the most interesting opportunity, able to provide radio coverage distances of almost 50 kilometers and data throughput up to 70 Mbps, and to complete wired network architectures, ensuring a cheap and flexible solution for the last-mile. WiMAX may be seen as the fourth generation (4G) of mobile communications systems. WiMAX is an IEEE 802.16 standard based technology responsible for bringing the Broadband Wireless Access (BWA) to the world as an alternative to wired broadband. WiMAX is expected to have an explosive growth, as well as the WiFi, but compared with the Wi-Fi WiMAX provides broadband connections in greater areas, measured in several kilometers, even with links not in line of sight. For these reasons WiMAX is a MAN, highlighting that “metropolitan” is referred to the extension of the areas and not to the density of population. [1]

DESIGN OF WIMAX SYSTEM MODEL USING AWGN CHANNEL

The main objective behind designing this model was to build up the real time model for the WiMAX system along with the suitable wireless channels compatible to various atmospheric conditions for the signal propagation. The model discussed here is built on QAM modulation scheme and OFDM technique based on the platform of Matlab R2009a, running on Windows XP SP2. Matlab Simulink includes all the mandatory function blocks as specified by the standard documents. The model shown in fig.1 comprises of transmitter, receiver and channel which is AWGN channel in the first case.

First of all, 256 x 256 image input with 96 samples per frame for image and 30138 samples with 1/35 sample time for the process of frame based speech output are taken. Once the data is received in terms of either speech or image, the randomization would be performed which will be applied for encoding. The encoder of the WiMAX system is the combination of Reed-Solomn (RS) code as an outer code and Convolution code (CC) as an inner code. The encoded baseband data is modulated by means of QAM which is applied for OFDM process as the physical layer of WiMAX system is made up of OFDM. In OFDM process, the in phase and quadrature phase components of the symbols will undergo through the process of IFFT so that requirement of effective bandwidth can

be made approximately half without any inter symbol interference. For the simulation purpose, the communication medium is considered to be suitable for long distance system wherein average fading is assumed to be constant throughout the path. To characterize the above system, the channel has been modeled as an additive white Gaussian noise (AWGN) channel. This is the simplest type of channel that is having the noise distribution with a constant power spectral density with Gaussian nature of PDF over the entire channel bandwidth. [2]

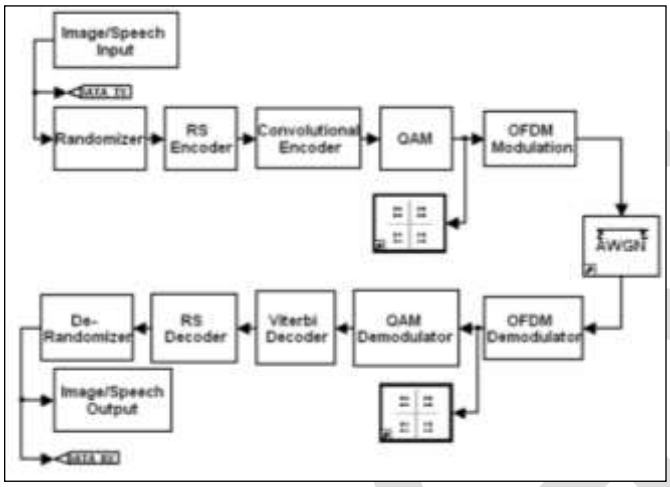

Fig 1 : Block diagram of WiMax System using AWGN Channel.

PROPOSED MODEL

The proposed model for the WiMax system is given in fig 2. The model discussed in the research paper is based on the platform of Matab R2013a. Simulink includes all the mandatory function blocks as specified by the standard documents.

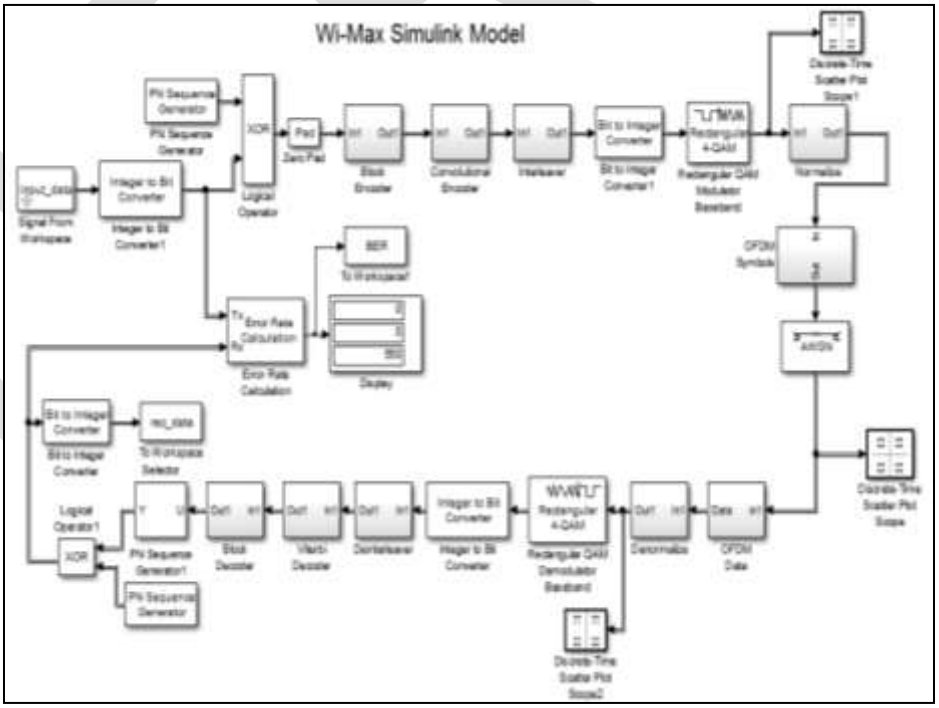

Fig.2: Proposed WiMax Simulink Model

SYSTEM IMPLEMENTATION

1. RANDOMIZER.

Randomization is the first process carried out in the physical layer after the data packet is received from the higher layers. Each error burst in Downlink and Uplink is randomized.

Randomizer operates on a bit by bit basis. The purpose of the randmizer is to convert long sequences of O's or 1 's in a random sequence to improve the coding performance.

The main component of the data randomization is a Pseudo Random Binary Sequence generator which is implemented using Linear Feedback Shift Register.[5]

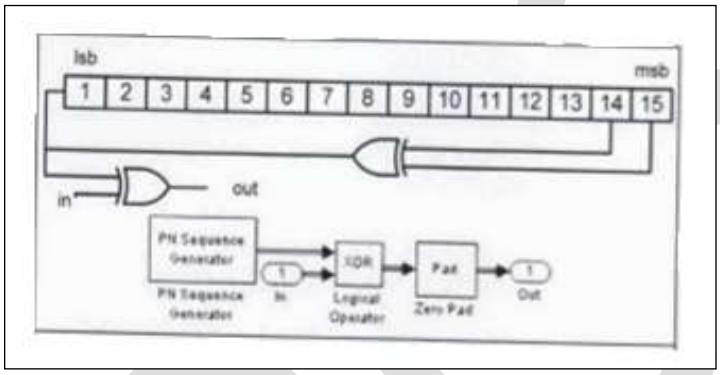

Fig 3 : Channel Encoding – Data Randomizer

2. BLOCK ENCODER

The use of Reed-Solomon code to the data is to add redundancy to the data sequence. This addition of redundancy helps in correcting block errors that occur during transmission of the signal. After randomizer the data is passed onto the Reed Solomon Encoder. The encoding process for RS encoder is based on Galois Field Computations for the calculations of the redundant bits. Galois Field is widely used to represent data in error control coding. [2]

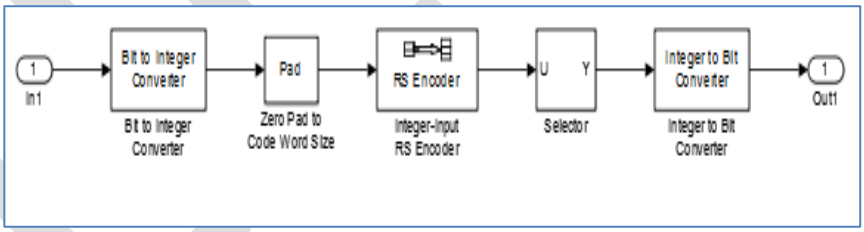

Fig 4 : Channel Cding – FEC Reed Solomon Encoder

3. CONVOLUTIONAL ENCODER

Convolutional codes are used to correct the random errors in the data transmission. A convolutional code is a type of FEC code that is specified by CC(m, n, k), in which each in-bit information symbol to be encoded is transformed into an n-bit symbol, where m/n is the code rate (n > m) and the transformation is a function of the last k information symbols, where k is the constraint length of the code. In WiMAX Physical Layer each RS block is encoded by the binary convolutional encoder, which has a code rate of 7/2 and a constraint length equal to 7.
The output of the convolutional encoder is then punctured to remove the additional bits from the encoded stream. The number of bits removed is dependent on the code rate used.[3]

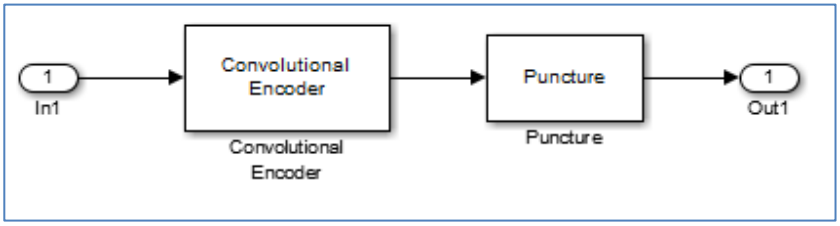

Fig 5 : Convolutional Encoder.

4. PUNCTURING PROCESS

Puncturing is the process of systematically deleting bits from the output stream of a low-rate encoder in order to reduce the amount of data to be transmitted, thus forming a high-rate code. The bits are deleted according to a perforation matrix, where a "zero" means a discarded bit. [3]

5. INTERLEAVER.

Interleaver in its most basic form can be described as a randomizer but it is quite different from the randomizer in the sense that it does not change the state of the bits but it works on the position of bits.

Interleaving is done by spreading the coded symbols in time before transmission. The incoming data into the interleaver is randomized in two permutations. First permutation makes sure that adjacent bits are mapped onto non-adjacent subcarriers. The second permutation maps the adjacent coded bits onto less or more significant bits of constellation thus avoiding long runs of less reliable bits.[3]

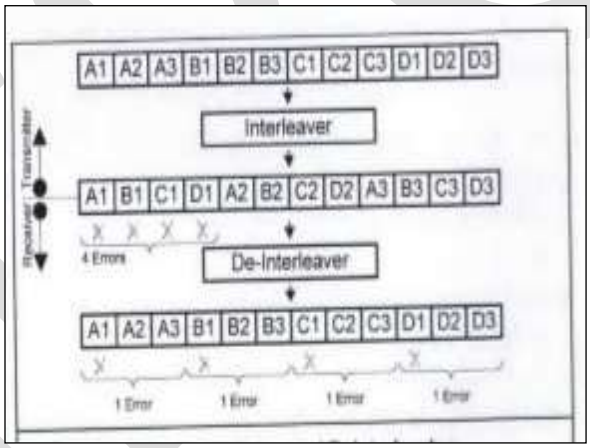

Fig 6 : Channel Coding – Interleaving and Deinterleaving

The first permutation is defined by the formula:

mk =(Ncbps/ 12) * mod(k, 12) + floor(k/ 12)

The second permutation is defined by the formula:

s = ceil(Ncpc/2)

jk = s x floor(mk / s)+ (ink + Ncbps - floor(2 xmk / Ncbps))mod(s)

where:

Ncpc = Number of coded bits per carrier

Ncbp s= Number of coded bits per symbol

k = index of coded bits before first permutation

jk=Index of coded bits after first permutation

mk= Index of coded bits after second permutation

Same permutation is done on the receiver side to rearrange the data bits into the correct sequence. Index of bits represented by jk is used during the modulation process.

6. Quadrature Amplitude Modulation

The interleaver reorders the data and sends the data frame to the IQ mapper. The function of the IQ mapper is to map the incoming bits of data from interleaver onto a constellation.

7. OFDM MODULATOR

The OFDM (Orthogonal Frequency Division Multiplexing) is a wideband wireless digital communication technique that is based on block modulation, with the wireless multimedia application becoming more and more popular, the required bit rate are achieved due to OFDM multicarrier transmission for video communication, very high bit rate/high-speed communication is required. To satisfy this, we must have the modulation scheme that can read more number of bits at a time and send it with considerably of the reception must be good enough. The OFDM is a digital modulation scheme that can support high-speed video communication along with audio with elimination of ISI and ICI. At the same time, it can accommodate more number of users showing the spectral efficiency. It is a multiplexing/multiple access scheme that has many favorable features required for the 4th generation wireless communication schemes. [4]

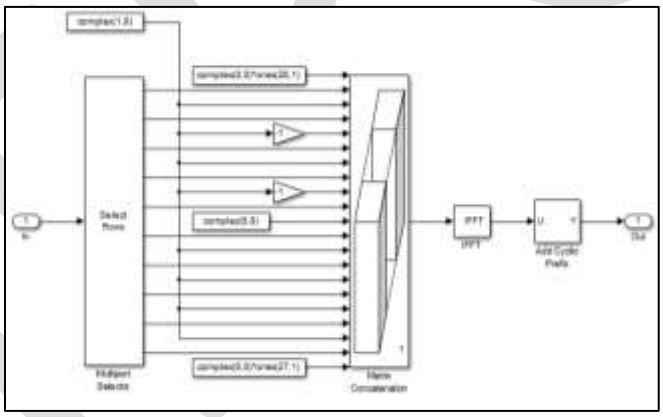

Fig 7 : OFDM Symbols

8. AWGN (Additive white Gaussian noise) Channel

The AWGN channel block adds white Gaussian noise to real or complex input signal. When the input signal is real, this block add real Gaussian noise and produces a real output signal. Additive white Gaussian noise is a channel model in which the only impairment to communication is a linear addition of wideband or white noise with a constant spectral density (expressed as watts per hertz of bandwidth) and a Gaussian distribution of amplitude. The AWGN channel is a good model for many satellite and deep space communication links.

9. OFDM DEMODULATOR

The OFDM Demodulator object demodulates using the orthogonal frequency division demodulation method. The output is a baseband representation of the modulated signal, which was input into the OFDM Modulator companion object. The Orthogonal Frequency

Division Modulation (OFDM) Demodulator System object demodulates an OFDM input signal by using an FFT operation that results in *N* parallel data streams [15].

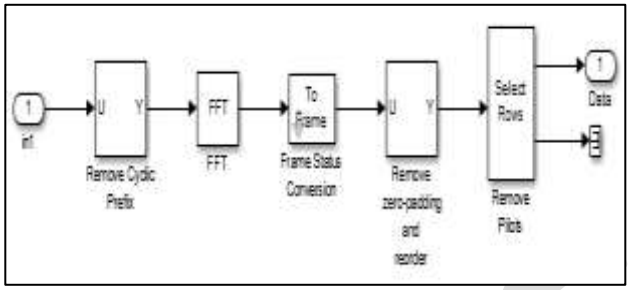

Fig 8 : OFDM Data.

10. VITERBI DEODER

TheViterbi algorithm reduces the computational load by taking advantage of the special structure of the trellis code. Another advantage is its complexity, which is not a function of the number of symbols that compose the codeword sequence. The Viterbi algorithm performs approximate maximum likelihood decoding. It involves calculating a measure of similarity or distance between the received signal at time ti, and all the trellis paths entering each state at the same time. [5]

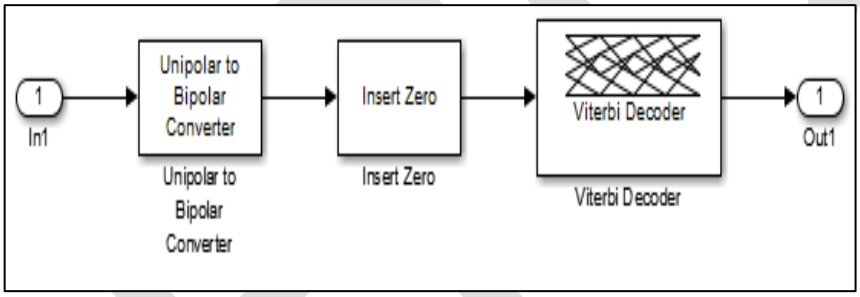

Fig 9 : Viterbi Decoder

11. RS DECODER

It performs the necessary operations to decode the signal, and get, at the end, the original message sent by the source. As in all the receiver blocks, the RS decoder reverses the different steps performed by its corresponding encoding block. [5]

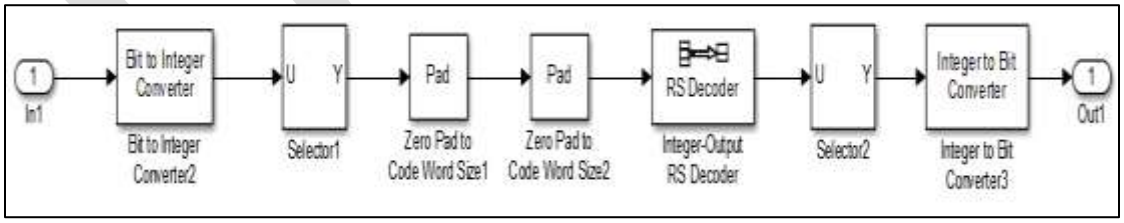

Fig 10 : RS Encoder

CONCLUSION

This paper represents the complete Simulink block diagram of the WiMax System. The blocks used in designing the WiMax model are explained in detail. The BER can be calculated by varying the SNR in the AWGN Channel. This model provides Zero BER from 15 SNR Onwards.

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Particle Swarm Optimization based Routing Protocol for Vehicular Ad Hoc Network

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Abstract - VANET is new technology for integrating ad hoc network, wireless LAN i.e. WLAN and cellular technology which is abbreviated as Vehicular Ad Hoc Network. The main aim of VANET is to achieve efficiency intelligent vehicle to vehicle communication, inter-vehicle communications and improve road traffic safety and efficiency. Depending on the type of information used for routing, they can be classified into two categories: topology based and position-based. To improve the data delivery performance in large scale network we propose the combination of SIFT and DREAM. We have also analyzed the Particle Swarm Optimization (PSO) technique on SIFT & DREAM protocol so as to improve the performance of routing protocols considering different parameters. PSO is a population based optimization technique use for finding optimum solution. PSO technique is originated from social behavior bird flocking. In PSO optimum solution is obtained from the behavior of bird. Since PSO uses for network centric localization purpose, this approach generates network navigational decisions by obviating centralized control thereby reducing both the congestion and delay

Keywords— Vehicular ad hoc network, DSDV, Trajectory based routing, Topology based routing, Position based routing, Trajectory based forwarding, Particle Swarm Optimization (PSO)

INTRODUCTION

A vehicular ad-hoc network (VANET) is a new immerging technology in ad hoc network that is becoming even more popular than the original ad hoc concept. VANET structure is built on mobile connectivity between cars and automobile equipment that informs the drivers about status of road or other necessary travel information. As density of vehicles on the road going increases day by day, new technology is imagine providing facilities to the passengers including emergency warning, safety application, assistance to the drivers etc. The VANET has capacity to reduce traffic congestion and improve the safety of the roads. It consists of dynamic nodes with wireless transcribing equipments. In MANET consist of wireless mobile nodes that can dynamically and freely self organized into temporary and arbitrary network topologies which allows nodes or devices to form a network without any pre-existing infrastructure. While many challenges like dynamic topologies, limited bandwidth, limited energy and many more remains unsolved. Vehicular ad hoc network (VANET) is a sub class of MANET with some unique properties. As number of wireless equipments that can be used in vehicles are increases so for supporting such product VANETs have emerging out these days. Some of these products are global positioning system, laptops and mobile phones. As mobile wireless networks and devices become increasingly important, the demand for Vehicle-to-Vehicle (V2V) and Vehicles-to-Roadside (VRC) or Vehicle-to-Infrastructure (V2I) Communication will continue to grow. VANET environment is challenging for developing efficient routing protocol because of some dissimilar properties like road pattern restriction, dynamic topology, mobility model, no restriction on network size, infinite energy supply and so on[1].

Efficient vehicle to vehicle communication is possible with the help of VANET so it enables the Intelligent Transportation System (ITS). ITS is the major application of VANETs which includes a variety of applications such as control of traffic flows, co-operative traffic monitoring, blind crossing, prevention of collisions and nearby information services. Intelligent transport system (ITS) that represent a range of applications like on analysis of traffic jam, traffic observation, global positioning system, traffic observation, analysis of traffic jam, management of traffic system, and diversion of routes which support the traffic scenario. As an example, existing roadside unit observing density of traffic on the roads and send all the information related to traffic to a central authority that analyze them to control traffic flow so that the traffic jam can be avoided. If an accident occurs on the road, the nearby vehicles will share this information to roadside units that then sends warning messages to the oncoming vehicles or communicate with emergency response unit. Another important application for VANETs are providing Internet connectivity to vehicular nodes while on the move, so the users can send emails, download music, or play back-seat passenger games.

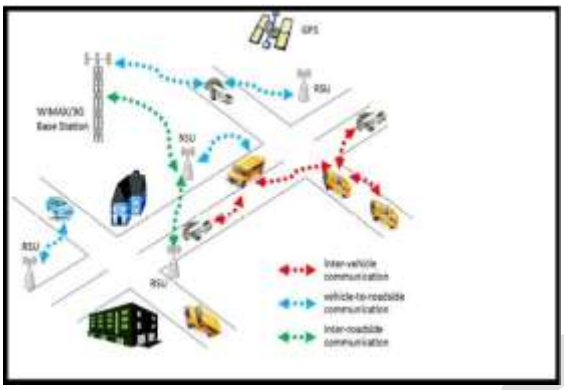

Fig 1. Architecture of VANET

There are two broad categories of wireless network: first one is infrastructure wireless network and another infrastructure less wireless network also known as ad-hoc network. In infrastructure network the main component are Base Stations (BSs) and Access Point (APs). If we consider an communication between different client on network nodes on wired network segment is first sent to the wireless BSs or APs. The wireless APs performs the forwarding of data to appropriate destination. Different wireless client on ad hoc network send their data directly to each other. In these network no wires, no communication infrastructure and no central controllers are required. If the nodes are moving vehicles then this type of network is said to be "Vehicular Ad-Hoc Network" i.e. (VANET). For routing purpose and to gather traffic information from vehicles VANETs may use fixed cellular gateways and WLAN access point at traffic intersections to connect to the internet. The possible solution for VANETs hybrid architecture consisting of is combining cellular, WLAN and ad hoc networks together called as hybrid architecture [2].

In this paper, we combine PSO algorithm with SIFT & DREAM routing algorithm, which can be adaptive to routing better. Then, according to mechanism we make combination of SIFT & DREAM along with PSO and realize it in NS-2. Finally systematic simulation is done and result is compared with DSDV protocol in the same simulation condition

1. Routing in VANET

Routing Protocol is nothing but determine the way of sending and receiving packets between mobile nodes which have significant role in terms of the performance in VANET. According to route update and position accusation method routing protocol can be classified as Topology based routing protocol, Position based routing protocol, Cluster based routing protocol, Geo cast routing protocol and Broadcast routing protocol. Topology based routing protocol use links information that exists in the network to perform packet forwarding. They are further divided into Proactive, Reactive & Hybrid Protocols. The proactive routing tries to capture complete network topology information at each node. Because of all routes are already in routing table there is little delay to transmission of data. The main advantages of proactive routing protocol are there is no need for route query phase. The another advantage of proactive routing protocol is that there is no route discovery since the destination route is stored in the background, but the low latency for real time application is disadvantage of this protocol. The various types of proactive routing protocols are: FSR, DSDV, OLSR, CGSR, WRP, and TBRPF. In contrast, reactive protocol provides a route only when it is necessary for a node to communicate with each other. If required not available currently then it will initiate route request query phase. Reactive routing consists of route discovery phase in which the query packets are flooded into the network for the path search and this phase completes when route is found. However it causes delay while initiating route request. The various types of reactive routing protocols are AODV, PGB, DSR, TORA, and JARR. The hybrid protocols are introduced to reduce the control overhead of proactive routing protocols and decrease the initial route discovery delay in reactive routing protocols. The various types of hybrid protocols are ZRP, HARP. Several works in mobile ad hoc networks have shown that nature inspired (bio inspired or swarm intelligence) algorithms inspired by insects or birds such as ant colony based optimization (ACO) and Particle Swarm Optimization (PSO), can be successfully applied for developing efficient routing algorithms. These algorithms have a quantity of advantages compared to other routing algorithms. For example, they reduce the routing overhead by sharing local information for future routing decisions. They also offer many paths enabling selection of another route in case of link failure on the previously selected path. A PSO algorithm maintains a swarm of particles, where each particle represents a potential solution. In analogy with evolutionary computation paradigms, a swarm is similar to a population, while a particle is similar to an individual [3].

I. DSDV, DREAM & SIFT DESCRIPTION

In this section there is a brief description of working of DSDV (Distance Sequence Distance Vector Routing), DREAM (Distance Effect Routing Algorithm for Mobility) & SIFT (Simple Forwarding over Trajectory).

A. DSDV

It is Table Driven routing protocol which is used in VANET and is based on classical Bellman-Ford algorithm. At the start every node broadcasts its own route tables to its neighbor node. The neighbor nodes update their routing table with the help of two type of packets- Full Dump Packet and Incremental Packet. Full Dump Packet contains information about every participating node in the network. These packets are transmitted periodically after a certain time of interval. Incremental Packet consists of updated change in nodes position since last Full Dump Packet. These packets are transmitted periodically in short interval of time and are stored in additional table. Routes are selected with the latest entry in the table. DSDV is good for networks where nodes are less dynamic. If position of a nodes are changes in short interval of time, its performance goes down because more Full Dump Packets are needed to send in the network, resulting into wastage of bandwidth.

The DSDV protocol requires each mobile station to represent, to each of its current neighbors, its self routing table. The entries in this list may change regularly over time, so the advertisement must be made rarely enough to ensure that every mobile computer can almost always locate every other mobile computer of the collection. In addition, each mobile node agrees to relay data packets to other node upon request. This algorithm places a premium on the ability to determine the shortest number of hops for a route to a destination; we would like to avoid unnecessarily disturbing mobile hosts if they are in sleep mode. In this way a mobile node may exchange data with any other mobile node in the group even if the target of the data is not within range for direct communication. If the notification of which other mobile node are accessible from any particular node in the collection is done at layer 2, then DSDV will work with whatever higher layer (e.g. Network Layer) protocol might be in use [4].

B. DREAM

DREAM protocol is a restricted flooding communication protocol used in unstructured architectures. Each node in the network may maintain a location table about all the nodes in the network and frequently floods a location packet, called as control packets. Which are required to update the information maintained by its neighboring nodes. Each location packet submitted by a node *A* to other nodes to update their location tables contains *A*'s coordinates along with its speed and the time the location packet was transmitted. DREAM uses the principle of distance effect in which by using the distance of the registered nodes, update frequency of location tables is determined. In other words the more updates sends to nodes which are closer to other nodes. The frequency of sending a control packet is adjusted based on the moving speed of the source node *S*.

When source node *S* wishes to send the message to destination node *D*, initially it looking for its location table and retrieve its information related to geographical position. If the destination direction is valid, *S* sends the message to the all one hop neighbors in the forwarding direction. If location information of destination *D* is not available then a recovery procedure must be executed by flooding partially or entirely the network in order to reach *D*. When the node *A* receive the message, it firstly checks whether it destination node or not. If it identifies the destination node then node *A* sends an acknowledgement to the source node. Otherwise, *A* repeats the same processes by sending it to all one hop neighbors in the direction of *D*. Each nodes repeats same process, until it reached to *D*. To determine forwarding zone in the direction of node *D*, the source node *S* calculates the excepted zone which contain *D*. As shown in Figure 2 the circle around the position of *D* is an excepted zone. The radius of this zone is set to $(t_1 - t_0)v_{max}$, where t_0 is the timestamp of the position information that *S* has about *D*, t_1 is the current time, and v_{max} is the local known mean speed that the node *D* may travel in the network. After determining the expected zone, the node S define its forwarding zone which is the region enclosed by an angle α starting from vertex S and sides of S are tangent to excepted zone calculated for D and then sends the packet, to all its neighbors in the forwarding zone [5].

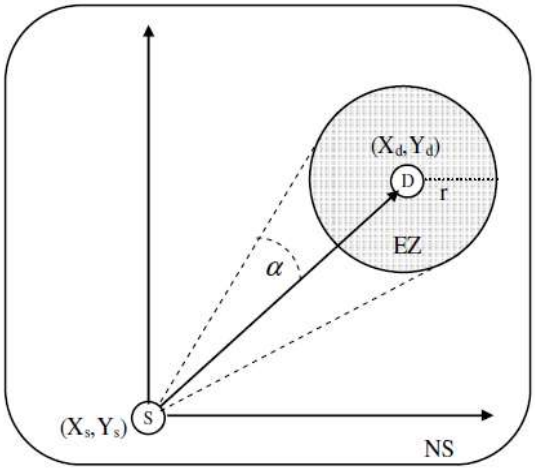

Fig 2. Expected Zone (EZ) within the network space (NS)

In DREAM it is an advantage that we can exchange nodes co-ordinate instead of changing complete link state or distance vector information which is helps in reducing the occupied bandwidth. DREAM uses the distance effect principle as discuss above, it can perform well in dynamic mobile ad hoc networks. [6]

DREAM (Distance effect routing algorithm for mobility) achieves the following properties:

- It is a bandwidth and energy efficient. Each control message carries only the coordinates and the identifier of a node, thus being small as compared to the control messages used by proactive protocols (that have to carry routing table) and to those used by reactive protocols (that have to carry an entire route).
- It is inherently loop-free, since each data message propagates away from its source in a specific direction.
- It is robust, meaning that the data message can reach its intended destination by following possibly independent routes.
- It is an adaptive to the mobility, since the frequency with which the location information is disseminated depends on the mobility rate.

C. SIFT

SIFT is a reactive source-based scheme, where trajectory is calculated when needed. Trajectory is nothing but the digital map expressed in different way and this map is assumed to be pre-stored in memory of nodes. SIFT uses broadcast transmission instead of point-to-point transmissions. Trajectory based forwarding is a hybrid forwarding strategy of source base routing and greedy forwarding. Source node defines the approximate trajectory and each intermediate node makes the geographical greedy forwarding along the trajectory. The source utilizes the GPS and digital map to define the trajectory of message i.e choosing the proper shortest and fastest dissemination path. In comparison with position based forwarding trajectory based forwarding has less data packets overhead. In case of trajectory based forwarding, if there is no vehicle on one path then message can be delivered by other path. Trajectory-based forwarding offers a better performance as compared to GPSR, because in VANET it is possible to build a trajectory that can account for obstacles that can produce a long detour of the data packet.

Each node that receives a packet takes the decision for forward it or not based which depends on its position, the last transmitter position and the trajectory. This reduces control overhead down to "0", that means SIFT sends no control packet. After receiving a packet, each node sets a timer according to its position with respect to the trajectory and the last transmitter position. The closer to the trajectory and the farther from the last hop a node is positioned; the shorter the timer is set. If there is copy of the same packet, forwarded by another node, is received before the timer expires, the timer is stopped and the packet is dropped. Elsewhere, the packet is transmitted when the timer expires. Thus, the node with the shortest timer will forward the packet. Packets are included into the header the trajectory and the coordinates of the last node that forwarded the packet. Generally, trajectories can be obtained from digital maps. Because intermediate nodes get all the required routing information from the packet header, they need not to know anything about its neighbors; hence they exchange no control packets. This problem is very interesting in highly dynamic environment [7].

Single Stream Trajectory

In this first we consider the simple case where the packet has to be forwarded along a single stream trajectory which is defined as an ordered sequence of straight segments. Here, each node, upon a packet reception, sets a timer according to its position with respect to the trajectory and the transmitter:

$$T_{out} = \Gamma \ (D_T / D_L) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where DT is the distance between the node and the closest trajectory segment, DL is the distance from the last node that transmitted the packet, and Γ is a constant which representing the time unit. If a node receives another copy of the packet before the timer expires, then the timer is stopped and the packet is deleted from the forwarding queue. Else, when the timer expires, the packet is processed by the Medium Access Control i.e. (MAC) layer for transmission. As a result of this, the packet is forwarded by the node with the minimum Tout, i.e. the node in the best position is far from the last the node and close to the trajectory. The information needed by SIFT and information carried in the packets header includes: the trajectory, the coordinates of the last node visited the packet source identifier, the packet sequence number, and the hops count. To avoid cycles, each node have to maintain a list of recently received packets (source ID and sequence number). SIFT can be implemented over any MAC i.e. multiple access control scheme, but its performance depends on the characteristics of the MAC scheme used for it. Note that this forwarding approach is quite robust against transmission error and collisions because of its correct operation, it is sufficient that one of the neighbor nodes receives the packet. Moreover, in the unlucky cases where no node successfully receives the packet, so the transmitting node can detect the problem and then retransmit the packet. Similarly to source routing, the overhead to code the trajectory depends on the number of segments. Before forwarding a packet, the forwarding node modifies the trajectory information by keeping only the segments not yet travelled [8].

Forwarding Strip

Due to limited transmission ranges, the above procedure may enable more than one node to forward a packet. As shown in Fig.3 a packet transmitted by node A is first forwarded by node C (the node in the best position). Its transmission prevents node B and node D to forward the same packet, but not to the node E and node F that are out of reach from C. This situation may lead to generate duplicated packets which travelling in the network along "parallel" trajectories at a distance from the original trajectory at least equal to the transmission range. The trajectories, however, soon or later will merge again therefore limiting the waste of network resources due to duplicated packet transmissions [9].

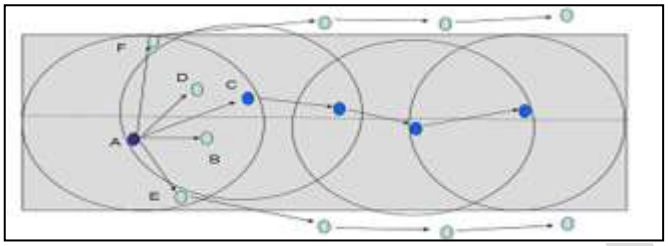

Fig.3 Forwarding Strip

2. Particle Swarm Optimization

Particle swarm optimization (PSO) is a population-based stochastic optimization technique developed by Kennedy and Eberhart in 1995. The use of PSO algorithm is to determine optimum solution. In PSO algorithm, an optimal solution is found from the social behavior of bird flocking. With the aim of discovering patterns that govern the ability of birds to fly synchronously and to suddenly change direction with a regrouping in an optimal formation. PSO consist of group of individual called as "particles". The particles fly through multidimensional search space looking for best solution. The effective solution can be obtained by using common information of the group and information own by particles itself. For better performance, each particle adjusts its velocity time to time based on its current velocity with respect to its previous best position and also the position of current best particle in the population. For solving the optimization problems and combinatorial problems PSO algorithm is most useful [10].

A PSO algorithm maintains a swarm of particle represents the potential solution. In simple terms, particles are randomly fly through the multidimensional search space, the particle adjust its position according to its own experienced and that of its neighbors. Let *xi(t)* represent the position of particle i in the search space at a discrete time step t. When the particle moves it get some velocity and its original position is changed, i.e.

$$Xi(t+1) = xi(t) + vi(t+1)$$

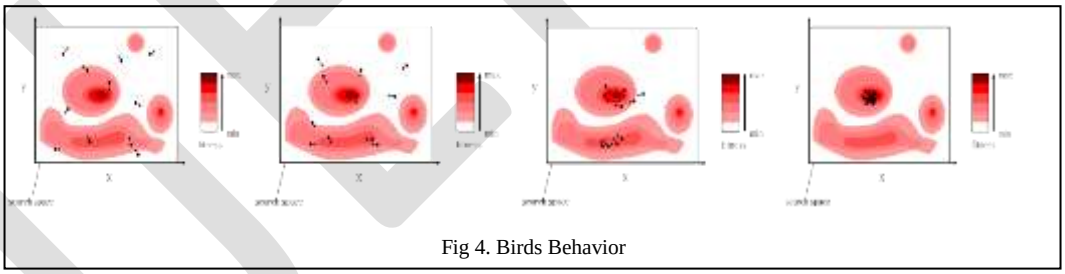

Fig 4. Birds Behavior

It is the velocity vector that drives the optimization process and reflects both the related knowledge of the particle and socially exchanged information from the particle's neighborhood. The experimental knowledge of particle is directly proportional to the distance of particle from its own best position known as *particle best (pbest)*. There are basically two concept of PSO algorithm, namely *pbest* and *gbest.* In global best (*gbest*) the neighborhood for each particle is entire swarm. The network establish in *gbest* PSO is by using star topology, in which the social particle velocity is updated regularly which gives information obtained from all the particle in swarm.

In personal best (*pbest*) PSO the network form by using ring social network topology where smaller neighborhood are define for each particle. In this network, information exchanged between the neighborhoods of particle, which provide local knowledge of the environment [11].

3. Performance Evaluation

Here we use the NS-2 simulator to analyze the performance of combined DREAM+SIFT and applying PSO optimization technique to DREAM+SIFT (DS) and DSDV. We analyzed performance of DREAM+SIFT with DSDV and PSO_DREAM+SIFT (PSO_DS) with PSO_DSDV on the basis of certain parameter like delay, energy, packet loss, network load and control overhead. We

perform the set of experiments for simulation area which is square 300m*300m using NS-2. Vehicles are able to communicate with each other using the IEEE 802.11 MAC layer. All the result is taken by varying the number of nodes in the network. The simulation parameter setting given in following table.

Table I: Simulation Parameter Setting

Parameters	Values
Simulator	NS-2
Area	300m*300m
Number of Nodes	10-40
Packet Size	1000 bytes
Packet Interval	0.07 seconds

4. SIMULATION RESULT

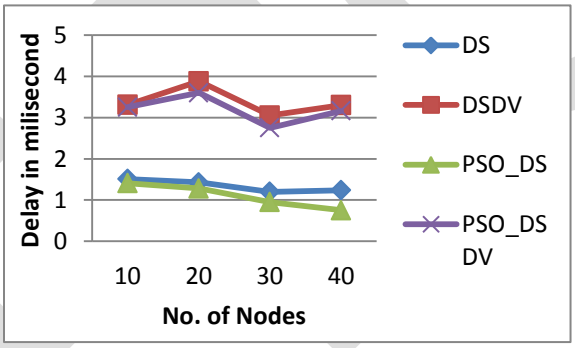

Fig 5. Delay Vs No. of Nodes

As shown in Fig.5, the graph is plotted between delay in millisecond and no. of nodes. The delay is defined as the time required arriving the packets at destination. From graph it can be say that the delay in case of normal DSDV is more as compared to normal DS. After applying the PSO algorithm the result is improved at some level. From graph the delay in case of PSO_DS is less as compared to PSO_DSDV. If we compared the PSO_DS with all three protocol we can said that the protocol PSO_DS have more efficiency as compared to DS, DSDV and PSO_DSDV. So the time required to arrive the packets at destination is less in case of PSO_DS hence it is more efficient as compared to remaining three protocols.

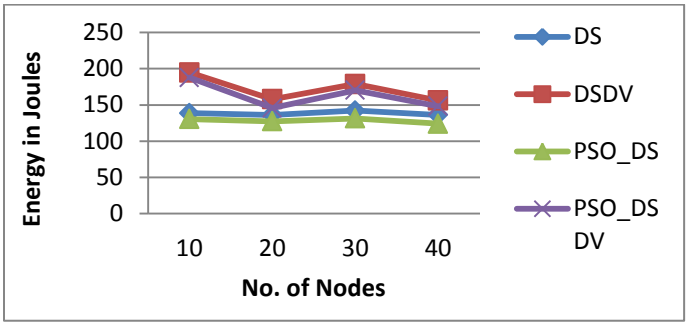

Fig 6. Energy Consumption

Energy consumption is nothing but the energy required by network for transmitting the packets between nodes. Fig. 6 shows the energy in joules for transmitting the packets over the network. From graph it is clear that DSDV consumes more energy as compared to DSDV. While after applying PSO algorithm the consumption of energy in case of both routing protocol get reduced by certain amount. The energy required by PSO_DS is less as compared to remaining three protocols. So we can say that the protocol PSO_DS is more efficient as compared to DSDV, DS and PSO_DSDV.

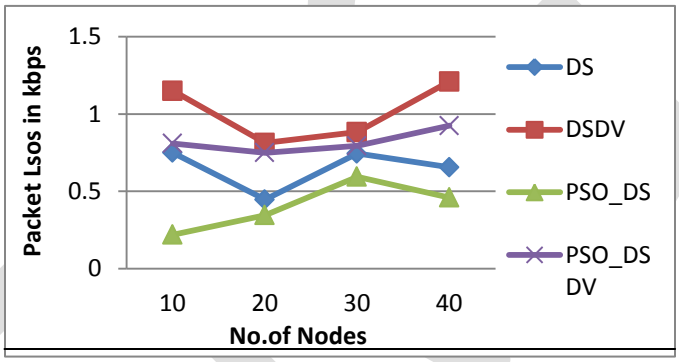

Fig 7. Packet Loss Vs No. of Nodes

Packet Loss is the number of packets gets lost during transmission of packets from source node to destination nodes. Fig.7 shows DSDV faces more number of packet loss as compared to DS. After applying PSO to both DSDV and DS the packet loss is minimize at some level. If we compared PSO_DS with the DSDV, DS and PSO_DSDV it shows the less packet loss. Hence we can say that the routing protocol PSO_DS is more efficient as compared to other routing protocols.

5. CONCLUSION

Classical ad-hoc routing schemes like DSDV experiencing more delay, energy consumption and packet loss than position based routing protocol like DREAM+SIFT because they use more efficient routing techniques. In the combination of DREAM+SIFT, SIFT does not sends any kind of control message but it helpful for solving the problems of control overhead. For making this combination more efficient we are applying an optimization technique i.e. Particle Swarm Optimization (PSO) to the combination of DREAM+SIFT. From result we can said that after applying PSO to routing protocol it increases the performance of DREAM+SIFT and it find to be more efficient as compared to DSDV. Hence PSO_DS becomes a very suitable forwarding protocol for VANET

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Effective Retransmission Reducing Ad hoc On Demand Multipath Distance Vector Routing Protocol for VANET

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Abstract— The eminent efficiency protocol is always mandatory for data routing in the network. The protocol's efficiency to deliver the data reduces due to path loss and leads to retransmission. In available protocols, Ad hoc On-Demand Multipath Distance Vector (AOMDV) which routes the data from source to destination node via multiple paths, however unable to avoid the retransmissions and Secure Ring Broadcast (SRB) routing protocol stabilizes the routes established but cannot neutralize the retransmissions. Due to path loss these retransmissions introduces time delay in data transfer and increases with traffic. But, no efficient protocols are available to neutralize retransmissions. The Effective Retransmission Reducing Ad hoc On-Demand Multipath Distance Vector (ERRAOMDV) routing protocol is proposed to avoid the retransmissions when path loss by making handoff. The retransmission reduces to negligible value as compared to any available protocols as shown in the analytical and simulation results.

Keywords— Effective Retransmission Reducing Ad hoc On-Demand Multipath Distance Vector (ERRAOMDV), VANET (Vehicular Ad Hoc Network), Ad Hoc on Demand Distance Vector (AODV), Ad hoc On-Demand Multipath Distance Vector (AOMDV), Mobile Ad hoc Network (MANET).

INTRODUCTION

The VANET is the network comprised of randomly moving nodes with variable speeds and static road side units [1]. Due to uncertainty of data traffic, movement direction, random location and number of nodes, the VANET is highly dynamic in nature. The communication in the VANET is direct from node to node, unlike Mobile Ad Hoc Network (MANET). In the VANET, a node dissociates from the route randomly and leads to path breakage [2]. Therefore, the potent routing protocol implication is significant.

The parameter name 'connection lifetime' is the time period for which path between the source node to destination node exists without retransmissions. Accordingly, the 'connection lifetime' must be longer for sophisticated implications like video conferencing and inter-vehicle voice communications in VANET. Therefore, the consistent and faster data transfer needs longer 'connection lifetime' for such sophisticated implications. The retransmission is inversely proportional to the 'connection lifetime' parameter. If the 'connection lifetime' is less then retransmission will be more. Hence, the 'connection lifetime' will increase by neutralizing the retransmissions. The retransmission process includes re-initiating the search and the establishment of the route between source and destination node. This retransmission process increases the latency by introducing huge time delay. Consequently, retransmissions slow down the data transfer from source to destination node. The retransmission increases with the increase in data traffic and the number of nodes. In the urban traffic scenario the data traffic and number of nodes are very arbitrary. At any instance of time the number of nodes and the data traffic may increase exponentially in the urban traffic scenario. This makes urban traffic scenario highly random in comparison with the highway traffic scenario. Therefore, the occurrence of retransmissions is high in the urban traffic scenario. Consequently, the urban traffic scenario requires a potent protocol to neutralize the retransmissions by making the handoff while the path loss. The handoff compensates broken path and avoids the retransmissions to occur. Handoff is the process in which the data routing is transferred from the node leaving the route to the node retaining or coming in route. The handoff process avoids the call drop in the MANET and can be used in VANET to avoid retransmissions. But, the achievement of handoff operation in the VANET is a difficult assignment compared to MANET. The MANET architecture manages the handoff process which is absent in VANET. The MANET architecture consists the network of cell towers and MTSO. A highly efficient protocol is required to make handoff and avoid retransmissions without architectural support in VANET.

The criterion to recognize route loss, intermediate node selection and shifting data route at available node is required in a protocol to realize the handoff process in VANET. But, the criterion to recognize the path loss and shift the data route from current node to available node is absent in protocols available. Due to the absence of criterion for intermediate node selection and to shift data route at selected node the handoff could not be possible and retransmission occurs. This article presents a new protocol idea to neutralize the retransmissions unlike any protocol available. If the route breaks at any instance between source to destination node then retransmission occurs. The proposed protocol recognizes the route loss circumstance, selects available node and shifts the data route to the selected node. Unlike MANET, this protocol implicates the handoff process successfully in VANET without architectural support. Accordingly, the 'connection lifetime' is increased and retransmissions are neutralized by the proposed protocol. The proposed protocol rectifies the demerit of existing protocols and boosts the operation of data routing from source node to the destination node.

LITERATURE REVIEW

Various protocols implicated for routing data in VANET are Fisheye State Routing (FSR), Ad hoc On-Demand Multipath Distance Vector (AODV), Secure Ring Broadcast (SRB), Zone Routing Protocol (ZRP), AOMDV and Directed Route Node Selection (DRNS) etc. These protocols have deteriorated performance with traffic increase. The single or multiple routes may exist between the source node and the destination node. The proposed proactive approach of fast-handoff making algorithm has utilized Access Point (AP) in VANET to reduce the hand-off' latency. The Fast Hand-off making algorithm utilized AP graph to improve the re-involvement latency and separate context transfer [3]. The authors utilized the idea of cluster and hands-off for better performance. The performance of Traffic Infrastructure Based Cluster Routing Protocol with Handoff (TIBCRPH) is found better than some available routing protocols [4].

The authors described the solution of the spectrum handoff problem by cross-layer optimization approach with estimation of routing and spectrum handoff planning. The Joint Spectrum Handoff Scheduling and Routing Protocol (JSHRP) minimized the spectrum handoff latency for the circumscription of network connectivity by coordinating multiple links spectrum handoff. The proposed protocol minimized multiple links spectrum handoff latency totally in a cognitive network [5]. A proposed novel algorithm monitored signal quality at user end by Modulation Error Rate (MER) evaluation and approximation [6]. An adaptive multipath protocol is proposed to accomplish less hand-off latency for hard handoff [7].

METHODOLOGY

Many protocols have been developed to reduce the retransmissions in VANET. But all these protocols discussed above have non-satisfactory performance. Only one path from the source node to destination node by all these protocols are possible same as AODV. But this single path from the source to destination node is not enough for the large data transfer. Therefore, a path adaptive routing protocol is required to neutralize the retransmissions and lower the latency.

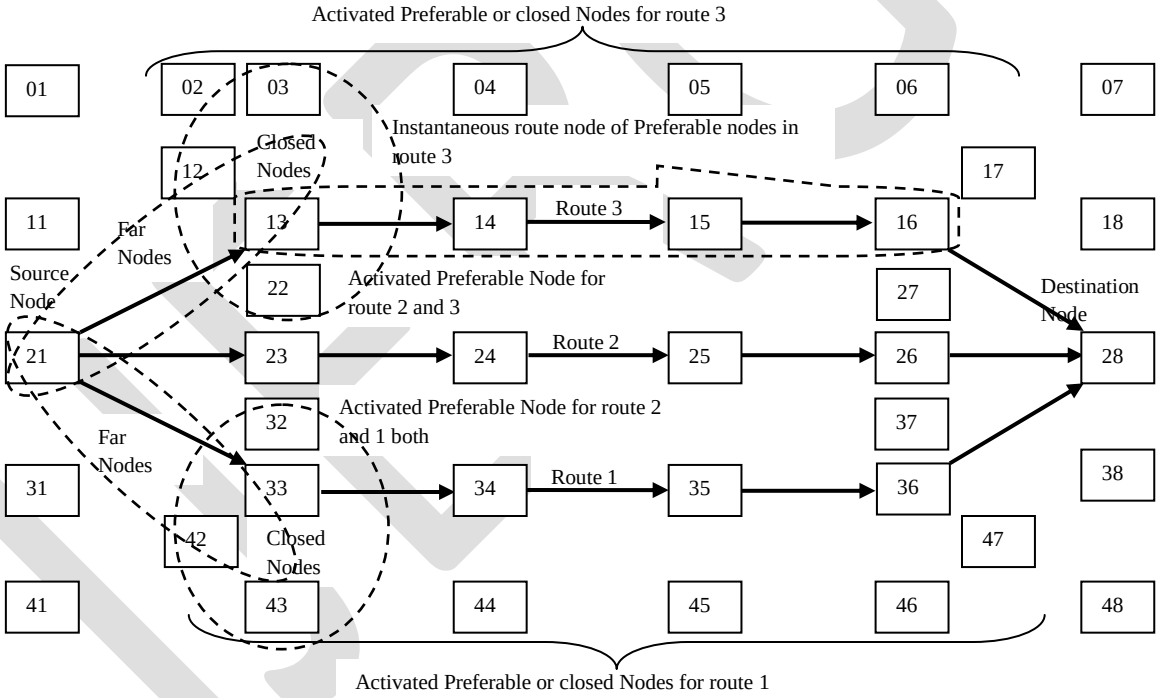


Fig. 1. Routine operation of ERRAOMDV routing protocol.

The operational features of proposed protocol are following:

1. Initially, the data is routed just like AOMDV.
2. Neutralize the retransmission when the route loss.
3. For neutralizing the retransmission, select the node from preferable nodes.
4. Without retransmission route the data via selected node.
5. Search closest intermediate node to another end node and avoid retransmission, in the absence of preferable nodes.
6. Complete the data transfer without retransmission from source to destination node, when another end node found. Hence, it avoids the time delay due to retransmissions in the network transfers data faster.

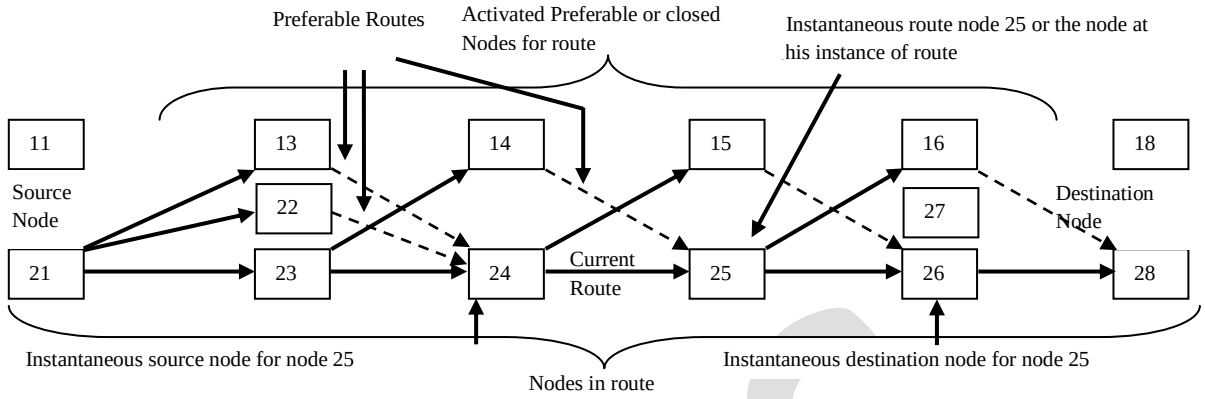


Fig. 2. Activation of preferable nodes by ERRAOMDV routing protocol.

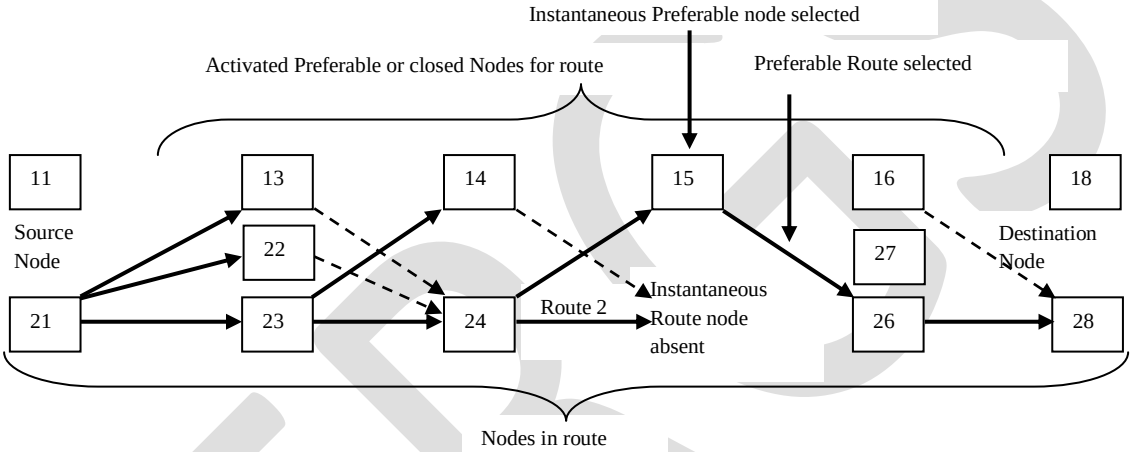


Fig. 3. Selection of instantaneous preferable node to neutralize retransmission by ERRAOMDV routing protocol.

The multipath data routing is shown in the Fig. 1. The route 1, route 2 and route 3 include nodes {21, 13, 14, 15, 16 and 28 respectively}, {21, 23, 24, 25, 26 and 28 respectively} and {21, 33, 34, 35, 36 and 28 severally. The instance is time instant for which the route node at the specific location. The node at any instance of location on route is an instantaneous route node.

Therefore, these nodes in the route are referred as instantaneous nodes in the route. The preferable nodes associated with an instantaneous route node are referred as instantaneous preferable nodes. As shown in the Fig. 1. nodes {02, 03, 12}, {04}, {05}, {06, 17} are instantaneous preferable nodes for the instantaneous root node 13, 14, 15, 16 on route 1. Similarly, nodes {22, 32}, {27}, {37} and nodes {32, 42, 43}, {33}, {34}, {35}, {36, 47} are instantaneous preferable nodes for the instantaneous route node 23, 24, 25, 26 in route 2 and node 33, 34, 35, 36 on route 3. The preferable nodes are only preselected intermediate neighbor nodes which neutralizes the retransmission by making the handoff. The preferable nodes are not used to route the data till the path loss due to absence of instantaneous route node or the route node at any instance for data routing. If the instantaneous route node or the route node at any instance of location is absent for data routing then preferable nodes in that instance or the instantaneous preferable node will be selected.

These preferable nodes are closed neighbor nodes (exposed nodes) for the instantaneous nodes in the route. The destination node and source node of that instantaneous route node is referred as instantaneous source node and instantaneous destination node as shown in the Fig. 2. The preferable nodes are exposed nodes to the instantaneous source node, instantaneous destination node and instantaneous nodes in the route. Accordingly, every instantaneous preferable node observes the echo of same data three times from the instantaneous source node, instantaneous node in the route and instantaneous destination node in the route. Consequently, the echo of the same data at second time is always from the instantaneous node in the route.

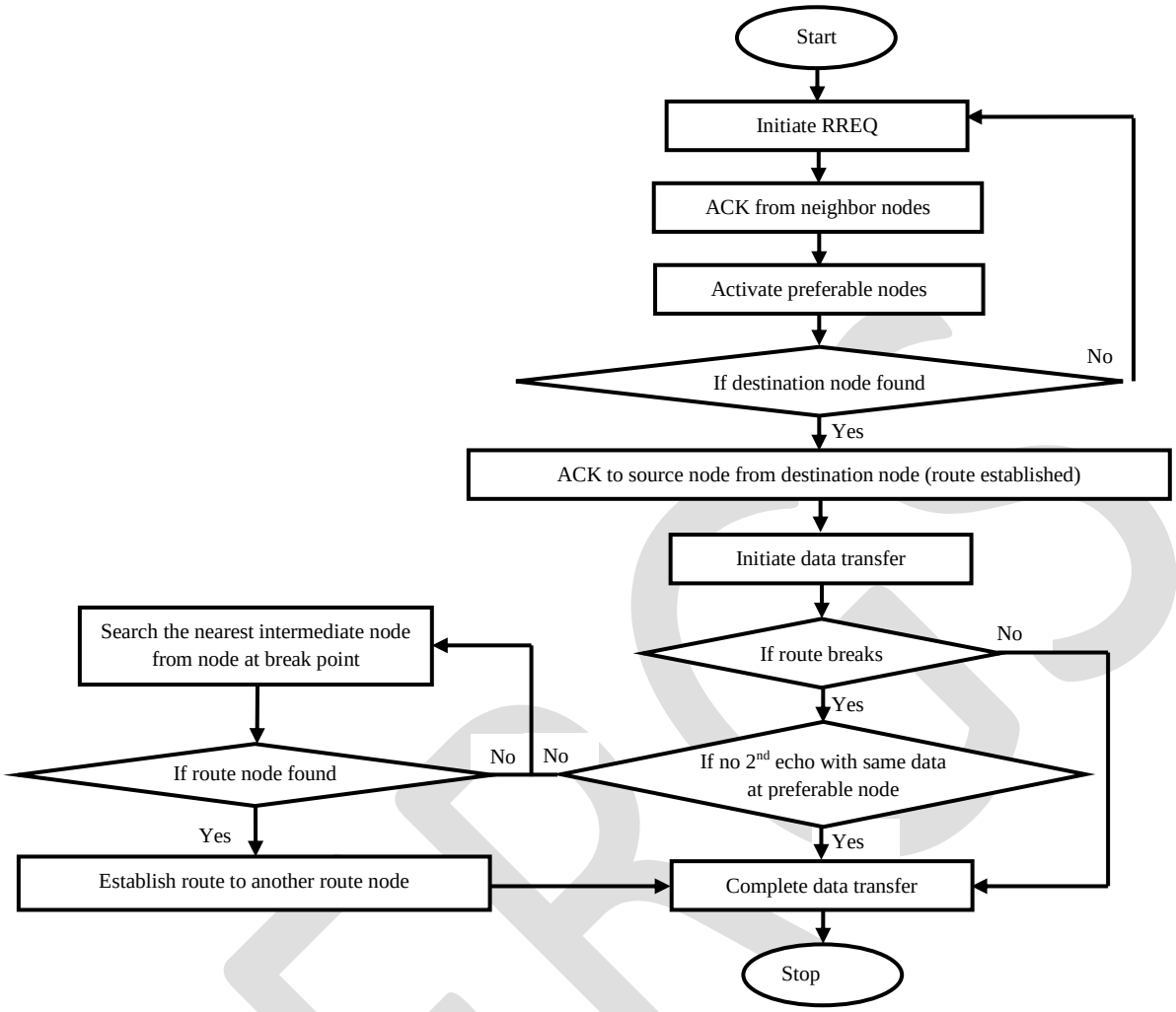


Fig. 4. Flow graph of the ERRAOMDV routing protocol.

As shown in the Fig. 3. when the node 15 echoes the data to node 26 then the handoff from node 25 to node 15 is acknowledged at instantaneous source node 24 and instantaneous destination node 26 both. The flow graph of the ERRAOMDV protocol is illustrated in above Fig. 4. The algorithm of the proposed ERRAOMDV protocol is following:

1. Send RREQ to each neighbor nodes for route searching to the destination node.
2. Generate the ACK to the source node and select the preferable nodes.
3. Transfer the data from source node to the destination node.
4. Activate the instantaneous preferable node to accomplish complete data transfer to the destination node, if "echo < 2".
5. If no instantaneous preferable node found, then initiate the RREQ form the node at path breakage to find a node in route at the other end.
6. If another end node found, then complete data transfer.
7. The preferable node is out of range or route does not exist or data transfer completed, if "1 > echo" or "no echo".

ANALYSIS

The probability of retransmissions and latency is derived from analysis of ERRAOMDV and existing protocols. For analysis the distance between source and destination node (Ds) is considered constant. The retransmissions probability (R) the mathematical analysis of is given below:

$$R \alpha 1/P$$

$$R = c_r / P \quad (1)$$

Here, c_r is the constant of proportionality. The c_r for AOMDV and AODV is given below.

$$c_r = ({}^{P}C_{P0}\, p^{P0}\, q^{(P-P0)})n_e \quad (2)$$

The c_r for ARNAOMDV is given below.

$$c_r = ({}^{P}C_{P0}\, p^{P0}\, q^{(P-P0)})/n_e \quad (3)$$

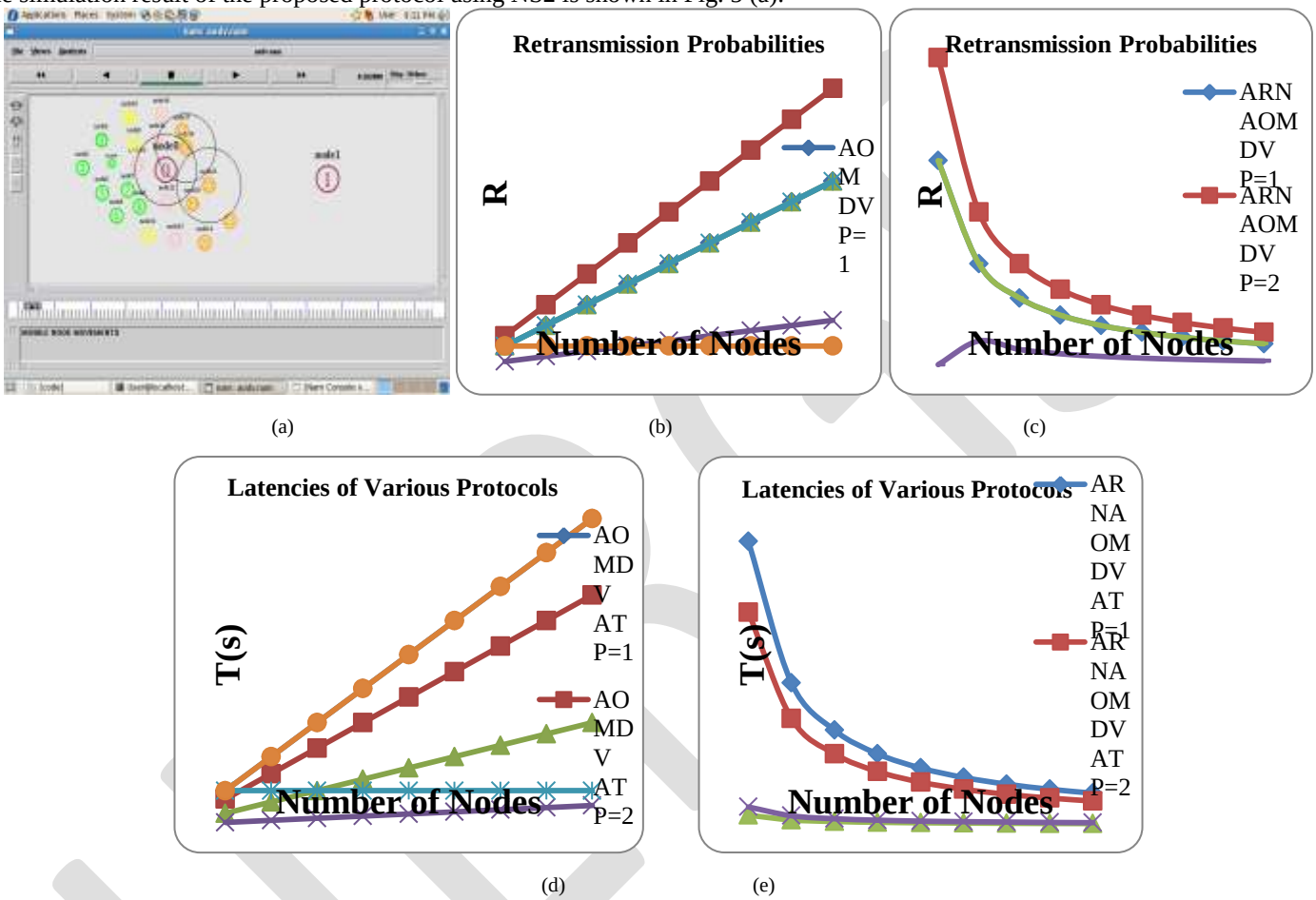
Here, cr is acquired by applying Bernoulli's equation and C is combination of P0 paths out of P paths in Bernoulli's equation of probability. The p and q are probabilities of establishing path and losing path. The P is the total number of paths possible, P0 is the accomplished number of paths and ne is the number of nodes engaged. The latency T is the given below:

$$T = D_s\, tD_d\, c_r /P \quad (4)$$

Here, T is latency, D_d is data size and t is required node to node time of a single hop.

ACKNOWLEDGMENT

The simulation result of the proposed protocol using NS2 is shown in Fig. 5 (a).



(a) (b) (c) (d) (e)

Fig. 5. Analytical results of protocols. (a) Simulation result of ERRAOMDV. (b) R of various protocols. (c) R of ERRAOMDV protocol. (d) Latencies of different protocols. (e) Latencies of ERRAOMDV protocol for different number of paths.

The analytical results of the proposed protocol with other protocols using MATLAB are shown in Fig. 5. The retransmission constants and latencies of various protocols have been illustrated in Fig. 6. As illustrated in Fig. 6 (a) and (b) the latency of the ERRAOMDV decreases unlike other protocols with an increase in the number of nodes. The ERRAOMDV protocol latency is low as compared to existing protocols. In the Fig. 6 (c) and (d) the retransmissions for the AODV, SRB, AOMDV and ERRAOMDV are shown. The retransmission constants of the ERRAOMDV are also low as compared to other protocols.

CONCLUSION

The operation of the ERRAOMDV protocol has been explained in this paper. This proposed protocol successfully neutralizes the retransmissions to occur because of route loss by using a handoff process. Therefore, this protocol increases the throughput with the reliable data delivery and reduces the latency, retransmissions. This protocol contains the advantages over the existing protocol to neutralize the retransmission at path loss but not their disadvantages. Unlike other protocols, it does not require the cluster formation and much information of the neighbor nodes to make handoff and neutralize the retransmissions. Unlike other protocols, it is more reliable, faster and performance efficient protocol.

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GRADUATE UNEMPLOYMENT AND ECONOMIC GROWTH:NIGERIAN EXPERIENCE UNDER DEMOCRATIC GOVERNMENT

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ABSTRACT
This paper examine the far reaching impact graduate unemployment have had on the economic activities in Nigeria since the inception of this present democratic government that started in 1999. The objective is to find out the relationship that exist between graduate unemployment and economic growth (Gross Domestic Product) using data collected from Central Bank of Nigeria and National Bureau of Statistics. A regression model was applied using unemployment as the dependent variable and Gross Domestic Product (GDP), Real wage, per-capita income Adult literacy rate and population as independent variables.
The result showed that there is a negative relationship between graduate unemployment and GDP and Real wages. It was also found that corruption, lack of political will to implement economic policies and reforms, over dependence on oil sector and poor educational planning are the major causes of graduate unemployment in Nigeria and until these factors are addressed the economic activities in Nigeria will continue to be attacked or plundered.

Key words: graduate unemployment, Gross Domestic Product, corruption, democracy.

INTRODUCTION

The International Labor Organization (ILO) defines the unemployment as numbers of the economically active population who are without work but available for and seeking work, including people who have lost their jobs and those who have voluntarily left work (World Bank, 1998). Graduate unemployment therefore is the sum of all graduates in the countries who are without work but are available and seeking work.
In the recent years in Nigeria when you visit centers where interviews or recruitment exams are being conducted you will shade tears when you see the number of graduate scrambling for a few slots of available jobs advertised. It is no longer news of how graduates lose their lives, are used as sex hawkers and even pay bribes in order to get employed in Nigeria.
This is most disturbing when you look at what the country has earned from the exportation of crude oil over the years under study and considering the promises made by politicians during their campaigns for votes.
Nigerians had great expectations at the emergence of democracy in 1999 especially believing it will address the problem of unemployment in Nigeria. As it is today, we are at a loss as the problems have continued to escalate.
According to Economic Watch (2005), unemployment in Nigeria is one of the most critical problems facing our country. This was in support of Alanana (2003) when he opined that unemployment is potentially dangerous as it sends disturbing signal to all segments of the Nigerian society.
Omotosho (2009) argues that 66% of Nigerians, especially educated youths live below international poverty line.
Within the period in review (1999 - 2014), there has been an increase in the percentage of graduate unemployment in Nigeria. This has also conceded with a lot of evil vices that have negatively affected economic activities in Nigeria as vandalization of government assets (pipeline vandalization), kidnapping of expatriates and Nigerian armed robbery, ritual killings, children trafficking, and terrorism. Will it be out of place to assert that there is a relationship between the two scenarios?
The researcher therefore puts up this hypothesis that increase in graduate unemployment is responsible for the disruption of economic activities in Nigeria.

LITERATURE REVIEW

YOUTH UNEMPLOYMENT IN NIGERIA

According to Uwem and Ndem (2012), youth unemployment and under employment impose heavy social and economic costs, which results not only in lost economic growth, but also in erosion of the tax base, increased welfare costs, and unused investment in education and training.
According to the National Bureau of Statistics (NBS) (2009; 2010; 2012) the national unemployment rates for Nigeria between 2000 and 2011 showed that the number of unemployed persons constituted 31.1% in 2000 and it reduced to 11.9% in 2005 and increased again to 23.9% in 2011. Nigeria with a youth population of 80 million, representing 60% of the total population with a growth rate of 2.6% per year will continue to experience a lot of social evils if a greater percentage of this population are unemployed and underemployed (Awogbenle & Iwuamadi: 2010).
Okafor (2011) maintains that the problem of chronic unemployment is very evident in Nigeria. He further asserts that Nigerian streets are littered with youth hawkers who ordinarily would have found gainful employment in some enterprise.

In the words of Castaneda, Serrani and Sperotti (2012), the difficulty in finding employment as a means for securing a livelihood experienced by young people is an ongoing issue, along with the sense of frustration arising from failure to meet their work expectations.

CAUSES OF GRADUATE UNEMPLOYMENT IN NIGERIA

Life operates on the law of cause and effect. Nothing just happens. For every cause there is an effect, and for every effect there is a cause. Same is true about graduate unemployment in Nigeria.

There are certain factors that led to the increase or surge in the level of graduate unemployment in Nigeria.

These includes;-

1. INADEQUATE TRAINING: The functioning and structure of the education system in Nigeria has been battered, a situation where over 50% of graduates in Nigeria lacks the skill, discipline, and knowledge required to make them employable, that is why Barbagelata (2012) asserts that there is broad consensus that inadequate training or lack of training.
2 MISMANAGEMENT AND NEGLIGENCE: According Ajaegbu (2012) in spite of Nigeria riches from oil economy, employment in Nigeria is actually falling. Even though Nigeria is endowed with diverse and infinite resources, years of negligence and mismanagement have led to the under-utilization of these resources.
3 UNTIMELY ECONOMIC POLICIES: There are economic policy measures introduced untimely in Nigeria that have led to the collapse of budding small scale and medium scale industries that should have been catalysts for industrialization and job creation. According to Bello (2003), the introduction of Structural Adjustment Program in September 1986, which ushered in liberalization, deregulation and devaluation program of the domestic currency, contributed to the demise of small scale and collage industries operated in both formal and informal sector that resulted in serious job losses.
4 LACK OF ENTERPRENEURAL SKILLS: Analysis have argued that in Nigeria, the skills the job seekers posses do not match the needs and demands of employers (Mcgrath, 1999; Kent and Mushi, 1995). According to them, the education system in Nigeria has its liberal bias which indeed over supplies the labour market with graduates who do not possess the skills required by employers in the words of Oladele, Adeleke and Oladunjoye (2011).

   Many graduates in Nigeria lack entrepreneurial skills to facilitate self-employment. Ajyfo (2013) corroborated this fact when she asserted that schools in Nigeria provide training programmes that are generally failure towards preparing young people for formal sector jobs, and since these jobs do not exist, there is often a mismatch between the skills possessed by the job seekers and the available jobs.
5 RAPID POPULATION GROWTH; One of the major factors responsible for graduate unemployment in Nigeria is rapid population growth. The increasing population growth according to Kakwagh and Ikwuba (2010), has produced an overwhelming increase in young population thereby resulting in rapid growth of labour which is outstripping the supply of jobs.
6 CORRUPTION: One of the cubs in the wheel of progress and a cankerworm that has eaten deep into the fabrics of every sector of Nigerian life is corruption. According to Udin and Udin (2013), corruption has robbed Nigeria of developing a vibrant economic base that would have created jobs for the youths in various sectors of the economy.
7 ENERGY CRISIS: The poor or epileptic power supply in Nigeria is another serious factor that has death a heavy blow on industrialization and economic expansion in the economy. So many firms and industries have closed down their business due to high cost of production orchestrated by cost of alternative source of power this has put the local industries in disadvantaged position in a fierce competition from foreign firms in this global of business. When industries closed shops or relocated for friendlier economic environment due to the high cost of production, employees were laid off and prospects of recruiting new ones were dashed. All these exacerbated the crises of youth unemployment in the labour market (Adeloye, 2010)

GENERAL EFFECTS OF GRADUATE UNEMPLOYMENT

Scholars and researchers globally have attested to the fact that unemployment has some negative impacts on the society, people and economies.

Adejumola and Tayo-Olajubulu (2009) contended that unemployment has been identified as one of the major causes of social vices, including armed robbery, destitution, prostitution, political thurgery, kidnapping and many more. Musari (2009) alludes to this fact by asserting that graduating from school without any hope of getting employment has left the youths in vicious cycle of poverty that daily erodes their self confidence and bright future.

According to Ajufo (2013), youth unemployment has national and global impacts, notably among which are increased violence crime, drug abuse and political instability. Desperation according to her can drive many people into living outside the law in order to survive and as a means of expressing dissatisfaction at the apparent neglect of their very existence.

Okafor (2005), also asserted the ruling class failed because they replaced the vision, policy and strategy, which should be the thrust of every leadership with transactions, as each successive government took turns to prey on the nation's wealth by using public power, resources, good will, utilities as instrument of abuse, and personal gain. Thus, crippling the economy and engendering and exacerbating unemployment which creates abject poverty, hunger and frustration. Hallary (2012), elucidated this when he asserts that the crisis in Nigeria was a result of failure of governance to address socio-economic issues facing the nation.

Nigerian Labour Congress (NLC) (2012) asserts that bodies employment growth and improvement in the GDP had not transformed into social well being, adding that unemployment had aggravated the spate of insecurity among other social vices in the polity.

EFFECTS OF UNEMPLOYMENT ON NIGERIAN YOUTHS

There are too many disturbing effects of the rising graduate unemployment in Nigeria that if not checked will bring a serious doom in the future of the country. Some of such effects are as follows:

1 BRAIN DRAIN: This is a situation where educated people more from their country to another country to another country usually for better pay or living condition. Since there is no hope of gaining employment after graduation, Nigerian graduates have been hit with an obsession to travel out of the country. This obsession has led them into all kinds of evil vices just to fulfill this quest and run out of boredom.

2 PSYCHOLOGICAL TRUAMA AND LONELINESS: This is a type of damage to psyche that occurs as a result of a severely distressing event. The situation of joblessness experienced by vast majority of Nigerian graduates completely overwhelms their ability to cope or integrate the ideas and emotions with the experience of having to live in the family house and depend on their ailing and retired parents for almost everything they need.

3 LOSS OF DRIVE AND APPARTY TOWARDS WORK: It is not exaggeration to say that most Nigerian youths have lost the appetite and the drive for excellence and hard work. This is as a result to the lost of hope of getting a meaningful job opportunity after graduation. They get so relaxed and allows anything to go. This is part of the reason for the low standard of education in Nigeria today.

4 VIOLENT BEHAVIOUR AND SOCIAL CRIMES: An idle mind they said is the devil's workshop. This is so true about Nigerian graduates today. Idleness resulting from unemployment has made Nigerian youths so vulnerable to violent behaviours and social crimes. Many have taken to armed robbery. Political thugry, prostitution, cyber-crimes and cultism as an alternative means of livelihood in the absence of employment.

5 LOSS OF SELF VALUE AND ESTEEM: Another devastating effect of unemployment on Nigerian graduates is the lost of self worth, self respect and self esteem. This is caused by the inability to move up in life after graduation because of joblessness. You are a graduate and yet you can't pay house rent to stay on your own, you can't feed yourself nor buy good cloths and shoes; while everyone is living the house in the morning you stay back in the house and become a house keeper, gardener or gate man. All these because you have no job. They all lead to one thing; loss of self worth.

REMEDIES TO GRADUATE UNEMPLOYMENT IN NIGERIA

1 ENHANCED POWER GENERATION: A fully functional electricity power supply needs to be achieved and deployed to release currently locked in enterprise and production potential in Nigeria, especially among the millions of the poor in the informal sector.

2 CAPACITY BUILDING FOR PRODUCTIVE SKILLS:

3 ENHANCED SKILL ACQUISITION: To curb the high level of graduate unemployment, the issue of skill acquisition in Nigeria must once again come to the front burner.

Salami (2011) asserts that skill acquisition is a veritable vehicle to promote employment generation. Awogbenle and Iwuamadi (2010) on the other hand argued that addressing the problems of mass unemployment, low productivity, high inflation and poverty will depend on how speedily Nigeria is able to develop the millions of its labour force into knowledgeable and skilled people needed for the required change. Hamel and Prahalad (1994) had earlier argued that for any person to compete effectively in an emerging economy that is knowledge – driven, he or she must possess relevant job competences including technical, business, cultural, interpersonal and intellectual competencies which could be obtained from functional technical and vocational education.

4 PROVISION OF ENABLING ENVIRONMENT FOR INVESTMENT AND INDUSTRIALIZATION: Many nations that broke through in development have done so through small and medium scale industries as catalyst for development. According to Balogu (2010), Nigeria has one of the highest percentages of the informal sector of 65%. It enabling environment is provided, this informal sector will not only thrive and expand but will also employ over 50% of the unemployed graduates in our country.

Rubl (2011) argued that the private sector can create productive and sustainable new job opportunities. Salami (2013) also argued that any government that is interested in creating large number of jobs must first create the right investment climate. This according to him is because the burdens of weak investment climate including access to infrastructure, land, finance and so on fall more heavily on young investors as well as young job seekers.

5 ENTREPRENEURAL APPROACH: To address the problem of mass graduate unemployment in Nigeria, focus should be given to entrepreneurial education, trainings and advocacy, one to change the mind set of our graduate from completely depending of government for employment, two to equip them with the skill that will not only make them employers of labour themselves and what to give back to the society and not only what they should receive.

6 ADOPTION OF PUBLIC-PRIVATE PARTNERSHIP MODEL OF DEVELOPMENT: Nigerian government alone cannot provide enough job opportunities for the teaming unemployed graduates in the country. Private sector has a very great major role to play. To see this effectively done, there has to be serious collaborations and partnership between the two in order to enjoy the synergy such partnership offers. There are so many areas where the public sector can partner with private sector to boost the economy and create more jobs especially in agricultural, industrial and telecommunication sectors.

7 DIVERSIFICATION OF THE ECONOMY: Since the discovery of crude oil in large quantity in Nigeria; Nigerian government no longer pay adequate attention to other sectors of the economy. Nigerian economy has been driven via one sector (petroleum sector) to the point that oil alone contributes to over 95% of budgetary revenue. Nigerian government should stop paying lip service to the development of other sectors as agriculture, solid minerals, tourism and sports. These other sectors when fully developed will be able to absorb about 80% of the unemployed graduates in the country.

8 DECLARE STATE OF EMERGENCY ON CORRUPTION: Since corruption has been identified as a cog in the wheel of development in our country concerted efforts of all; both public and private entities must be made to uproot this evil from the blood stream of our country. A state of emergency must have to be declared on the fight against corruption. The anti-corruption agencies have to be strengthened and empowered, government have to come out clear with political will to tackle corruption, non-governmental agencies have to mount up serious advocacy against corruption, the media must rise up to the fight and all the sundry must come out red alert both to expose corruption and to condemn it at all levels of our national and private lives.

CONCLUSION

In conclusion this paper we have to say that graduate unemployment in Nigeria has reached its crescendo and requires the attention of all; both the government, private sector organizations, non-governmental organization, the media and in fact the international community. It is a keg seating on top of a gun powder if nothing is done it will blow out of proportion. To avert what is happening in the Middle East and North Africa from spreading to Nigeria, the issues of graduate unemployment have to be urgently and holistically addressed. The government must show serious commitment and political will to fight corruption, provide enabling environment for investment, the school curriculum have to be reviewed to bring in entrepreneurship in the front burner and the private sector have to partner with the public sector to develop the industrial base and diversity the economy.

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Design and analysis of Autonomous Robots

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Abstract— An autonomous robot is a robot that performs behaviors or tasks with a high degree of autonomy, which is particularly desirable in fields such as space exploration, cleaning floors, moving lawns, waste water treatment and delivering goods and services. An autonomous robot may also learn or gain new knowledge like adjusting for new methods of accomplishing its tasks or adapting to changing surroundings.

Keywords— UAVs, AUVs

INTRODUCTION

Autonomous robots have the ability to gain information about their environments, and work for an extended period of time without human intervention. Examples of these robots range from autonomous helicopters to robot vacuum cleaners. These self-reliant robots can move themselves throughout the operation without human assistance, and are able to avoid situations that are harmful to themselves or people and property. Autonomous robots are also likely to adapt to changing surroundings.

A fully autonomous robot can:

- Gain information about the environment (Rule #1)
- Work for an extended period without human intervention (Rule #2)
- Move either all or part of itself throughout its operating environment without human assistance (Rule #3)
- Avoid situations that are harmful to people, property, or itself unless those are part of its design specifications (Rule #4)

FEATURES OF AUTONOMOUS ROBOTS

Autonomous robots use infrared or ultrasound sensors to see obstacles, allowing them to navigate around the obstacles without human control. More advanced robots use stereo vision to see their environments; cameras give them depth perception, and software allows them to locate and classify objects in real time.Autonomous robots are helpful in busy environments, like a hospital. Instead of employees leaving their posts, an autonomous robot can deliver lab results and patient samples expeditiously. Without traditional guidance, these robots can navigate the hospital hallways, and can even find alternate routes when another is blocked. They will stop at pick-up points, and collect samples to bring to the labAnother place autonomous robots are useful is in our natural environment. In 2013, researchers at Virginia Tech developed an autonomous robotic jellyfish with the intent of one day conducting undersea military surveillance or monitoring the environment. The 5 foot 7 inch jellyfish has a long duration and range of operation.

TYPES OF AUTONOMOUS ROBOT

Manipulation of robotic system is classified into three types.

1. Autonomous control robots.

2. Remote controlled robots.

3. Manually controlled robots.

Autonomous robots are mainly used in industrial areas. where as the remote controlled robots are used in environments that are restricted for human beings. manually controlled robots are widely used for handing goods and also for transportation.

Types of autonomous robotic system:

Out of three types of manipulation robotic system, the autonomous system is further classified into 4 types.

i). Programmable.

ii). Non-programmable.

iii). Adaptive

iv). Intelligent.

i).Programmable autonomous robot

It is a first generation robot with a actuator facility on each joint. The robots can be reprogrammable based on the kind of application they are commissioned to.The main drawback of this autonomous robot is that once programmed it persist operation even if there is a need to change its task.

ii).Non-Programmable autonomous robot

This robot is one of the basic types of robot , infact, a non programmable robot. This robot is not even considered as a robot, but is an exploiter lacking reprogrammable

iii).Adaptive robots

Adaptive robots are also industrial robots that can be adapted independently to various ranges in the process.Adaptive robots are mainly used in applications such as spraying, and welding system.

iv). Intelligent robot

Intelligent robot as the name suggest are the most intelligent of all other types of robots with sensors and microprocessor for storing and processing the data.These robots find their applications in the fields like medical, military applications and home appliance control system etc.

4. Applications of autonomous robots:

For real world applications the robot must be sold in numerous copies to customer, who will read a short set of recommendations, power the robot, and check from time to time that the work is being properly done. customers are not willing to spend time in instructing their robot, letting it carefully explore the environment, and buy the risk of sub-optimal performance.Current limitations in energy autonomy naturally favour "white-collar" applications of autonomous robots, such as surveillance.

Autonomous robots find numerous applications in diverse fields such as defense, medical, surveillance, security, and space exploration. These applications are rapidly growing in scope and implementation, and will include environmental membrane filtration

and medical treatment. Researchers are developing autonomous unmanned aerial vehicles (UAVs) that can fly and work together in groups. They would have invented functionally improved surveillance and rescue-bots, pets that double up as security guards, elderly care robots, robotic public transportation, and multipurpose home-cleaning robots.CSIRO autonomous robotic systems can assist or replace people in tasks that are repetitive, difficult, unpleasant, or performed in hazardous environments. They can be used across a wide range of industries.

Aerial

Autonomous robotic systems can be used to carry out hazardous or difficult missions that until now have been performed by people. CSIRO, collaborating with the Queensland University of Technology, Boeing Research and Technology Australia, and Insitu Pacific, are developing autonomous unmanned aircraft for use in a range of applications including invasive species surveying over tropical rainforests.

CSIRO developed technology for the Smart Skies Project, a multi-award winning international research project that developed an electro-optical mid-air collision avoidance system, a static obstacle avoidance system, a mobile ground-based aircraft

Unmanned aircraft system

Mining

Remote telerobotic systems increase efficiency, productivity and profitability, and remove people from hazardous and inhospitable working environments by allowing them to remotely control mining equipmentTraditionally, remote operation in the mining industry involved a human operator relying only on video streaming to make decisions. CSIRO has developed technologies that improve mining operations by using a variety of sensors to provide additional information to the human operator in real-time, thus allowing better control over the equipment while reducing human fatigue and errors

Rockbreaker at RioTinto's West Angelas iron ore mine

Underwater monitoring

CSIRO Autonomous Underwater Vehicles (AUVs) use video cameras as one of the primary sensors for navigation, and are ideal for data collection, inspecting and cataloguing natural habitats. CSIRO is developing technologies that allow the underwater robot to immediately and autonomously recognise objects in the video stream and make decisions accordingly. This enables adaptive mission planning with the vehicle changing its survey plan based on data obtained in real-time

CSIRO robotic submarine

Education

CSIRO, partnering with National Museum education experts and the Department of Broadband, Communications and the Digital Economy, has developed an autonomous robot that allows remote visitors, such as school students in rural Australia, to virtually visit the National Museum through a high-speed broadband connection. The robot navigates itself around the museum alongside an educator, and remote visitors can talk to the educator through a video chat session and see the museum gallery through the robot cameras

Mobile telepresence robot

5. CONCLUSION:

The primary aim is to provide the robot with the ability of automatic interpretation of scenes in order to understand and predict the actions and interactions of the observed objects based on theinformation acquired by its sensors. One limitation of the presented system is that object and people detection are accomplished at pre-defined goal positions where the robot stops and stays still in order to process data.Other wireless technologies like Wi-Fi or Bluetooth can be used as communication protocol instead of Zigbee technology. Touch screen/Voice based robot control can also be used in future to make the system sophisticated.

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FACE ANALYSIS BY LOCAL DIRECTIONAL NUMBER PATTERN

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Abstract— In Face analysis, the Local directional number pattern method encodes the directional information of the face's textures producing a more discriminative code than current methods. We compute the structure of every micro pattern with the support of a compass mask, which extracts directional information, and we encode such information using prominent direction indices and sign, which allows us to distinguish among similar structural patterns that have different intensity transitions. We divide the face into many regions, and extracting the distribution of the LDN features from them. Then, concatenating these features into a feature vector, and we use it as a face descriptor. The descriptor performs consistently under noise, illumination, expression, and the time lapse variations.

Keywords— Features, local pattern, directional number pattern, image descriptor, face descriptor, face recognition, expression recognition

[1] Introduction

A photograph or video frame is the input to the Image processing; the output of the image processing may be either an image or a set of characteristics related to the image. The acquisition of images (producing the input image in the first place) is referred to as imaging. Image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. The Image processing usually refers to digital image processing, but optical and the analog image processing also are possible. An image may be defined as a two-dimensional function, f(x, y), where x and y are coordinates, and the amplitude of f at any couple of coordinates (x, y) is called the intensity of the image at that point. When x, y, and an amplitude values of f are all finite, separate quantities, we call the image a digital image. The digital image is the collection of a finite number of elements, pixels is the term most commonly used to indicate the elements of a digital image.

Face recognition is one of the most successful applications of image analysis; It has recently received important attention, especially during the past few years. With constant growing of image analysis and pattern recognition technology, facial expression recognition has attracted more attention, and it generally contains three processes: image acquisition, feature extraction and expression classification, in which key point is the feature extraction. And the performance of an expression recognition method more critically depends on the extracted expression features with better discrimination capability. There are two common approaches to extract facial features: geometric-feature-based and appearance based methods [1-3]. The Geometric feature based methods extracts the shape and locations of facial components (including mouth, eyes, and nose) to represent the face geometry [45], [46].

Appearance-based methods deal with the whole face or specific face-regions to extract appearance changes of face using image filters such as Gabor-wavelet and local binary pattern (LBP) [47],[13]. The performance of the appearance-based methods is fantabulous in constrained environment but their performance degrades in environmental variation [15]. The face and expression features are recognized in different applications in different conditions. The descriptor of the face appearance is the key issue in face analysis [48],[49]. The descriptor efficiency depends on its representation and the ease of extracting it from the face, a good descriptor should have a high variance among classes (between different persons or expressions), but little variation within classes (same person or expression in different conditions). Descriptors are used in facial expression and face recognition. The two common approaches to extract facial Features are geometric-feature-based and appearance-based methods [4]. The former [50], [6] encodes the shape and locations of different facial components; they are combined into a feature vector that represents the face. An instance of these methods

is the graph-based methods [5]–[9], which use some facial components to create a representation of the face and process it. Furthermore The Local-Global Graph algorithm [5]–[7] is an interesting approach that uses Voronoi tessellation and Delaunay graphs to segment local features and builds a graph for face and expression recognition. These features are combined into a local graph; the algorithm creates a skeleton (global graph) by interrelating the local graphs to represent the topology of the face. Moreover the facial features are widely used in expression recognition as the work done by Ekman and Friesen [12] identifying six basic emotions produced a system to categorize the expressions, known as Facial Action Coding System [11], and later it was simplified to the Emotional Facial Action Coding System [14]. However the geometric feature- based methods requires accurate and reliable facial feature detection and tracking, which is difficult to put up in many situations. The appearance based methods [13], [16] use image filters, either some exact face-region, to create local features, or on the whole face, to create holistic features, to extract the appearance changes in the face image.

We propose a face descriptor, local Directional Number Pattern (LDN), for robust face recognition that encodes the structural information and the intensity variations of the face's texture. LDN gives the structure of a local neighborhood by analyzing its directional information. Accordingly, we compute the edge responses in the neighborhood, in eight distinct directions with a compass mask. And then, from all the directions, we select the top positive and negative directions to produce a meaningful descriptor for different textures with similar structural patterns. This approach allows us to differentiate intensity changes (e.g., from bright to dark and vice versa) in the texture, yet it is more compact-as it is 6 bit long. It uses the information of the entire neighborhood, instead of using sparse points for its computation like LBP. So, our approach conveys more information into the code.

[2] LITERATURE REVIEW

The two common approaches to extract facial Features are geometric-feature-based and appearance-based methods [4]. Eigen faces [18] and Fisher faces [17] are some methods for the holistic class, which are built on Principal Component Analysis (PCA) [18]; the more recent 2D PCA [20], and Linear Discriminant Analysis [19] are also examples of holistic methods. Local descriptors have gained attention because of their robustness to illumination and pose variations. Heisele et al. presented the validity of the component based methods, and how they perform holistic methods [22]. The local-feature methods calculate the descriptor from parts of the face, and then collect the information into one descriptor. In that these methods are Local Features Analysis [21], Gabor features [24], Elastic Bunch Graph Matching [23], and Local Binary Pattern (LBP) [13], [26]. The last one is an extension of the LBP feature, that was designed for texture description [25], applied to face recognition. LBP gained popularity because; it achieved better performance than previous methods. Newer methods tried to overcome the shortcomings of LBP, like Local Ternary Pattern (LTP) [28], and Local Directional Pattern (LDiP) [27-29], The previous method encodes the directional information in the neighborhood as an alternative of the intensity. Zhang et al.[32,31] explored the use of higher order local derivatives (LDeP) to produce better results than LBP. Both these methods use other information as alternative of intensity to overcome illumination and noise difference problems. However, these methods still suffer in nonmonotonic illumination variation, unsystematic noise, and changes in age, pose, and different expression conditions. Few methods, like Gradient faces [34], have a high discrimination power under different illuminations, but they still have low recognition capabilities for expression and in variant age conditions. However some methods explored different features, such as, infrared [33], near infrared [31], and phase information [36], [35], to overcome the illumination problem while maintaining the performance under difficult conditions.

I.Kotsia and I.Pitas [6] proposed facial expression recognition in facial image sequences are presented. The user has to place few Candide grid nodes to face landmarks depicted at the first frame of the image sequence under assessment. Grid-tracking and deformation system is used based on deformable models, select the grid in successive video frames eventually, as the facial expression

evolves, in anticipation of the frame that corresponds to the greatest facial expression intensity. The geometrical displacement of selected certain Candide nodes, characterized as the dissimilarity of the node coordinates between the first and the greatest facial expression intensity frame also used as an input to a novel multiclass Support Vector Machine (SVM) system of classifiers that are used to identify either a set of chosen Facial Action Units (FAUs) or the six basic facial expressions.

M. Pantic and L. J. M. Rothkrantz [15] proposed the Face Expression Recognition and Analysis: The State of the Art in this automatic face and expression recognition the characteristics of an ideal system, Databases that have been used and the advances made in terms of their standardization and a detailed summary of the state of the art and discusses facial parameterization using FACS Action Units (AUs) and MPEG-4 Facial Animation Parameters (FAPs) and the recent advances in face tracking, detection, feature extraction methods. Observations have also been provided on emotions, expressions and facial features, conversation on the six prototypic expressions and the recent studies on expression classifiers.

L.Wiskott,J.-M.Fellous,N.Kuiger and C. von der Malsburg[23] proposed Face Recognition by Elastic Bunch Graph Matching ,it presents a system for recognizing human faces from single images out of a large database consisting one image per person. The task is hard because of image variation in terms of expression, position, size, and pose. The system collapses majority of this variance by extracting concise face descriptions in the form of the image graphs. In these, fiducial points on the face (eyes, mouth, etc.) are described by sets of wavelet components (jets). Image graph extraction is based on a novel approach, the bunch graph, that is developed from a little set of sample image graphs. Recognition is based on simple comparison of image graphs.

T. Ahonen, A. Hadid, and M. Pietik¨ainen [26] proposed a Face Description with Local Binary Patterns: Application to Face Recognition in that the face image is divided into several regions from which the LBP feature distributions are extracted and combined into an enhanced feature vector to be used as a face descriptor. The act of the proposed method is evaluated in the face recognition problem under different challenges

T. Xu, J. Zhou, and Y. Wang presented an effective image description for facial expression recognition, which is a variation of local directional pattern (LDP), and introduced weightings on the modular's LDP and investigated the effect on recognition rates with different weightings. Finally, the overlapped block is proposed when using LDP and proposed method. For recognition, it adopts PCA+LDP subspace method for feature reduction, and the nearest neighbor classifier is used in the classification. The results of extensive experiments on benchmark datasets JAFFE and Cohn-Kanade illustrated that the proposed method not only can obtain better recognition rate but also have speed advantage. Furthermore, the appropriately selected weightings and regional overlapping can improve recognition rates for both proposed method and LDP method [44].

[3] LOCAL DIRECTIONAL NUMBER PATTERN

The proposed Local Directional Number Pattern (LDN) is a six bit binary code allotted to each pixel of an input image that represents the structure of the texture and its intensity transitions. The previous research [38], [37] proved, edge magnitudes are largely unresponsive to lighting changes. Accordingly, we create our pattern by calculating the edge response of the neighborhood using a compass mask, and by considering the top directional numbers, which is the most positive and negative directions of those edge responses. We represent this coding scheme in fig. 1. The positive and negative responses yield valuable information of the structure of the neighborhood, as they reveal the gradient direction of bright and dark areas in the neighborhood. Thereby, this differentiation between dark and bright responses, allows LDN to distinguish between blocks with the positive and the negative direction exchanged (which is equivalent to swap the bright and the dark areas of the neighborhood, as demonstrated in the middle of fig. 1) by developing a different code for each instance, as other methods may mistake the swapped regions as one. Moreover, these transitions occur frequently in the face, for example, the top and bottom edges of the eyebrows and mouth have different intensity

transitions. Thus, it is very important to differentiate among them; LDN can perform this task as it assigns a specific code to each of them.

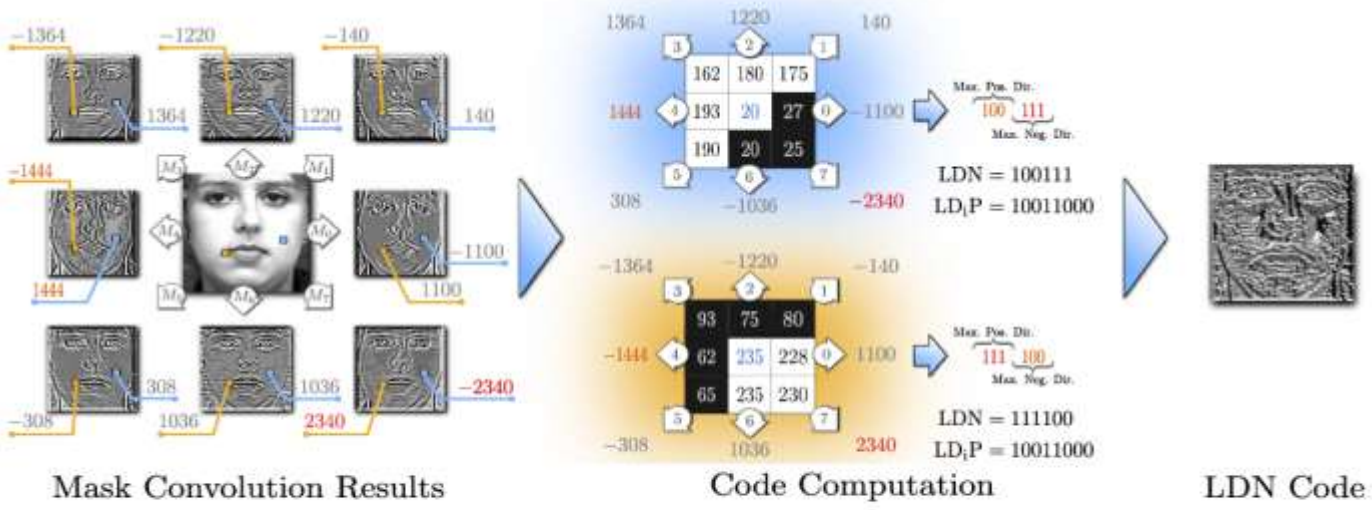

Fig. 1. LDN code computation. The (Kirsch) compass masks are convoluted with the original image to extract the edge response images (shown in the left). From these images, we choose the prominent directional numbers (positive and negative directions) to encode the texture in the neighborhood. We show an example of a neighborhood in the middle-top, that corresponds to the colored marks on the edge response images. It shows the different response values, the top directional numbers (in red and orange), and the final LDN code (shown in the right). Moreover, LDN can detect changes in the intensity regions by producing a different code (as shown in the middle-bottom) while other directional patterns cannot (like LDiP), as they produce the same code for different textures.

3.1 COMPARISON WITH PREVIOUS WORK

Current methods have several disadvantages. For example, LBP [26] encodes the local neighborhood intensity by using the centre pixel as a threshold for a sparse sample of the neighboring pixels. Some number of pixels used in this method introduces several problems: First, it limits the precision of the method. Second, the method rejects most of the information in the neighborhood. Lastly, it makes the method very sensitive to noise. Furthermore, these disadvantages are more apparent for bigger neighborhoods. Accordingly, to avoid these problems more information from the neighborhood can be used, as other methods do [28], [27], [32], [36], [35]. Even though the use of more information makes these methods more constant, they still encode the information in a same way as LBP: by marking certain characteristics in a bit string. And in spite of the simplicity of the bit string coding strategy, it discards most information of the neighborhood. For example, the directional (LDiP) [27] and derivative (LDeP) [32] methods miss some directional information (the responses' sign) by considering all directions equally. Also, they are responsive to illumination changes and noise, while the bits in the code will flip and the code will represent a totally different feature. To avoid these problems, we investigate a new coding scheme, that implicitly utilizes the sign of the directional numbers to increase the encoded structural information, with two dissimilar masks: a derivative-Gaussian (to avoid the noise disturbance, and to set up our method robust to illumination changes, as previous methods showed [34]) and a Kirsch compass mask. Figure 1 demonstrates how LDN produces distinct codes in different scenarios, while LDiP [27] produces the same code (note that LDeP will have a same result). hence, the use of the directional numbers produces a more robust code than a simple bit string. Furthermore, the use of principal directions may be similar to a weighted coding strategy, in the sense that not all directions have the same prominence. In contrast, previous weighting methods [33] treat the code (again) as a bit string, picking all the information of the neighborhood, and weight only the inclusion of each code into the descriptor. However, we (equally) use the two principal directional numbers of each neighborhood (and code them into a single number) instead of assigning weights to them. Accordingly, we pick the prominent information of each pixel's neighborhood. So, our method filters and gives more importance to the local information before coding it, while other methods weight the grouped (coded) information. the

important points of our proposed method are: (1) the coding scheme is based on directional numbers, instead of bit strings, that encodes the information of the neighborhood in a more effective way; (2) the inexplicit use of sign information, in comparison with preceding directional and derivative methods we encode more information in less space, and, at the same time, differentiate more textures; and (3) the use of gradient information makes the method strong against illumination changes and noise.

3.2. CODING SCHEME

In this coding scheme, we develop the LDN code, by analyzing the edge response of all mask, $\{M^0,...,M^7\}$ that represents the edge significance in its respective direction, and by totaling the dominant directional numbers. Given that the edge responses are not evenly important, the presence of a high negative or positive value signals a salient dark or bright area. Therefore, to encode these salient regions, we implicitly use the sign information, as we allot a fixed position for the top positive directional number, the three most significant bits in the code and three least significant bits are the top negative directional number, as presented in fig.1.
Therefore, the code is:

$$\mathrm{LDN}(x, y) = 8i_{x,y} + j_{x,y} \qquad (1)$$

where (x,y) is the central pixel of the neighborhood to be coded, $i_{x,y}$ is the directional number of the maximum positive response, and the $j_{x,y}$ is the directional number of the minimum negative response represented by:

$$i_{x,y} = \arg\max_i \{\mathbb{I}^i(x, y) \mid 0 \le i \le 7\} \qquad (2)$$

$$j_{x,y} = \arg\min_j \{\mathbb{I}^j(x, y) \mid 0 \le j \le 7\} \qquad (3)$$

where $\mathbb{I}^i$ is the convolution of the original image, I ,and the i^{th} mask, M^i, defined by:

$$\mathbb{I}^i = I * M^i. \qquad (4)$$

3.3 COMPASS MASKS

To compute our code, we use the gradient space instead of the intensity feature space. The former has more information than the later, because it holds the relations among pixels implicitly (while the intensity space ignores these relations). Furthermore, the gradient space reveals the underlying structure of the image due to these relations. Accordingly, the gradient space has more incisive power to detect key facial features. Additionally, we explore the utilization of a Gaussian to smooth the image, that makes the gradient computation more constant. These operations make our method more robust; likewise previous research [27], [32], [34] used the gradient space to calculate their code. So, our method is robust against illumination due to the gradient space, and noise due to the smoothing. We need a compass mask to compute the edge responses, to produce the LDN code,. In this paper, we analyze our proposed code using two different asymmetric masks: Kirsch and derivative-Gaussian (illustrated in figs 2 , and 3).

These masks operate in the gradient space, as it reveals the structure of the face. Moreover, we explore the use of Gaussian smoothing to stabilize the code in presence of noise by using the derivative-Gaussian mask. The Kirsch mask [40] is rotated 45^0 apart to get the edge response in eight different directions, as shown in fig. 2. We express the use of this mask to produce the LDN code by

LDN^K. Furthermore, inspired by the Kirsch mask [40], we use the derivative of a skewed Gaussian to create an asymmetric compass mask that we use to calculate the edge response on the smoothed face. This mask is robust against illumination changes and noise. while producing strong edge responses. Therefore, given a Gaussian mask represented by:

$$G_\sigma(x,y) = \frac{1}{2\pi\sigma^2}\exp\left(-\frac{x^2+y^2}{2\sigma^2}\right) \qquad (5)$$

where x,y are location positions, σ is the width of the Gaussian bell; we represent our mask as:

$$M_\sigma(x,y) = G'_\sigma(x+k,y) * G_\sigma(x,y) \qquad (6)$$

where G'_σ is the derivative of G_σ with respect to x, σ is the width of the Gaussian bell, $*$ is the convolution operation, k is the offset of the Gaussian with respect to its center—in our experiments for this offset we use one fourth of the mask diameter. Then, we develop a compass mask, $\{M^0_\sigma,\ldots,M^7_\sigma\}$, by rotating M_σ, 45^O apart in eight different directions. Thus, we get a set of masks similar to those shown in fig. 3. Because of the rotation of the mask, M_σ, there is no need of calculating the derivative with respect to y (because it is equivalent to the 90^0 rotated mask) or other combination of these variables. We express the code developed through this mask as $\mathbf{LDN}^G_\sigma$, where σ represents the parameter for the Gaussian.

$$\begin{bmatrix}-3&-3&5\\-3&0&5\\-3&-3&5\end{bmatrix}_{M_0}\begin{bmatrix}-3&5&5\\-3&0&5\\-3&-3&-3\end{bmatrix}_{M_1}\begin{bmatrix}5&5&5\\-3&0&-3\\-3&-3&-3\end{bmatrix}_{M_2}\begin{bmatrix}5&5&-3\\5&0&-3\\-3&-3&-3\end{bmatrix}_{M_3}$$

$$\begin{bmatrix}5&-3&-3\\5&0&-3\\5&-3&-3\end{bmatrix}_{M_4}\begin{bmatrix}-3&-3&-3\\5&0&-3\\5&5&-3\end{bmatrix}_{M_5}\begin{bmatrix}-3&-3&-3\\-3&0&-3\\5&5&5\end{bmatrix}_{M_6}\begin{bmatrix}-3&-3&-3\\-3&0&5\\-3&5&5\end{bmatrix}_{M_7}$$

Fig. 2. Kirsch compass masks.

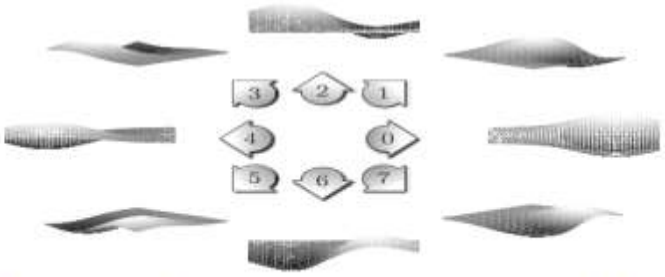

Fig. 3. Derivative of Gaussian compass masks, computed by Eq. (6).

[4] FACE DESCRIPTION

As shown in fig. 4(a), each face is represented by a LDN histogram (LH). The LH contains fine to coarse information of an image, such as corners, spots ,edges, and other local texture features. The histogram only encodes the occurrence of certain micro-patterns without location information, to combine the location information to the descriptor, we divide the face image into small parts, $\{R^1,\ldots,R^N\}$, and extract a histogram H^i from each region R^i. We generate the histogram H^i, using each code as a bin, and then gathering all the codes in the region in their respective bin by:

$$H^i(c) = \sum_{\substack{(x,y)\in R^i \\ \mathrm{LDN}(x,y)=c}} v, \quad \forall c, \qquad (7)$$

where c is a LDN code, and (x,y) is a pixel position in the region R^i, the LDN(x,y) is the LDN code for the position (x,y) and v is the accumulation value—commonly the accumulation value is one. Finally, the LH is calculated by concatenating those histograms:

$$LH = \prod_{i=1}^{N} H^i, \qquad (8)$$

Where *N* is the number of regions of the divided face, and $\sqcap$ is the concatenation operation. The spatially combined LH plays the role of a global face feature for the granted face. The use of the derivative-Gaussian mask allows us to freely vary the size of the mask. The alter in the size allows the coding scheme, LDN^G, to capture distinct characteristics of the face. Therefore, a fine to coarse representation is achieved by finding the LDN^G_σ code at n different σ_i (which we represent by $LDN^G_{\sigma_1,\ldots,\sigma_n}$), and by concatenating the histogram of each σ_i, $H^j_{\sigma_i}$, which is computed in the same way as Eq.(7) by using LDN^G_σ, we can merge the characteristics at different resolutions [as presented in fig. 4(b)]. We call this mixture of resolutions a multi-LDN histogram (MLH), and it is calculated by:

$$MLH_{\sigma_1,\ldots,\sigma_n} = \prod_{j=1}^{N} \prod_{i=1}^{n} H^j_{\sigma_i}, \qquad (9)$$

Where $\prod$ is the concatenation operation, $H^j_{\sigma_i}$ is the histogram of the $LDN^G_{\sigma_i}$ code at the R^j region, and n is the number of σ's used—in our experiments we limit ourselves to three. The modification in the mask's size allows our method to capture features in the face that otherwise may be overlooked. As previous research showed [39], it is critical to provide descriptive features for long range pixel interaction. Even so, previous works do not take into account the long range pixel interaction that takes place outside the coverage of their neighbourhood system. We find that joining the local shape information, the relationship between the edge responses, relating the information from different resolutions can better characterize the face's characteristics. We represent the face using a single-feature histogram, by using LH, or by a multi-feature histogram, by using the MLH. The LDN code in LH is LDN^K or LDN^G_σ and the code in MLH must be a $LDN^G_{\sigma_1,\ldots,\sigma_n}$

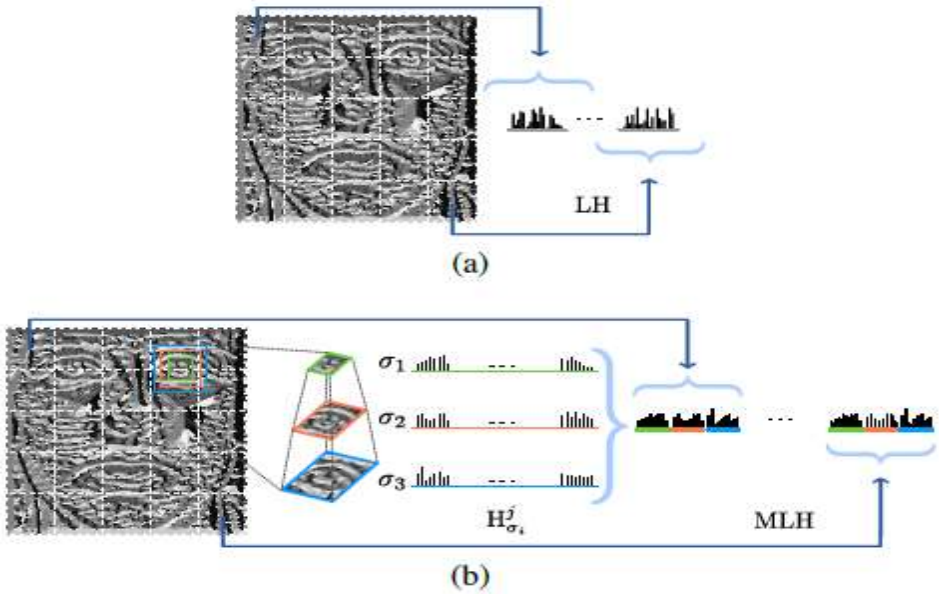

Fig. 4. Face descriptor using uniform grid for histogram extraction. (a) LDN histogram (LH), and (b) multi-LDN histogram (MLH).

4.1 FACE RECOGNITION

During the face recognition process, the LH and MLH are used. The purpose is to compare the encoded feature vector from one person with all other candidate's feature vector with the Chi-Square dissimilarity measure. Measure between two feature vectors, F1& F2, of length N is defined as:

$$\chi^2(F_1, F_2) = \sum_{i=1}^{N} \frac{(F_1(i) - F_2(i))^2}{F_1(i) + F_2(i)}. \qquad (10)$$

The related face of the feature vector with the lowest measured value indicates the match found

4.2 EXPRESSION RECOGNITION

To evaluate the performance of the proposed method, we perform the facial expression recognition by using a Support Vector Machine (SVM). SVM[42] is a supervised machine learning technique that implicitly maps the data into a higher dimensional feature space . Accordingly, it finds a linear hyperplane, with a maximal margin, to segregate the data in different classes in this higher dimensional space.

Assume a training set of M labeled examples

$T=\{(x_i, y_i) \mid i=1,...,M\}$,

where $x_i \in \mathbb{R}^n$ and $y_i \in \{-1,1\}$,the test data is classified by:

$$f(x) = \text{sign}\left(\sum_{i=1}^{M} \alpha_i y_i K(x_i, x) + b\right), \qquad (11)$$

where α_i are Lagrange multipliers of dual optimization problem, b is the bias, and K(.,.) is a kernel function. Make a note that SVM allows domain-specific selection of the kernel function. As though many kernels have been proposed, the most often used kernel functions are the linear, polynomial, and Radial Basis Function (RBF) kernels. Given that SVM forms binary decisions, multi-class classification can be accomplished by adopting the one-against-one or one-against-all techniques. In our work, we opt for one-against- one technique, which constructs k(k-1)/2 classifiers, that are trained with data from two classes [41]. We perform a grid-search on the hyper-parameters in a 10-fold cross-validation scheme for parameter selection, as advised by Hsu et al. [43]. The parameter setting bring out the best cross-validation accuracy was picked.

IV. CONCLUSION

The LDN uses directional information that is more stable against noise than intensity, to code the distinct patterns from the face's textures .It takes advantage of the structure of the face's textures and that encodes it efficiently into a compact code. And also, we analyzed the use of two different compass masks (a derivative-Gaussian and Kirsch) to extract this directional information. In general, LDN, implicitly, uses the sign information of the directional numbers which allows it to distinguish similar texture's structures with different intensity transitions—e.g., from bright to dark and vice versa. The derivative-Gaussian mask is more stable against illumination variation and noise, which makes LDN^G a reliable and stable coding scheme for face identification. Moreover,

the use of Kirsch mask makes the code suitable for expression recognition, as the LDN^K code is more robust to find structural expression features than features for identification. Furthermore, the proposed face descriptor that combines the information from several neighborhoods at different sizes to encode micro patterns at those levels. Accordingly, LDN recovers more information, and uses it to boost its discriminating power.

Moreover, the combination of different sizes (small, medium and large) gives better recognition rates for certain conditions. For example, the combination of 5 x 5, 7 x 7, and 9 x 9 neighborhoods, in the LDN^G code, gives better results for expression and time lapse variation, in general. For noise intense environments large neighborhood's sizes perform better than other combinations, and in such environments the Kirsch mask performs as well as the derivative-Gaussian mask. Also, we analyzed LDN under expression, illumination variations and time lapse, and found that it is reliable and robust throughout all these conditions, unlike other methods. For example, Gradient faces had excellent results under illumination variation but failed with expression and time lapse variation. Also, LBP and LD_iP recognition rate deteriorates faster than LDN in presence of illumination changes and noise

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