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CHIEF EDITOR BOARD

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 Fifth Issue of the Fifth Volume of International Journal of Engineering Research and General Science. A total of 13 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 Sustainable innovative solutions. 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 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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Impact of Corporate Governance on Organizational Performance

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Abstract- This study examined whether corporate governance has impact on organizational performance in Financial Institutions as research problem. This research was carried out with objective to measure association between Corporate Governance and Financial Institution's Performance in Batticaloa district. Conceptual framework has been developed to measure linkages between Corporate Governance and Financial Institution's Performance. Board Size, Corporate Governance Mechanism, Communication Strategies, and Code of Conduct are considered as the measurement variables of Corporate Governance which was derived from Changezi & Saeed (2013) and Customer Satisfaction, Employee Commitment and Corporate Reputation are considered as the measurement variable of Organizational Performance which was derived from Bayoud (2012) and Carton (2004). Questionnaires were used to collect data for this study. 115 Management Respondents and 115 Customers from whole Financial Institutions in Batticaloa district have been selected for this study. Data were analyzed and evaluated by Univariate and Bivariate techniques. In Univariate analysis, Descriptive statistic has been used for the analysis. In Bivariate analysis, Correlation and multiple regressions have been used for the analysis. Findings have shown the Corporate Governance and Organizational Performance are at high level. Moreover, it also found that there is a strong positive relationship between Corporate Governance and Organizational Performance. Corporate Governance significantly impacts Organizational Performance of Financial Institutions. These findings would be useful to consider more on Corporate Governance practices to avoid the Corporate Collapses and to achieve successful Organizational Performance

Keywords- Corporate Governance, Organizational Performance.

INTRODUCTION

Corporate governance has admired as an emerging aspect in past decades to improve the performance of companies (Mishra et. al., 2001; McConaughy et al., 1998; Khatri et al., 2001; Kwak, 2003; Black et al., 2003). Because best practice of corporate governance diminishes threat for stakeholders, attract investment capital and enhances the performance of companies (Spanos, 2005). Good corporate governance increases the profitability of companies and long term value of firms (Khumani et al., 1998). Hence it has become an important concept for every company. Moreover, failures of companies were taken place in the mind of researchers to study about corporate governance practices.

Cadbury (1992) defined corporate governance as "the system by which companies are directed and controlled. Corporate governance is mainly considered with board of directors' duties and responsibilities and relationship with the stakeholders to meet the success of company. The Organization for Economic Co-operation Development Principles of Corporate Governance (1999) states that "Corporate governance involves a set of relationships between a company's management, its board, its shareholders and other stakeholders. It also provides the structure through which the objectives of the company are set, and the means of attaining those

objectives and monitoring performance are determined". Thus definition of corporate governance can be concluded that mechanisms developed into the company by which companies are directed to increase long term value of stakeholders and ultimately improving the performance of companies.

There are varieties of definition of organizational performance in the literature. In general, Carton (2004) states that "the concept of organizational performance is based upon the idea that an organization is the voluntary association of productive assets, including human, physical, and capital resources for the purpose of achieving a shared purpose".

The collapse of companies has highlighted to study about corporate governance practices and its impact on organizational performance. Therefore, the purpose of study was to examine impact of corporate governance on organizational performance in financial institutions in Batticaloa district. Reason for selecting financial institutions is that there are many expansions of financial institutions and also it is one of growing sector in Batticaloa. It is important to study corporate governance system and its relationship with organizational performance in Batticaloa. Rare research has been conducted regarding this topic so this study is important and relevant in order to fill the knowledge gap to find out to what extent corporate governance impacts on organizational performance.

LITERATURE REVIEW

Corporate Governance is broad concept and it is not easy to describe due to continuously expanding the boundaries of the concept. The definition may vary based on the different perspective of researchers. In literature, the basic definition of Corporate Governance can be defined as "the system by which companies are directed and controlled" (Cadbury, 1992). OECD (1999) states "this structure specifies the distribution of rights and responsibilities among different participants in the corporation, such as the board, managers, shareholders and other stakeholders, and spells out the rules and procedures for making decisions on corporate affairs". However some of definitions of Corporate Governance are generally classified into value creation and value protection which is accomplished through corporate governance (Heenetigala, 2011). According to Heenetigala (2011), Value creation indicates that developing the long term goals for sustainable performance by focusing on the shareholders of the company. Value protection based on accountability of managers and protects the interest of both shareholders and stakeholders (Rezaee, 2009). Stone & Andrew et al. (1998) state that "making such set of laws and motivation through which administration of company is bounded and administered for profit maximization which ultimately adds the value for shareholders as well as for management". Hermalin (2005) and Lee (2008) indicate that "the concept of corporate governance lies in between all these aspects and management of organizational resources fairly while concerning the interests of all stakeholders".

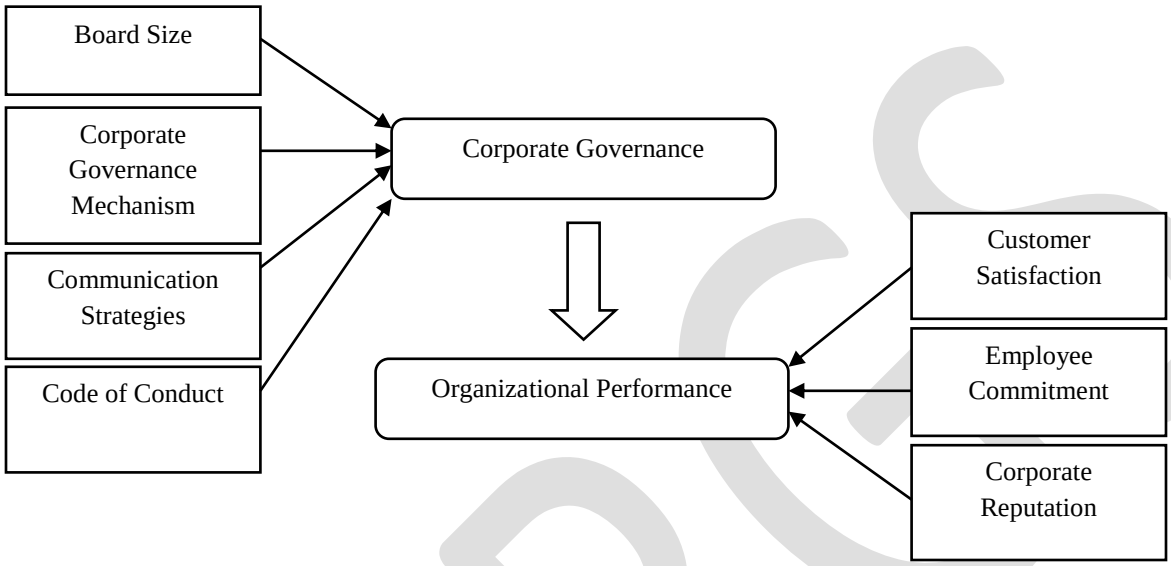
Concept of organizational performance is an important aspect which has been using in all areas of business researches and it is difficult to have general definition and measurement by reason of continuously expanding their boundaries. Akal (1992) defines that "organizational performance is the evaluation of all the efforts devoted to achieving the business goals". Most of the researchers argue that definition of organizational performance is incorporated with efficiency and effectiveness. Santos & Brito (2012) state "business performance or firm performance is a subset of organizational effectiveness that covers operational and financial outcomes". Conversely, Cameron & Whetten (1983) indicate that "organizational effectiveness is a broader construct that captures organizational performance, but with grounding in organizational theory that entertains alternate performance goals".

Relationship between corporate governance and organizational performance is still a fundamental issue for the researchers. Some scholars have identified as positive relationship and some scholars have failed to show a positive association. For this reason, this study is vital to find what kind of association that financial institutions have.

CONCEPTUAL FRAMEWORK

Based on literature survey following conceptual framework was developed. This conceptual framework establishes link between corporate governance and organizational performance.

Figure 1 Conceptual Model



(Sources: Changezi & Saeed, 2013; Bayoud, 2012; Carton, 2004)

METHODOLOGY

This section provides how this study has been conducted to examine the impact of Corporate Governance on Organizational Performance in Batticaloa district. This chapter describes the method of data collection, the variables used to test the hypothesis, and statistical techniques used to define the results.

RESEARCH DESIGN

Research design deals to plan and provide the path to do the study to obtain the validity of the findings (Mouton, 1996). According to the research design, the structured questionnaires were firstly issued to respondents from management by visiting their financial institutions. After that, the customers of those financial institutions were approached and questionnaires were issued to them. And also, other structured questionnaires were issued to customers through the social networks. Both questionnaires' data were entered in databases and databases were consolidated into one database for analysis purpose. Descriptive analysis, correlation, regression, and ANOVA analysis were employed to test the hypotheses. After analyses were preformed, findings were discussed. As result of the findings, conclusions were drawn.

STUDY POPULATION

Central Bank of Sri Lanka (2014) comprised the financial institutions as Licensed Commercial Banks (LCBs) & Licensed Specialized Banks (LSBs), Finance & Leasing Companies, and Insurance Companies. As at 2014, there were 25 Licensed Commercial Banks (LCBs) & 9 Licensed Specialized Banks (LSBs), 56 Finance & Leasing Companies, and 21 Insurance Companies (Central Bank of Sri Lanka, 2014).

SAMPLE SIZE

There were 12 Licensed Commercial Banks (LCBs) & 8 Licensed Specialized Banks (LSBs), 24 Finance & Leasing Companies, and 15 Insurance Companies in Batticaloa district (Manmunai North Divisional Secretariat). This research covers all the main branch of financial institutions in Batticaloa district (Manmunai North Divisional Secretariat). Thus, 59 financial institutions were considered as the population.

SAMPLING METHOD

Total numbers of financial institution were 59 in Batticaloa district (Manmunai North Division Secretariat). There were 115 management respondents. Simple random sampling method was applied to select the samples of management respondents to measure the Corporate Governance of financial institution. Quota sampling method was applied to select the customers of the selected financial institutions to measure the Organizational Performance.

DATA COLLECTION

This study was carried out based on primary data. The data were collected from Management respondents and Customers of financial institutions. For that reasons, two structured questionnaires were issued to collect the data. Questionnaire I was used to measure Corporate Governance from Management respondents of financial institutions and questionnaire II was used to measure Organizational Performance from Customers of financial institutions.

Primary data were collected through closed ended statements in both questionnaires. Likert scale of 1-5 which ranges from "strongly disagree" to "strongly agree" were employed to identify the responses from management respondents and customers.

METHOD OF DATA ANALYSIS AND EVALUATION

UNIVARIATE ANALYSIS

This study evaluates individual characteristics of Dimensions and variables. Mean values and standard deviation are considered to assess the level of dimensions and variables with the following criteria.

Board size is a numerical scale dimension and it is converted to 5 point likert scale. Therefore, it needs specific decision criteria to evaluate the level of board size. For that reason, level of the board Size (X_1) is explained by the ideal number of board of directors stated in the earlier researches. Lipton & Lorsch (1992) recommend limiting the membership of board to ten people, with a preferred size of eight or nine. Adams & Mehran (2011) stated that ideal size of board is 10-12 members. Jensen (1993) stated that seven or eight directors are ideal for the board. With the support of the studies, a decision criterion is developed for this study.

Table 1: Decision Criteria for level of board size

Range for Decision Criteria	Decision Criteria	Decision Attribute
More than 12 board of directors	$X_1 > 3$	Larger board size
7-9 board of directors	$X_1 = 3$	Optimum board size
1-3 board of directors	$X_1 < 3$	Smaller board size

Where X_1 = mean value of board size

Rest of the dimensions such as corporate governance mechanism, communication strategies, code of conduct, customer satisfaction, employee commitment, and corporate reputation are assessed through the below decision criteria.

Table 2: Decision Criteria for Univariate Analysis

Decision Criteria	Decision Attribute
$1.0 \leq X_i \leq 2.5$	Low Level
$2.5 < X_i \leq 3.5$	Moderate Level
$3.5 < X_i \leq 5.0$	High Level

Where X_i = mean values of an dimension/indicator/variable

Independent Variable & Dimensions

X_2 = *Mean Value of Corporate Governance Mechanism*

X_3 = *Mean Value of Communication Strategies*

X_4 = *Mean Value of Code of Conduct*

Dependent Variable & Dimensions

X_5 = *Mean Value of Customer Satisfaction*

X_6 = *Mean Value of Employee Commitment*

X_7 = *Mean Value of Corporate Reputation*

Where X_i = (2,3,4,5,6,7)

Bivariate Analysis

To identify the relationship between the corporate governance and organizational performance, the correlation analysis was employed.

FINDINGS

Corporate Governance and its Dimensions

Table 3: Overall Measures of Corporate Governance and its Dimensions

Description	Dimensions				Independent variable
	BS (X_1)	CGM (X_2)	CS (X_3)	CC (X_4)	Corporate Governance
Mean	2.904	4.357	4.327	4.237	3.956
Standard Deviation	0.878	0.471	0.553	0.589	0.336
Coefficient of variance	0.302	0.108	0.128	0.139	0.085
Maximum	5.00	5.00	5.00	5.00	4.75
Minimum	1.00	2.67	2.20	2.00	3.05
Number of data	115	115	115	115	115

Where BS = Board Size, CGM = Corporate Governance Mechanism, CS = Communication Strategies, and CC = Code of Conduct

This independent variable as corporate governance includes four dimensions which are board size, corporate governance mechanism, communication strategies, and code of conduct. Board Size dimension has the mean values of 2.904. It shows almost 3 therefore it can be concluded that majority of Financial Institutions have 7-9 board of directors and it is the optimum or ideal size of board. Other dimensions show high level of significant in the Corporate Governance. They have the mean values of 4.357, 4.327, and 4.237

respectively. In addition, most of the respondents have expressed the common opinion toward the dimensions of Corporate Governance (Standard Deviations are 0.878, 0.471, 0.553, and 0.589 respectively.

Among 115 Management respondents, Corporate Governance Mechanism was most significant (Mean = 4.357) to Corporate Governance rather than other dimensions. Next, Communication Strategies was most significant (Mean = 4.327) to Corporate Governance rather than Code of Conduct dimensions.

Corporate Governance's Dimensions in respect of Financial Institutions

Table 4: Overall Measures of Corporate Governance Dimensions in respect of Financial Institutions

Measure	Commercial Bank & Specialized Bank				Finance & Leasing Company				Insurance Company			
	BS	CGM	CS	CC	BS	CGM	CS	CC	BS	CGM	CS	CC
Mean	2.53	4.28	4.24	4.05	3.23	4.43	4.35	4.28	3.00	4.38	4.44	4.47
SD	0.81	0.51	0.55	0.52	0.95	0.48	0.60	0.69	0.62	0.39	0.48	0.42
CV	0.32	0.12	0.13	0.13	0.29	0.11	0.14	0.16	0.21	0.09	0.11	0.09
Minimum	1.00	2.67	2.40	2.75	1.00	2.83	2.20	2.00	2.00	3.67	2.6	3.5
Maximum	4.00	4.83	5.00	4.75	5.00	5.00	5.00	5.00	4.00	5.00	5.00	5.00
N	45	45	45	45	43	43	43	43	27	27	27	27

Where BS = Board Size, CGM = Corporate Governance Mechanism, CS = Communication Strategies, CC = Code of Conduct, SD = Standard Deviation, CV = Coefficient of Variable, N = Number of observation

According to the table 4, mean value for Board Size is at highest level in Financial & Leasing Companies (Mean = 3.23) rather than other companies to support to Corporate Governance. However, mean values of Financial Institution is almost 3. Therefore, it can be concluded that 7-9 board of directors are enough to do board functions. Mean value of Corporate Governance Mechanism is at highest level in Finance & Leasing Companies rather than other companies (Mean = 4.43). It shows that these companies have more concentrated on recording minutes, shares owned by board, meeting information, performance monitoring, reasonable for development of objectives, and have clear policy for concurrent positions. Mean value of Communication Strategies is at highest level in Insurance Companies rather than other companies (Mean = 4.44). It shows that these Insurance Companies have more concentrated on public access of financial reports, access to critical information, accessible through internet, arrangement of general meetings, and assessing mechanism. Mean value of Code of Conduct is at highest level in Insurance Companies rather than other companies (Mean = 4.47). It shows that these Insurance Companies have more concentrated on tracking changes in ownership, rights and responsibilities of shareholders, award and bonuses, and consideration of all stakeholders.

Corporate Governance in respect of Financial Institutions

Table 5: Overall Measures of Corporate Governance in respect of Financial Institutions

Measure	Commercial Bank & Specialized Bank	Finance & Leasing Company	Insurance Company
Mean	4.020	3.945	4.072

Standard Deviation	0.435	0.542	0.279
Coefficient of Variation	0.108	0.137	0.069
Minimum	2.57	2.30	3.34
Maximum	4.75	4.90	4.49
Number of Observation	45	43	27

According to table 5, Mean value of Corporate Governance is highest in Insurance Companies (Mean = 4.072) rather that Commercial Banks, Specialized Banks and Finance & Leasing Companies. It can be derived that Insurance Companies have highly Corporate Governing Financial Institution in Batticaloa.

Corporate Governance and its Dimensions

Table 6: Overall Measures of Organizational Performance and its Dimensions

Description	**Dimensions**			**Dependent Variable**
	CSA (X_5)	**EC (X_6)**	**CR (X_7)**	**Organizational Performance**
Mean	4.397	4.316	4.241	4.3178
Standard Deviation	0.476	0.453	0.486	0.408
Coefficient of Variance	0.108	0.105	0.115	0.095
Maximum	5.00	4.83	5.00	4.88
Minimum	2.40	2.33	2.67	2.64
Number of data	115	115	115	115

In this table, CSA = Customer Satisfaction, EC = Employee Commitment, CR = Corporate Reputation

This dependent variable as organizational performance includes three dimensions which are customer satisfaction, employee commitment, and corporate reputation. These dimensions show high level in the Organizational Performance. They have the mean values of 4.397, 4.316 and 4.241 respectively. In addition, most of the respondents have expressed the common opinion toward the dimensions of Corporate Governance (Standard Deviations are 0.476, 0.453 and 0.486 respectively.

Among 115 Customer respondents, Customer Satisfaction was most significant (Mean = 4.397) to Organizational Performance rather than other dimensions. Next, Employee Commitment was most significant (Mean = 4.316) to Organizational Performance rather than Corporate Reputation dimension.

Organizational Performance's Dimensions in respect of Financial Institutions

Table 7: Overall Measures of Organizational Performance Dimensions in respect of Financial Institutions

Measure	**Commercial Bank & Specialized Bank**			**Finance & Leasing Company**			**Insurance Company**		
	CSA	**EC**	**CR**	**CSA**	**EC**	**CR**	**CSA**	**EC**	**CR**
Mean	4.31	4.22	4.13	4.50	4.47	4.35	4.39	4.22	4.26
SD	0.52	0.55	0.52	0.39	0.28	0.47	0.52	0.45	0.42

CV	0.12	0.13	0.13	0.09	0.06	0.11	0.12	0.11	0.10
Minimum	2.60	2.33	2.67	2.80	3.50	3.00	2.40	3.00	3.33
Maximum	4.80	4.83	4.83	5.00	4.83	5.00	5.00	4.67	5.00
N	45	45	45	43	43	43	27	27	27

Where CSA = Customer Satisfaction, EC = Employee Commitment, CR = Corporate Reputation, SD = Standard Deviation, CV = Coefficient of Variable, N = Number of observation

According to table 7, Mean value of Customer Satisfaction is highest level in Finance & Leasing Companies rather than other companies (Mean = 4.50). It shows that these companies are more concentrated on customer commitment, customer loyalty. Mean value of Employee Commitment is highest level in Finance & Leasing Companies rather than other companies (Mean = 4.47). It shows that that these companies are more concentrated on affective commitment, continuance commitment, and normative commitment. Mean value of Corporate Reputation is highest level in Finance & Leasing Companies rather than other companies (Mean = 4.35). It shows that that these companies are more concentrated on financial aspects, social aspects, and environmental aspects.

Organizational Performance in respect of Financial Institutions

Table 8: Overall Measures of Organizational Performance in respect of Financial Institutions

Measure	Commercial Bank & Specialized Bank	Finance & Leasing Company	Insurance Company
Mean	4.218	4.440	4.289
Standard Deviation	0.460	0.315	0.411
Coefficient of Variation	0.109	0.071	0.096
Minimum	2.64	3.10	2.91
Maximum	4.71	4.88	4.82
Number of Observation	45	43	27

According to table 8, Mean value of Organizational Performance is highest in Finance & Leasing Companies (Mean = 4.44) rather that Commercial Banks, Specialized Banks and Insurance Companies. It can be derived that Finance & Leasing Companies have highly performing Financial Institution in Batticaloa.

Relationship between corporate governance and organizational performance

Table 9: Correlation Analysis: Pearson Correlation

	BS	CGM	CS	CC	CSA	EC	CR	CG	OP
BS	1.000								
CGM	-0.122	1.000							
CS	-0.343**	0.452**	1.000						

CC	-0.316**	0.416**	0.702**	1.000					
CSA	-0.055**	0.570**	0.479**	0.282**	1.000				
EC	-0.173**	0.434**	0.616**	0.329**	0.649**	1.000			
CR	-0.216**	0.361**	0.471**	0.535**	0.575**	0.646**	1.000		
CG	-0.708**	0.598**	0.793**	0.787**	0.412**	0.464**	0.498**	1.000	
OP	-0.171	0.526**	0.601**	0.444**	0.857**	0.879**	0.860**	0.530**	1.000

** Correlation is significant at the 0.01 level (2-tailed)

Results show that there is weak negative relationship between Board Size and Organizational Performance ($r = -0.171$, $p > 0.01$) but it is not significant, strong positive relationship between Corporate Governance Mechanism and Organizational Performance ($r = 0.526$, $p < 0.01$), strong positive relationship between Communication Strategies and Organizational Performance ($r = 0.601$, $p < 0.01$), moderate positive relationship between Code of Conduct Organizational Performance ($r = 0.444$, $p < 0.01$). Among the Corporate Governance dimensions, Communication Strategies has highest significant positive relationship with Organizational Performance, compared with other dimensions.

According to the table, there is a strong positive relationship between Corporate Governance and Organizational Performance ($r = 0.530$, $p < 0.01$).

Impact of corporate governance on organizational performance

It analyses the influence of Corporate Governance on Organizational Performance. In order to figure out which are important determinants of Organizational Performance consequently in order to assess the relative importance of each Corporate Governance on Organizational Performance, the multiple regression model was used.

Table 5.39 Influence of Corporate Governance on Organizational Performance

Independent Variables	**Regression Coefficients**
	Organizational Performance
Board Size	0.012
Corporate Governance Mechanism	0.277**
Communication Strategies	0.352**
Code of Conduct	-0.011
Constant	1.600**
Adjusted R Square	0.423
F-Statistics	21.895

** Significant at the 0.05 level ($p<0.05$)

According to the table, 27.7% of variation in Organizational Performance is explained by the dimension, Corporate Governance Mechanism. Likewise, 35.2% of variation in Organizational Performance is explained by the dimension, Communication Strategies. The above said two influences are significant at 5% significance level. The other two variables, Board Size and Code of Conduct

explain 1.2% and -0.11% variation in Organizational Performance respectively. But their relationship is not significant at 5% significance level.

Out of four determinant variables, Communication Strategies has more influence on Organizational Performance of Financial Institutions in Batticaloa.

While considering the overall impact of the model on Organizational Performance, F-Statistics value 21.895 with 5% significance level reveals that the model is significant. Furthermore, Adjusted R Square statistic is 0.423 which implies that 42.3% of change in Organizational Performance is explained by these four variables.

CONCLUSION AND RECOMMENDATION

This study has been conducted to find the impact of Corporate Governance on Organizational Performance of Financial institutions in Batticaloa district (Manmunai North Divisional Secretariat). It gives conclusion on Corporate Governance. The Financial Institutions are highly Corporate Governed organizations. It means that they succeed in using the Corporate Governance practices in their organization. They have more incorporated with Corporate Governance Mechanism and Communication Strategies at a high level to pursue Corporate Governance. According to the regression analysis, Communication Strategies has highest influence in Financial Institutions in Batticaloa district. It gives the transparency of companies' activities to the all the stakeholders of the companies and an effective communication with the stakeholders that ensures to understand their companies performance. Corporate Governance Mechanism also has highest influence in financial institutions in Batticaloa district. It helps to make a better decision and future planning for companies. However, the results of the study provide that board size and code of conduct have not significantly contributed to organizational performance. It can be suggested that board of directors have to concentrate on their roles to lead the organization successfully. Meanwhile, financial institutions have high level of organizational performance. Thus, these institutions have more concentrated on customer satisfaction and employee commitment. But financial institutions fail to concentrate on corporate reputation. Hence, they should focus on risk of investment and also future growth of companies. The Pearson correlation analysis exposed the strong positive relationship between Corporate Governance and Organizational Performance and also regression analysis confirmed the Corporate Governance influences the Organizational Performance. Simultaneously, it has been found that Corporate Governance impacts the Organizational Performance of Financial Institutions in Batticaloa district.

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Removal of copper and cadmium using industrial effluents in continuous column studies by mixed adsorbent

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Abstract- Continuous column study experiments were conducted for both copper and cadmium in packed bed column and the parameters such as effect of bed height (12, 24, 36cm) at fixed volumetric flow rate of 10 ml/min, and effect of volumetric flow rate (10, 20,30 ml/min) at fixed bed height of 36 cm were carried out and the breakthrough curves were plotted in terms of C_e/C_o vs time. The break through time at 12, 24, 36 cm and 10 ml/min for Cu (II) were 50, 90, and 150 min respectively. The saturation time for Cu (II) at 12, 24, 36cm and 10 ml/min were 420, 480, and 600 min respectively. Similarly the break through time for Cd (II) at 12, 24, 36 cm and 10 ml/min were 50, 60, and 90 min respectively. The saturation time for Cd (II) at 12, 24, 36 cm and 10 ml/min were 210-240, 330-360, and 390-420 min, respectively. The optimized breakthrough curves were obtained at 36 cm bed height and 10 ml/min for both the metals copper and cadmium.

Key words: Column study, copper, cadmium, packed bed column, Effect of bed height, Volumetric flow rate, breakthrough curves, saturation time.

1. Introduction

The contamination of water from various industries has become a serious problem to human and aquatic life and further failure to treat wastewaters has become a challenging task to avoid the environmental pollution. Producing clean drinking water to the next generation is a great concern and many industrial techniques such as electrochemical methods, reverse osmosis, adsorption, co-precipitation, evaporation, chemical coagulation/floatation, flocculation, cementation, heavy metal removal from biosurfacants, biosorption, ion exchange, chemical precipitation, chemical oxidation and reduction, ion exchange, filtration, electrochemical treatment, reverse osmosis (membrane technologies), evaporative recovery and solvent extraction have been adopted for the wastewater treatment [1-3].

In the environment, the heavy metals are generally more persistent and toxic than organic contaminants such as chemicals released from pesticides, fertilizers and petroleum by products, etc. Heavy metal harm was because of drinking water through tainting (ex. lead channels, mechanical and industrial waste) and passes through the way of life through food chain or high ambient air conditions near emission sources. Heavy metals are of special concern because they are non-degradable and thus persistent. Heavy metals have harmful effect on the human body, physiological and other biological systems when they exceed the tolerance levels [4]. Exposure to

these metals can cause liver diseases, brain damage, and kidneys failure and even to death ultimately. Besides chronic exposure to these contaminants present even at low concentrations in the environment also proved to be harmful to the human health and due to the above reasons the heavy metals must be removed from industrial effluents [5].

These classical or conventional techniques give rise to several problems such as unpredictable metal ions removal and generation of toxic sludge which are often difficult to de-water (remove the contaminants) and require extreme caution in their disposal. Besides that, most of these methods also have some limitations whereby they are economically viable at high or moderate concentrations of metals but not at low concentrations (1 to 100 mg/l) of dissolved metals. Heavy metals removed by classical techniques involve expensive methodologies. These are due to high energy and frequent reagent requirements. Comparing with conventional methodologies, generally the adsorption and bio sorption of heavy metals is a very cheap, eco-friendly and efficient methodology for the removal of heavy metals from industrial waste water [5-7].

Adsorption refers to the selective collection and concentration of a particular type of molecules contained in a fluid phase onto a solid surface. The molecules of the adsorbate come from the fluid phase into the interface, where they remain for a period of time. In a reversible process, the molecules go back to the phase from which they came or reversibly pass into another phase while other molecules replace them at the interface. On reaching the solid surface the adsorbed molecules exchange energy with structural atoms of the surface and if sufficient time was there for adsorption, the adsorbed molecules and the surface atoms reach thermal equilibrium and at equilibrium, the number of molecules arriving at the interface in a given time is equal to the number of molecules leaving the interface to go into the fluid phase [8-9].

2. Materials and Methodology

The methods of adsorbent preparation, physical characterization and continuous column study procedure along with the design have been explained in this section.

2.1 Mixed adsorbent preparation

The mixed adsorbent was prepared by mixing activated charcoal (AC) and bone charcoal (BC), in 1:1 ratio and particle size analysis (Malvern, Malvern Instruments Ltd, United Kingdom) was carried out in particle size analyzer to determine the particle size of the mixed adsorbent. The average particle size of the mixed adsorbent was reported to be as 572.2 nm. The surface area of the mixed adsorbent was found to be 951 m^2/g.

2.2 Continuous column flow studies

Persistent column flow operation analyses were conducted in a cylindrical round and hollow plastic cylinder (4 cm internal diameter and 100 cm height) as shown in the **Fig 1.** A 20 mesh size stainless sieve was attached to the bottom of the column. A known quantity of the mixed adsorbent in 1:1 ratio was added in the column from top to yield the desired bed weight of 50 g, 100 g, and 150 g, respectively. Cu (II) & Cd (II) effluent solutions of known concentration (100 mg/l) were pumped into the column from the bottom using a 40 W submersible pump at the desired flow rates of (10, 20, 30 ml/min) respectively. Samples were collected from the exit of

the column at different bed heights at different intervals of time until the equilibrium was attained and the residual metal ion concentration (MIC) were analyzed using AAS (Atomic Absorption Spectrophotometer) (Make –Thermo Scientific). The parameters that were studied in the continuous flow operations involve the study of breakthrough curves with respect to weight of the adsorbent, volumetric flow rates, initial metal ion concentration. The parameters that were involved in the column design are

- Weight of the mixed adsorbent added into the column from the top 50 g, 100 g, and 150 g
- Inner Diameter of the column 4 cm
- Total height of the column = 100 cm
- Mixed adsorbent ratio = 1:1 (AC+ BC)
- Submersible pump for sending effluent from bottom to top (into the column) = 40 Watt.
- Initial concentration of the metal ions Cu and Cd (C_o = 100 ppm)
- Effect of volumetric flow rates (10, 20, 30 ml/min)

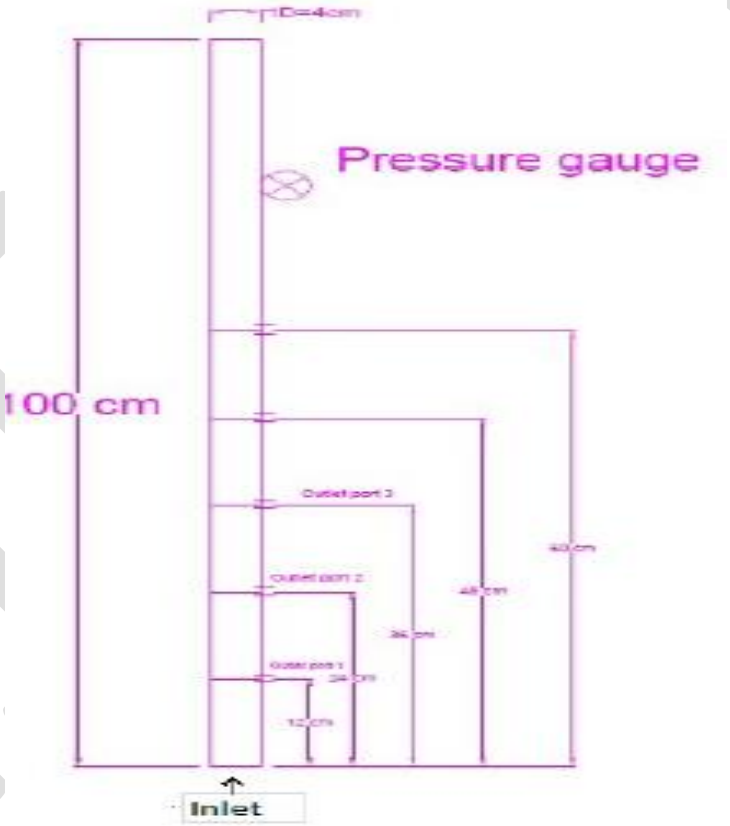

Fig 1: Experimental set up of the packed bed column

3. Results & Discussion

3.1 Continuous column studies for the removal of copper and cadmium using industrial effluents

Continuous column study experiments were conducted for both copper and cadmium in packed bed column and the parameters such as effect of bed height (12, 24, 36 cm) at fixed volumetric flow rate of 10 ml/min, and effect of volumetric flow rate (10, 20, 30 ml/min) at fixed bed height of 36cm are carried out and the breakthrough curves were plotted in terms of C_e/C_o vs time.

3.1.1 Effect of bed height / adsorbent dosage for Cu (II) and Cd (II) removal from industrial effluent

It is observed that the adsorption of metal ion in the packed bed column is directly proportionally to the quantity of adsorbent in the column. The blended adsorbent (1:1 ratio) of 50 g, 100 g, and 150 g are taken in a column and experiments were carried out to investigate the parameters required to evaluate the efficiencies of column in adsorption process. The adsorption breakthrough curves are obtained by changing the bed height from 12, 24 and 36 cm at fixed volumetric flow rate of 10 ml/min. Faster breakthrough curves were obtained for a bed height of 12 cm, while the slowest breakthrough curve was observed at a bed height of 36 cm. Higher the absorbent packed in the column, more the active sites that are accessible for the metal particles to attach and diffuse deep on to the pores as well as on to the surface of the mixed adsorbent [10] which leads to the achievement of higher bed capacity. Further, when the flow rate is less, the metal ion solution has more contact time to run in the column and the increment of bed height brought more active sites that were being in contact with the metal ions to interact and bind with the adsorbent [11]. This phenomenon has permitted the metal particles to diffuse deeper into the active sites of the mixed adsorbent. Subsequently, the percentage of metal ion removal increased when the bed height was increased. Both the breakthrough time and saturation time increased for Cu (II) with the increase of bed height from 12 cm to 36 cm. The break through time at 12, 24, 36 cm and 10 ml/min for Cu (II) were 50, 90, and 150 min respectively. The saturation time for Cu (II) at 12, 24, 36cm and 10 ml/min were 420, 480, and 600 min respectively. It can be observed from **Figs. 2 and 3** that the optimized break through curve were obtained at 36 cm bed height and 10 ml/min and further predicts that 36 cm bed height was taken as an optimized value and further experiments were carried out at 20 ml/min, 30 ml/min with the same bed height of 36cm to study the effect of volumetric flow rate on Cu (II) and Cd (II) metal ions removal using packed bed column. Similarly the break through time for Cd (II) at 12, 24, 36 cm and 10 ml/min were 50, 60, and 90 min respectively. The saturation time for Cd (II) at 12, 24, 36 cm and 10 ml/min were 210-240, 330-360, and 390-420 min, respectively.

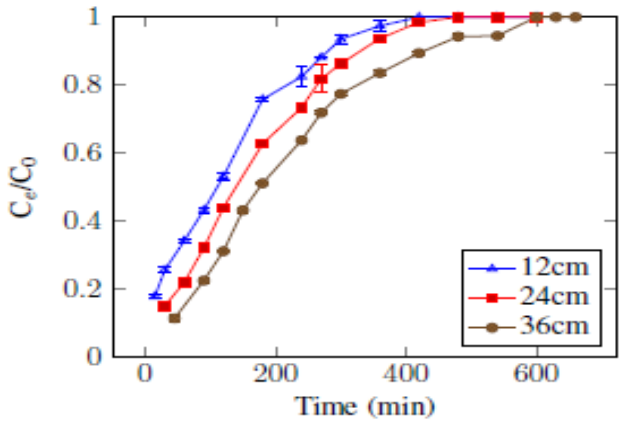

Figure 2 Breakthrough curves for copper at 10 ml/min flow rate, IMC of 100 ppm at different bed heights of 12, 24 and 36 cm

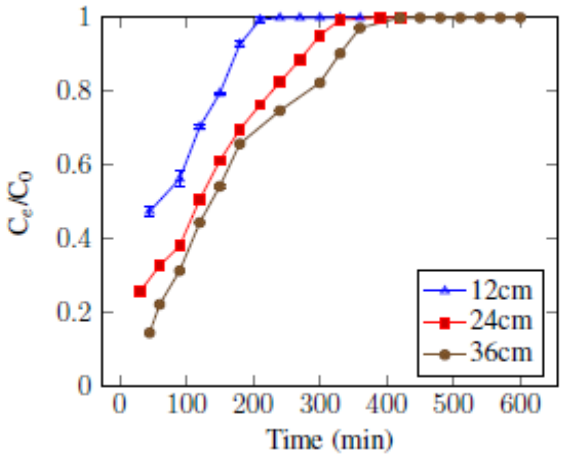

Fig 3 Breakthrough curves for cadmium at 10ml/min flow rate, IMC of 100 ppm at different bed heights of 12, 24 and 36 cm

3.1.2 Effect of volumetric flow rate on removal of Cu (II) and Cd (II) from industrial effluent

The effect of flow rate on Cu (II) and Cd (II) ions from industrial effluent by using the mixed adsorbent was investigated by varying the flow rate of the metal ion solution from 10, 20 and 30 ml/min while maintaining the fixed initial metal ion concentration of 100 mg/l and bed height at 36 cm (150 g) respectively. A graph of metal ion concentration ratio on y-axis vs effluent outlet time / sampling time on x-axis at different flow rates was plotted. The quicker breakthrough was observed for the highest flow rate of 30 ml/min, with a bed height of 36 cm due to less contact time between the metal ion particle and the mixed adsorbent. When the volumetric flow rate increased, there was less contact time between the metal ion and the adsorbent which leads to the decrease of bed capacity. But at lower flow rates of metal ion solution, the contact time between the metal ions and the adsorbent were more [11] which results in a slower breakthrough curve. Conversely at the higher flow rates the metal ion solution will leave the bed before its attainment of equilibrium. This will result in reduced amount of metal ion concentration being adsorbed from the industrial effluent. The break through time and saturation time for Cu (II) at 36 cm (150 g) with different flow rates of 10, 20, 30 were 45 and 600 min; 30 and 480 min; 15 and 360 min, respectively were observed in this experimental study. Similarly the break through time and saturation time for Cd (II) at 36 cm (150 g) with different flow rates of 10, 20, 30 ml/min were 90 and 390-420 min; 60 and 240-270 min; 30 and 210-240 min, respectively were observed. In the continuous column experiments, the breakthrough point shifted towards the right side for both Cu (II) and Cd (II) when the adsorbent dosage was increased from 50 to 150 g at a fixed initial metal ion concentration of 100 ppm. It was observed from the **Figs. 4 and 5** that the optimized break through curve were obtained at 36 cm and 10 ml/min for both Cu (II) and Cd (II). A longer breakthrough time implies better adsorption capacity which means that it would take a longer time for the adsorbent material to completely get saturated with the adsorbate solution.

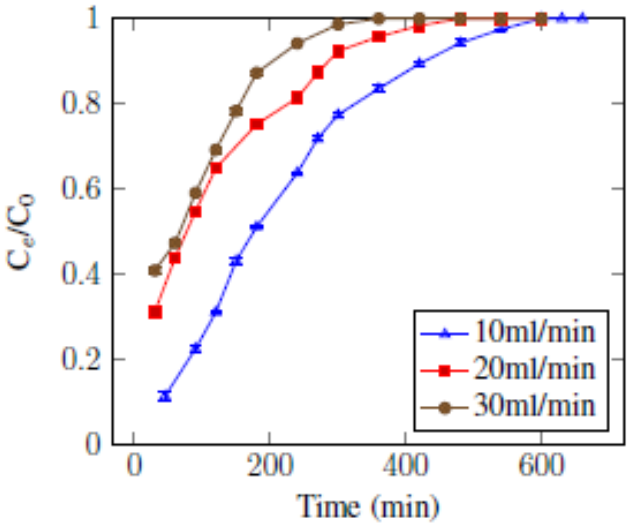

Fig 4 Breakthrough curves of copper at 36cm BH, IMC of 100 ppm at different flow rates of 10ml/min, 20ml/min, and 30 ml/min

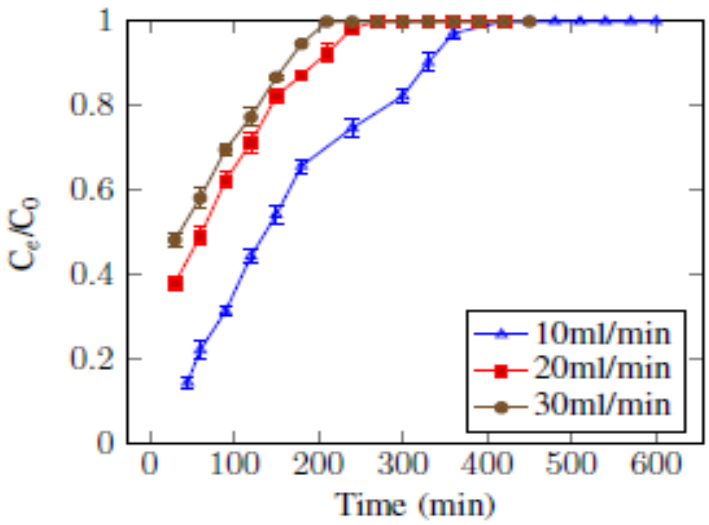

Fig 5 Breakthrough curves of cadmium at 36cm BH, IMC of 100 ppm at different flow rates of 10ml/min, 20ml/min, and 30 ml/min

4. Conclusions

Continuous column study experiments were conducted for both copper and cadmium in packed bed column and the parameters such as effect of bed height (12, 24, 36cm) at fixed volumetric flow rate of 10 ml/min, and effect of volumetric flow rate (10, 20, 30 ml/min) at fixed bed height of 36cm are carried out and the breakthrough curves were plotted in terms of C_e/C_o vs time. The break through time for Cd (II) at 12, 24, 36 cm and 10 ml/min were 50, 60, and 90 min respectively. The saturation time for Cd (II) at 12, 24, 36 cm and 10 ml/min were 210-240, 330-360, and 390-420 min, respectively. The break through time and saturation time for Cu (II) at 36 cm (150 g) with different flow rates of 10, 20, 30 were 45 and 600 min; 30 and 480 min; 15 and 360 min, respectively were

observed in this experimental study. Similarly the break through time and saturation time for Cd (II) at 36 cm (150 g) with different flow rates of 10, 20, 30 ml/min were 90 and 390-420 min; 60 and 240-270 min; 30 and 210-240 min, respectively were observed. The optimized breakthrough curves were obtained at 36 cm bed height and 10 ml/min for both the metals copper and cadmium.

Conflict of Interests The authors declare that they have no conflict of interests.

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A review on gas sensors for environment monitoring using electronic sensors for detecting pollution due to solid waste gases

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Abstract— The main aim of this research work is to detect the butane, carbon monoxide, methane, ethane, LPG and other organic gases from the solid waste and do environment monitoring. Here the set of sensors used to detect the pollutant gases from solid waste. Green and pollution free environment across the globe is very much required for the health of the nature. The different kinds of pollutions are affecting the quality of the environment around us. This review paper is mainly dealing with environment monitoring of organic gases which is a very sensitive issue in the world and is directly affecting the human health and disturbs the biological balance of earth. Here our aim is to develop a sensor array system which will detect maximum pollutant gases and which is highly responsive, accurate and low cost and low power consuming. Here we use the parallel factor analysis technic (PARAFAC) for detection of gases and compare it with the principal component analysis (PCA).

Keywords— Electronic aroma detector, E-nose device, Multi sensor array, sensors; classification; discrimination; quantification; odor concentration.

INTRODUCTION

The electronic nose is a device that detects the smell more effectively then the human sense of smell. An electronic nose consists of a mechanism for chemical detection. The electronic nose is an intelligent sensing device that uses an array of gas sensors which are overlapping selectively along with a pattern reorganization component. Now a day the electronic noses have provided external benefits to a verity of commercial industries, agriculture, biomedical, cosmetics, environmental, food, water and various scientific research fields. The electronic nose detects the hazardous or poisonous gas which is not possible to human sniffers. An electronic nose is an instrument comprising an array of electronic chemical sensors with partial specificity, and an appropriate pattern recognition system that is capable of recognizing both simple and complex odors. The smells are composed of molecules, which has a specific size and shape. Each of these molecules has a corresponding sized and shaped receptor in the human nose. When a specific receptor receives a molecule it sends a signal to the brain and brain identifies the smell associated with the particular molecule. The electronic noses work in a similar manner of human. The electronic nose uses sensors as the receptor. When a specific sensor receives the molecules, it transmits the signal to a program for processing, rather than to the brain. Electronic noses have been used in a variety of commercial agricultural-related industries, including the agricultural sectors of agronomy, biochemical processing, botany, cell culture, plant cultivar selections[1]. Pollution is the introduction of impurity into the environment that causes some change in the environment around us. Pollution can take the form of chemical substances such as solid particles, liquid droplets, or gas [2] and energy such as noise, heat, light. Air pollution comes from both natural and human-made sources. An air pollutant is a substance in the air that can have adverse effects on humans and the ecological community in the world. So there is increasing demand for detection and monitoring of greenhouse gases because of rise in polluted gases [3]. But in this paper our objective is to deal with the organic gases those are produced by the solid waste and we will concentrate on Indoor air pollution because it is major environmental risk to health [4]. So proposed system meets all the requirements for pollution monitoring. It measures and records concentration of different polluted gases such as CO, CO2, LPG. the greatest difficulties have been encountered in field applications as the most commonly-used sensors are sensitive to variations in atmospheric conditions[5,6]. The electronic nose purpose is to continuous monitoring of the material emission and validation of the correlation between the electronic nose responses and odor intensity. Quality control (QC) of the aroma characteristics of Manufactured products is of paramount importance because product consistency is essential for Maintaining consumer brand recognition and satisfaction [8].

ELECTRONIC NOSE WORKING PRINCIPLE

The electronic nose was developed in order to mimic human olfaction whose functions are non-separate mechanism, i.e. the smell or flavor is perceived as a global finger print. Essentially the instrument consists of sensor array, pattern reorganization modules, and headspace sampling, to generate signal pattern that are used for characterizing smells. One of the first studies to evaluate the possibility of using an electronic nose to identify specific environmentally-relevant compounds was carried out in 1995 by Hodgins [7]. The electronic nose consists of three major parts which are detecting system, computing system, sample delivery system.

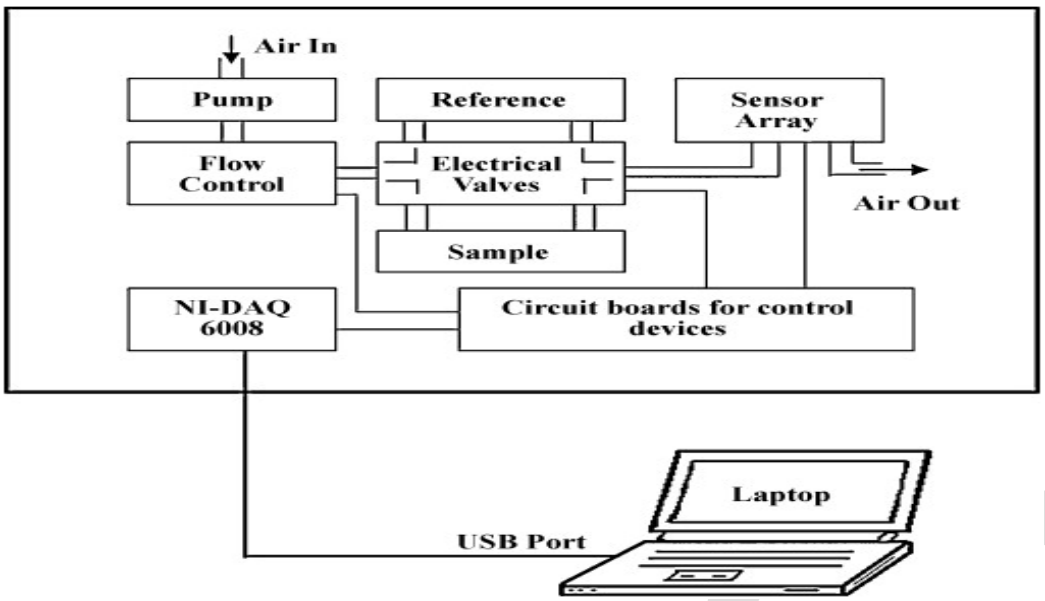

Figure.1: *Electronic nose block diagram*

METAL OXIDE SEMICONDUCTOR SENSOR

This is used for switching or amplifying electronic signals. The Working principle of MOSFET is that molecules entering into the sensor area will be charged positively or negatively which have directly effect on the electric field inside MOSFET. Sensors used in electronic noses convert gases into digital signals by using ions, molecules, atoms or fluids [9].

Metal Oxide sensors: (MOS) This sensor is based on adsorption of gas molecules to provoke change in conductivity. This conductivity change is the measure of the amount of volatile organic compounds adsorbed.

DATA ANALYSIS FOR ELECTRONIC NOSE

The digital output generated by electronic nose sensors has to be analyzed and interpreted in order to provide. There are three main types of commercially available techniques.

- Graphical analysis-
- Multivariate data analysis
- Network analysis

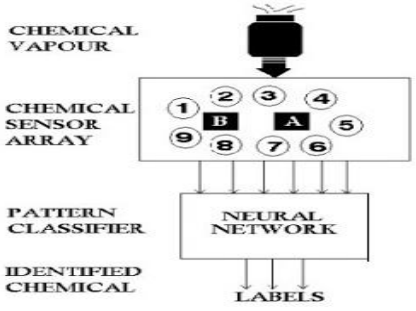

Figure.2: *Data analysis for Electronic nose*

The simplest form of a data reduction is a graphical analysis useful for comparing samples or comparing smells identification elements of unknown analysts relative to those of known sources in reference libraries. The multivariate data analysis generates a set of techniques for the analysis of data that is trained or untrained technique. The untrained techniques are used when a data base of known samples has not been built previously. In a study which used this electronic nose, classification of pears was made and the quality was determined according to their collection dates [10]. They applied regression algorithms on electronic nose data and obtained successful results [11]. Zhang also mentioned about zNose in a study that determine quality of food [12].

The PCA is a most useful when no known sample is available. The neural network is the best known and most derived analysis techniques utilized in a statistical software packages for commercially available electronic nose. The proposed electronic nose system was tested with the smells of three fruits namely, leman, banana, litchi. The smells were prepared by placing a sample of fruits in the breakers sealed with a cover. The 8051 was set in to testing or training mode. If the system is in training mode, sensor value is shown

on the LCD. If the system is in testing mode, classification result of the target fruit is shown on the LCD. The sensor array gets the gas through Valve1, which is normally closed. The vacuum pump is turned on for 20 sec to pump the gas out of the sensor array.

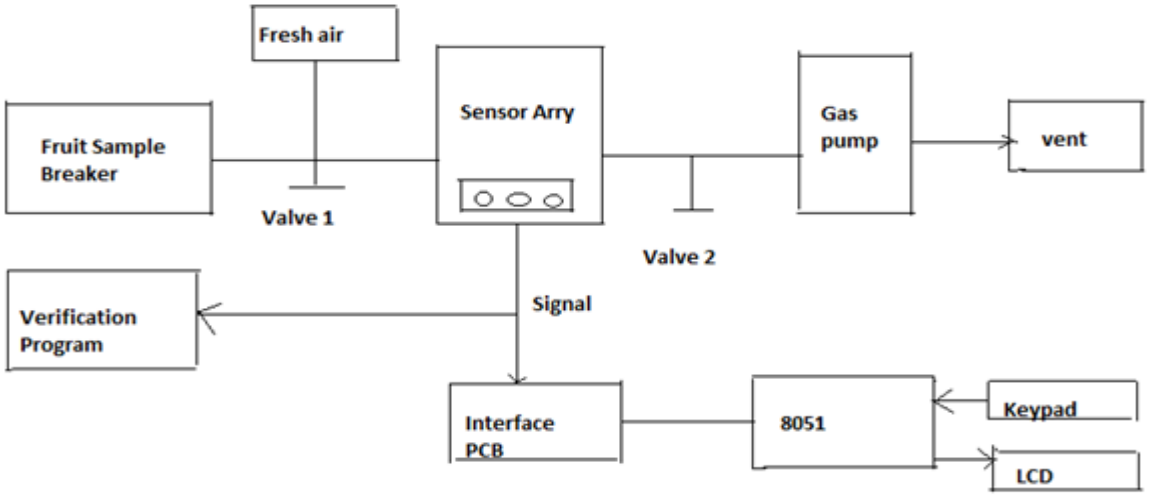

Figure. 3: *Gas testing setup for the proposed E-Nose system*

The value1 was closed and the sensor resistance was given 60 sec to reach a study state mode. The classification result of sensors characteristic value appeared on the LCD. The sensor array chamber was disconnected from the fruit sample breaker and the valve1 was opened to turn fresh air, the valve 2 was opened so that the smells were pumped out. The chamber was aired out with fresh air for two minutes.

APPLICATION OF ELECTRONIC NOSE

- Medical diagnostics and health monitoring
- Environmental monitoring
- Application in food industry
- Detection of explosive
- Space applications (NASA)
- Research and development industries
- Quality control laboratories
- The process and production department
- Detection of drug smells
- Detection of harmful bacteria

CLASSIFICATION OF SENSOR

SNO	SENSOR TYPE	GASES	POWER CONSU -MPTION	RELIA -BILITY	SENSITIVITY (CHANGE IN RATIO OF RESISTANCE RS/RO)	COMMENT
1	TGS 822	Detection of organic solvent vapors(ethanol, Methane ,co)	660mW	High stability and reliability over a long period.	Rs(Ethanol at 300ppm/air) /Rs(Ethanol at 50ppm/air)= (0.4-0.6)	It uses simple electric circuit and it has many applications like Breath alcohol detectors, Gas leak detectors/alarms, Solvent detectors for factories, dry cleaners, and semiconductor.

2	TGS2600	Iso-butane, hydrogen, Methane,co, Ethanol.	210mW	Good reliability	Rs(100 ppm of H2)/Ro(air) (0.3-0.6)	The sensor can detect hydrogen at a level of several ppm.Its application Air cleaners, Ventilation control, Air qualitymonitors
3	TGS2611	Methane	305mW	Good reliability	Rs(9000ppm)/ Ro(3000ppm) (0.54-0.66)	It is semiconductor type gas sensor which combines high sensitivity to methane gas with low power consumption and long life.
4	TGS2620	Iso-butane, co, H2,methane.	210mW	Good reliability	Rs(300ppm ethanol)/Rs (50ppm ethanol) (0.3-0.5)	High selectivity to volatile organic vapors. Solvent detectors for factories, dry cleaners, and semiconductor industries.
5	TGS825	H2S	660mW	Good reliability	Rs(H2S at 50ppm)/Rs (H2S at 10ppm) (0.30-0.45)	High sensitivity to low concentration of hydrogen sulfide.Hydrogen sulfide detectors/ Alarms.
6	TGS6810	Methane, LPG	525mW	Good reliability	(5-14)mv at 5000ppm	It has been developed for residential gas detection. And Residential LNG and LPG alarms. Detectors for LNG and LPG.
7	TGS2602	Ammonia,H2S, Hydrogen, Ethanol	280mW	Good reliability	(0.15-0.5) Rs(12ppmof EtOH)/Rs(air)	It is use to detection of air contaminants and application are Air cleaners, Ventilation control, Air quality monitors, VOC monitors, Odor monitors.
8	MICS5135	CO, Hydrocarbon	120mW	Good reliability	(1.5-2.2) Rs(at 60ppm of CO)/Rs(100 ppm of CO)	It has some important features Fast thermal response, High resistance to shocks and vibrations.
9	MICS5521	Hydrocarbon, CO	88mW	Good reliability	(1.8-3) Rs(60ppm of co)/Rs(200ppm of co)	Its features are short pre-heating time. Miniature dimension, Wide

						detection range.
10	TGS3821	Alcohol tester,H2,CO	163mW	Good reliability	(0.4-0.67) Rs(150ppm Etoh)/Rs(50ppm Etoh)	It is very high sensitive to alchol and quick response.

ODOR CLASSIFICATION

As far as the use of electronic noses for odor classification is concerned, one of the first studies that involved the use of an electronic nose in the environmental field to assign the analyzed odor samples to a specific olfactory class was reported by Nicolas et al., in 2000. After having trained the instrument with samples coming from industrial sites on different days, and with different climatic conditions, the authors have used the electronic nose in the field in order both to detect the presence of odors and to classify them, thereby using the olfactory classes identified during the training phase. Even though the instrument turned out to be able to distinguish between the different types of odors, the authors have highlighted the influence of the atmospheric conditions on the sensor responses and thus the necessity to carry out repeated training over time in order to reduce the problem of sensor drift. The study involved the use of two electronic noses, equipped with MOS sensors, which were moved at regular time intervals to six different positions inside the poultry house. The sensor response data were analyzed by PCA in order to visualize the clustering of the measurements. Principle Component Analysis (PCA)[13]. The analysis highlighted how the measures relevant to a given position inside the poultry house are located close to each other in the two-dimensional space of the PCA, thus producing data clustering depending on the sampling point. Then data were analyzed using an ANN to predict odor concentration, by discriminating samples between high, medium or low concentration levels. The obtained results are promising, as the instrument was able to predict odor concentrations that turned out to be coherent with those measured at the different sampling points. Field-recorded data is essential for achieving effective field calibration methodologies with synthetic pollution-mixture standards using sensor-fusion algorithms that are properly tuned via supervised training [14, 15].

PARALLEL FACTOR ANALYSIS (PARAFAC)

The sample component of aroma is obtained by applying PARAFAC. PARAFAC (Parallel factor analysis) is a generalization of PCA (Principle component analysis) to higher order arrays, but some of the characteristics of the method are quite different from the ordinary such as there is no rotation problem in PARAFAC, and e.g., pure spectra can be recovered from multi-way spectral data. Parallel Factor Analysis (PARAFAC)is a method to decompose multi-dimensional arrays in order to focus on the features of interest, and provides a distinct illustration of the results. We applied PARAFAC to analyze spatio-temporal patterns in the functional connectivity between neurons, as revealed in their spike trains recorded in cat primary visual cortex. During these recordings we reversibly deactivated feedback connections from higher visual areas in the pMS (posterior middle suprasylvian) cortex in order to study the impact of these top-down signals. Cross correlation was computed for every possible pair of the 16 electrodes in the electrode array. PARAFAC was then used to reveal the effects of time, stimulus, and deactivation condition on the correlation patterns. Our results show that PARAFAC is able to reliably extract changes in correlation strength for different experimental conditions and display the relevant features. Thus, PARAFAC proves to be well-suited for the use in the context of electrophysiological (action potential) recordings.

Here, we applied PARAFAC to three-dimensional arrays. A three-dimensional array can be simply viewed as a set of two-dimensional matrices of the same size. An example for a two-dimensional data array could be some measured variable, say the concentration of ozone (O_3) in the air, at different times of the day in different geographical locations. Two-way arrays of this kind are often decomposed using (bilinear) Principal Component Analysis (PCA). Imagine you are now interested in the ozone concentration not only at certain times and geographical coordinates, but also at different altitudes. The measurements now become dependent on three variables, and your array three-dimensional. PCA cannot be applied to three-dimensional structures as it is inherently bilinear. If unfolded, the array can be subjected to PCA, but loses its true three-dimensional structure. PARAFAC is able to work directly on the three-dimensional array and thus capture its true composition. An alternative to PARAFAC can be provided by the Tucker3 algorithm, which is essentially a more flexible version of PARAFAC.

RESULT AND DISCUSSION

Above we have given the different sensors and their characteristics. We have made the code for the data of sensors those are available with good qualities. The snapshot of algorithm and other graphs those have been taken from the sensors are given below. The e-nose used is this experiment contains an array of six different MOX gas sensors whose readings are recorded to obtain an odor fingerprint

of the odor. These sensors are Figaro TGS-2600, TGS-2602, TGS-2611 and TGS-2620, and e2v MICS-5135 and MICS-5521. By using these sensors work we will give the graph for gas acetone and ethanol[16].

[0-20]sec: Initially the odor container was kept closed and separated from the e-nose aspiration tube for the first 20 seconds, allowing the measurement of the baseline level (sensor's response in absence of the target gas) for each sensor.

[20-30]sec: After that time, the bottle was opened and left unattended for another 10 seconds, allowing the stabilization of the gas dispersion rate.

[30-90]sec: At second 30, the e-nose aspiration was brought near the bottle, at a distance of 10cm approximately over the bottle "mouth", allowing the e-nose to smell the gas and recording its readings for 60 seconds.

[90-X]sec: Finally, the e-nose aspiration was taken away and the bottle was closed to avoid contaminating the testing room in excess. Due to the long recovery time of MOS sensors, the e-nose was left to recover its baseline level for almost 10 min before starting a new run.

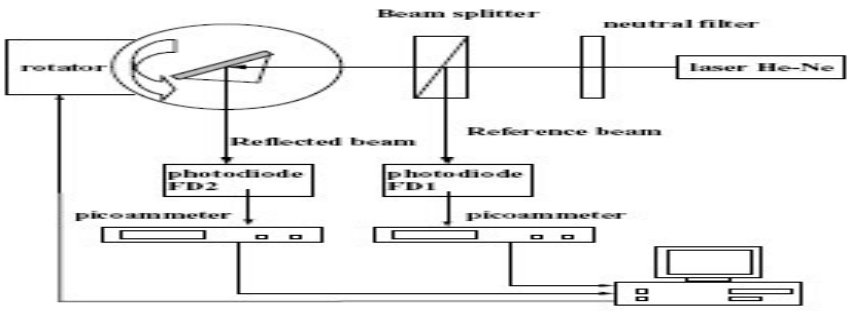

Figure.4:Gas sensing technologies Optical gas sensors

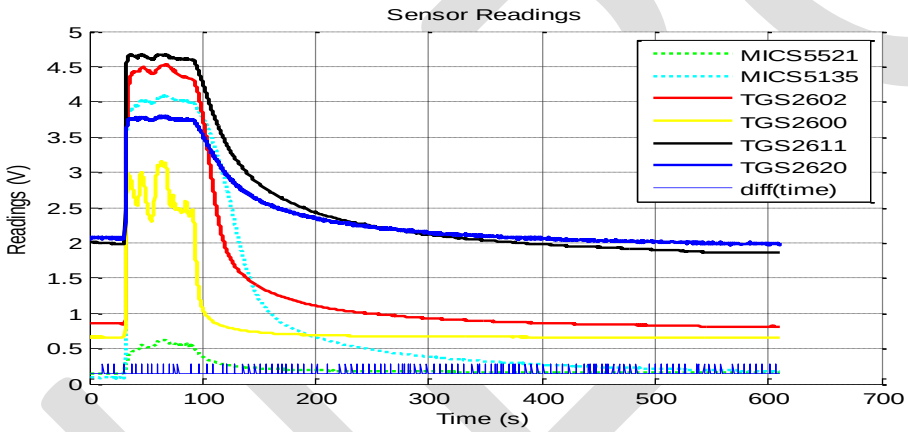

Figure.5: Different sensor graph for Acetone

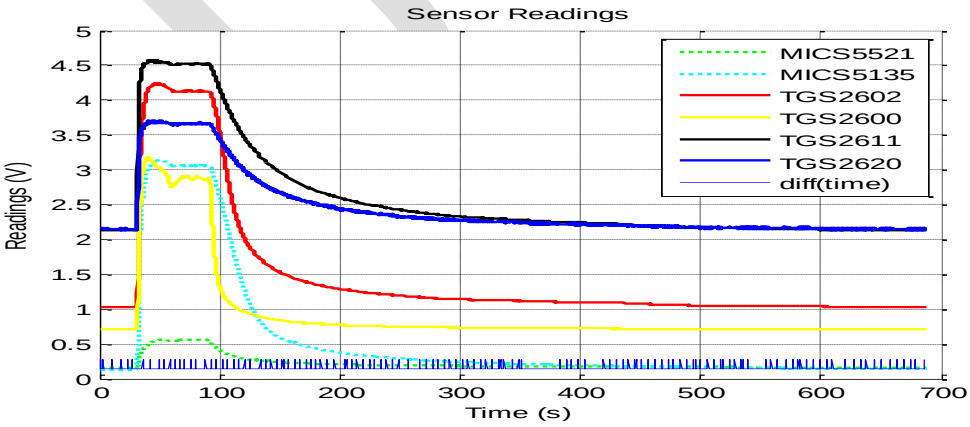

Figure.6: Different sensor graph for Ethanol

DATA STRUCTURE

The data structure of all the sensors in matlab programming.

Column 1 Time.
Column 2 Temperature (Not available)
Column 3 MICS 5521 readings.
Column 4 MICS 5135 readings.
Column 5 TGS 2602 readings.
Column 6 TGS 2600 readings.
Column 7 TGS 2611 readings.
Column 8 TGS 2620 readings.
Column 9 and following Not used

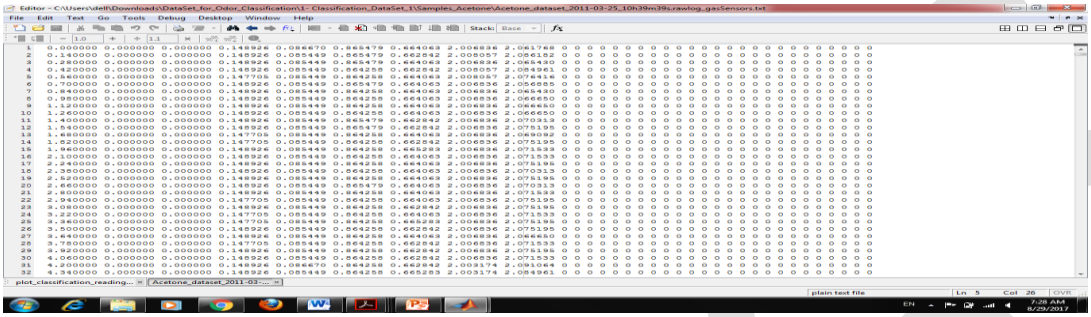

Figure.7: The data set after the programming of the sensors

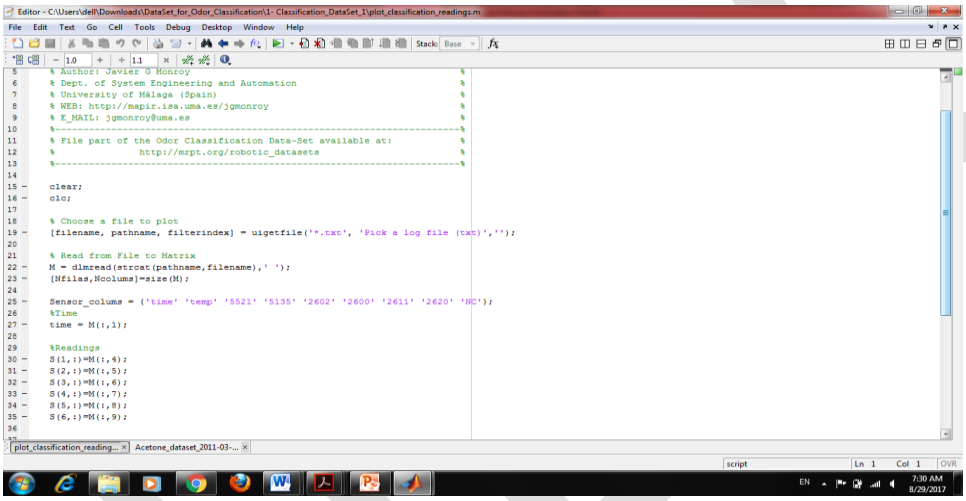

Figure.8: Programming for the sensors

FUTURE SCOPE

Future challenges regarding the use of electronic noses in the field of environmental monitoring shall presumably not be focused on the development of new sensors or data processing methods, but rather concentrate on the adjustment of the instrument for outdoor applications. In future, it would be extremely interesting to have electronic noses able to tolerate the variability that is typical of real environmental applications, as well as mobile electronic noses for field-inspection-like applications. This paper summary describes the different sensors and their uses in aroma detection. Further in future we produce these sensors in different places.

CONCLUSION

Electronic noses are an interesting and promising technology in the environmental field, both for odor impact assessment control application purposes. Once opportunely trained, electronic noses can be used successfully for both detecting and identifying odors, by attributing the analyzed air to an olfactory class corresponding to a specific odor source. With respect to other measurement methods involving the use of human assessors, instrumental analysis with electronic noses entails the great advantage of allowing the measurements to be run continuously, and at lower costs. The studies conducted in order to evaluate the possibility to use electronic noses in the environmental field have proved that said instruments are generally suitable for the different applications reported, if the instruments are specifically developed and fine-tuned. As a general rule, literature studies also discuss the critical aspects connected with the different possible uses, as well as research regarding the development of effective solutions for said problems. Regarding the sensors, several studies have highlighted the problem of stability towards temperature and humidity variations, as well as sensor response drift over time On the contrary, they require sophisticated and complex technology in order to produce accurate and reliable

results. Actually, there are several extremely simple devices commercially available, which are generically defined as "electronic noses", able for instance to detect gas leaks or evaluate single gas concentrations. It is important to highlight that such simple instruments are unsuitable for environmental monitoring purposes. Here we have conclude the all data related to sensors and the graphs those are valuable for the project.

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Survey on Self Balancing Two Wheel Electric Prototype

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Abstract— Two wheeler vehicles are the essential part of transportation, bicycle, bikes and other vehicles are everywhere and we can say that they are one of the important parts of human needs. The transportation vehicles that are made today haven't changed from many years, means they constantly needs a rider to ride it or to balance it. Balancing a two wheel vehicle is a hard task as compare to the four wheel vehicle (cars). There are lots of innovations ongoing in the field of transportation as cars become electric, smart and safe, but at same time they are expensive too and not everyone can afford it. In other hand two wheeler bikes are cheap and most efficient way of transportation but because of lack of innovation they still need rider(human) to balance it, which means motorcycle constantly need human balance and ride it. Apart from that any transportation vehicle needed lots of fossil fuel which after burned emits carbon and it is harmful for our environment and causes pollution. Also balancing a bike on two-wheel without human interaction can achieve with the help of principle of gyroscope. Gyroscope is use everywhere from balancing large ship to space shuttle, the application of gyroscope is vast. So in this paper we can understand the mechanism for constructing Inline two-wheel electric bike which can balance itself with the help of gyroscope and how we can made our transportation safer than ever and prevent accident, all by using the self balancing electric bike.

Keywords— Gyroscope, Accelerometer, Automatic Balancing Bike, Pollution, Transportation, Electric bike, Environment.

INTRODUCTION

The deployment of electric vehicles in vast quantity can viewed as a carbon free transportation sector. As because of pollution the environment is also getting weaker and hence the quality of life also affect dramatically. The majority of the carbon emission is due to the fossil fuel vehicles. There is so much innovation when it comes to the four or three wheeler market, as most of the cars are now electric and come with lots of different feature when it comes to the human safety. In the other hand because of lack of innovation in manufacturing of the two wheel motorcycle we are still lacking behind when it come to rider safety. The solution here is making a bike which can balance itself using the principle of gyroscope so that the rider not have to worry about falling because of lack of balance over the bike. The idea here is to make a bike which can balance itself without human interaction. As the bike is balance itself with the help of gyroscope and some other sensors, it is also safe for the people which have certain disability.

From the couple of decades human tries to balance a two wheel vehicles itself with the help of gyroscope or using the principle of inverted pendulum. In 1903, Louis Grennan was first to patent a gyroscopic balancing vehicle. The vehicle was monorail but the project fails because of unstable behavior of gyrostats. The most famous self balancing vehicle in the market right now is Segway which is good for short distance travel but it also need human interaction to balance it and apart from balancing Segway is not close to the traditional bike that we use today for transportation as it only carry one human at a time and for very short distance.

Our system will consist of gyroscope and accelerometer and some other sensors capable of measuring the current angle of the vehicle and adjusts the rotation of the gyroscope according to the balance of vehicle. It is simply a two wheeled vehicle which balance itself even in its initial position. This project attracts so much to the field of control engineering. This project almost cover the modelling of bike, research in the field of electronics for controlling the system, also researching about suitable control system for the vehicle and implementation of the bike. The aim of this project is to balance a bike on two wheels and control it with android phone for steering and moving. Using simple commands this prototype model of self balancing bike can move forward and backward according to user.

DESCRIPTION OF THE SYSTEM:-

Main components that are use in proposed system are mainly divided into following section:

- Gyroscope
- 3-axis Accelerometer
- PID controller for logic processing

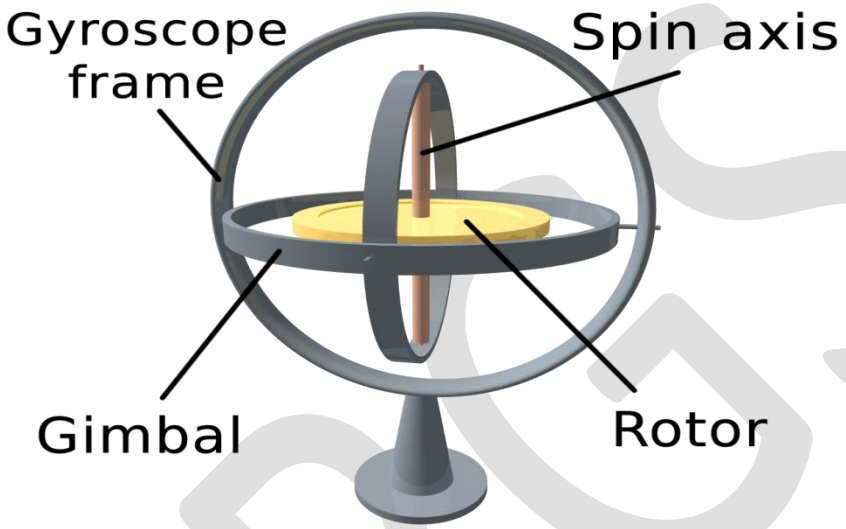

Figure 1: Gyroscope

Figure 1 shows a picture of gyroscope, there is wheel mounted on Gimbal there are three Gimble which support the rotation of the flywheel about a single axis. Accelerometer is use to measure acceleration force. PID controller is use to control the regulation of the speed.

LITERATURE REVIEW

The bike which can balance itself is very popular project in robotics and engineering. There is lot of work going on about balancing bike and some are already done and a lot of work still need to done. The following section is our literature review on this particular topic.

In 1903, an Irish-Australian inventor Louis Grennan was first to patent a gyroscopic balancing vehicle. Brennan patented a monorail which can gyroscopically balance, he designed it for military use, Louise Grennan successfully demonstrated the apparatus in 1909. He mounted gyrostats (modified gyroscope) along the body of the monorail, by using gyrostats monorail balanced itself whenever its equilibrium was disturbed. But if gyrostats would fail in use, the whole system would fail. Thus because of Brennan feared of failure he prevented the monorail from being mass-produced [1].

In 1912, Russian inventor Dr.Pyotr Shilovsky in collaboration with Louis Grennan developed and designed a two wheel car with gyroscope sitting in the middle of the body of car for maintaining stabilizing force. The car us 20 horsepower Wolseley engine which running the flywheel as well as a rear drive wheel [2][3].

Nbot is small scale robot which is built by David P Anderson. This robot won the one of the NASA competition in the year 2003. It uses the inertial sensor which is commercially available to balance the robot.

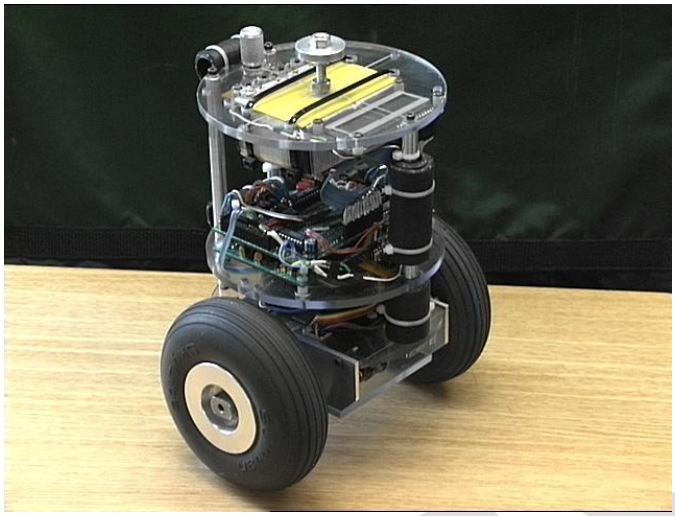

Figure 2: Nbot Robot [3]

Nbot uses almost four sensors to maintain its balance this sensors are optical encoder to measure the position of the vehicle and other three sensors are accelerometer, gyroscope and tilt angle sensors [4].

The self balancing and two wheel robot SEGWAY HT is commercially available and it is invented by Dean Kamen who has design more than 140 systems. It is manufactured by SEGWAY Inc. The feature of this robot is that it is able to balance itself and the user can standing on top of it and navigate the vehicle according to him. However, this uses more than one gyroscope and a few other sensors to keep it balanced vertically. Ginger is alternate name for SEGWAY before it commercially available [5].

The more innovative approach to construct a balancing robot was used by Steven Hassenplug. He developed a balancing system the chassis of the body of system is constructed by using the LEGO Mindstorms robotics kit. The balancing method of controlling the system is very unique with two Electro-Optical Proximity Detector sensors is used to provide the tilt angle information for the controller. This system of Steven Hassenplug omits the conventional use of gyroscope that has been used by previous robot researchers.

The group from Columbia University developed a modern version of Brennan's monorail. But unfortunately, the group was not able to create a working prototype. The main problem was the electronic component of the model continuously overheated during testing, causing the motor to malfunction [6].

In CES (Consumer Electronics Show) 2017 Honda unveiled the 'Riding Assist' technology which is the best example and working model of self balancing bike. Honda Riding Assist technology allows motorcycle to maintaining balance in slow speed. The bike doesn't use gyroscope for balancing because according to Honda it increase the weight of the bike.

TECHNICAL CHARACTERISTICS OF PROPOSED BALANCING BIKE

The balancing bike has a battery which can be rechargeable and provide enough power to rotate flywheel as well as drive motor. The bike is heavier than a conventional bike because of the use of gyroscope in it and environmental friendly to other motorized transportation modes. [7].

1) Purpose	To prevent rider from falling during accident, To keep bike balance itself, for transportation.
2) Motor : Type	Engine Type- hub motor, brush and brushless motor.

3) Battery: Type	Type- Lithium polymer rechargeable battery Voltage- 12V
4) Other	Gyroscope, accelerometer, Aurdino chip and other necessary sensors

Table 1: Generic description of balancing bike

The bike can be operate with the help of android application for moving forward as well as backward and also for steering the bike left or right. It can have a Bluetooth receiver which receives all the command made from the android application. The brain of this bike will be the Aurdino chip which can be highly customizable.

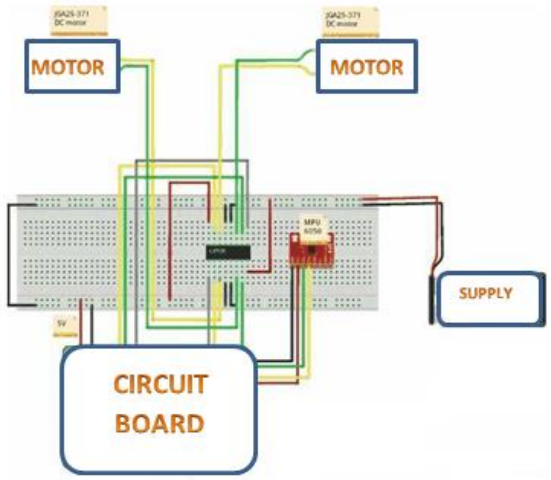

Figure 3: Control System Circuit Diagram

The above shown Circuit diagram consists of two switches used for controlling the working of commercially available Segway. The switch is called engage switch and all series get power from the constant power supply of the 12V battery. The Circuit board is programmable to control the steering of the Segway and control the speed of the device.

EXISTING SYSTEM

Numerous projects are still going on in the field of automobile like electric bike and self balancing bike and some are already done. We have studied some of the previous work in this filed and we find that a lot of self balance vehicles use different types of gyroscope and various types of sensor to maintain their balance and almost most of them are electric vehicles. The great example is SEGWAY HT, the commercially available product which uses two parallel wheels instead of two-in-line wheel for maintaining balance and it constantly need human to maintain its balance. Segway is best for personal use but not suitable for every one as it is expensive and only carries one person at a time.

So it is clear that two wheel motorcycle use today are not advance and from many years instead of its design nothing revolutionary change, they still use the same traditional petrol engine and are not capable of maintaining their balance. Vehicles that are use today are responsible for the carbon emission and hence it causes pollution. There are some electric bikes available in transportation sector but they are not self balanced and advance. Also bikes available today are not capable of maintaining its balance when rider moves its hands from steering wheel or from handle. These are the some things that lead us to the making of self balancing bike.

FUTURE WORK

The proposed system can be more useful in future when there is high demand for electric vehicles because of the lack of fossil fuel. It can be the best transportation option as we are looking forward to build actual bike using this principle. We can also use some advance algorithm which are capable of reading the data from the bike and its surrounding to move itself without human interaction. In future this work can be done.

CONCLUSION

This paper presents the results of an exploratory survey on a market for electric self balance bike. This research work demonstrates the remarkable use of the balancing bike for the people whose concern is safety first and people with certain disability. Research also quantifies the market for electric bike in the transportation sector as compare to the conventional vehicles. It clear from our research that there must be cheap and alternative way for transportation in urban as well as rural area which is advance and comparatively cheap than current conventional vehicles.

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Biometrics in Internet of Things (IoT) Security

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ABSTRACT*:* The "Internet of things" (IoT) is a hot topic of conversation both in the workplace and outside of it. Basically, IoT is a concept of connecting any device to the internet. This includes almost everything from mobile phone, washing machines, baby monitors, cars or even a jet engine of an airplane. IoT certainly opens the door to virtually endless opportunities but also to many challenges. Security vulnerabilities are big issues that are usually brought up in conversations. It's obvious that traditional approaches of user authentication are now inadequate and ineffective in the IoT era. This survey paper presents the security in the form Biometrics in Internet of Things security.

KEYWORDS: Internet of Things (IoT) , Interoperability , Privacy ,Security vulnerability, Internet

I. INTRODUCTION

The Internet of Things (IoT) is a dynamic global information network consisting of Internet-connected objects, such as Radio frequency identifications, sensors, actuators, as well as other instruments and smart appliances that are becoming an integral component of the future Internet. Over the last decade, we have seen a large number of the IoT solutions developed by start-ups, small and medium enterprises, large corporations, academic research institutes (such as universities), and private and public research organizations making their way into the market.

Fig 1.Iot Works in Biometrics

Biometric characteristics can be divided in two main classes, as represented in the following figure:

Physiological are related to the shape of the body. Examples include, but are not limited to fingerprint, face recognition, hand and palm geometry and iris recognition.

Behavioral are related to the behavior of a person. Characteristic implemented by using biometrics are signature verification, keystroke dynamics, and voice

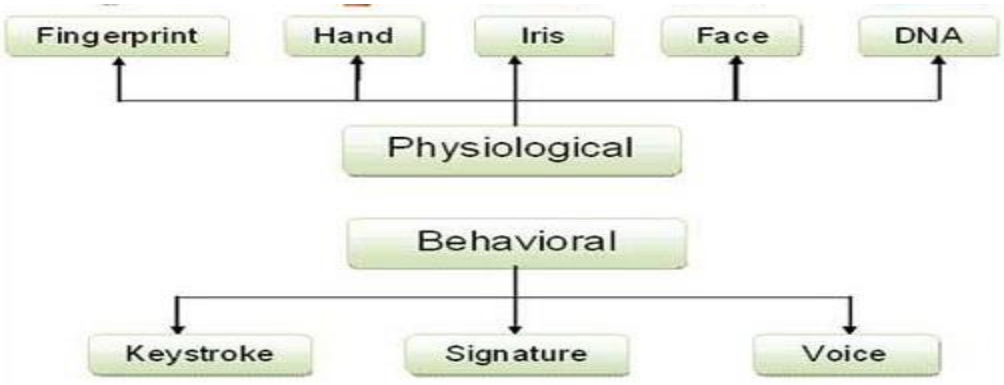

Fig 2. Types of Biometrics

A. *Finger print:* The patterns of friction ridges and valleys on an individual's fingertips are unique to that individual. For decades, law enforcement has been classifying and determining identity by matching key points of ridge endings and bifurcations. Fingerprints are unique for each finger of a person including identical twins. One of the most commercially available biometric technologies, fingerprint recognition devices for desktop and laptop access are now widely available from many different vendors at a low cost. With these devices, users no longer need to type passwords – instead, only a touch provides instant access.

B. *Facial Image:* The identification of a person by their facial image can be done in a number of different ways such as by capturing an image of the face in the visible spectrum using an optical camera or by using the infrared patterns of facial heat emission. Facial recognition in visible light typically model key features from the central portion of a facial image. Using a wide assortment of cameras, the visible light systems extract features from the captured image(s) that do not change over time while avoiding superficial features such as facial expressions or hair. Several approaches to modeling facial images in the visible spectrum are Principal Component Analysis, Local Feature Analysis, neural networks, elastic graph theory, and multi-resolution analysis. Major benefits of facial recognition are that it is non-intrusive, hands-free, and continuous and accepted by most users.

C. *Hand recognition:* These methods of personal authentication are well established. Hand recognition has been available for over twenty years. To achieve personal authentication, a system may measure either physical characteristics of the fingers or the hands. These include length, width, thickness and surface area of the hand.

D. *Iris recognition:* This recognition method uses the iris of the eye which is the colored area that surrounds the pupil. Iris patterns are thought unique. The iris patterns are obtained through a video-based image acquisition system. Iris scanning devices have been used in personal authentication applications for several years. Systems based on iris recognition have substantially decreased in price and this trend is expected to continue. The technology works well in both verification (1:1) and identification (1:N) modes (in systems performing one-to-many searches in a database). Current systems can be used even in the presence of eyeglasses and contact lenses. The technology is not intrusive. It does not require physical contact with a scanner. Iris recognition has been demonstrated to work with individuals from different ethnic groups and nationalities.

E. *Retina Scan:* The human retina is a thin tissue composes d of neural cells that is located in the posterior portion of the eye. Because of the complex structure of the capillaries that supply the retina with blood, each person's retina is unique. The network of blood vessels in the retina is so complex that even identical twins do not share a similar pattern. Although retinal patterns may be altered in cases of diabetes, glaucoma, retinal degenerative disorders or cataracts, the retina typically remains unchanged from birth until death. Due to its unique and unchanging nature, the retina appears to be the most precise and

reliable biometric. Advocates of retinal scanning have concluded that it is so accurate that its error rate is estimated to be only one in a million.

F. *Signature recognition:* Biometric signature recognition systems will measure and analyze the physical activity of signing, such as the stroke order, the pressure applied and the speed. Some systems may also compare visual images of signatures, but the core of a signature biometric system is behavioral, i.e. how it is signed rather than visual, i.e. the image of the signature. Benefits of signature biometric systems: 1. While it is easy to copy the image of a signature, it is extremely difficult to mimic the behavior of signing; 2. Low False Acceptance Rates (FAR); 3. People are used to sign documents, so signature recognition systems are not perceived to be invasive.

G. *Voice or speech recognition:*

Voice or speech recognition is the ability of a machine or program to receive and interpret dictation, or to understand and carry out spoken commands. Strictly speaking, voice is also a physiological trait because every person has a different pitch, but voice recognition is mainly based on the study of the way a person speaks, commonly classified as behavioral.

II. THE INTERNET OF THINGS

With the growth of IoT and biometric technology, authentication is being completely re imagined. Deploying IoT security is one of the great challenges in the inter-connected world, and it requires a solution that relies on the strongest authentication.

This is the brave new world of the Internet of Things (IoT). The security vulnerabilities of the IoT are almost as varied as the devices and sensors connected to it.

Existing methods for authentication, such as passwords aided by a second factor, are being rendered moot due to human error as well as the enhanced sophistication of malware and other attacks.

III. THE BENEFITS OF BIOMETRICS

Biometric authentication is a conclusive, logical way to prove one's identity – a password can be replicated, for instance, but a fingerprint cannot.

Consumers are becoming more familiar with, and comfortable with, on-device biometrics. The latest Apple and Samsung mobile phones, as well as many new desktop and laptop computers, contain embedded biometric sensors.

When authenticating to a smart lock, or even a smart car it is important that authentication take place on the smart device rather than on the user's end. Malware may be used to spoof the authenticated user identity and unlock a smart node without the proper credentials.

Authentication is essentially split across both the user's mobile device and the lock itself when validation capability is embedded directly into a smart lock. A secure lock becomes a standalone biometric validation server, and cannot be remotely authenticated without the presence of a trusted biometric device.

Mobile devices with embedded biometric sensors are changing how users authenticate to services they use every day, including email, social media, banking – and now for physical access.

The IoT is a revolution in how we communicate and interact with the world around us. It is a growing entity with almost as many security pitfalls as work and life advantages. There are many more devices to potentially be hacked, and when it comes to securing intellectual property and mission-critical applications, enterprises, financial institutions and government agencies cannot take chances.

Older forms of user authentication simply cannot combat today's advanced and sophisticated security threats. Advances in biometric technology have enabled this method of authentication to be embedded in the mobile devices we use every day. It's a scalable security solution that can help organisations of all types and sizes stay ahead of the cyber criminals

Listed below is everything that one needs to know about biometric systems and Internet Of Things (IOT) as the essential factor:

IV. PURPOSE

- ✓ Basically designed to ensure secure identification purposes with highly optimized usage of existing technologies and resources.
- ✓ Create no-password criteria in the various interfaces dealing with confidential authentication systems.
- ✓ Inculcate decentralization of the biometric systems and provide greater encryption standards.

V. APPLICATIONS

Biometric attendance system, security and encryption standards are duly incorporated into various fields for application on a greater scale. What stands to create the perfect rendering of these "secure systems" is the highly revolutionized "Internet of Things" technology that facilitates better assurance of deployment for maximum security standards.

A. *Banking and E-Payment:* Payment solutions through online or mobile mode, Block chain Systems, E-Trading facilities, and the like.

B. *Corporate and Enterprise levels:* Facilitate authorized Employee Access (direct or remote).

C. *Individual User Level:* IoT features in smart solutions for homes, cars, and other personal belongings, etc.

D. *Health Care Organizations:* Easy retrieval and monitoring of the corresponding user data for better analysis of health statistics.

VI. FEATURES

- ✓ Complete authentication with full time security feature.
- ✓ High end monitoring of the secured systems on the go.
- ✓ Full time support systems to deal with any kind of issues generated during the corresponding operation.
- ✓ Smart and creative user interface to facilitate enhanced user experience
- ✓ Personalization features specifically in terms of the desired requirements
- ✓ Affordable smart security solutions and totally worth the investment.
- ✓ Detailed report generation and analysis of the obtained data for further varied purposes.
- ✓ Real time execution of the biometric data obtained for authorization of various related procedures.
- ✓ Quicker and faster solutions with improved efficiency.
- ✓ Highly improved alert features with necessary strategic steps for the same.
- ✓ Greater security standards through complex encryption algorithms and n-step authentication procedures for best applicability on a universal scale.
- ✓ Complete digitization of data for better integration into other applications.
- ✓ Multi layer security levels for better hack-proof solutions.
- ✓ Cross platform synchronization features

VII. ADVANTAGES

- ✓ Go Password-less with the implementation of IoT based biometric security systems. No more requirements to type in cumbersome passwords or remember one as such.
- ✓ Better proofing against existing security breaches through multi layer security levels.
- ✓ On the go monitoring facility helps implement and improvise security solutions as per the need of the hour.
- ✓ Compatibility to various platforms and devices creates much favorable response from the client end
- ✓ Personalized biometric security features help create different security standards for different purposes.
- ✓ Greater ease of validation of biometric data obtained.
- ✓ One stop solution for all requirements -the same biometric information can be used for other security applications too.
- ✓ Modular segregation of the biometric system from the core operations, to differentiate malware from creating potential risks to the mainstream functionalities.
- ✓ Authentication done at the smart device. Modularity of the same between the user's mobile and the smart device provides for greater decentralization of security factors.
- ✓ IoT based biometric systems can also be used for authenticating individual presence. Hence, a more efficient way to prove an individual's location record.
- ✓ Full time support assistance creates better implementation feasibility.
- ✓ Mapping of biometric data is literally tough to replicate, hence more popular than traditional passwords.
- ✓ Reduces time complexity to a fairly large extent.

VIII. DISADVANTAGES

- ✓ A single failure in a particular module can create a chain reaction of deactivation, if proper modularity is not ensured.
- ✓ Improper functioning of the authenticating device or software corruption can pose open path for security breaches.
- ✓ Inadequate knowledge of the functioning of IoT based biometric systems can cause potential risk for essential data.
- ✓ IoT technology has undoubtedly become a part and parcel of the existing lifestyle and is in fact taken things to a digital level with every step in the positive direction. When considered from a user point of view, simple facilitation of security systems via IoT has effectively lowered the potential to possible threats. Also with greater manageability options on their very own specific devices and customized authentication procedures for the same, things from basic to highly confidential status can easily be monitored closely for enhanced security standards via the IoT technology.

IX. CONCLUSION

Biometrics in IoT will not only unlock bank apps, email accounts but also cars, homes and many other things. "We conservatively estimate that biometric sensors, which includes work time management and premise security entry consoles, will total at least 500 million "Internet of Things" connections by the upcoming years." With the evolution of the IoT and the utilizing of biometrics, there will be endless applications giving both convenience and security in different industries such as: smart home, automotive industry, finance, healthcare, etc. which will only be limited by human's imagination.

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EFFICIENT LANE DETECTION USING THE HYBRIDISATION OF ARTIFICIAL BEE COLONY & MODIFIED HOUGH TRANSFORM

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Abstract— This paper discusses lane coloration in real time vehicular adhoc system. Lane detection is normally helpful to localize path limits, determine undesired lane variations and to enable approximation of the upcoming geometry of the road. There are different types of methods that are used for detecting lines i.e. Hough transform, clustering and curve fitting. These methods are working efficiently but generally the however they are unsuccessful or otherwise not provide efficient results when there are curved lane road images. The objective of this paper is to improve lane coloration algorithm based edge detector by modifying the Hough transform i.e. hybridization of additive Hough transform with artificial bee colony edge detection to detect curve lanes.

Keywords— Lane Detection, ABC Algorithm, Modified Hough Transform, Curved lanes, Clahe, Segmentation, Region of Interest

INTRODUCTION

Nowadays in this contemporary world, travelling has turned into an essential part of regular life. Consequently, in the last few years, the volume of automobiles around the world population has enhanced to massive degree. A particular adverse component of this kind of development are the traffic incidents that take numerous lives in day- to- day life. The primary factors that cause these types of injuries are fatigue and ineptness. Automated lane detection is a key component of urban driving that plays a significant role in driver assistance systems and finds application in both autonomous as well as manned vehicles. Lane detection is generally helpful to localize road boundaries, to discover undesired lane variations as well as to enable estimation of the forthcoming geometry of the road. [3] Due to the fact that the volume of accident victims has increased annually with the expanding amount of vehicles on the road so as a result lane detection has become a crucial exploration area for smart automobile technologies. A lot of accidents develop from insufficient awareness about driving ailments caused by driver negligence as well as visual interference. The goal of the lane detection is to discover lane marks out of background debris and in addition to track out their actual location by utilizing specific appliances or by using machine vision based techniques. The principle connected with Lane Departure Warning System (LDWS) as well as Forward Collision Warning System (FCWS) is the curve lane detection. Lane detection becomes a difficult task under challenging conditions such as the dashed lane markings and automobile occlusion because of unreliable lane feature points on the structural paths.[5] Lane detection is an important procedure in large number of these applications as lanes provide important information like region-of interest for further processing. Due to huge variety of road types such as (rural, urban, suburban), varying weather conditions like (sunny, cloudy, rainy, snowy, foggy) as well as illumination variations such as (shadow, glare and also darkness) stating that it gets difficult to develop a powerful lane detection algorithm that always works efficiently for many different road environments. So far, several methods have been proposed to detect lane markings painted on the road surface like RADAR[12], DBSCAN[15], Spiking Neural Networks and Hough Transform[16],Edge Detection with Median Filter and Weiner filter[18] etc. All these methods have failed in the case of curved lanes and are mainly used for detection of straight lanes. Further, the condition of lanes in the presence of noise, shadow, illumination conditions are not detected. So in this paper we discuss an Artificial Bee Colony & Clahe based algorithm by using hybrid hough transform for efficient lane detection. Finally we study the performance of traditional hough transform and proposed modified hough transform based approach.

RELATED WORK

The literature survey of existing research in lane detection has been presented in the form of table as follows:

SNo	Year	Authors	Technique used	Limitations
1.	2014	Sukriti Srivastava et al	Lane detection using median filter, weiner filter and integrated hough transform	did not solve the problem of detecting lanes in case of heavy rain as well as different lighting conditions
2.	2015	Upendra Suddamalla et al	Edges are extracted using adaptive thresholding	Poor results in terms of weather conditions
3.	2015	Xue Li et al	Lane detection based on spiking neural network and hough transform	Failed in case of optimization algorithms
4.	2015	Jianwei Niu et al	Two stage feature-extraction along with curve fitting	does not address explicitly lane occlusions and is not applicable to lanes with large curvatures
5.	2014	Jongin Son et al	Real time illumination invariant lane detection for lane departure warning system	Not applicable in complicated contexts for example blur conditions, low sun angle conditions as well as lane cracks
6.	2014	Abdelhamid Mammeri et al	MSER Algorithm, Hough Transform and Kalman Filter	Lanes cannot be detected in case of noisy conditions
7.	2013	Andreas Richtsfeld et al	B-Spline Curves in order to detect RGB-D images	Sharp edges are not considered
8.	2013	Payam S. Rahmdel et al	multilayer fractional Fourier transform (MLFRFT) and the state-of-the-art advance lane detector (ALD)	High computational time required
9.	2013	Dajun Ding et al	Adaptive Road ROI Determination Algorithm	Absence of appropriate road data and the effect of disturbances causes problems
10.	2013	Elif Deniz Yigitasi et al	Edge detection algorithm	Corner pixels and pixels of frame around the image are often either ignored or taken as zero.

PROPOSED WORK

In the lane detection algorithm initially an image is captured with the help of a camera and then preprocessing is done with the help of artificial bee colony algorithm in order to extract region of interest. After that scaling and segmentation are done to extract the segmented portions of an image. Firstly, adaptive thresholding and then fuzzy c-means is used for the segmentation technique. The Vertical histogram is constructed to get the estimation about the mid lane of segmented image. To locate the sharp images of segmented image, prewitt operator is used to found the gradient magnitude of an image. Then the inner margins of the lane marks are recognized and colored. Modified Hough Transform is applied to detect and color lanes and finally its performance is evaluated. Various steps used for lane detection are as shown below:

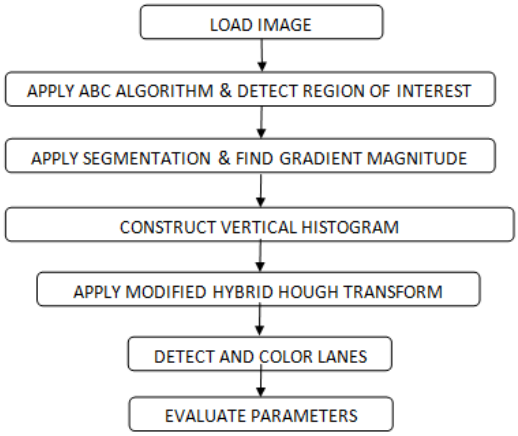

Fig 4.1: Framework of Proposed Algorithm

In this paper we use artificial bee colony algorithm to find region of interest in order to enhance the results. Artificial Bee Colony is a novel optimization technique involving natural behavior of honey bees in search for the best food resources. The Pseudocode of our algorithm is as follows:

Step1: Read input image and resize it

Step 2: Define problem specific variables

$objfun = 'Distancefn';$

$D = 100;$

$ubd = ones(1, D) * 100;$

$lbd = ones(1, D) * (-100);$

$for\ r' = 1{:}\ runtime$

Step3: Initialization of food sources in the range]lbd, ubd[

$Range = repmat((ubd - lbd), [foodnum\ 1]);$

$Low = repmat(lbd, [foodnum\ 1]);$

$Foodsrc = randm(foodnum, D) * Range + Low;$

Step4: Evaluate objective function and update fitness value

$ObjVal = feval(objfun, Foods);$

$Fitness = calculateFitness(ObjVal);$

Step5: memorize the best source of food

$BestI'n'd' = find(ObjVal == \min(ObjVal));$

$BestI'n'd' = BestI'n'd'(end);$

$GlobalMin = ObjVal(BestI'n'd');$

$GlobalParams = Foods(BestI'n'd', :);$

$itern = 1;$

$while\ ((itern \leq maxCycle))$

Step6: Phase of Employed bee

for i $= 1{:}\ (FoodNum)$

$Para2Change = fix(randm * D) + 1;$

$neighbr = fix\big(randm * (FoodNum)\big) + 1;$
$while(neighbr == i)$
$neighbr = fix\big(randm * (FoodNum)\big) + 1;$
$end;$
$soln = Foods(i,:);$
$soln(Para2Change) = Foods(i,Para2Change) + (Foods(i,Para2Change) - Foods(neighbr,Para2Change)) * (randm - 0.5) * 2;$
$i'n'd' = find(soln < lbd);$
$soln(i'n'd') = lbd(i'n'd');$
$i'n'd' = find(soln > ubd);$
$sol(i'n'd') = ub(i'n'd');$
$ObjValSoln = Feval(objfun, soln);$
$FitnessSoln = calculateFitness(ObjValSoln);$

Step7: A Greedy approach is applied between the current solution k and its mutant

$if\ (FitnessSoln > Fitness(i'))$
$Foodsrc(i',:) = soln;$
$Fitness(i') = FitnessSoln;$
$ObjVal(i') = ObjValSoln;$
$trial(i') = 0;$
$else$
$trial(i') = trial(i') + 1$
$end;$
$end;$

Step8: Probability is measured by using fitness values and then normalized by dividing maximum fitness value

$probab = (0.9.* Fitness./\max(Fitness)) + 0.1;$

Step9: ONLOOKER BEE PHASE

$while(t < FoodNum)$
$if(randm < probab(i))$
$t = t + 1;$
$Para2Change = fix(randm * D) + 1;$
$neighbr = fix\big(randm * (FoodNum)\big) + 1;$

Step10: Arbitrarily chosen solution should vary from the solution i

$while(neighbr ==)$
$neighbr = fix\big(randm * (FoodNum)\big) + 1;$
$end;$
$soln = Foodsrc(i,:);\ sol(Para2Change) = Foodsrc(i,Para2Change) + \big(Foodsrc(i,Para2Change) - Foodsrc(neighbr,Para2Change)\big) * (randm - 0.5) * 2;$

Step11: Generated parameter value is shifted onto the boundaries

$i'n'd' = find(soln < lbd);$
$soln(i'n'd') = lbd(i'n'd');$
$i'n'd' = find(soln > ubd);$
$soln(i'n'd') = ubd(i'n'd');$

Step12: Find out a new effective solution

$ObjValSoln = feval(objfun, soln);$
$FitnessSoln = calculateFitness(ObjValSoln);$
$if\ (FitnessSoln > Fitness(i))$
$Foodsrc(\mathrm{i},:) = sol; Fitness(i) = FitnessSoln;\ ObjVal(i) = ObjValSoln;$
$trial(i) = 0;$
$else$
$trial(i) = trial(i) + 1;$
$end;$
$end;$
$i = i + 1;$
$if(i == (FoodNum) + 1)$
$i = 1;$

$end;$
$end;$

Step13: The most effective source of food is memorized

$i'n'd' = find(ObjVal == \min(ObjVal));$
$i'n'd' = i'n'd'(end);$
$if(ObjVal(i'n'd') < GlobalMin)$
$GlobalMin = ObjVal(i'n'd') * p;$
$GlobalParams = Foods(i'n'd', :);$
$end;$

Step14: Determine the sources of food whose trial counter exceeds the "limit" value.

$i'n'd' = find(trial == \max(trial));$
$i'n'd' = i'n'd'(end);$
$if(trial(i'n'd') > limit)$
$Bas(i'n'd') = 0;$
$sol = (ubd - lbd).* randm(1, D) + lbd;$
$ObjValSoln = feval(objfun, soln);$
$FitnessSoln = calculateFitness(ObjValSoln);$
$Foodsrc(i'n'd', :) = soln;$
$Fitness(i'n'd') = FitnessSoln;$
$ObjVal(i'n'd') = ObjValSoln;$
$end;$
$itern = itern + 1;$
end
$GlobalMins(r) = ceil(GlobalMin);$
$end;$
$soln = (p * GlobalMins)/(n^3)$

Step15: Apply ABC based Clahe

$abc_{factor} = stretchlim(Image, sol);$
$abc_{image} = imadjust(Image, abc_{factor}, [\ ]);$

Step16: Evaluate and update region of interest

$imgData = Image(:, ;, 1);$
$[A, B] = find(imgData \cong 255);$
$xmin = \min(A);$
$xmax = \max(A);$
$ymin = \min(B);$
$ymax = \max(B);$
$width = xmax - xmin;$
$height = ymax - ymin;$
$imgSelect = imcrop(imgData, [xmin, ymin, xmax, ymax]);$
$imgSelectrgb = imcrop(Image, [xmin, ymin, xmax, ymax]);$

Step17: Apply fuzzy c-means based segmentation

$data = reshape(Image, [\ ], 1);$
$[center, member] = fcm(double(data), 3);$
$[center, cidx] = sort(center);$
$member = member';$
$member = member(:, cidx);$
$[maxmember, label] = max(member, [\ ], 2);$
$binary1 = Image >$
$level = \frac{\max(data(label == 1)) + \min(data(label == 2))}{2};$ $if\ level > 1$
$level = \frac{level}{255};$
end

Step18: Evaluate Gradient Magnitude Of Image

$yaxis = fspecial('prewitt');$
$xaxis = yaxis';$

$Imageyaxis = imfilter(double(Image), yaxis, 'replicate');$
$Imagexaxis = imfilter(double(Image), xaxis, \quad 'replicate');$
$gradmag = sqrt(Imagexaxis.^2 + Imageyaxis.^2);$

Step19: Apply canny based hough transform

$BW = edge(binary, \quad 'canny');$
$[H, T, R] = hough(BW);$
$P = houghpeaks\left(H, 5, 'threshold', ceil\left(0.3 * \max(H(:))\right)\right);$
$x = T(P(:,2)); y = R(P(:,1));$

Step20: Apply morphological operations

$binary = bwareaopen(binary, 46);$
$s'e' = strel('disk', 2);$
$b'w' = imclose(b'w', se);$
$b'w' = imfill(b'w', 'holes');$
$[B, L] = bwboundaries(b'w', 'noholes');$

Step21: Demonstrate the particular label matrix as well as draw each and every boundary

$for\ k = 1: length(B)$
$boundaryy = B\{k\};$
$plot(boundaryy(:,2), boundaryy(:,1), 'b', 'LineWidth', 2)$
end
$stats = regionprops(L, 'Area', 'Centroid');$
$for\ k = 1: length(B)$

Step22: Estimate the basic approximation of the object's perimeter

$delta_{sq} = diff(boundaryy).^2;$
$peri = sum\left(sqrt\left(sum\left(delta_{sq}, 2\right)\right)\right);$

Step23: Determine the calculated area corresponding to label 'k'

$area = stats(k).Area;$

Step24: Calculate the roundness metric

$$metric = 4 * pi * \frac{area}{peri\text{^}2};$$

$metric_{string} = sprintf('\%2.2f', metric);$
$metricn(k) = metric;$

Step25: Mark objects over the threshold with a black circle

$count = count + 1;$
$centroid = stats(k).Centroid;$
$plot(centroid(1), centroid(2), 'ko');$
end
$lowthreshold = .009;$
$BW_{filled} = imfill(b'w', 'holes');$
$boundaries = bwboundaries(BW_{filled});$

Step26: Find lines and plot them

$liness = houghlines(BW, T, R, P, 'FillGap', 5, 'MinLength', 7);$
$max_{len} = 0;$
$for\ k = 1: length(liness)$
$x'y' = [liness(k).point1; liness(k).point2];$

Step27: Determine the endpoints of the longest line segment

$length = norm(liness(k).point1 - liness(k).point2);$
$if(length > \max_{len})$
$\max_{len} = length;$

$x'y'_{long} = x'y';$
end
end

Step28: Return lane colorized image

```
if count~ = 0
hold on
for k = 1:count
b = boundaries{k};
if metricn(k) < threshold && metricn(k) > lowthreshold
plot(b(:,2),b(:,1),' g',' LineWidth',3);
hold on
end
end
end
```

RESULTS -

In an effort to measure the performance of existing and proposed algorithm criteria, different lane metrics are usually considered. For this we have taken 10 set of various images in .jpg format.

A. Balanced Error Rate (BER)

The Balanced error rate is the average of the errors on each class and is denoted by formula:

temp_BER = 100 * (1 -temp_BCR)

According to the need this error rate should decrease and in addition should be minimum.

Table 2 shows the different values of balanced error rate for set of 10 different images.

Input Image	Existing work	Proposed work
1	49.2835	39.5502
2	32.5438	29.7490
3	27.0138	20.0426
4	32.1851	6.1262
5	24.3058	19.4388
6	26.4659	21.0262
7	37.9812	8.8886
8	45.2974	36.5385
9	24.6136	22.7887
10	12.3718	7.9066

Table 2: Balanced Error Rate

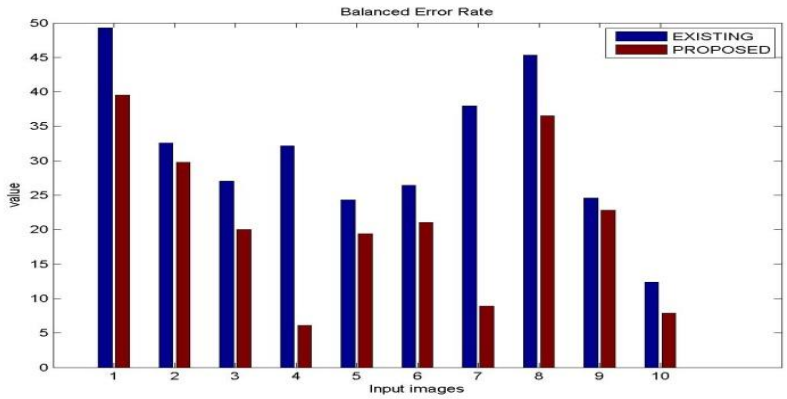

Fig 3: Balanced Error Rate

Fig 3 shows a graph of balanced error rate analysis. It is seen that the proposed technique has lower balanced error rate as compared to existing technique.

B. F-measure

F-measure is used for computing the average values of precision and recall. Table 3 shows the different values of f measure for set of 10 different images.

Input Image	Existing work	Proposed work
1	2.8254	34.5734
2	51.7557	57.6533
3	62.9877	74.9333
4	52.5398	93.4740
5	67.8895	75.8707
6	64.0087	73.3757
7	38.7586	90.2442
8	17.1934	42.4242
9	67.3501	70.4853
10	85.8815	91.4145

Table 3: F-measure

F-measure is expressed with the help of following formula :
F-measure=2(precision.recall) / (precision + recall)
Graphical representation of f measure is shown in fig 4. From the graph it is clearly highlighted that the proposed technique is much better than simple lane detection algorithm.

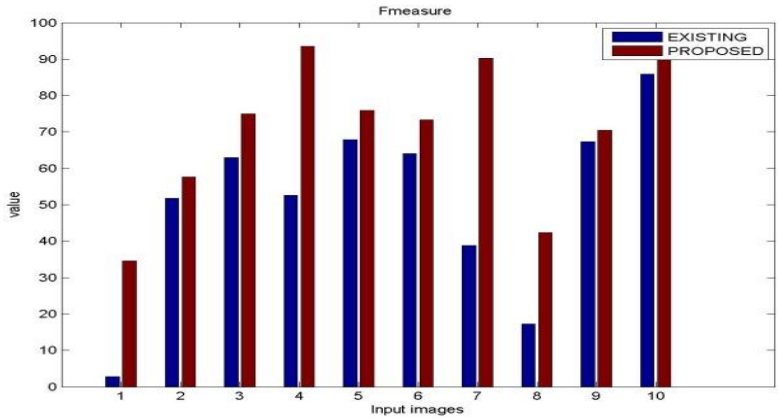

Fig 4: F-measure

C. Recall

Recall is the measure of how many positives does our proposed algorithm gives. It also determines the sensitivity of our network. Recall is expressed with the help of following formula :

Recall = (Number of true positive assessments) / (Number of all positive assessments)

Table 4 shows the different values of f measure for set of 10 different images.

Input Image	Existing work	Proposed work
1	0.0143	0.2090
2	0.3491	0.4050
3	0.4597	0.5991
4	0.3563	0.8775
5	0.5139	0.6112
6	0.4707	0.5795
7	0.2404	0.8222
8	0.0941	0.2692
9	0.5077	0.5442
10	0.7526	0.8419

Table 4: Recall

The value of recall should be higher. As higher the value of recall better is the performance of our algorithm.
Fig 5 shows the graphical representation of recall analysis.

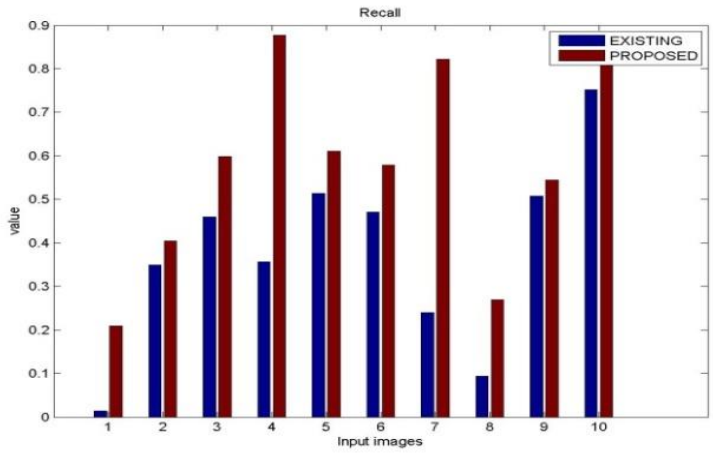

Fig 5: Recall Analysis

CONCLUSION

Lane detection enables you to obtain the position as well as direction of the vehicle along with lane information. There are different types of methods that are used for detecting lines. The methods formulated until now are operating effectively as well as providing beneficial results in scenario when the straight lane images are generally there. However challenge is simply because that they are unsuccessful or otherwise not provide successful outcomes whenever there are curved lane road images. In this modify Hough transform i.e. additive Hough transform with artificial bee colony based edge detector is used to improve straight lane as well as curved lane road images. The proposed technique has been designed and implemented in Matlab simulator 2010 by using image processing toolbox. The comparison has been drawn between Hough transform and Hybridization of additive Hough transforms with ABC edge detection by using various parameters balanced error rate, f-measure and recall. The proposed methods outperforms over existing methods.

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A survey on design and implementation of LMS and DLMS Adaptive Filter and its performance analysis based on FPGA

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Abstract— The most important issue for practical signal processing applications is removing noise, echo etc. The hardware implementation of adaptive filters is a challenging issue in real-time practical noise cancellation, echo cancellation, applications. An adaptive filter is a kind of filter that changes and updates its specifications according to the application automatically. Adaptive filter in general consists of two basic processes, filtering process and adaptive weight control process. This adaptive weight control mechanism may be different algorithms such as LMS,DLMS,RLS,NLMS which are used for error minimization.

This paper presents the survey on design and implementation of LMS and DLMS adaptive filter architectures on a Field Programmable Gate Arrays (FPGA) chip. The adaptive filters LMS and DLMS will be compared and analyzed on the basis of performance parameters such as Device utilization summary w.r.t. FPGA, Speed Factor and maximum operating frequency. The filter architecture is considered for designing and the VHDL hardware description language will be used for algorithm modeling. The practical results of simulation will be monitored using Modelsim.

Keywords— LMS, DLMS, FPGA, Adaptive filter, Modelsim, VHDL, Xilinx FPGA.

INTRODUCTION

Today, the main issues in most of the applications are noise signals or error signals due to which the originality of signals is lost. To overcome this problem, filters are used. Filters can be FIR or IIR. The filter is said to be optimum only when the statistical characteristics of the input data match the prior information on which the design of filter is based. The most efficient way for filters to be favourable is to use adaptive mechanism. But in some cases, the noise model is time varying and could not be removed by stationary- coefficient based filters. In advance, Adaptive filters are employed that could adapt their coefficients by changing the filter inputs. Adaptive filters may contain FIR or IIR filters. FIR filters are commonly used as they used forward paths only and are stable. The LMS algorithm is a well-known adaptive algorithm for updating filter coefficients in dynamic and unknown environments. However, the delay in the feedback error for updating the weights according to the LMS algorithm does not favors its pipeline implementation under high sampling rate condition. For that purpose the delayed LMS (DLMS) algorithm for pipeline implementation of LMS. The improved or delayed version of LMS is called as DLMS adaptive filter.

Microprocessors, microcontrollers and digital signal processors (DSP) chips perform fetching, decoding and execution stages sequentially and not simultaneously using fixed hardware and architecture. Therefore, they could not process data simultaneously. The FPGA chips are reconfigurable and can process data and information simultaneously for different processing applications. FPGAs

have been used in a wide range of applications such as network communication, video communication and processing and cryptographic applications. The objective of the project is to present implementation of least mean square (LMS) adaptive filter and Delayed least mean square (DLMS) architectures on a Spartan Field Programmable Gate Arrays (FPGA) chip and compare their parameters.

LITERATURE REVIEW

Various researchers have been done to improve the performance parameters values for the given algorithms. Some of which are listed below.

Fohl and Matthies [1] implemented an adaptive filter on FPGA to investigate the applicability of this chip as a hardware base for real-time audio processing and they concluded that the FPGA is so suited for complex real-time audio processing. A 64-tap 9-bit LMS adaptive FIR filter for active noise control (ANC) was implemented on Altera Cyclone II FPGA considering a 24 KHZ uniform random noise signal.

Elhossini et al [2] has proposed three different architectures for implementing a least mean square (LMS) adaptive filtering algorithm, using a 16 bit fixed-point arithmetic representation. These architectures were implemented using the Xilinx multimedia board as an audio processing system. The Virtex-II FPGA chip is used to implement the three architectures.They had showed that using a pure hardware implementation results in a much higher performance with somewhat lower flexibility.

Kim and Poularikas [3] in their paper developed classic ANC, variable step size ANC and SCAF ANC for removing noise in speech signals and compared those schemes according to their performance and computation complexity. In the paper, an adjusted step size LMS (least mean squares) algorithm is proposed for possible improvements in the performance of adaptive FIR filters in nonstationary environments. Simulation results of comparing SCAF with a fixed step size LMS algorithm were presented.

Vella, and Debono [4] illustrated an LMS adaptive filter in a line echo cancellation scheme and different architectures were used to implement multiplication blocks for decreasing hardware utilization and increasing computation speed. The ever increasing data rates used in communication systems bring along the need for faster adaptive filtering systems that are capable of handling the echo tail generated. This paper describes the implementation of such an adaptive filter on a Xilinx Spartan 3 FPGA.

PROPOSED WORK

The most efficient way for filters to be optimum is to use adaptive mechanism. An adaptive filter is a filter that can updates its specifications according to application. The theory of widely used algorithm named as least mean square (LMS) algorithm was developed by widrow and Hoff in1960. LMS algorithm is an important member of the family of stochastic gradient algorithms. A significant feature of the LMS algorithm is its simplicity. It does not require matrix inversion nor pertinent correlation function.The simplicity of LMS algorithm made it the standard against other linear adaptive filtering algorithm.

The LMS algorithm is a linear adaptive filtering algorithm which consists of two processes. A filtering process, which involves firstly computing the output of filter in response to input signal and secondly generating an estimation error by comparing this output with desired response. Figure 1 shows simple block diagram of adaptive filter. An adaptive process, which involves the automatic adjustment of parameters of filter in accordance with estimation error.

In filtering process the filter may be FIR or IIR, FIR filters are commonly used as they used forward paths only and are stable. This adaptive weight control mechanism may be different algorithms such as LMS,DLMS,RLS,NLMS which are used for error

minimization. LMS algorithm is a least mean square algorithm used among different algorithms due to its simplicity, low computational processing tasks and high robustness.

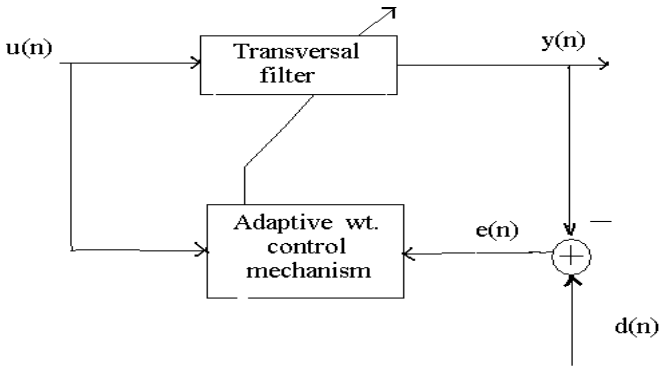

FIG.1 BLOCK DIAGRAM OF ADAPTIVE FILTER

The combination of these two processes form a feedback loop as shown in fig. 1. First we have transversal filter around which LMS algorithm is built, responsible for filtering process and we have adaptive control process on tap weights of filter thus called as adaptive weight control mechanism.

Details of transversal filter are presented in fig 2. The tap inputs x(n),x(n-1).....x(n-N+1) form the elements of N-by-1 tap input vector x(n) where (N-1) is the no. of delay elements. The tap weights w_0 (n),w_1(n), ...w_{N-1}(n) form the elements of N-by-1 tap weight vector w(n). The value computed for this vector using LMS algorithm represents an estimate whose expected value may come close to weiner solution w_0 as the no. of iterations n, approaches infinity. During filtering process, the desired response d(n) is supplied for processing alongside the tap input vector x(n). Given this input , the transversal filter produces an output y(n) used as an estimate of desired response d(n).

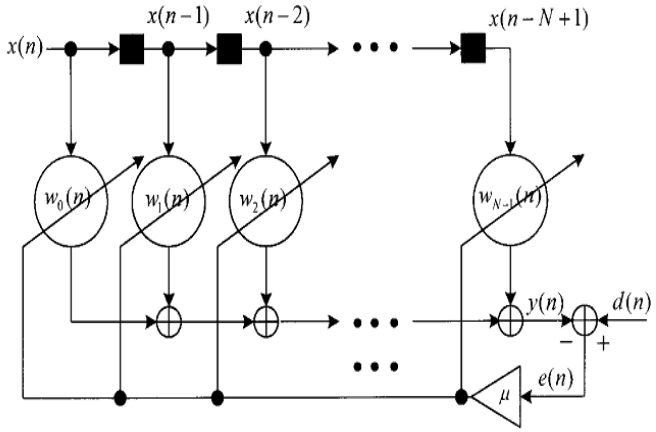

FIG. 1 LMS ADAPTIVE FILTER

Accordingly following equations are defined,

Filter output:

$$y(n) = w(n)\, x(n) \qquad \text{.....(1)}$$

Estimation error:

$$e(n) = d(n) - y(n) \qquad \text{.....(2)}$$

In adaptive weight control mechanism a scalar version of inner product of estimation error e(n) and tap input x(n-k) for k= 0, 1, 2,……., N-2, N-1; is processed. The result so obtained defines correction applied to tap weight $w_k(n)$ at iteration (n+1). The scaling factor used in this computation is denoted by positive quantity 'μ' called as step size parameter. Step size (μ) plays an important role in deciding the error and then weights. But there is a bound on this step size which is denoted as

$$0 < \mu < 2/MS_{max} \qquad \text{……..(3)}$$

Where,

S_{max} is the value of power spectral density of tap input x(n) and M is the filter length.

Tap weight adaptation:

$$w(n+1)=w(n) + \mu x(n)e(n) \qquad \text{……(4)}$$

If we observe, that LMS algorithm requires only 2M+1 multiplications & 2M additions per iterations, where M is the number of tap weights. This is repeated and the new weights minimize the error signal. In other words the computational complexity of LMS algorithm is less than the steepest descent algorithm which is time consuming.

DLMS is a delayed least mean square algorithm which has a pipelined architecture.In the conventional LMS adaptive filter, the estimated signal in each data interval is computed and subtracted from the desire signal. The error is then used to update the tap coefficients before the next sample arrives. In some practical applications, the LMS adaptation scheme imposes a critical limit on its implementation. LMS algorithm uses the feedback-error corresponding to the nth iteration for updating the filter weights to be used for computing the filter output for the (n+1)th iteration. The DLMS algorithm is similar to the LMS algorithm, except that in case of DLMS algorithm, the weight increment terms to be used in the current iteration are estimated from the error value and input samples corresponding to a past iteration. Figure 3 shows the structure of conventional DLMS algorithm.

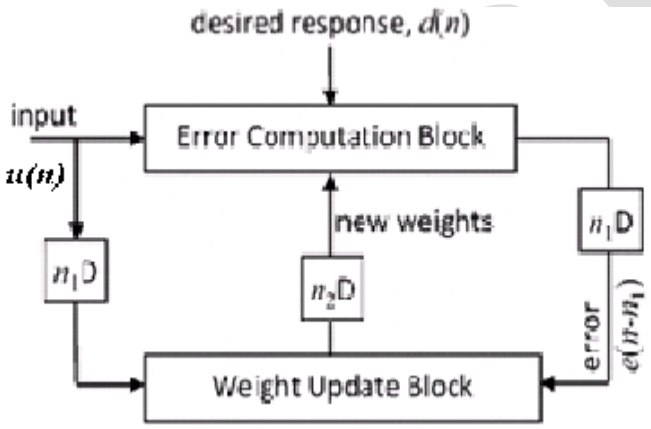

FIGURE 2 DLMS ADAPTIVE FILTER

The weight update equation algorithm is given by,

$$w(n + 1) = w(n) + \mu\, u(n - D)\, e(n - D) \qquad \ldots\ldots\ldots\ldots\ldots(5)$$

From the figure 3 it is clear that the error signal is delayed by n_1 number of cycles and then given to weight update block. Same amount of delay is provided to the input signal. In the weight update block these signals are utilized according to the equation 6.Then further n_2 number of cycles delay is given and then this output is distributed to FIR filter in terms of new weights.

CONCLUSION

Here in this paper the study of adaptive digital LMS and DLMS filters is proposed. The detailed study on the different architectures i.e. on LMS and DLMS is efficiently carried out. It is observed that the LMS filters do not support pipelining, thus for handling critical paths and further error minimization DLMS adaptive filter is used. The delay introduced in the DLMS filter at the input as well as at the error output block updates the weights further. Thus, the new updated weights will improve the performances.

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Tele-Consulting Through Rural Health Centres for All Community – A Case Study from Nizamabad

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Abstract— Access to quality healthcare is rights of every individual, however, a large part of rural population in India do not have access to same. This is particularly acute among the all community who are a marginalized section of the society. This paper is based on the case study of community in Nizamabad District of Telangana. A tele-consulting system through rural health centre is proposed in this paper. The field implementation of this system is currently underway at Telangana mission in Nizamabad.

Keywords- Rural healthcare, Tele-consulting, Rural areas

I. INTRODUCTION

Healthcare is a right of every individual but lack of quality infrastructure, dearth of qualified medical functionaries, and non-access to basic medicines and medical facilities thwarts its reach to 60% of population in India. Around 700 million people live in rural areas where the condition of medical facilities is deplorable. Though a lot of policies and programs are being run by the Government, the success and effectiveness of these programs is questionable due to gaps in implementation. In rural India, where the number of Primary Health Care centers (PHCs) is limited, 8% of the centers do not have doctors or medical staff, 39% do not have lab technicians and 18% PHCs do not even have a pharmacist. India also accounts for the largest number of maternity deaths. 31% of the population travels more than 30 kms to seek healthcare in rural India. About 30% of people in rural India did not opt for treatment because of financial constraints. Around 39 million Indians are pushed to poverty because of ill-health every year [1].

This national level situation is closely reflected in the Nizamabad district of Telangana as well. Close to 35.4% of population in Nizamabad all community. There habitations are in remote inaccessible regions. The health situation among this community is more acute owing to the infrastructural difficulties. National Rural Health Mission (NRHM) identified 8 such areas in Nizamabad. Our project implementation is at one such location called Armur coming under the Pakkom PHC.

In order to improve this healthcare system in Nizamabad specifically amidst the inaccessible all community regions, we propose a tele-consulting system in this paper. The field implementation of the system is currently underway. The preliminary results from the study are shared in this paper.

II. RURAL HEALTHCARE SYSTEM IN INDIA

The rural healthcare infrastructure in India is a three tier system as shown in Figure 1. This system is developed on the basis of populations norms provided in Table 1. As on March, 2011, there are 148124 Sub Centers, 23887 Primary Health Centers (PHCs) and 4809 Community Health Centers (CHCs) functioning in the country [1].

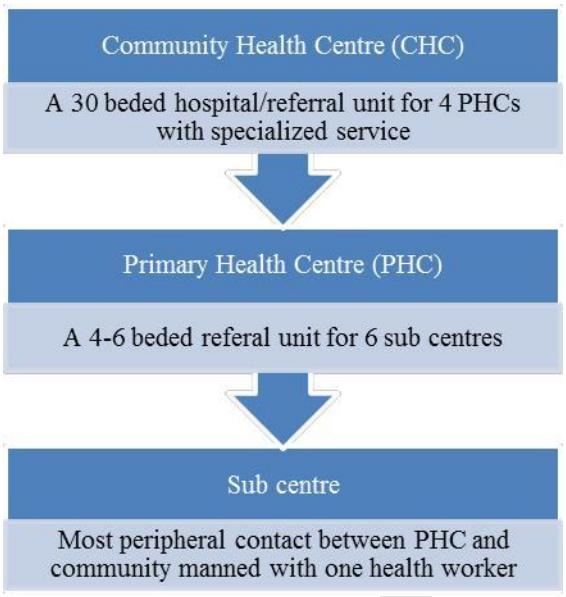

Figure 1. Three-tier rural health infrastructure in India

	Population norms (No. of People)	
Centre	**Plain area**	**Rural area**
Sub Centre	6000	4000
PHC	25000	20000
CHC	110000	85000

Table 1. Population norms for the three-tier system

According to the National Rural Health Mission (NRHM) report, 700 million people live in 636000 Indian Villages. Majority of people die due to preventable and curable diseases like diarrhea, measles and typhoid [1]. The key factors that are inhibiting rural healthcare delivery in India include:

- Not attractive enough for private sector considering the distributed population and lack of purchasing power of the customers.
- Less efficient public sector initiatives.
- Inefficient distribution networks and lack of skilled staff.

About 31% of the population travels more than 30 kms to seek healthcare in rural India. Due to this inaccessibility to public health care and low quality of health care services, a majority of people in India turn to the local private health sector. Around 92 percent of

healthcare visits are to private providers of which 70 percent is urban population [2]. The rural population is however not in a position to afford this expensive health service. Around 39 million Indians are pushed to poverty because of rural-health every year. We developed this project idea with an aim of making a difference to this alarming reality.

III. BACKGROUND OF THE PROJECT

Before you begin to format your paper, first write and save the content as a separate text file. Keep your text Nizamabad, one of the most backward districts of Telangana, is one among the 90 backward districts in India. According to census report, Nizamabad is primarily a rural district; 96.2% of the total population lives in villages. Armur (district headquarters), Kamareddy and Banswada are the three major business towns of the district. There is a substantial concentration of minority (mainly Muslims and Christians) population.

Another important demographic feature of the district is the presence of about 17.4 per cent of tribal population. This is highest among all districts in Telangana. Schedule Cast populations in the district are found in remote and inaccessible areas. They are dependent on labour in agriculture, plantation work and forestry for survival. Many of the tribal regions are inaccessible due to infrastructural constraints. This situation becomes more acute during the rainy season [5].

A. Health Situation in Nizamabad.

As mentioned earlier, Nizamabad is one of the most backward districts in Telangana. The district lags behind all India figures in 3 out of the 8 socio-economic indicators. Against all India figures of 87.9 percent households having access to safe-drinking water, only 56.3 percent of the households have access to the same in Nizamabad [5]. This is leading to a number of water borne diseases in this district. The health infrastructure in the district is not uniformly distributed. 67% of the villages have a hospital or dispensary. However, the health facilities in tribal inhabited areas are poor owing to difficulty in reaching the locations [5].

In Nizamabad district, 17.43 % of the total population comprises of tribes and the problem of alcohol dependence is prevalent among them. Alcohol dependence and tobacco consumption are leading to numerous social problems such as violence, suicide, health hazards, and economic problems amongst this population. The geographical situation provides a favorable atmosphere for the production and sale of illicit liquor. The excise and police officials find it difficult to reach the locations in time to take legal actions due to infrastructural difficulties. Illiteracy and unemployment add to the severity of the problem.

According to a recent report [3], NRHM has identified 8 locations as difficult to reach within the district [3: pg – 182]. One of these eight areas called community under the Pakkom PHC is target location of the current study. Owing to the difficulty in reaching the site, health services offered in the area are poor. The detailed description of the site is provided in the next section.

B. Description of the site for initial field implementation.

The initial field implementation of the project is planned in the Telangana mission. This Telangana mission is situated 12 kms inside the forest from mallaram. The only means of reaching this Telangana mission field is by crossing the Godavari River. There are no proper means of water transportation available to cross this river. For implementation of the project, we are working in collaboration with an evangelist at this Telangana mission. Social work, de-addiction, tuition centers, running health camps etc. are the

main current activities of this Telangana mission. Currently the Bhukya Madhu Research Scholar, Osmania University and Bukya Ravi support this mission field.

C. Field Study Observations

Before starting off with this project, we did a field study to understand the requirements of the people in the area. One of the concerns expressed by the people was the difficulty in reaching the PHC at Pakkom owing to poor transport facilities. The prevalence of fake doctors and unhygienic medicinal practices was also there. Alcohol consumption and drug addiction was high in the area. The general health and socio-economic standard were below the average norms.

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IV. PROPOSED SYSTEM

Given the limited healthcare support provided to the all community at Armur, we developed a tele-consulting system with support from the Telangana mission. The proposed system is developed to give the all community people better access to health care. There is a remote health centre equipped with essential diagnostic tools (for temperature, blood, blood pressure, ECG, urine, etc.).The health centre can work in collaboration with PHC/sub centre or work as a separate entity. This remote health centre is manned by health workers. The patient comes to the centre and a health worker at the centre does a preliminary check-up and basic health details are collected. Then the patient is directed to a tele or video conference room so that patient can talk with a doctor. The doctor then provides appropriate prescriptions to the patients or refers him for further check-up and treatment.

Additionally, the system has a cloud-based Electronic Health Record System which maintains the history of the patient which can be used for future reference. On receiving a call from a patient, the doctor can find patient's previous records through the patient's ID number. A past record contains previous prescribed medicine and the doctor can easily ask the status of follow-up actions to the patients. This saves doctor time and also the cost burden on the patient will be reduced. It also provides a good psychological feel to the patient and enhances the trust in the doctor. This is particularly important because of two reasons. First, because the system operates remotely, people are generally unwilling to have faith in such a system. This feeling was expressed in the initial field study we did with the stakeholders. Second, it was important to overcome the past unpleasant experiences that people had in dealing with fake doctors.

In this specific location where the field implementation is underway, internet facilities are available. The doctor can monitor the patients live ECG, ophthalmic image , Heart Beat Rhythm etc. through the devices that has been configured through the system so the doctor can diagnose more effectively. However, because of the erratic nature of internet facility during rainy season, the initial implementation is restricted to an audio based tele-consulting. The detailed working of the system is described in the next section. In addition, this system offers some value added services to patients such as SMS alerts to remind them about taking medicines, customized health tips, reminders for next visit to the health centre, advertisement of medicines, advertisements of various treatment facilities available hospitals. Though the revenue generation mechanism of advertisements we intent to develop a system that is self - sustainable in the long run. The overall system architecture is shown in Figure 2.

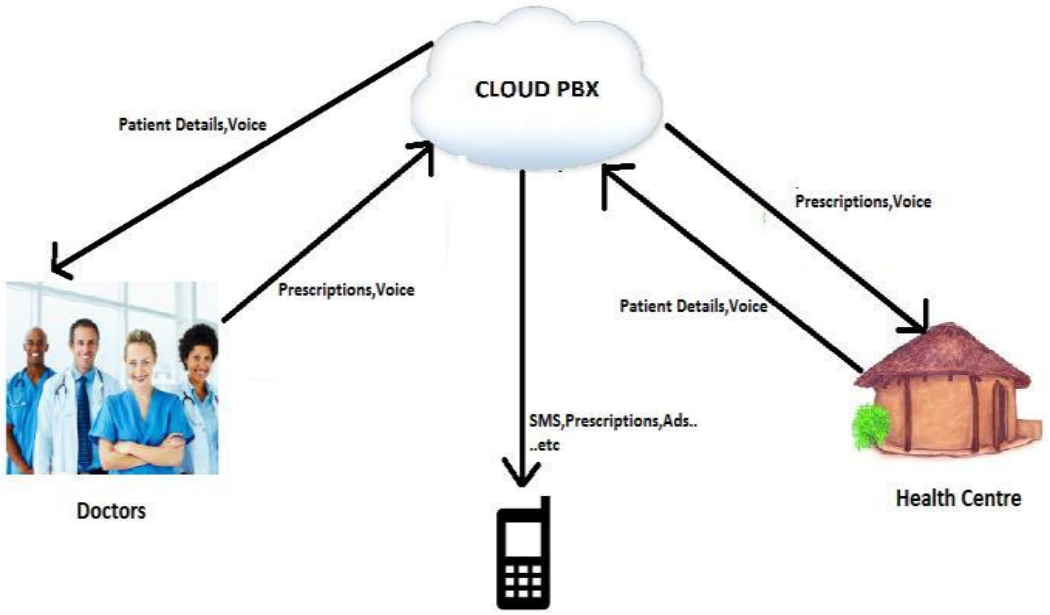

Figure 2. System architecture

V. WORKING OF THE SYSTEM

Step1

A patient comes to the centre, the health agent will ask the basic details and it is entered into a software interface. Each patient is given unique id. The health agent will also check the vital signs and readings are entered.

Step 2

The patient is then directed to an audio conferencing room so that he/she can talk with a remote doctor. The audio call is routed through a cloud PBX (Private Branch Exchange) so that customized IVR prompts and bulk SMS services all can be integrated into the system.

Step 3

Doctors have a software interface where the basic details entered by the health agent are displayed on doctor's laptop or is available in the form of SMS on the doctor's mobile phone.

Diagnosis phase: The patient explains the symptom and then the doctor queries the patient based on the symptoms to find out the cause of the symptom.

Advice phase: The doctor then either prescribes medicine (over the counter medicine only because of the medical policy issue), or suggests a nearby hospital for further check-up and consultancy. The doctor enters his prescription through the application and sends to the remote clinic where the health agent can take a printout and give it to patients. In case of absence of internet connection the

same can be done through SMS.

Step 4

Audio conversation and patient history is saved for future requirements.

VI. PRELIMINARY RESULTS

Once the patient arrives at the rural health centre the health assistant will do a preliminary checkup. This checkup is necessary to get the vital signs of the patients which in turn help in the consultation. For the preliminary checkup we are using several portable systems that are available in the market and those which were developed during our earlier studies [6]. The system is cost effective and portable for such telemedicine centers. The instrumentation we use for monitoring different parameters and the preliminary results are detailed below.

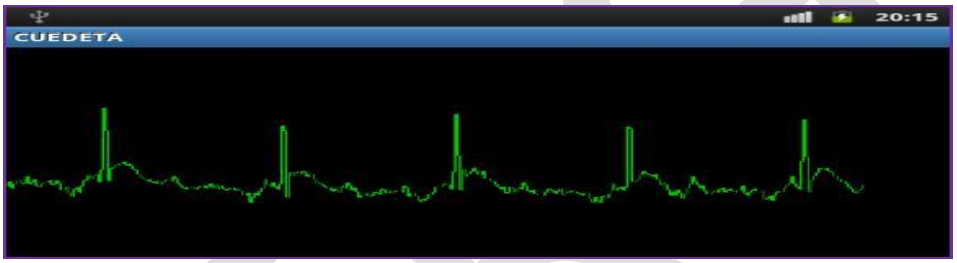

Figure 3. Live ECG monitoring

A. ECG Monitoring

ECG Monitoring can be done using the system called CUEDETA which is a real time heart monitoring system in android OS. This mobile cardiac monitoring incorporates a design of an integrated electrocardiogram (ECG) beat detector, supported by the PDA version of Personal Health Information Management System (PHIMS) and Facilitated Accurate Referral Management System (FARMS) through wireless network. This system is designed to be used for continuous monitoring of the patients at different environments such as home, hospital, work place, and practically anywhere [6]. Figure 3 shows the live monitoring of ECG Signals in the CUEDETA system.

B. Collecting blood pressure, blood sugar and blood oxygen level

For this we can integrate several portable handheld devices. These devices are supported by bluetooth which enables easy transmission of data to the central database. For the preliminary study, we have used one touch ultra 2 glucometer for measuring the blood glucose; A&D UA-76 PBT blood pressure meter to check the blood pressure, blood oxygen level; and pulse can be checked using the oximeter.

C. Software system

The software interface can be used to enter the details obtained from the patient. The details are also saved helping in future treatment. This software in currently developed in android and the PC version of the software is under development. The health workers in the facility have to enter the patient details like vital signs through the software interface, so that before teleconsulting the doctor will get a background idea of the patient. A sample of the data collected from the study is provided in Table 2.

Name	**Pressure (Sys/Dia)**	**Blood Glucose Level(mg/dL)**	**SpO2 %**	**Pulse (bpm)**	**Temp (^{0}F)**
Roshan	120/70	110	98	80	98
Jibu	140/90	140	97	68	100
Cyril	110/70	100	99	90	99
Ajay	150/90	170	98	75	98

Table 2. Sample data collected

VII. CONCLUSION

Health consultancy through mobile phones is getting population across the Bottom of Pyramid (BoP) markets. Popular services include Gram Health, Gram Vaani [2] and others. Our project is a step in the direction of providing healthcare facilities to remote rural areas though tele-consulting. Our project specifically focuses on the tribal population which is a marginalized section of society in India.

Future development of this project involves the implementation of a video -based consulting. For this, the internet infrastructure in the area needs to be developed. For this, we aim to incorporate specific applications aimed at providing internet facility in rural India like N-Logue. N-loge offers internet and voice services through its wireless access system called Correct. This system offers 35/70 kbps internet access. This service is already offered successfully in the states of Maharashtra, Gujarat and Tamil Nadu [4].

This project also offers immense possibilities of big data analytics on health parameters in India. Currently a large portion of rural health records are maintained in hard copies that are likely to get damaged or lost. Our system offers the possibility of digitization of entire medical records of patients leading to possibilities of predictive analysis. If the proposed system is implemented in the large scale, the immense volume of data developed could be used for predicting outbreak of epidemics and other diseases. Such predications can help the health department to take preventive steps before the actual outbreak.

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A Review Paper on Solar Energy System

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Abstract - The plant (an arrangement of solar panels) which converts solar energy to light energy from the sun into electrical energy (charge emission) is called a solar power plant process. In solar plant there are many solar panels are connected and in panels there are many cells units which make panels. In which special metal is used which is in the form of lines and these lines are also connected to very thin lines and all these lines are connected to a metal line frame which is mainly quadrilateral in shape. So there is large area to trap light i.e. now there is a suitable area for light to fall on it as the metal arrangement in large to fall on it electrons start's to emit from thin lines to metal frame and current goes into a diode box which is behind the panel and then comes into supply wires.

Keywords: CSP, DER, FIT

INTRODUCTION

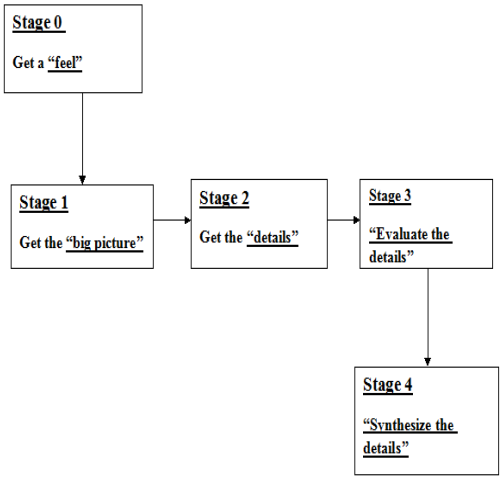
When a suitable light of certain frequency (i.e E=hv energy of light depends on its frequency) is fall on a special metal like silicon, electrons get some energy of suitable frequency which is greater than work function[work function is minimum energy required by an electron to emit from metal surface . So there is no photoelectric emission possible below work function (w≤E) and emit from the conduction band and come out from metal surface. Like that other electron come out and form a big unit of charge flow which is responsible for electric current.

- First, the projects tend to reduce the overall cost of the energy technology as large Scale utilization of a particular technology, in general, tends to reduce the cost of that technology. This has also encouraged the entrepreneurs to invest in solar energy technologies.
- Second, the projects are serving as test platforms for large scale solar energy Utilization technologies.
- Third, these projects are engaging the academic institutions in long-term solar Energy research, development, and pedagogical activities.
- Fourth, these projects have increased the awareness of green technologies.

Fig. 1 Solar Cells

II. REVIEW PROCESS ADOPTED

A literature review is necessary to know about the research area and what problem in that area has been solved and need to be solved in future. This review process approach were divided into five stages in order to make the process simple and adaptable. The stages were:-



Stage 0: Get a "feel"

This stage provides the details to be checked while starting literature survey with a broader domain and classifying them according to requirements.

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Stage 3+: "Synthesize the detail"

Stage 3+ deals with evaluation of the details presented and generalization to some extent. This stage deals with synthesis of the data, concept & the results presented by the authors.

III. How to Calculate Size of Solar Panels, Battery and Solar Inverter in India

Power (in watts) = Voltage x Current

How to calculate size of solar system in India?

Most of the solar installations in India are off-grid because our country, India, faces frequent power cuts. Off grid solar installation has 3 key components: **solar panels, battery and solar PCU (solar PCU is a solar inverter with built-in solar charge controller).** To calculate size of solar system, it is important to follow these steps:

Step 1: Calculate your total load that you want to run

You should know how much power (in watts) your electrical appliances consume. For example, a tube light consumes 40watts, fan consumes 80 watts etc. You should add the electrical load (in watts) that you wish to use. Let's assume that you added everything and the figure that you get is **1000 watts**.

Step 2: Size your solar inverter based on electrical load

After know the total electrical load, the next thing that you have to do is find a solar inverter that can power the load. **In this case where your total electrical load is 1000 watts, you should choose an inverter of 1600 watts**. It is advisable to oversize the inverter because unfortunately DC to AC conversion that solar inverters do causes loss of energy. It is also good to know that a 1600 watts inverter comes in 24v (v = voltage). Remember this because we are going to use this fact ahead in our calculations.

Step 3: Calculate the total current of your load

Power (in watts) = Voltage x Current

In our example, the power (watts) is 1000 and we already know the voltage to be 24v. Let's insert these figures into our formula.

1000 (watts) = 24V x current

1000/24 = 41.66 amps

Let's round it off to 41 amps. Now our solar system needs to generate at least 41 amps of current to power the connected electrical load.

Step 4: Decide how many hours of battery backup you need – buy battery based on that

The next step in calculating size of solar system in India is to think how many hours of backup you need. Remember, solar PCU/inverter will directly power your electrical load through solar. However, when solar is not available, the solar energy stored in batteries can be used to power load. Let's say you need backup of 5 hours. Now there is a very simple formula to calculate size of battery based on your total load and backup time required.

Total load (in watts) x hours of backup needed / 24

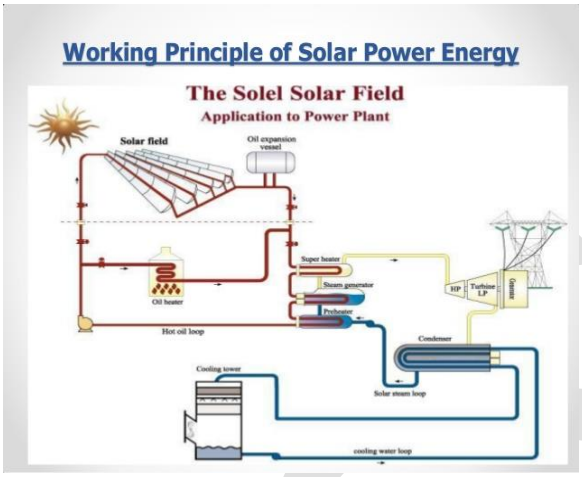

Fig. 2 Solar Power Energy System

Why should we divide by 24? Because our inverter is 24v. Let's put the figures from our example in this formula: 1000 (watts) x 5 hours / 24 = 208

Let's round it off to 300AH because it is OK to have extra backup. We can install 2 batteries of 150Ah.

Step 5: Calculate size of solar panels based on battery size and current of electrical load

Yes, sizing of solar panels comes at the last because panels are either going to feed the battery or run electrical load. They need to produce enough voltage and current to charge the battery properly and to run electrical load. So how do we decide the size of solar panels?

Charging Current of Battery = 1/10th of its Total AH.

In this case, we have 300ah so if we divide it by 10 we get 30amps. Our solar panels need to make 30 amps of current to feed our battery bank.We already calculated that our electrical load will need 41amps to run. We need to add this to the amps that our battery bank is going to take: 30+41 = 71amps.

Our solar panels should make 71amps.

Fact: On an average, 250 watts solar panels have a voltage of 30v. Power = Volts x Amps

Amps: We calculated in the last step that we need 71amps (30amps to feed the battery bank and 41amps to run the electrical load directly through solar).

Power = 30x71amps = 2130 watts. Let's round it off to 2500 watts because you can't have 2130 watts panels.

This is our answer: We need to install panels of 2500 watts to feed our battery bank and run electrical load.

So, we can go for 10 panels of 250 watts each.

IV. CONCLUSION

Solar power is an immense source of directly useable energy and ultimately creates other energy resources: biomass, wind, hydropower and wave energy.

Most of the Earth's surface receives sufficient solar energy to permit low-grade heating of water and buildings, although there are large variations with latitude and season. At low latitudes, simple mirror devices can concentrate solar energy sufficiently for cooking and even for driving steam turbines.

The energy of light shifts electrons in some semiconducting materials. This photovoltaic effect is capable of large-scale electricity generation. However, the present low efficiency of solar PV cells demands very large areas to supply electricity demands.

Direct use of solar energy is the only renewable means capable of ultimately supplanting current global energy supply from non-renewable sources, but at the expense of a land area of at least half a million km^2.

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Design & Analysis of Low-Power Low-Voltage Double-Tail Comparator

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Abstract- The need for ultra low-power, area efficient and high speed analog-to-digital converters is pushing toward the use of dynamic regenerative comparators to maximize speed and power efficiency. In the base paper, an analysis on the delay of the dynamic comparators will be presented and analytical expressions are derived. From the analytical expressions, designers can obtain an intuition about the main contributors to the comparator delay and fully explore the tradeoffs in dynamic comparator design. Based on the presented analysis, a new dynamic comparator is proposed, where the circuit of a conventional double tail comparator is modified for low-power and fast operation even in small supply voltages. Without complicating the design and by adding few transistors, the positive feedback during the regeneration is strengthened, which results in remarkably reduced delay time. Post-layout simulation results in a 0.18-µm CMOS technology confirm the analysis results.

I. INTRODUCTION

Comparator is one of the building blocks in most of the Analog- to- Digital converter. High-speed comparators in ultra deep sub micrometer (UDSM) CMOS technologies suffer from low supply voltages especially when considering the fact that threshold voltages of the devices have not been scaled at the same pace as the supply voltages of the modern CMOS processes [1]. Designing high-speed comparators is more challenging when the supply voltage is smaller. In this technology to achieve high speed, larger

transistors are required to compensate the reduction of supply voltage, which also means that more die area and power is needed. Low –Voltage operation results in limited common-mode input range, which is important in many high-speed ADC architectures, such as flash ADCs.

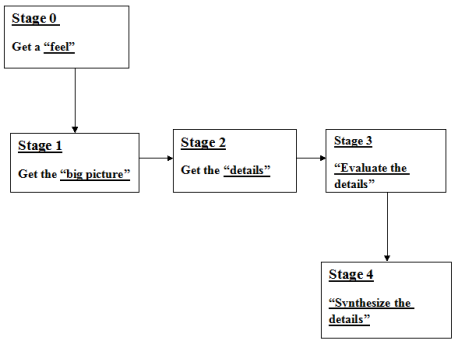
In electronics, a comparator is a device that compares two voltages or currents and outputs a digital signal indicating which is larger. It has two analog input terminals V_+ and V_- and one binary digital output V_o. The output is ideally

$$V0 = \begin{cases} 1, \text{if } V_+ > V_- \\ 0, \text{if } V_+ < V_- \end{cases}$$

A comparator consists of a specialized high-gain differential amplifier. They are commonly used in devices that measure and digitize analog signals, such as analog-to-digital converters (ADCs), as well as relaxation oscillators.

II.REVIEW PROCESS ADOPTED

A literature review is necessary to know about the research area and what problem in that area has been solved and need to be solved in future. This review process approach were divided into five stages in order to make the process simple and adaptable. The stages were:-



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III. VARIOUS ISSUES IN THE AREA

After reviewing 31 research papers on designing and implementation of Low-Power Low-voltage Double –Tail Comparator we have found following issues:

a) CONVENTIONAL DYNAMIC COMPARATOR

b) CONVENTIONAL DOUBLE-TAIL DYNAMIC COMPARATOR

c) DOUBLE-TAIL DYNAMIC COMPARATOR

IV. ISSUE WISE DISCUSSION

a) ***Issue1*:-** CONVENTIONAL DYNAMIC COMPARATOR

The schematic diagram of the conventional dynamic comparator widely used in A/D converters, with high input impedance, rail-to-rail output swing, and no static power consumption is shown in Fig. 4.1 [1], [17]. The operation of the comparator is as follows. During the reset phase when CLK = 0 and M_{tail} is off, reset transistors (M7–M8) pull both output nodes Out_n and Out_p to VDD to define a start condition and to have a valid logical level during reset. In the comparison phase, when CLK = VDD, transistors M7 and M8 are off, and M_{tail} is on.

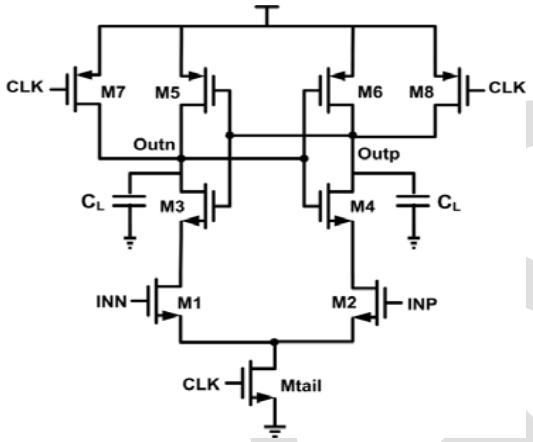

FIG. NO. 4.1 CONVENTIONAL DYNAMIC COMPARATOR

Output voltages (Out_{put}, Out_n), which had been pre-charged to VDD, start to discharge with different discharging rates depending on the corresponding input voltage (INN/INP). Assuming the case where VINP > VINN, Outp discharges faster than Out_n, hence when Out_p (discharged by transistor M2 drain current), falls down to VDD–|Vthp| before Outn (discharged by transistor M1 drain current), the corresponding PMOS transistor (M5) will turn on initiating the latch regeneration caused by back-to-back inverters (M3, M5) and M4, M6). Thus, Outn pulls to VDD and Outp discharges to ground. If VINP < VINN, the circuits works vice versa. As shown in Fig. 3.1, the delay of this comparator is comprised of two time delays, t0 and t_{latch}.

The delay t0 represents the capacitive discharge of the load capacitance CL until the first p-channel transistor (M5/M6) turns on. In case, the voltage at node INP is bigger than INN (i.e., VINP > VINN), the drain current of transistor M2 (I2) causes faster discharge of Outp node compared to the Out n node, which is driven by M1 with smaller current.

b) ***Issue 2*:-** CONVENTIONAL DOUBLE-TAIL DYNAMIC COMPARATOR

A conventional double-tail comparator is shown in Fig. 3.2 [10]. This topology has less stacking and therefore can operate at lower supply voltages compared to the conventional dynamic comparator. The double tail enables both a large current in the latching stage and wider Mtail2, for fast latching independent of the input common-mode voltage (Vcm), and a small current in the input stage (small Mtail1), for low offset [10].

The operation of this comparator is as follows , During reset phase (CLK = 0, Mtail1, and Mtail2 are off), transistors M3-M4 pre-charge fn and fp nodes to VDD, which in turn causes transistors MR1 and MR2 to discharge the output nodes to ground. During decision-making phase (CLK = VDD, Mtail1 and Mtail2 turn on), M3-M4 turn off and voltages at nodes fn and fp start to drop with the rate defined by IMtail1/Cfn(p) and on top of this, an input-dependent differential voltage Vfn(p) will build up. The intermediate stage formed by MR1 and MR2 passes Vfn(p) to the cross coupled inverters and also provides a good shielding between input and output, resulting in reduced value of kickback noise [10].

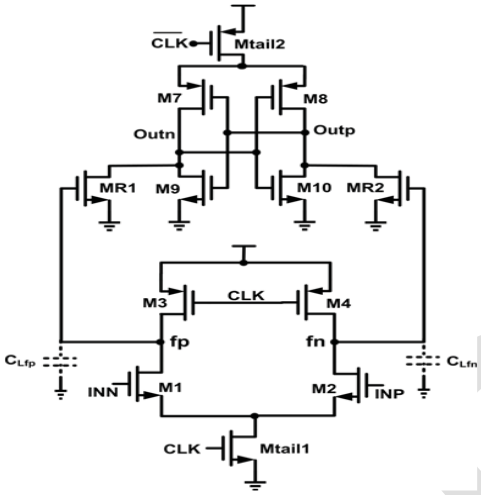

FIG. NO. 4.2 CONVENTIONAL DOUBLE TAIL DYNAMIC COMPARATOR

Similar to the conventional dynamic comparator, the delay of this comparator comprises two main parts, t0 and tlatch. The delay t0 represents the capacitive charging of the load capacitance CLout (at the latch stage output nodes, Outn and Outp) until the first n-channel transistor (M9/M10) turns on, after which the latch regeneration starts; thus t0 is obtained where IB1 is the drain current of the M9 (assuming VINP > VINN) and is approximately equal to the half of the tail current (Itail2). After the first n-channel transistor of the latch turns on (for instance, M9), the corresponding output (e.g., Outn) will be discharged to the ground, leading front p-channel transistor (e.g., M8) to turn on, charging another output (Outp) to the supply voltage (VDD).

a) ***Issue 3:-*** DOUBLE-TAIL DYNAMIC COMPARATOR

Due to the better performance of double-tail architecture in low-voltage applications, the proposed comparator is designed based on the double-tail structure. The main idea of the proposed comparator is to increase Vfn/fp in order to increase the latch regeneration speed. For this purpose, two control transistors (Mc1 and Mc2) have been added to the first stage in parallel to M3/M4 transistors but in a cross-coupled.

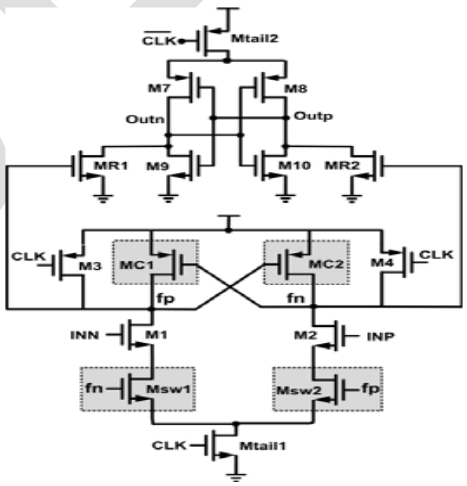

FIG. NO. 4.3 DOUBLE TAIL DYNAMIC COMPARATOR

V. Different Circuit Parameters used for Experimentation:-

TABLE I SUMMARY OF THE COMPARATOR PERFORMANCE

Item	Value
Technology	180-nm CMOS
Supply voltage	1.2 V
Average power dissipation per conversion @ freq. = 500 MHz	329 μW
Worst case delay (Vcm = 0.6 V, _Vin = 1 mV)	550 ps
Delay/log(_Vin)	69 ps/dec
Offset standard deviation (1-sigma) (σos)	7.8 mV
Energy efficiency	0.66 pJ

The performance of the conventional dynamic comparator, Double-tail dynamic comparator & proposed dynamic comparator & their structure can be compared by following table:-

TABLE II PERFORMANCE COMPARISON

Comparator structure	Double-tail Dynamic comparator	Proposed Dynamic Comparator	Conventional Dynamic comparator
Technology CMOS	180nm	180nm	180 nm
Supply voltage (V)	0.8 V	0.8 V	0.8 V
Maximum sampling frequency	1.8 GHz	2.4 GHz	900 MHz
Delay/log(_Vin) (ps/dec.)	358	294	940
Peak transient noise voltage at regeneration time(nV)	221 n	219 n	215n
Energy per conversion (J)	0.27p	0.24p	0.3p

VI. Result-

CONVENTIONAL DYNAMIC COMPARATOR FOR 130 nm

Conventional dynamic comparator is a design in which two voltages are comparing. Input voltage 1.2 V and we are comparing the results Vn and Vp voltages. In the starting we are giving the Vp > Vn . Vp = 1.0 v and Vn = 0.5 V.

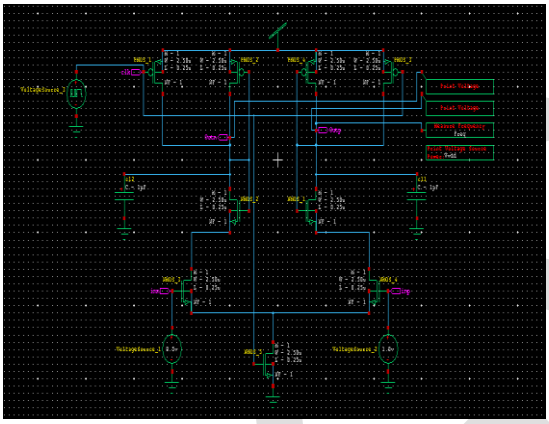

Fig. no. 6.1 Conventional dynamic comparator

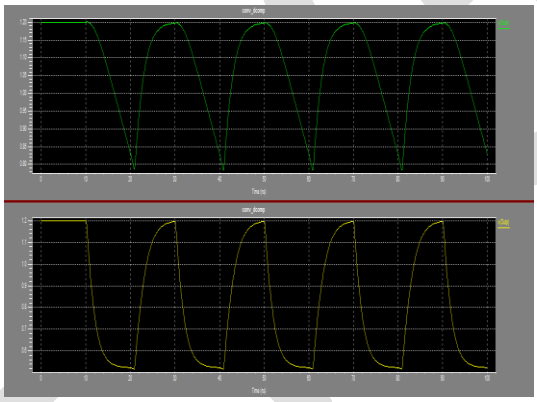

Fig. no. 6.2Waveform for Conventional dynamic comparator

CONVENTIONAL DOUBLE-TAIL DYNAMIC COMPARATOR AT 130 nm

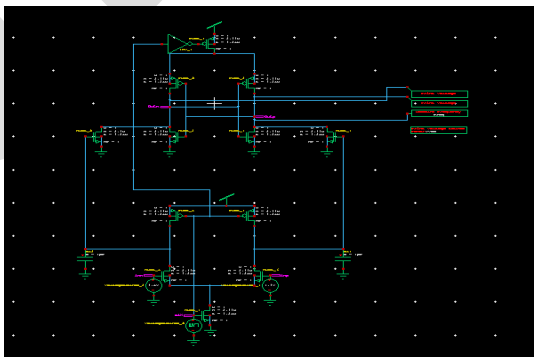

Fig. no. 6.3Conventional Double-Tail Dynamic Comparator

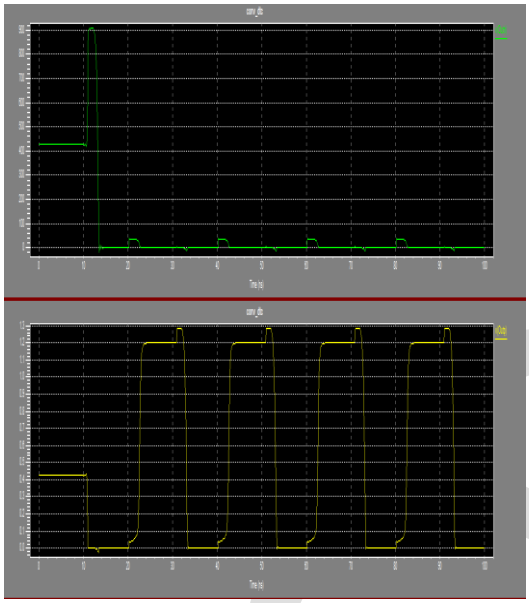

Fig. no. 6.4Waveform for Conventional Double-Tail dynamic comparator

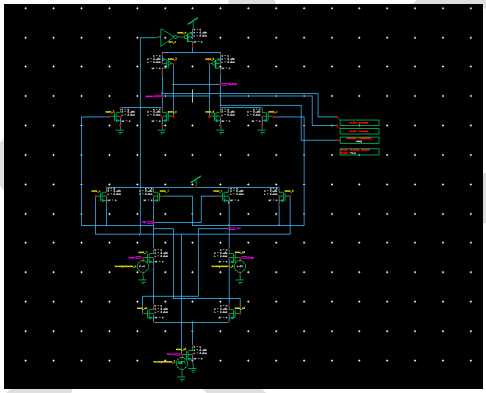

Fig. no. 6.5 Double-Tail Dynamic Comparator

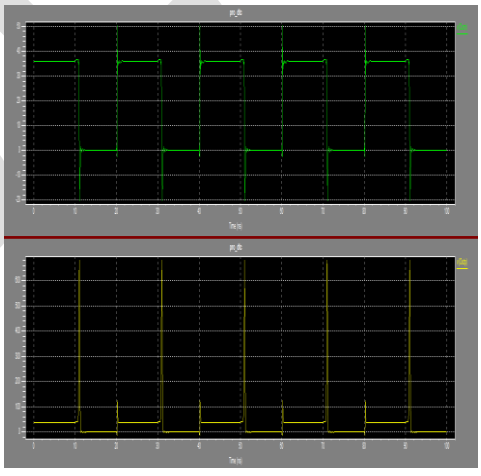

Fig. no. 6.6 Waveform of Double-Tail Dynamic Comparator

VII. Conclusion

In the total experimental work we presented a comprehensive delay analysis for clocked dynamic comparators and expressions were derived. Two common structures of conventional dynamic comparator and conventional double-tail dynamic comparators were analyzed. Also, based on theoretical analyses, a new dynamic comparator with low-voltage low-power capability was proposed in order to improve the performance of the comparator. Post-layout simulation results in 0.18-μm CMOS technology confirmed that the delay and energy per conversion of the proposed comparator is reduced to a great extent in comparison with the conventional dynamic comparator and double-tail comparator.

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PHYSIO-CHEMICAL ANALYSIS OF WATER SAMPLES FROM DISTRICT KARNAL, HARYANA, INDIA

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Abstract: The analysis of physiochemical parameters of groundwater from different locations of District Karnal, Haryana was carried out. The physiochemical parameters namely pH, electrical conductivity, Total Dissolved Solids, Total Alkalinity, Total Hardness, Chloride, Calcium, Magnesium, and dissolved oxygen were determined. Each parameter was compared with the standard desirable limits prescribed by World Health Organization (WHO), Bureau of Indian Standard (BIS) and Indian Council of Medical Research (ICMR) to assess the quality of ground water. Systematic calculation was made to determine the correlation coefficient 'r' amongst the parameters. Significant value of the observed correlation coefficients between the parameters was also carried out. It is concluded that the water quality of water supply systems in different locations of Karnal is of medium quality and suitable suggestions were made to improve the quality of water.

Keywords: pH, Kurukshetra, ground water, water quality, physiochemical parameter, water pollution

1. INTRODUCTION

Water is the most important natural resource on earth. We cannot imagine our life without water because we need it for different purposes. The main applications of water are domestic uses, irrigation, commercial uses, industrial uses and for the production of hydropower. Safe drinking water is the primary need of all human beings. The safety of drinking water is affected by various chemical and microbiological contaminants and these contaminants cause serious health problems. Due to these contaminants, the quality of the drinking water is getting poorer day by day, which causes many diseases in the humans. Water pollution may occur due to different phenomenon. In the villages, domestic sewage and animal wastes are leading causes of ground water pollution [1-4]. Quality of ground water is continuously changing due to natural and human activities. It varies from place to place and with the depth of the water table. Most of the waste products seep down into soil and hence contaminating the underlying ground water. Therefore all ground water sources are not safe. So, physiochemical analysis can be used to monitor water quality.

Many investigations have found a correlation between cardiovascular deaths and water composition. Many workers have studied the physio-chemical parameters of ground water from different areas of India [5-18]. The objective of the scientific investigations is to determine the hydrochemistry of the ground water in Karnal, Haryana and to classify the water in order to evaluate the water suitability for drinking, domestic and irrigation uses and its suitability for municipal, agricultural and industrial use. The social relevance of the problem has encouraged us in carrying out this work.

2. MATERIALS AND METHODS

Physio-Chemical Analysis was carried out for various water quality parameters such pH, electrical conductivity (EC), Total dissolved solids (TDS) , Total Hardness (TH), Total alkalinity (TA), Calcium (Ca^{2+}), Magnesium (Mg^{2+}), Dissolved oxygen (DO), as per standard procedure described "Standard methods for the examination of water and waste water American public Health Association (APHA)" [19]. The physical parameter pH was determined using the digital pH meter (LT-10, Labtronics, Panchkula, India) and EC was determined using the digital conductivity meter (LT-16, Labtronics, Panchkula, India).

2.1 STUDY AREA

The water samples were collected from nineteen locations of District Karnal for their physio-chemical analysis. The different sampling locations are given in Table 1. Samples were collected in good quality polythene bottles of one-liter capacity. Sampling of water is truly representative of any aquatic environment. Once a sample has been taken it should have no possibility of transporting trace elements either to or from the sampling container walls. Sampling was carried out without adding any preservative. The bottles were well rinsed before sampling and tightly sealed after collection and labeled in the field.

TABLE 1: SAMPLING LOCATIONS OF KARNAL

Sr. No.	Sampling Locations	Source	Location Code
1.	Kachwa Village	Submersible Tube well	K1
2.	Dabri Village	Hand pump	K 2
3.	Gandhi Nagar	Submersible Tube well	K 3
4.	Gandhi Nagar	Hand pump	K 4
5.	Bank Colony	Tube well	K 5
6.	Nirmal Kuttia (Zarifa Farms)	Submersible Pump	K 6
7.	Saudagar House, Pal Nagar	Submersible Pump	K 7
8.	Maan Colony	Tube well	K 8
9.	Railway Station	Tube well	K 9
10.	Bus Stand	Tube well	K 10
11.	Jyoti Nagar	Submersible Pump	K 11
12.	Nikka Singh Kuttia, By pass Karnal	Submersible Pump	K 12
13.	Civil Hospital	Submersible Pump	K 13
14.	CSSIR	Tube well	K 14
15.	Kalampura Village	Submersible Tube well	K 15
16.	NDRI, Karnal	Submersible Pump	K 16

17.	Sanatan Dharam Mandir, Kunjpura Road	Submersible Pump	K 17
18.	Model Town, Karnal	Submersible Pump	K 18
19.	Rambagh Colony Near Randhir Cinema	Submersible Pump	K 19

3. RESULTS AND DISCUSSIONS

Characterization of the physiochemical parameters of groundwater from nineteen different locations in Karnal, Haryana are reported in Table 2. Each parameter was compared with the standard desirable limits prescribed by World Health Organization (WHO), Bureau of Indian Standard (BIS) and Indian Council of Medical Research (ICMR) to assess the quality of ground water [20-21]. The physiochemical parameters namely pH, electrical conductivity, Total Dissolved Solids, Total Alkalinity, Total Hardness, Chloride, Calcium, Magnesium, and dissolved oxygen were determined. Systematic calculation was made to determine the correlation coefficient 'r' amongst the parameters.

TABLE 2: PHYSIOCHEMICAL PARAMETERS OF GROUNDWATER FROM DIFFERENT LOCATIONS IN KARNAL, HARYANA

Sr. No.	Location Code	pH	EC(25°C) (µs/cm)	TDS (ppm)	TA (ppm)	TH (ppm)	Ca^{2+} (ppm)	Mg^{2+} (ppm)	DO (ppm)
1.	K1	6.94	1200	780	305	497.29	118.91	378.38	2.6
2.	K 2	6.92	900	585	215	356.76	210.81	145.95	2.9
3.	K 3	6.91	500	325	100	351.35	205.40	145.95	3.8
4.	K 4	7.23	400	260	60	443.24	248.65	194.59	2.3
5.	K 5	6.94	700	455	160	367.57	108.11	259.46	2.3
6.	K 6	7.07	1100	715	240	243.24	151.35	91.89	7.3
7.	K 7	7.21	1000	650	250	286.49	178.38	108.11	6.0
8.	K 8	6.92	300	195	55	189.19	108.11	81.08	6.2
9.	K 9	7.08	1100	715	195	524.32	281.08	243.24	4.8
10.	K 10	6.93	700	455	145	378.38	156.76	221.62	6.9
11.	K 11	7.47	300	195	65	205.41	118.92	86.49	6.9
12.	K 12	7.16	500	325	105	329.73	189.19	140.54	5.0
13.	K 13	7.1	700	455	150	432.43	297.29	135.14	7.7
14.	K 14	6.98	500	325	110	335.14	189.19	145.95	6.3
15.	K 15	7.01	1100	715	245	508.11	118.92	389.19	4.2

16.	K 16	7.5	900	585	210	454.05	259.46	194.59	6.1
17.	K 17	7.2	1200	780	195	605.41	394.60	210.81	4.5
18.	K 18	7.3	700	455	170	367.57	194.60	172.97	7.1
19	K 19	7.5	1000	650	200	421.62	194.59	227.03	6.7

The desirable limit of pH value for drinking water is specified as 6.5 to 8.5. Measured pH value of the water samples ranges from 6.9 to 7.5. pH values are within desirable limit. The electrical conductivity of the samples ranges from 300μs/cm to 1200μs/cm. BIS prescribed that the desirable limit of TDS is 500 ppm and the maximum permissible level is 2000 ppm. The TDS value ranges from195 ppm to 780 ppm. TDS of all samples is within maximum permissible limit. The standard desirable limit of alkalinity in portable water is 120 ppm and the maximum permissible level is 600 ppm. The values of alkalinity in the water samples of villages of District Karnal are in between 55 ppm to 305 ppm. Total alkalinity of all samples is within maximum permissible limit but in maximum samples it is above desirable limit. The value of alkalinity of water provides an idea of natural salts present in water. Main cause of alkalinity is the mineral, which dissolves in water from the soil. Water hardness is a measure of capacity of water to react with soap. Hardness is very important property of ground water from utility point of view for different purposes. Standard permissible limit for total hardness specified by ICMR and BIS is 300 ppm of $CaCO_3$. A fluctuating trend, i.e., from 189.19 ppm to 605.41 ppm is observed in the measured total hardness values in the samples. Also, in maximum samples it is above permissible limit. For domestic use, the maximum desirable limit for calcium is 75 ppm whereas in case of non availability of water, calcium upto 200 ppm could be accepted. Calcium concentration in water samples from all the locations was found to vary from 108.11 ppm to 394.60 ppm. It is above maximum desirable limit in all samples. Also, in many samples it is above maximum permissible limit. Magnesium concentration in water samples from all the locations ranged from 81.08 ppm to 389.19 ppm. The highest permissible limit of Magnesium concentration is 150 ppm. Magnesium concentration in most of the samples is above the highest permissible limit. Dissolved oxygen (DO) in water is the vital gas for many animal organisms. It is consumed in water from decomposition of organic matters. It is a highly fluctuating factor in water. In this study dissolved oxygen content varied in a limited range of 2.3 ppm to 7.7 ppm.

4. CORRELATION STUDIES

Study of correlation reduces the range of uncertainty associated with decision making. The correlation coefficient ‘r’ was calculated using the equation

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \times \sum y^2}}$$

The correlation matrix for the water quality parameters are given in Table 3.

TABLE 3: CORRELATION MATRIX FOR THE WATER QUALITY PARAMETERS

Parameters	pH	EC	TDS	TA	TH	Ca^{2+}	Mg^{2+}	DO
pH	1	0.0081	0.0081	-0.0325	0.0434	0.2651	0.7315	0.3931
EC		1	0.9999	0.9349	0.6129	0.2618	0.5463	-0.1154
TDS			1	0.9348	0.6128	0.2617	0.5464	-0.1153
TA				1	0.4382	0.0205	0.5344	-0.1109
TH					1	0.6126	0.7315	-0.1662
Ca^{2+}						1	-0.0909	0.0269
Mg^{2+}							1	-0.5057
DO								1

4.1 TEST OF SIGNIFICANCE OF THE OBSERVED CORRELATION COEFFICIENTS

Significance of the observed correlation coefficient has been tested by using 't' test. A total of 36 correlations were found between the two parameters. Negative correlations were found in cases between the TA and pH, between TDS and DO, between TH and DO, between Mg and DO, TA and DO, between DO and EC, between Ca and Mg. Some of the highly significant correlations were discernible between the EC and total dissolved solids, between EC and TA, between TDS and TA.

5. CONCLUSIONS

Study of physiochemical parameters of groundwater from nineteen areas of District Karnal, Haryana was carried out. Theses samples were collected from different locations. The water samples were analyzed for pH, EC, total alkalinity, total hardness, soluble cations Ca^{2+} and Mg^{2+} following the standard procedures. The quality of drinking water depends upon the harmful elements present in it. Systematic calculation was made to determine the correlation coefficient 'r' amongst the parameters. Significant value of the observed correlation coefficients between the parameter was also carried out. The results showed significant variations in water quality parameter in the study areas. Total Alkalinity of all samples is within maximum permissible limit but in most of the samples average of alkalinity has exceeded the desirable limits which are due to improper drainage system and due to domestic and agricultural activities in the villages. TDS of all samples is within maximum permissible limit. Total Hardness in maximum samples is above permissible limit. Calcium concentration is above maximum desirable limit in all samples. Also, in many samples it is above maximum permissible limit too. Magnesium concentration in most of the samples is above the highest permissible limit.

Ground water of the villages of District Karnal is suitable for drinking and domestic purposes but in some areas there is need of treatment to minimize the contamination specially alkalinity. However, the hazardous effects of fertilizers, pesticides, animal wastes and sediments have not been detected in the ground water samples. It is advised that waste products should not be deposited near the water sources. The use of fertilizers and pesticides in the agriculture should be limited.

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To Analyse T-shape Thermal Expansion with Reduced Length

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Abstract-In this paper we compare the T-shape thermal expansion with varying its length using COMSOL Tool. Thermal expansion is very imperative device used in MEMS. When we change the length of the device than the displacement produced in the device is changed which is further used in Fire Alarm & Bimetallic strips. The change in length also causes shift in position vs displacement graph.

Keywords: MEMS, COMSOL, Bimetallic Strip, Fire alarm

I INTRODUCTION

Microelectromechanical systems (MEMS) devices contain both electrical and mechanical components and are in use and under development for applications in the consumer products, automotive, environmental sensing, defense, and health care industries. Thermal microactuators are standard components in microsystems and can be powered electrically through Joule heating.[1] Thermal actuator designs using a single material are both symmetric, referred to as bent-beam or V-shaped, structures.[2,3] Z shaped thermal actuator are used for force or displacement sensor.[4] Rectangular shape thermal expansion is used for Bimetallic strips.[5] Automatic Fire alarm system based on the Wireless Sensor Network.. So this type of Thermal Expansion can be used in Fire Alarm.[6]

II DESIGNING

T shape geometry consists of 3 straight verticle rectangles of 10µm, 80µm and horizontal rectangle of 30µm, 10µm width, height respectively. With two alternate rectangles to connect T as shown in figure 1.

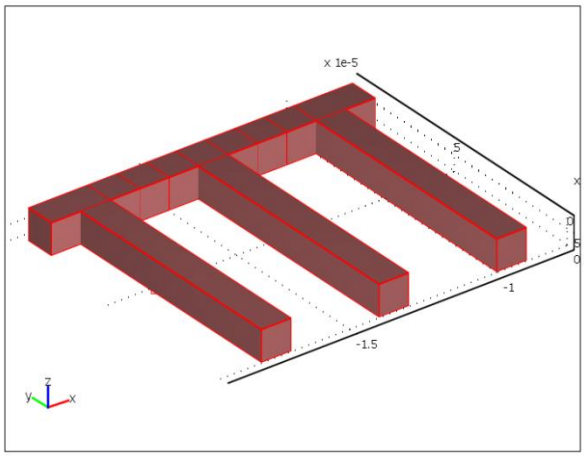

Figure1: Model Geometry of the Device

T shape geometry consists of 3 straight verticle rectangles of 10µm, 70µm and horizontal rectangle of 30µm, 10µm width, height respectively. With two alternate rectangles to connect T as shown in figure 2.

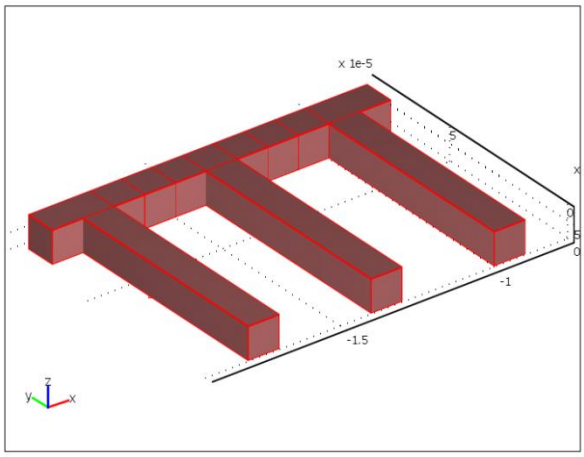

Figure 2: Model Geometry of the Device

When length is reduced to 60µm & whole dimensions are same which is shown in figure 3.

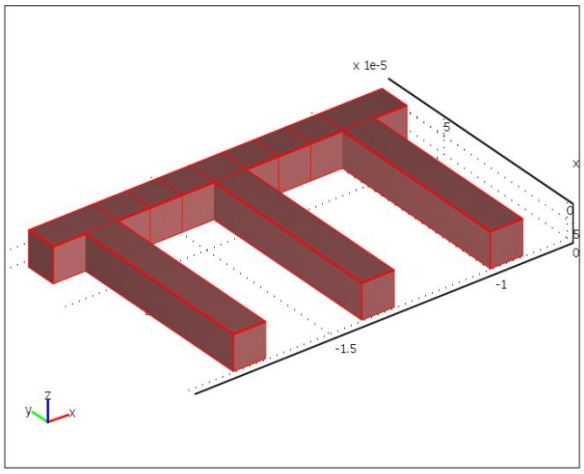

Figure 3: Model Geometry of the Device

When length is reduced to 50µm & whole dimensions are same which is shown in figure 4.

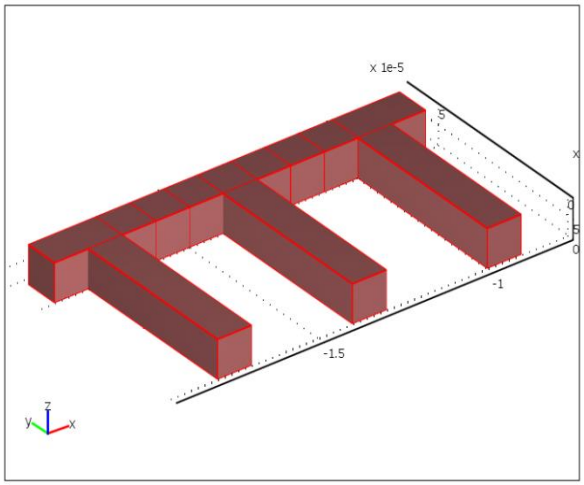

Figure 4: Model Geometry of the Device

When length is reduced to 40μm & whole dimensions are same which is shown in figure 5.

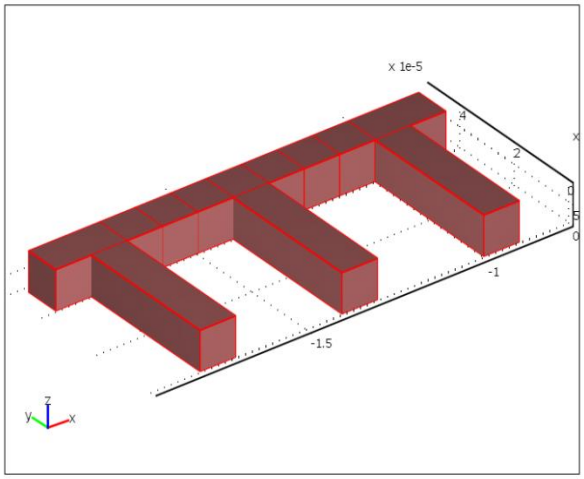

Figure 5: Model Geometry of the Device

III RESULT

When we use 298K as external temperature then the maximum displacement is $5.5*10^{-8}$. The figure 6 shows the temperature distribution in the device. The heat source increases the temperature to 323.18 K from an ambient temperature of 298 K. The temperature varies less than 1/100 of a degree in the device.

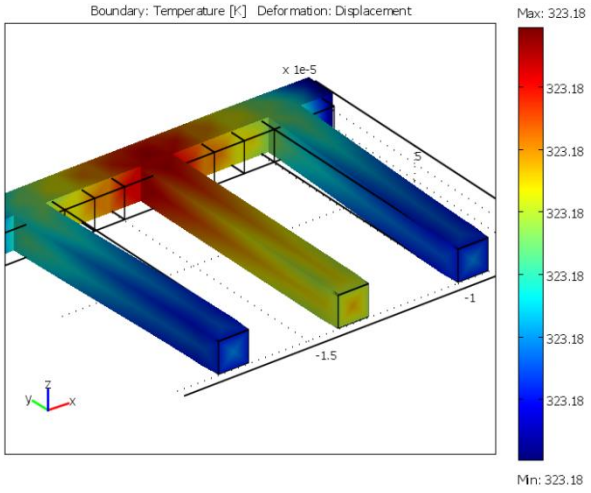

Figure 6: Temperature distribution of the Device at 298K

The figure 7 shows the displacement of a curve that follows the top inner edges of the device from left to right.

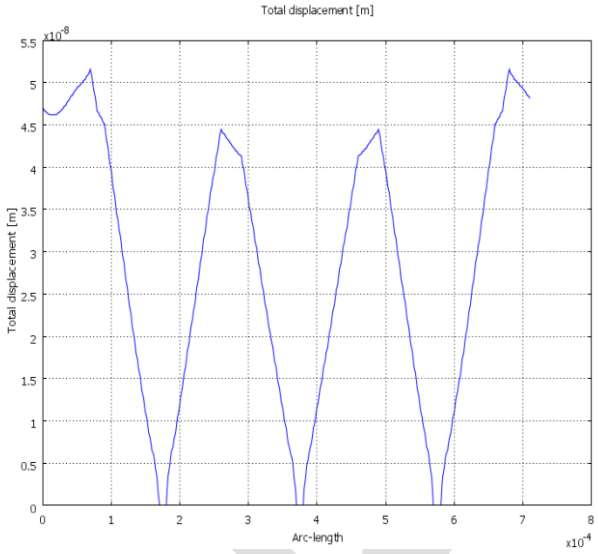

Figure 7: Displacement Vs Position graph

Figure 8 shows the temperature distribution of the device when length is reduced to 70 μm.

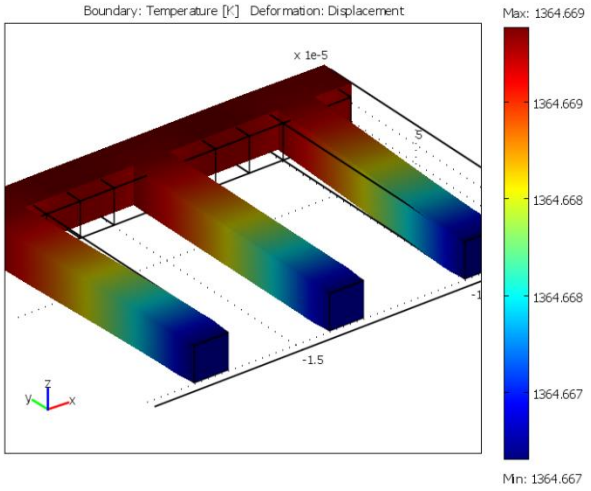

Figure 8: Temperature distribution of the Device at 298K

The figure 9 shows the displacement of a curve that follows the top inner edges of the device from left to right.

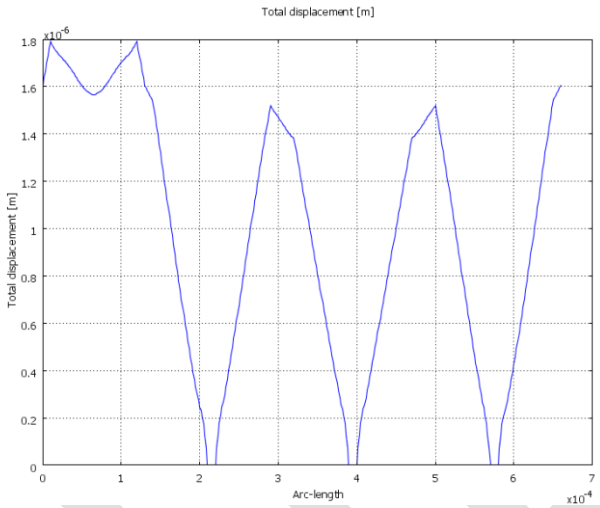

Figure 9: Displacement Vs Position graph

Figure 10 shows the temperature distribution of the device when length is reduced to 60 µm.

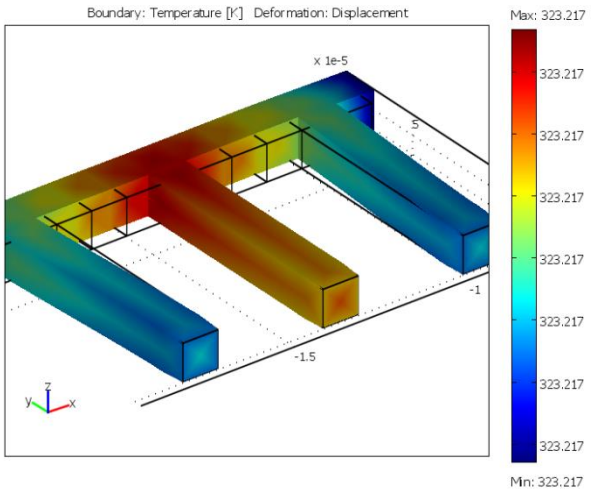

Figure 10: Temperature distribution of the Device at 298K

The figure 11 shows the displacement of a curve that follows the top inner edges of the device from left to right.

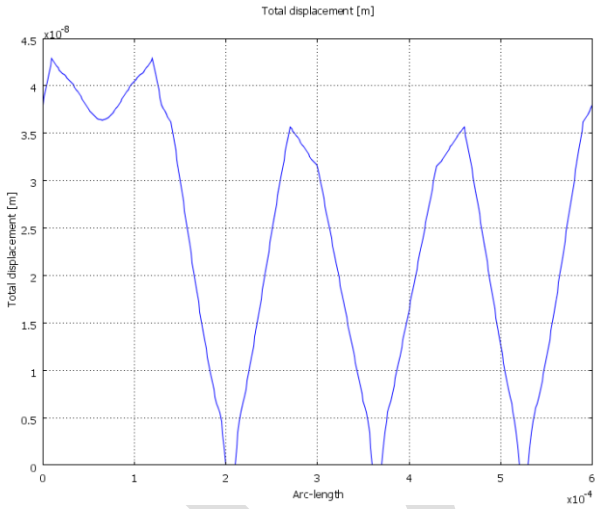

Figure 11: Displacement Vs Position graph

Figure 12 shows the temperature distribution of the device when length is reduced to 50 µm

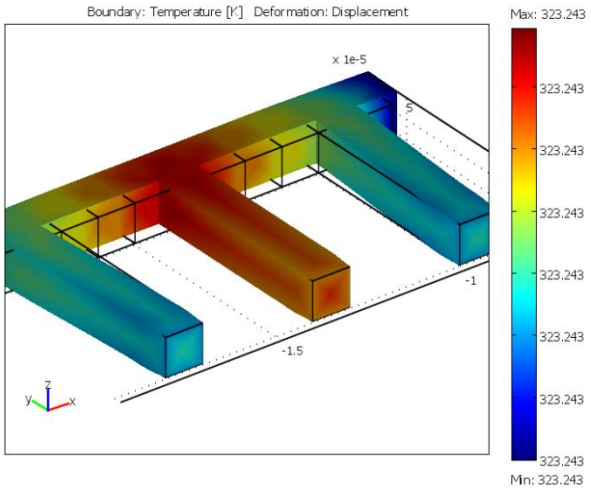

Figure 12: Temperature distribution of the Device at 298K

The figure 13 shows the displacement of a curve that follows the top inner edges of the device from left to right.

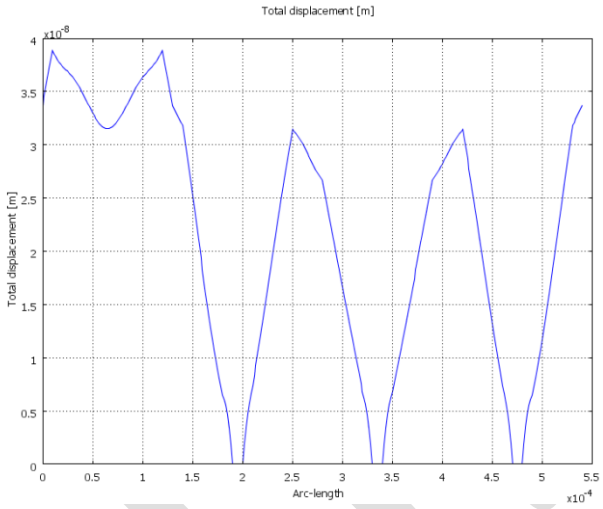

Figure 13: Displacement Vs Position graph

Figure 14 shows the temperature distribution of the device when length is reduced to 40 µm

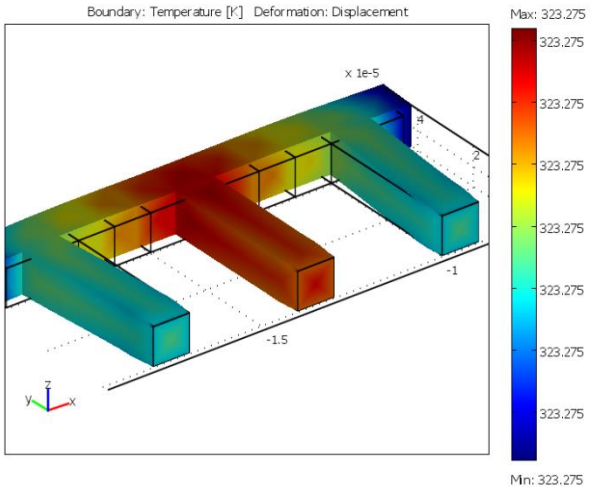

Figure 14: Temperature distribution of the Device at 298K

The figure 15 shows the displacement of a curve that follows the top inner edges of the device from left to right.

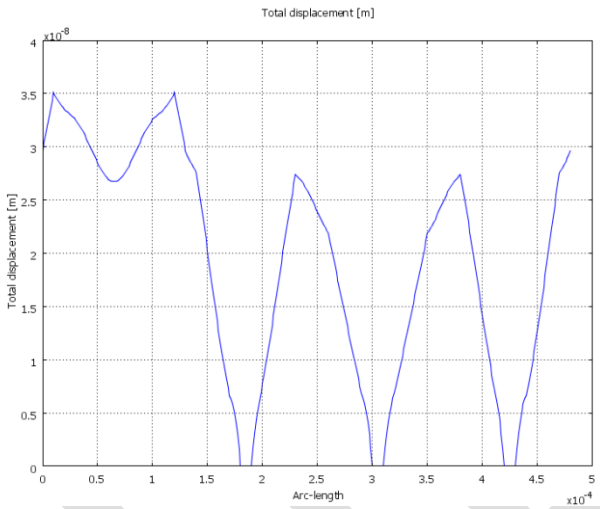

Figure 15: Displacement Vs Position graph

COMPARATIVE ANALYSIS

When we compare all the cases listed above (with reduced length) we noted that when length decreases by 80µm to 70 µm displacement increases by large amount & the graph is also shifted towards right.

Table1: Displacement at different length

Length of device	Displacement
8e-5	4.7e-8
7e-5	1.6e-6
6e-5	4e-8
5e-5	3.5e-8
4e-5	3e-8

When we decrease further length of the device then first there is large decrease in displacement & then there is small decreament as shown in figure 16.

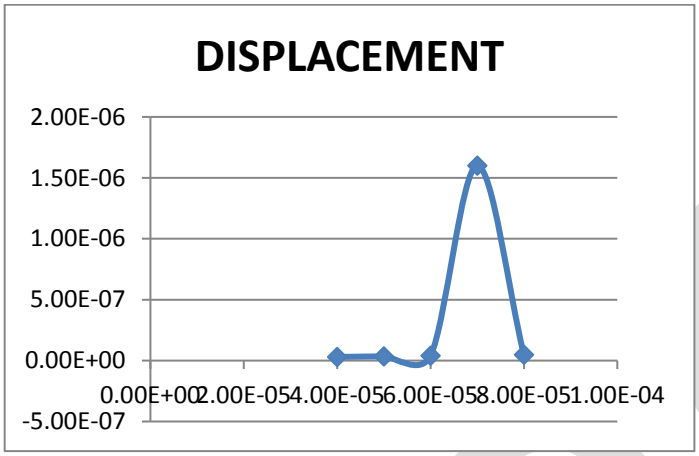

Figure 16: Displacement Vs Length grap

CONCLUSION

From result it is concluded that when we change the length of the device then displacement is also changes. First displacement increases & then decreases by large factor & then decreases by small factors. When displacement changes from 8e-5 to 7e-5 the displacement vs position graph also shift towards right.

PROPOSED FUTURE WORK

In future we wish to redesign the T shape thermal expansion with its reduced width. This would change the displacement in the top inner edges of the device. So we would redesign the device. We can reshape the device from T to H or any other.

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Comparitive Analysis Of Scaling Factor In Aerial View Using DBscan And Data Grid Algorithm

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ABSTRACT- The key problem in achieving efficient and develop user-friendly retrieval in the domain of image processing and also to estimate the density (height)of the snowfall in cross section view with scaling factors and density based algorithms. In this research work, an aerial digital images can be gathered from various background situations with 7.2MP resolution. After pre-processing the snowfall image, the proposed methodology can be implemented in order to identify the snowfall region using DBSCAN and data grid clustering algorithms. Using the clustering algorithm, the snowfall regions are clustered and segmented according to their size. After clustering the snowfall area, using binarization technique the total number of black pixels(1's) snowfall area are computed automatically. Final objective is to identify the suitable cluster density for landing the flight with respect to minimum density region and size for different sets of images in the snowfall occurrence area. The efficiency of the proposed methodology have been compared with DBSCAN and Data Grid algorithm with respect to memory usage and running time of the algorithms for different sets of aerial images.

Keywords- Binarization, clustering, DBSCAN , Data Grid algorithm, scaling factors.

I.INTRODUCTION

Contemporary methods for assessing the presentation of image mining algorithms are based on comparisons of one algorithm over the previous using the identical image datasets. This has led to diverse conclusions where now and again one of the algorithms is accessible as the best, while in other publications that equivalent algorithms performed in a different way. It is understood that some algorithms are finest appropriate to a particular type of image and that they will perform better when tested on these images. The projected study will based its evaluation on the use of diverse sets of images. Image Mining can do on dissimilar type of images like real time image, satellite image, and also in medical images. The Image Processing involves an assortment of steps namely; Image pre processing, Restoration, Analysis and Compression. Pre processing includes numerical correlation and radiometric correlation. The associated image is then fed for re-establishment task. In this research work, an aerial digital images can be gathered from various flight run way occurrence with snowfall as background situations.

The organization of the paper is structured as follows. Chapter 2 explains about the research problem and Data for Research .Chapter 3 demonstrates the proposed methodology. Chapter 4 reveals the Results and Discussion for image clustering and scaling factors techniques. Finally, Chapter 5 concludes the paper.

II.DATA FOR RESEARCH

In this research work, an aerial digital images can be gathered from various background situations with 7.2MP resolution. The original images where resized to a lower resolution of approximately 457x630 pixels so the algorithms chosen can process them more efficiently.

Figure 1 (a) and (b) shows the image datasets used for this study.

Fig 1(a) set1 image with snow

Fig 1(b) set2 image with snow

III. PROPOSED METHODOLOGY - GRID DENSITY PARAMETER ESTIMATION

The Grid Density is a base algorithm of density of cells based clustering. It requires user specified two global input parameters i.e. MinPts and Eps. The density of an object is the number of objects in its Eps-neighborhood of that object. Grid Density can specify upper limit of a core object i.e. how much objects may present in its Eps-neighborhood. So due to this, the grid density of clusters are detected by it, are having wide variation in local density and forms clusters with any arbitrary shape. Such clusters may be represented by several smaller clusters so that each cluster may have reasonably uniform density.

Grid Clustering Flowchart

The following diagram(2) represents the flowchart for Grid density based clustering for grouping of snowfall region according to black and white pixels in the flight runway area.

Distance between Black pixels(1's)

To clusters a dataset, the Grid Density implementation starts by identifying the k nearest neighbours black pixels(1's) of each point and identify the farthest k nearest neighbour (in terms of Euclidean distance ki). Let's consider O1 and O2 be two black pixels intensity values from the aerial digital images and k be the minimum distance between black pixels from the universe of possible objects. The distance between O1 and O2 is denoted by distance (O1,O2) or d(O1,O2) .

Euclidean distance = (O_i,O_j) = sqrt($\Sigma^n(O_ik - O_jk)^2$

= sqrt(5-3)2 + (6-9)2 + (4-3)2 + (9-2)2 = 8.25 cm

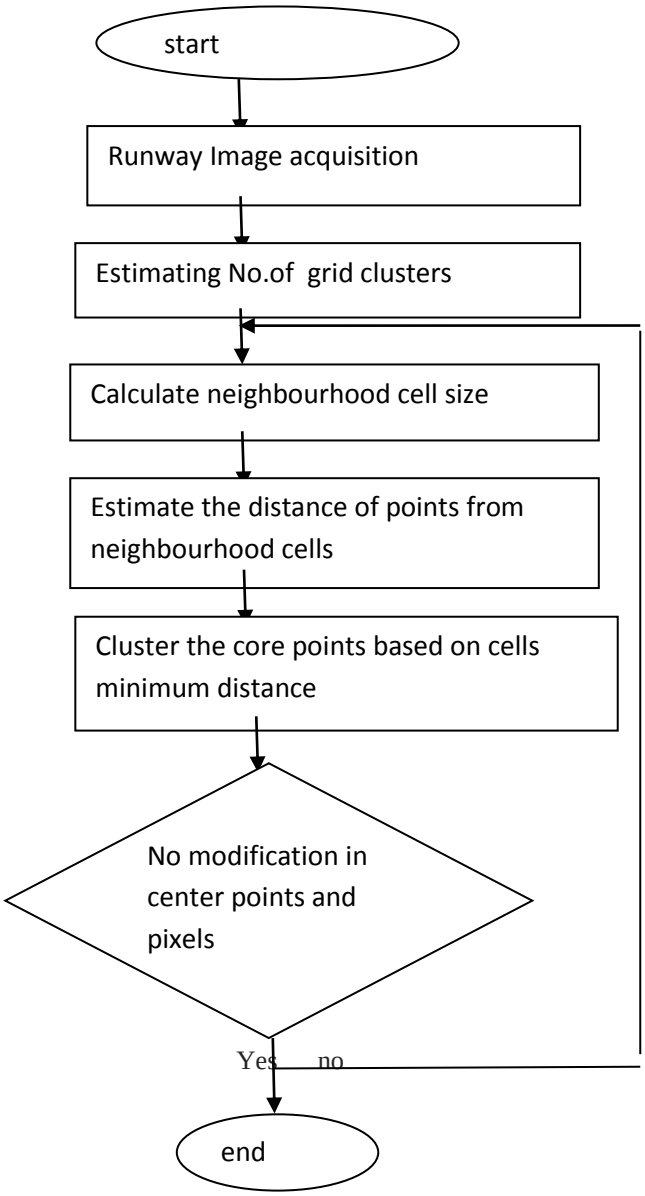

Fig 2: density clustering flowchart

After determining the average distance(Eps) values, there is a need to estimate the value of the minimum density (MinPts) is the immediate and urgent task. So firstly, the number of average data objects in Eps neighborhood of every point in dataset is calculated one by one.

In the fig (3) the joining or tree clustering method uses the black pixels when forming the clusters with respect to size, shape and density of pixels. It can be represented using Euclidean distance as follows.

The mathematic expectation of all these data objects is calculated, which is the value of MinPts.

Minpts = 1/n $\Sigma^{n}_{i=1} P_i$

Where pi is the number of points in Eps neighborhood of point i. So for each different value of Eps we will get corresponding Minpts value.

Distance (Oi,Oj) = $1 / n \mid O_{ik} - O_{jk} \mid$

$= 1 / 4 (|5 - 3| + |6-9| + |4-3| + |9-2|$

= 2.06 cm

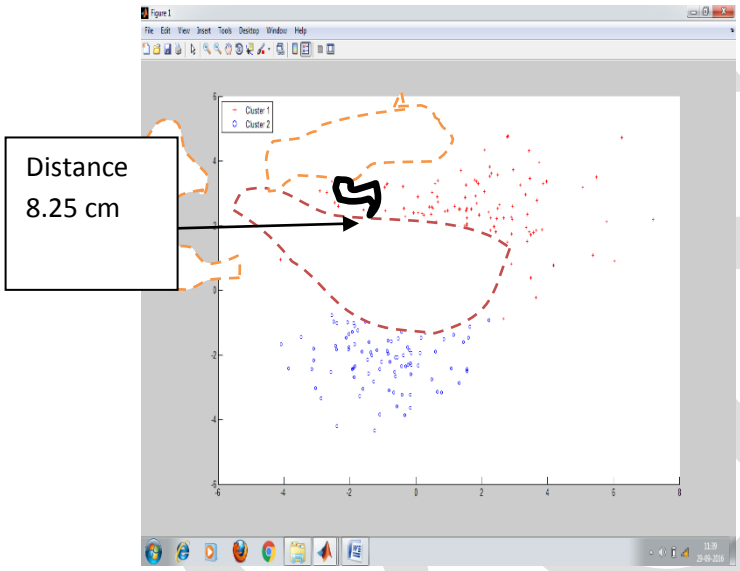

Fig 3 distance between two pixels

Average distance can be estimated the intensity difference across black and white pixels. It can be represented using the following figure(4) and formula. Consider the total no.of image data set n = 4 images and distance between two pixels $O_{ik} - O_{jk}$ respectively.

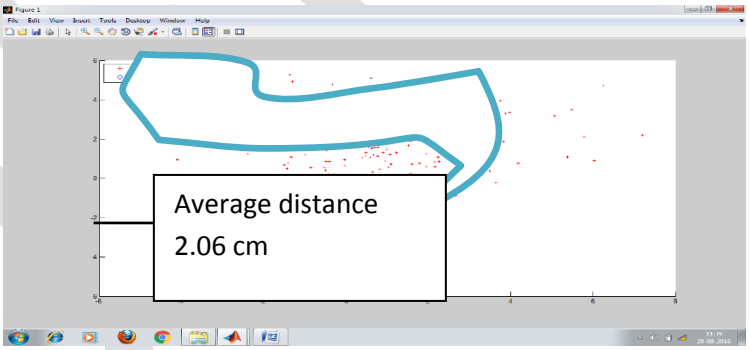

Fig 4 average distance between pixels

IV. IMAGE SCALING FACTORS

After estimating the total no. of black pixels, then image scaling factors can be estimated using the focal length of the camera and total no of black pixels in the image. It can be represented in the using the following image scaling factors method.

regionQuery(P, eps)

Total occurrence of snowfall Real area = primary area * m

M = 1 / image scaling factor

Image scaling(I) = focal length(fl) of the camera / height(h) of snowfall clustering.

return all points within P's eps-neighborhood (including P)
Image scaling(I) = focal length(fl) of the camera / height(h) of snowfall clustering.

= 100 mm / 14,326 = 0.0024250 mts

Co-efficient of the Image

After estimating the image scaling factors then co-efficient of the image can be estimated using image scaling factor. It can be estimated using the following method.

regionQuery(P, eps)

Total occurrence of snowfall Real area = primary area * m

M = 1 / image scaling factor.

Image scaling(I) = focal length(fl) of the camera / height(h) of snowfall clustering.Co-efficient of the image can be calculated using the following formula,

M = 1 / image scaling factor == 1 / 0.0024250 = 412.37 metres

The following diagram(5) illustrates the distance from the runway run way edge along with the image scaling factors. The coefficient of the image scaling factors can be estimated using focal length of the camera and the height of the snowfall region. In the following diagram the image scaling factors are estimated as 41.237 meters.

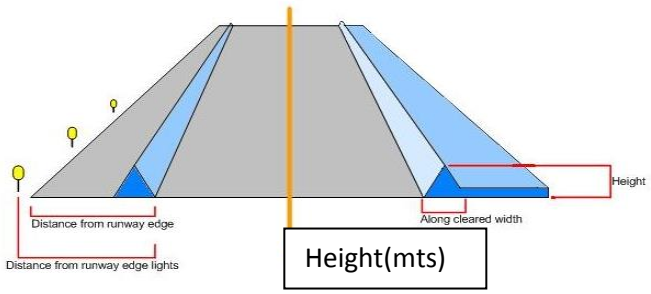

Fig 5: run way width estimation using image scaling factors.

Overall coverage of snowfall area

After estimating the co-efficient of the image then compute the total primary area coverage using the image scaling factor. The height of the snowfall region can be estimated using the Minpts(least density) and Eps(average distance between pixels)regionQuery(P, eps) can be represented in the figure(6).

Total occurrence of snowfall Real area = primary area * m

M = 1 / image scaling factor

Image scaling(I) = focal length(fl) of the camera / height(h) of snowfall clustering.

Hence the overall snowfall occurrence area can be calculated using the following formula,

Total occurrence of snowfall Real area = primary area * m = 412.37 * 0.0024250 = 0.989688 hectares

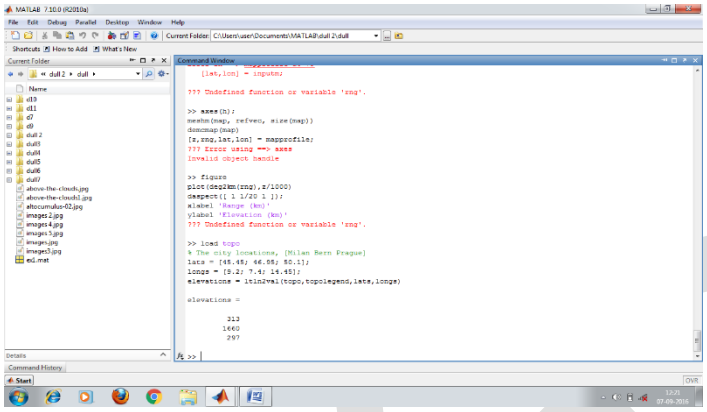

Fig 6 DBSCAN estimation of snowfall density and primary area coverage

Range of clusters shaped is compared with the size of image. DBSAN is performed when the volume of any of the clusters created is greater than 1/10th of image . if the probability density mixture of black pixel cluster size become less than 1/10th of image the iteration stops. The figure (7) represents the black and white pixel formation of cluster using dbscan clusteing. Blue and green circle represents the black pixels in the snowfall area and yellow and red colour represents the snowfall density height and total coverage area of snowfall region. The circumference of the total snowfall area are calculated using image scaling factors.By simply calculating the primary area and co-efficient 'm' ,the total snowfall occurrence area is obtained in 0.989688 hectares with respect to least density 0.002 mts.

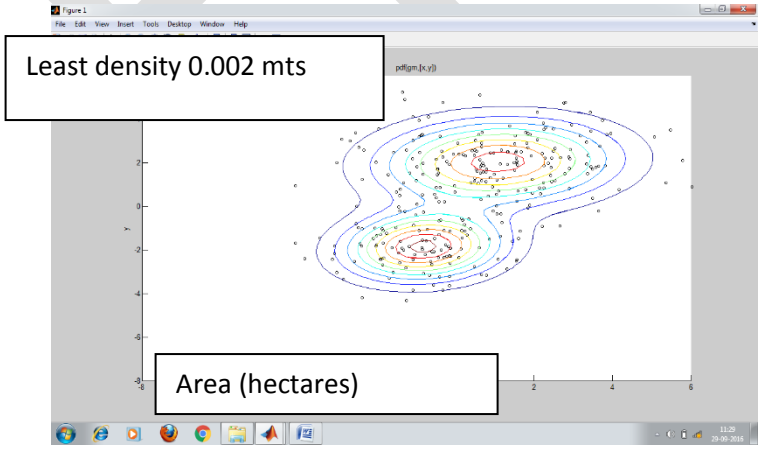

Fig 7representation of least density and total area coverage of snowfall

V CONCLUSION & FUTURE WORK

This proposed work which is useful for analysing and estimating the cluster segmentation of snowfall area using Datagrid algorithm. To evaluate DBSCAN algorithm, the snowfall occurrence aerial image was taken in flight runway area using the camera with the focal length 100mm.The proposed design can be used for analyzing the density of snowfall occurrence and estimated the spread over circumference area of snowfall region , and a framework of methodology has been developed for analyzing the aerial image sequence for a step by step process. The proposed technique is very useful, in order to know the snowfall density and also estimate the primary area coverage of snowfall with respect to segmentation and clustering. Regarding the possibilities of future research on the same lines, the current research can be extended to and evaluate the work in the following areas, Extend the proposed methodology focal length of the camera above 100mm.This promises a great scope for further research on these lines.

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