



Journal which deals with research, Innovation and Originality



**International Journal Of Engineering Research and General
Science**

ISSN 2091 - 2730

Table of Content

Topics	Page no
Chief Editor Board	3-4
Message From Associate Editor	5
Research Papers Collection	6-853

CHIEF EDITOR BOARD

- 1. Dr Gokarna Shrestha, Professor, Tribhuwan University, Nepal**
- 2. Dr Chandrasekhar Putcha, Outstanding Professor, University Of California, USA**
- 3. Dr Shashi Kumar Gupta, , Professor, IIT Rurkee, India**
- 4. Dr K R K Prasad, K.L.University, Professor Dean, India**
- 5. Dr Kenneth Derucher, Professor and Former Dean, California State University,Chico, USA**
- 6. Dr Azim Houshyar, Professor, Western Michigan University, Kalamazoo, Michigan, USA**
- 7. Dr Sunil Saigal, Distinguished Professor, New Jersey Institute of Technology, Newark, USA**
- 8. Dr Hota GangaRao, Distinguished Professor and Director, Center for Integration of Composites into Infrastructure, West Virginia University, Morgantown, WV, USA**
- 9. Dr Bilal M. Ayyub, professor and Director, Center for Technology and Systems Management, University of Maryland College Park, Maryland, USA**
- 10. Dr Sarâh BENZIANE, University Of Oran, Associate Professor, Algeria**
- 11. Dr Mohamed Syed Fofanah, Head, Department of Industrial Technology & Director of Studies, Njala University, Sierra Leone**
- 12. Dr Radhakrishna Gopala Pillai, Honorary professor, Institute of Medical Sciences, Kirghistan**
- 13. Dr P.V.Chalapathi, Professor, K.L.University, India**
- 14. Dr Ajaya Bhattarai, Tribhuwan University, Professor, Nepal**

ASSOCIATE EDITOR IN CHIEF

- 1. Er. Pragyan Bhattarai , Research Engineer and program co-ordinator, Nepal**

ADVISORY EDITORS

- 1. Mr Leela Mani Poudyal, Chief Secretary, Nepal government, Nepal**
- 2. Mr Sukdev Bhattarai Khatry, Secretary, Central Government, Nepal**
- 3. Mr Janak shah, Secretary, Central Government, Nepal**

4. Mr Mohodatta Timilsina, Executive Secretary, Central Government, Nepal

5. Dr. Manjusha Kulkarni, Asso. Professor, Pune University, India

6. Er. Ranipet Hafeez Basha (Phd Scholar), Vice President, Basha Research Corporation, Kumamoto, Japan

Technical Members

1. Miss Rekha Ghimire, Research Microbiologist, Nepal section representative, Nepal

2. Er. A.V. A Bharat Kumar, Research Engineer, India section representative and program co-ordinator, India

3. Er. Amir Juma, Research Engineer ,Uganda section representative, program co-ordinator, Uganda

4. Er. Maharshi Bhaswant, Research scholar(University of southern Queensland), Research Biologist, Australia

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 Second Issue of the Third Volume of International Journal of Engineering Research and General Science. A total of 326 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 Innovation. We also welcome more research oriented ideas in our upcoming Issues.

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

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

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

Er. Pragyan Bhattarai,

Assistance Editor-in-Chief, P&R,

International Journal of Engineering Research and General Science

E-mail -Pragyan@ijergs.org

Contact no- +9779841549341

DETECTION & RECOGNIZATION OF PLANT LEAF DISEASES USING IMAGE PROCESSING AND ANDROID O.S.

Renuka Rajendra Kajale.

E-mail Id: renukajale@gmail.com

Abstract— In this paper we present an automatic detection of plant diseases using image processing techniques. The presented system is a software solution for automatic detection and computation of texture statistics for plant leaf diseases. The processing system consists of four main steps, first a color transformation structure for the input RGB image is created, then the green pixels are masked and removed using specific threshold value, then the image is segmented and the useful segments are extracted, finally the texture statistics is computed. From the texture statistics, the diseases, if present on the plant leaf are evaluated.

Keywords — HSI, Texture, Co-occurrence matrix, Hue color attribute, segmentation, Masking of pixels, Plant Disease Detection

INTRODUCTION

Digital image processing and image analysis technology based on the advances in microelectronics and computers have many applications in biology and they find a way to the problems that are associated with traditional photography. This new tool helps in improving the images from microscopic to telescopic range and also analyzing them. Plant diseases cause periodic outbreak of diseases which leads to a number of disasters. Because of the devastating effects of plant diseases, some of the crop cultivation has been abandoned. The naked eye observation of experts is the main approach adopted in practice for detection and identification of plant diseases. but, this requires continuous monitoring of experts which might prove to be quite expensive in case of large farms. Further, in some developing countries, farmers may have to go long distances to contact experts, this makes the process time consuming and moreover farmers are unaware of non-native diseases. Automatic detection of plant diseases is an important research topic as it may be quite beneficial in monitoring large fields, and it can help in automatically detecting the corresponding diseases from the symptoms appearing on the plant leaves. This enables machine vision that is to provide image based automatic inspection, process control and robot guidance.

The classification accuracy is achieved with the help of HSI transformation. It is applied to the input image, and then, segmented using Fuzzy C-mean algorithm. Feature extraction stage deals with the color, size and shape of the spot and finally classification is done using neural networks.



Fig.1 Affected leaves with various Diseases

The fast and accurate method for detection of leaf diseases is by using the k-means which is based on segmentation. Automatic classification of leaf diseases is done based on high resolution multispectral and stereo images. This approach uses sugar beet leaves. Here the diseased region is extracted using segmentation and the plant diseases are graded by calculating the quotient of disease spot and leaf areas. An optimal threshold value for segmentation is obtained using weighted Par-Zen window. This reduces the computational burden and storage requirements without degrading the final segmentation results. Detection and classification of leaf diseases is based on masking and removing of green pixels, applying a specific threshold to extract the infected region and computing the texture statistics to evaluate the diseases.

3. EXISTING TECHNIQUES -

Sr. No.	Reference Name (IEEE/ACM/Springer/Any other journal, etc. Paper Title)	Work description	Problems found	Publication year
1	Jayme Garcia , Arnal Barbedo (SpringerPlus)	This paper presents a survey on methods that use digital image processing tech.to detect ,quantify and classify plant diseases from digital images the visible spectrum.	Lose Concentration ,thus decreasing their accuracy.	2013
2	Parul Arora, S.N.Ghaiwat (ISSN)	In this paper classification performed in two different phase, Uninfected and diseased leaves are classified based on the number of peaks in the histogram.	This Classifier involves long training time. In SVM it is difficult to understand the functions.	2014
3	B.Tanawal, V.shah (IJARCSSE)	This paper consists of two phases to identify the affected part of disease. Initially edge detection based image segmentation is done, and finally image detection and classification of diseases is performed using homogenous pixel counting technique.	Disease management is a problematic task for these implementation technique. Precise quantification of these visually observed diseases has not studied because of high complexity.	2013

4.WORK CONTRIBUTION-

PROCEDURE OF THE PROPOSED SYSTEM as follows:

1. RGB image acquisition.
2. Convert the input image from RGB to HSI format.
3. Masking the green-pixels.
4. Removal of masked green pixels.
5. Segment the components.
6. Obtain the useful segments.
7. Computing using color-co-occurrence method.

Working Overview:

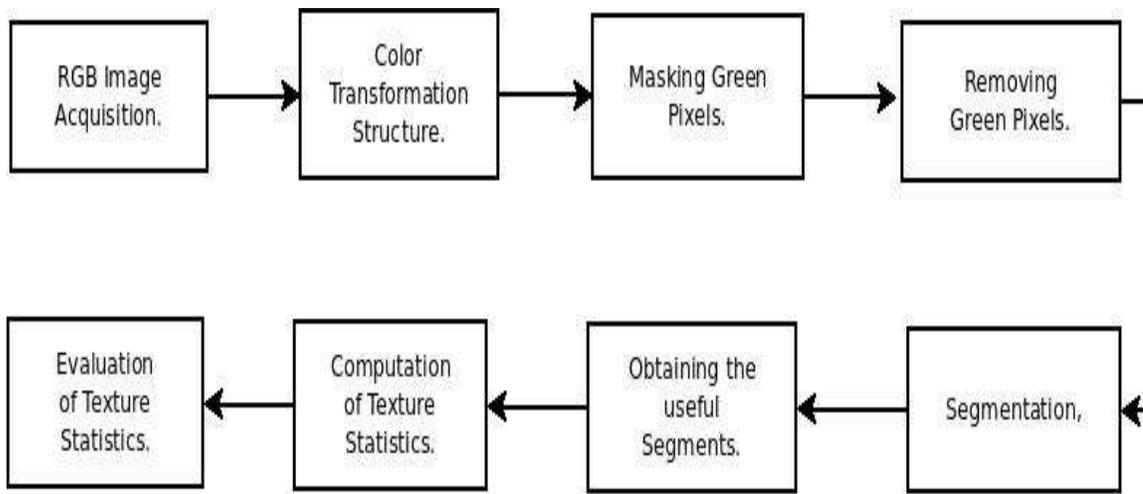


Fig 2: Block diag. of Working steps

A. Color Transformation Structure

First, the RGB images of leaves are converted into Hue Saturation Intensity (HSI) color space representation. The purpose of the color space is to facilitate the specification of colors in some standard, generally accepted way. HSI (hue, saturation, intensity) color model is a popular color model because it is based on human perception.

B. Hue Color Attribute

It refers to the dominant color as viewed by a person. Saturation refers to the relative Purity or the amount of white light added to hue and intensity refers to the amplitude of the light. Color spaces can be converted from one space to another easily. After the transformation process, the H component is taken into account for further analysis. S and I are dropped since it does not give extra information.

C. Masking Green Pixels

Here, we identify mainly the green colored pixels. After this, based on specified threshold value computed for these pixels, the mostly green pixels are masked as if the green component of the pixel intensity is less than the pre-computed threshold value, the red, green and blue components of the this pixel is assigned to a zero value.

D. Segmentation

From the above steps, the infected portion of the leaf is extracted. The infected region is then segmented into a number of patches of equal size. The size of the patch is chosen in such a way that the significant information is not lost. In this approach patch size of 32*32 is taken. The next step is to extract the useful segments. Not all segments contains significant amount of that information. So the patches which are having more than fifty percent of the information are taken into account for the further analysis.

E. Color Co-Occurrence Method

The color co-occurrence texture analysis method is developed through the Spatial Gray- level Dependence Matrices (SGDM). The gray level co-occurrence methodology is a statistical way to describe shape by statistically sampling the way certain gray- levels occur in relation to other gray levels. These matrices measure the probability that a pixel at one particular gray level will occur at a distinct distance and orientation from any pixel given that pixel has a second particular gray level.

F. Texture Features

Contrast, Energy, Local homogeneity, Cluster shade and Cluster prominence are the texture features which are calculated for the Hue content of the image.

5. RESULTS–

The image processing can be used in agricultural application for following purposes:

1. Detecting leaves with disease.
2. Quantify area that is affected.
3. Finding the shape of affected area.
4. Determine color of the affected area.
5. Texture analysis by determining size and shape of leaf.

6. CONCLUSION -

The main approach of this approach is to recognize the diseases. Speed and accuracy are the main characteristics of disease detection. Hence, the extension of this work will focus on developing the advanced algorithms for fast and accurate detection of leaves with disease. This paper explains an application of texture analysis in detecting the plant diseases. The results of this approach can recognize the leaf diseases with little computational effort.

REFERENCES:

1. Jayme Garcia Arnal Barbedo” Digital image processing techniques for detecting, quantifying and classifying plant diseases”(SPRINGER PLUS-2013.
- 2.liboluo and Guomin Zohu, “Extraction of the Rice Leaf Disease Image Based on Software Engineering (CiSE2009) ,IEEE
- 3.S. Ananthi and S. Vishnu Varthini , DETECTION AND CLASSIFICATION OF PLANT LEAF DISEASES USING IMAGE PROCESSING TECHNIQUS. Year -2012
- 4.PATIL J.K. AND RAJ KUMAR.Department of Electronics & Telecommunication Engineering, Bharti Vidyapeeth College of Engineering, Year – 2012.
- 5.Hiroya Kondou, Hatuyoshi Kitamura, Yutaka Nishikawa, Yo-shitakaMotonaga and Atsushi Hashimoto, Shape Evaluation by Digital Camera for Grape Leaf. Year -2012.

Analysis of Chaos MIMO Communication System with Fading channels

Kirutiga.MC, Mrs.Kavitha Narayanan, Chinmayi AV

SRM University, kirutigachandrasekaran@gmail.com,8754405440

Abstract— The security of chaos communication system is superior to other digital communication system, because it has characteristics such as non-periodic, wide-band, non-predictability, easy implementation and sensitive initial condition. Chaos sequences are non-periodic sequences which are sensitive to their initial conditions i.e. spread factor and time delay respectively. If many antennas are applied to chaos communication system, the capacity of data is proportional to the number of antenna. so it is good way applying multiple-input and multiple-output (MIMO) to the chaos communication system. This paper makes a primary contribution to evaluate the BER performance of Chaos MIMO Communication system in fading channels. The chaotic maps that have been considered are Tent map, Boss map, Henon map and logistic map. The modulation scheme that has been considered is CDSK in presence of AWGN channel and Rayleigh fading channel.

Keywords— Chaos maps, Tent map, Boss map, Henon map, Logistic map, MIMO, AWGN channel, Rayleigh channel, CDSK (correlation delay shift keying).

INTRODUCTION

Earlier use of Linear system was prominent. But with technological advancement, Non-Linear system started to be used by combining it with chaos communication system for improved performance.^[1] Chaos communication aims at providing security for transmission of information performed through technologies.^[2] The characteristics of Chaos communication include non-periodicity, wide-band, non-predictability and easy implementation. Chaos communication system is decided by initial conditions of equation. It has sensitive characteristic according to initial condition, because chaos signal is changed to different signal when initial condition is changed.^[3-4] If the initial condition is known to the intruder, then it becomes sensitive to the outside world. As long as the initial condition concealed from the outside world, it is impossible to predict the chaos signal. The chaotic sequences make the transmitted signal look like noise; therefore, it does not attract the attention of an unfriendly receiver. These characteristics makes the security of chaos communication superior to digital communication systems. Because of this added advantage of security, chaos communication has been extensively studied.

During the last two decades or so, lots of digital communication schemes using chaos have been suggested and studied, which utilize either coherent or non-coherent detections for information extraction^[5]. Because chaotic synchronization in coherent detection performs poorly, demodulation in chaos based communication schemes with coherent receivers using this synchronization technique becomes a real challenge in noisy environments. Therefore, non-coherent schemes seem more feasible and appealing in practical environments. In 1996, Kolumb'an et al. proposed the non-coherent differential chaos shift keying (DCSK) which is the most suitable scheme in wireless communications due to its good noise performance^[6,7]. However, the prices that it has to pay are low attainable data rate and weakened information security. In 2000, Sushchik et al. proposed the non-coherent correlation delay shift keying (CDSK) whose bandwidth utilization ratio and information security are much better than DCSK.

Chaos communication system has many transmitted symbols, because information signal is spread according to the characteristic of chaos map. So, study of chaos system for data rate improvement is necessary. MIMO (Multi Input Multi Output) system transmit data by several paths using several antennas. And, in receiver part, it is a technique which can reduce interference by detecting received signal at each path, and provides a better data rate, link reliability and bandwidth efficiency. MIMO system increase the capacity of data communication in proportion to number of antenna, and provide the high data processing Speed^[8].

This paper is organized as follows section II explains what is Chaotic system, Section III gives the Chaotic signals, section IV elaborates the system overview, Section V discuss about the performance evaluation of the system i.e., we will evaluate the performance of different chaotic maps in the CDSK chaotic modulation system and will find out which chaotic map shows superior

performance. Using the superior map obtained from the analysis we proceed to the 2x2 MIMO concepts. In the later stage we compare the performance of BPSK and CDSK over MIMO AWGN channel. And a comparative analysis of the 2x2 Chaotic MIMO Concept and 4x4 chaotic MIMO concept using CDSK Modulation in AWGN channel, Then performance of 2x2 chaotic MIMO and 4x4 chaotic MIMO in Rayleigh channel was analysed. Finally in Section VI we will make the conclusion.

CHAOTIC SYSTEM

A chaotic dynamical system is an unpredictable, deterministic and uncorrelated system that exhibits noise-like behavior through its sensitive dependence on its initial conditions, which generates sequences similar to PN sequence. They have been successfully employed to various engineering applications such as automatic control, signals processing and watermarking Since the signals generated from chaotic dynamic systems are noise-like, super sensitive to initial conditions and have spread and flat spectrum in the frequency domain, it is advantageous to carry messages with this kind of signal that is wide band and has high communication security. Secure communication with chaos has been developed. [6] These systems tend to be more computationally complex than non-spread communication systems, yet they provide advantageous multipath mitigation and multi-user spectral re-use capabilities.

CHAOTIC SIGNALS

A chaotic sequence is non-converging and non-periodic sequence that exhibits a noise-like behavior through its sensitive dependence on its initial condition i.e., spread factor and time delay respectively. [4] A large number of uncorrelated, random-like, yet deterministic and reproducible signals can be generated by changing initial value. These sequences so generated by chaotic systems are called chaotic sequences. [7] Chaotic sequences have been proven easy to generate and store. Merely a chaotic map and an initial condition are needed for their generation, which means that there is no need for storage of long sequences. Moreover, a large number of different sequences can be generated by simply changing the initial condition. The secrecy of the transmission is important in many applications. The chaotic sequences help achieve this security from unwanted reception in several ways.

SYSTEM OVERVIEW

I. Correlation delay shift keying system

Existing modulation system consists of a switch in the transmitter, creating the problem of power wastage and eavesdropping occurs by twice transmission. Technique that has been proposed to solve these problems is CDSK system where transmitted signal does not repeat as the switch at the transmitter is being replaced with an adder circuit.

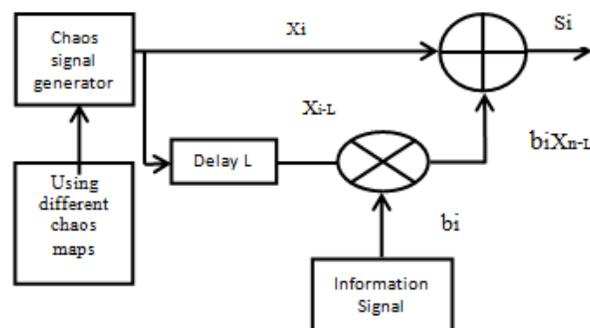


Fig .1 Transmitter of CDSK system

Fig.1 shows the transmitter of a CDSK system. The chaos signal from the generator is being delayed and is multiplied with the information signal. The resulting signal is being added with the original chaos signal generated from the generator finally producing the transmitter output.

$$s_i = x_i + b_i x_{i-L} \quad (1)$$

Equation (1) indicates transmitted signal from transmitter. Here L denotes the delay time.

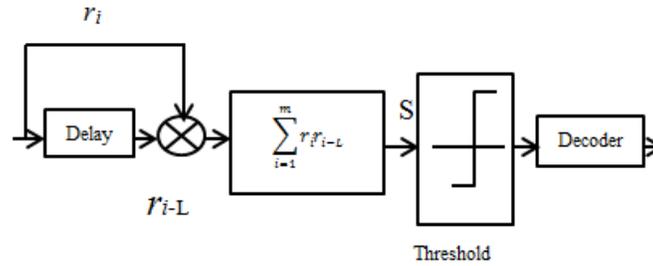


Fig.2 Receiver of CDSK system

Fig.2 shows the CDSK receiver system. CDSK receiver is correlator based receiver, and it is performed in order to recover the symbol. Received signal and delay received signal are multiplied, and this signal is added as much as the spreading factor. Afterward the signal is quantized according to an appropriate threshold and information signal is recovered through decoding.

$$s = \sum_{i=1}^M r_i r_{i-L} \quad (2)$$

Equation (2) indicates output value of correlator of CDSK system. Information bits are possible to recover when delay time and spreading factor have to use exact value that is used in transmitted signal.

II. Chaos maps

In this paper, the types of chaos map that has been considered are Tent map, Boss map, Logistic map and Hénon's map.

a. Tent map

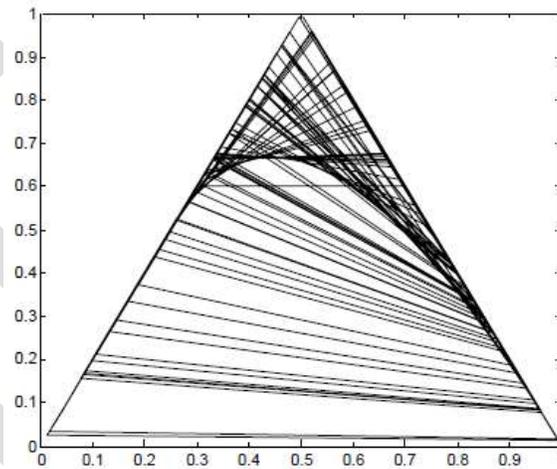


Fig.3 Trajectory of tent map

Fig.3 shows trajectory of Tent map. The x-axis and the y-axis of fig.3 mean x_n and x_{n+1} , and Tent map has trajectory of triangular shape.

$$x_{n+1} = \begin{cases} \alpha x_n & \text{for } x_n < 0.5 \\ \alpha(1 - x_n) & \text{for } 0.5 \leq x_n \end{cases} \quad (3)$$

Equation (3) is the representation of tent map. Equation of Tent map uses existing output value as current input value, and it is indicated as figure when initial value is 0.1 and parameter alpha is 1.9999.

b. Boss map

Boss map is similar to Tent map because of the fact that Boss map was obtained by transforming the Tent map. Equation (3) is the representation of Boss map. The initial value as 0.1 and parameter alpha as 2.5 are used in the equation

$$x_{n+1} = \alpha [0.45 - |0.503 - x_n|] \quad (4)$$

$$y_{n+1} = x_n - 0.3$$

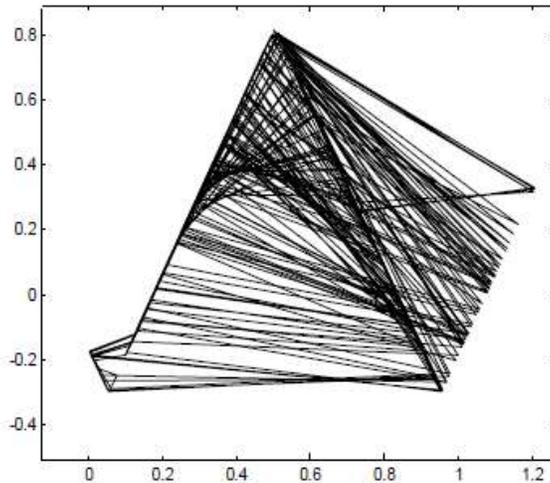


Fig. 4 Trajectory of boss map

Fig.4 shows trajectory of Boss map. The x-axis and the y-axis of Boss map mean x_n and y_n unlike the Tent map, it draws trajectory in a pyramid shape. The equation below defines the Boss map.

c. Logistic map

The logistic map is a polynomial mapping (equivalently, recurrence relation) of degree 2, often cited as an archetypal example of how complex, chaotic behavior can arise from very simple non-linear dynamical equation.

$$x_{n+1} = rx_n(1 - x_n) \quad (5)$$

Equation (5) is the representation of Logistic map. Here x_n is a number between zero and one it represents the ratio of existing population to the maximum possible population.

The bifurcation diagram is a self-similar if you zoom in on the above-mentioned value $r = 3.82843$ and focus on one arm of the three, the situation nearby looks like a shrunk and slightly distorted version of the whole diagram. The same is true for all other non-chaotic points. This is an example of the deep and ubiquitous connection between chaos and fractals.

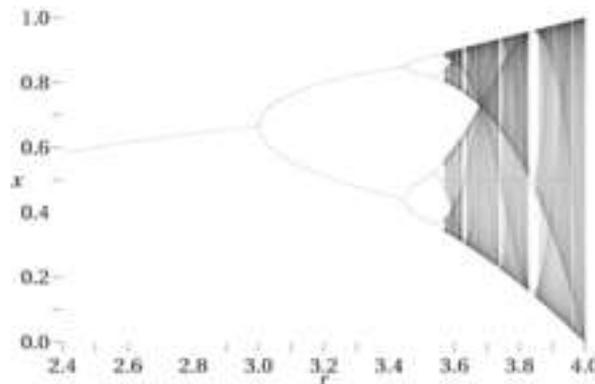


Fig. 5 Representation logistic map

d. Hénon's map

The Hénon's map is a discrete-time dynamical system. It is one of the most studied examples of dynamical systems that exhibit chaotic behavior.

$$\begin{aligned}x_{n+1} &= 1 - ax_n^2 + y_n \\y_{n+1} &= bx_n\end{aligned}\quad (6)$$

The Hénon's map takes a point (x_n, y_n) in the plane and maps it to a new point. Equation (6) is used to specify Hénon's map.

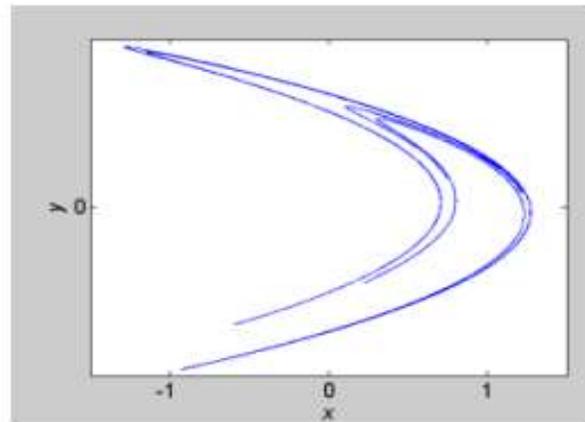


Fig.6 representation of Hénon's map

Fig.6 shows the representation of Hénon's map. The map depends on two parameters, a and b , which for the classical Hénon map have values of $a = 1.4$ and $b = 0.3$. For the classical values the Hénon map is chaotic. For other values of a and b the map may be chaotic, intermittent, or converge to a periodic orbit. An overview of the type of behaviour of the map at different parameter values may be obtained from its orbit diagram.

III. MIMO communication channel

The use of multiple antennas at the transmitter and the receiver in communication systems are generally known as MIMO (multiple-input-multiple-output). This technology has rapidly gained over the past decade due to its powerful performance-enhancing capabilities. Communication in wireless channels is impaired predominantly by multi-path fading. Multi-path is the arrival of the transmitted signals at an intended receiver through differing angles or differing time delays or differing frequency (i.e., Doppler) shifts due to the scattering of electromagnetic waves in the environment. Consequently, the received signal power fluctuates in space (due to angle spread) or frequency (due to delay spread) or time (due to Doppler spread) through the random superposition of the impinging multi-path components.

The random fluctuation in signal level, known as fading, can severely affect the quality and reliability of wireless communication. Additionally, the constraints posed by limited power and scarce frequency bandwidth make the task of designing high data rate, high reliability wireless communication systems extremely challenging.

MIMO technology constitutes a breakthrough in wireless communication system design. The technology offers a number of that helps meet the challenges posed by both the impairments in the wireless channel as well as resource constraints. In addition to time and frequency dimensions that are exploited in conventional single-antenna (single-input single-output) wireless systems, the leverages of MIMO are realized by exploiting the spatial dimension (provided by the multiple antennas at the transmitter and the receiver).

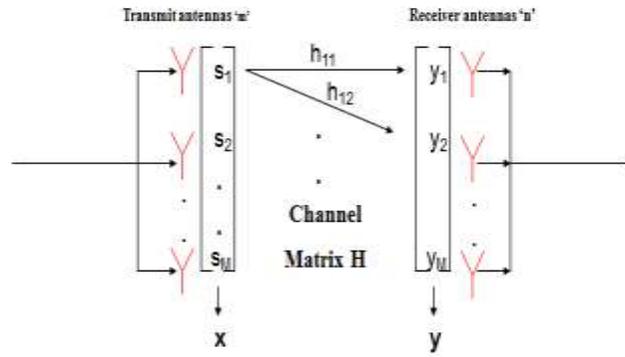


Fig. 7 General outline of MIMO

$$\text{where, } H = \begin{bmatrix} h_{11} & h_{21} & \dots & h_{m1} \\ h_{12} & h_{22} & \dots & h_{m2} \\ \vdots & \vdots & \ddots & \vdots \\ h_{1m} & h_{2m} & \dots & h_{mm} \end{bmatrix} \quad (7)$$

The two main formats for MIMO are given below:

- (1) Spatial diversity: Spatial diversity used in this narrower sense often refers to transmit and receive diversity. These two methodologies are used to provide improvements in the signal to noise ratio and they are characterised by improving the reliability of the system with respect to the various forms of fading.
- (2) Spatial multiplexing: This form of MIMO is used to provide additional data capacity by utilising the different paths to carry additional traffic, i.e. increasing the data throughput capability.

As a result of the use multiple antennas, MIMO wireless technology is able to considerably increase the capacity of a given channel while still obeying Shannon's law. By increasing the number of receive and transmit antennas it is possible to linearly increase the throughput of the channel with every pair of antennas added to the system. This makes MIMO wireless technology one of the most important wireless techniques to be employed in recent years.

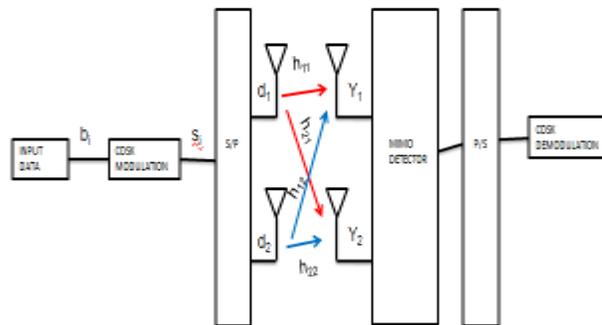


Fig.8 Block diagram of CDSK system with 2x2 MIMO.

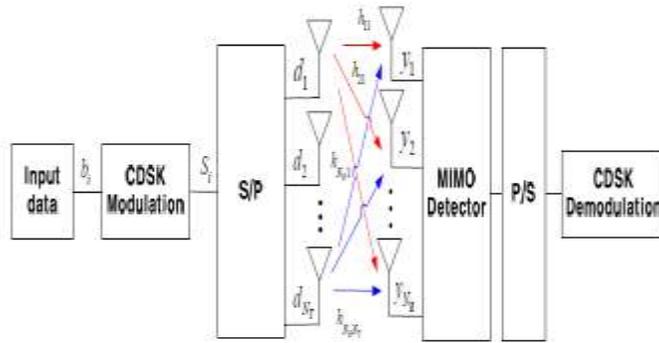


Fig.9 Block diagram of CDSK system with 4x4 MIMO.

PERFORMANCE EVALUATION

In this paper, the BER performance of chaos MIMO system in AWGN (Additive White Gaussian noise) channel and Rayleigh channel. A comparative analysis of chaotic maps is evaluated. And the outperform map is considered for fading channels. The figure (9) shows BER performance of chaotic CDSK system in AWGN channel over all the above stated maps.

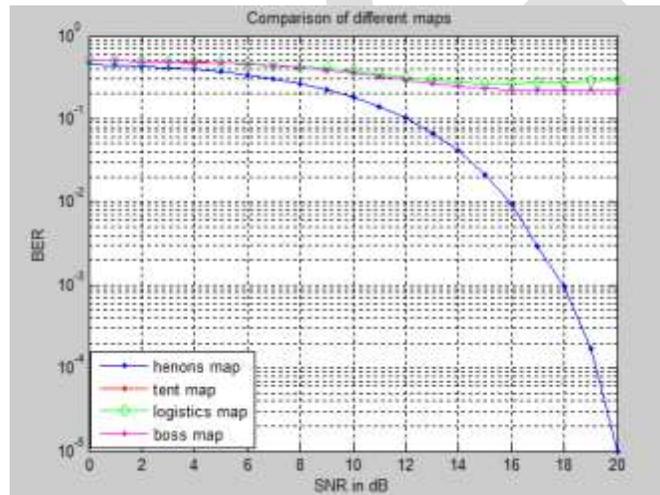


Fig.10 BER performance of chaotic CDSK system

Fig.10 shows the comparative analysis of all the maps. Here, we observe that the BER Performance of Hénon's map is better than other maps i.e., at different values of SNR we observe that the Hénon's map shows better performance than other three maps. At low SNR the performance of all maps are more or less similar but for high SNR Hénon's map performs well.

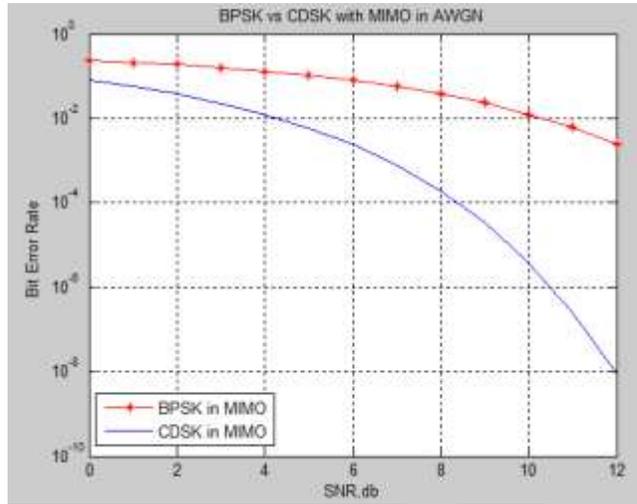


Fig.11 Performance analysis of BPSK and CDSK with 2x2 MIMO in AWGN

Fig.11 shows the BER performance of BPSK and CDSK modulation over AWGN with Hénon's map in 2x2 MIMO communication channel. From the figure it is clear that CDSK performance is much better compared to BPSK.

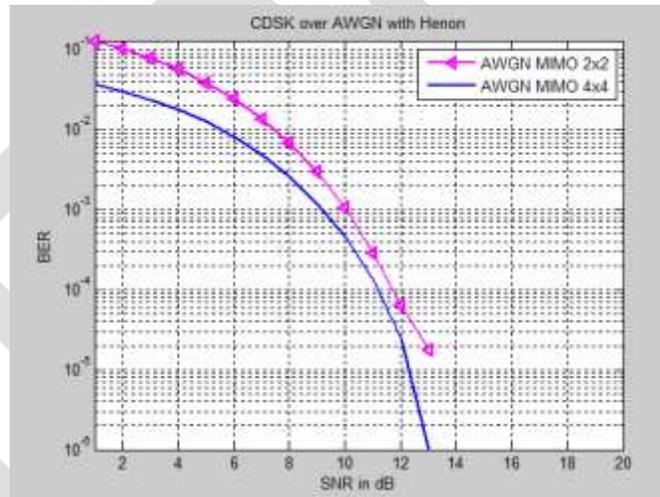


Fig.12 Performance analysis of CDSK with MIMO 2x2 and 4x4 in AWGN

Fig.12 shows the BER performance of CDSK modulation with Hénon's map over AWGN channel in 2x2 and 4x4 MIMO communication channel was analysed. From the simulation 4x4 MIMO communication channel shows a better performance.

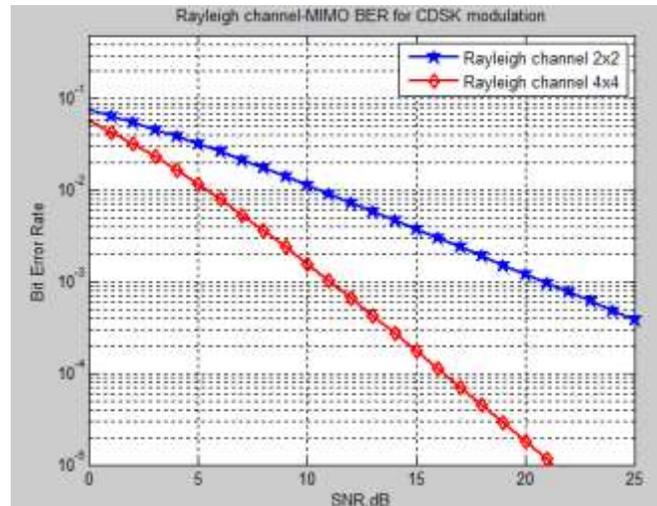


Fig.13 Analysis of Chaos MIMO 2x2 and 4x4 in Rayleigh channel

Fig.13 shows the performance of chaos MIMO communication in Rayleigh channel.

CONCLUSION

In this paper, the BER performance of Chaos communication system was evaluated using various chaotic maps i.e., Tent map, Boss map, logistic map, Hénon's map and Hénon's map was found to outperform all other maps. Further, we used Hénon's map for CDSK 2X2 and 4x4 MIMO system in AWGN and Rayleigh channels. We found an extensive improvement in system performance. This work can be carried on further by considering other channel models and evaluating the system performance.

REFERENCES:

- [1] Sung-Wook Yoon, Jun-Hyun Lee, and Heung-Gyoon Ryu, "Chaos Communication System using MIMO Technique".
- [2] "Chaos communication", Internet: http://en.Wikipedia.org/wiki/Chaos_communications, 23 December 2013, [1 January 2015].
- [3] Arathi.c Chaos CDSK communication system, The journal of IJRASET, ISSN: 2321-9653 special issue 1, October 2014
- [4] H. Yang and G. P. Jiang, "Reference-modulated DCSK: a novel chaotic communication scheme," IEEE Transactions on Circuits and Systems II, vol. 60, no. 4, pp. 232–236, 2013.
- [5] Junyeong Bok and Heung-Gyoon Ryu, "Digital chaotic communication system based on CDSK modulation," The Journal of the Korean Institute of Communications and Information Sciences, vol. 38A, no. 6, pp. 479-485, June 2013.
- [6] Dian-Wu Yue and K.Q.T. Zhang, "Wireless MIMO systems in fading environments: A stabilizing transmission approach," Wireless Communications, Networking and Mobile Computing (WiCOM), 2012 8th International Conference on, pp. 1-8, Sept. 2012.
- [7] G. Kaddoum, Mai Vu and F. Gagnon, "On the performance of chaos shift keying in MIMO communications systems," Wireless Communications and Networking Conference (WCNC), 2011 IEEE, pp. 1432-1437, March 2011.
- [8] Q. Ding and J. N. Wang, "Design of frequency-modulated correlation delay shift keying chaotic communication system," Communications, IET, vol. 5, no. 7, pp. 901-905, May 2011.
- [9] Sung Il Hong and Eun Young Jang, "FPGA implementation of digital transceiver using chaotic signal," Korea Institute of Information Technology Review, vol. 8, no. 8, pp. 9-15, Aug. 2010.
- [10] M. Sushchik, L.S. Tsimring and A.R. Volkovskii, "Performance analysis of correlation-based communication schemes utilizing chaos," Circuits and Systems I: Fundamental Theory and Applications, IEEE Transactions on, vol. 47, no.12, pp.1684-1691, Dec 2000

DEVELOPMENT PERFORMANCE AND EVALUATION OF ULTRASONIC PEST AND INSECT REPELLING SYSTEM

Khapare Nilima Kailas

Bodke Pranali S.

Khapare Kailas Namdev

Asst. Professor of Physics Dept.
K. K. Wagh College of Agril.
Engg. And Technology.
Nashik, Maharashtra

Asst. Professor of Electrical Dept.
K. K. Wagh College of Agril.
Engg. And Technology.
Nashik, Maharashtra

M.Sc (Chemistry) Lab Incharge,
Maharashtra Rajya Draksh
Bagaitdar Sangh, Pune,
Nashik Division

Abstract:-The common method of pest control is the use of the pesticides. Pesticides are substances or a mixture of substances used for destroying, preventing, repelling or mitigating pests. To solve the above problem ecofriendly device can be used for repelling pest and insects. The aim of paper is to repel the insects and pests from the area. This paper explained the use of an electronic device which can utilize sonic or ultrasonic sound waves to repel pest. Rodents have their audible frequency ranges from 1 Hz to 100 KHz. High frequency sound produced causes intense auditory stress to the rodents and force them to leave the area. Effectiveness of ultrasonic devices increase by continuously varying frequency of oscillation, so pest will not habitual.

Key Words:- pest, insects, ultrasonic sound, oscillating unit, amplifier unit, power unit, frequency generator

1.1 Introduction of Ultrasonic Pest Repelling System (UPRS)

An UPRS consist of electronic circuit which emits ultrasonic frequency (above 20,000 Hz), these frequencies affect the auditory senses of pests such as rodents, avian and nocturnal insects by making them uncomfortable in their abode.

Rodents have their audible frequency ranges from 1 Hz to about 100 KHz. High frequency sound produced causes intense auditory stress to the rodents & force them to leave the area. Effectiveness of ultrasonic devices increased by continuously varying frequency of oscillation, so pest will not habitual. The objective of this study is to develop an electronic device for that generates multiple frequencies of oscillation and at the same time covers a broad frequency range of pests.

Various methods for repelling or mitigating the pests and insects are:

1.1.1 Chemical method:

The use of pesticides (chemicals) is the most common method used. Pesticides are substances or a mixture of substances used for destroying, preventing, repelling or mitigating pests. Pesticides are commonly used in and around homes because they are easy to apply, fast-acting, and effective against a wide variety of pests. Chemical method of pest control has been found to be very effective but quite expensive to maintain. Also, these chemicals are highly poisonous and harsh both to human beings and pest. Air pollution is most important risk factor arising due to the use of chemical method. Human risk factors such as respiratory diseases, particularly for bronchial asthma and chronic obstructive pulmonary disease (COPD) etc. are taking place. Moreover, it adversely affects the environment, it brings about the genetic mutation of the internal make up of these pests that they produce offspring that are immune to these chemicals that were used on their predecessor. This, coupled with society's growing concern about environmental risks, makes alternative methods of pest control increasingly attractive.

1.1.2 Bio Pesticides:

It is an ecofriendly and alternative means to chemical pesticides, which encompasses a broad range of microbial pesticides, biochemical derived from micro-organisms and other natural sources, and processes involving the genetic incorporation of DNA into agricultural commodities that confer protection against pest damage. The potential benefits to agriculture and public health programs through the use of bio pesticides are considerable. The interest in bio pesticides is based on the disadvantages associated with chemical pesticides. The total world production of bio pesticides is over 3,000 tons/year, which is increasing at a rapid rate. The market share of bio pesticides is only 2.5% of the total pesticide market.

1.1.3 Mechanical method:

The mechanical method of controlling pest involves generating sounds mechanically to scare pests away. It also involves setting of traps, the use of guns and other mechanical means to kill pests. Any pest can be controlled by sound. Fireworks, acetylene exploders, balls horns and other noise makers have been utilized in bird control. Each has some applications but there is always one problem or the other which limits the situation to which it is applicable. Some specialized setup is required making better mechanical method of pest and insect control.

1.1.4 Integrated Pest Management:

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. It is an Ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with

the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

1.1.5 Sonic/ Ultrasonic Devices:

An electronic device can utilize sonic or ultrasonic sound waves, ultraviolet or UV rays, visual scare characteristics or other means to discourage, scare or repel pests. The most popular of these are the ultrasonic pest repelling systems. The electronic device emits high frequency sound through the tweeters which causes auditory stresses to pests.

1.2 Importance of the Study

Insects and pests exist in the natural environment. They are very detrimental to human beings when they cause damage to the crops and stored valuables. Each method has some or the other drawback. The main focus was given on the Ultrasonic pest repelling devices (UPRS).

However, research has confirmed that pests, insects and rodents get used to this high frequency sound, and shows no repellence effect. Therefore, in order to improve the efficiency of the UPRS there was a need to generate multiple frequencies of oscillations. The UPRS is an eco-friendly system which does not affect the biological parts of the pests and insects. It just repels the pests away from undesired area.

Indeed, this project is to create a suitable system to drive pest and insects away from field and from storage structures. This Non-invasive method provides ultrasonic frequency output through tweeters and promotes easy set up and installation of the device. The device has also the potential to drive rodents away.

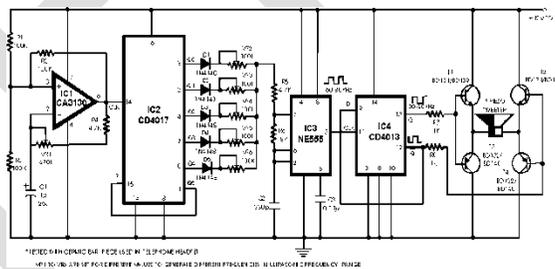
1.3 Problems Statement:

Various pests' and insects cause harmful effect to the crops, they can carry some diseases with them which in turn affects the total production. They also affect the quality of the agricultural commodities. Small birds eat the fruits and crop grains and also scattering grains on ground which reduces the overall production. Some of the insects also hampers the growth of plants, wilting of leaves etc. insects and pests also affect the sanitary conditions in storage structures.

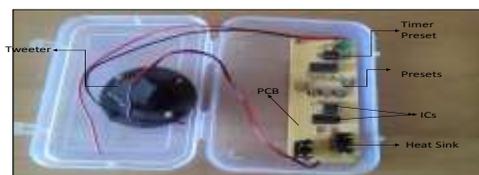
Rodents in storage structures cause spilling of grains, and are very detrimental for causing huge storage losses. Because of this, the physical properties of grains stored are greatly affected. Rodents like rats and mice contaminate the stored commodities by their urine and feces. They gnaw plastic bags, light metal bins and cause grain loss as well as loss of property. Also, these rodents eat roots of many plants and thus make them weak.

Therefore a system that can be applied Non-invasively can be made to repel the pests & insects away from the desired area. The system produces Ultrasonic frequency by which they are repelled.

The Ultrasonic Bird and Pest repelling system is to be made by using electronic circuit comprising various components as shown in following circuit diagram:



Ultrasonic pest repelling circuit mounting:



1.4 The device comprises of the following units:

1. The power unit,
2. The pulse generator unit,
3. The oscillating unit and
4. The amplifier unit.
5. The output unit

1.4.1. The power unit

The battery is used in the power unit that supply power to different electric component used in circuit. Electric circuits usually require a DC power supply that can maintain fixed voltage while supplying enough current to drive a load. Batteries make good DC supplies, but their relatively small current capacities make them impractical for driving high-current frequently used circuits. A regulated 12 volts power supply is used to convert a 230VAC, 50Hz line voltage into a usable fixed DC voltage.

1.4.2. The pulse generator unit

It consist of IC 1 and IC 2 unit. In this, accurate pulses are produced. By using the module, frequency of emission of ultrasonic sound is continuously varied step by step automatically. Five stages of variation were used. For each clock pulse output from operating ICI CA3130 (which is wired here as a low frequency square wave oscillator), the logic 1 output of IC2 CD4017, which act as the counter, shifts from the output of D1 to the output of D5. Five presets are set for different values and connected to the input of the oscillating unit. By varying the presets we can get different variations in the frequency output. Variable resistance is also used for Varying the Pulse timings in the circuit.

1.4.3. The oscillating unit

The oscillator unit which consists of the CA3130 op-amp, a 470 Ω variable resistor, RV1, 3 100 k Ω fixed resistors and a 4.7 k Ω fixed resistor. The CA3130 Op Amp is wired as a low-frequency square wave oscillator. The clock pulse from this unit generates a frequency which is ≤ 150 Hz and is fed into the input of the CD 4017 decade counter, U2, for each clock pulse output of the CA3130 Op-amp. RV1 is used to change clock pulse rate.

1.4.4. The amplifier unit

The amplifying unit which consists of a CD4017 decade counter, signal diodes, D1 to D2, five 100 k Ω presets/variable resistors a 555 timer, a CD4013 dual D-type flip flop, two 1k Ω fixed resistor. The pulse output from the oscillator unit is fed into the clock input of the CD4017 decade counter. Five presets RV2 through RV6, one of each connected to Q0 to Q4 output pins of U2 through signal diodes, D1 to D5, are set at different values from 10 to 60 k Ω , to produce different frequency output at each shift of the decade counter. The diodes serve as a protection against reverse current. The outputs of the presets are connected to pin 7 of the 555 timer. The 555 timer is wired as an unstable multivibrator operating at a frequency of above 60 kHz. Its output is not symmetrical. At this stage, the low frequency generated by the oscillator unit is amplified to a very high frequency.

1.4.5. The output unit

The output unit which consists of PNP and NPN transistor, labelled Q1 and Q3, Q2 and Q4, bipolar transistors and a piezo sounder/tweeter. The outputs of the CD4013 are connected to the transistors. The CD4013 is a stable dual flip-flop IC, which generates a symmetrical square wave whose frequency value is half the frequency value of the input from the stable multivibrator. The transistors do the function of final amplification in push-pull mode and drive the high frequency piezo tweeter/sounder.

As the input supply of 12 V is given through the Battery source or Single power supply the Amplified Ultrasonic frequency is produced in the Tweeters. The range of frequency depends on the Inverse square law.

1.5 Design Parameters

1.5.1 Time high:

$$T_H = 0.693 C_A (R_A + R_B)$$

Where T_H = Time High In seconds,

R_A = Input Resistance of the Oscillator

R_B = Resistance of the Diodes

$$C_A = \text{constant} (330 \times 10^{-12})$$

1.5.2 Time Low:

$$T_L = 0.693 C_A R_B$$

Where T_L = Time Low In seconds

1.5.3 Frequency Minimum:

Frequency is the reciprocal of Time Period. It is defined as the Number of Oscillations taking place per unit Time.

$$F_{\text{Min}} = \frac{1}{T_{\text{Max}}}$$

Where T_{max} = Maximum Time Period in Seconds

1.5.4 Frequency Maximum:

$$F_{\text{Max}} = \frac{1}{T_{\text{Min}}}$$

Where T_{Min} = Minimum Time Period in Seconds

1.5.5 Intensity of Sound Emitted: (Inverse Square Law)

$$I = \frac{P}{4\pi r^2}$$

Where P = Power of the Circuit

I = Intensity of Sound

r = Effective Distance Covered by the Sound

1.6 Circuit Test:

1.6.1 Testing:

The circuit test includes checking of the circuit mountings on PCB, checking the logic of the circuit with the help of digital Multimeter. Various circuit components were Checked and Tested for Their rated Values. All ICs were tested for their respective functions.

1.6.2. Result:

Complete apparatus was set in the laboratory. Input supply of 12 V was verified on the digital multimeter, and the circuit was started. The output frequency is observed to be Oscillating from **30Hz to 40 KHz**.



1.6.3.1 Time High:

$$\begin{aligned}T_H &= 0.693C_A (R_A + R_B) \\ &= 0.693X (330 X 10^{-12}) X (105.318X10^3 + 18 X 10^3) \\ &= 28.2 X 10^{-6} \text{ Seconds}\end{aligned}$$

1.6.3.2 Time Low:

$$\begin{aligned}T_L &= 0.693C_A (R_B) \\ &= 0.693X (330 X 10^{-12}) X 18X 10^3 \\ &= 4.12 X 10^{-6} \text{ Seconds}\end{aligned}$$

$$\begin{aligned}T_{\text{Max}} &= T_L + T_H \\ &= 4.12 X 10^{-6} + 28.2 X 10^{-6} \\ &= 32.32 X 10^{-6} \text{ Seconds}\end{aligned}$$

1.6.3.3 Minimum frequency:

$$\begin{aligned}F_{\text{min}} &= \frac{1}{T_{\text{max}}} \\ &= \frac{106}{32.32} \\ &= 30.94 \text{ KHz}\end{aligned}$$

Similar calculations are made for frequency Maximum

$$F_{\text{Max}} = 105.2 \text{ KHz}$$

1.7 Following points should be considered for testing UPRS:

The electronic circuit when powered will emit ultrasonic sound through the Transducers. The intensity of sound is measured by ultrasonic level detector. Following points should be considered for testing the ultrasonic bird and pest repelling system:

1.7.1. Signal attenuation due to Atmospheric effect:

In this part the distance covered by the ultrasonic sound is observed on Sunny, rainy and dull days. The atmospheric factors like humidity, air velocity, temperature etc. affect the distance covered by the sound. The sound travels longer distances in rainy seasons and, travels longer in mornings on the pretext of relatively lower temperatures in mornings. The waves travel for long distances in moist air as compared to dry air.

1.7.2. Effect of Gadget Elevation on the Signal Reach:

In this part the distance covered by ultrasonic sound is observed as per the elevation of the Gadget from the ground surface. As the elevation increases the area covered by the ultrasound increases.

1.7.3. Effect of power input:

In this part the distance covered by ultrasonic sound is observed as per the power input. The area covered by the ultrasound increases if the power input is increased. (As per the Inverse Square law). However here the input voltage is not exceeded beyond 15V.

1.7.4. Field Test:

Observations showed that the birds' activity would be greatest early in the morning and gradually decline as the day progresses. So perfect timing should be considered for evaluating the field tests. It is known that most of the bird activity takes place in early mornings, therefore for testing morning time should be selected.

1.7.5.Special Arrangements:

If the multiple systems are used for covering the larger area then the following two arrangements can be used effectively (as per the Quadblaster system for gardens):

1. Spatial Infestations:

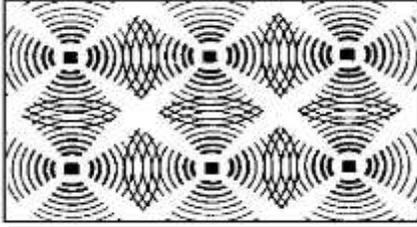


Figure: Illustrates a solution for a widespread bird problem. The atmosphere is totally saturated by the use of multiple units. The sound waves overlap and cover the whole area.

2. Perimeter Defense:

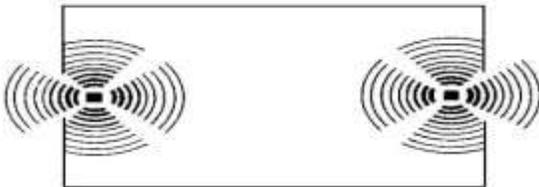


Figure: Demonstrates the placement of the units once the bird problem is under control. The *Perimeter Defence* discourages birds from returning.

1.8 Actual testing of the device:

The judgement of the performance of the ultrasonic pest and insect repelling system is bit tedious, as there is no such criteria to judge repellence. Pests and insects move on continuously so it becomes difficult to adore them. Apart from such indispensable consequences, the testing of the device was conducted on a trial and error basis.

1.8 .1 Testing of the device on Wheat pest: (Local Name- 'Sonde pest')



From figure we can see that, the pest moves away from the wheat grains. However the performance of the device is not judgemental. The frequency of operation showed variation from 90 Hz to 31 KHz.

REFERENCES:

- [1] **Ezeonu Stella Ogochukwu**, Amaefule Desmond Okechukwu and Okonkwo Godfrey Nnaegbo, 2012 *construction and testing of ultrasonic bird repeller*, . Department of Physics/Industrial Physics NnamdiAzikiwe University, Awka , journal of natural science research, vol.2, 2224-3180.
- [2] **Instruction manual QuadblasterQB 4** ultrasonic bird repeller, 1994.
- [3] **KhairulFadzly Bin Kushiar**2011, *Pest repeller system*, Faculty of Electronic and Computer Engineering ,UniversityTeknikal Malaysia Melaka.
- [4] **Simeon M.I., Mohammed A.S. and Adebayo S.E.**, 2013, *Development and preliminary testing of an electronic pest repeller with automatic frequency variation*, Department of Agricultural and Bioresources Engineering, Federal University of Technology, Minna, Nigeria, Vol.2, 2319-6734.
- [5] **SyazwaniElyaBtShaharuddin**, 2009, *Ultrasonic Bird repeller* dept. of electrical engg., 2412-2669

Distributed Document Clustering Using Parallel Computing Framework of Hadoop

Mr. Vitthal Kumbhar, Prof. Shyamrao Gumaste
vitthalkum@gmail.com, svgumaste@gmail.com

Abstract— Every day internet user's accesses data from various sources which in the form of text, images, audios and videos. This extraction of the data not limited to these terms, but it expands among vast area of searching things. But to give better services to user, data provider organization are searching technology which mainly focuses on challenging issues like accessing, storing, searching, sharing, transfer and visual presentation of data. Managing distributed unstructured data is impossible with traditional relational database system. Proposed system manages big data which is in the form of text, distributed among different text or pdf document. Paper focused on use of MapReduce framework as a parallel computing system of Hadoop. System proposes implementation of TF-IDF factor, k-means clustering on Hadoop. Also system proposes hierarchical clustering of documents. System reduces computing time to cluster data using Hadoop as compare to computing system implemented by using simple Java.

Index Terms— Hadoop, K-means clustering, MapReduce, Text mining.

INTRODUCTION

Data being mined in today's scenario is majorly from the internet through different devices such as mobiles, desktop computers, laptops etc. Search engine like Goggle, Yahoo, Twitter, facebook produces huge amount of data every day. To extract useful pattern for text mining is not easy with traditional database management system. There is need to form new application which reduces time to access data, avoid loss of data, provide high security to data and also perform inter machine communication. Also there is need to better understand how organizations view big data and to what limit they are currently using it to make beneficial to their businesses [1]-[6], [12]. Hadoop is new solution for over many of problems to handle big data. Google uses MapReduce parallelism of Hadoop and runs 1000 MapReduce jobs per day [13].

The large amount of information stored in unstructured form cannot simply be used for further processing by computers. For example information stored in unstructured text format is handled by computer as simple sequences of character strings. The presenting system mines big data which is stored in the form of text by applying k-means clustering with use of parallel computing framework of Hadoop.

Xindong Wu, Xingquan Zhu, Gong-Qing Wu, and Wei Ding [1] proposed Big Data Characteristics with HACE theorem. The characteristics defined by HACE theorem are in terms of data sources. These are as follow:

Heterogeneous and diverse sources: - Heterogeneous and diverse data sources generates huge amount of data. This is because different data sources have their different protocols for collection and storing of data.

Autonomous sources: - Autonomous data sources generate and collect information without any centralized control. For example, different web server provides a certain amount of information and each server works without depending on other servers

Complex and evolving relationship: - Multi-structure and multi-source data is complex data. Examples of complex data types are bills of materials, word processing documents, maps, time-series, images and video

To keep in mind challenging issues like heterogeneous, diverse and autonomous data sources, system uses MapReduce as a parallel computing framework of Hadoop to cluster data. Hadoop provides Map reduce parallel computing framework which clusters data parallelly. In text and PDF document clustering, TF-IDF is important factor to calculate weight of each document. After calculating TF-IDF, data is clustered hierarchically by using K-means clustering algorithm [14], [15].

Paper composes with 6 sections. Introduction is given in First section. Second section focuses survey of related work. Third section elaborates system architecture along with TF-IDF and K-means algorithms. Section 4 gives mathematical modeling. Results shown in section 5 and paper conclude with conclusion in section 6.

RELATED WORK

Existing system mines data efficiently by using traditional relational database management system. Data used by existing application is in structured form. These applications are unable to handle data which is in unstructured form. The existing system uses methods for clustering are time consuming and also unable to perform inter-machine communication.

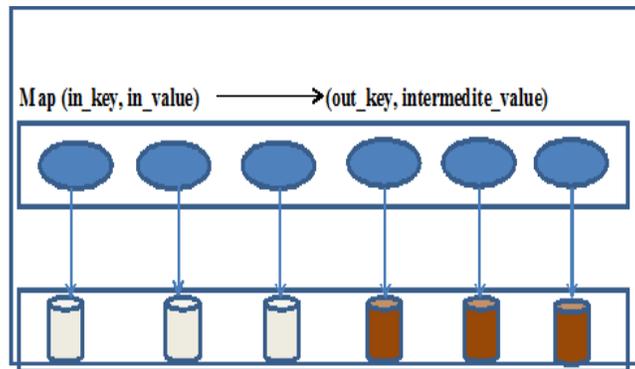


Fig.1 Map operation

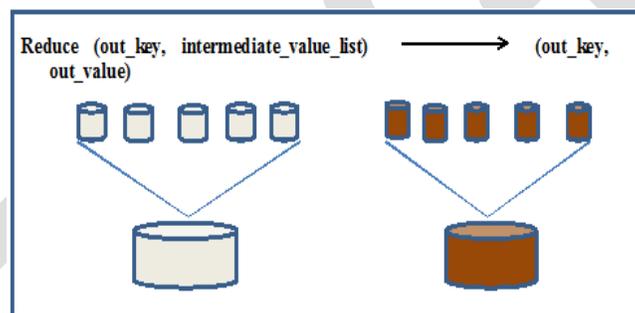


Fig.2 Reduce Operation

Emad A Mohammed, Behrouz H Far and Christopher Naugler [2], in their work they present MapReduce programming framework and its implementation platform Hadoop in clinical big data and related medical health informatics fields.

Jeffrey Dean, Sanjay Ghemawat [8], in their implementation, MapReduce runs on large cluster of commodity machines and is highly scalable. Work related to proposed system is to implement K-means and hierarchical clustering on Hadoop. As increase in nodes in Hadoop cluster reduces workload and time. Also Hadoop keep copies of data on each node. If any data on particular node goes fail, copy of that data would be available on another node.

MapReduce operation

As shown in fig1 and fig2, MapReduce operations perform with map and reduce function. In map function, master node takes input and divides into smaller sub problems. These sub problems are then distributed among worker node. Then worker node may again do same thing, leading to form multilevel tree structure. Worker node processes these sub problems and send the answer back to the master node [17].

In reduce function, master node collects the answers to all sub problems and combines them to desired output.

Hadoop Distributed File System

Apache Hadoop is an open-source software framework. Hadoop supports for data-intensive distributed applications and run applications on large clusters of commodity hardware. Hadoop was derived from Google's MapReduce and Google File System (GFS) papers [3].

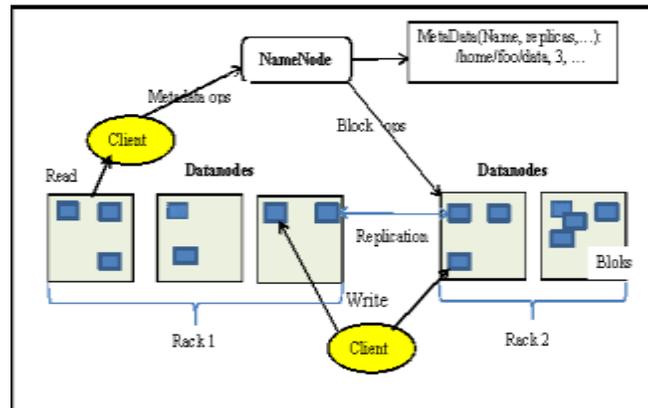


Fig.3 HDFS Architecture [10]

A small Hadoop cluster will include a single master and multiple worker nodes. The master node consists of a Job Tracker, TaskTracker, NameNode and DataNode. A slave or worker node acts as both a DataNode and Task Tracker, though it is possible to have data-only worker nodes and compute-only worker nodes. These are normally used only in nonstandard applications. To work with Hadoop, it requires Java Runtime Environment (JRE) 1.6 or higher. The standard start-up and shutdown scripts require Secure Shell (ssh) to be set up between nodes in the cluster [11].

The author Tian Xia [7], present "An Improvement to TF-IDF: Term Distribution based Term Weight Algorithm", Published by Journal of Software, Vol. 6, No. 3, March 2011, he present how to find Tf-Idf weight which is used in document clustering.

SYSTEM ARCHITECTURE

System proposes abstract level of Big Data to manage the Big Data stored in different location. This abstract model provides visual representation of data sources and creates fundamental data architecture so that more applications optimize data reuse and reduce computing costs. Figure 1 demonstrates idea of Big Data model. Big Data Model Architecture is represented through three layers. Physical layer represents sources of big data; these sources are in the form of structured or/and unstructured format. In next layer of model consist of management of physical data i.e. input data set, so that computing make easy in third layer. The last layer consists of computation in which data is retrieved for business value. By using these three layers it's easy to retrieve information instead of accessing physical data.

A. Big Data model

Figure 4 shows three model layers; the physical layer, data modeling layer, computing layer. Physical layer indicates the data in a Big Data system. It contains different types of data such as audio, videos, business tables, emails, logs and so on. The data modeling layer also called as abstract data model manages physical data. The computing layer also called as application layer that retrieves information for business value. To separate physical data and data use, these three models

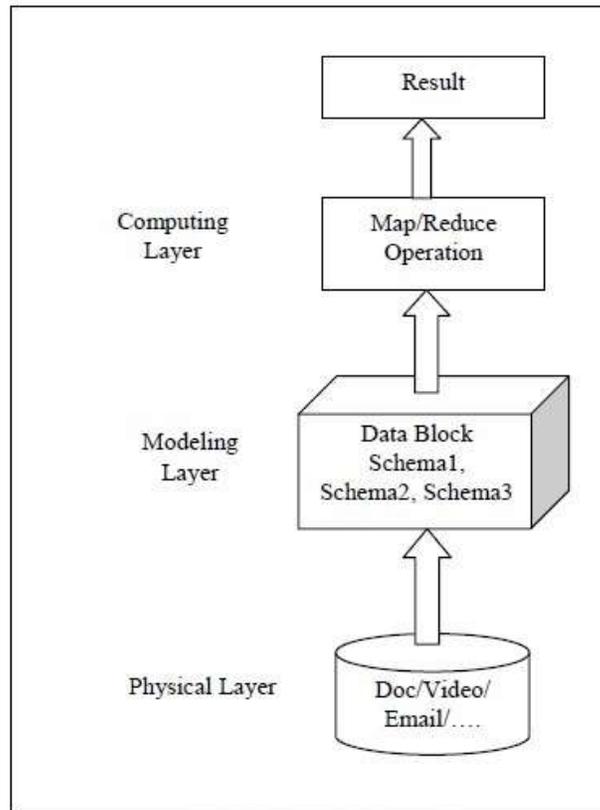


Fig.4 Big data model layers

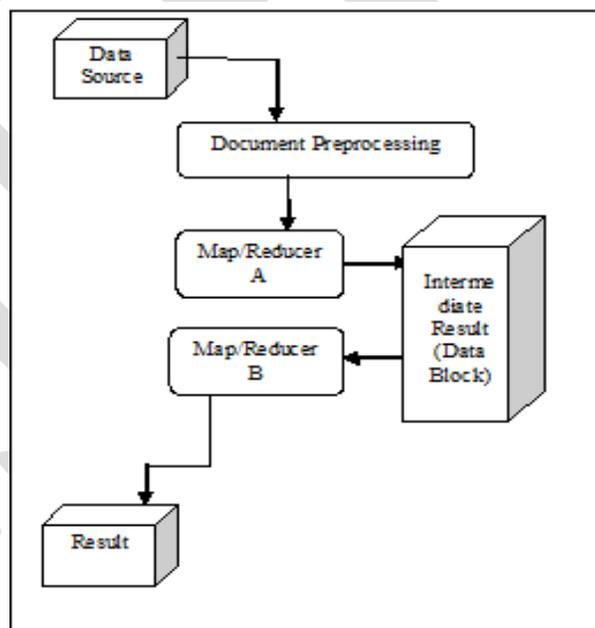


Fig.5 Proposed System Architecture

can be used to build data models. By using these three models application can access data through this data model without accessing the physical data. This data model makes flexibility in applications and data management.

As shown in fig 5, input data source consist of text documents or pdf documents undergoes document preprocessing before MapReduce operation. Document preprocessing in which documents are processed as follow:

1. Store stream of pdf document file in random access file create using COS Document constructor.
2. Parse the Pdf documents.
3. Extract the text from pdf documents and write it into newly created text file.
4. Tokenize each word from sentence and remove common words such as is, the, but, of etc.
5. Remove punctuations like comma, dot etc. from series of tokenized word.

TF-IDF Calculation

Term frequency-Inverse document frequency (TF-IDF) [7], [16] is calculated to find effect of terms that occurs frequently in corpus.

$$\text{TF-IDF} = \log(N(d) / F_t)$$

Where, **TF-IDF** =Inverse document frequency of term **N(d)**=Number of documents in corpus **F_t**=Frequency of a term **t** in corpus.

Cosine Similarity function

Cosine similarity function is used to find similarity between documents to form the cluster. The formula for finding cosine similarity is given by.

$$\text{Sim}(x, y) = \frac{\sum_{i=0}^n x_i y_i}{\sqrt{\sum_{i=0}^n x_i^2} \sqrt{\sum_{i=0}^n y_i^2}}$$

Where, **x_i** is the **TF-IDF** weight of **ith** term in first document

y_i is the **TF-IDF** weight of **ith** term in second document

K-means Algorithm for document clustering

Input: Set of pdf or text documents. K- no. of cluster,

- I. Identify unique words present in the input dataset; here dataset is pdf or text document.
- II. Generate input vector by calculating weight using TF-IDF
- III. Generate similarity matrix by using cosine similarity.
- IV. Specify no. of input cluster i.e. Value of k.
- V. Select randomly k no. of documents
- VI. Place one of k selected documents in each cluster based on similarity between documents and present document in the cluster.
- VII. Compute centroids for each cluster.
- VIII. Again apply similarity measures to find the similarity between the centroids and the input documents.
- IX. Now place the documents in the clusters based on similarity between documents and the centroids of clusters.
- X. After placing all the documents in the clusters, compare the precious iteration clusters with current iteration clusters.
- XI. In all clusters if documents in current iteration similar to documents in previous iteration then stop the process, else repeat the steps through step 7.

Hierarchical document clustering Algorithm

Input: 'n' number of text or pdf documents.

1. Create 'n' no. of folders.
2. Put each doc in individual folder

3. For every document in each folder do the following
 - I. map the document using map function
 - II. Calculate TF-IDF weight value
 4. Repeat the following till criterion function converges
 5. For every calculated document do the following
 - I. Reduce the document using reduce function
 - II. If Tf-Idf matches with other documents then merge folders
 6. Merge all disjoint folders in a root folder.
- Output: Hierarchical clustered documents.

The above algorithm is Hierarchical document clustering algorithm where the input is in the form of text or pdf documents. MapReduce function processes documents parallelly to determine the TF-IDF values. The initial clusters are chosen as a value of K from the corpus and then each cluster is kept in a separate folder.

MATHEMATICAL MODELING

Term frequency-Inverse document frequency (TF-IDF) [7] is calculated to find effect of terms that occurs frequently in corpus.

$$\text{TF-IDF} = \log(N(d) / F_t)$$

Where, TF-IDF = Inverse document frequency of term $N(d)$ = Number of documents in corpus F_t = Frequency of a term t in corpus.

Cosine Similarity function

Cosine similarity function is used to find similarity between documents to form the cluster. The formula for finding cosine similarity is given by.

$$\text{Sim}(x, y) = \frac{\sum_{i=0}^n x_i y_i}{\sqrt{\sum_{i=0}^n x_i^2} \sqrt{\sum_{i=0}^n y_i^2}}$$

Where, x_i is the TF-IDF weight of i^{th} term in first document

y_i is the TF-IDF weight of i^{th} term in second document.

EXPECTED RESULT

Result of the proposed system is based on number of input documents and initial value of cluster.

Expected result will be in the form of TF-IDF values of each word of each file. Partition clusters as per given input as an initial value of K to the system and Hierarchical Clusters.

CONCLUSION AND FUTURE SCOPE

This paper present small use of MapReduce feature of Hadoop to work on big data. This algorithm requires initial values. It requires presumed set of cluster as an input. Future scope of this system is to take advantage of MapReduce infrastructure of Hadoop to parallel computing. Also manage failure of any node by creating copy on another node. Future scope also involves implementing new algorithms on Hadoop and measure the performance. The design and implementation of algorithm is main contribution to this work.

ACKNOWLEDGMENT

I express true sense of gratitude towards my project guide Prof. S. V. Gumaste, HOD and Associate Professor in Computer Department. I would also thanks to Prof. Sandip Kahate, PG-Coordinator, Computer Engineering department and Dr. Kharat Sir, Principal SPCOE, for their guidance and for allowing me to use the college resources and facilities.

REFERENCES:

- [1] Xindong Wu, Fellow, IEEE, Xingquan Zhu, "Data Mining with Big Data", IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING, VOL. 26, NO. 1, JANUARY 2014
- [2] Emad A Mohammed, Behrouz H Far and Christopher Naugler, "Applications of the MapReduce programming framework to clinical big data analysis: current landscape and future trends", Mohammed et al. BioData Mining 2014.
- [3] Ankit Darji, Dinesh Waghela," Parallel Power Iteration Clustering for Big Data using MapReduce in Hadoop", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 6, June 2014 ISSN: 2277 128X.
- [4] Bharti Thakur, Manish Mann, "Data Mining for Big Data: A Review", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 5, May 2014
- [5] Dave Chappelle, "Big Data & Analytics Reference Architecture", An Oracle White Paper, September 2013.
- [6] "IBM What Is Big Data: Bring Big Data to the Enterprise," <http://www-01.ibm.com/software/data/bigdata/>, IBM, 2012.
- [7] Tian Xia, "An Improvement to TF-IDF:Term Distribution based Term Weight Algorithm", Published by Journal of Software, Vol. 6, No. 3, March 2011.
- [8] Jeffrey Dean, Sanjay Ghemawat, "MapReduce: Simplified Data Processing on Large Clusters", Google, Inc 2004.
- [9] Anand Rajaraman, Millway Labs, Jeffrey D. Ullman, "Mining of Massive Datasets" Jure Leskovec Stanford Univ, Copyright © 2010, 2011, 2012, 2013, 2014
- [10] Jinbao Zhu, Allen Wang, "Data Modeling for Big Data", CA Technologies Copyright © 2012 CA.
- [11] <http://hortonworks.com/hadoop/hdfs/>
- [12] http://en.wikipedia.org/wiki/Big_data.
- [13] http://erwin.com/expert_blogs/detail/opetarational_data_hadoop_and_new_modeling.
- [14] http://home.deib.polimi.it/matteucc/Clustering/tutorial_html/kmeans.html
- [15] <http://codingwiththomas.blogspot.in/2011/05/k-means-clustering-with-mapreduce.html?m=1>.
- [16] <https://code.google.com/p/hadoop-clusternet/wiki/RunningMapReduceExampleTFIDF>
- [17] Neep Shaha, Dr. Sunita Mahajan, "Distributed Document Clustering Using K-means", IJARCSSE, Volume 4, Issue 11, November 2014

HYDRODYNAMICS STUDIES ON SEMI-FLUIDIZED BED REACTOR USING INTERNALS

Deepika J¹, Gengadevi R², Saravanan K^{**}

^{1,2}DEPARTMENT OF CHEMICAL ENGINEERING, KONGU ENGG COLLEGE, PERUNDURAI, ERODE

^{**} (PROFESSOR AND HEAD) DEPARTMENT OF CHEMICAL ENGINEERING, KONGU ENGG COLLEGE, PERUNDURAI,
ERODE

¹corresponding author E-mail id: jdeepikakrishnan@gmail.com

ABSTRACT: Mixing is an important unit operation encountered in chemical and allied industries. It can be achieved by many ways. One such way is fluidization. The efficiency of conventional fluidized bed is enhanced by semi-fluidized bed reactor. It is a novel type of fluid-solid contacting device. The semi fluidized bed is characterized by a fluidized bed and a fixed bed in series with single contacting vessel. Any improvements that made in the fluidized section of semi fluidized bed will increase overall efficiency of semi fluidized bed. This can be achieved by employing mixing elements in fluidized section of semi- fluidized bed reactor. For this purpose, Experiments have been conducted in a 50 mm ID, 1m-height vertical glass column using water as liquid phase and glass beads, sand, quartz used as solid phase. kenics elements of different L/D ratios are used. It is found that pressure drop increases with increase in particle size and static bed height. The minimum liquid semi-fluidization velocity increases with particle size but is a weak function of static bed height. The height of top packed bed increases with liquid and but decreases with particle size and static bed height. Results are presented graphically.

Keywords: Semi-fluidized bed, Mixing, static elements, pressure drop, Minimum and Maximum Semi-fluidization velocity, packed bed formation

1. INTRODUCTION

A Semi-fluidized bed can be viewed as the combination of a batch fluidized bed at the bottom and a fixed bed at the top within a single vessel. A Semi-fluidization bed has the advantages of both the packed and the fluidized beds. It is a new and unique type of fluid-solid contacting technique which has been reported recently. In most of the chemical plants we come across situations where a solid phase has to be kept in contact with a fluid phase — for example diffusional operations like drying, adsorption, reaction kinetics, solid catalysed reactions, heat transfer, etc. In all these cases fluid-solid contacting is very essential and developments to increase the efficiency of contact and mixing are always welcome. Static elements incorporated in the fluidizing section helps to increase the mixing efficiency. The development and advantages of the semi-fluidized bed relating to studies on hydrodynamics, mass transfer, reaction kinetics and filtration ^[4]. Fixed bed or packed bed, batch and continuous fluidization and semi-fluidization all are two phase phenomena. In case of batch fluidization if the free expansion of the bed is restricted by the introduction of porous disc or sieve and the fluid velocity is increased the particles are fluidized and the expansion starts with further increase in velocity of fluid—the particles will be carried and the formation of a fixed bed results at the top. So by the introduction of restraint some of the particles

are distributed to bottom section which is in the form of a packed bed. This is known as semi-fluidization which can be considered as a new type of solid-fluid contacting method which combines the features of both fixed and fluidized beds [7].

This type of technique overcomes the disadvantages of fluidized bed namely back mixing of solids, attrition of solids and problems involving erosion of surfaces. This also overcomes certain draw backs of packed bed, viz., Non-uniformity in temperature in the bed, channel flow and segregation of solids. Semi-fluidized bed are advantageous for fast exothermic reactions such as vapor phase oxidation and chlorination of hydrocarbons and used in the filtration operation for the removal of suspended solids and also used as bioreactors. Any improvements that made in the fluidized section of semi fluidized bed will increase overall efficiency of semi fluidized bed. For this purpose, an attempt was made to study the hydrodynamics of semi-fluidized bed with internals for liquid-solid systems.

2. EXPERIMENTAL SECTION

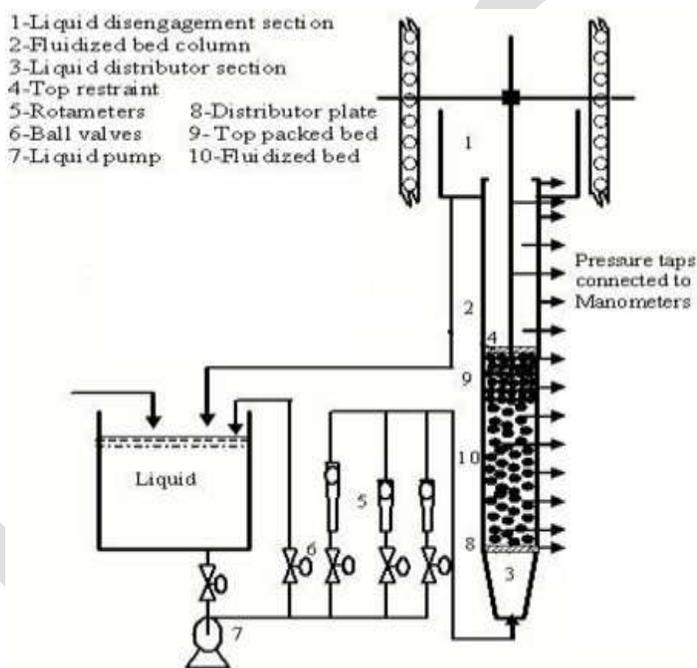


Fig 2.1 Experimental setup



Fig 2.2 Kenics element

A schematic representation of the experimental setup is shown in Fig. 2.1. The experimental semi-fluidized bed consists of a fluidized bed assembly, a top restraining plate with fixture, and a pressure measuring arrangement. The fluidized bed assembly consists of a fluidizer, liquid distributor, liquid storage tank, calibrated liquid rotameter. The fluidizer is a vertical cylindrical glass column of 0.05m internal diameter and 1m height. The liquid distributor is located at the bottom of the fluidized bed column and is designed in such a manner that uniformly distributed liquid enters the fluidized bed column. The higher cross-section end is fitted to the fluidized bed column, with a perforated distributor plate made of G.I. sheet of 0.001 m thick, 0.05m diameter having open area equal to 20 % of the column cross-sectional area with a 16 mesh (BSS) stainless steel screen in between. The size of the holes has been increased from

inner to outer circle. The top restraining plate is made from Perspex sheet of 0.05m diameter and 3 mm thick containing 3 mm holes with approximate total open area of 40%. There is a minor clearance between the plate and the inner wall of the column, which facilitated the free movement of the plate in the column, restricting the particle entrainment. A BSS 16 mesh screen is attached to the bottom of the plate and the plate is supported by a Perspex slotted support from the top. The whole assembly is fitted to an iron rod of 5 mm diameter with nut bolt arrangement.

Four Particles of different sizes and water have been used as the solid and the liquid phases respectively. Kenics elements employed as mixing element shown in Fig2.2. The scope of the experiment is presented in Table 2.1 and 2.2. Accurately weighed amount of material is fed into the column, fluidized and de-fluidized slowly and adjusted for a specified reproducible initial static bed height. Liquid is pumped to the fluidizer at a desired flow rate using liquid rotameter. Approximately five minutes are allowed to make sure that the steady state has been reached. The readings of the manometers and the expanded bed heights or the top packed bed height (as the case may be) are then noted. The procedure has been repeated by varying the particle size, particle density bed expansion ratio(R) and initial static bed height (H_s) and internals L/D ratio.

Table 2.1 Characteristics of particle-liquid system used in the study

Solid –liquid Systems	D_p , mm	ρ_p , (kg/m ³)	ϵ_s	ρ_l , (kg/m ³)	$\mu_l \times 10^3$, Pa.s
Sand-Water	1.1	2644.35	0.452	995.7	0.789
Quartz- water	3	2830	0.503	995.7	0.789
Glassbeads- Water	2.18	2470	0.425	995.7	0.789
Glassbeads- Water	5	2470	0.526	995.7	0.789

Table 2.2 Range of Variables

Variables	Range
Particle size (d_p)	1.1, 2.18, 3, 5 (mm)
Particle hardness	5.5, 7, 69
Initial static bed height (h_s)	12.7, 15.2 (cm)
Bed expansion ratio(R)	1.5, 2, 2.5, 3
Internals L/D ratio	2, 3, 4

3. RESULTS AND DISCUSSIONS

The experiments were conducted by varying the flow rate of $0.0333 \text{ m}^3/\text{s}$ to $0.5334 \text{ m}^3/\text{s}$. Pressure drop across the entire bed was measured using U-tube manometer and also top packed bed height height were noted for each flow rate. Minimum and Maximum Semi-fluidization velocity were observed visually and graphically.

3.1 Effect of bed expansion ratio (R)

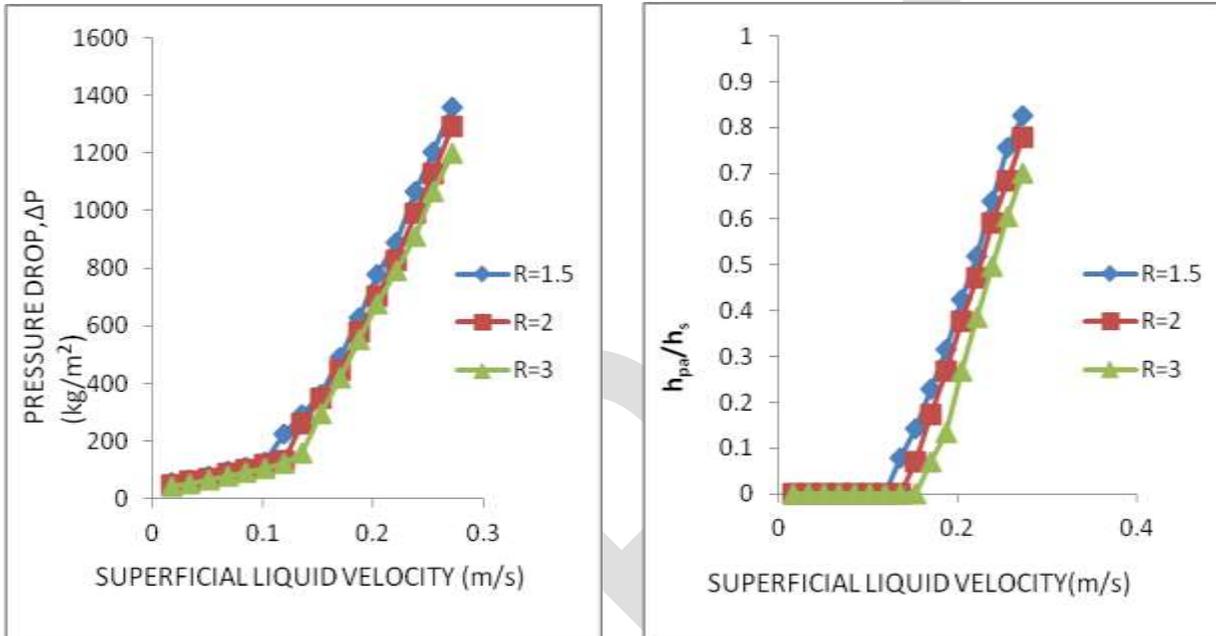


Fig 3.1.1 Effect of superficial liquid velocity on bed pressure drop and h_{pa}/h_s for 0.003m particles (Quartz) in water at different R without internals with $h_s=0.127 \text{ m}$

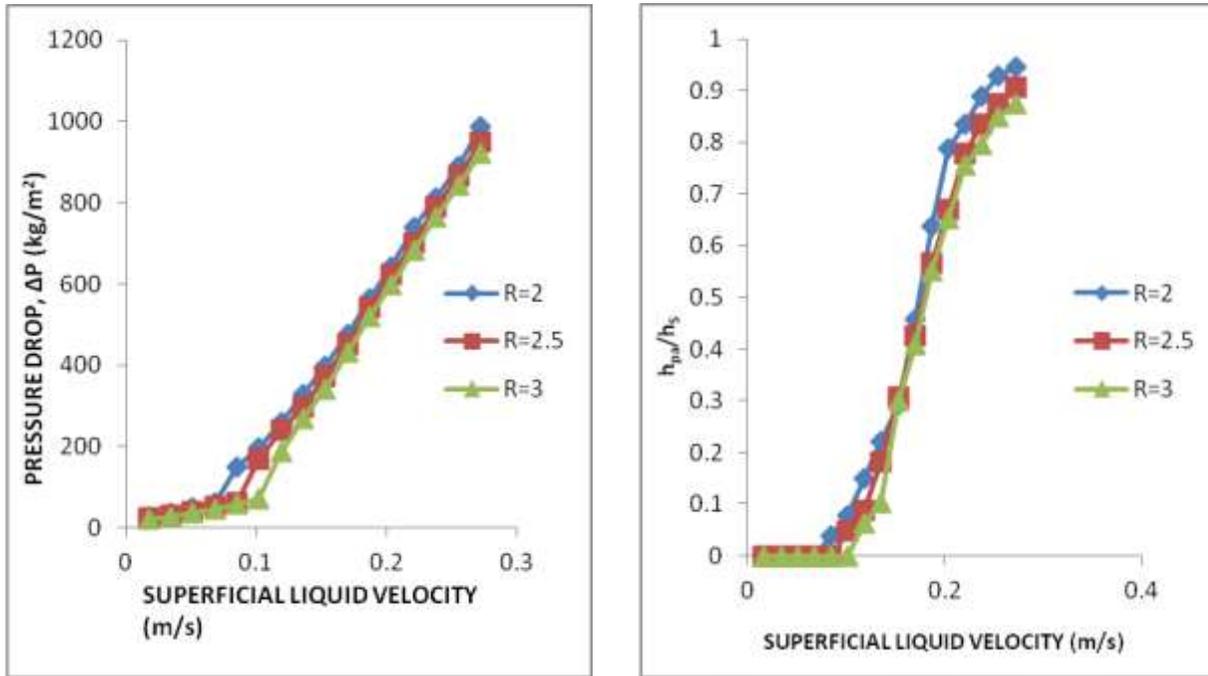


Fig 3.1.2 Effect of superficial liquid velocity on bed pressure drop and h_{pa}/h_s for 0.0011m particles (sand) in water at different R using internals with $h_s=0.127$ m and $(L/D)_1=3$

From these above figures, it can be observed that pressure drop across the bed and top packed bed formation decreases with increasing the bed expansion ratio for both with and without internals. The minimum Semi-fluidization velocity also called onset velocity of semi-fluidization (U_{osf}) is the superficial liquid velocity at which a bed particle of the expanded fluidized bed first touches the top restraint of the semi-fluidizer. Experimentally the minimum Semi-fluidization velocity can be determined by the following methods^[11]. (1) From the plot of the ratio of the height of the top restraint to the height of the expanded fluidized bed (h_t/h_f) Vs the superficial liquid velocity (U_f). (2) From the plot of pressure drop across the bed Vs the superficial liquid velocity. The bed expansion ratio has a stronger effect on the minimum Semi-fluidization velocity as illustrated in fig 3.1.1 and 3.1.2. The reason is the requirement of higher fluid velocity to lift the particle to the higher position of the top restraint in the bed. U_{osf} increases with the increase in bed expansion ratio. The same behavior has been observed by other investigators also^[10].

3.2 Effect of particle diameter and hardness

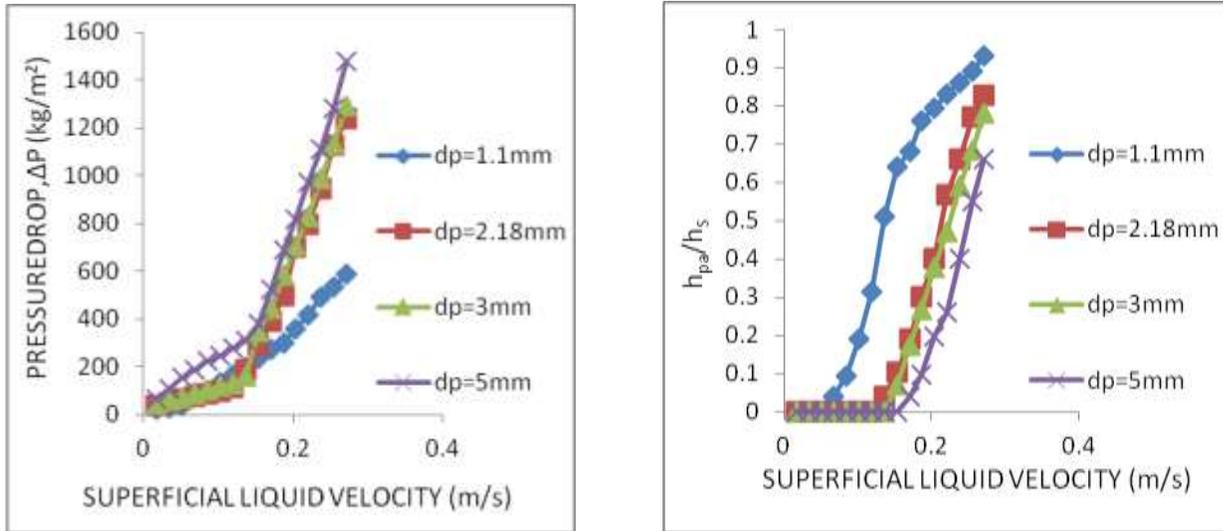


Fig 3.2.1 Effect of superficial liquid velocity on bed pressure drop and h_{pa}/h_s at different d_p particles in water without internals with $R=2$ and $h_s=0.127m$

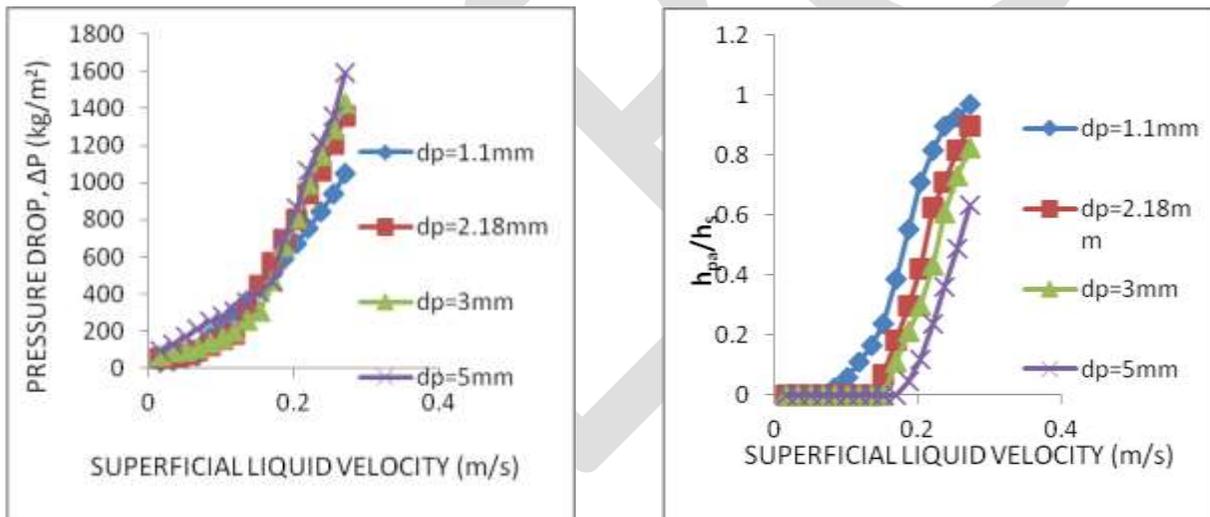


Fig 3.2.2 Effect of superficial liquid velocity on bed pressure drop and h_{pa}/h_s at different d_p particles in water using internals with $R=2$, $h_s=0.152m$ and $(L/D)_1=3$

From the above figures, it can be observed that increases the particle size, pressure drop across the bed increases but the top packed bed formation decreases with the increase the particle size and hardness for both with and without internals. The effect of particle size on U_{ost} is presented in fig 3.2.1 and fig 3.2.2. This shows that larger the particle size and hardness higher is the minimum semi-fluidization velocity. This is true as higher drag force and ultimately the higher fluid velocity is required to lift the bigger size particle which bears a higher mass. The same behavior has been observed while using internal elements of different L/D ratio.

3.3 Effect of initial static bed height (h_s)

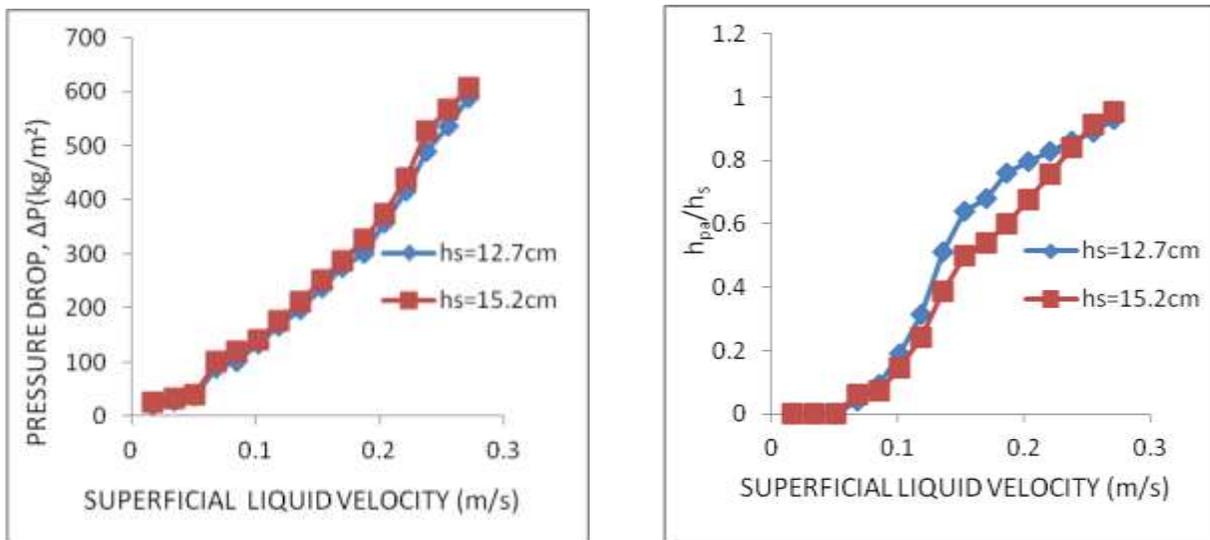


Fig 3.3.1 Effect of superficial liquid velocity on bed pressure drop and h_{pa}/h_s for 0.0011m particles (sand) in water at different h_s without internals with $R=2$

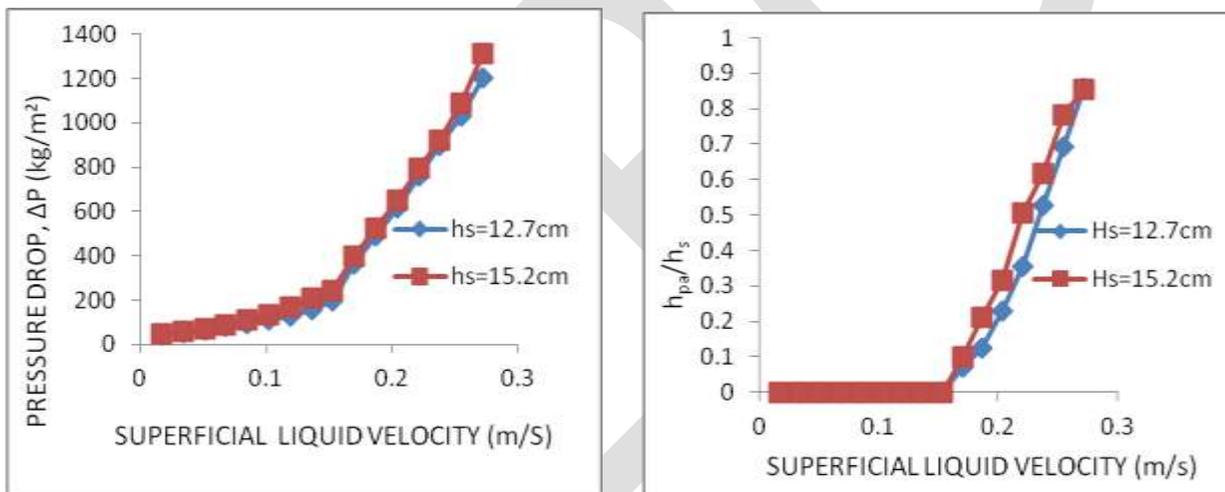


Fig 3.3.2 Effect of superficial liquid velocity on bed pressure drop and h_{pa}/h_s for 0.00218m particles (glass beads) in water at different h_s using internals with $R=3$ and $(L/D)_f=3$

From these above figures, it can be noted that the pressure drop increases with the increase in initial static bed height and top packed bed formation decreases with initial static bed height. The minimum semi-fluidization velocity being partially unaffected by the initial static bed height is indicated in fig 3.3.1 and fig 3.3.2. The maximum semi-fluidization velocity (U_{mst}) is the fluid velocity at which the entire bed of solid particles is transferred to the top packed bed. There are two methods used for the prediction of the maximum semi-fluidization velocity from extrapolation of the experimental data. (1) By extrapolation of the porosity of the fluidized section (ϵ_f) vs superficial liquid velocity curve to $\epsilon_f=1$ or (2) By extrapolation h_{pa}/h_s vs superficial liquid velocity curve to $h_{pa}/h_s=1$. In the present study, second method has been used to determine the maximum semi-fluidization velocity. From the figures 3.1.1. to 3.3.2, it can be noted that maximum semi-fluidization velocity has been found to increase with the static bed height, the particle size and the bed expansion ratio.

3.4 Effect of (L/D) ratio of internal elements

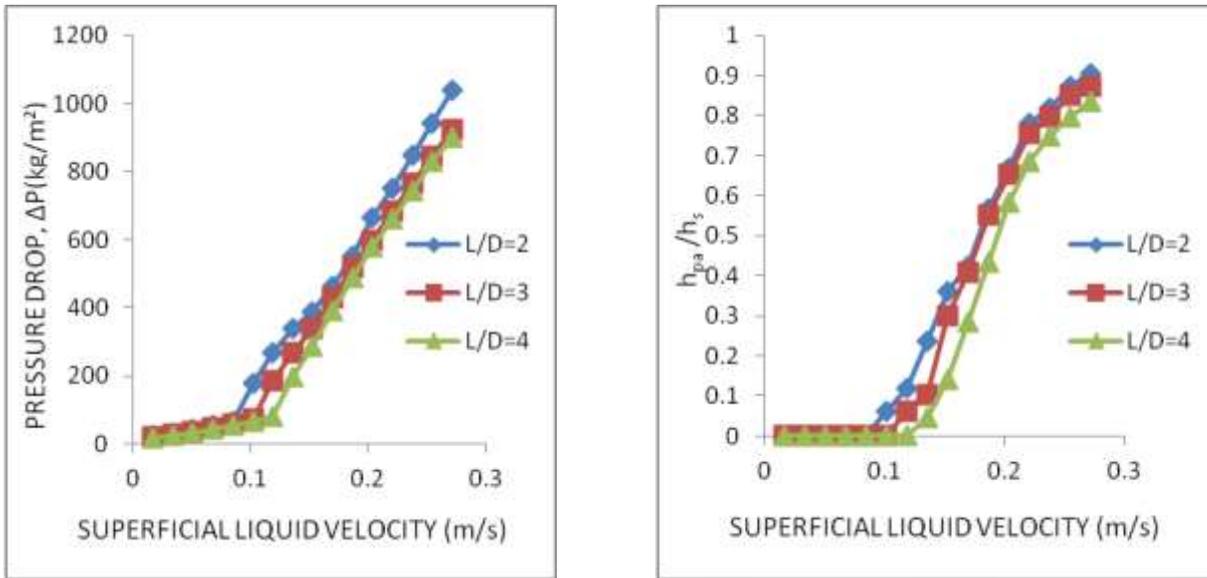


Fig 3.4.1 Effect of superficial liquid velocity on bed pressure drop and h_{pa}/h_s for 0.0011m particles (sand) in water at different (L/D) ratio of internal elements with $R=3$ and $h_s=0.127m$

From the figure 3.4.1, it can be found that pressure drop across the bed and top packed bed formation increases with the decrease in L/D ratio of internals from 4 to 2. And the minimum semi-fluidization velocity increases with increasing the L/D ratio of internals from 2 to 4. This shows that larger the L/D ratio of elements, it restricts the free motion of particles. Hence, higher fluid velocity is required to lift the particle to the top restraint plate.

3.5 Effect of with and without internals

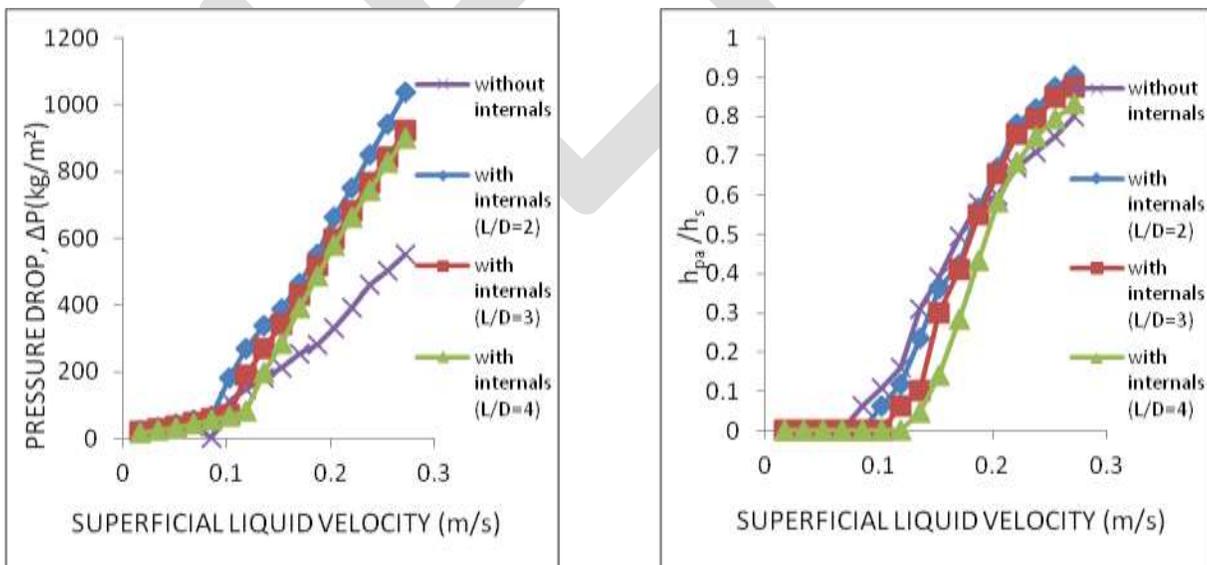


Fig 3.5.1 Effect of superficial liquid velocity on bed pressure drop and h_{pa}/h_s for 0.0011m particles (sand) in water at different (L/D) ratio of internal elements with $R=3$ and $h_s=0.127m$

From the figure 3.5.1, it can be observed that bed pressure drop and top packed bed formation increases while using internal elements. With internals, Minimum semi-fluidization velocity increases and the top packed bed formation initially decreases and after reaching the minimum semi-fluidization velocity h_{pa} increases when compared with the experiments without internals. Due to the presence of elements, the free motion of particles being affected so higher fluid velocity are required. Once it reaches the U_{osf} , elements enhance the mixing and accelerates higher packed bed formation.

4. ACKNOWLEDGEMENT

We take this opportunity to express our thanks to department of chemical engineering, kongu engineering college to undertake this work and allow us to present our findings as our contribution to the development of knowledge in the field of chemical reaction engineering and also wish to express my sincere thanks to my parents and all my friends for their support

5. CONCLUSION

The present study of the liquid-solid semi-fluidized bed hydrodynamics has been resulted with following conclusions. Both the minimum and maximum semi-fluidization velocities increase with the increase in particle size and bed expansion ratio and also increases while using internals than without using internals. The minimum semi-fluidization velocity is independent of the variation of initial static bed height, but the maximum semi-fluidization velocity increases with increase the static bed height. When using internals with lesser L/D ratio, bed pressure drop and packed bed formation increases. The efficiency of semi-fluidized bed reactor was enhanced by using internals of smaller L/D ratio.

Nomenclature

D_p	Mean particle diameter, m
h_f	Height of the expanded fluidized bed, m
h_{pa}	Height of the top packed bed, m
h_s	Height of initial static bed height, m
h_t	Height of the top restraining plate, m
ΔP_{sf}	Pressure drop across the semi-fluidized bed, Kg/m^2
R	Bed expansion ratio, dimensionless
U_{osf}	Minimum semi-fluidization velocity, m/s
U_{msf}	Maximum semi-fluidization velocity, m/s
ϵ_f	porosity of the fluidized bed, dimensionless
ϵ_{pa}	porosity of the packed section, dimensionless
μ_l	viscosity of the liquid, Pa s

ρ_s density of solid, kg/m^3

ρ_l density of liquid, kg/m^3

REFERENCES:

1. Abass O. Alade, Ahmad T. Jameel, Suleyman A.Muyibi, Mohamed I.Abdul Karim and Md.Zahangir Alam "Application of Semi-Fluidized Bed Bioreactor as Novel Bioreactor System for the treatment of Palm Oil Mill Effluent(POME)" African Journal of Biotechnology, 10(81), 18642-18648,2011
2. Abass O. Alade, Suleyman A.Muyibi and Ahmad T. Jameel "Treatment of Palm OIL Effluent using Semi-Fluidized Bed Bioreactor" Chemical Engineering Science ,65,1111-1117,2011
3. Abbas H. Sulaymon, Ahmed A. Mohammed and Tariq J. Al-Musawi "Predicting the Minimum Fluidization Velocity of Algal Biomass Bed" American Journal of Engineering Research (AJER), 2320-0847, 2(12), 39-45,2013
4. Chen Hanping, Li Bin, Yang Haiping and Yang Guolai, Zhang Shihong "Experimental Investigation of Biomass Gastification in a Fluidized Bed Reactor" American Chemical Society (Energy & Fuels), 22, 3493-3498,2008
5. Dora D.T.K, Mohanty Y.K and Roy G.K "Hydrodynamics of Three Phase Fluidization of Homogeneous Ternary Mixture of Irregular Particles" Chemical Engineering Science, 79, 210-218,2012
6. Dora D.T.K, Mohanty Y.K, Roy G.K "Hydrodynamics of Three Phase Fluidization of Homogeneous Ternary Mixture of Regular Particles" Powder Technology, 237, 594-601,2013
7. Huiyan Zhang, Shanshan Shao, Rui Xiao, Qiwen Pan, Ran Chen and Jubing Zhang "Numerical Study on the Hydrodynamics of a Self Heating Biomass Fast Pyrolysis Reactor" American Chemical Society (Energy & Fuels), 25, 4077-4084,2011
8. Jena H.M, Roy G.K and Meikap B.C "Comparative Study of Immobilised Cell Bioreactors for Industrial Waste Water Treatment" WMCI,2005
9. Jena H.M, Roy G.K and Singh R.K "A Novel Technique for Phenolic Waste Water Treatment"International Symp., Desalination and Water Purification: Water Resources and their Management., MNIT, Jaipur, India,2006
10. Jena H.M, Roy G.K and Meikap B.C "Experimental Hydrodynamic Study of a Three Phase Semi-Fluidized Bed" Indian Chemical Congress, Ankleshwar, India,2006
11. Jena H.M, Roy G.K and Meikap B.C "Hydrodynamics of Regular Particles in a Liquid-solid Semi-Fluidized Bed" Powder Technology, 10, 1016,2009
12. Murthy J.S.N and Roy G.K "Semi-Fluidization: A Review" Indian Chemical Engineer, 22, 9-22,1986
13. Nageswara Rao L "Immobilised Bioreactors for the Treatment of Industrial Waste Water" International Journal of Engineering Sciences and Research Technology" 2(10).2013
14. Narayanan C.M "Performance Analysis of Semi-Fluidized Bed Bio film Reactors with Liquid Phase Oxygen (LPO) Utilization" The 14th International Conference on Fluidization- From Fundamental to Products, ECI Symposium,2013
15. Roy G.K and Sarma K.J.R "Prediction of onset Semi-Fluidization, Maximum Semi-Fluidization Velocities and the Packed Bed Height" Chemical Processing and Engineering,1971
16. Roy G.K, Sarma K.J.R and Sen Gupta P "Prediction of Minimum and Maximum Semi-Fluidization Velocities by Nomographs" Chemical Age of India,1971
17. Roy G.K and Sarma K.J.R "Prediction of Minimum and Maximum Semi-Fluidization Velocities for Liquid-Solid Systems

from Dimensional Analysis Approach” Chemical Era,1971

18. Roy G.K and Sen Gupta P “Prediction of the Packed Bed Height in Gas-Solid Semi-Fluidization” American Chemical society,1974
19. Roy G.K and Sarma K.J.R “Relation between Minimum and Maximum Semi-Fluidisation Velocity in Liquid-Solid Systems” Journal of Institution of Engineers, 54,1974
20. Roy G.K and Sarma K.J.R “Prediction of Semi-Fluidization Velocity of Irregular Particles in Liquid–Solid System” Chemical Engineering World,1975

IJERGS

DEVELOPING A MODEL FOR FINANCIAL FORECASTING THROUGH ARTIFICIAL NEURAL NETWORKS

SANDEEP MALIK

Research Scholar

Department of Computer Science

Singhania University, Pacheri Bari, Rajasthan (India)

E-Mail: smaliknnl@gmail.com, Mob +918421082285

Dr. ASHUTOSH KUMAR BHATT

Assistant Professor

Department of Computer Science

BIAS, Bhimtal, Nanital, Uttarakhand (India)

E-Mail: ashutoshbhatt123@gmail.com

Abstract: Financial forecasting plays a prominent role in finance market because of its commercial applications with respect to high stakes and attractive gains that it provides. The purpose of the study is to develop a new analytical ANN based model for predicting the FER and compare proposed model efficiency with the existing technique. Model was proposed to predict the euro to dollar exchange, pound to dollar exchange and rupee to dollar exchange. It was noticed that outcomes of proposed model performs better and faster to evaluate the FER. There was a slight difference found between real ER and predicted ER. Future work would be carried out to enhance the study area by emerging a new analytical model by adopting ANN along with any other appropriate analytical model or other NN model.

Keywords: neural networks, artificial neural networks (ANN), exchange rate, foreign exchange rate (FER) Hidden Markov Model Foreign Exchange Rate (HMMFER), artificial neural network foreign exchange rate forecasting model (AFERFM), Hidden Markov Model (HMM).

1.1 Introduction:

Forecasting is a significant factor and most prominent activity in markets of finance. It is helpful for numerous players namely policy makers, regulators, investors, practitioners, investors and academia. When forecasting with weak factors it has strong effect in the growth of economy because of its negative influence on global trade and investment adopting a weak model for predicting would result in incorrect judgment [1]. It could support organization to take decision in the upcoming years. Models of forecasting include judgmental, time series (TS) and cause-and-effect (CE). TS forecasting model is a variable that would be sequentially placed. Such variable would possess equal length and time gap [2]. Some of the examples of TS methods are predicting the linear, growth curve, box-Jenkins, exponential smoothing, auto-aggressive moving average and estimating the trend. TS are applied to numerous fields such as workload projections, control of quality and process, budgetary analysis, economic and sales forecasting, yield projects, analyzing the stock market, inventory studies and so on [3]. CE model would determine the form of link and applies prediction for the following variable [4] [5].

ER (Exchange Rates) plays a key role in maintaining the dynamics in market of foreign exchange. Probably forecasting ER would be successful factor in the business and for fund managers. Although, financial market is well-known for its unpredictable nature and volatility however various groups like financial institutions or banks, agency and so on are there for forecasting the ER through unique techniques. Forecasting the ER is a demanding and needed application in the area of TS forecasting [6]. Characteristics of ER are non-stationary chaotic, deterministic and more noisy. Due to such characteristics complete data cannot be gained from prior behaviours of

market of foreign exchange to completely gain the relied between the rates of past and future. Methods which are employed to predict the currency ER involves soft computing, economic and TS methods [7] [8].

Neural networks (NN) are powerful and supportive tools for prediction in the area of artificial intelligence [9-14]. NN are generally non-linear models and if such models are well-trained then it would help in mapping prior and future values in the field of time series and get concealed structures and relationships which guide the data [9][14]. NN are applicable in various fields [15] [16] like filtrating data, phenomena related to economy and finance, forecasting and optimization and producing time-series [10] [13] and more. Artificial NN (ANN) could be applied for predicting the FER (Foreign Exchange Rate) that supports various players in the financial markets. Therefore organizations in the market of overseas exchange could adopt ANN model in determining the ER for future as well as provides a beneficial trading strategy and suitable decision on allocating the assets [17].

1.2 Problem Statement:

FER is a huge problem in finance that is obtaining more focus especially due to its complexity and practical applications. ANN was adopted by various industries for different purposes of real-time applications. ANN was adopted as an alternative and prominent approach to predict FER due to various unique characteristics [14]. Many investigators have developed several models in ANN to forecast FER, all failed to concentrate on forecasting during uncertain and instable market situations. Therefore the proposed research would develop a new analytical ANN model to predict the FER and compare its efficiency with the existing technique namely AFERFM model.

2. Literature Review:

Kadilar et al [18] carried out a research to forecast the ER series with ANN for high volatile US/Turkish dollar ER series and outcomes indicated that method of ANN had the best accuracy in terms of accuracy to TS models namely ARCH (Auto-regressive conditional heteroschedasticity) and ARIMA. Pradhan and Kumar [19] had deployed ANN model for predicting FER with specific reference to India. ANN model performs coupling international revolutionary topologies of network search, initial heuristic and input series near-optimal weights. Such method enhances the prediction by testing, proper training and cross-validation. It was stated that NN is an advanced method to be adopted for FER. It was suggested that ER's linear unpredictability could be enhanced and non-linearity could be found out by adopting the modeling of NN. Highlight of such model is that the data concealed in ER could be able to extract with the help of ANN.

According to the research by Pacelli et al [20] predicted the trend of ER USD/Euro using ANN model. It was found that developed ANN model could be able to forecast the trend to 3 days of ER US dollar/Euro. Philip et al [21] developed an ANN model to predict FER. In this research, ANNFER forecasting model (AFERFM) was developed for forecasting the FER to correct few issues. It was found that proposed model outperforms well in evaluating the FER. It was noticed that proposed model showed good results in terms of accuracy percentage. When AFERFM performed it was compared with Hidden Markov Model FER forecasting model (HFERFM), projection of FER performs better. Accuracy of AFERFM model was 81.2 per cent. It was indicated that new proposed model gives an enhanced technique to conduct FER forecasting.

Perwej and Perwej [22] examined the prediction of INR (Indian Rupee)/ US dollar currency ER using ANN. Number of hidden and input nodes are the experimental factors of ANN. Both performance of out-of-sample prediction and fitting ability of in-sample with 3 forecast horizons are estimated with 3 criteria MA (Mean Absolute) Error, MA Percentage Error and RMSE (Root Mean Square

Error). 2 training sample impacts were analyzed with the similar predictive horizons. Goal of this research is to explore the impacts of certain significant factors in NN on fitting the model and predicting the behaviours. Purpose of forecasting is not suitable to estimate the capability of ANN with the sample of training alone. At the same time, there are no widely adopted methods for building best and suitable model for prediction through in-sample data of training. Selecting the architecture of optimal network would be on the basis on the outcomes of test sample. Number of nodes in input plays a significant part in NN and TS forecasting.

Erdogan and Goksu[23] predicted the analysis of Turkish Lira and Euro ER with ANN. Certain factors affect the NN accuracy in the process of implementation. Different structures are constructed by modifying the various neurons, learning algorithms and transfer functions for obtaining higher performance. It compared the accuracy of various architectures of ANN as well as various time horizons. Outcomes are estimated by values of MSE of each and every case and it was identified that ANNs could predict the future Turkish Lira and Europe ER. Pedram and Ebrahimi[24] examined the estimation of model and forecasting the data of ER using ANN. It was noticed that NN could probably estimate continuous function. When comparing the performance of NN with ARIMA, it was noted that NN performs well and errors also reduced gradually. Thus it was concluded that it is probable to evaluate a model for predicting the ER value even by accessing with limited data subset.

3. Research Design:

This research develops a new analytical ANN based model for predicting FER as well as compares its efficiency with the existing technique namely AFERFM. Proposed FER prediction adopted new analytical ANN model with certain specifications of existing HFERFM. HMM involves hidden set states namely M, output alphabet represented as U, probabilities of output or emission E, probabilities of transition P and probabilities of initial state as α . Instead of observing present state, each state gives an outcome with a specific probability C. Particularly the states M and outputs E are perceived, so HMM had tripled and represented as (P, M, α).

Hidden states $E = \{E_j; j=1, 2, 3, \dots, N\}$ ----- 3.1

Subsequently Probabilities of Transition state $P = \{p_{ik} = S(E_{t+1} | E_t \text{ at } r)\}$ -----3.2.

Where, $S(h|b)$ is denoted as probability of condition of a given b, $r=1, R=$ time and e_j in E.

Observations $D = \{d_v\}, v= 1, 2, 3, \dots, N$ ----- 3.3.

Probabilities of emission $G = \{g_{jk} = g_j(d_v) = S(d_v | e_j)\}$, where d_v in D.

Where, G is referred as probability and that probability output d_v is given as the current state of e_j .

Probabilities of initial state $\alpha = \{\alpha_k = k(d_v \text{ at } B=1)\}$ ----- 3.4.

Such model is performed by total parameters set: $\mu = \{P, M, \alpha\}$.

These Canonical problems have to be resolved in HMM.

- Given are the parameters in the model, in which probability has to be computed with particular output sequence. Such issue could be resolved by backward and forward algorithms.
- Given parameters in the model, determine the most probable sequence of concealed states which are emerged as the given output sequence. This would be resolved by viterbi algorithm and posterior decoding.
- Given sequence of output, determine the state transition set as well as output probabilities resolved by BWA. Proposed work adopted BWM.

Baum-Welch algorithm (BWA):

A set of noticed sequence N^1, N^2, N^3, \dots is considered as input.

Algorithm initialization would be chosen by parameters of arbitrary model

$$\pi' = A_{bc}, G_b () : \text{data} = \sum_s D (N^r \pi')$$

Repeat

$$\{\pi = \pi', S = S'\}$$

For each and every sequence, N^r

{

Estimate $\gamma (G, b)$ for N^r using backward algorithm

Estimate $\alpha (G, b)$ for N^r using backward algorithm

Estimate the dedication of N^r to G using

$$A_{bc} = \sum_r 1/g (N^r) \sum_g (g, b) A_{bc} D_a (N^r_{g+1}) \gamma (g + 1, b)$$

Estimate the dedication of β^r to G using

$$G_a = \sum_r 1/g (\alpha^r) \sum \{g \setminus N^r s = \beta\} \beta(r, b) \gamma (g, b)$$

$$A_{bc} = A_{bc} / \sum_j A_{bc}; G_j (\beta) = G_j (\beta) / \sum_g G_j (\beta)$$

$$\text{data} = \sum_r G (N^r / r_{bc}, G_j ())$$

}

Until the transformation in data is less than specific threshold

BWM would know the data parameters and implicitly determines the motive. This research adopts viterbi algorithm to estimate the motive for states of every input data.

4. Discussion:

ANN based model was deployed for two major purposes. 1st section focuses on the deployment of ANN based model to predict the stock market with specific reference from euro to dollar exchange and 2nd section focuses on the implementation of ANN based model to predict the stock market with specific reference from rupee to dollar exchange. In this research proposed research ANN based model is deployed for all 3 data types such as rupee to dollar, pound to dollar and euro to dollar.

Proposed model was explained through code and screenshots.

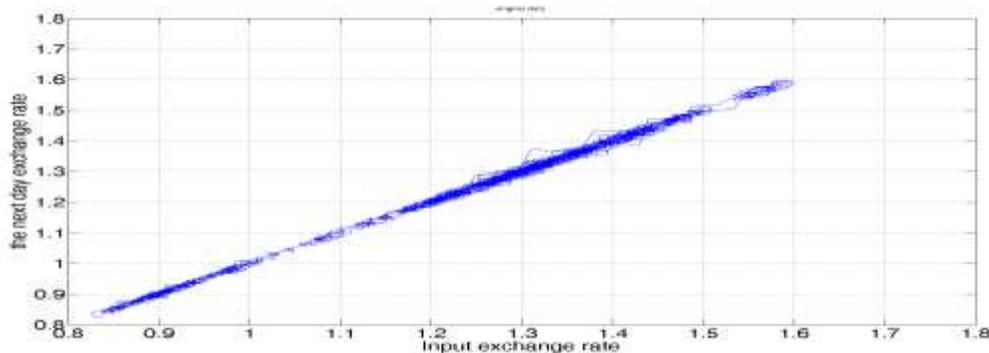


Figure 4.1: Input ER and next day ER for euro to dollar exchange

This figure explains about the original input ER data and next day ER from euro to dollar exchange. X- Axis represents the input exchange rate and Y-Axis represent next day exchange rate

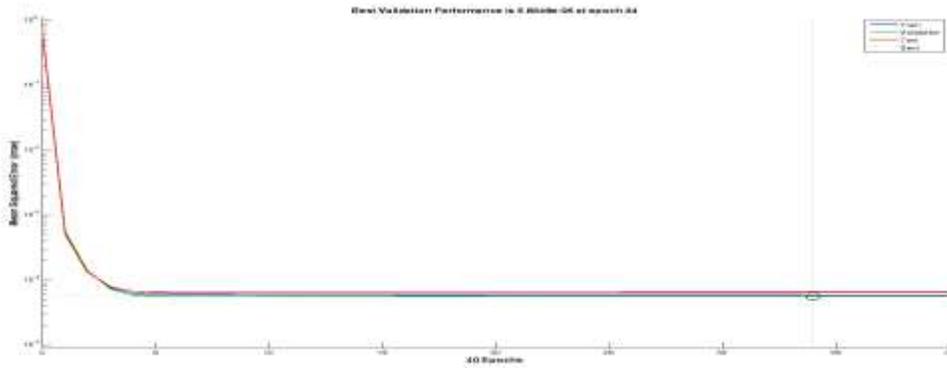
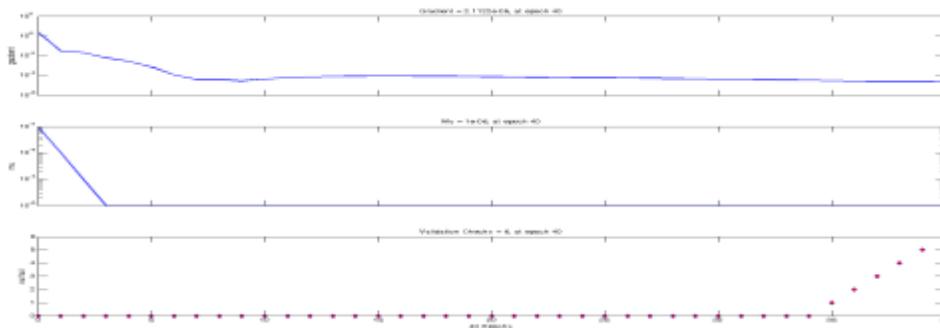


Figure 4.2: Training results of exchange rate

The above figure presents the training results from euro to dollar ER. X-axis represents Epochs and Y-Axis represents mean squared error. It was noticed that performance of best validation was identified at 5.6346×10^{-5} at epoch



34.

Figure 4.3: Training errors in the NN

The above screenshot shows the errors in the NN. Gradient errors, Mu errors and validation checks were seen at 2.112×10^6 at epoch 40, DB at epoch 40 and 6 at epoch 40 respectively.

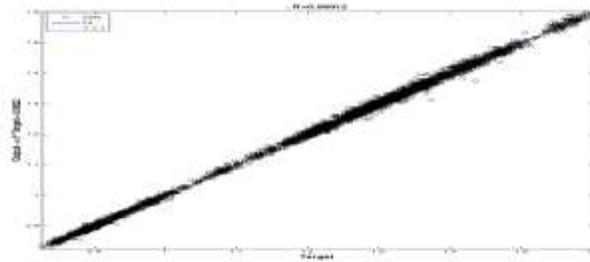


Figure 4.4: The regression of neural networks

Figure 4.4 represents the NN regression. Regression was found at 0.99912.

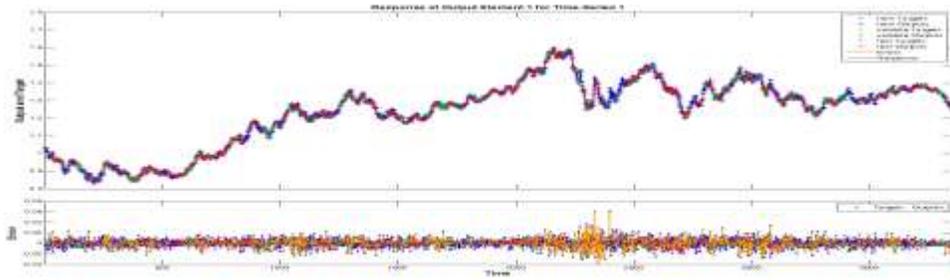


Figure 4.5: Response time of NN

Figure 4.5 indicates the response time of NN. This figure explains the output response for TS. Blue, green and red colour * symbol denotes training targets, validation targets, test targets respectively. Blue, red and green colour+ symbol represents the train outputs, test outputs and validate outputs. Orange colour line represents the NN errors. Black colour line denotes the output element response.

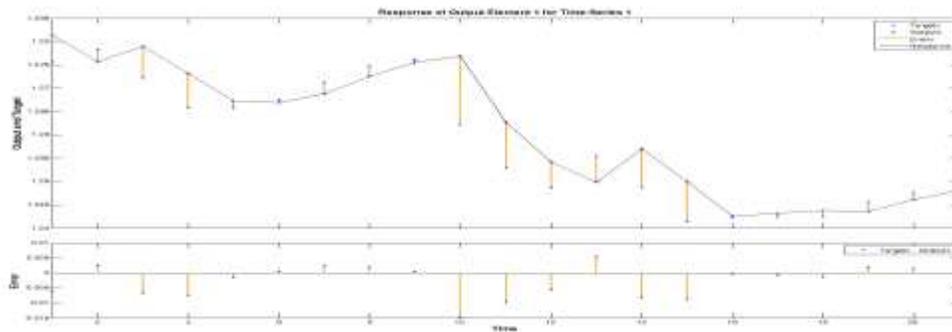


Figure 4.6: The time series prediction in the neural networks

This figure explains the forecasting for output element 1 response for TS 1. Blue colour * symbol indicates targets in NN. Blue colour + symbol denote outputs in NN. Orange colourline represents the errors found in the NN. Response in TS was represented by dotted line.

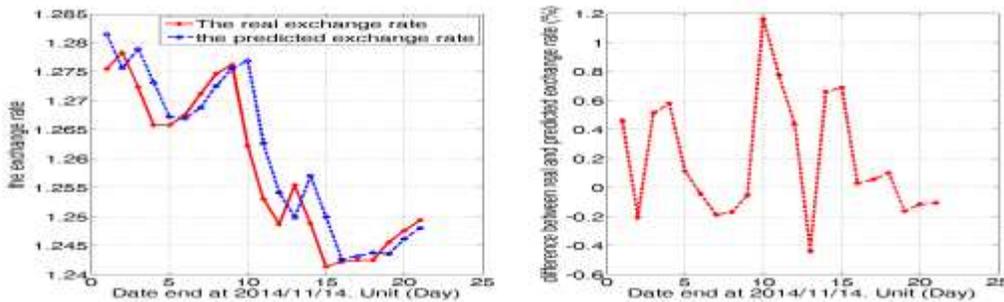


Figure 4.7: The real exchange and predicted results in the neural networks

Figure 4.7 indicates the real and predicted ER outcomes in NN. 1st graph indicates the graph of real ER and predicted ER. In 1st graph, red colour represents real ER. Blue colour represents predicted ER. 2nd graph describes the difference between predicted and real ER.

This section discusses about the deployment of ANN for predicting stock market from rupee to dollar exchange.

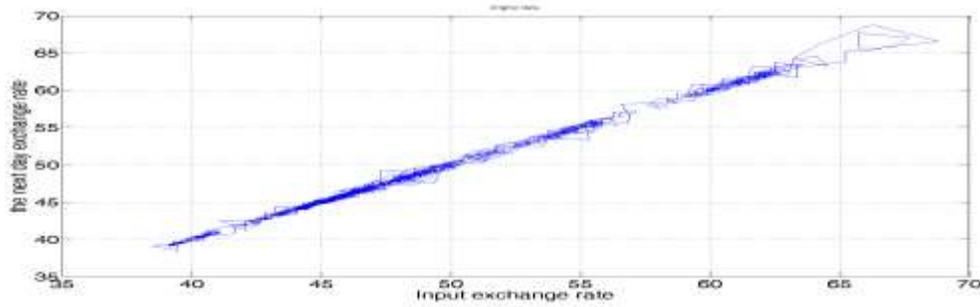


Figure 4.8: Input ER and next day ER for rupee to dollar exchange

This figure represents the original data of input ER and next day ER from rupee to dollar exchange.

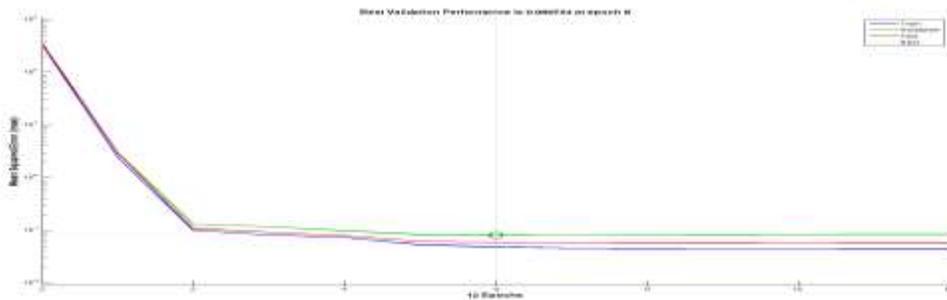


Figure 4.9: Training results of ER

This screenshot represents the training results of rupee exchange to dollar. It was noticed that best validation performance was seen at 0.080754 at epoch 5.

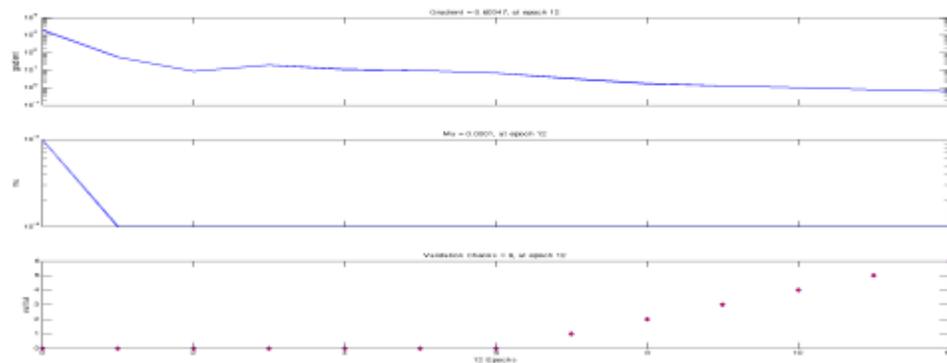


Figure 4.10: Training errors in the NN

Figure 4.10 represents the errors found in the training in NN. Gradient errors, Mu errors and validation checks were seen at 0.60927 at epoch 12, 0.0001 at epoch 12 and 6 at epoch 12 respectively.

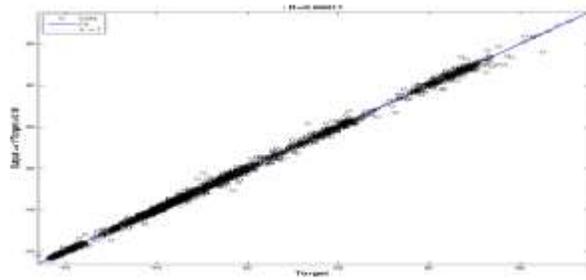


Figure 4.11: The regression of NN

This screenshot shows the NN regression. Regression was found at 0.99911.

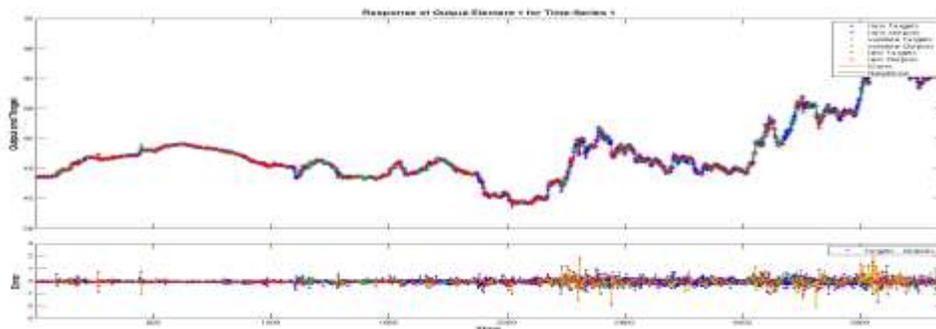


Figure 4.12: The response time of neural networks

This screenshot represents the response of element of output 1 for TS.

The following figure explains the error's auto-correlation in NN

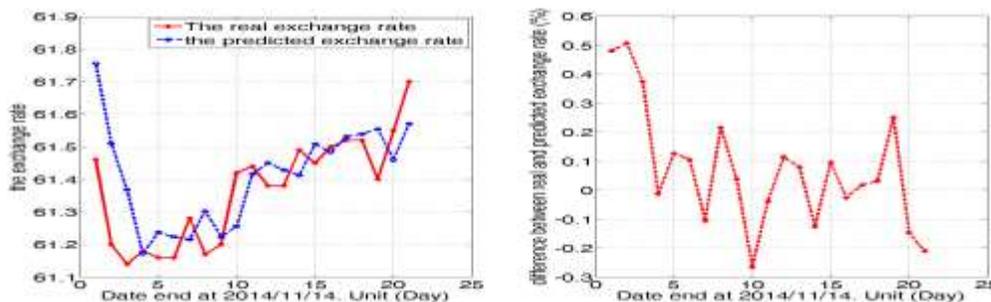


Figure 4.13: The real exchange and predicted results in the neural networks

This figure indicates two plotted graphs. 1st graph denotes real ER and predicted ER outcomes. Red colour line represents real ER. Blue colour dotted line denotes the predicted ER. 2nd graph indicates the difference between real ER and predicted ER. It was found that there is only slight difference in real ER and predicted ER for euro ER to dollar ER and rupee ER to dollar ER.



Figure 4.14: Pounds to Dollar

Above figure denotes the outcomes of pound rates to dollar ER. 1st graph explains the graph of real ER and predicted ER. 2nd graph explains the difference between the real and predicted outcomes. Top graph represents the outcomes of pounds to dollar ER on the basis of response time with TS.

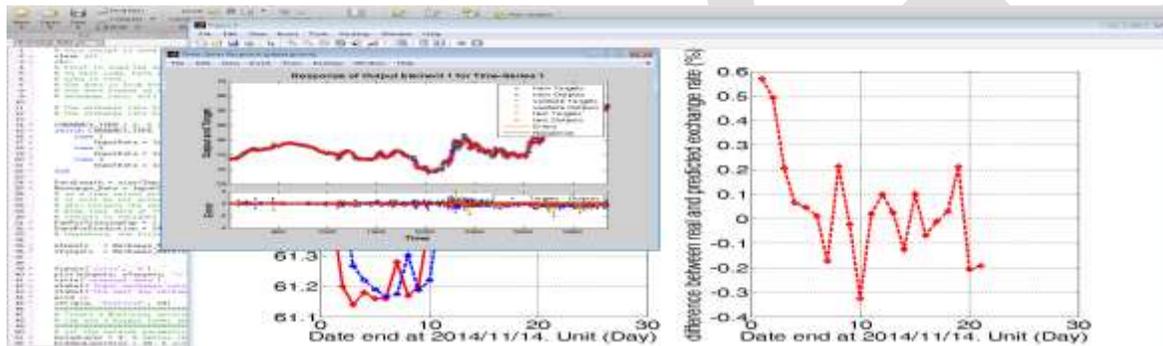


Figure 4.16: Rupee to Dollar

This figure explains the outcomes of rupee to dollar exchange. 1st graph explains the graph of real ER and predicted ER. Top graph represents the outcomes of rupee to dollar ER on the basis of response time with TS. 2nd graph explains the difference between the real and predicted outcomes.

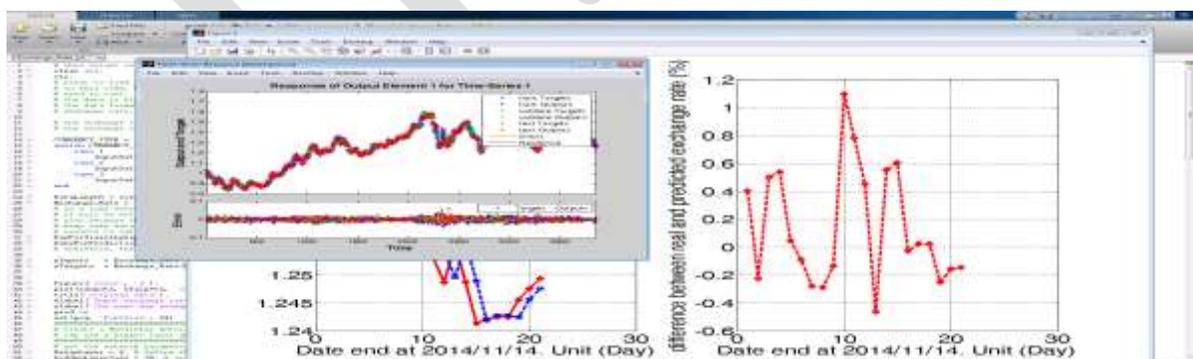


Figure 4.17: Euro to Dollar

This figure explains the outcomes of Euro to dollar exchange. First graph explains the graph of real exchange rate and predicted exchange rate. Second graph explains the difference between the real and predicted outcomes. Further, top most graphs represent the outcomes of euro to dollar ER on the basis of response time with TS.

5. Conclusion and Future Work:

The proposed ANN based model was emerged for predicting the stock market with respect to pound to dollar exchange, euro to dollar exchange and rupee to dollar exchange. From the above analysis, it was observed that outcomes of forecasting looks good and variance between forecasted outcome and real ER is noticed as less than 0.7 per cent. It was confirmed that outcomes of proposed analytical ANN based model for predicting FER performs faster and better in evaluating the FER. Proposed model developed for predicting FER could ensure FER for provided data and also gives better accuracies percentage. When the performance of proposed model for predicting FER is compared with existing models of FER models for prediction, it was found that proposed method performs better. It is possible to enhance the study area by emerging a new analytical model by adopting ANN along with any other appropriate analytical model or other NN model.

REFERENCES:

- [1] Oyewale A M, Evaluation of Artificial Neural Networks in Foreign Exchange Forecasting. American Journal of Theoretical and Applied Statistics, Vol. 2, No. 4, 2013, pp. 94-101
- [2] S.Makridakis, S.C.Wheelwright, R.J.Hyndman, "Forecasting: Methods and Applications", 3rd edition, John Wiley & Son, Inc. pp. 1-16, 2004
- [3] Huang, W., Lai, K.K., Nakamori, Y., And Wang, S. "Forecasting Foreign Exchange Rates With Artificial Neural Networks: A Review," International Journal Of Information Technology And Decision Making (3:1), Pp 145-165, 2004
- [4] W.Y.Peng, C.W.Chu, "A comparison of univariate methods for forecasting container throughput volumes.", Mathematical and Computer Modelling 50", pp. 1045-1057, 2009
- [5] L.R.Weatherford, S.E.Kimes, "A comparison of forecasting methods for hotel revenue management", International Journal of Forecasting 19", pp. 401-415, 2003
- [6] Kyung-jae Kim, "Finacial time series forecasting using support vector machines", Neuro computing 55, pp. 307-319, 2003
- [7] N. Ancona, R. Maestri, D. marinazzo , L. Nitti, M Pellicoro, G.D. Pinna and Stramaglia, "Leave-one-out prediction error of systolic arterial pressure time series under paced breathing", Physiological Measurement 26, pp. 363-372, 2005
- [8] Ding-zhou Cao, Su-lin Pang, Yuan-huai Bai, "Forecasting exchange rate using support vector machines", Proceedings of the fourth international conference on machine learning and cybernetics, pp.3488-345, 2005
- [9] Hu, Michael Y; Tsoukalas, Christos, "Combining Conditional Volatility Forecasts Using Neural Networks: An Application to the EMS Exchange Rates", Journal of International Financial Markets, Institutions & Money, Vol. 9 (4). p 407-22, 1999
- [10] Cheh, John J; Weinberg, Randy S; Yook, Ken C. "An Application of an Artificial Neural Network Investment System to Predict Takeover Targets", Journal of Applied Business Research, Vol. 15 (4). p 33-45. Fall 1999
- [11] Shtub, Avraham; Versano, Ronen, "Estimating the Cost of Steel Pipe Bending, a Comparison between Neural Networks and Regression Analysis", International Journal of Production Economics, Vol. 62 (3). p 201-07, 1999

- [12] Terna, Pietro, "Neural Network for Economic and Financial Modelling: Summing Up Ideas Emerging from Agent Based Simulation and Introducing an Artificial Laboratory", Cognitive Economics, Viale, Riccardo, ed., LaSCoMES Series, vol.1. Torino: La Rosa. p 271-309, 1997
- [13] Hamm, Lonnie; Brorsen, B Wade, "Trading Futures Markets Based on Signals from a Neural Network", Applied Economics Letters, Vol. 7 (2). p 137-40, 2000
- [14] Cogger, Kenneth O; Koch, Paul D; Lander, Diane M "A Neural Network Approach to Forecasting Volatile International Equity Markets, Advances in financial economics. Volume 3. Hirschey, Mark Marr, M. Wayne, eds., Greenwich, Conn. and London: JAI Press. p 117-57, 1997
- [15] White, H., "Option Pricing in Modern Finance Theory and the Relevance of Artificial Neural Networks," Discussion Paper, Econometrics Workshop, March 1996
- [16] Garcia, Rene; Gencay, Ramazan, "Pricing and Hedging Derivative Securities with Neural Networks and a Homogeneity Hint", Journal of Econometrics, Vol. 94 (1-2). p 93-115, 2000
- [17] Hwang H B and Ang H T, "A Simple Neural Network for ARMA(p,q) Time Series," OMEGA: Int. Journal of Management Science, vol. 29, pp 319-333, 2002
- [18] Kadilar.C, Simsek.M and Aladag.H, Forecasting the Exchange Rate Series with ANN: Case of Turkey, EkonometriveIstatistikSayi: 9, 17-29, 2009
- [19] Pradhan.P and Kumar.R, Forecasting Exchange Rate in India: An Application of ANN, Journal of Mathematics Research, vol 2, no 4, pp:111-117, 2010.
- [20] Pacelli.V, Bevilacqua.V and Azzollini.M, An ANN Model to Forecast Exchange Rates, Journal of Intelligent Learning Systems and Applications, 3, 57-69, 2011
- [21] Philip A A, Taofiki A A and Bidemi A A, "Artificial Neural Network Model for Forecasting Foreign Exchange Rate," World of computer science and information technology Journal, Vol. 1 No 3, pp. 110- 118, 2011
- [22] Perwej.Y and Perwej.A, Forecasting of Indian Rupee/US Dollar Currency Exchange Rate Using ANN, vol 2, no, 2, pp: 40-52, 2012.
- [23] Erdogan.O and Goksu.A, Forecasting Euro and Turkish Lira Exchange Rates with ANN, International Journal of Academic Research in Accounting, Finance and Management Sciences, vol 4, no 4, pp: 307-316, 2014
- [24] Pedram.M and Ebrahimi.M, Exchange Rate Model Approximation, Forecast and Sensitivity Analysis by Neural Networks, Case of Iran, Business and Economic Research, vol 4, no 2, pp: 49-62, 2014.

CRM-centric E-Commerce Web Application

Er. Shabina Sayed, Mr. Asad Khan, Mr. Nomaan Syed, Mr. Mohtashim Shaikh

M. H. Saboo Siddik College of Engineering (Dept. of Information Technology), University of Mumbai

Abstract—The Internet revolution has led to the continuous rise in E-Commerce all over the world. With more and more people adopting, and becoming savvy with online commercial portals, it has become almost necessary for businesses to have intimate customer relationships with its user base. Various studies and publications have shown that targeting and maintaining loyal customers remains a considerable challenge for online enterprises. This paper describes a framework for a CRM-centric E-Commerce Web Application portal (CCECWA), which is designed around the concept of CRM, rather than using it as an add-on benefit. Here we have proposed a system of conducting E-Commerce, keeping at the fore front, the customers' demand for good quality reliable products while maintaining a profitable and sustainable business model using CRM's latent benefits. We believe this model framework has great potential and can be implemented for startups and other ambitious projects as well.

Index Terms—E- Commerce, Quality bar, CRM, e-CRM.

I. INTRODUCTION

E-commerce is basically the process of doing business through computer networks. The main advantage of e-commerce over traditional commerce (brick and mortar) is the user can browse online shops, compare prices and order merchandise sitting at home on their PC. On the other hand, Customer relationship management (CRM) is a comprehensive set of processes and technologies for managing the relationships with potential customers and business partners across marketing, sales, and service (regardless of communication channel) [2]. CRM is quickly becoming one of the top strategies that many successful companies use nowadays [7]. Due to an explosion of customer information available, e-commerce has become highly competitive and consumers have become highly entitled. [8]. This paper describes a framework for offering a different type of E-Commerce web application by integrating a customer-oriented CRM system to provide a trusted & reliable experience for the customers. Simply stated, Customer Relationship Management - Centric Electronic Commerce is just the application of CRM methodologies to e-commerce through the Internet [3]. The main point of argument is the difference in real CRM and E-CRM. Unlike in traditional e-commerce, online portals have access to the minutest of the customers' details, often providing deep insights into inclinations and interests, as well as affinity for quality [6]. With a proven expectancy of greater profit has pushed many firms into taking up CRM projects and especially, ECCRM projects as a core module of their e-commerce establishment [11]. In the hey days of Internet e-commerce, markets witnessed general company investments into CRM nearly double at times, inevitably becoming equal to, and exceeding investments in ERPs [3]. With a disparity between the promised quality and the delivered quality, there's a need for transparency in the CRM process in the e-commerce domain [12]. This project is mainly about offering a different type of e-commerce web application by integrating a customer-oriented CRM system to provide a trusted & reliable experience for the customers. The proposed framework includes a new feature, the Quality Bar. Using this feature, customers can view what level of quality of products they can reasonably expect and rely on. Another feature of the application is the Smart Review, which provides different types of feedback from various certified reviewers. These drawbacks of the present system have been targeted in the proposed framework model as described in the paper.

II. RELATED WORK

In mid 1990s, the base platform for CRM software began to emerge with Sales Force Automation (SFA) and Customer Information System (CIS) hybrids establishing a place for themselves in the market. By the early years of the 00's, a more comprehensive CRM system that manages all business relationships was suggested. In 2007, Sales force initiated a revolution in cloud based CRM systems and changed the industry with Force.com with unparalleled customization and integration. In the beginning of their online campaign, Coca-Cola needed an effective software program that could be tailored to fit as a component of a broader e-commerce and logistics environment. This solution could provide sales teams and clientage better transparency in sales and distribution media to recognize new vistas and potential sales opportunities. Synolia, an established solutions partner, modified and deployed the Sugar Professional Software as a Service – on a demand basis to almost 40 users in a quarter. Coca Cola now uses a comprehensive custom CRM solution attached to its e-commerce engine and logistics platform. Sales and marketing teams, and their heads now receive instant access to reports for different markets and customer bases through an integrated reporting generation mechanism [4].

According to new figures from the Indian commerce group ASSOCHAM, India's online purchasers invested almost 16 billion USD in 2 years ago (2013) [17]. To put the industry into view, Indian e-tailing industry was guessed to be almost 30 thousand crore rupees (i.e. USD 4.38 billion) in 2011 and slated to hit 53 thousand crore (i.e. USD 19 billion) this year [16]. For perspective, China's e-commerce expenditure allegedly topped an estimated \$265 billion in 2013 thanks to the country's half billion-plus netizens [17]. Ideally, CRM allows an enterprise or an organization in adapting its products and/or services to each of its customer preferences and nuances [14].

E-CRM applications are designed with the customer in mind and give the customer the entire experience on the web interface [12]. It's shown that personalized customer experience in the on-line world is causing an increasing demand to avail these services by more and more people [1]. In the e-commerce scenario, the customer's trust is a major important factor in attracting and retaining potential buyers [9], which is, incidentally, a fundamental target of e-CRM.

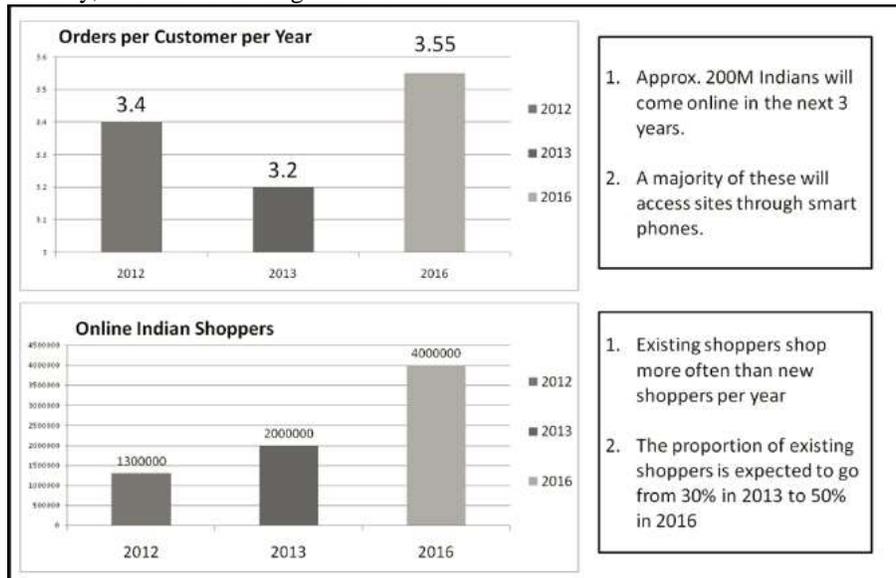


Figure1. Potential of Growth of E-commerce in India [17]

A huge advantage of integrating CRM would be the development of better relations with the existing customers, which will result in improved sales through better timed services by anticipating needs based on trends and history, identifying demand more efficiently by analyzing specific customer requirements, inter-marketing of various products by emphasizing and exploring alternate options. This would lead to improved marketing of the products/services by deliberating on improved concentrated marketing strategies designed specifically keeping in mind the audience's quality needs. The use of a customized technique and improved product/service reviews help to bring more exchange prospects. Subsequently, this would result in improved customer satisfaction and retention, ensuring that the good reputation in the market continues to expand.

III. PROPOSED SYSTEM MODEL

In the proposed system, the CRM system in the application helps the site implicitly offer products according to the user's preferences, depending on their choice of price over quality or vice versa. Here, special importance is given to the users' preference of quality and costs. There's also a special Quality Bar feature that displays a quantitative measurement for the given product's quality, based on different factors, to accurately depict the estimated expected value for price, for the given item on sale. Quality Bar rating will be calculated using various inputs like expert's ratings, user's ratings, expert reviews and user reviews.

A. Quality Bar Feature

This feature includes a graphical bar that displays a quantitative measurement for the given product's quality,

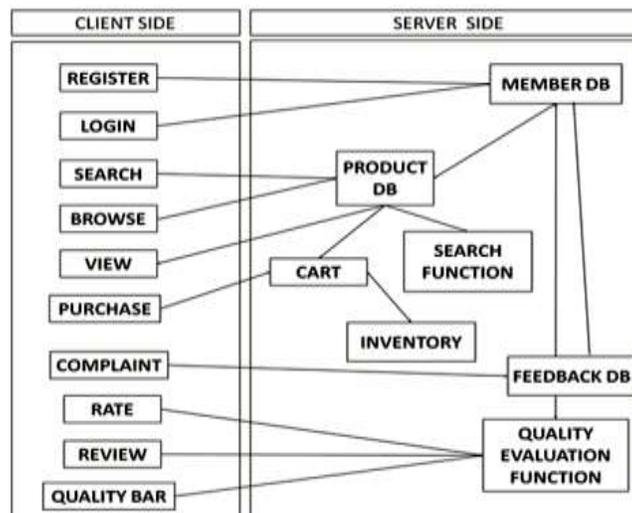


Figure2. Proposed System Design Diagram

based on different factors, to accurately depict the estimated expected value for price, for the given item on sale. This quality bar rating will be calculated using various inputs like expert's ratings, user's ratings, expert reviews and user reviews, using a Quality Evaluation Function.

$$\text{QEF Value} = 0.6(\text{User ratings}) + 0.4(\text{Expert Ratings}) \quad (1)$$

Quality Evaluation Function is a simplistic algorithm used to calculate the relative Quality Bar value by the formula giving weight to user ratings and expert ratings.

- (a) *User ratings* are those reviews submitted by individual members who have bought the product or have proficient knowledge on it.
- (b) *Expert ratings* are those reviews submitted by certified quality evaluation experts who have bought the product or are qualified to review it.

B. Smart Review Feature

This feature involves providing reliable reviews from experts of the particular products obtained from dependable sources on the web, as well as interested individuals who can provide insights regarding user experience and expected quality. With these comprehensive opinions, the application will provide reliable and realistic representations of products and their quality so customers can rely on the information provided to them. Furthermore, this will empower the customer to make intelligent informed investment decisions.

IV. FLOWCHART

(This is a sample of a general action flow sequence)

- User can then easily register as a new member on the site through a web interface.
- By using search feature, user can look for any particular product they wish to view and the search results are displayed and viewed by user accordingly.
- Users have the ability to apply any special filters to narrow search results.
- Using quality bar feature, user can apply more specific constraints on searches.
- Once the user has found a product they wish to buy, they can use the add-to-cart feature so the item is added to the shopping cart.
- This process is repeated for every item the customer wishes to buy.
- Then after adding all items to shopping cart, user can choose to checkout and select payment options as per their ease.
- Once the user shipment details are entered into the system, the order is placed.
- As per customer's choice, either they are logged out or returned to shopping site.

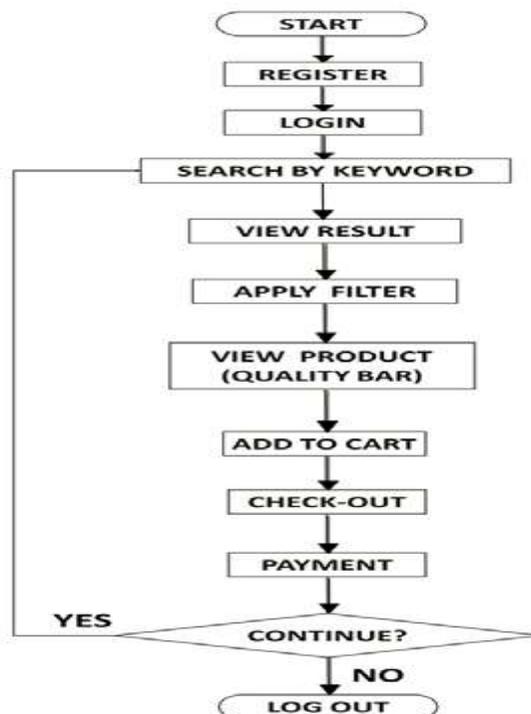


Figure3. Flowchart Diagram

V. SUMMARY

The special case made here was a new look at the application of online commercial activities, being CRM centric, as opposed to normal e-commerce applications. The potential is huge for conducting and applying extensive CRM to an everyday online e-commerce portal with the aim of providing customers with true-to-cost, excellent quality, best-priced products. Being a web-based application framework, the CCECWA aims to take advantage of modern front-end and back-end technologies to provide reliable and feasible services to its customers. The use of quality bar, expert review system, (optional) bargain chat and other features helps us achieve our target and helps deliver excellent products and a better service. We believe this model framework is complete and ready for implantation to prototype stage. To be effective, the management of this model implementation must have an integrated approach embodying strategic direction.

VI. FUTURE WORK

Our goal is now to take this model framework and construct a full working prototype based on the requirements and specifications stated in the documentation. If time constraints permit, additional features might be added as beta trials of the finished project.

REFERENCES:

- [1] Sandeep Mane, Prasanna Desikan, and Jaideep Srivastava, From Clicks to Bricks: CRM Lessons from E-Commerce, Department of Computer Science and Engineering, *University of Minnesota*, October 2005.
- [2] M Muhammad Ali Khan, Muhammad Amer Shahzad, Managing Customer Relationships on the Internet, Dept of BASS, *Lulea University of Technology*, January 2005.
- [3] Detlef Schoder, Nils Madeja, Is Customer Relationship Management A Success Factor In E-Commerce? Otto-Beisheim- Graduate School of Management, *Journal of Electronic Commerce Research*, Volume 5, Number 1, June 2011.
- [4] Cloud case studies , Tacklers Ltd , “ Coca - Cola Enterprise ” , http://www.cloudcasestudies.com/case_Coca_Cola_Enterprise.html, December 2014.
- [5] Nicholas C. Romano (Jr.), Jerry Fjermestad, Introduction to Ecommerce Customer Relationship Management (ECCRM) Mini-Track, *Proceedings of the 37th Hawaii International Conference on System Sciences*, January 2004.
- [6] Abbas Keramati , Alireza Nili, A Proposal Framework For Investigating The Impact Of Customer Relationship Management On Customer Retention In E-Commerce, *Proceedings of the 2011 International Conference on Industrial Engineering and Operations Management*, Kuala Lumpur, Malaysia, January 2011.
- [7] Rashem Dhillon, Sukhpreet Kaur, Review Paper on e-Business & CRM, *International Journal of Computing & Business Research (Proceedings of 'I-Society 2012')*, October 2012.
- [8] Abdullah Nabeel Jalal, Othman bin Ibrahim , Influence of Customer Relationship Management on Online Shopping , *IJCSI International Journal of Computer Science Issues*, Volume 9, Issue 6, Number 1, November 2012.
- [9] K ubilus, N. J., Integrating Web Sites and Databases, *Communications of the ACM*, Volume 45, Issue 9.4, September 2000.
- [10] Brian A. Johnson, Fault Lines in CRM: New E-Commerce Business Models and Channel Integration Challenges , (whitepaper)source : <http://johnson.CRMproject.com> .
- [11] Md. Rashid Farooqi, Dr. Devendra Kumar Dhusia A Comparative Study Of CRM And E-CRM Technologies , *Indian Journal of Computer Science and Engineering (IJCSE) Volume 2, Number 4*, September 2011.
- [12] Meltem Caber, A. Akin Aksu, Tahir Albayrak, A Model For Exploiting E-Crm In B-To-B E-Commerce, *Tourismos: An International Multidisciplinary Journal Of Tourism*, Volume 7, Number 2, pp. 121-143, Autumn 2012.
- [13] Novin Hashemi ,Nastaran Hajiheydari Customer Knowledge Management Framework in E-Commerce, *International Conference on E-business, Management and Economics IPEDR*, Volume 25, Singapore, September 2011.
- [14] Daminni Grover, Effective Customer Relationship Management through e-CRM, *Viewpoint Magazine*, Volume 2, Number 1, June 2011.
- [15] Anderson, R., Francis, B., Homer, A., Howard, R., Sussman, D. Watson, Designing an E-Commerce site for users, *Crossroads*, Volume 7 Issue 1, September 2000.
- [16] ET, “Economics Times”, Website, <http://articles.economicstimes.indiatimes.com/2011-03-2>, October 2011.
- [17] Tech Asia, “India-Ecommerce-Market-Spending” , Website , <http://www.techinasia.com/india-ECommerce -market-spending-16-billion-dollars-in-2013>, October 2014

AN EFFICIENT CYCLIC FEATURE DETECTION WITH SUB-NYQUIST SAMPLING FOR WIDE BAND SPECTRUM SENSING

¹P.Abinaya, ²Ms.B.Ayshabegum

¹PG Student, Department of ECE,
Sri Krishna College of Engineering and Technology, Coimbatore
eceabinayashree14@gmail.com

²Assistant Professor, Department of ECE,
Sri Krishna College of Engineering and Technology, Coimbatore

I ABSTRACT

A cognitive radio is an intelligent radio that can be programmed and configured dynamically. For cognitive radio networks, efficient and robust spectrum sensing is a crucial enabling step for dynamic spectrum access. Cyclic spectrum sensing techniques work well under noise uncertainty, but require high-rate sampling which is very costly in the wideband regime. The existing method develops robust and compressive wideband spectrum sensing techniques by exploiting the unique sparsity property of the two-dimensional cyclic spectra of communications signals. To do so, a new compressed sensing framework is proposed for extracting useful second-order statistics of wideband random signals from digital samples taken at sub-Nyquist rates. The time-varying cross-correlation functions of these compressive samples are formulated to reveal the cyclic spectrum, which is then used to simultaneously detect multiple signal sources over the entire wide band. But the disadvantage in this method is less spectrum sensing performance. So, in the proposed system a new technique is used which is called novel multi-rate sub-Nyquist spectrum sensing (MR-SNS) system that implements cooperative wideband spectrum sensing in a CR network. MS can detect the wideband spectrum using partial measurements without reconstructing the full frequency spectrum. An experimental result shows that the proposed method achieves high spectrum sensing performance in a fading scenario, with a relatively low implementation complexity and a low computational complexity.

Keywords – Cognitive radio, wide band spectrum, sub nyquist sampling, cyclic spectrum, wireless spectrum, random signals, spectrum sensing.

II INTRODUCTION

A cognitive radio is an intelligent radio that can be programmed and configured dynamically. Its transceiver is designed to use the best wireless channels in its vicinity. Such a radio automatically detects available channels in wireless spectrum, then accordingly change its transmission or reception parameters to allow more concurrent wireless communications in a given spectrum band at one location. This process is a form of dynamic spectrum management.

Depending on transmission and reception parameters, there are two main types of cognitive radio

- Full Cognitive Radio, in which every possible parameter observable by a wireless node is considered
- Spectrum-Sensing Cognitive Radio, in which only the radio-frequency spectrum is considered.

Other types are dependent on parts of the spectrum available for cognitive radio:

- Licensed-Band Cognitive Radio, capable of using bands assigned to licensed users (except for unlicensed bands, such as the U-NII band or the ISM band).
- Unlicensed-Band Cognitive Radio, which can only utilize unlicensed parts of the radio frequency (RF) spectrum. One such system is described in the IEEE 802.15 Task Group 2 specifications.
- Spectrum mobility: Process by which a cognitive-radio user changes its frequency of operation. Cognitive-radio networks aim to use the spectrum in a dynamic manner by allowing radio terminals to operate in the best available frequency band.
- Spectrum sharing: Provides a fair spectrum-scheduling method; maintaining fairness is a major challenge to open-spectrum usage.

III SIGNAL MODEL

Let us consider a wide band of interest in the frequency range $[-f_{max}, f_{max}]$ where f_{max} is very large, e.g., over-GHz. There are I active PU signals emitting over this wide band, where the signal is denoted by $x_i(t), i \in \{1, 2, \dots, I\}$. There is no information regarding the waveform, bandwidth and carrier frequency of neither each signal, nor the number of signals present. A CR is equipped with an (ideal) wideband antenna that passes all signal components within $[-f_{max}, f_{max}]$. Hence, the received signal is given by,

$$x(t) = \sum_{i=1}^I x_i(t) + w(t)$$

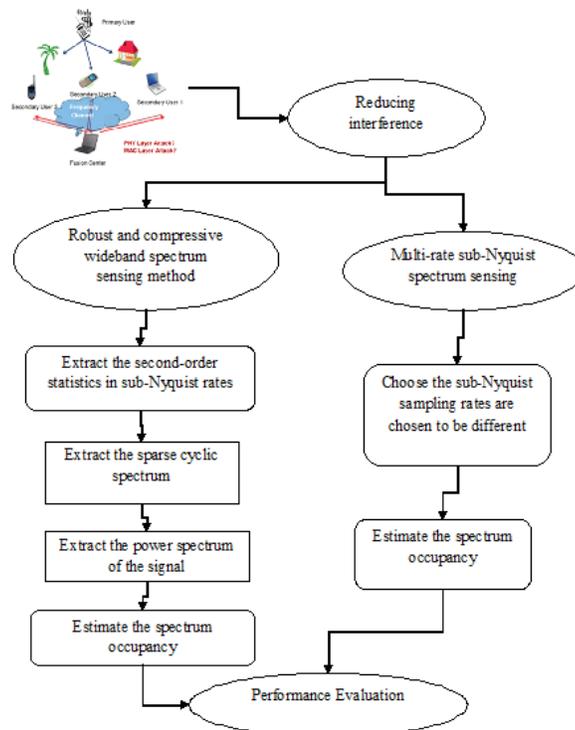
Where $w(t)$ is the additive ambient noise. Suppose that primary user signals $x_i(t)$ are non-overlapping in frequency, since they could represent emitters from different services. The goal is to estimate the spectrum occupancy of the composite signal $x(t)$ over the entire wide band, whose nonzero support regions reveal the frequency locations and bandwidths of individual signal components $x_i(t)$. This is different from most existing work on cyclostationary signal processing, in which only one signal or signal mixture occupies the frequency band of interest. To motivate to investigate the cyclic spectrum $S(\alpha, f)$ of $x(t)$ where f is the frequency and α is the cyclic frequency. Defining the cyclic autocorrelation function, $R_x(\alpha, \tau) = \int_{-\infty}^{\infty} [x(t + \tau)]/2 x^*(t - \tau/2) e^{j2\pi\alpha t} dt$ the cyclic spectrum, also termed the spectral correlation function (SCF), is the Fourier transform of $R_x(\alpha, \tau)$ with respect to the time-delay τ .

$$S_x(\alpha, f) = \int R_x(\alpha, \tau) e^{-j2\pi f \tau} d\tau$$

It essentially indicates the correlation of spectral components that are separated by α in frequency, and exhibits nonzero values only at a discrete set of cyclic frequencies that reveals the inherent second-order periodicity of $x(t)$. It is known that $S_x(\alpha, f)$ can be

nonzero only for $|f| + \frac{|\alpha|}{2} \leq f_{max}$ which suggests a diamond-shaped region around the origin of the bifrequency plane. The cyclic spectrum of the digital samples contains folded replicas of the original cyclic spectrum, with folding intervals being integer multiples of f_s on both (α, f) directions. To avoid any aliasing in the cyclic spectrum, the minimum sampling rate should be $2f_{max}$ that is $f_s = \frac{1}{T_s} \geq 2f_{max}$.

Because f_{max} is very large in the CR sensing task, the required sampling rate f_s has to be very high, causing large energy consumption and high hardware costs in ADC.



IV ESTIMATION OF SPECTRUM OCCUPANCY

After recovering the sparse 2-D cyclic spectrum $S(\alpha, f)$ in its vectorized form $\hat{s}_x^{(c)}$ now want to simultaneously estimate the spectrum occupancy of all frequency sub-bands within the monitored wide band. The two spectrum detection algorithms are developed: one adopts a band-by-band multi-cycle generalized likelihood ratio test (GLRT) framework that works for all types of modulation and waveform patterns, and the other is tailored to known modulation types for simple and fast estimation, for which take BPSK signals as an example.

Band-by-Band Approach Based on Multi-Cycle GLRT: The goal of spectrum occupancy estimation is to decide whether a specific frequency location $f^{(n)}$ is occupied or not. To set $f^{(n)} = \left(\frac{n}{N}\right)f_s, \forall n \in \left[0, \frac{N}{2}\right]$ according to the frequency resolution of the discrete cyclic spectrum $s_x^{(c)}(\alpha, b)$. The sensing task amounts to a band-by-band inspection of the spectrum occupancy over the entire frequency range

$$|f| \leq \frac{f_s}{2}, \text{ with } \frac{f_s}{2} > f_{max}$$

It is important to note that such a band-by-band inspection is a computational approach for processing the data collected simultaneously from a wideband antenna, which is fundamentally different from a narrowband approach in which narrowband antennas scan the wide spectrum one by one along with frequency shifters and narrowband filters/processors. Now focus on the occupancy decision on a single band $f^{(n)}$. An active signal on this band would occupy a region $I^{(n)}$ of the 2-D cyclic spectrum map

defined by the cyclic-frequency and frequency pairs (α, f) satisfying $f + \frac{\alpha}{2} = f^{(n)}$ and $|f| + \frac{|\alpha|}{2} \leq f_{max}, \forall (\alpha, f) \in I^{(n)}$. In the discrete-time domain, this region is represented by discrete Points $(\alpha_i, f_i) \in I^{(n)}$

which correspond to a set of integer-valued indices (a_i, b_i) that is $S(\alpha_i, f_i) = s_x^{(c)}(\alpha_i, b_i), \forall i \in I_d^{(n)}$. Because $\alpha_i \in \left(\frac{\alpha_i}{N}\right)f_s$ and $f_i = \left(\frac{b_i}{N}\right)f_s$ by definition, the index set $I_d^{(n)}$ can be deduced,

$$b_i + \frac{a_i}{2} = n \text{ and } |b_i| + \frac{|a_i|}{2} \leq \frac{f_{\max} N}{f_s} \leq \frac{N}{2}, \forall i \in I_d^{(n)}$$

To stack the estimated $\{s_x^{(c)}(a_i, b_i)\}_{i \in I_d^{(n)}}$ into a vector $c^{(n)}$ of length $|I_d^{(n)}|$ which is formed by selected entries of the vectorized cyclic spectrum, $s_x^{(c)}$ that is $c^{(n)}[i] = s_x^{(c)}(a_i, b_i), \forall i \in I_d^{(n)}$. The row selection can be expressed as,

$$c^{(n)} = J_n s_x^{(c)}$$

Where the binary-valued selection matrix $J_n \in \{0,1\}^{|I_d^{(n)}| \times N^2}$ is obtained from the $N^2 \times N^2$ identity matrix by retaining its rows with indices $\forall i \in I_d^{(n)}$ only. Apparently $J_n^T J_n = I_{|I_d^{(n)}|}$. To test for the presence of a PU signal at the frequency $f^{(n)}$ the following binary hypothesis test is formulated:

$$H_1: c^{(n)} = c^{(n)} + \epsilon$$

$$H_0: c^{(n)} + \epsilon$$

Where $c^{(n)}$ is the nonrandom true vector of cyclic spectrum, values and ϵ is asymptotically Gaussian distributed, i.e., $\lim_{LN \rightarrow \infty} \sqrt{LN} \epsilon \sim N(0, \Sigma^{(n)})$ where $\Sigma^{(n)}$ is the asymptotic covariance matrix. Because $\Sigma^{(n)}$ is not readily available, to derive a blind estimator for $\hat{\Sigma}^{(n)}$ using the available reduced-rate measurements $\{z_r(l)\}_{l=0}^L$. Replacing $\Sigma^{(n)}$ by $\hat{\Sigma}^{(n)}$ results in a data-adaptive GLRT detector. Treating $c^{(n)}$ as an unknown nuisance parameter, the adaptive Form the cyclic spectrum matrix \hat{S}_x^c from $\hat{s}_x^c = \text{vec}\{\hat{S}_x^c\}$.

- 1) Let $f^{(n)} = \left(\frac{n}{N}\right) f_s$. Find the cyclic spectrum values of interest from (32), and calculate $c^{(n)}$.
- 2) Calculate the test statistic using $\hat{\Sigma}^{(n)}$ is computed. If it is larger than a predetermined threshold $\eta^{(n)}$ then a PU is declared present at frequency $f^{(n)}$ otherwise PU absence is declared.
- 3) If $n < \frac{N}{2}$ increase n by 1 and go to Step 2).

Fast Algorithm for Known Modulation Types: When the modulation type of the signal sources are known, their cyclic features on the bi-frequency plane can be utilized to quickly identify the key signal parameters. For example, consider that $x(t)$ consists of

multiple BPSK signals, each with carrier frequency f_c symbol rate $\frac{1}{T_0}$ and a full-width rectangular pulse shaper. The number of signal components and their modulation parameters are unknown, but the modulation type is known. Ignoring the weak sidelobes in

the frequency domain, the major cyclic feature is a main lobe at $\alpha = 2f_c$ spanning Over $f = -\frac{1}{T_0} f = \frac{1}{T_0}$.

The idea is to identify the modulation-dependent parameters T_0 and f_c by finding the lobe locations on the estimated 2-D cyclic spectrum. First, can simply search over the cyclic frequency α along the axis $f = 0$. If $|\hat{S}(\alpha, 0)| > \gamma$ then claim that there is a

BPSK signal with estimated carrier frequency $\hat{f}_c = \frac{\alpha}{2}$. Next, let $\mathcal{A} = \{\alpha \mid |S(\alpha, \cdot)| > \gamma\}$. For each $\hat{\alpha} \in \mathcal{A}$ search along the line $\alpha = \hat{\alpha}$ to find the double-sided width of the lobe, denoted by 2ω , such that all the points in the lobe have absolute values equal to or greater than γ . The bandwidth of the corresponding BPSK signal is also 2ω , and hence can claim that the frequency band $\left[\frac{\hat{\alpha}}{2} - \omega, \frac{\hat{\alpha}}{2} + \omega\right]$ is occupied and be estimated symbol period is $\hat{T}_0 = \frac{1}{\omega}$. By now, identified not only the carrier frequency f_c but also

the bandwidth $\frac{1}{T_0}$ of a BPSK signal. The procedure is applicable to the entire wide band to identify all BPSK signals. Combining all the occupied frequency bands, which is able to draw the spectrum occupancy map.

Extensions of the fast approach to other types of modulated signals are possible, using the features of the modulation types. For instance, for an SQPSK signal with carrier frequency f_c and symbol rate $\frac{1}{T}$ two peaks with similar heights will appear $\alpha = 2f_c - \frac{1}{T}$ and $\alpha = 2f_c + \frac{1}{T}$ and this feature can be used for fast detection.

VI MULTI-RATE SUB-NYQUIST SPECTRUM SENSING METHOD

To improve the detection performance of sub-Nyquist sampling system in the preceding subsection, the influence of sampling rates is analyzed. Firstly, consider the case of spectral sparsity level $s=1$ which means that only one frequency bin $k_1 \in \Omega$ is occupied by the PU. If the numbers of samples in multiple CRs, i.e., M_1, M_2, \dots, M_v are different primes, and meet the requirement of

$$M_i M_j > N, \quad \forall i \neq j \in [1, v]$$

then two or more CRs cannot have mirrored frequencies in the same frequency bin. Secondly, considering the spectral sparsity level $s \geq 2$ find that, if the conditions in Lemma 1 are satisfied, the parameter p is bounded by s . It is because only one CR can map the original frequency bin $k_j \in \Omega_i$ to the aliased frequency in Ω_A and the cardinality of the spectral support Ω_i is s . Therefore, to obtain the detection performance. If the numbers of samples in multiple CRs M_1, M_2, \dots, M_v are different consecutive primes, and meet the requirement of $M_i M_j > N, \forall i \neq j \in [1, v]$ using the decision rule of the probabilities of false alarm and detection have the following bounds:

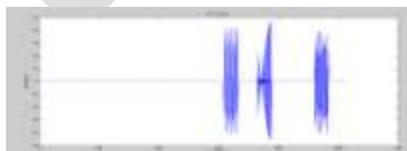
$$\frac{\Gamma\left(J_v, \frac{\lambda_k}{2}\right)}{\Gamma(J_v)} \leq P_{f,k} \leq Q_{J_v} \left(\sqrt{\frac{2}{N}} \sum_{i \in \mathcal{Y}}^{|\mathcal{Y}|=s} M_i \gamma_i[k], \sqrt{\lambda_k} \right)$$

$$P_{d,k} \geq Q_{J_v} \left(\sqrt{\frac{2}{N}} \sum_{i=1}^v M_i \gamma_i[k], \sqrt{\lambda_k} \right)$$

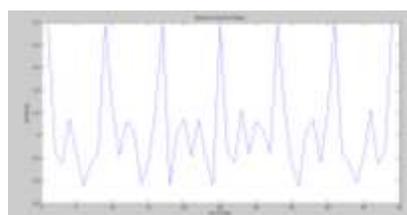
Further more, when the energy of one spectral component in Ω maps to another spectral component in Ω the probability of detection will increase.



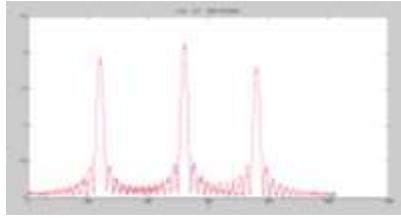
(a) Input signal generation



(b) FFT output



(c) Spectrum sensed output



(d)Minimum Square Error

VII CONCLUSION

In the existing method, a new method is used for recovering the sparse 2-D cyclic spectrum from a reduced number of compressive samples. The vectorized cyclic spectrum is reformulated to take a linear relationship with the covariance function of the compressive samples, which is a key step in enabling effective recovery of the 2-D cyclic spectrum via convex l_1 -norm minimization. As a special case of the compressive cyclic spectrum estimator, a new power spectrum estimator for stationary signals is also developed, which allows sub-Nyquist rate sampling even for non-sparse signals. From the recovered cyclic spectrum, two techniques have been developed to estimate the spectrum occupancy of a wide band hosting an unknown number of active sources: a band-by-band multi-cycle GLRT detector and a fast thresholding technique for signals with known modulation types such as BPSK signals. The proposed spectrum occupancy estimation techniques demonstrate salient robustness to sampling rate reduction and noise uncertainty. But the disadvantage in this method is less spectrum sensing performance. So, in the proposed system a new technique is used which is called novel multi-rate sub-Nyquist spectrum sensing (MR-SNS) system that implements cooperative wideband spectrum sensing in a CR network. MS can detect the wideband spectrum using partial measurements without reconstructing the full frequency spectrum.

REFERENCES:

- [1] FCC, "Spectrum Policy Task Force Report," ET Docket No. 02-155 Tech. Report, Nov. 2002.
- [2] I. F. Akyildiz, W.-Y. Lee, M. C. Vuran, and S. Mohanty, "NeXt generation/ dynamic spectrum access/cognitive radio wireless networks: A survey," *Comput. Netw.*, vol. 50, no. 13, pp. 2127–2159, Sep. 2006.
- [3] A. Sonnenschein and P. Fishman, "Radiometric detection of spread spectrum signals in noise of uncertain power," *IEEE Trans. Aerosp. Electron. Syst.*, vol. 28, no. 3, pp. 654–660, Jul. 1992.
- [4] R. Tandra and A. Sahai, "Fundamental limits on detection in low SNR under noise uncertainty," in *Proc. IEEE Conf. Wireless Netw., Commun., Mobile Comput.*, 2005, vol. 1, pp. 464–469.
- [5] S. Shellhammer and R. Tandra, "Performance of the power detector with noise uncertainty," IEEE 802.22-06/0075r0, Jul. 2006.
- [6] W. A. Gardner, "Signal interception: A unifying theoretical framework for feature detection," *IEEE Trans. Commun.*, vol. 36, no. 8, pp. 897–906, Aug. 1988.
- [7] W. Gardner, "Exploitation of spectral redundancy in cyclostationary signals," *IEEE Signal Process. Mag.*, vol. 8, no. 2, pp. 14–36, Apr. 1991.
- [8] A. V. Dandawate and G. B. Giannakis, "Statistical tests for presence of cyclostationarity," *IEEE Trans. Signal Process.*, vol. 42, no. 9, pp. 2355–2369, Sep. 1994.
- [9] M. Oner and F. Jondral, "Air interface recognition for a software radio system exploiting cyclostationarity," in *Proc. IEEE Int. Symp. Personal, Indoor, Mobile Radio Commun. (PIMRC)*, 2004, vol. 3, pp. 1947–1951.
- [10] K. Kim, I. A. Akbar, K. K. Bae, J.-S. Um, C. M. Spooner, and J. H. Reed, "Cyclostationary approaches to signal detection and classification in cognitive radio," in *Proc. IEEE DySPAN Conf.*, 2007, pp. 212–215.
- [11] J. Lunden, V. Koivunen, A. Huttunen, and H. V. Poor, "Collaborative cyclostationary spectrum sensing for cognitive radio systems," *IEEE Trans. Signal Process.*, vol. 57, no. 11, pp. 4182–4195, Nov. 2009.
- [12] J. Lunden, S. A. Kassam, and V. Koivunen, "Robust nonparametric cyclic correlation-based spectrum sensing for cognitive radio," *IEEE Trans. Signal Process.*, vol. 58, no. 1, pp. 38–52, Jan. 2010.
- [13] P. D. Sutton, K. E. Nolan, and L. E. Doyle, "Cyclostationary signatures in practical cognitive radio applications," *IEEE J. Sel. Areas Commun.*, vol. 26, no. 1, pp. 13–24, Jan. 2008.
- [14] C. M. Spooner and R. B. Nicholls, "Spectrum Sensing based on Spectral Correlation," in *Cognitive Radio Technology*, B. A. Fette, Ed., 2nd ed. Waltham, MA: Newnes, 2009, pp. 593–634

Improved Cost Efficient AODV Routing Protocol

Supriya Sawwashere¹, Ashutosh Lanjewar²

¹Assistant Professor Guru Nanak Institute of Engineering and Technology, Nagpur (Maharashtra)
ssawashere486@gmail.com

² Assistant Professor Guru Nanak Institute of Technology, Nagpur (Maharashtra)
Ashutoshlanjewar39@gmail.com

Author Correspondence: P.NO.104, shastri layout, opposite Somalwar Nikalas school, Khamla, Nagpur-440025, Maharashtra.
Mobile Number: 09960642476

Abstract— AODV (Ad-Hoc On-Demand Distance Vector) is a reactive routing protocol for mobile Ad-Hoc networks (MANETs) and other wireless ad-hoc networks. Reactive means that it establishes a route to a destination only on demand. The cost is one of the most important network performance parameter. In the paper, the conventional AODV is compared with proposed Improved Cost efficient AODV routing protocol using Euclidean distance. The route with shortest Euclidean distance is selected for communication. The proposed AODV routing protocol thus helps to overcome the factors like End to End Delay, Packet Loss and Network Routing Load which generally occurs in conventional AODV routing protocol due to changing topology of the network.

Keywords— AODV, Cost, End-to-end Delay, Metric

INTRODUCTION

MANET is a collection of wireless nodes [9] that can dynamically be set up anywhere and anytime without using any pre-existing network infrastructure [11]. AODV is a mainly used for wireless network where nodes are not stationary. AODV is the on-demand routing protocol [1] [3]. Routes, in AODV protocol, are established based on minimum hop count [15]. Routes are established in AODV Routing Protocol when it requires to send the data from source. So the AODV routing protocol is called as reactive routing protocol. The cost of network is one of the important parameter. Secondly the reliability of network also plays the vital role. The cost efficient network requires to satisfy the various network performance constraints such as energy consumption, End-to-End delay, Packet loss and Network Routing Load. The energy consumption depends upon the efforts taken by source node to circulate the data among intermediate node till it reaches to the destination. The energy consumption varies with the distance among the nodes. If the distance between the nodes is large the energy consumption will automatically rise or vice versa. The energy consumption directly affect the cost of the network. End-to-End delay is time required by the information to travel from the source node to destination node. Delay will engage the node in the network for large time and thus increase possibility of the hop count as well power consumption. This delay in return affects the cost of the network. The Packet loss occurs when the source node sends data to destination node which is placed at long distance or there may happen the link failure during communication.

The rest of this paper is ordered as follows. The Section 2 represents working of AODV routing protocol and related works are discussed in Section 3. Section 4 gives the idea regarding the Euclidean distance concept; Section 5 explains the proposed Method and Section 6 gives detail of simulation results and its discussion. The Section 7 provides the conclusion and future work whereas Section 8 represents References.

WORKING OF AODV PROTOCOL

In AODV routing Protocol the source node floods the Route Request packet in the network when a route is not available for the desired destination. It may obtain multiple routes to different destinations from a single Route Request. Routes, in AODV protocol, are established based on minimum hop count [13]. The exceptional thing in the AODV protocol is that it uses the DestSeqNum to update the path.

There are various types of messages are used in AODV routing Protocol

- a) **Route Request (RREQ) message:** It is used to form a route from one node to another node in a network.
- b) **Route Reply (RREP) message:** It is used to connect destination node to source node in a network.
- c) **Route Error (RERR) message:** It is used to indicate any route broken or node failure.
- d) **HELLO message:** It is used to determine the activeness of the network. The transmission of data depends on route discovery and route maintenance in AODV. The route discovery depends on RREQ and RREP messages, if a node initiate's request of

route it will form route after getting the RREP. The route will be maintained by sending HELLO messages to neighbour nodes, if any link failure it will indicate using RERR message.

The Routing Mechanism in AODV comprises of two main processes i.e. route discovery and route maintenance.

Route Discovery Process:

When source node tries to send a message to a destination node without knowing an active route to it, the sending node will initiate a path discovery process. A route request message (RREQ) is broadcasted to all neighbors, which continue to broadcast the message to their neighbors and so on. The RREQ forwarding process is continued until the destination node is reached or until an intermediate node knows a route to the destination that is new enough. In order to keep loop-free and most recent route information, every node maintains two counters: sequence number and broadcast_id. The broadcast_id and the address of the source node uniquely identify a RREQ message. The broadcast_id is incremented for every RREQ the source node initiates. An intermediate node can receive multiple copies of the same route request broadcast from various neighbors. In this case if a node has already received a RREQ with the same source address and broadcast_id it will discard the packet without broadcasting it anymore. When an intermediate node forwards the RREQ message, it records the address of the neighbor from which it received the first copy of the broadcast packet. This way, the reverse path from all nodes back to the source is being built automatically. The RREQ packet contains two sequence numbers: the source sequence number and the last destination sequence number known to the source. The source sequence number is used to maintain “freshness” information about the reverse route to the source while the destination sequence number specifies what actuality a route to the destination must have before it is accepted by the source. When the route request broadcast reaches the destination or an intermediate node with a fresh enough route, the node responds by sending a unicast route reply packet (RREP) back to the node from which it received the RREQ. So actually the packet is sent back reverse the path built during broadcast forwarding. A route is considered fresh enough, if the intermediate node’s route to the destination node has a destination sequence number which is equal or greater than the one contained in the RREQ packet. As the RREP is sent back to the source, every intermediate node along this path adds a forward route entry to its routing table. The forward route is set active for some time indicated by a route timer entry. If the route is no longer used, it will be deleted after the specified amount of time. Since the RREP packet is always sent back the reverse path established by the routing request, AODV only supports symmetric links.

Route Maintenance Process:

Route maintenance can be accomplished by two different processes

- Hop-by-hop acknowledgement at the data link layer
- End-to-end acknowledgements

Hop-by-hop acknowledgement is the process at the data link layer which allows an early detection and retransmission of lost packets [7]. If the data link layer determines a serious transmission error, a route error packet is being sent back to the sender of the packet. The route error packet contains the information about the address of the node detecting the error and the host’s address which was trying to transmit the packet. Whenever a node receives a route error packet, the hop is removed from the route cache and all routes containing this hop are truncated at that point. When wireless transmission between two hosts does not process equally well in both directions, end-to-end acknowledgement may be used. As long as a route exists, the two end nodes are able to communicate and route maintenance is possible. In this case, acknowledgements or replies on the transport layer used to indicate the status of the route from one host to another. However, with end-to-end acknowledgement it is not possible to find out the hop which has been in error.

RELATED WORK

AODV is reactive routing protocol. It is simple, efficient and effective routing protocol having wide application [14]. The topology of the network in AODV gets change time to time. As a result of this, maintaining the Cost, End-to-End, Packet Loss and Network Load is a great challenge. Various researches have been carried out on above factors. Tooska D. [16] had presented a semi-proactive routing protocol (SP-AODV) based on a reactive AODV protocol. In SP-AODV protocol, all nodes use AODV routing protocol to find a path to a destination. The results showed that SP-AODV routing protocol has more packet delivery ratio and fewer end-to-end delay compared to AODV. They also observed that control packet overhead in SP-AODV is less than AODV in low and medium mobility of nodes; but it is more than AODV in high mobility of nodes. Sujata et.al. [12] had done the comparison of AODV and RAODV routing protocols. In RAODV they had changed route replay packet configuration of AODV and named it RRREQ. The simulation results of RAODV are better than other version of AODV algorithm. In future they will work on energy concept in RAODV, so that they can assign the priority of different dedicated paths between source and destination on the basis of both energy as well as the stability of nodes or paths. P. Parvathi [10] had done the comparative analysis of CBRP, AODV and DSDV. They observed that DSDV routing protocol consumes more bandwidth, because of the frequent broadcasting of routing updates and AODV is better than DSDV as it doesn’t maintain any routing tables at nodes which results in less overhead and more bandwidth. While Compared with AODV, CBRP overhead is lower and its throughput is considerably higher. Mohammad S. [7] had studied the AODV routing protocol and black hole attack. They proposed the method to prevent the malicious packet dropping by considering the number of neighbor of each and every individual node. Also, they have shown that, the right place to validate the RREP which it is sent by an intermediate node should be the first node in the reverse path, to avoid propagating false route information in the network. In future they would like to extend the proposed scheme for detecting the wormhole attack. Manoranjan D. et.al. [6] had observed from the detailed analysis

that the packet delivery fraction for the MANET with higher load is less than lower load. The cause of lower packet delivery fraction at higher load is high packet drop at network interface due to overflow. They also observed that the routing load for network with higher load is higher than the network with lower load. The number of link breaks is higher at lower pause time but the packet delivery is better at lower pause time due to the ability of the nodes to get alternate path. Li Y. et.al [5] had done a nonlinear dynamic optimization for route discovery phase of AODV through simulation and analysis Packet delivery ratio, average end to end delay, routing load, packet loss rate. The results show that the improved AODV routing protocol enhances node's data forwarding capability while reducing the routing load and packet loss rate. The protocol is not perfect because of limit time. Kishore B. et.al. [4] had proposed improved protocol PWAODV based on piggyback mechanism and they introduced weighted neighbor stability. The path selected in protocol is more stable and effective. It also reflects the mobility of nodes accurately. Finally, the advantage reflected in the simulation results is brought by reducing transmission of redundant packets and improving the robustness of the route. The direct result is that the performances of route cost and end-to-end delay have been improved greatly. Moreover, when compared with using the GPS auxiliary hardware or the cross-layer thought it can avoid many problems. Hemant G. et.al. [2] had done discussion of how routing load and packet loss in AODV protocol can be minimized in any given network. They had developed technique which identify the broken link between any two nodes and also repaired the same or route can be discarded from the network to avoid loss of packets. M. Usha et.al. [8] had proposed an enhancement of AODV routing protocol. They named new protocol as RE-AODV (Route-Enhanced AODV). They take routing overhead and end-to-end delay as QoS parameters. TOSSIM simulator is used for performance evaluation. When the routing overhead is evaluated for RE-AODV and it is found to be 25% less compared to AODV. Moreover end-to-end delay of packets from source to destination in RE-AODV reduced by 11%, as against AODV. In future, they will work on energy efficiency parameter of AODV.

EUCLIDEAN DISTANCE CONCEPT

The network with nodes A,B,C,D,E,F is given in figure 1. Consider the Euclidean space for two dimension.

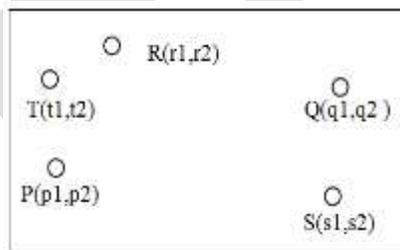


Figure.1 Scenario of a wireless Network with Mobile nodes

Consider the two dimension Euclidean space. When the node P has to send the data to the Q, then first of all the P will check the Euclidean distance of the nearby nodes. The path which can be followed to send the data may be P-T-R-Q, P-S-Q, P-R-Q or P-Q. First of all AODV has to calculate the Euclidean distance for all possible path then require to follow the path with small metric i.e. Euclidean distance. In order to find the Euclidean distance between two nodes P and Q, first of all P and Q are described with coordinates (P1,P2) and (Q1,Q2) respectively. In first step length between the P and Q is given by $|P1 - Q1|$ and $|P2 - Q2|$. Secondly the Pythagorean Theorem is between the two length gives $((P1 - Q1)^2 + (P2 - Q2)^2)^{1/2}$. So the distance between two points P

= (P1, P2) and Q = (Q1, Q2) in two dimensional space is there given as $D = \sqrt{(P1 - Q1)^2 + (P2 - Q2)^2}$. Through the calculation of Euclidean distance it is easy to calculate the power consumption, End- to -End delay and the number of hop required. Large the Euclidean distance more power will get consumed, End-to-End delay will increase and the number of hop will increase indirectly the net cost of the network gets increase. Similarly if Euclidean distance is less the net cost of the network gets reduce.

PROPOSED METHOD

The working of proposed improved cost efficient AODV routing protocol using Euclidean concept is given below. Consider the figure 1 given above for the proposed AODV protocol scheme. In the figure1 P,Q,R,S,T are the nodes in the network. The number of Nodes (N) are responsible for size of the network. S is the source node and D is the destination node. In network if P is the source

Node (S) and Q is the destination Node (D). The data is send from S to D with the help of nearby Nodes (Nn) and using the AODV protocol based on Euclidean Distance (Ed) concept. Later on the Cost(C) of the network is calculated. The algorithm of the proposed method is given below.

- Step 1: Set N
- Step 2: Define S and D
- Step 3: Set the AODV protocol.
- Step 4: Calculate the Ed between S & Nn.
- Step 5: Send data from S to D by using Nn with small Ed.
- Step 6: Suppose the 'T' is placed at small Ed from S i.e P, then follow the path P → T, then T will be the S. This will continue till data reach to D i.e Q.

SIMULATION RESULTS AND DISCUSSION

The simulation is done using Network Simulator 2.35. The network performance parameters such as cost, End-to-End delay, Packet Loss and Network Routing Load are evaluated against number of communications or data transfers for both conventional AODV and Improved Cost efficient AODV Routing protocols and are shown below. The blue colour curve represents the conventional AODV protocol while the Red colour curve represents the proposed improved AODV protocol. The Simulation Parameters are given below.

Parameter	Value
Simulator	NS2.34
Simulator Time (s)	50 seconds
Number of Nodes	20,40,60
Simulation Area	500*500
Routing Protocol	AODV
Traffic	CBR (UDP)
Channel Capacity	1 M Bits/sec
MAC Layer Protocol	IEEE802.11
Transmission Range	1.5 Meters

Table I. Simulation parameters

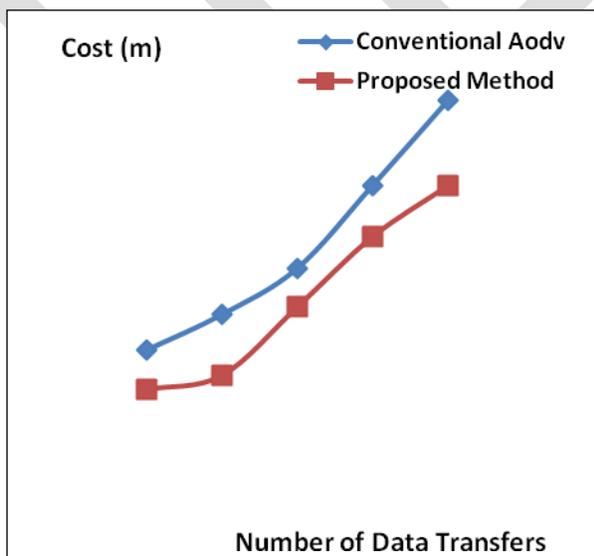


Figure 2 Comparison of Cost for 60 Nodes

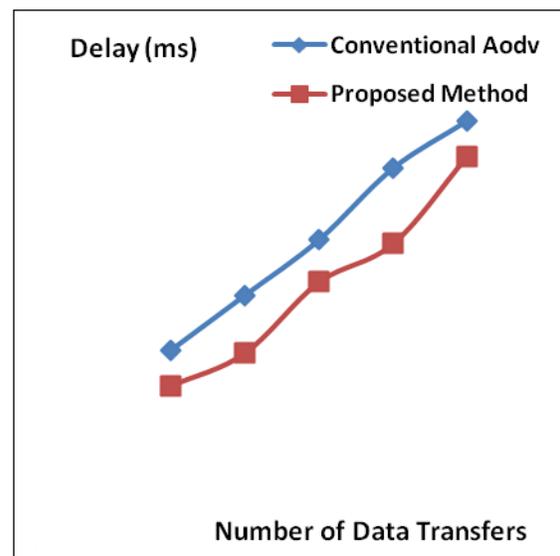


Figure 3 Comparison of End-to-End Delay

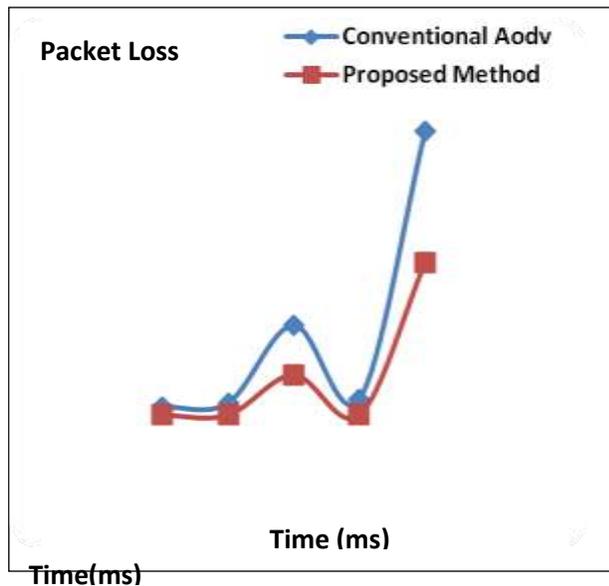


Figure 4 Comparison of Packet loss

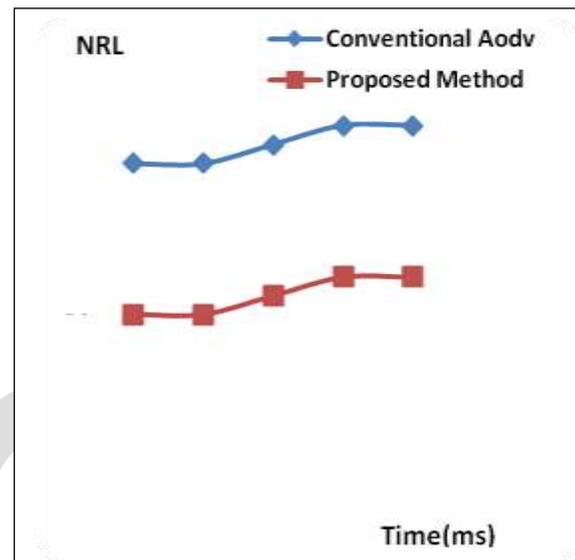


Figure 5 Comparison of NRL

Figure 5.1 Comparison of Cost for 60 Nodes

- Cost is the amount of energy consumed .It also depends on number of nodes utilized, and packet loss. Energy consumption varies with the Euclidean distance .Larger the distance between the nodes more will be energy consumption or vice versa. In figure 2. Number of Data transfers is plotted against the cost. In the graph five data transfers are consider. It is observed that cost of proposed improved cost efficient AODV routing is very less as compare with conventional AODV. Cost in proposed AODV simulation touches the lowest level by reducing the distance and follows the shortest path of 1300 meters.
- End-to-End Delay means the delay; a packet suffers between leaving the sender application and arriving at the receiver application. This metric represents average end-to-end delay and indicates how long it took for a packet to travel from the source to the application layer of the destination. It is measured in seconds. In figure.3 the Number of data transfers is plotted against the delay. It is observed from graph that Proposed AODV has reduced the End-to-End Delay as compare to the conventional method.
- Packets Dropped: The dropped packet count is the number of data packets that are collided or crashed during the data transmission between source and destination.In figure.4. The Number of data transfers is plotted against Packet loss. It is observed from graph that Proposed AODV has low packet loss as compare with conventional AODV routing Protocol.
- Normalized routing load is the number of routing packets “transmitted” per data packet “delivered” at the destination. Each hop-wise transmission of a routing packet is counted as one transmission. In figure.5 the Number of data transfers is plotted against Network Routing Load. It is observed from graph that Proposed AODV has negligible network routing load in all data transfers as compare to conventional AODV routing protocol.

CONCLUSION AND FUTURE WORK

The performance metrics such as Cost, Delay, Packets Loss and Network Routing Load are evaluated against number of data transfers for both conventional AODV and improved cost efficient AODV protocol with number of mobile nodes of up to 60 using NS-2.35. It is observed even though if numbers of nodes are increased, still the improved cost efficient AODV protocol performs well and yields better throughput level with less delay and consumes less energy. Despite having high Network load the proposed AODV is able achieve less packets Drop when compared to conventional AODV protocol. In this simulation the proposed AODV protocol has best all-round performance. In future same work can be extended by introducing the security parameter to avoid wormhole attack .Secondly the performance comparison of AODV with other routing protocols can be also carried out to judge the performance of the work.

REFERENCES:

- [1]Guo-ping XU, Jian-hui, “Improvement of AODV Routing Protocol based on Wireless mesh networks”, International Conference on Computer, Mechatronics, Control and Electronic Engineering (CMCE), Volume-1, pp. 372 – 375, May 2010.
- [2]Hemant Kumar Garg, P.C.Gupta, “Minimization of Average Delay, Routing Load and Packet Loss Rate in AODV Routing Protocol”, International Journal of Computer Applications, Volume 44, pp.14-17, April 2012.
- [3]HuaYang, Zhi-yuan Li, “Simulation and Analysis of a Modified AODV Routing Protocols”, International Conference on Computer Science and Network Technology (ICCSNT) , 2011Volume 3, pp. 1440 – 1444, Dec. 2011.
- [4]Kishore Bagathi, Kuda Nageswara Rao , Muddada Murali Krishna, M.Sitharam, Bhadrachalam Kollati,“An improved AODV protocol with lower route cost and smaller delay-PWAODV”, International Journal of Futuristic Science Engineering and Technology , Vol 1 Issue 3, pp. 172-183, March 2013
- [5]Li Yuanzhou, Hu Weihua, “Optimization Strategy for Mobile Ad Hoc Network Based on AODV Routing Protocol”, 6th International Conference on Wireless Communications Networking and Mobile Computing (WiCOM), 2010 , pp-1-4, Sept. 2010
- [6]Manoranjan Das, Banoj Kumar Panda, Benudhar Sahu, “Analysis of Effect of Mobility on Performance of AODV in Mobile Ad hoc Network” , International Conference on Computer Communication and Informatics (ICCCI -2012), pp-1-4. Jan. 2012.
- [7]Mohammad Taqi Soleimani, Abdorasoul Ghasemi, “Secure AODV against Maliciously Packet Dropping”, 7th International Conference on Networked Computing (INC), 2011, pp.5-10.
- [8]M.Usha, S.Jayabharathi, R.S.D. Wahida Banu, “RE-AODV: An Enhanced Routing Algorithm for QoS Support in Wireless Ad-Hoc Sensor Networks” IEEE International conference on Recent Trends in Information Technology, pp.567-571, 2011.
- [9]Nishant Chaurasia, Sanjay Sharma, Dheresh Soni, “Review Study of Routing Protocols and Versatile challenges of MANET”, IJCTEE, Volume2, Issue 1, pp.150-157, 2012.
- [10]P.Parvathi, “Comparative Analysis of CBRP, AODV, DSDV Routing Protocols in mobile Ad-hoc Networks”, International Conference on Computing, Communication and applications (ICCCA), pp. 1 – 4, 2012.
- [11]Sachin Kumar Gupta, R. K. Saket, “Performance metric comparison of AODV and DSDV routing protocols in manets using ns-2”, IJRRAS Volume7, Issue 3, pp.339-350, January 2013.
- [12]Sujata Wasudeorao Wankhade, P. R. Deshmukh, “Comparison of AODV and RAODV Routing Protocols in Mobile Ad Hoc Networks ”, International Journal of Advanced Research in Computer Science and Software Engineering Volume 3, Issue 1, pp.374-377, January 2013.
- [13]Xiaodong Xu, V.Seethalakshmi, “Improved AODV Algorithm Based on Feedback and Silence” International Conference on Internet Technology and Applications (iTAP), pp-1-3, Aug 2011.
- [14]Perkins C.E, Royer E., “Ad-Hoc On-Demand Distance Vector Routing”, IEEE Workshop on Mobile Computing Systems and Applications, pp.90-100, 1999.
- [15]Said Khelifa, Zoulikha Mekakia Maaza “An Energy Multi-path AODV Routing Protocol in Ad Hoc Mobile Networks” IEEE International Symposium on Communications and Mobile Network, 2010 Conference Publications, pp.1-4, 2010.
- [16]Tooska Dargahi, Amir Masoud Rahmani, Ahmad Khademzadeh, “SP-AODV: A Semi-Proactive AODV Routing Protocol for Wireless Networks power”, International Journal of Innovative Technology and Exploring Engineering (IJITEE), Volume-1, Issue-2, pp.109-112, July 2012.

QUALITY EVALUATION OF MANGIFERA INDICA USING NON - DESTRUCTIVE METHOD

Prof. Mangesh A. Parjane, Devtale Vidya Gajanan, Gole Dipmala Ramdas, Jadhav Supriya Mahadev

Assistant Prof. at SBPCOE, Indapur, India, mparjane@gmail.com, 9970089973

Abstract— The ability to identify the fruits based on Quality in the industry which is most important technology in the realization of automatic mangoes sorting machine in order to reduce work of human and time consuming. In this work the identification of defective and non-defective mangoes focused on the methods using MATLAB. First we use the X-ray images of mangoes, later using different method like segmentation, thresholding and thus we get related databases. Comparing several databases, we get a mango is defective or not. This paper represents analysis of good or bad mangoes with a very high accuracy successfully using image processing.

Keywords— Quality, Spongy Tissue, Morphological Processing, fruit sorting, NRI Spectroscopy, X-Ray Firmness, Astringency, Dilation, Erosion etc.

INTRODUCTION

Agriculture in India is one of the important economic sectors. India ranks first among world's mango producing countries accounting for about 50% of the world mango production. When any agricultural product are exported from India, quality of that product most important. Quality is denotes the degree of excellence. Fruit quality is related to both internal variables Flavor(Sweetness, Sourness, Astringency, Aroma), Texture(Firmness, Crispness, Juiciness),Nutrition (Carbohydrates, Proteins, Vitamins, Functional property), Defect(Internal cavity, Water core, Frost damage, Rotten) and external variables Size (weight, volume, dimension), Shape (diameter/depth ratio) ,Color (uniformity, intensity), Defect (bruise, stab, spot)[17] need to be sorted by different techniques. The consumer demand increasing for high-quality fruit has led to the development of optical, acoustic and mechanical sensors that determine this quality [3]. We are focusing on internal quality of the mango. There are many pests and disorders with which mango is damaged. In this paper, we find out the spongy tissue in a non-destructive manner. Spongy tissue is a ripening disorder, causes of the ST fetches low value in the market. Non-destructive techniques are MRI, NIR, CT, Ultrasonic and X-Ray method etc. In this paper- Ray method has been developed to detect affected mangoes. Narendra V G & Hareesh K S in 2010 developed automatic sorting and quality evaluation of agricultural products by using computer vision system. In 2013, R Renu and D V Chidanand developed internal quality classification of agriculture produce using Non-Destructive (X-Ray) Method. Generally, Manually sorting are less efficient, time consuming and costly. To overcome these problems, the most important technique is automatic mango sorting machine is developed by using MATLAB.

TYPES OF SOURCES

SR.N O.	TYPE	INTERNAL PARAMETER	EXTERNAL PARAMETER
1.	NIR/MRI	Sugar content, Oil, Moisture content, water	-
2.	Machine Vision	-	size, color, texture
3.	LASER SPECTROSCOPY, Image analysis	Firmness	Shape, Size ,color
4.	X-ray/CT	Firmness, tenderness. internal cavity and structure, ,ripeness	

PROPOSED METHODOLOGY

The fig.1.shows proposed block diagram for automatic mango fruit sorting .

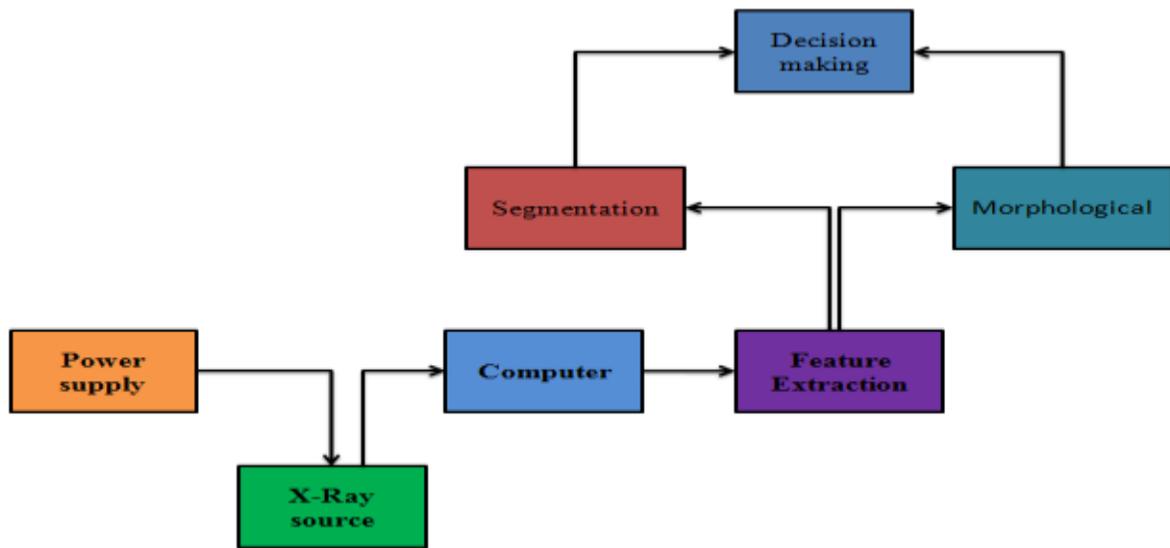


Fig.1 Proposed model automated mango fruit sorting

HISTOGRAM AND THRESHOLD

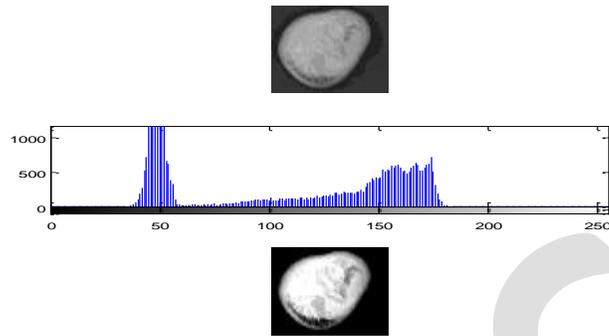


Fig.2 Results of Histogram and Thresholding on Mango Fruit

Overview of Morphological Processing –

A. Dilation-

Let A be a set of pixels and let J be a structuring element. Let $(\hat{J})_s$ be the reflection of J about its origin and followed by a shift by s . Dilation, written $A \oplus J$, is the set of all shifts that satisfy the following:

$$A \oplus J = \{s | (\hat{J})_s \cap A\}$$

Using Dilation we can repair breaks and intrusions.

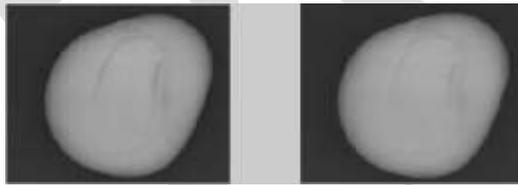


Fig.3 Results after Dilation

B. Erosion

Given sets A and B , written $A \ominus B$, is defined as:

$$A \ominus B = \{s | (B)_s \text{ belongs to } A\}$$

That the erosion of A by B is the set of all points s such that B , translated by z is contained in A

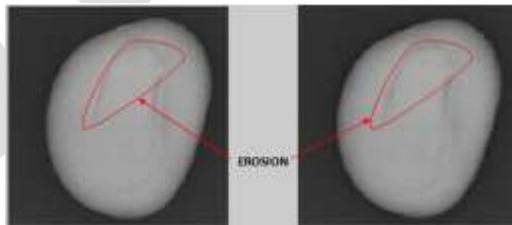


Fig.4 Results after Erosion

For getting the better results from morphological Processing over the input images we applied some operations respectively:

1. Surface Illumination
2. Increase the Image Contrast
3. Threshold the Image

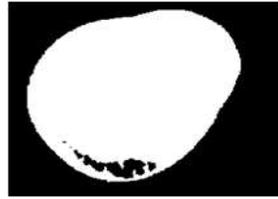


Fig.5 Results after all 3 Morphological Processing.

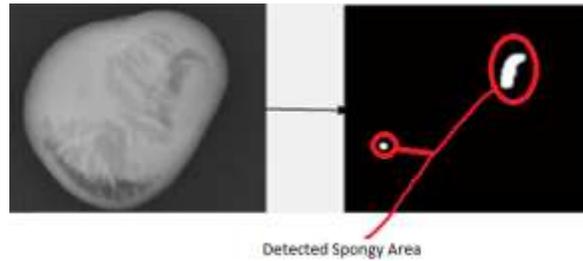


Fig.6 Extracted features that is Spongy Tissue after Processing

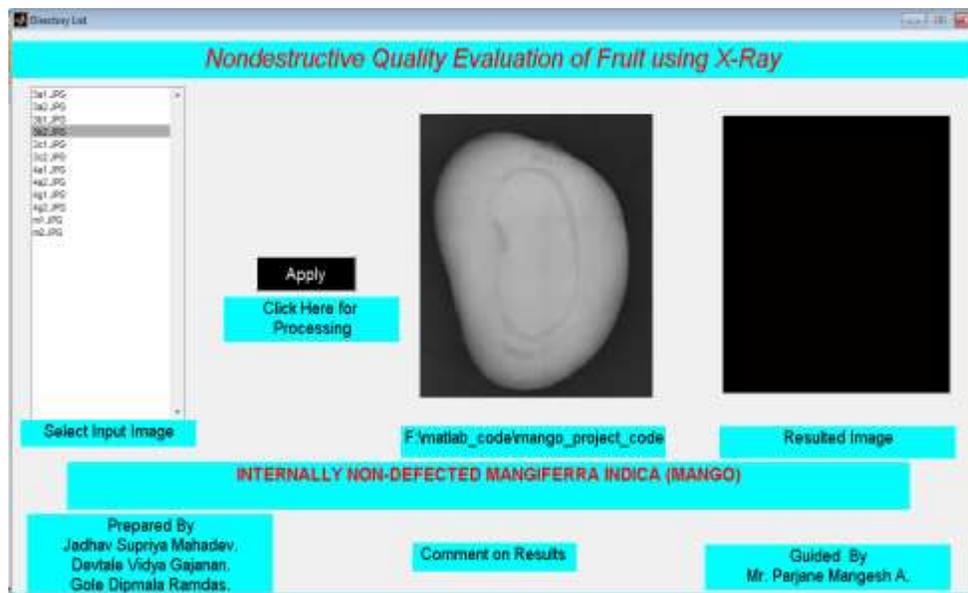


Fig.7GUI of Proposed Methodology

CONCLUSION

Soft X-ray based imaging techniques are powerful tools for non destructive internal quality evaluation. In this paper, we used different segmentation methods and morphological methods the identification of good and bad mangoes based on quality in image processing using MATLAB is successfully done with 92% accuracy.

REFERENCES:

- [1] C. S. Nandi, B. Tudu and C. Koley , A. Mason et al. (eds.) "Machine Vision Based Techniques for Automatic Mango Fruit Sorting", Springer International Publishing Switzerland 2014.
- [2] R Renu and D V Chidanand "Internal Quality Classification of agricultural produce using Non-destructive Image Processing Technologies (soft X-ray)", Vol. 2 Issue 4 July 2013.
- [3] F. J. García-Ramos et al. / Span J Agric "A review of Non-destructive fruit firmness sensors", Res (2005) 3(1), 61-73.
- [4] "Soft X-Ray Imaging for Non-Destructive Detection of Spongy Tissue in Alphonso Mango", DOEACC CENTRE, AURANGABAD.
- [5] 'Master Thesis, "Sensing taste of fruits and vegetables using near infrared (NIR)Technology", December, 2001.
- [6] R. Yogamangalam, "Segmentation Techniques Comparison in Image Processing", et al. / International Journal of Engineering and Technology (IJET).
- [7] Rohan et al 'Review: Existing Image Segmentation Techniques', International Journal of Advanced Research in Computer Science and Software Engineering 4(4), April - 2014, pp. 153-156.
- [8] Color image segmentation techniques and issues: International Journal of Scientific & Technology Research, May 2012
- [9] Edge Detection Techniques: Evaluations and Comparisons, Department of Computer Engineering, Faculty of Engineering Mazandaran Institute of Technology, Vol. 2, 2008, no. 31, 1507 – 1520.
- [10] Performance Evaluation of Edge Detection Techniques for Images in Spatial Domain, (IJCTE), Vol. 1, No. 5, 2009
- [11] Comparison for Image Edge Detection Algorithms, IOSR Journal of Computer Engineering (IOSRJCE) ISSN: 2278-0661 Volume 2, Issue 6, 2012
- [12] Er. Snigdha Mohanty and Er. Mahesh Prasad Sahoo. EDGE DETECTION : A COMPARISON
- [13] Kyu-Hong Choi, Kang-Jin Lee, Giyoung Kim, "Nondestructive Quality Evaluation Technology for Fruits and Vegetables Using Near -Infrared Spectroscopy.
- [14] Ryszard S. Chora's. "Image Feature Extraction Techniques and Their Applications for CBIR and Biometrics Systems, International journal of biology and biomedical engineering"
- [15] Megha Goyal "Morphological Image Processing", IJCST Vol. 2, Issue4, Oct . - Dec. 2011
- [16] Amalorpavam, G, Harish Naik T, Jyoti Kumari, Suresh M, "ANALYSIS OF DIGITAL IMAGES USING MORPHOLOGICAL OPERATIONS", Vol 5, No 1, February 2013.

- [17] R. C. Gonzalez & R. E. Woods Digital Image Processing, 2nd ed. 2002 Image Processing–Laboratory 7: Morphological operations on binary images
- [18] Morphological Operators, CS 111: Digital Image Processing
- [19] Alasdair M^C Andrew, “Introduction to digital image processing with matlab”.
- [20] Radha B. Randive, M. N. Vharkate -edge detection with bilateral filtering for fruit grading using spiral architecture. volume-1, issue-6

IJERGS

Forest area Segmentation from LiDAR images

Deepthi Krishnan, Arunkumar G

PG Scholar, TKMIT, Kollam, Kerala, India

deepthik426@gmail.com

Abstract— LiDAR (Light Detection And Ranging) is a remote sensing technology used for a wide variety of applications and multi-scale LiDAR image analysis is a promising tool for forestry and terrain related studies. The segmentation of forest area is possible from LiDAR images, which is very much useful in forest management. Due to some disadvantages of conventional segmentation schemes, the attentive vision method can be used for this purpose, which is based on our visual attention mechanism. In this, primitive feature map is generated as the initial step. Primitive feature map is created by applying a LoG (Laplacian of Gaussian) filter on the input image. Attentive vision method involves the detection of feature point. Then, a ring region and a disk region are defined on image with arbitrary radii and detected feature point as center for calculating some parameters like isotropic local contrast, height variance, mean value of pixels in disk region and the total number of points in the ring region. For object area recognition, a descriptor vector is formed to represent the current disk area centered at feature point. The difference between this vector and the reference vector is compared with a threshold vector to recognize whether the considered area is an object area. Forest area segmentation is completed by doing a region growing segmentation with the feature point as seed point. This method provides an effective segmentation of forest areas using attentive vision method to remote sensing image analysis.

Keywords— LiDAR images, Feature point, Attentive vision method, Region growing, LoG, Isotropic local contrast, Descriptor vector.

INTRODUCTION

Remote sensing is the process of collecting information related to objects without being in physical contact with them. In most of the remote sensing techniques, the process involves an interaction between incident radiation and targets. There are two main types of remote sensing: active remote sensing and passive remote sensing. Passive remote sensors detect radiations reflected or emitted by the objects whereas in active remote sensing, the source emits energy to scan objects and sensor analyses the reflected or backscattered radiation from the target. Light Detection And Ranging (LiDAR) is an active remote sensing technique because they emit pulses of light and detect the reflected light. This characteristic allows LiDAR data to be collected at night when the air is usually clearer and sky contains less air traffic than in daytime. LiDAR equipment is typically mounted in aircrafts to rapidly collect points over a large area. It is also placed in ground based stationary or mobile platforms. Collection of elevation data using LiDAR has several advantages such as high resolution and ground detection in forested terrains over other techniques[2]. Remote sensing has been applied to forest ecosystem management for many years. The LiDAR technology has become popular in forestry during past decade. LiDAR can provide high resolution representation of objects. Very good resolution and available radiometric data make LiDAR a most acceptable tool for studying forests. LiDAR uses shorter wavelength of electromagnetic spectrum. It fires rapid pulses of light towards a surface and analyzes each returned pulse. LiDAR allows the direct measurement of three-dimensional structures and the underlying terrain.

In forestry, LiDAR can be used to measure the three dimensional structure of a forest. LiDAR penetrates the tree canopy to return an accurate interpretation of ground surface. LiDAR technology provides horizontal and vertical information at high resolution and accuracy. The first return will be generated from uppermost limit of canopy, followed by less intense returns through the canopy, down to the underlying terrain. Returns are classified based on whether it is from ground or aboveground source. Ground return can generate a detailed terrain of the interested area while aboveground returns such as canopy return can be filtered to provide forest structure. LiDAR images in forest areas have some different features compared to images from other regions. First, the objects have irregular shape. Second, the presence of multiple objects of interest. Third, in dense forests tree-tops cannot be easily distinguished from each other. Fourth, estimation of digital terrain model (DTM) images is difficult in dense forest areas. In these conditions, image segmentation cannot be handled in a conventional manner. For object segmentation task, three common methods are used such as pixel-wise thresholding in which a height threshold is used to separate objects of interest, pixel classification method which considers pixels as a vector belongs to one of two classes-objects and background and third method is the extraction of object feature points. For object detection from LiDAR images in a computational manner, two major approaches have been widely used such as the direct processing of LiDAR data and segmentation of surfaces as point clouds and the second one is the object detection and segmentation on Digital Surface Model (DSM) images.

Several methods of tree detection and forest segmentation based on airborne LiDAR data have been recently developed. A combination of surface reconstruction with watershed segmentation was applied to full waveform data to delineate trees[7]. Another example is the method of gray-scale morphology used to detect tree tops in dense forest areas[8]. Fusion of LiDAR data and high

resolution aerial images is an effective way for the successful reconstruction of forest areas [9]. Forest area segmentation and individual tree detection are also possible in a GIS environment [10]. 2-D wavelet analysis is also useful in determining the position and height of individual trees [11]. Most of these methods are based on a single-scale analysis and object detection is implemented through time-consuming and unstable prior segmentation of LiDAR images. So there is a need for developing a method for object detection from LiDAR images. The goal of this work is to develop a method for effective segmentation using feature point extraction method from LiDAR images and object detection using DSM images. The method is based on visual attention model of image segmentation [13], [14] which concentrates on salient regions in an image. Object detection is performed by locating the feature points and these feature points are used for final segmentation. Region growing segmentation with some modifications is used here for final segmentation.

METHODOLOGY

Forest area segmentation from LiDAR images is a promising tool for the studies related to forestry. Fig. 1 shows the workflow of proposed method for detecting forest areas from LiDAR images. It consists of primitive feature computation, feature point detection, object area recognition and a region growing.

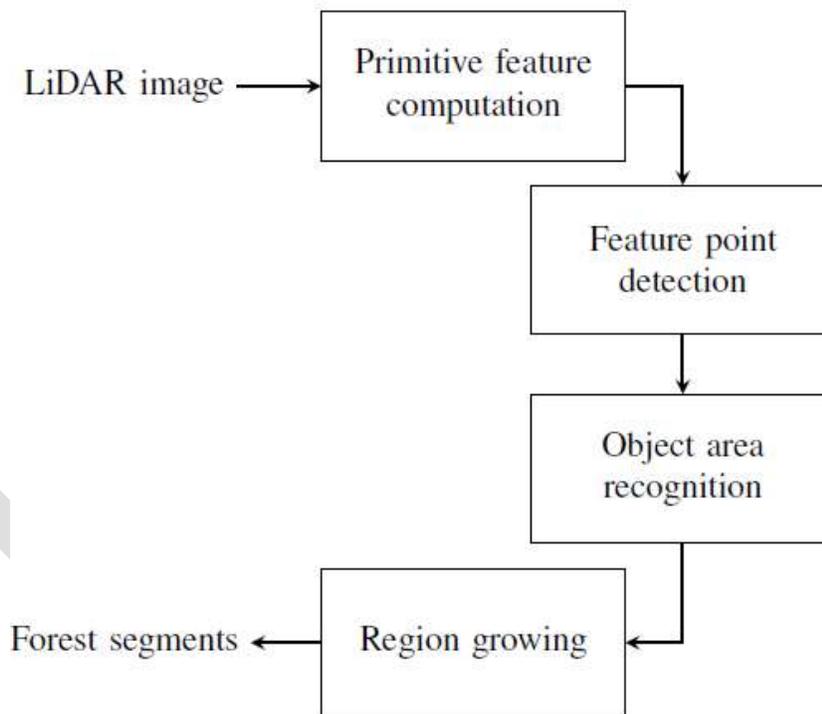


Fig.1: Work flow for forest area segmentation

The basic block diagram for the object segmentation of LiDAR images in forest areas is shown in Fig.1. LiDAR image of a forest area is given as the input image. Primitive feature is computed as the first step. It is calculated as the sum of square of Laplacian of Gaussian filtered image in which the filter is applied on a windowed section of input image. Using visual attention model, the feature points are detected on input image. These feature points are considered as the centers of object area. Object area can be recognized by a descriptor vector comparison. Finally region growing is performed to segment the entire object region.

1. Primitive feature computation

Primitive feature can be different characteristics of return pulses such as pulse intensity or width of return pulses in the case of multiple returns LiDAR data. Density of particular return pulse can also be used as a primitive feature since it characterizes the object

area to be detected. But in this case only a single component initial image is given as input. The value of primitive feature in point (i,j) is computed as

$$g(i,j) = \frac{1}{|A_k|} \sum_{(m,n) \in A_k(i,j)} (L_k[G_k[f(m,n)]])^2 \quad (1)$$

where $f(m,n)$ is the input image, $A_k(i,j)$ is the local window centered at (i,j), L_k is the Laplacian operator and G_k is the Gaussian operator. Laplacian filters are derivative filters used to find areas of rapid change in images. Since derivative filters are sensitive to noise it is common to smooth the image before applying Laplacian. This is LoG filter. This preprocessing step will reduce the high frequency noise content present in the image prior to differentiation. Laplacian operator generally operates on a grayscale image and generates a grayscale image as output. A discrete convolution kernel which can approximate the second derivatives in the definition of Laplacian should be formed.

Since convolution is an associative operation we have to first convolve the Gaussian filter with Laplacian mask at first and then convolve this with the input image. The 2-D Gaussian smoothing operator is a convolution operator that removes the details and noises present in the input images. Since Gaussian filter is a smoothing filter it reduces the range of scales over which intensity can change. Intensity change can be detected based on the assumption that wherever a change occur there will be a corresponding peak in the first directional derivative or a zero-crossing in the second directional derivative of intensity. To detect the direction of changes a second-order differential operator Laplacian is used.

2. Feature point detection

Feature detection is the process where an image is automatically examined to extract features that are unique to objects in the image. The process can be divided into three steps:

- Detection: Identifies interesting points (feature point). Same feature should be always detected irregardless of viewpoint.
- Description: Each feature point should have a unique description that does not depend on the features, scale and rotation.
- Matching: Determines the objects contained in the input image and possibly the transformation of objects based on predetermined feature points.

Speeded-Up Robust Feature (SURF) detector is used here to detect feature points. The technique to achieve scale invariance is to examine the image at different scales, scale space using Gaussian kernels. SURF divides scale space into levels and octaves. The octave is divided into uniformly spaced levels.

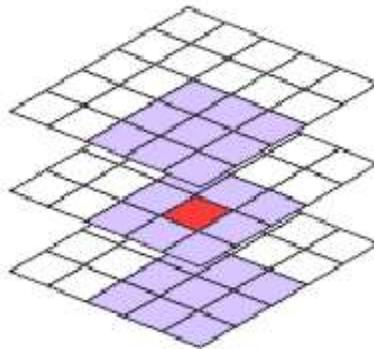


Fig.2: Three octaves with 3 levels

Figure 2 shows three octaves with three levels. Then interest points are the points that are the extrema among 8 neighbors in the current level and its 2x9 neighbors in the below and above levels. This is a non-maximum suppression in a 3x3x3 neighborhood. The neighborhood for the 3x3x3 non-maximum suppression used to detect features is highlighted in figure 2. SURF uses a Hessian based detector to detect interest points. Determinant of Hessian matrix represents the local change around the area.

$$H(X, \sigma) = \begin{bmatrix} L_{xx}(X, \sigma) & L_{xy}(X, \sigma) \\ L_{xy}(X, \sigma) & L_{yy}(X, \sigma) \end{bmatrix} \quad (2)$$

$$L_{xx}(X, \sigma) = I(X) * \frac{\partial^2 g(\sigma)}{\partial x^2} \quad (3)$$

$$L_{yy}(X, \sigma) = I(X) * \frac{\partial^2 g(\sigma)}{\partial y^2} \quad (4)$$

$$L_{xy}(X, \sigma) = I(X) * \frac{\partial^2 g(\sigma)}{\partial xy} \quad (5)$$

$L(X, \sigma)$ is the convolution of image with the second derivative of Gaussian. Since the convolution is very costly to calculate it is approximated and speeded-up with the use of integral images and approximated kernels. Integral image $I(X)$ is an image where each point $X=(x,y)^T$ stores the sum of all pixels in a rectangular area.

$$I(X) = \sum_{i=0}^{i \leq x} \sum_{j=0}^{j \leq y} I(x, y) \quad (6)$$

The SURF algorithm approximates the second order Gaussian kernels with box filters[15]. The use of integral images enables calculating the response in a rectangular area with arbitrary size using 4 look-ups as illustrated in Fig. 3.

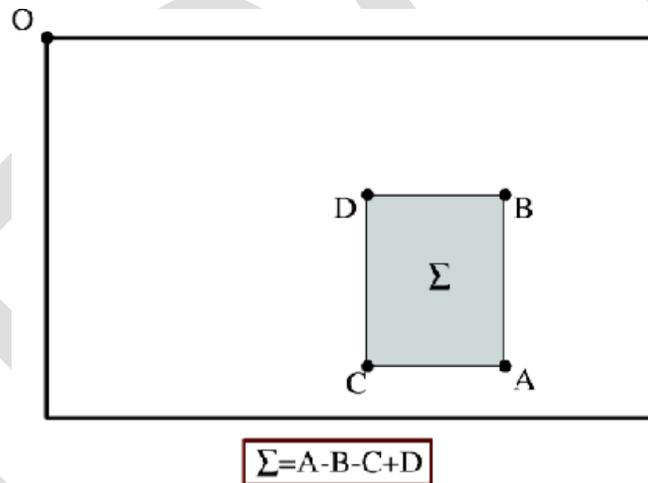


Fig. 3: Four memory look ups is sufficient to calculate the sum of an rectangular area with an integral image

3. Object area recognition

For object area recognition, a model-based approach[16] can be used. This model-based approach can be implemented with the help of Salient Disk Model(SDM)of high-contrast homogeneous regions. A Salient Image Disk is defined as a circular image fragment of a variable diameter, which is inscribed into a homogeneous region and has the local maximum of contrast-to-homogeneity ratio. A region is called high-contrast homogeneous if the ratio of the regional contrast to intensity variance inside the region is higher than a certain threshold. It involves the assumption of representing the object regions by homogeneous and high-contrast disk areas inscribed into the object regions. Then the feature points are set as the centers of the disk areas[17]. The structure of a Salient image disk is shown in Fig. 4.

Two non-overlapping regions centered at point (i, j) are involved in the estimation of Salient Image Disk homogeneity and local contrast. Disk region S is a maximal-diameter disk centered at (i, j) with its diameter equal to σ , and inscribed in the homogeneous region. The ring region Q_σ has its outer diameter equal to $\delta + 2\delta_{\min}$, where δ_{\min} is the minimal scale diameter. Ring region is introduced for contrast calculations.

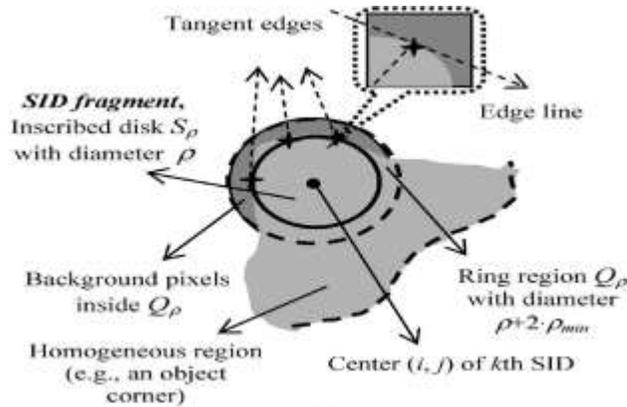


Fig.4: Salient image disk of a homogeneous region

The image area description for object area recognition involves the creation of a descriptor vector which represents the current disk area centered at feature point. Three descriptors are used for creating the descriptor vector:

- Planar pose parameter
- Area shape descriptor
- Intensity parameter

Planar pose parameters include two coordinates of the feature point, local scale and dominant direction and intensity parameters include mean value, root-mean-square deviation $d(x,y)$ and local isotropic contrast $c(x,y)$. Determination of local scale includes the selection of greatest by diameter disk centered at (x,y) and inscribed into the current homogeneous region. Local scale value is the diameter of inscribed disk. Area shape descriptors play a key role in image matching since they determine the local uniqueness of image fragments containing objects of interest. Shape descriptors are some set of numbers that are produced to represent a shape feature. Usually the descriptors are in the form of a vector.

Shape descriptors should meet the following requirements:

- The descriptor should be possibly complete to represent the information content.
- The descriptor vector should not be too long.

The shape description method[18],[19] called radial shape pattern is based on salient disk model. The algorithm for radial shape pattern consists of two basic steps:

- Determination of dominant direction
- Estimation of L directional descriptor components

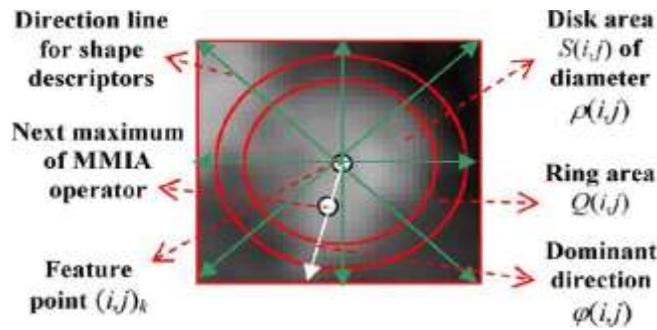


Figure 5: Determination of object area descriptors

Fig. 5 shows the object area descriptors in which the feature point is set as the center of concentric regions. Shape description consists of determination of dominant direction and estimation of L directional descriptor components. Dominant direction can be determined as the maximum of attention operator on a circle with diameter $\delta(x,y)$ centered at (x,y) . Second step involves the analysis of directional contrast in L directions lying on a circle of diameter $\delta(x,y)+\delta_{\min}$ centered at (x,y) where L is the total number of shape components and δ_{\min} is the diameter of minimum scale disk.

4 Region growing

Basic function of region growing is the partition of an image into non-overlapped regions. First it takes a seed and then merges pixels with similar property and then forms a region corresponds to each seed[20]. Output of region growing must satisfy the following constraints:

$$\sum_{i=1}^L R_i$$

- L is the number of regions. It means that sum of all regions should give the entire image.
- R_i is connected region, $i=1,2,3,\dots,n$, where n is the number of regions. $R_i \cap R_j = \text{Null}$ for all $i \neq j$.
- Mutual exclusion of region.

Region growing consists of following steps:

- Selection of initial seeds: Seeds should have some similar features with respect to their neighbors. There should be a seed for each region. No seeds should be connected to each other.
- Growing formula based on stopping criterion: Growing formula decides the homogeneity between the seed and its neighbors. Stopping criteria should be sufficient to differentiate neighbor elements.

There are mainly three goodness-of-seed conditions: the seed point has to be located inside a homogeneous image region, preference is given to the seed point locations whose area intensity has higher contrast with surrounding region and for a non-compact region the seed point has to be located at the center of its largest circular fragment inscribed into the region. Feature points are selected as seed points in this case to satisfy all the goodness-of-seed conditions[21].

In this methodology, a modified version of conventional region growing is used with three modifications to create a more effective segmentation of LiDAR images. First modification is to use an adaptive threshold in stopping criterion in which the threshold depends on the statistical characteristics of growing region. Second one is that region growing proceeds not on initial image but it is based on most relevant component of objects of interest. Third modification is that the growing process is limited by a circular area, whose diameter is comparable to local scale value. Since the threshold selection and region growing conditions depends on local scale value this region growing is also known as scale adaptive region growing.

RESULTS AND DISCUSSIONS

The main aim of this work is to segment the forest area from LiDAR images. For this an input image and a reference image are needed. First the primitive feature is computed on two small sections of smoothed input image. Laplacian of Gaussian filtering is applied for this. Then feature point is located on the same images. For object area recognition, a descriptor vector should be created. Descriptor vector contains feature point coordinates, isotropic contrast and height variance. So for the calculation of these values, a concentric ring and disk region are created on smoothed section of input image. These steps are repeated on reference image also. Then recognition is performed by comparing the difference between descriptor vectors of input and reference images with a threshold vector. Region growing completes forest segmentation. The simulation of project is performed using MATLAB R2014b.

The input images are downloaded from the website of open topography. The test site is located in Canada. LiDAR raw data were acquired with a LiDAR system having pulse frequency of 100 KHz. The points were then converted to a raster of 0.5m per pixel resolution. Fig. 6 shows the input image and Fig.7 is the reference image. Then primitive feature map is created and feature point is detected using SURF algorithm. Corresponding figures are shown in Fig. 8 and Fig. 9 respectively.



Fig. 6. Input image

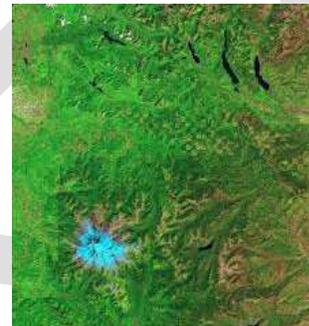


Fig. 7. Reference image



Fig. 8. Primitive feature map

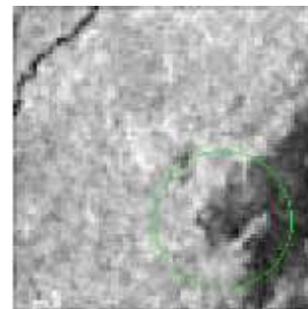


Fig. 9. Windowed input image with detected feature point

Then for creating the descriptor vector, a concentric disk region and a ring region are created on the input image and the parameters like isotropic contrast, height variance number of points in both disk and ring regions, etc. are calculated. Detected feature point is selected as the center of ring and disk and arbitrary radii are selected for both. The ring is setup with a larger diameter than disk. Same step is repeated on reference image also. The calculated values are summarized in Table 1.

Table 1: Calculated parameters of Input and Reference images

Parameter	Input Image	REFERENCE IMAGE
Feature point location	[51.82,53.06]	[31.52,24.77]
No.of points in disk region	657	674
No.of points in ring region	818	823
Isotropic local contrast	623.08	602.73
Height variance	0.0087	1.8668

This process is explained for windowed sections of input image. Finally a region growing algorithm is used with detected feature points as seed points for obtaining the segmented forest area from input image. The region growing is applied only for those areas which are recognized as object area through a descriptor vector comparison. The output image with detected forest area is shown in Fig. 10.

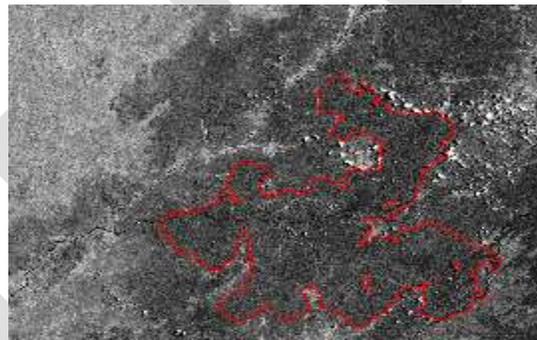


Fig. 10. Segmented forest area

CONCLUSION

LiDAR image analysis has numerous applications in forestry. It can be used to detect forest areas from LiDAR DSM images. For this a segmentation method based on attentive vision scheme is presented here. Compared to existing methods, the main difference is the computation of primitive feature as first step. This method is based on the visual attention model of image segmentation which helps to overcome the disadvantages of existing methods for forest segmentation. The object area recognition is based on the model based approach. Another important advantage is that the final segmentation is based on scale adaptive region growing in which both the threshold selection and stopping criterion are dependent on local scale value. It helps to eliminate the demerits of conventional region growing algorithm. This method also possess some characteristics. First, it is a model-based approach that can include both height

characteristics and shape features of objects to be detected. Second, it does not require the ground points and finally, it provides a fast processing of LiDAR images.

REFERENCES:

- [1] Roman Palenichka, Frederik Doyon, Ahmed Lakhssassi and Marek B. Zaremba, "Multi-Scale Segmentation of Forest Areas and Tree Detection in LiDAR Images by the Attentive Vision Method", IEEE Journal of selected topics in applied earth observations and remote sensing, Vol.6, No. 3, June 2013.
- [2] [Online] Available: <http://www.lidar-uk.com/usage-of-lidar>.
- [3] J.C. Fernandez, A. Singhanian, J. Caceres, K.C. Slatton, M. Starek and R. Kumar, "An Overview of Lidar Point Cloud Processing Software", Geosensing Engineering and Mapping (GEM) University of Florida, 2007.
- [4] Nabil Ouerhani and Heinz Hugli, "MAPS: Multiscale Attention-based Pre-Segmentation of Color Images", Institute of Microtechnology, University of Neuchatel, Switzerland, June 2013.
- [5] Dimitri Lisin, Edward Riseman and Allen Hanson, "Extracting salient image features for reliable matching using outlier detection techniques", Department of Computer Science, USA.
- [6] Nicu Sebe and Michael S Lew, "Comparing salient point detectors", Liden Institute of Advanced Computer science, Netherlands..
- [7] J. Reitberger, P. Krzystek, and U. Stilla, "Combined tree segmentation and stem detection using full waveform lidar data," Proc. ISPRS Workshop on Laser Scanning 2007 and SilviLaser 2007, Espoo, Finland, Sep. 12-14, 2007, vol. XXXVI, pp. 332-337.
- [8] H. Andersen, S.E. Reuterbuch and G.F. Schreuder, "Automated individual tree measurement through morphological analysis of a LiDAR-based canopy surface model", Proc. 1st Int. Precision Forestry Symp., 2001, pp. 11-22.
- [9] Liang-Chien Chen, Tsai Wei Chiang and Tee Ann Teo, "Fusion of LIDAR Data and High Resolution Images for Forest Canopy Modeling", Center for Space and Remote Sensing Research, Taiwan.
- [10] Dirk Tiede, Gregor Hochleitner and Thomas Blaschke, "A Full GIS-based workflow for tree identification and tree crown delineation using laser scanning" IAPRS, xxxvi, Aug. 2005.
- [11] Michael J. Falkowski, Alistair M.S. Smith, Andrew T. Hudak, Paul E. Gessler, Lee A. Vierling and Nicholas L. Crookston, "Automated estimation of individual conifer tree height and crown diameter via two-dimensional spatial wavelet analysis of lidar data", Can. J. Remote Sensing, vol. 32, no. 2, pp. 153-161, 2006.
- [12] R. Palenichka and M. Zaremba, "Multi-scale Isotropic Matched Filtering for individual tree detection in LiDAR images", IEEE Trans. Geosci. Remote Sens., vol. 45, no. 12, pp. 3944-3957, 2007.
- [13] Paul L. Rosin, "A simple method for detecting salient regions", Pattern Recognition, pp. 2363-2371, 2009.
- [14] R. Palenichka and M. Zaremba, "A Spatio-Temporal Isotropic Operator for the Attention-Point Extraction", Computer analysis of images and patterns, Vol. 5702, 2009, pp. 318-325.
- [15] Jacob Toft Pedersen, "SURF: Feature detection and description", Dept. of Computer Science, Aarhus.
- [16] R. Palenichka, Maria Petrou and Yannis Kompatsiaris and Ahmed Lakhssassi, "Model-based extraction of image area descriptors using a multi-scale attention operator", International conf. on pattern recognition, Nov. 2012.
- [17] Roman M. Palenichka and Marek B. Zaremba, "Automatic Extraction of Control Points for the Registration of Optical Satellite and LiDAR Images", IEEE Transactions on Geoscience and Remote Sensing, Vol. 48, No. 7, July 2010.
- [18] Mingqiang Yang, Kidiyo Kpalma and Joseph Ronsin, "A Survey of Shape Feature Extraction Techniques", Pattern Recognition, In-Tech., pp. 43-90, 2008.

[19] Dengsheng Zhang and GuojunLu, "Review of shape representation and description techniques", Journal of Pattern Recognition Society, Vol.37, pp.1-19, July 2003.

[20] Shilpa Kamdi and R.K.Krishna, "Image Segmentation and Region Growing Algorithm", International Journal of Computer Technology and Electronics Engineering (IJCTEE), Vol.2, Issue 1, ISSN 2249-6343.

[21] Shilpa Dantulwar and Prof. R.K.Krishna, "Performance analysis using single seeded region growing algorithm".

IJERGS

Design of L Slot Loaded Rectangular Microstrip Patch Antenna for DCS/PCS Applications

Veerendra Kumar¹, Manish Kumar Singh², Kapil Gupta³

^{1&2}M.Tech. Scholar, BBDNIIT, Lucknow, virendra_ec91@rediffmail.com

³Assistant Professor (Dep. of ECE), BBDNIIT, Lucknow, kg3634@gmail.com

Abstract— Rectangular microstrip patch antenna is most widely used antenna in current scenario because of its low size, low weight and high efficiency. Here we have selected L slot structure for our design and loaded it in a patch which is designed at 1.92 GHz frequency. When it is energized through feed line it is observed that the proposed antenna is radiated in the frequency band 1.55 GHz to 2.11GHz which is suitable for digital communication system (DCS) and personal communication system (PCS). Fractional bandwidth of proposed antenna is 30.60%. The gain has been improved up to 3.23 dBi, directivity upto 3.67 and antenna efficiency is 90.5%. The proposed slot loaded Microstrip antenna is fed by strip line feed. The proposed antenna is simulated by IE3D Zealand simulation software based on method of moments

Keywords— L-slot, Enhance Bandwidth, Microstrip Patch, Gain, Line Feed, VSWR, Resonate Frequency, Directivity, Efficiency

INTRODUCTION

Microstrip antenna is basically a printed board circuit over which power dividers, phasing circuits, matching networks and radiators are photo etched on one side of the board and other side of the board is metal ground plane, hence the antenna can be directly applied to metallic surface on an aircraft or missile. Microstrip patch antenna has many advantages such as low profile, light weight, small volume and compatibility with microwave integrated circuit (MIC) and monolithic microwave integrated circuit (MMIC) [1], but microstrip antenna has narrow bandwidth which is the major disadvantage of microstrip antenna. Generally, the impedance bandwidth of the traditional microstrip antenna is only a few percent (2% - 5%) [2]. Hence it is very important to develop a technique by which we can enhance the bandwidth of patch antenna. The proposed L- slot loaded patch antenna is shown in Figure 1 which is operates in the frequency band 1.55 GHz to 2.1 GHz and provides the enhance bandwidth of 30.60 %, this frequency band is suitable for DCS and PCS applications. In the past decade many planar antenna had been designed to meet the requirement of mobile cellular communication systems. The most demanding these days are Global system for mobile communication system (GSM) ranging from 890 MHz to 960 MHz, Digital communication systems (DCS) ranging from 1710 MHz to 1880 MHz, Personal Communication system (PCS) ranging from 1850 MHz to 1990 MHz and Universal Mobile telecommunication system (UMTS) ranging from 1920 MHz to 2170 MHz [2]. The proposed antenna has been designed on glass epoxy substrate having dielectric constant ($\epsilon_r=4.4$) [3]. Determination of an antenna size and its bandwidth are largely influenced by substrate material. By Increasing the dielectric constant we can reduce the antenna size but its bandwidth and efficiency are also reduces while by decreasing the dielectric constant we can increases the bandwidth but with an increment in antenna size. The design frequency of proposed L slot antenna is 1.92 GHz.

ANTENNA DESIGN

For designing a rectangular Microstrip patch antenna, the length and width are calculated as below:

$$w = \frac{c}{2f_d} \sqrt{\frac{2}{\epsilon_r + 1}} \quad (1)$$

Where c is the velocity of light, ϵ_r is the dielectric constant of substrate, f_d is the antenna design frequency, w is the patch width, and the effective dielectric constant ϵ_{reff} is given as [4], [5]

$$\epsilon_{reff} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2} \left[1 + 12 \frac{h}{W} \right]^{-\frac{1}{2}} \quad (2)$$

at $h = 1.6\text{m}$,

The extension length ΔL is calculated as [4], [5]

$$\frac{\Delta L}{h} = 0.412 \frac{(\epsilon_{reff} + 0.3) \left(\frac{W}{h} + .264\right)}{(\epsilon_{reff} - .258) \left(\frac{W}{h} + 0.8\right)} \quad (3)$$

By using the above mentioned equation we can find the value of actual length of the patch as [4], [5]

$$L = \frac{c}{2f_d \sqrt{\epsilon_{reff}}} - 2\Delta L \quad (4)$$

The length and the width of the ground plane can be calculated a [4], [5]

$$L_g = 6h + L \quad (5)$$

$$W_g = 6h + W \quad (6)$$

ANTENNA DESIGN SPECIFICATIONS

The design of proposed L-slot patch antenna is shown in figure 1. Glass epoxy substrate is used for designing the proposed antenna which has a dielectric constant 4.4 and the design frequency 1.92 GHz is taken. Antenna dimensions can be calculated by above given equations. The calculated patch length and width are 36.96 mm and 47.54 mm respectively. The ground plane length and width are calculated as 46.96 mm and 57.54 mm respectively. Height of the dielectric substrate is 1.6 mm and loss tangent $\tan \delta$ is .0013. Microstrip line feed is used to radiate the antenna. IE3D simulation software is used to simulate the work

Table I

Antenna Design Specifications

S.No.	Parameters	Value
1.	Design Frequency (f_d)	1.92GHz
2.	Dielectric Constant (ϵ_r)	4.4
3.	Substrate Height (h)	1.6 mm
4.	Feeding Technique	Line feed
5.	VSWR	1:5:1
6.	Patch Width (W_p)	47.54 mm
7.	Patch length (L_p)	36.96 mm
8.	Ground Plane Width (W_g)	57.54 mm

9.	Ground Plane Length (L_g)	46.96 mm
----	-------------------------------	----------

ANTENNA DESIGN PROCEDURE

All the required dimensions of the proposed antenna design should be calculated carefully by using above equations 1, 2, 3, 4, 5 and 6. Design frequency 1.92 GHz is taken. Design procedure of proposed antenna is very simple a L slot structure is introduced into a patch and it is investigated for different frequency ranges with different feed locations. Geometry of proposed antenna is shown in figure 1. During the designing of proposed antenna on IE3D 9.0 version simulating software ground plane is starting from $(X = 0, Y = 0)$ co-ordinate at lower left corner and a patch is cut on ground plane starting from $(X = 10, Y = 5)$ co-ordinate at lower left corner of length and width 36.96 mm and 47.54 mm respectively. The probe feed is placed at co-ordinate point $(X=7.5, Y=0.8)$ with 50Ω impedance matched co-axial cable to achieve maximum bandwidth. 50Ω impedance matched co-axial cable is because at this impedance maximum power is transferred to the radiating element.

GEOMETARY OF DESIGN ANTENNA

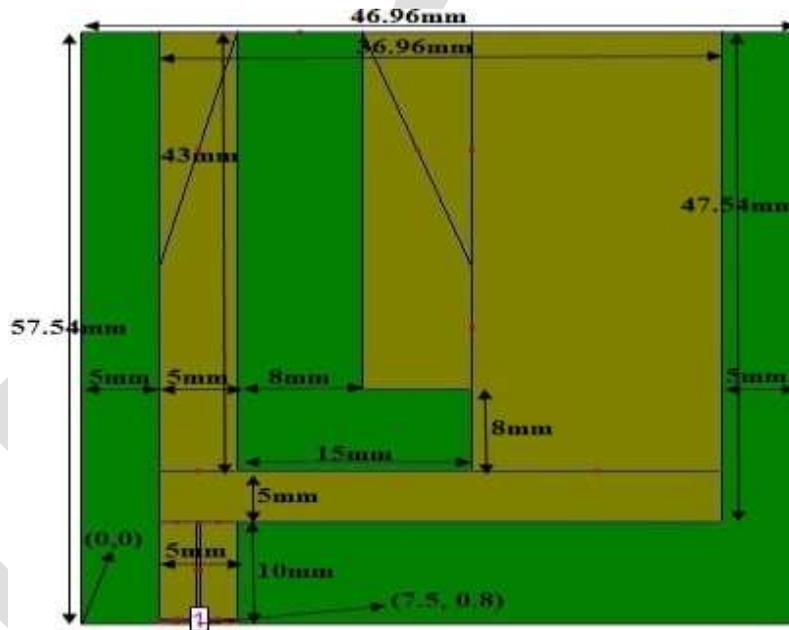


Fig.1. Construction Geometry of Proposed Antenna

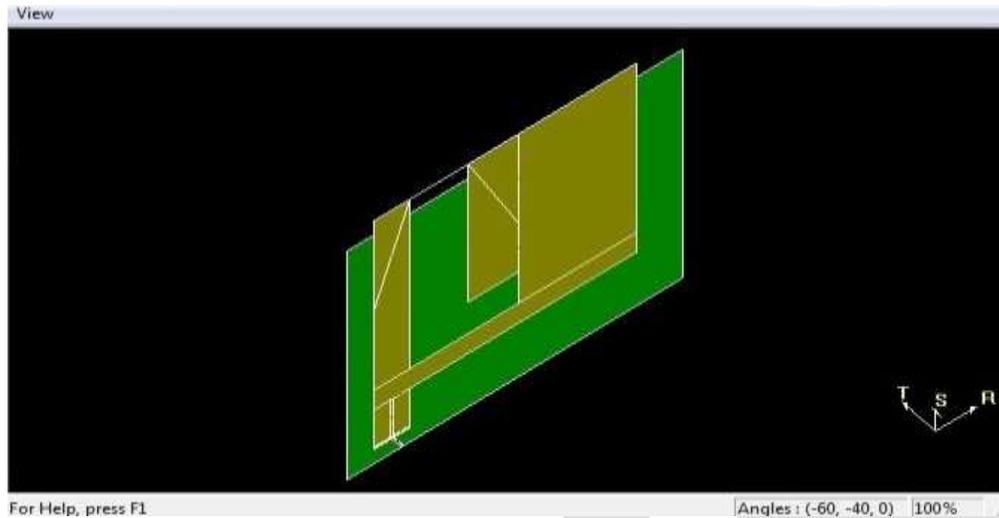


Fig.2. 3D View of Proposed Antenna

SIMULATION AND RESULT DISCUSSION

The design of proposed antenna is shown in above figure 1. The length and width of patch and slot is clearly mentioned in the figure 1. The probe feed is placed at (X = 7.5, Y = 0.8) on strip line. Microstrip antenna has narrow bandwidth which restricts its uses at abroad label. Hence in the present work bandwidth of rectangular microstrip antenna is improved by loading L-slot structure into the patch. Simulated output specifications of proposed antenna like Bandwidth, Return loss, VSWR, Gain, Efficiency, 2D & 3D Radiation patterns and Smith chart are obtain by IE3D 9.0 version Zeland simulating software which is based on method of moments. All the graphical representation output of proposed antenna is shown in following given figure.

The return loss of proposed antenna is around -21 dB and the antenna is resonate at 1.9 GHz as shown below in given figure 3. The frequency band of proposed antenna is 1.55 GHz to 2.11 GHz. The fractional bandwidth of proposed antenna is around 30.60%.

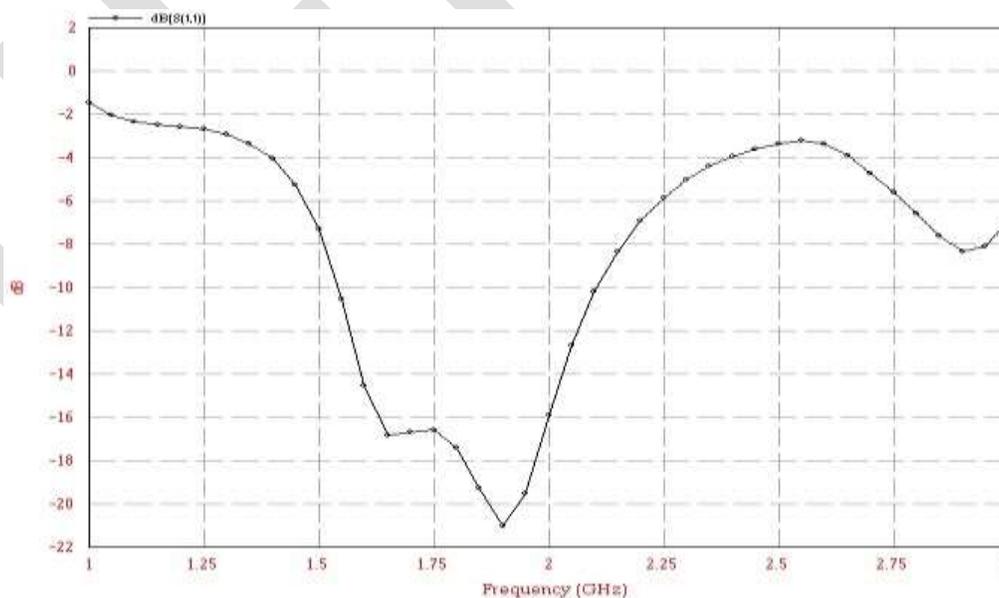


Fig.3. Return loss v/s Frequency Graph of Proposed Antenna

The VSWR of proposed antenna is between 1 and 2 as shown below in given figure 4 which shows that antenna is efficiently radiates.

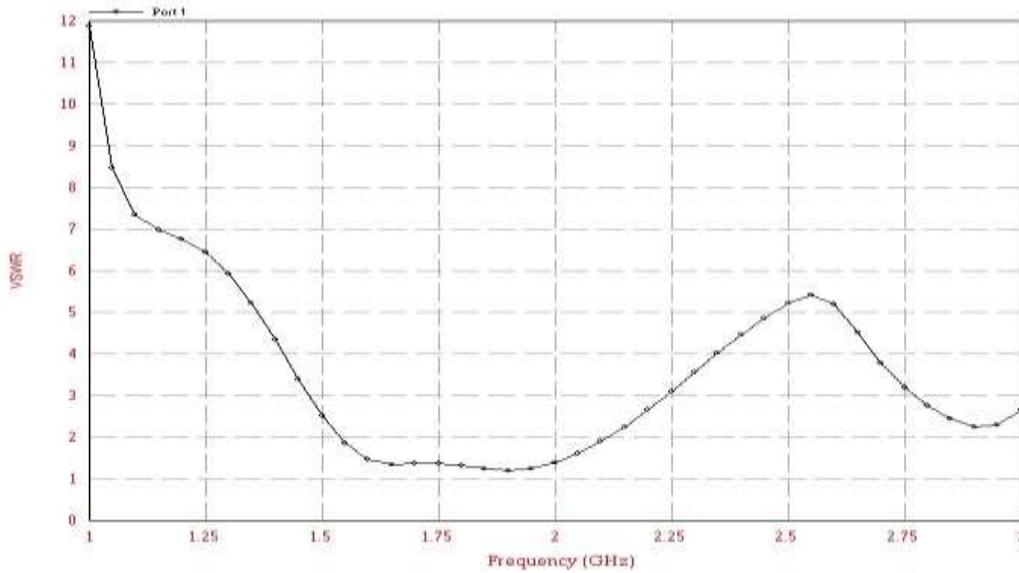


Fig.4. VSWR v/s Frequency Graph of Proposed Antenna

The gain of proposed antenna is 3.23 dB at resonate frequency 1.9 GHz as shown below in given figure 5

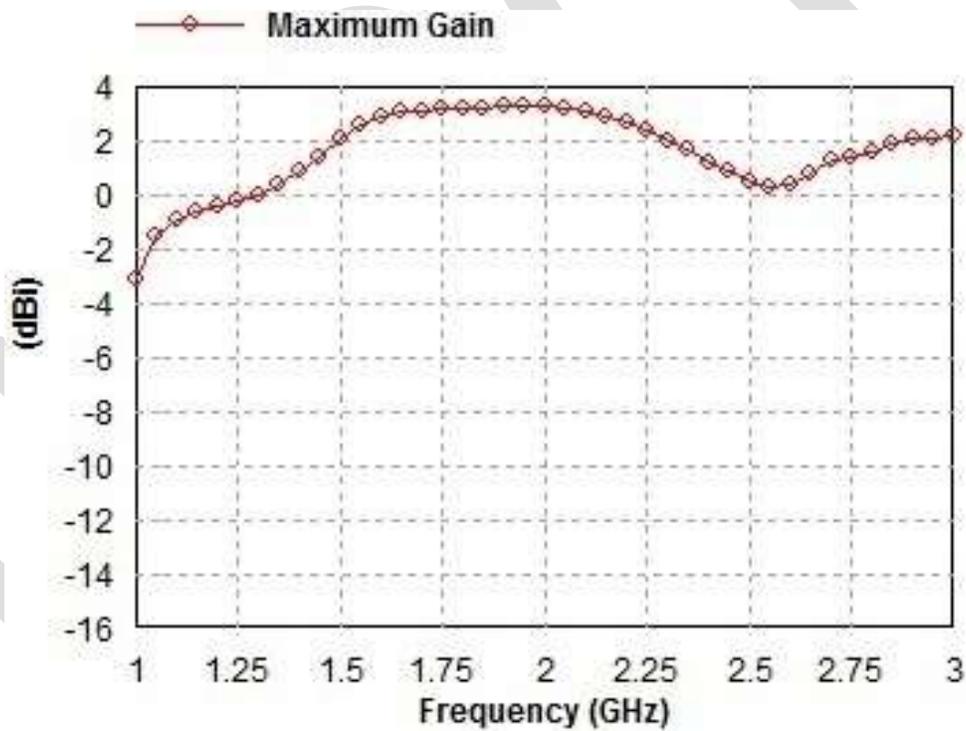


Fig.5. Gain v/s Frequency Graph of Proposed Antenna

The directivity of proposed antenna is 3.67 at resonate frequency 1.9 GHz as shown below in given figure 6.

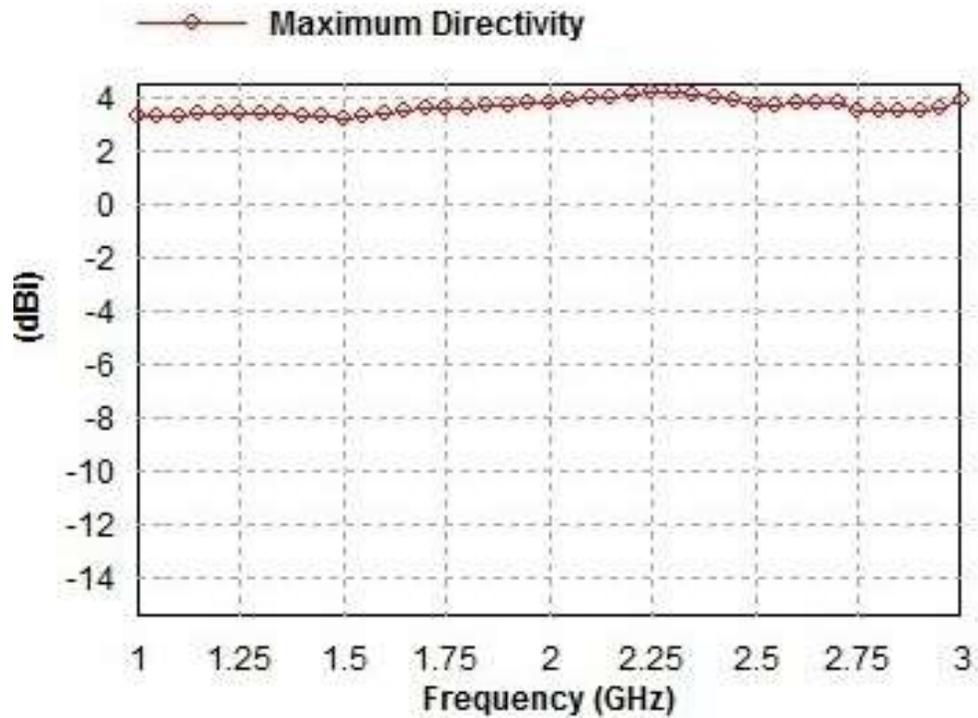


Fig.6. Directivity v/s frequency Graph of Proposed Antenna

The efficiency of proposed antenna is 90.5% at resonate frequency 1.9 GHz as shown below in given figure 7

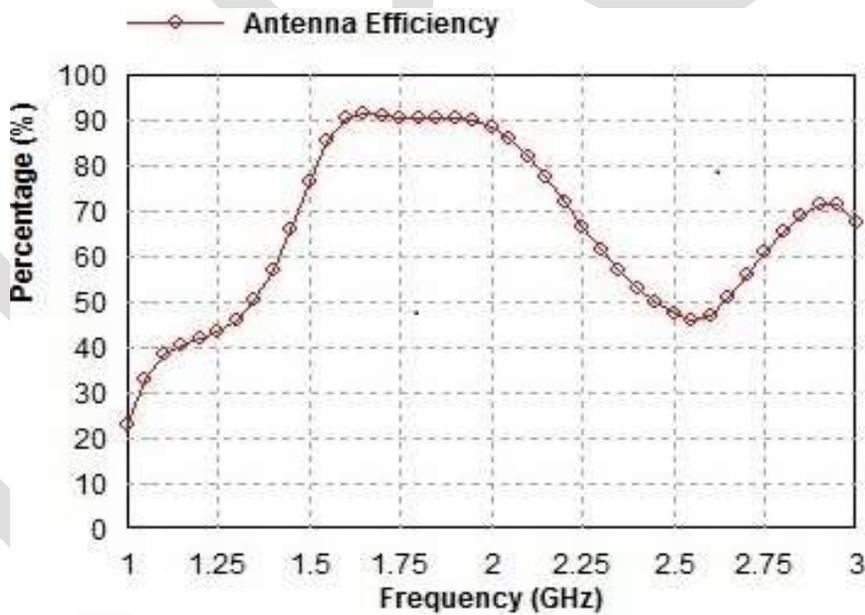


Fig.7. Efficiency v/s Frequency Graph of Proposed Antenna

2D pattern of the proposed antenna shows that antenna has bidirectional radiation pattern as shown below in given figure 8.

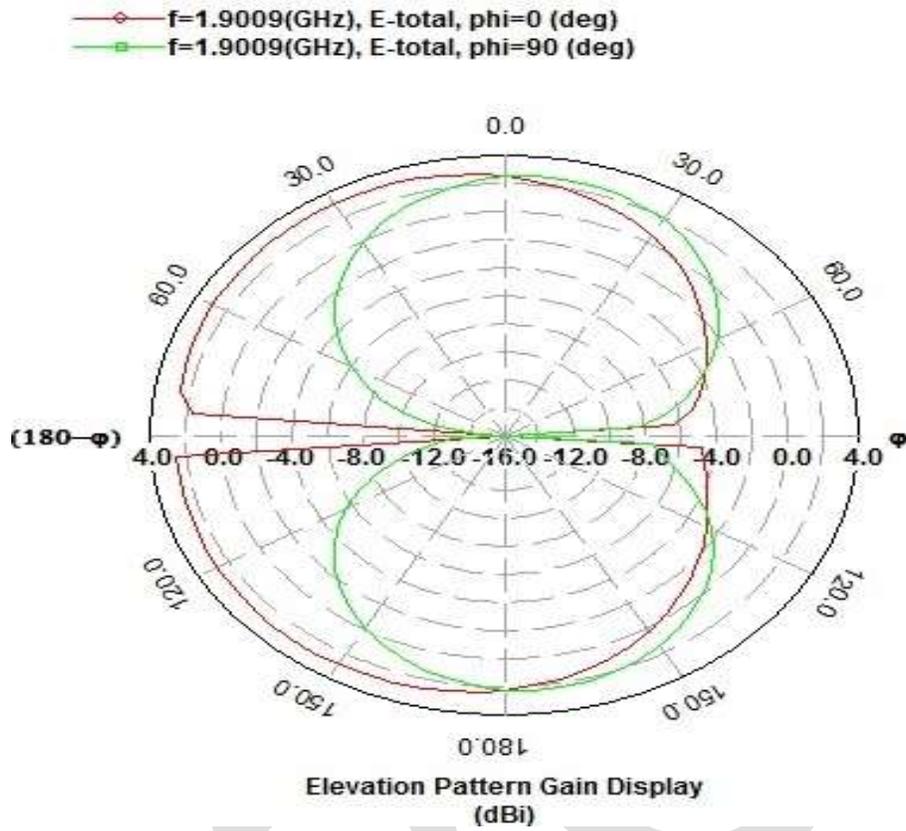


Fig.8. 2D Pattern Of proposed antenna

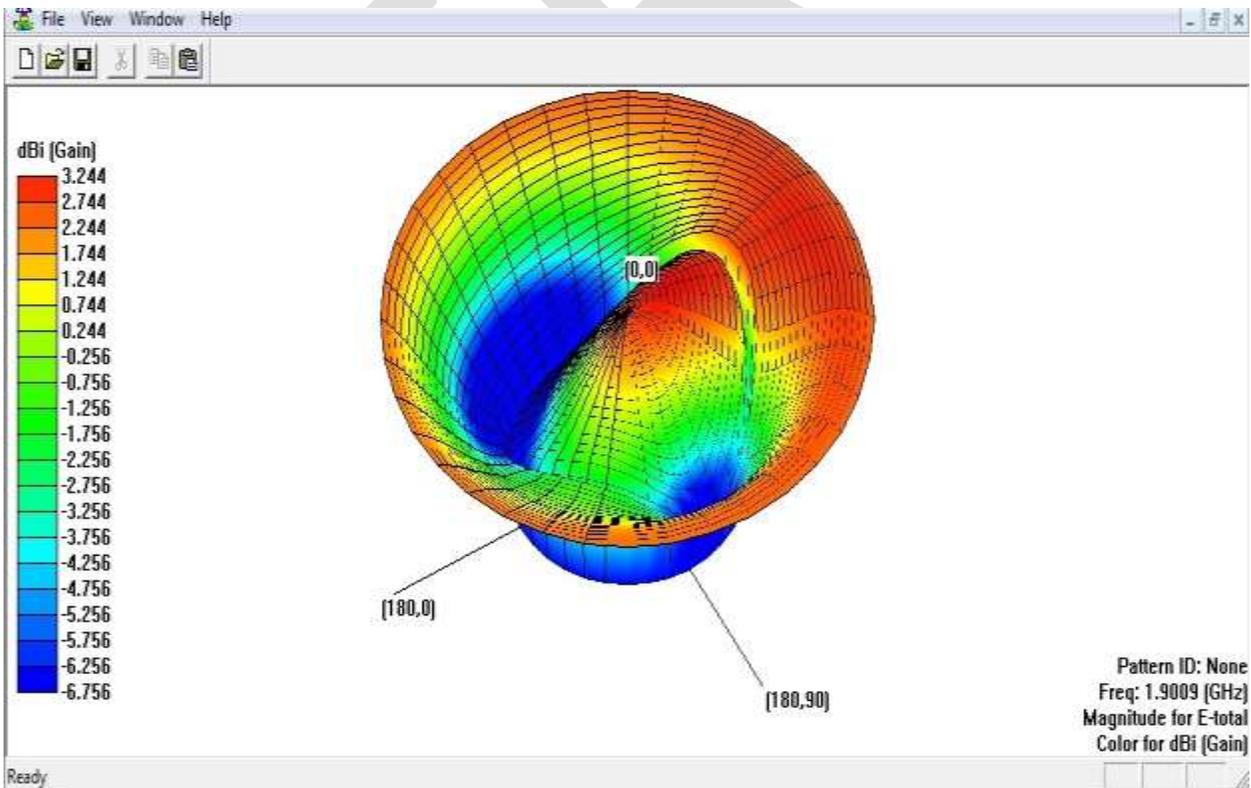


Fig.9. 3D Radiation pattern of proposed antenna

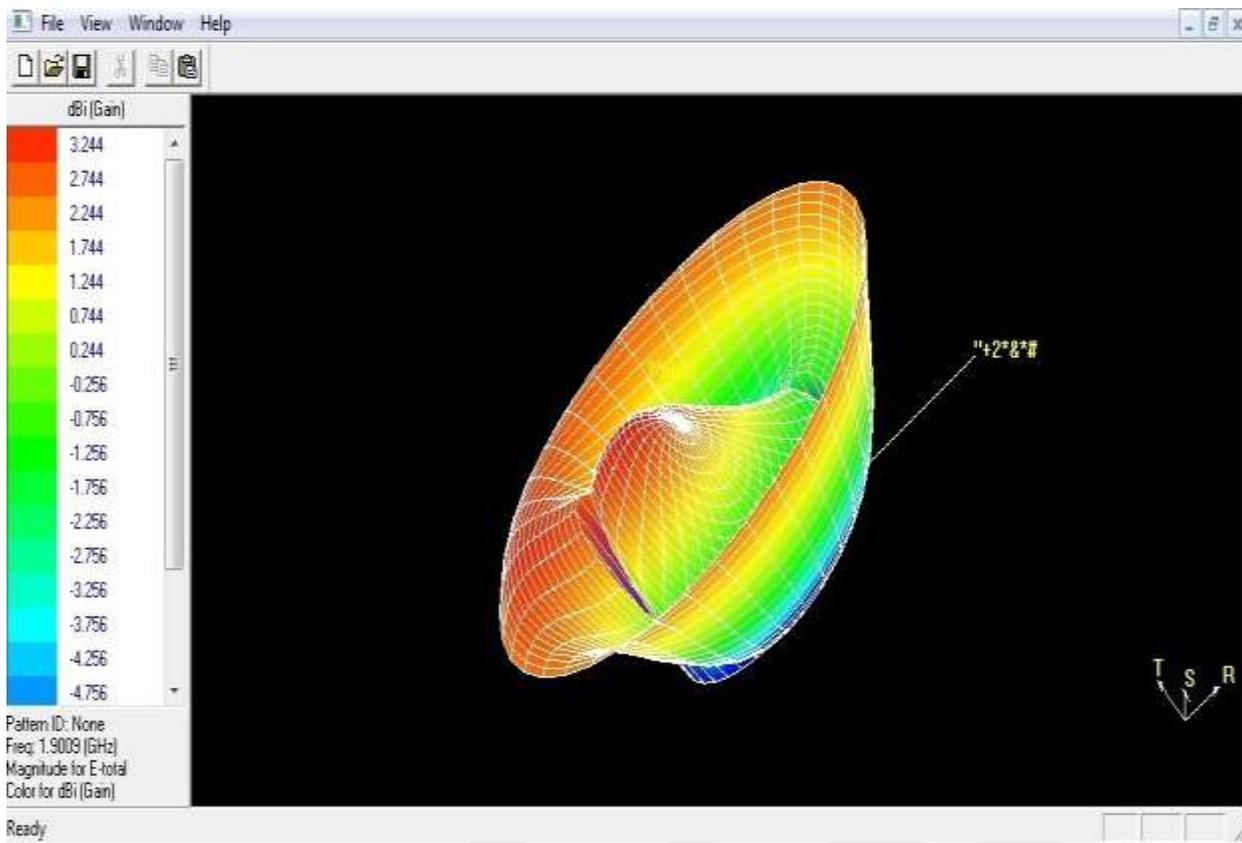


Fig.10. 3D Open Radiation pattern of proposed antenna

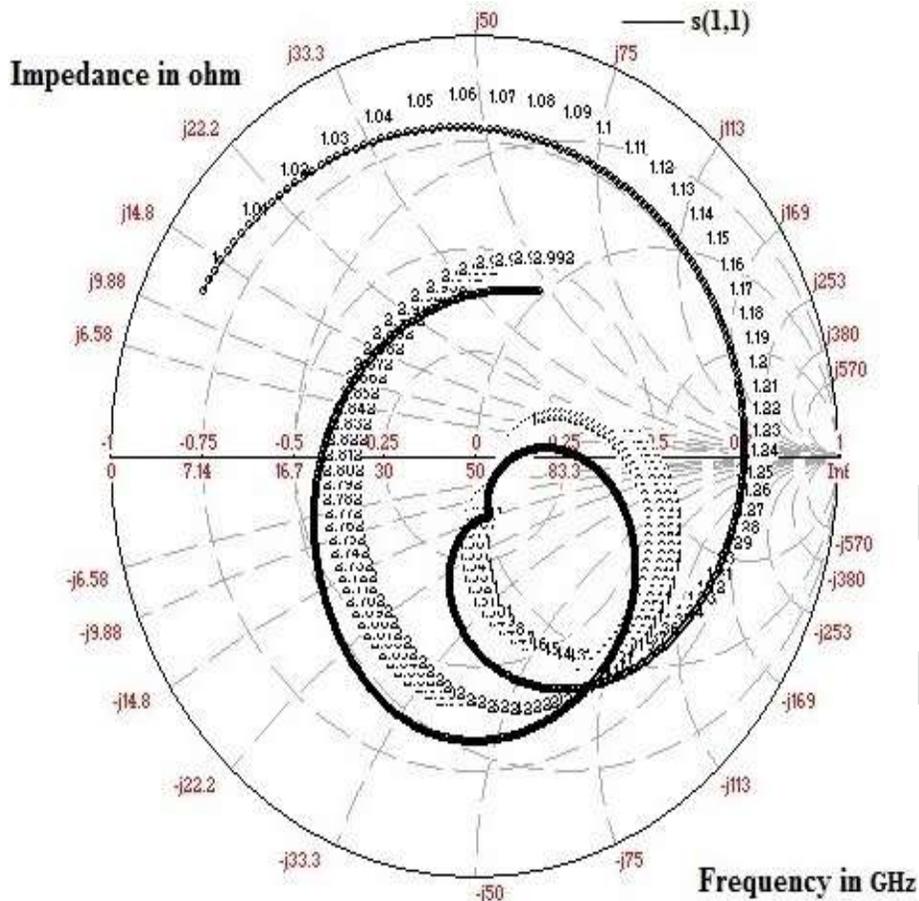


Fig.11. Smith chart of proposed antenna

CONCLUSION

All the characteristics of proposed L slot loaded rectangular microstrip antenna are studied. Usually in the most of the cases, the impedance bandwidth of the conventional microstrip antenna is only a few percent (2% -5%) [2]. The resultant graph between return loss and frequency regarding proposed antenna shown in figure 3 gives the enhanced fractional bandwidth upto 30.60%.The designing work of the proposed antenna is done on glass epoxy substrate to achieve maximum radiation efficiency about 90.5 %, directivity 3.67 and gain 3.23 dB .Obtained band of frequency is suitable for DCS and PCS application.

REFERENCES:

- [1]. Indra Surjati, Yuli KN and Yuliasuti, "Increasing Bandwidth Dual Frequency Triangular Microstrip Antenna For WiMAX Application", International Journal of Electrical & Computer Sciences IJECS-IJENS Vol: 10 No: 06.
- [2]. C. A. Balanis, Antenna Theory - Analysis and Design,3rd edition, Wiley, 2006
- [3]. Saurabh Jain, Vinod Kumar Singh, Shahanaz Ayub, "Bandwidth and Gain Optimization of a Wide Band Gap Coupled Patch Antenna", IJESRT, ISSN: 2277-9655, March 2013.
- [4]. K. V. Rop, D. B. O. Konditi, H. A. Ouma and S. M. Musyoki, "Parameter optimization in design of a rectangular microstrip patch antenna using adaptive neuro-fuzzy inference system technique", IJTPE Journal, ISSN 2077-3528,September 2012.
- [5]. Constantine A. Balanis, "Antenna theory, Analysis and Design", John Wiley & Sons, Inc Hoboken, New Jersey, 2005.

- [6]. Saurabh Jain, Vinod Kumar Singh, Shahanaz Ayub, “Bandwidth and Gain Optimization of a Wide Band Gap Coupled Patch Antenna”, IJESRT, ISSN: 2277-9655, March 2013
- [7]. Ramesh Garg, Prakash Bartia, Inder Bahl, Apisak Ittipiboon, “Microstrip Antenna Design Handbook”, 2001, pp 1-68, 253-316 Artech House Inc. Norwood, MA.
- [8]. W.L. Stutzman, G.A. Thiele, Antenna Theory and design, John Wiley & Sons, 2nd Ed., New York, 1998.
- [9]. Pozar, D. M., and D. H. Schaubert, “The Analysis and Design of microstrip antennas and arrays”, 4th edition, Wiley Interscience, New York, 2001.
- [10]. J. R. James and P. S. Hall, Handbook of Microstrip Antennas, vol. 1, London: Peter Peregrinus Ltd., 1989.
- [11]. Kin –Lu Wong , “ Compact and Broadband Microstrip Antenna”, John Wiley & Sons, 2002.
- [12]. Ramesh Garg, Prakash Bhartia, Inder Bahal, Apisak Ittipiboon, “Microstrip Antenna Design Handbook”, 3rd edition, Artech house, London, 2001

Nanomolecular diagnostics: Recent trends and future perspectives

Kaliyaperumal Rani* and Barindra Sana

Division of Bioengineering, School of Chemical & Biomedical Engineering, Nanyang Technological University, 70 Nanyang Drive, Singapore 639457. E-mail: kranimani@gmail.com

Abstract— Nanobiotechnology refers to the unique fusion of two emerging technologies, biotechnology and nanotechnology with the tremendous potential of characterizing biological processes at the nanoscale levels. Nanomolecular diagnostics encompasses various molecular biological techniques that integrate nanotechnological concepts to make the diagnosis accurate and expedited. Unlike conventional molecular diagnostics, which require bulky instrumentations, high sample volume and extended analysis, nanodiagnosics enable simultaneous real time evaluation of various disease markers with exalted accuracy and sensitivity. Eventhough some of the nanodiagnosics are currently at the initial stage of evolution, while others are at testing phases, the current diverse applications of nanodiagnosics apparently evince its prodigious potential in molecular diagnosis. Hence this review presents an insight into the recent progresses in the field of nanomolecular diagnosis. The applications described here strongly suggest that nanodiagnosics continue to make tremendous strides and wide ranging impact in the scope of molecular diagnosis and lay the foundation for the establishment of novel therapeutic strategies for deadly diseases.

Keywords— Nanobiotechnology, Nanomolecular diagnostics, Molecular imaging, Nanoparticles, Nanosensors, Nanoarrays, Cancer research, Nanopores, Personalized medicine

INTRODUCTION

Nanotechnology, at its simplest refers to engineering functional systems at the nanoscale, which is about 1 to 100 nanometers. It pertains to the projected ability to fabricate items from the bottom up, using contemporary techniques at the nanoscale level to hatch complete, high performance articles. On the other hand, biotechnology refers to technology based on biology, which harnesses cellular and biomolecular processes to develop services and products that help to enrich our lives and the health of our planet. Nanobiotechnology or bionanotechnology refers to the unique fusion of two major fields; biotechnology and nanotechnology. The nanotechnical approach to biology is being considered pivotal as it offers unprecedented possibilities in studying and modulating biological processes on a molecular and atomic scale [1]. Nanotechnology, may, thus open up innovative ideas in virtually all sorts of disciplines spanning from medicine, food and agriculture to environmental, cosmetics and chemical industry. Nano-optics, novel nanoscale materials, nanosensors, nanocosmetics, nanocomposites, nanofoods and nanomedicines are just a few examples from this revolutionary field.

Nanotechnology enacts an imperative role in clinical medicine and its potential applications include disease diagnosis, molecular imaging, 3D nanostructured scaffolds and target-specific drug delivery [2]. In medicine, nanotechnology revolutionizes current treatments and facilitates target-specific drug delivery. Further, it introduces innovative concepts including novel tools into regenerative medicine to rejuvenate impaired tissues. In disease diagnosis, this technology helps to revolutionize many of the existing diagnostic tools and procedures to be more personalized, efficient, faster and cheaper. Taken together, the present scenario of nanotechnology apparently evinces its immense potential across a wide range of disciplines. Therefore, the current review explores the distinct nanotechnological applications in the realm of molecular diagnosis.

MOLECULAR DIAGNOSTICS AT A GLANCE

Molecular diagnosis, the emerging segment of clinical testing today, refers to the identification of abnormal mutations in DNA and RNA samples in order to diagnose and monitor diseases. It comprised of various molecular biological techniques (Molecular diagnostics) used to spot the defective genes and characterize the molecular bases of diseases. It also bolsters to interpret the genetic interactions including protein-protein, protein-DNA and their contribution in genetic abnormalities. Further, It also aids to understand expression patterns of protein-coding genes in different types of cells. Hence, molecular diagnostics play an instrumental role in disease prevention and treatment. Molecular diagnostics effectively translate novel findings and innovative technologies into pragmatic clinical assessments and propound the potential for advancing from diagnostics to prognostics. For instance, cancers, the leading causes of morbidity and mortality worldwide, a significant increment in recovery rate would be possible only if the novel molecular mechanisms that drive the pathophysiology of cancer could be explored which will establish the fundament for cutting-edge cancer therapeutics [3].

Molecular diagnostics are currently used in the following areas, which entail infectious disease molecular testing, molecular oncology testing, inherited diseases molecular testing, identity testing (DNA fingerprinting), histocompatibility testing and pharmacogenetics testing.

NANOTECHNOLOGY IN MOLECULAR DIAGNOSTICS: NANOMOLECULAR DIAGNOSTICS

Nanomolecular diagnostics, also termed as “Nanodiagnostics” refers to the inclusion of nanotechnological concepts in molecular diagnostics. Owing to the nanoscale nature of surface receptors, membrane pores and other vital constituents of cells, the anatomy and functions of these constituents could be explored with the aid of nanoscale probes [4]. The ultimate mission of any diagnostic regimen involves non-invasiveness, primitive and precise diagnosis with greater sensitiveness and cost effectiveness. Nanotechnology protracts the frontiers of molecular diagnostics to the nanoscale, which enable simultaneous real-time detection of a wide spectrum of diseases with exalted accuracy and greater cost-effectiveness [5]. For instance, nanoparticles immobilized on amorphous or nanocrystalline materials provoke greater functionality and bioavailability [6]. Molecular imaging strategies such as Infrared (IR) or Magnetic Resonance Imaging (MRI) are the promising approaches for early and explicit prediction of diseases. The resolution and sensitivity of imaging techniques are greatly enhanced with the aid of nanoparticles, quantum dot and nanocrystals. For instance, superparamagnetic iron oxide nanoparticles (SPION) with phosphorothioate-modified oligo DNA sequences (PS-ODNs) complementary to c-fos mRNA (SPION-cfos) was employed in magnetic resonance imaging (MRI) to diagnose neurodegenerative diseases [6-8]. Further, functionalized nanoparticles have gained much attention recently owing to their potential in detecting complementary functional groups present on cell outer layers, which are characteristics of deadly diseases such as cancer [6]. Taken together, nanodiagnostics act as vital means for establishing new therapeutic approaches for various deleterious diseases.

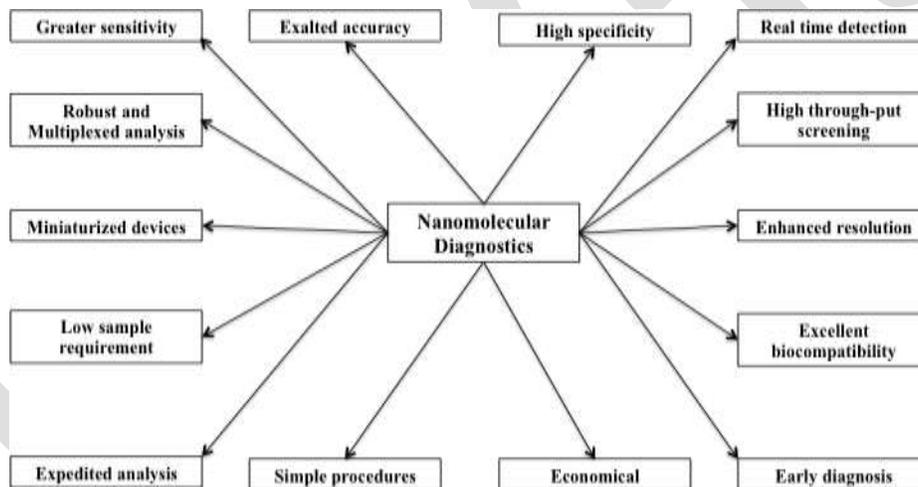


Fig. 1. Salient features of nanomolecular diagnostics, which make them superior to conventional molecular diagnostics.

NANOPARTICLES FOR MOLECULAR DIAGNOSTICS

The unique nanoscale characteristics of nanoparticles make them a promising nanoplatforms for molecular diagnostics. They are used as molecular imaging probes where the nanoparticles are functionalized with a typical targeting agent that could recognize cell surface biomarkers. Nanoparticles based probes bind with the healthy tissues and thus lifting the contrast between malignant and healthy tissues. This feature is of great value for diagnosing malignancies via magnetic resonance imaging. Nanoparticles that are currently used for molecular diagnosis include gold nanoparticles, magnetic nanoparticles, and quantum dots (QD).

GOLD NANOPARTICLES

Gold nanoparticles typically comprised of a metal core with quasi-continuous electronic conduction bands [9]. Gold nanoparticles are facile to make and are non-cytotoxic, surpassingly biocompatible with lesser nonspecific binding. These salient characteristics offer the possibility to use them as attractive nanomaterial for molecular diagnosis purpose. Electrons present in the conduction band around the metal core and are excited by light results in plasmonic responses [9]. The surface plasmon resonance of gold nanoparticles has diverse application and has drawn tremendous attention in recent years.

Gold nanoparticles are employed for sample labeling in transmission electron microscopy. Owing to their enduring electron absorbing properties, gold nanoparticles provide enhanced contrast as compared to conventional contrast agents and thus, act as a stain for samples with low contrast, such as tissue specimens. For instance conjugation of gold nanoparticles with antibodies provoke enhanced spatial resolution and specificity and are considered crucial in the labeling procedure [10]. Meanwhile, the exceptional optical features of the gold nanoparticles including robust absorption, scattering and in particular plasmon resonance make them amicable to use in a broad-spectrum of imaging techniques including Fluorescence Reflectance Imaging (FRI) systems and Optical Coherence Tomography (OCT). Also, in Photoacoustic imaging (PAI), an emergent hybrid biomedical imaging modality, gold nanoparticles are employed as contrast agents for functional, structural and molecular imaging [11-13].

A central theme of any molecular diagnostic procedure especially for molecular imaging, involves the use of radiolabelled tracers. The added value of gold nanoparticles is that they can be radiolabelled by neutron activation, thus enabling greater sensitivity in detection process, and are well accepted as x-ray contrast agents [14]. The optical properties of gold nanoparticles could alter upon conjugation with certain compounds, facilitating the accurate sensing and quantification of wide-spectrum of analytes. Upon aggregation, the absorption spectra of gold nanoparticles alter remarkably and this salient feature is of most beneficial in detecting DNA strand with single-base mismatch [10]. In Surface-Enhanced Raman Spectroscopy (SERS), gold nanoparticles are conjugated with specific-antibodies to detect pathogenic microbes [15]. This approach potentially obviates PCR and fluorescent tags used in the detection procedures.

Fluorophores tagged to nucleic acid-gold nanoparticle conjugates hold pledge in the area of biological sensing. This novel approach is considered quite significant as the inclusion of fluorophores provides the complementary effect. One of the greatest advancements in this realm was the introduction of nanoflare constructs, which enable specific and real time detection of intracellular molecules such as mRNAs, microRNAs and other tumor markers present in blood [16, 17].

QUANTUM DOTS

Quantum Dots (QDs) are nanocrystals of semiconducting materials with peculiar optical and electrical characteristics. The unique advantages of QDs include tunable sizes and composition, broad adsorption and emission profile across a wide spectral range and greater sensitivity with strong photostability as compared to the classical organic dyes [18]. QDs have found applications in in vitro real time imaging of single cell migration, labeling of biomolecules in fixed cells and tissue parts, biosensors and in vivo imaging of cells and organs [19]. Enhanced photostability and exalted brightness of QDs are other striking features, which are of highly beneficial for live animal targeting and imaging. Further, recent researches have proven that QDs exhibit extremely higher two-photon cross sections of up to 50,000 GM and hence, considered as potential contrast agents in imaging applications. [20].

Fluorescent dyes are virtually applied in a wide spectrum of imaging applications in order to visualize cells, cell organelles and molecules. However, the photobleaching natures of those dyes limit their applications. QDs are applied as fluorescent tags in various immunoassays in place of fluorescent dyes [21, 22]. For instance in immunoassays for detection of Salmonella Typhi, a potent foodborne pathogen, quantum dots act as fluorescent tags [23]. Moreover, the ability of QDs to detect viruses even at trace amounts makes them an excellent nanomaterial in the detection of infectious microbes [24].

Another category of QD known as Bioconjugated QDs also attracted much attention in the recent years. Conjugations of QDs with biomolecules for instance, antibodies or peptides maximize their specificity and sensitivity and hence bioconjugated QDs are of great use in targeting cancer biomarkers. In QD-based multiplexed molecular imaging, several tumor biomarkers are simultaneously stained which reveals the tempo-spatial pattern among molecules. This feature is rather significant as it could help to delineate the molecular

mechanism behind cancer invasion and analyze tumor microenvironment [25, 26]. This holds the pledge in understanding the tumor invasion mechanism and paves the way for improved personalized treatments.

MAGNETIC NANOPARTICLES

Magnetic nanoparticles are spherical nanocrystals of 10-20 nm of size, which are lured to a high magnetic flux density. In general, these particles comprised of magnetic components such as iron, nickel, cobalt and their chemical mixture. As for magnetic nanoparticles, its unique magnetic resonance behaviors is a big advantage to use as contrast agents in Magnetic Resonance Angiography (MRA) and Molecular Resonance Imaging (MRI) [27]. For instance, superparamagnetic iron oxide particles (SPIO) act as potential MR contrasts in diagnosing hepatic metastases owing to its rapid hepatic uptake [28, 29]. Also, in Diffusion Weighted MRI (DW-MRI), SPIO has tremendous potential in diagnosing nodal metastases and prostate cancer [30]. Iron-oxide or iron-cored nanoshells have been employed to diagnose colorectal cancers [31]. Macrophages play crucial roles in atherosclerotic plaque developments and SPIOs of great use in tracking macrophage activities and therefore lay foundation for establishing novel therapeutic strategies against atherosclerosis. In addition, SPIOs role in demonstrating stem cell activities in host organs such as brain yield novel opportunities in the field of regenerative medicine [32].

Diagnostic magnetic resonance (DMR) technology that uses magnetic nanoparticles as sensors holds considerable promise to identify targets such as DNA/mRNA, enzymes, proteins and peptides, drugs and microbes [33-35]. This technology is more robust and highly sensitive enabling multiplexed analysis using microliter samples.

NANOARRAYS

Microarrays remain as novel platform for high-throughput diagnosis of biomolecules such as multiplexed DNA and proteins. However, microarrays require relatively large sample volumes, prolonged incubation time and bulky instrumentation. Also, microarray analysis typically requires robust amplification and labeling, which make the analysis quite laborious and expensive. Nanoarrays are the miniaturization of microarrays and comprised of an array of molecules scattered in micron or sub-micron spatial range. Biological samples such as protein, DNA, RNA and whole viruses as well as nonbiological samples such as solutions, colloids, and particle suspension could serve as spots of nanoarray. The advantages of Nanoarrays over classic microarrays are manifold. Nanoarrays take only 1/10000 of the surface area utilized by a classic microarray system and over 1500 nanoarray spots could be embedded in the space required for a single microarray spot [36]. For instance, one nanoarray system imprints biological and nonbiological sensors onto silicon chips with ultra-micro spot sizes ranging from 1 to 20 μm and in the nanometer range to 250 nm. This distinctive advantage translate to economized reagent costs, expedited analysis and potentially greater specificity and sensitivity [37].

Nanoarrays are employed for biomolecular analysis in personal healthcare. These arrays exhibit higher sensitivity and selectivity and hence are potent in detecting pathogens even at trace quantities [38]. They are applied in bioaffinity tests for identifying DNA/RNA targets, proteins and receptor-ligand bindings. They are of great use in attaching diverse chemical and biological moieties, biomolecular materials and specific molecular segments such as single-stranded DNA for hybridization [39-44]. IL-6 is considered as a crucial bioprognostic marker in prostate cancer and nanoarrays constructed on amine-reactive surface using antibodies against IL-6 and PSA were potentially beneficial in capturing their cognate antigen with greater specificity and sensitivity (10 pg/ml). In addition to serum PSA, nanoarrays are found equally efficient in detecting cellular PSA [45].

Biochips such as protein or antibody arrays seem to be a reliable approach for detecting disease markers at smaller quantities, which is of most helpful for early and accurate diagnosis of diseases, examining disease progression and scanning drug responses. Thus, this approach fosters to understand the functional and molecular characterization of diseases [46, 47]. Further, the excellence of nanoarrays in depicting tumor subtypes help to establish new and effective treatment strategies to treat tumors of different stage and nature [48-56].

The ultimate aim of molecular diagnostics involves single cell analysis. Nanoarrays are potentially useful to differentiate healthy cells from diseased cells at a single-cell resolution scale. Such ultra-high sensitivity aids to detect minor differences among cell types or debilitated effects of therapeutics, which might not be feasible with classical biochemical techniques. Thus, nanoarrays are potentially

beneficial in analyzing cell mixtures. Another great advantage of nanoarrays lies in its ability to detect targeted species by measuring atomic vibrational frequency, without labeling. This sort of label-free detection is considered highly beneficial so that biological activity of the target molecule remains intact for subsequent analysis.

NANOCHIPS : NANOBIO TECHNOLOGY ON A CHIP

The classical analysis of DNA sequencing is performed by hybridization or by probing with the complementary strands of known sequence. However, the major demerits of these techniques are non-specific hybridization of DNA. Thus, there is a need to construct a system that can eliminate non-specific DNA bindings. Nanogen's nanotechnology-based chips promise here superior alternatives to conventional DNA sequencing strategies. The chips are integrated with electronic current and DNA probes are separated on the basis of charge and size, to appropriate locations on the chip. The DNA probes hybridize with the cognate DNA present in the sample and the fluorescence emitted by hybridized DNA is detected and transmitted to an onboard computer by means of platinum wiring, installed in the chip. The salient feature of this device is that the test sites are electronically governable through an onboard computer. Also, the chip facilitates the simultaneous placement of multiple probes at distinct locations according to the sequence of interest, which makes the diagnosis process expedited and easier.

MICRO-ELECTROMECHANICAL SYSTEMS (MEMS)

Microfluidic and microcantilever devices are micro-electromechanical (MEM) systems fabricated using nanotechnology for in vitro diagnostics.

MICROFLUIDICS (LAB-ON-A CHIP)

Microfluidics represent another contemporary technologies involve manipulating and controlling fluids and particles such as protein, DNA, cells, viruses, etc. at micrometer and sub micrometer dimensions based on the particle's electro kinetic properties including size, density, charge, light scattering and antigenic properties. These chips are easy to use, as the entire procedure of DNA analysis is integrated into a single chip comprised of a glass and silicon substrate. The chip contains micro fabricated fluidic chambers, heating systems, temperature sensors and fluorescence monitors to examine DNA specimens of nanolitre size [57]. The potential applications of microfluidics involve monitoring allergic response. To monitor this, cells are cultivated in the chamber of a chip and the fluorescence tagged dyes released upon allergic stimulation were detected by virtue of photomultiplier tube (PMT) connected with microscope [58].

Recently it was demonstrated that microfluidic systems could be fabricated to analyze the composition of cells, however, the samples analyzed need to have fluidity [59]. One of the most promising applications of microfluidic devices is in point-of-care diagnosis, for instance, in detecting bacterial infections in the mouth [60]. Microfluidic based techniques are cost efficient, fast, highly sensitive and require minimal sample volume. Inclusion of materials such as poly dimethylsiloxane in microfluidic techniques implies additional advantages, as these materials are of biocompatible and provoke less endotoxin contamination and complement activation [61-63]. These devices were shown to have potential in capturing substantial amount of cancer cells from cell mixture. Early and accurate detection of PSA (Prostate Specific Antigen) is of great significance to distinguish prostate cancer from other benign prostatic states. The lack of specificity of the serum marker PSA is a solemn concern since its elevated level could be linked to several abnormalities. Microfluidic chips offer possible solution to overcome the drawbacks. Further, they are also playing vital part in monitoring allergic responses [63, 64].

MICROCANTILEVERS

Micro cantilevers sensors function through measuring variations in cantilever bending or vibration spectrum. These sensors are known to have numerous merits such as minimal sample requirement, immense sensitivity, low cost, precise testing procedure and rapid response. In this sense, they turned out to be great use to detect disease markers, blood glucose level and chemical and biological warfare agents. Their potential use as biological sensor has been recently demonstrated by Arun Majumdar and co-workers in the diagnosis of prostate cancer [65]. In this approach, PSA specific antibodies were coated on microcantilever's surface. The cantilever's

bending due to antigen-antibody interaction was detected optically using a photo detector. The microcantilever's extra sensitiveness in detecting PSA even at lower concentrations holds the key to future diagnostic applications.

In an other approach, blood glucose concentration was measured through immobilizing the enzyme so called glucose oxidase on microcantilever's surface [66]. Due to microcantilever's efficiency in surface stress measurements, they are useful in detecting low-density lipoprotein (LDL) and oxidized LDL (oxLDL). This is of great significance as oxLDL is correlated to cholesterol deposition in aorta, a pivotal step in coronary heart disease.

Single nucleotide polymorphisms (SNPs) are key areas of interest in genomics research. Several genetic abnormalities such as Tay Sachs syndrome, β -Thalassemia and Alzheimer's disease are evoked by single base mutation. Hence, detecting SNPs is of most helpful for early diagnosis of such abnormalities and Microcantilevers are of great benefit to capture DNA targets and detects point mutations.

Nanocantilevers: Nanocantilevers are the next generation tools in the evolution of cantilevers. Harold Craighead and co-workers demonstrated the practicability of employing 90 nm thick, silicon nitride nanocantilevers to distinguish DNA strand of 1578 base pairs. These nanocantilevers potentially eliminate the amplification step as it could accurately detect 0.23 attograms (1 attogram = 10^{-18} gram) of molecules [67]. Thus, these nanodevices have great impact to make molecular diagnosis procedures simplified.

NANOPORES

A nanopore is a nano-scale aperture found in membranes, which permits DNA molecules to penetrate through. This nanoaperture could be of biological (protein pores in lipid bilayers), solid state (fabricated in artificial membranes, such as graphene) or hybrid (pore-forming protein fabricated in artificial membranes) type. Nanopores serve as single-molecule analytical devices and the operating principle of this nanopore technique corresponds to that of a Coulter counter [68]. The nanopore is made in the membrane bifurcating the electrochemical chambers containing conductive electrolyte. Under the influence of an applied electric field, the charged molecules are galvanized through the aperture. The resultant changes in ionic current provoke details on the structural features and dynamic movements of the molecules. Nanopore analysis is of great use as it could help to analyze charged polymers such as single and double stranded DNA and RNA at sub nanometer resolution and eliminating the necessity of amplification, chemical modification, surface adsorption and probe hybridization Church et al., first demonstrated the real potential of nanopore analysis in the process of DNA sequencing [69].

Biological nanopores, as naturally occurring nanopores, are of great use in single-molecule DNA analysis due to their abundant nature with remarkable heterogeneity in terms of size and composition. For instance, α -haemolysin, a heptameric transmembrane nanopore has been extensively employed in DNA sequencing. This nanopore comprises 3.6 nm diameter vestibule coupled to transmembrane β -barrel of ~ 5 nm long and ~ 2.6 nm wide. Owing to the nature of the pore size, α -haemolysin only permits the translocation of single-stranded DNA (ssDNA). Translocation of ssDNA and ssRNA molecules through α -haemolysin was first reported by Kasianowicz *et al* [70]. Further native α -haemolysin has been employed to differentiate between RNA homopolymers made of adenylic and cytidylic acid [71] and ssDNA of deoxyadenylic acid and deoxycytidylic acid [72].

MspA (*Mycobacterium smegmatis* porin A) is another well-studied octameric channel pore which contains a single constriction of ~ 0.6 nm long and ~ 1.2 nm wide. It can distinguish trinucleotide sets of AAA, GGG, TTT and CCC at greater efficiency [73]. Similarly, the bacteriophage Phi29 DNA-packaging nanomotor (dodecamer) serves as a channel for the transit of DNA double-strands. The channel size of phi29 connector not only permits the translocation of ssDNA and dsDNA but it also allows small peptides and proteins. Owing to its bigger size, channel modifications such as insertion of chemical groups could be easily achieved which in turn enhances the efficiency of sensing and diagnosis process.

Solid-state nanopores possess outstanding characteristics such as well-confined geometries, sound mechanical stability, perfect sensitivity and exceptional compatibility with other analytical techniques and serve as a versatile alternative to biological nanopores [74-76]. They hold great promise for DNA sequencing and bar coding, characterizing protein interactions and detecting molecular transport such as individual DNA/RNA molecules and ions [77-80]. Recently, Graphene, a two-dimensional layer of carbon atoms, becomes an exceptional choice for single molecule detection and DNA sequencing processes by virtue of its remarkable mechanical, optical, electrical, magnetic and thermal characteristics [81]. Of all features, its sub-nm thickness is quite attractive as the thickness

corresponds to spaces among nucleotides of single-stranded DNA. This standout characteristic makes graphene nanopore an excellent tool for nucleic acid analysis and DNA sequencing.

DNA hypermethylation serves as a valuable biomarker in diseases such as cancer, lupus and muscular dystrophy. Synthetic nanopores have tremendous potential in detecting abnormal DNA methylation [82]. Given the crucial role of single nucleotide polymorphisms (SNPs) in causing phenotypic differences among individuals, it seems apparent that SNPs play significant part in tumor progression. Owing to its DNA sensing ability, nanopores might be able to distinguish the SNPs and thereby facilitate early diagnosis of malignancies. Besides, nanopore analysis has also been used to analyze RNA/Antibiotic complexes at single molecular level suggesting its potential in diagnosing RNA-mediated diseases [78].

CONCLUSION AND FUTURE PERSPECTIVES

Nanomolecular diagnostics have the potential to conquer many of the challenges associated with conventional molecular diagnostics, in spite of its intrinsic features such as facile procedures, miniaturized devices, expedited and high-throughput screening processes. Since the field of nanomolecular diagnosis is presently burgeoning expeditiously, this review presented an overview of some enticing progresses. Nanomolecular diagnostics have incredible potential to analyze single cells with high sensitivity. This notable proficiency of nanomolecular diagnostics opens completely new perspectives for cancer detection. Nanoparticles, quantum dot and nanoclusters enhance the resolution and sensitivity of imaging techniques by acting as contrast agents. Q-dots offer the possibility to detect low abundance antigens. Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) is a crucial mediator of cystic fibrosis (CF) and quantum dots labeled anti CFTR antibodies are employed in AFM to detect and quantify CFTR.

Other promising candidates in this field are microfluidic chips, which are of immense use in isolating and manipulating living cells and diagnose inflammatory processes at early stage. Furthermore, biochip with an anisotropic nanofluidic sieving structure serves as an appropriate tool to isolate and categorize biological molecules such as DNAs or peptides. Modification of biochip surfaces using nanotechnological methods makes them more effective in RNA analysis at the single-cell level. Antibody arrays offer an attractive tool for characterizing cancer subtypes and thus, establishing molecular basis of diseases.

Nanosensors have emerged as a versatile alternative to conventional biosensors. Cantilever based sensors can be employed for the effective measurement of various disease markers such as myoglobin, glucose and lipoproteins. Silicone nanowire sensors show potential in the rapid and effective detection of influenza A virus. The use of nanopores in the detection of cancer biomarkers is of paramount significance as it facilitates early diagnosis, staging, advancement and most significantly chemotherapeutic drug response.

The applications described here suggest that nanodiagnostics have been stepping closer to the goal of accurate diagnosis of various life-threatening diseases in the early stages. Without doubt nanodiagnostics will make tremendous strides and wide ranging impact in the field of molecular diagnosis and lay the groundwork for the establishment of novel therapeutics and personalized medicine (PM) for various diseases.

REFERENCES:

- [1] Fakruddin, M., Hossain, Z. & Afroz, H., "Prospects and applications of nanobiotechnology: a medical perspective", *J Nanobiotechnology*, 10, 31, 2012.
- [2] Moghimi, S.M., Hunter, A.C. & Murray, J.C., "Nanomedicine: current status and future prospects", *FASEB J*, 19, 311-330, 2005.
- [3] Ries, L.H., D.; Krapcho, M.; Mariotto, A.; Miller, BA.; Feuer, E.J.; Clegg, L.; Eisner, & MP.; Horner, M.H., N.; Hayat, M.; Hankey, BF.; Edwards, BK., editors. "SEER Cancer Statistics Review", National Cancer Institute; Bethesda, MD, 1975–2003, 2004.
- [4] Jain, K.K., "Nanodiagnostics: application of nanotechnology in molecular diagnostics", *Expert Rev Mol Diagn*, 3, 153-161, 2003.
- [5] Azzazy, H.M., Mansour, M.M. & Kazmierczak, S.C., "Nanodiagnostics: a new frontier for clinical laboratory medicine", *Clin Chem*, 52, 1238-1246, 2006.
- [6] Riehemann, K. et al., "Nanomedicine--challenge and perspectives", *Angew Chem Int Ed Engl*, 48, 872-897, 2009.
- [7] Liu, C.H. et al., "Noninvasive delivery of gene targeting probes to live brains for transcription MRI", *FASEB J*, 22, 1193-1203, 2008.
- [8] Liu, C.H. et al., "MR contrast probes that trace gene transcripts for cerebral ischemia in live animals", *FASEB J*, 21, 3004-3015, 2007.

2007.

- [9] Qian, H., Zhu, M., Wu, Z. & Jin, R., "Quantum sized gold nanoclusters with atomic precision", *Acc Chem Res*, 45, 1470-1479, 2012.
- [10] Sperling, R.A., Rivera Gil, P., Zhang, F., Zanella, M. & Parak, W.J., "Biological applications of gold nanoparticles", *Chem Soc Rev*, 37, 1896-1908, 2008.
- [11] Yang, X., Stein, E.W., Ashkenazi, S. & Wang, L.V., "Nanoparticles for photoacoustic imaging", *Wiley Interdiscip Rev Nanomed Nanobiotechnol*, 1, 360-368, 2009.
- [12] Feis, A., Gellini, C., Salvi, P.R. & Becucci, M., "Photoacoustic excitation profiles of gold nanoparticles", *Photoacoustics*, 2, 47-53, 2014.
- [13] Schultz, D.A., "Plasmon resonant particles for biological detection", *Curr Opin Biotechnol*, 14, 13-22, 2003.
- [14] Hainfeld, J.F., Slatkin, D.N., Focella, T.M. & Smilowitz, H.M., "Gold nanoparticles: a new X-ray contrast agent", *Br J Radiol*, 79, 248-253, 2006.
- [15] Cheng, H.W., Huan, S.Y., Wu, H.L., Shen, G.L. & Yu, R.Q., "Surface-enhanced Raman spectroscopic detection of a bacteria biomarker using gold nanoparticle immobilized substrates", *Anal Chem*, 81, 9902-9912, 2009.
- [16] Heuer-Jungemann, A., Harimech, P.K., Brown, T. & Kanaras, A.G., "Gold nanoparticles and fluorescently-labelled DNA as a platform for biological sensing", *Nanoscale*, 5, 9503-9510, 2013.
- [17] Halo, T.L. et al., "NanoFlares for the detection, isolation, and culture of live tumor cells from human blood", *Proceedings of the National Academy of Sciences*, 111, 17104-17109, 2014.
- [18] Chan, W.C. et al., "Luminescent quantum dots for multiplexed biological detection and imaging", *Curr Opin Biotechnol*, 13, 40-46, 2002.
- [19] Michalet, X. et al., "Quantum dots for live cells, in vivo imaging, and diagnostics", *Science*, 307, 538-544, 2005.
- [20] Larson, D.R. et al., "Water-soluble quantum dots for multiphoton fluorescence imaging in vivo", *Science*, 300, 1434-1436, 2003.
- [21] Ness, J.M., Akhtar, R.S., Latham, C.B. & Roth, K.A., "Combined tyramide signal amplification and quantum dots for sensitive and photostable immunofluorescence detection", *J Histochem Cytochem*, 51, 981-987, 2003.
- [22] Wegner, K.D. et al., "Nanobodies and nanocrystals: highly sensitive quantum dot-based homogeneous FRET immunoassay for serum-based EGFR detection", *Small*, 10, 734-740, 2014.
- [23] Yang, L. & Li, Y., "Quantum dots as fluorescent labels for quantitative detection of Salmonella typhimurium in chicken carcass wash water", *J Food Prot*, 68, 1241-1245, 2005.
- [24] Tully, E., Hearty, S., Leonard, P. & O'Kennedy, R., "The development of rapid fluorescence-based immunoassays, using quantum dot-labelled antibodies for the detection of Listeria monocytogenes cell surface proteins", *Int J Biol Macromol*, 39, 127-134, 2006.
- [25] Xing, Y. et al., "Bioconjugated quantum dots for multiplexed and quantitative immunohistochemistry", *Nat Protoc*, 2, 1152-1165, 2007.
- [26] Tholouli, E. et al., "Quantum dots light up pathology", *J Pathol*, 216, 275-285, 2008.
- [27] Howles, G.P., Ghaghada, K.B., Qi, Y., Mukundan, S., Jr. & Johnson, G.A., "High-resolution magnetic resonance angiography in the mouse using a nanoparticle blood-pool contrast agent", *Magn Reson Med*, 62, 1447-1456, 2009.
- [28] Thorek, D.L., Chen, A.K., Czupryna, J. & Tsourkas, A., "Superparamagnetic iron oxide nanoparticle probes for molecular imaging", *Ann Biomed Eng*, 34, 23-38, 2006.
- [29] Corot, C., Robert, P., Idee, J.M. & Port, M., "Recent advances in iron oxide nanocrystal technology for medical imaging", *Adv Drug Deliv Rev*, 58, 1471-1504, 2006.
- [30] Triantafyllou, M. et al., "Diffusion-weighted MRI to detect pelvic lymph node metastases in patients with bladder or prostate cancer: comparison with histopathology as gold standard", *Proceedings of the ISMRM, Hawaii*, 2009.
- [31] Fortina, P. et al., "Applications of nanoparticles to diagnostics and therapeutics in colorectal cancer", *Trends Biotechnol*, 25, 145-152, 2007.
- [32] Hill, J.M. et al., "Serial cardiac magnetic resonance imaging of injected mesenchymal stem cells", *Circulation*, 108, 1009-1014, 2003.
- [33] Perez, J.M., Josephson, L., O'Loughlin, T., Hogemann, D. & Weissleder, R., "Magnetic relaxation switches capable of sensing molecular interactions", *Nat Biotechnol*, 20, 816-820, 2002.
- [34] Lee, H., Sun, E., Ham, D. & Weissleder, R., "Chip-NMR biosensor for detection and molecular analysis of cells", *Nat Med*, 14, 869-874, 2008.
- [35] Lee, J.H. et al., "Artificially engineered magnetic nanoparticles for ultra-sensitive molecular imaging", *Nat Med*, 13, 95-99, 2007.
- [36] Lynch, M. et al., "Functional protein nanoarrays for biomarker profiling", *Proteomics*, 4, 1695-1702, 2004.
- [37] Silzel, J.W., Cercek, B., Dodson, C., Tsay, T. & Obremski, R.J., "Mass-sensing, multianalyte microarray immunoassay with imaging detection", *Clin Chem*, 44, 2036-2043, 1998.
- [38] Chen, H. & Li, J., "Nanotechnology: moving from microarrays toward nanoarrays", *Methods Mol Biol*, 381, 411-436, 2007.
- [39] Maurya, D.K., Ng, W.Y., Mahabadi, K.A., Liang, Y.N. & Rodriguez, I., "Fabrication of lab-on chip platforms by hot embossing and photo patterning", *Biotechnol J*, 2, 1381-1388, 2007.

- [40] Truskett, V.N. & Watts, M.P., "Trends in imprint lithography for biological applications", *Trends Biotechnol*, 24, 312-317, 2006.
- [41] Lee, K.B., Lim, J.H. & Mirkin, C.A., "Protein nanostructures formed via direct-write dip-pen nanolithography", *J Am Chem Soc*, 125, 5588-5589, 2003.
- [42] Bruckbauer, A. et al., "Multicomponent submicron features of biomolecules created by voltage controlled deposition from a nanopipet", *J Am Chem Soc*, 125, 9834-9839, 2003.
- [43] Zimmermann, J., Rabe, M., Verdes, D. & Seeger, S., "Functionalized silicone nanofilaments: a novel material for selective protein enrichment", *Langmuir*, 24, 1053-1057, 2008.
- [44] Geho, D. et al., "Fractionation of serum components using nanoporous substrates", *Bioconjug Chem*, 17, 654-661, 2006.
- [45] Nettikadan, S. et al., "Detection and quantification of protein biomarkers from fewer than 10 cells", *Mol Cell Proteomics*, 5, 895-901, 2006.
- [46] Lin, Y. et al., "Profiling of human cytokines in healthy individuals with vitamin E supplementation by antibody array", *Cancer Lett*, 187, 17-24, 2002.
- [47] Zhu, X., Gerstein, M. & Snyder, M., "ProCAT: a data analysis approach for protein microarrays", *Genome Biol*, 7, R110, 2006.
- [48] Usui-Aoki, K., Shimada, K. & Koga, H., "A novel antibody microarray format using non-covalent antibody immobilization with chemiluminescent detection", *Mol Biosyst*, 3, 36-42, 2007.
- [49] Kato, K., Toda, M. & Iwata, H., "Antibody arrays for quantitative immunophenotyping", *Biomaterials*, 28, 1289-1297, 2007.
- [50] Nedelkov, D., Tubbs, K.A. & Nelson, R.W., "Surface plasmon resonance-enabled mass spectrometry arrays", *Electrophoresis*, 27, 3671-3675, 2006.
- [51] Koga, H., Kyo, M., Usui-Aoki, K. & Inamori, K., "A chip-based miniaturized format for protein-expression profiling: the exploitation of comprehensively produced antibodies", *Electrophoresis*, 27, 3676-3683, 2006.
- [52] Sanchez-Carbayo, M., "Antibody arrays: technical considerations and clinical applications in cancer", *Clin Chem*, 52, 1651-1659, 2006.
- [53] Watanabe, M. et al., "Antibody array analysis of peripheral and blood cytokine levels in rats after masseter inflammation", *Neurosci Lett*, 382, 128-133, 2005.
- [54] Haab, B.B., "Antibody arrays in cancer research", *Mol Cell Proteomics*, 4, 377-383, 2005.
- [55] Ivanov, S.S. et al., "Antibodies immobilized as arrays to profile protein post-translational modifications in mammalian cells", *Mol Cell Proteomics*, 3, 788-795, 2004.
- [56] Lal, S.P., Christopherson, R.I. & dos Remedios, C.G., "Antibody arrays: an embryonic but rapidly growing technology", *Drug Discov Today*, 7, S143-149, 2002.
- [57] Mueller, O. et al., "A microfluidic system for high-speed reproducible DNA sizing and quantitation", *Electrophoresis*, 21, 128-134, 2000.
- [58] Matsubara, Y., Murakami, Y., Kobayashi, M., Morita, Y. & Tamiya, E., "Application of on-chip cell cultures for the detection of allergic response", *Biosens Bioelectron*, 19, 741-747, 2004.
- [59] Walt, D.R., "Chemistry. Miniature analytical methods for medical diagnostics", *Science*, 308, 217-219, 2005.
- [60] Chen, Z. et al., "A microfluidic system for saliva-based detection of infectious diseases", *Ann N Y Acad Sci*, 1098, 429-436, 2007.
- [61] Vickers, J.A., Caulum, M.M. & Henry, C.S., "Generation of hydrophilic poly(dimethylsiloxane) for high-performance microchip electrophoresis", *Anal Chem*, 78, 7446-7452, 2006.
- [62] Takayama, S. et al., "Subcellular positioning of small molecules", *Nature*, 411, 1016, 2001.
- [63] Du, Z., Colls, N., Cheng, K.H., Vaughn, M.W. & Gollahon, L., "Microfluidic-based diagnostics for cervical cancer cells", *Biosens Bioelectron*, 21, 1991-1995, 2006.
- [64] Majumdar, A., "Bioassays based on molecular nanomechanics", *Dis Markers*, 18, 167-174, 2002.
- [65] Wu, G. et al., "Bioassay of prostate-specific antigen (PSA) using microcantilevers", *Nat Biotechnol*, 19, 856-860, 2001.
- [66] Chen, G.Y., Thundat, T., Wachter, E.A. & Warmack, R.J., "Adsorption-induced surface stress and its effects on resonance frequency of microcantilevers", *Journal of Applied Physics*, 77, 3618-3622, 1995.
- [67] Ilic, B. et al., "Enumeration of DNA molecules bound to a nanomechanical oscillator", *Nano Lett*, 5, 925-929, 2005.
- [68] Hu, J. & Zhe, J. (Google Patents, 2008).
- [69] Church, G., Deamer, D. W., Branton, D., Baldarelli, R. & Kasianowicz, J., "Characterization of individual polymer molecules based on monomer-interface interactions.", US patent 5,795,782, 1995.
- [70] Kasianowicz, J.J., Brandin, E., Branton, D. & Deamer, D. W., "Characterization of individual polynucleotide molecules using a membrane channel", *Proc. Natl Acad. Sci. USA*, 93, 13770-13773, 1996.
- [71] Akeson, M., Branton, D., Kasianowicz, J.J., Brandin, E. & Deamer, D.W., "Microsecond time-scale discrimination among polycytidylic acid, polyadenylic acid, and polyuridylic acid as homopolymers or as segments within single RNA molecules", *Biophys J*, 77, 3227-3233, 1999.
- [72] Meller, A. & Branton, D., "Single molecule measurements of DNA transport through a nanopore", *Electrophoresis*, 23, 2583-2591, 2002.
- [73] Derrington, I.M. et al., "Nanopore DNA sequencing with MspA", *Proc Natl Acad Sci U S A*, 107, 16060-16065, 2010.

- [74] Kim, M.J., Wanunu, M., Bell, D. C. & Meller, A., "Rapid fabrication of uniformly sized nanopores and nanopore arrays for parallel DNA analysis", *Adv. Mater.*, 18, 3149–3153 2006.
- [75] Nam, S.W., Rooks, M.J., Kim, K.B. & Rossnagel, S.M., "Ionic field effect transistors with sub-10 nm multiple nanopores", *Nano Lett*, 9, 2044-2048, 2009.
- [76] McNally, B. et al., "Optical recognition of converted DNA nucleotides for single-molecule DNA sequencing using nanopore arrays", *Nano Lett*, 10, 2237-2244, 2010.
- [77] Schneider, G.F. et al., "DNA translocation through graphene nanopores", *Nano Lett*, 10, 3163-3167, 2010.
- [78] Wanunu, M. et al., "Nanopore analysis of individual RNA/antibiotic complexes", *ACS Nano*, 5, 9345-9353, 2011.
- [79] Haque, F., Li, J., Wu, H.-C., Liang, X.-J. & Guo, P., "Solid-state and biological nanopore for real-time sensing of single chemical and sequencing of DNA", *Nano Today*, 8, 56-74, 2013.
- [80] Atas, E., Singer, A. & Meller, A., "DNA sequencing and bar-coding using solid-state nanopores", *Electrophoresis*, 33, 3437-3447, 2012.
- [81] Geim, A.K., "Graphene: status and prospects", *Science*, 324, 1530-1534, 2009.
- [82] Mirsaidov, U. et al., "Nanoelectromechanics of methylated DNA in a synthetic nanopore", *Biophys J*, 96, L32-34, 2009.

Intrusion Detection System Based on Genetic-SVM for DoS Attacks

A.Naveena Devi ^{#1}, K.Pradeep Mohan Kumar ^{*2}

[#]*M.Tech & CSE & Periyar Maniammai University*
^{*}*Research Scholar & CSE & Periyar Maniammai University*
Vallam, Thanjavur, India

¹ naveenal310@gmail.com

² pradeep_nv2004@yahoo.co.in

Abstract--Nowadays IDS have become a necessary component for protecting interconnection of computer resources and network environment very effectively. Denial-of-service (DoS) is an attack that attacks on public web servers have been recently become a tedious problem in computer society. A denial of service (DoS) attack is a malicious attempt to compromise a server or a network resource unavailable to legitimate users, usually by temporarily interrupting or blocking the services of a requested normal host in the Internet. An intrusion detection system (IDS) was used for detecting malicious traffic, blocking and reporting to the authorized person to take necessary action. So far, many different approaches like encryption techniques, firewall, and access control have been followed in to increase the detection accuracy of DoS attacks. But still it is not sufficient capacity to protect our computer resources very much effectively. so, In this paper, we are focusing on developing new hybrid based IDS model based on genetic algorithm (GA) and support vector machine(SVM) for DoS attack Detection. In the proposed Hybrid IDS model, attacks are identified by training the SVM classifiers after extracting features from PMU 2014 datasets using genetic algorithm. SVM classifier deals with large volume of data, make it easy to detect suspicious behaviors, causing speed training and testing process. Genetic-SVM based on wrapper feature selection which is superior then filter based feature selection. The proposed work was implemented in Mat lab 7.2. The result shows that the proposed hybrid ids has high detection accuracy (99.5%) and fewer false alarms compared to the existing available models.

Keywords—Intrusion Detection System (IDS), Denial of Service (DoS), GA-SVM

I. INTRODUCTION

An intrusion detection system (IDSs) is the process of identifying, blocking and responding unauthorized activity to the system administrator to take necessary action. Based on the data collection mechanism IDS can be classified in to three types (i) HIDS, (ii)NIDS,(iii)Hybrid IDS. HIDS resides on a particular host and looks for the indications of attacks on that host system. NIDS is located on a separate system and monitor the network traffic for finding attacks based on rule set. Hybrid IDS perform both the functionality of Network based and Host based intrusion detection system. Based on the attack detection techniques IDS can be classified into (i)Anomaly Detection, (ii) misuse Detection. In anomaly based detection, captured network traffic data is used to differentiate attack traffic data compared with predefine normal pattern.

On the other hand, misuse detection system, also called as signature based IDS, uses patterns of well known attacks to match with captured traffic to find out attack pattern easily A lot of computational intelligence approaches have been proposed by the researchers for example artificial neural network, fuzzy sets, evolutionary computation, expert system approach, rule based approach, artificial immune systems etc [2].The existing datasets KDDCUP99 include the Neptune, smurf, Pod and Teardrop are the types of DoS attacks. The DoS attacks is a emerging attacks for creates threat to business and Internet service providers around the world. Computational mechanism is needed to encounter this type attacks and extend the support provided to environment security that increase the hopeful of the users to do Internet based business. so, IDS is the more power full tool to detect the various types of DoS attacks with higher detection accuracy, reducing false alarms. The working of IDS shown in fig.1.IDS continuously captured the network activity and gives the report to the system administrator. Finally the alarm report will be generated. The both function of monitor system and security administrator response to the intrusion.

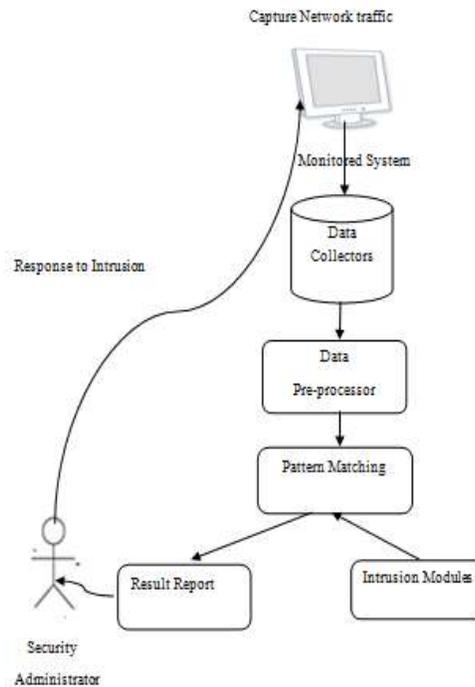


fig 1. Working of IDS

IDS is tested with large amount of dataset that the aim is slow training, testing process and low detection rate. So, feature extraction is the challenging task in developing IDS [8]. Generally, the implementation of IDS consists of three phases such as data preprocessing, features extraction and classifier. The tasks that are carried out in preprocessing phases are (i) identifies the attributes and their value (ii) Convert categorical to numerical data (iii) Data normalization and (iv) compute redundancy check and handle about null value. Feature extraction process is a preprocessing step when constructing IDS, used to reduce the dimensionality of the dataset by removing irrelevant, redundant features and improving the prediction accuracy of the classifier using selected features from the dataset. Classifier module finds the conditions of the traffics are either legitimate or malicious attack. Classifier is faced with a problem when it has to generate rules with many attributes or features.

Obviously, the time required to generate rules is proportional to the number of features. In addition, irrelevant and redundant features can reduce both the predictive accuracy and comprehensibility of the induced rule and degrade the classifier speed. Thus, selecting the most relevant features is necessary, this strategy is implemented to simplify the rules and reduce its computational time while retaining the quality of classifier, as it represents the original features set. Support Vector Machines are known as maximum-margin classifiers since they find the optimal hyper plane between two classes, defined by a number of support vectors. The feature of the technique is mainly due to the introduction of calculation of pattern weight that allows us to prevent the effects of outliers by permitting a certain amount of misclassification errors. Although this technique was able to provide only linear classification and also handle non-linear problems. The Objective function is used to implicitly map the data points into a higher-dimensional feature space. The rest of this paper is organized as follows. In section II discusses the related works about existing algorithm to detect dos attack, In section III Illustrates the proposed genetic-SVM abased IDS model. Section IV describes the implementation and performance of the proposed algorithm using PMU dataset. In the last section, deals with conclusion and future work.

II. EXISTING METHOD

In order to detect the SYN flood attacks, There are many methods and frameworks. A few of them are given in this section. The authors detected the SYN flooding attacks at leaf routers which connect end hosts to the Internet, that utilizes the normalized difference between the number of SYN packets and the number of FIN (RST) packets in a time interval. The router recognizes that some attacking traffic is mixed into the current traffic, . If the rate of SYN packets is much higher than that of FIN (RST) packets by a non-parametric cumulative sum algorithm. Similar works have been presented, where the fast and effective method was proposed for detecting SYN flood attacks. Moreover, a linear prediction analysis was proposed for DoS SYN flood attack detection. This mechanism makes use of the exponential back off property of TCP used during timeouts. it is shown that this approach is able to

detect an attack within short delays, By modelling the difference of SYN and SYN&ACK packets. Again this method is used at leaf routers to detect the attack without the need of maintaining any state.

However, considering the fact that the sources of attack can be distributed in different networks, there is a lack of analysis for the traffic near the sources and also the detection of the source of SYN flooding attack in TCP based low intensity attacks is missing. Moreover, a quite similar approach has been used, which also considers a non-parametric cumulative sum algorithm; then apply it to measure the number of SYN packets, and by using an exponential weighted moving average for obtaining a recent estimate of the mean rate after the change of SYN packets. Three counters algorithms for SYN flooding defence attacks was proposed and included detection and mitigation. The detection scheme utilizes the inherent TCP valid SYN-FIN pairs behaviour, which is capable of detecting various SYN flooding attacks with high accuracy and short response time. The mitigation scheme works in high reliable manner for victim to detect the SYN packets of SYN flooding attack. Although the given schemes are stateless and required low computation overhead, making itself immune to SYN flooding attacks, and the attackers may retransmit every SYN packet more than one time to destroy the mitigation function.

The authors have built a standard model generated by observations from the characteristic between the SYN packet and the SYN+ACK response packet from the server. The author have proposed a method to detect the flooding agents by considering all the possible kinds of IP spoofing, which is based on the SYN/SYN-ACK protocol pair with the consideration of packet header information. The Counting Bloom Filter is used to classify all the incoming SYN-ACK packets to the sub network into two streams, and a nonparametric cumulative sum algorithm is applied to make the detection decision by the two normalized differences, with one difference between the number of SYN packets, the number of the first SYN-ACK packets, another difference between the number of the first SYN-ACK packets and the number of the retransmission SYN-ACK. There are also some other related studies such as SYN cookies, SYN filtering mechanisms, SYN cache, SYN proxy (firewall), SYN kill and D-SAT. The ESDM is a simple but effective method to detect SYN flooding attacks at the early stage. The ESDM achieves shorter detection time and small storage space. However, these exiting methods or defence mechanisms which oppose to the SYN flooding attack are effective only at the later stages, when attacking signatures are obvious.

II. PROPOSED GENETIC-SVM BASED IDS

The architecture of the proposed GA-SVM model is shown in Fig.1. The architecture contains two phases (i) Training phase (ii) Testing phase. In training phase, KDDCUP 99 dataset undergoes data pre-processing and the pre-processed data is then fed to the feature selection block where feature selection is done using genetic algorithm. The selected features are then given as input to the classifier where DoS attack patterns are classified using PSO. The other stage is the testing stage where the captured traffic is pre processed as in training phase and the identified patterns are matched with the stored DoS patterns in database thereby taking a decision. If any new patterns were found during the analysis of traffic behaviour and if it was found against the legitimate traffic, the new pattern will be captured and updated in the database. The implementation of Genetic-SVM based IDS has three phases which includes 3.1. Preprocessing, 3.2 Feature Selection and 3.3. Classifier.

A. Data Preprocessing

Data Preprocessing is an important step in the machine learning computing that eliminates out of range values, impossible data combinations, missing values etc. Generally data preprocessing includes learning, normalization, transformation, feature extraction and selection. The output of the data preprocessing is the final training set that extracts knowledge for the testing phase. The following steps are involved in data preprocessing.

- Identifying features and its related values.
- Converting original feature data value in to numerical data value.
- Applying data normalization based on min-max normalization.
- Performing similarity checks and removing null values.

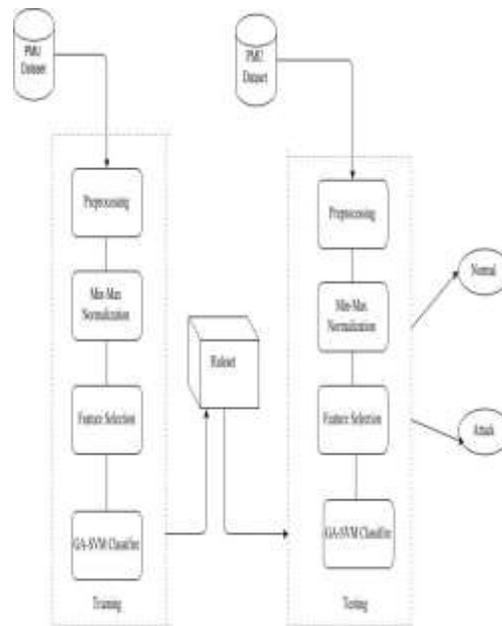


Fig. 2. Architecture of Genetic-SVM based IDS

B. Feature selection based on Genetic algorithm

Accuracy of the classifier depends on the selection of optimum feature subset. Feature selection method is mainly used for selecting the subset of features from the original data set. Two feature selection methods namely filter method and wrapper method were already proposed. Filter method is mainly based on the general characteristics of data features without involving machine language. These features are ranked based on certain criteria, where features with highest rank values are selected as optimal. The main advantages of filter method are low computational cost without involving any machine language algorithm for feature selection. Frequently used filter method is the information gain method. Wrapper method is mainly used for feature subset selection from the data set based on objective function and analysis of the performance of feature subset. In this paper, Genetic Algorithm (GA) is used to select optimal feature subset from the dataset. GA reduces the PMU features from 41 attributes to 6 attributes those are related to the characteristics of DoS attack thereby reducing 85% of the space of features. The six attributes that are considered by the GA are 1. Protocol, 2. src_bytes, 3. dst_bytes, 4. count (No of connections to the sameDest), 5. srv_count, 6. same_srvrate, 7. Diff_srvrate, 8. logged_in, 9. diff_host_same_src_portrate, 10. service.

The existing KDDCUP'99 dataset contains huge number of redundant records. 10% of the full dataset contains two types of DoS attacks (Smurf and Neptune). These two types constitute over 71% of the testing dataset which completely affects the evaluation of IDS. The steps involved in GA where features are selected from the dataset are presented below in Alg.1.

- 1) Initialize pre-processed data as population.
- 2) Calculate objective function based on derived rules for DoS attack for each individual pre processed data.
- 3) Select individual solution.
- 4) Perform mating of pair of individuals.
- 5) Perform mutation operation.
- 6) Calculate objective function for newly created population.
- 7) If (6) is satisfied, stop the operation.
- 8) If (6) is not satisfied, repeat step 3.
- 9) Return the best features from PMU dataset that reflects the properties of DoS attacks.

Alg.1. Genetic Algorithm based feature selection.

C. SVM classifier

GA generates a set of enhanced population of chromosomes, i.e. a group of individuals with different chromosomes. Each individual chromosome consists of ten different parameters namely protocol_type, service, src_bytes, dst_bytes, count, srv_count, Ssrv_rate, Dsrv_rate, logged in, Dst_host_same src port rate. The pattern weight of the individual chromosome should be determined properly by using the training dataset to include as many solutions as possible. Calculate the fitness value of each individual in the

initial population using Eq. (2) and rank them according to their fitness value. In Eqn.2, X indicates the training dataset and Y indicates the enhanced chromosome subset.

$$F = \sum_{k=1}^n X * Y$$

Equ 2

To calculate the fitness value of an individual or a chromosome, the training record is compared with each gene of the chromosome in the normal population. So each and every record generates different pattern value for different feature values. Similarly training record is compared with each gene of the chromosome in the attack population. So each and every record generates different pattern value for different feature values. Finally we will calculate support vector values for normal pattern and attack pattern with the help of pattern weight for normal and attack population. Now, we will get two SVM values i.e 1 and 0. $F \geq 1$ indicates normal record and $F < 1$ indicates attack record. SVM classifies our dataset based on newly generated hyper plane values. Now each and every testing record is compared with each and every gene of the normal and attack population. This will generate a pattern weight {0, 1, 2, 3, 4, 5} based on which we will identify whether our testing record belongs to normal or attack model.

Rule set for Dos Attacks:

Normal Rule set

protocol=tcp,sourceIp=172.20.62.33, DestIp=172.20.62.255,178>src_byte<322,10>Dst_byte<224,SYNcount=1or2,Ack=1or2,FIN_c
 ount=1or2,RSTbit=0,Outofseqpacket=0,0>dst_,host_same_src_port_rate<1,Src_data_packet=55.

Neptune Rule Set

protocol=tcp,sourceIp=172.20.62.33, DestIp=172.20.62.255, src_byte= 0, Dst_byte=0, SYN bit=3 to
 160,ACK=0,FIN=0,RSTbit=0,Outseqpacket=0,0>dst host same src port rate<1,Src_data_packet=0.)

Smurf Rule Set

protocol = UDP, source Ip=172.20.62.33 ,Dest Ip=172.20.62.25, src_byte= 221120,Dst_byte=0,SYN
 bit=238to512,ACK=0,FINcount=0,RST bit=0,Out seq packet=0,0<dst ,host same src port rate<2,Src data packet=560.

IV. SIMULATION RESULT AND DISCUSSIONS

The simulation of the proposed IDS model was implemented in MAT Lab 7.1 environment. Using PMU Dataset 2014, feature selection has been done using genetic search filter method. Genetic search has reduced the dimensionality of the feature from 113 to 12. Genetic search has reduced 89% of the features. 2000000 lakhs records are used for testing. These records mainly focused on TCP,UDP traffic around 100% records belongs to DoS attack traffic. So, it is necessary for training the machine language for DoS attack. if done, that will increase the detection accuracy and reducing false alarm rate. Only 0.5%, 0.5% and 0.5% of Normal, Smurf and Neptune attack instances has been misclassified respectively.

Hybrid based IDS(GA-SVM) is evaluated based on how correctly intrusion is predicted. Given event is compared with predefined knowledge of IDS and it produces four types of outcomes.

- True Positive.
- True Negative.
- False Negative.
- False Positive.

Detection rate= $TP/(TP+TN)*100$.

TABLE I. GA-SVM EXPERIMENT RESULTS

Test Data	Trainig Data	Test data	Detection accuracy(%)
			Enhanced GA-SVM (Anomaly and Misuse Detection)
Normal	8671	5460	100
Smurf	40018	20456	99.5
Neptune	152065	62345	99.5

V. CONCLUSION

In this thesis, new hybrid based computational techniques were proposed for extracting the attacking patterns available in the datasets. The result shows that enhanced GA reducing false alarm rate incorporates with SVM. In this model irrelevant and redundant features are not recognized that brings down the processing speed of evaluating the known patterns. An efficient features selection model eliminates dimension of data, reduce redundancy and ambiguity caused by none important attributes. Hence, the performances of the proposed hybrid models are better than existing models. The proposed methods performs the classification task and extract the recovered knowledge using GA-SVM. These systems are highly reliable, adequate interpretability and compare with several well known algorithms such as SVM, snort based hybrid system, Teacher Learning based Optimization IDS, Group Teacher Learning based Optimization IDS and Fuzzy logic IDS. The experiment results emphasized that the proposed hybrid models are suitable technique and produced better accuracy compared to the existing model. In future work, the octopus activities will be studied, use as a detection technique to find the patterns of the attacks and evaluate the performance with existing IDS.

REFERENCES:

- [1] Yogendra Kumar Jain and Upendra, "An Efficient Intrusion Detection based on Decision Tree Classifier Using Feature Reduction," International Journal of Scientific and Research Publication, Volume 2, Issue 1, pp. 1-6, January 2012.
- [2] J. Gómez1, C. Gil2, N. Padilla1, R. Baños2, and C. Jiménez1, "Design of a Snort-Based Hybrid Intrusion Detection System".
- [3] D. M. Divakaran, H. A. Murthy and T. A. Gonsalves, "Detection of SYN Flooding Attacks Using Linear Prediction Analysis", 14th IEEE International Conference on Networks, ICON 2006, pp. 218-223, Sep. 2006.
- [4] D. Nashat, X. Jiang and S. Horiguchi, "Detecting SYN Flooding Agents under Any Type of IP Spoofing", IEEE International Conference on eBusiness Engineering table of contents, 2008.
- [5] W. Chen and D.-Y. Yeung, "Defending Against SYN Flooding Attacks Under Different Types of IP Spoofing", ICN/ICONS/MCL '06, IEEE Computer Society, pp. 38-44, April 2006.
- [6] G. Wei, Y. Gu and Y. Ling, "An Early Stage Detecting Method against SYN Flooding Attack", International Symposium on Computer Science and its Applications, pp.263-268, 2008.

- [7] CERT Advisory CA-1996-21 “TCP SYN flooding and IP spoofing attacks”. [Online]. Available: <http://www.cert.org/advisories/CA-1996-21.html>
- [8] BoonPing Lim Md. Safi Uddin, 2005, “Statistical-based SYN-flooding Detection Using Programmable Network Processor”. (ICITA’05)
- [9] Tamas Abraham, “IDDM: Intrusion Detection using Data Mining Techniques”, Information Technology Division, Electronics and Surveillance Research Laboratory, DSTO GD-0286.
- [10] Wei Li, “Using Genetic Algorithm for Network Intrusion Detection”, Department of Computer Science and Engineering, Mississippi, State University, Mississippi State, Ms 39762.
- [11] J. Haggerty, T. Berry, Q. Shi and M. Merabti, 2004, “A System for Early Detection of TCP SYN Flood Attacks”, IEEE Communications Society Globecom

IJERGS

Multiple Vehicles Detection using MVDR based Phased Array Radar Beamformer

Vishal Das, Debasish Bhaskar, Rabindranath Bera

Abstract— To achieve ‘Vision Zero Collision’ objective in smart vehicle, radar based ADAS (Automatic Driving Assistant System) are being developed worldwide. Motivated by the above requirement toward public safety driving, this paper aims at modeling such radar for vehicular friendship. This paper is now catering for development and modeling of radar having two ADAS modes of operation namely i) ADAS1 with mode 1 having capability of collision avoidance by detecting the multiple target present on the road with the help of switched transmit beam like Minimum Variance Distortionless Response (MVDR).

For today’s vehicular driver assistance, this digital beam forming based adaptive tracking system is highly efficient and approaching towards cost effective commercial utilization.

Index Terms— ADAS (Automatic Driving Assistant System), MVDR (Minimum Variance Distortionless Response).

INTRODUCTION

As smart RADAR continues to spread throughout the Intelligent Transport System (ITS) industry globally, it is essentially needed to find comforts for the drivers where they could be relaxed during a long drive through the transport highways. To support the driver by means of Automatic Cruise Control after a successful tracking is achieved by the switched beam technology (i.e., MVDR based target detection), a large scale efforts have been executed throughout the world in building the “smart car”. The minimum variance distortionless response (MVDR) beamformer and its associated adaptive algorithm, the generalized sidelobe canceller (GSC), are probably the most widely studied and used beamforming algorithms, and are basis to some commercially available arrays. Assuming the direction of arrival (DOA) of the desired signal is known, the MVDR beamformer estimates the desired signal while minimizing the variance of the noise component of the formed estimate. In practice, however, the DOA of the desired signal is not known exactly, which significantly degrades the performance of the MVDR beamformer. A lot of research has been done into a class of algorithms known as robust MVDR. As a general rule, these algorithms work by extending the region where the source can be located. Nevertheless, even assuming perfect sound source localization (SSL), the fact that the sensors may have distinct, directional responses adds yet another level of uncertainty that the MVDR beamformer is not able to handle well. Commercial arrays solve this by using a linear array of antenna elements, all pointing at the same direction, and therefore with similar directional gain.[4]

In this paper, the Basics of Beamforming has been illustrated under Section-II. The Linear Array Design part has been discussed in Section-III. Mathematical algorithm of “Direction of Arrival Estimation” has been given under Section-IV. The Section-V deals with how the multiple beam formations have been executed to achieve Switched Beam technique. The details of Minimum Variance Distortionless Response (MVDR) based Beamformer have been pointed out in Section-VI. The MUSIC Algorithm as a special technique for Direction of Arrival Estimation is discussed under Section-VII. The working simulation model and its Block Diagram has been illustrated in Section-VIII. The final outcomes of the model have been framed under Section-IX. The Conclusion of the designed MVDR based Phased Array Radar Beamformer has been highlighted under Section-X.

BASICS OF BEAM-FORMING

Beamforming is an advanced signal processing technique which, when employed along with an array of transmitters or receivers will be capable of controlling the 'directionality of' or 'sensitivity to' a particular radiation pattern. This method creates the radiation pattern of the antenna array by adding the phases of the signals in the desired direction and by nullifying the pattern in the unwanted direction. The inter element phase usually adjusts the amplitudes to optimize the received signal. A standard tool for analyzing the performance of a beamformer as shown in Fig.1. In Fig. 1 the outputs of the individual sensors are linearly combined after being scaled with the corresponding weights optimizing the antenna array to have maximum gain in the direction of desired

signal and nulls in the direction of interferers. For beamformer the output at any time n , $y(n)$ is given by a linear combination of the data at M antennas, with $x(n)$ being the input vector and $w(n)$ being the weight vector.[1][8]



Fig. 1: Beamforming

$$y(n) = w^H(n) * x(n) \dots\dots (1)$$

Weight vector $W(n)$ can be define as:

$$w(n) = \sum_{n=0}^{M-1} w_n \dots\dots (2)$$

And

$$x(n) = \sum_{n=0}^{M-1} X_n \dots\dots (3)$$

For any algorithm that avoids matrix inverse operation and uses the instantaneous gradient vector $\nabla J(n)$ for weight vector up gradation the weight vector at time $n + 1$ can be written as:

$$W(n+1) = W(n) + \frac{1}{2} \mu [\nabla J(n)] \dots\dots (4)$$

Where μ is the step size parameter, which controls the speed of convergence and it lies between 0 and 1. Very small values of μ leads to the slow convergence and good approximation of the cost function; on the contrary the large values of μ may lead to a faster convergence but the stability around a minimum value may be lost.[8]

$$0 < \mu < \frac{1}{\lambda} \dots\dots (5)$$

An exact calculation of instantaneous gradient vector $\nabla J(n)$ is not possible as prior information of covariance matrix R and cross-correlation vector p is needed. So an instantaneous estimate of gradient vector $\nabla J(n)$.

$$\nabla J(n) = -2p(n) + 2R(n)W(n) \dots\dots (6)$$

$$R(n) = X(n)X^H(n) \dots\dots (7)$$

$$\mathbf{P}(\mathbf{n}) = d^*(\mathbf{n})X(\mathbf{n}) \dots \dots \dots (8)$$

By putting values from (6, 7, and 8) in (4) the weight vector is found to be

$$\begin{aligned} W_{(n+1)} &= \mathbf{W}(\mathbf{n}) + \mu[\mathbf{p}(\mathbf{n}) - \mathbf{R}(\mathbf{n})\mathbf{W}(\mathbf{n})] \\ &= \mathbf{W}(\mathbf{n}) + \mu\mathbf{X}(\mathbf{n})[d^*(\mathbf{n}) - X^H(\mathbf{n})\mathbf{W}(\mathbf{n})] \\ &= \mathbf{W}(\mathbf{n}) + \mu\mathbf{X}(\mathbf{n})e^*(\mathbf{n}) \end{aligned}$$

The desired signal can be define by three equations below:

$$y(\mathbf{n}) = w^H(\mathbf{n}) * (\mathbf{n})$$

$$e(\mathbf{n}) = d(\mathbf{n})y(\mathbf{n})$$

$$\mathbf{W}(\mathbf{n} + 1) = \mathbf{W}(\mathbf{n}) + \mu\mathbf{X}(\mathbf{n})e^*(\mathbf{n})$$

LINEAR ARRAY DESIGN

To electronically scan a radiation pattern in a given direction, it is essential to have an array of elements arranged in a specific configuration. Although linear arrays lack the ability to scan in 3-D space, the planar array scan the main beam in y direction of θ (elevation) and ϕ (azimuth). Following the design of the individual rectangular patch antenna, a linear array of eight micro strip patches with inter element spacing of $\lambda/2$ (half wavelength), where space in cm is based on the resonance frequency.[6]

The reasons for choosing inter element spacing of $\lambda/2$ are as follows: To combat fading, the inter element spacing of at least $\lambda/2$ is necessary so that the signals received from different antenna elements are (almost) independent in a rich scattering environment (more precisely, in a uniform scattering environment). In such cases, the antenna arrays provide performance improvement through spatial diversity. However, to avoid grating lobes (multiple maxima), the inter element spacing should not exceed one wavelength. However, to avoid aliasing and causing of nulls to be misplaced, the inter element spacing should be less or equal to $\lambda/2$ (the Nyquist rate). Thus, to satisfy all three conditions, the inter element spacing of $\lambda/2$ (half wavelength) is chosen.

The total amplitude radiation patterns of the 16-element linear array based on the cavity model are represented, neglecting coupling, by the product of the element pattern (static pattern) and the array factor (dynamic pattern).

DIRECTION OF ARRIVAL ESTIMATION

The objective of this part is to find the direction of the desired user is and t the interference in order to steer the main beam towards the desired user and null along the interference. We have used a linear array here. Assuming this array to be equispaced and lay out along with the z-axis and the array factor is:

$$R(\theta) = \sum_{m=-M}^M -N \frac{Ic}{I_0} \exp(j n k \cos[\theta])$$

I_n is the complex currents that are fed to array element and I_c is the reference current. Total number of elements are $2N+1$ and d is the inter element spacing of the array. To estimate the direction of arrival of a signal that impinges on the array elements, suppose a source lies at a distance that is much greater than the separation between the array elements. The induced currents in the array elements will be same, but with a successive phase the difference given by

$$\epsilon = kd \cos\theta$$

θ is angle of direction of arrival of signal with the axis of array as shown in Fig. 2.

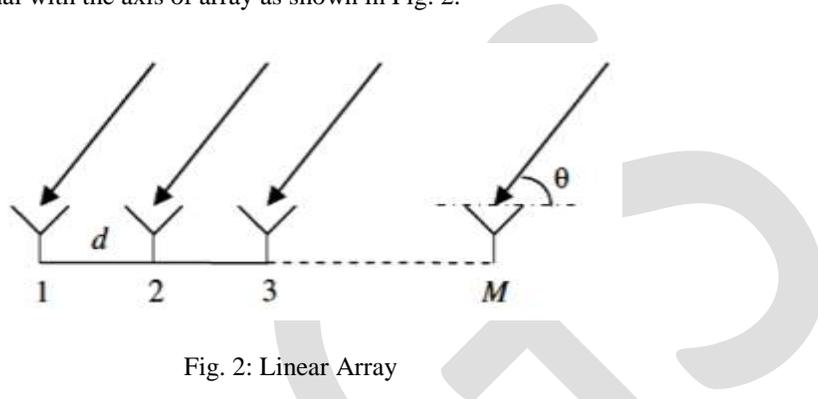


Fig. 2: Linear Array

Without loss of generality, assuming the azimuth of all incident signals on antenna array are $\frac{\lambda}{2}$, that is, all signals are from the same plane, the elevation angle of i th incident signal is i^{th} . The coordinate vector of the m th antenna in space is:

$$u_m = [[X]_m, y_m, Z_m] = [0, (m - 1)d, 0]$$

Then, the signal steer vector on array elements can be expressed as Equation steering [13]

$$R_\theta = \begin{bmatrix} 1 \\ \exp\left\{j \frac{2\pi}{\lambda} (\sin\theta_1) d\right\} \\ \exp\left\{j \frac{2\pi}{\lambda} (\sin\theta_1) (m - 1) d\right\} \end{bmatrix}$$

METHOD

This paper presents a single target and radar with 16-element antenna array. Assume that there are d desired signal sources and i interference sources simultaneously transmitting on same frequency channel, initially the antenna receives signals from different sources (user) and each element of antenna have incident wave at the same time each user have angle. Next the weight (w) will get many values (amplitude, phase). The w selects the beiger value to steer beam (desired) for the user by using the following received signal equation. [5]

$$X(n) = \sum_{j=1}^d a(\theta_j) s_j(t) + \sum_{k=1}^1 a(\theta_{int-k}) s_k(t)$$

Where $a(\theta)$ are array steering vector denoting the amplitude gain and the phase shift of the signal at the i -th antenna relative operator. $s(t)$ is signal. The beamformer system output can be written as:

$$y(n) = w^H(n) * (n)$$

Then the null-steering beam-forming problem can be formulated as:

1. Estimation DOAs by using algorithm:

There are a set of methods, which are used to estimate DOA such as the Multiple Signal Classification (MUSIC) method is the first of the high-resolution algorithms for correcting the underlying data model of narrow band signals in additive noise. The next algorithm is Minimum Norm-Method (MNM) and ESPRIT using to find DOAs. An expression for the power spectrum is given by,

$$P(\theta) = \frac{1}{a_1^H \theta^H R^{-1} a_1 \theta} P(\theta)$$

Where: R array correlation matrix.

The estimated DOAs are to be classified for this type of validation process which separate out desired signal from

Interferences are carried out. After the validation process if, it is found that there is only single desired user and others

are interferences then the null steering mode is invoked. If it is found that there is more than one desired user then multi-beam-forming mode is invoked. The optimization of two vectors comprises of two techniques

- MVDR/ CAPON
- LCMV

MINIMUM VARIANCE DISTORTIONLESS RESPONSE (MVDR) BEAMFORMER

This is the case in which the signal is nonrandom but unknown. In the initial discussion, we consider the case of single plane-wave signal. [2]

The frequency-domain snapshot consists of signal plus noise,

$$X(\omega) = X_s(\omega) + N(\omega) \dots \dots \dots (1)$$

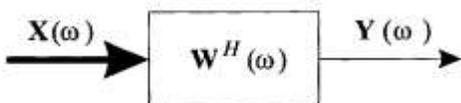


Fig. 3 Matrix processor

The signal vector can be written as

$$X_s(\omega) = F(\omega)v(\omega;K_s), \dots\dots\dots (2)$$

Where, $F(\omega)$ is the frequency domain snapshot of the source signal and $v(\omega;K_s)$ is the array manifold vector for a plane wave with wave number K_s . The noise snapshot, $N(\omega)$ is a zero-mean random vector with spectral matrix,

$$S_n(\omega) = S_c(\omega) + \sigma_n^2 L \dots\dots\dots (3)$$

Later we will add the assumption $N(\omega)$ that is a zero-mean circular complex Gaussian random vector.

We process $X(\omega)$ with a matrix operation $W^H(\omega)$ as shown in Figure 3. The dimension of $W^H(\omega)$ is $1 \times N$.

The first criterion of interest is called the distortionless criterion. It is required that, in the absence of noise,

$$Y(\omega) = F(\omega) \dots\dots\dots (4)$$

For any $F(\omega)$. Under this constraint, we wish to minimize the variance of $Y(\omega)$ in the presence of noise. Thus, we write

$$Y(\omega) = F(\omega) + Y_n(\omega) \dots\dots\dots (5)$$

and minimize $E\{[Y_n(\omega)]^2\}$

The constraint of no distortion implies

$$W^H(\omega)v(\omega;K_s) = 1 \dots\dots\dots (6)$$

The mean square of the output noise is,

$$E\{[Y_n(\omega)]^2\} = W^H(\omega)S_n(\omega)W(\omega) \dots\dots\dots (7)$$

We want to minimize $E\{[Y_n(\omega)]^2\}$ subject to the constraint in (6)

This second criterion is called the minimum variance unbiased estimate criterion. Here we require that $Y(\omega)$ be the minimum variance unbiased estimate of $F(\omega)$. This implies [2]

$$E\{Y(\omega)\} = F(\omega) \dots\dots\dots (8)$$

Thus, using (5) and (8),

$$E[Y(\omega)] = E[F(\omega)] + E[N(\omega)]$$

$$= E[F(\omega)]$$

For any $F(\omega)$. This equality implies

$$W^H(\omega)v(\omega; K_s) = \mathbf{1}$$

which is identical to the constraint in (6).

MUSIC ALGORITHM

While several algorithms for AOA estimation are available using the measurements S_i or S_{ij} (e.g. MUSIC [4]), our goal is to obtain general design guidelines for the antennas used at the radar receiver. Analysis in this section adopts the Fisher information (F) [5], [6] to evaluate the accuracy of a generic AOA estimation algorithm in relation to some important design parameters. The value F measures the amount of information that a signal carries about an unknown parameter. In the case discussed, the signals are the S_{ij} values, while the parameter to estimate is θ . The Fisher information is [7]

$$F_{ij}(\theta) = E \left\{ \left[\frac{\partial}{\partial \theta} \log f_{ij}(s_{ij}; \theta) \right]^2 \right\}, \dots \dots \dots (1)$$

Where $f_{ij}(s_{ij}; \theta)$ is the probability density function (pdf) that describes the measurements S_{ij} . Assuming independent and identically distributed (i.i.d) noise components N_{ij} with Gaussian distribution $N(0, \sigma_{r_{ss}}^2)$, it is possible to demonstrate that the total amount of Fisher information available from a system with N_r antennas is

$$F(\theta) = \frac{1}{\sigma_{r_{ss}}^2} \sum_{\{i,j\} \in C} \left[\frac{\partial(G_i - G_j)}{\partial \theta} \right]^2$$

$$= \frac{1}{\sigma_{r_{ss}}^2 \left[N_r \sum_{i=0}^{N_r} \left(\left[\frac{\partial G_i}{\partial \theta} \right]^2 \right) - \left(\sum_{i=0}^{N_r-1} \left[\frac{\partial G_i}{\partial \theta} \right] \right)^2 \right]} \dots \dots \dots (2)$$

Where C denote the set of the $N_r(N_r - 1)/2$ distinct antenna pairs $\{i, j\}$

➤ AOA Estimation Bound

The Fisher information $F(\theta)$ expresses the theoretical limit achievable when estimating θ . If T is an unbiased estimator for θ , the inverse of $F(\theta)$ bounds the minimum variance of the estimation error

$$Var[T(X)] \geq F^{-1}(\theta) \dots \dots \dots (3)$$

The inequality, known as the Cramér-Rao Bound (CRB) [2], is a limit that applies to any estimator that uses measurements S_{ij} to compute θ . The Fisher information and the CRB depend on the gains G_i of the antennas used in the system. To obtain general design guidelines, we model the gain of a generic patch antenna using a cardioid shaped function with exponent $m \geq 1$, and maximum gain G_{max} [7]

$$G(\theta) = G_{max}^m \max\left(\frac{1+\cos(\theta)}{2}\right) = G_{max}^{2m} \max\left(\cos\left(\frac{\theta}{2}\right)\right) \dots\dots\dots (4)$$

As shown in Fig. 2a, larger values of the exponent m correspond to more directive antennas. Substituting (4) into (2), we obtain an analytical expression for the CRB

$$N_r \sum_{i=0}^{N_r} \left[\tan\left(\frac{\theta - i\Delta}{2}\right)^2 - \left(\left(\sum_{i=0}^{N_r-1} \tan\left(\frac{\theta - i\Delta}{2}\right) \right)^2 \right) \right] \dots\dots\dots (5)$$

Where $CRB(\theta) = F^{-1}(\theta)$, and $\Delta = 360^\circ/N_r$. Figure 2b shows the CRB for a system with $N_r = 2$ faces and $m = 2$. Note the different values of the CRB for different θ values. The minimum error is achieved for angles $\theta = 0^\circ$ and 180° , while larger estimation error are to be expected for angles close to $\theta = \pm 90^\circ$. The error can be understood by observing the function that describes the gain difference between two equispaced faces (see Fig. 2c). The function $G_1(\theta) - G_2(\theta)$ changes abruptly for angles close to 0° and 180° : small variations of the angle determine large variation in the gains' difference. Since the Fisher information depends on the derivative of $G_1(\theta) - G_2(\theta)$, this condition corresponds to a lower estimation error for θ . On the other hand, the estimation error increases for angles close $\pm 90^\circ$, where $G_1(\theta) - G_2(\theta)$ has a less steep slope.

BLOCK DIAGRAM

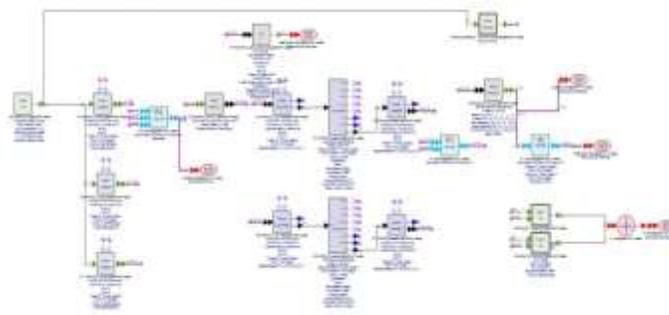


Fig. 4 Block Diagram to generate Switched Beam

The above block diagram includes:

- **LFM** waveform generator which will generate Linear Frequency Modulation.
- **Radar_Tx_DBS_2D** (Digital Beam Synthesis) this model is used to synthesize the main lobe along the direction determined by theta and phi.
- **Math Lang** (Math Language Model) model uses Math Language equations to process input data and produce output data.

- **Radar_MultiCH_Tx** this model is the behaviour simulation model of multi-channel transmitter. It's a timed model which is used to represent analog/RF circuit digital implementation that involves the notion of time in its behaviour.
- **Radar_Tx_Synthesis** this model is used to synthesis the electric wave from plane array to far field observation point. Both rectangle array of equally spaced elements and user defined phase shift are supported. x_i is the i th input signal, $y(t)$ is the output signal, A_i is the phase to be shifted for the i th array element, N is the number of input signals.

$$y(t) = \sum_{i=1}^N x_i(t) * A_i(t)$$

- **Radar_TargetEcho** this model is to generate the echo of the moving target under the Cartesian and Spherical coordinate. The typical RCS values of kinds of targets are given by the parameter. The user defined RCS values is support too.
- **Radar_PhaseShift** this model is used to add phase shift from the far electric field observation point to digital array antenna. Both rectangle array of equally spaced elements and user defined phase shift are supported. $X(t)$ is the input signal, $y_i(t)$ is the i th output signal, A_i is the i th phase to be shifted, then

$$y_i(t) = x(t) * \exp(j * A_i)$$

- **Radar_MultiCH_Rx** this model is the behaviour simulation model of multi-channel receiver from RF to baseband. The model input is a timed input which is used to represent analog/RF circuit digital implementation that involves the notion of time in its behaviour.
- **Radar_Tx_DBS_Measurement** this model is used to calculate the radiation pattern of the transmitter rectangle array antenna. Theta or phi is linear swept to calculate the corresponding square of voltages to show the radiation pattern with theta or phi.

$$Output(k) = \left(abs \left(\sum_{i=1}^{PRI * Sampling Rate * Num of Antx * Num of Anty} \sum_{j=1}^{PRI * Sampling Rate * Num of Antx * Num of Anty} [input(j)(i) * Rotation(j)(k)] \right)^2 * \exp(SweepStart + k * SweepStep) \right)$$

Description:-

This block diagram shows how the switched beam is generated and target is being detected. A LFM waveform generator is used which is given to as an input to Radar_DBS_Tx which will synthesize the main lobe along the direction of theta parameter is set as number of element used sixteen and width between antenna is 0.5, this block diagram have used three Tx_DBS having three different theta values to generate a switched beam which is shown in (4.2 result) Fig. 3. A Mathlang block is used where addition of the three Tx_DBS is processed and the output is given to the Radar_MultiCH_Tx which is processing the input from baseband to RF used a 79 GHz carrier frequency, the RF output is passed through Radar_Tx_DBS_Measurement where θ is linearly swept to calculate the corresponding square of voltages to show the radiation pattern with θ by adding a sink to the output of Radar_Tx_DBS_Measurement. The RF output from the Radar_MultiCH_Tx is passed through two Radar_TargetEcho where the RCS type is set to automobile, again a mathlang block is used to adding the two output data from each Radar_TargetEcho. Then it is again processed through Radar_MultiCH_Rx which does the down conversion of incoming RF signals, the output is passed through an Mathlang block where the processing is done with the help of the program. After digital signal processing, the detection of two targets is achieved where the nearer target is situated at 100 M and farther target is positioned at 200 M as shown in Fig.6.

RESULTS

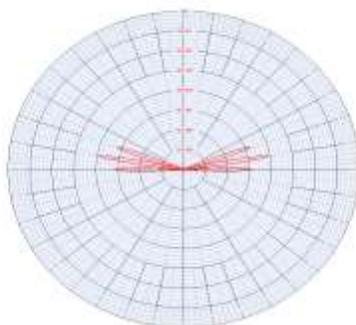


Fig. 5 Switch Beam is generated

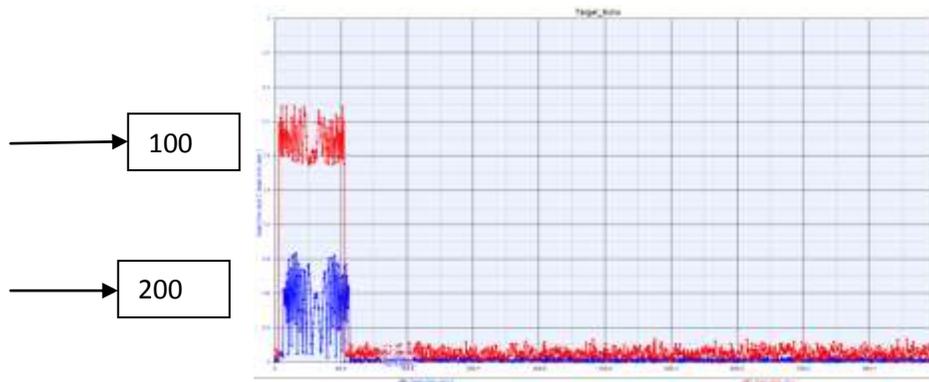


Fig. 6 Target is being Detected

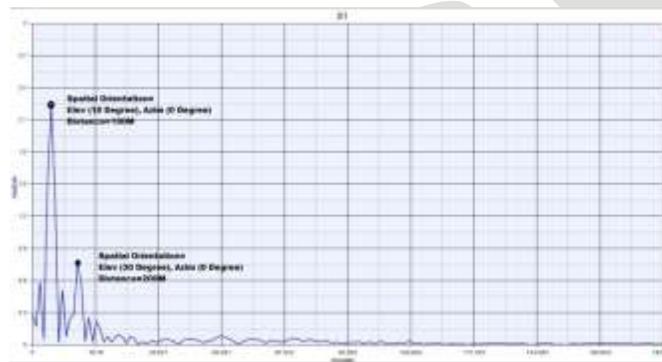


Fig. 7 Output of Pulse Compression

CONCLUSION

The paper includes the latest technology on vehicular radar having *Target detection* mode. Radar is with MULTI-BEAM AND MULTI-RANGE categories. On road situation the vehicular radar is able to detect multiple targets with broad antenna beam which is simulated using the concept of switching beams of Antenna array (i.e., MVDR based target detection). Multiple beams are formed at the radar transmitter using multiple DBF functions which are added together and further passed to the Uniform Rectangular Array (URA) through up-conversion blocks. Two Road vehicles are simulated at the channels and received signals are passed through MVDR processing for vehicles detection and both the vehicles are successfully detected.

Further this may be upgraded with a Target Tracking mode.

REFERENCES:

- [1] Balasem. S.S, S.K.Tiong, S. P. Koh, "Beamforming Algorithms Technique by Using MVDR and LCMV" Vol (2), Issue (5), May, 2012.
- [2] Harry L. Van Trees, "Optimum Array Processing," Part IV of Detection, Estimation, and Modulation Theory. Canada: 2002.
- [3] H. Vincent Poor, "An Introduction to Signal Detection and Estimation", Springer, 1989.
- [4] Demba E. Ba, Dinei Florencio and Cha Zhang, "Enhanced MVDR Beamforming For Arrays of Directional Microphones", IEEE International Conference on Multimedia and Expo, July, 2007.
- [5] Compton R. "Adaptive antennas concept and performance". Prentice Hall, 2011.
- [6] Y. Bah, ceci and T. M. Duman, "Combined Turbo Coding and Unitary Space-Time Modulation," IEEE Trans. Commun., Vol. 50, No. 8, Aug. 2002. pp. 1244-1249.
- [7] G. Giorgetti, S. Maddio, A. Cidronali, S. K. S. Gupta and G. Manes, "Switched Beam Antenna Design Principles for Angle of Arrival Estimation", University of Florence, I-50139 Florence, ITALY, 2009.
- [8] Rana Liaqat Ali, Anum Ali, Anis-ur-Rehman, Adaptive Beamforming Algorithms for Anti-Jamming. International Journal of Signal Processing, Image Processing and Pattern Recognition Vol. 4, No. 1, March. 2011

Liner Material Thermal Analysis for Diesel Engines

Dineshkumar. S^[1], Sriprashanth.V^[2]

¹ Assistant Professor, Department of Mechanical engineering, JKKM College of technology,
TN Palayam, India, dineshjk@gmail.com

² PG Student, Department of Mechanical engineering, JKKM College of technology,
TN Palayam, India, sriprashanth.v@gmail.com

ABSTRACT- It is observed that approximately 50% of the heat input is converted into work in an IC engine particularly in diesel engine. About an equal amount of heat is carried away by cooling system and the remaining heat is lost in exhaust and friction. The main objective of this project is to study the performance of the diesel engine by changing the cylinder wall i.e sleeve material. About 2500°F temperature is produced while combustion process in internal combustion engine with diesel as fuel. In this combustion process approximately 35% of heat is lost through the cylinder walls; heat transfer in excess to the coolant will also reduce the engine performance. The scope of this project is to select proper material for the cylinder liners, so that the heat loss through liner wall in IC engine can be reduced. To achieve this low thermal conductivity materials with required mechanical properties is considered and compared.

Keywords: Wet liners, liner material, Inconel 713 C, grey cast iron, combustion, mechanical properties, CFD

INTRODUCTION

Nowadays the main scope of the automotive industry is to optimize, the engine design, in order to meet the reduction in heat loss and at the same time to maintain the engine performance at high levels. To this scope, computer simulation engine models are extensively used to investigate how each engine parameter affects engine performance and efficiency. As computer power increases, the role of Computational Fluid Dynamic (CFD) models is becoming more and more significant, using detailed sub-models for the various processes and finer grids together with high quality dynamic mesh techniques.

In Internal Combustion engine, heat transfer from the working gas to the cooling system of a conventional Diesel engine accounts for up to 30% of the fuel energy. About 50% of this energy is lost through the piston and 30% through the head. In general, the combustion chamber of an internal combustion engine is formed by cylinder wall, head and piston, where the temperature distributions are different for each surface. Typically, the temperature of each surface is assumed to be a constant, where this is not consistent with the actual situation occurring on the surface of the combustion chamber. A cylinder liner or also known as sleeve is a cylindrical component that is placed in an engine block to form a cylinder. It is an important part because it gives a wear protective surface for piston and piston rings. There are two types of liner which are wet liner and dry liner. Wet liner will contact with coolant while dry liner will contact directly with cylinder block. Among important functions of cylinder liners are to form a sliding surface, to transfer heat and to compress a gas.

For the scope, five material are considered such as Grey cast iron ASTM grade 60, Inconel 713C and Cast SS17-PH, H1100, Carbon steel AISI 1095, Nickel aluminium bronze alloy. The liner 3D modeling has been done in Solid Works 2012. The reduction in heat loss and at the same time to maintain the engine performance at high levels. To this scope, computer simulation engine models are extensively used to investigate how each engine parameter affects engine performance and efficiency. As computer power increases, the role of Computational Fluid Dynamic (CFD) models is becoming more and more significant, using detailed sub-models for the various processes and finer grids together with high quality dynamic mesh techniques.

METHODOLOGY

Methodologies of this study starts with the product selection (wet liners) and continue with problem identification it refers to the problem in excess amount of heat loss through liners, collection of geometric data from an already existing diesel engine cylinder wet liners and goes to creation of model using solid works software finally it ends with the CFD analysis to optimize



PROBLEM IDENTIFICATION

Almost about 25 to 35 percentages of chemical energy in internal combustion engines ,at best can transform in the thermal energy into mechanical energy, about 35 percent of the heat generated is lost to the cooling medium, remainder being dissipated through exhaust and lubricating oil.

GEOMETRICAL DATA & MODELLING

Geometrical Data

For the scope a 5bhp four stroke Diesel engine with direct injection system is selected with the compression ratio of 16.5:1 with 1500rpm. The bore and stroke length is 80mm X 110mm and medium of cooling is water.

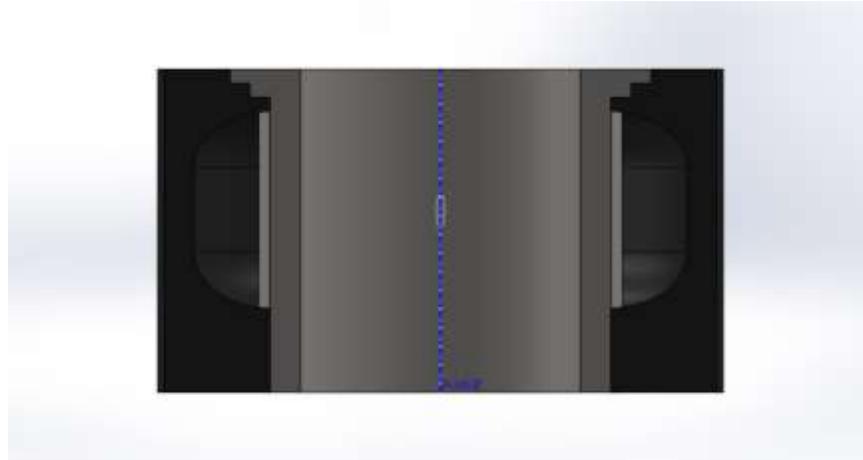


Fig 1 : Section view of Cylinder wet liner with cylinder

3D modeling

Modeling of cylinder wet liner are done in solid works, when compared to other software solid works modeling are more user-friendly The Cylinder liner with 80mm inner dia with 7.5mm thickness are considered. Since it is wet liners the coolant passage width is taken as 19 mm and the length is 75 percentage of stroke length which is 85mm

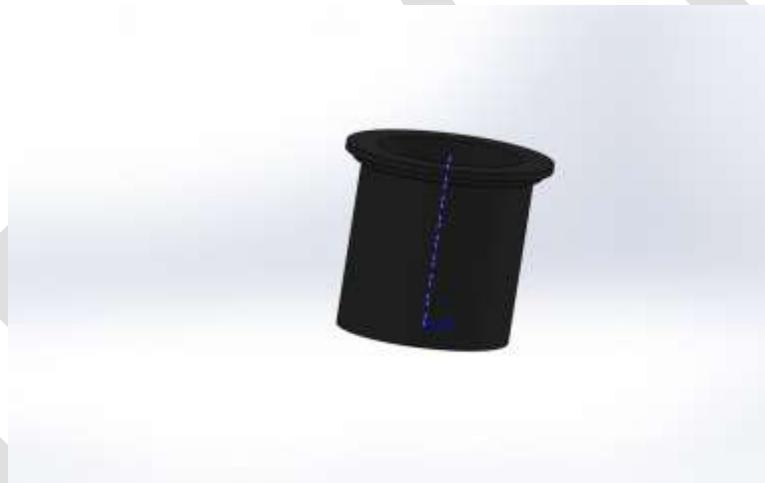


Fig 2 : 3D view of cylinder liner in solid works

MATERIAL PROPERTIES

The aim of this project is to find the alternate material for the internal combustion engine cylinder liners, so that the engine heat loss in the cylinder liner will reduce considerably and performance of the engine will increase. For these purpose similar materials (Grey cast-iron Grade60, Cast SS17, Inconel 713C, Carbon steel AISI 1095, Nickel Aluminium bronze alloy) with considering the thermal conductivity and working temperature has been.

Grey CI grade 60

- Density - 7100 Kg/m³
- Hardness - 250 HV
- Tensile Strength - 430 Mpa
- Yield Strength - 276 Mpa
- Youngs Modulus - 206 Gpa
- Max service temperature - 551 °C
- Thermal conductivity - 46 W/mK

Inconel 713C

- Density - 8000 Kg/m³
- Hardness - 420 HV
- Tensile Strength - 990 Mpa
- Yield Strength - 900 Mpa
- Youngs Modulus - 216 Gpa
- Max service temperature - 980 °C
- Thermal conductivity - 17 W/mK

Cast SS 17 PH,H1100

- Density - 7900 Kg/m³
- Hardness - 420 HV
- Tensile Strength - 1000 Mpa
- Yield Strength - 914 Mpa
- Youngs Modulus - 207 Gpa
- Max service temperature - 320 °C
- Thermal conductivity - 19 W/mK

Nickel Aluminum Bronze alloy

- Density - 7500 Kg/m³
- Hardness - 260 HV
- Tensile Strength - 660 Mpa
- Yield Strength - 360 Mpa
- Youngs Modulus - 140 Gpa
- Max service temperature - 650 °C
- Thermal conductivity - 42 W/mK

Carbon Steel AISI 1095

- Density - 7500 Kg/m³
- Hardness - 260 HV
- Tensile Strength - 660 Mpa
- Yield Strength - 360 Mpa
- Youngs Modulus - 140 Gpa
- Max service temperature - 650 °C
- Thermal conductivity - 50 W/mK

CFD ANALYSIS

CFD analysis is carried out to optimize which material will transfer less heat energy to the surrounding by means of the following steps.

1) Model Creation

The Model is created in Solid works for the above discussed dimensions and it is imported in ANSYS.

2) Mesh Generation

After importing the model to the ANSYS, fine meshing is done, the component 2D view and right side of the component is considered for meshing, this is done in order to reduce the processing time and since the liner is a cylinder shaped any one side can be considered for processing.

3) Applying boundary conditions

After fine meshing is done the boundary conditions are applied to this system, as per the working process there are two similar boundary condition i.e. the linear inside and outer side where the heat transfer from working area to the coolant through conduction and convection. The rest of the boundary conditions are taken from the Materials properties as stated above.

4) Initialization

The solver functioning areas its initialization values in constant working temperature at max 1200 °F and with forced convection to the water.

5) Solution converged plot

In solver stage optimum results computed with the solution converged plot. In the below shows fig's, the solution converged plot, which is taken from ANSYS/CFD is shown for three different materials.

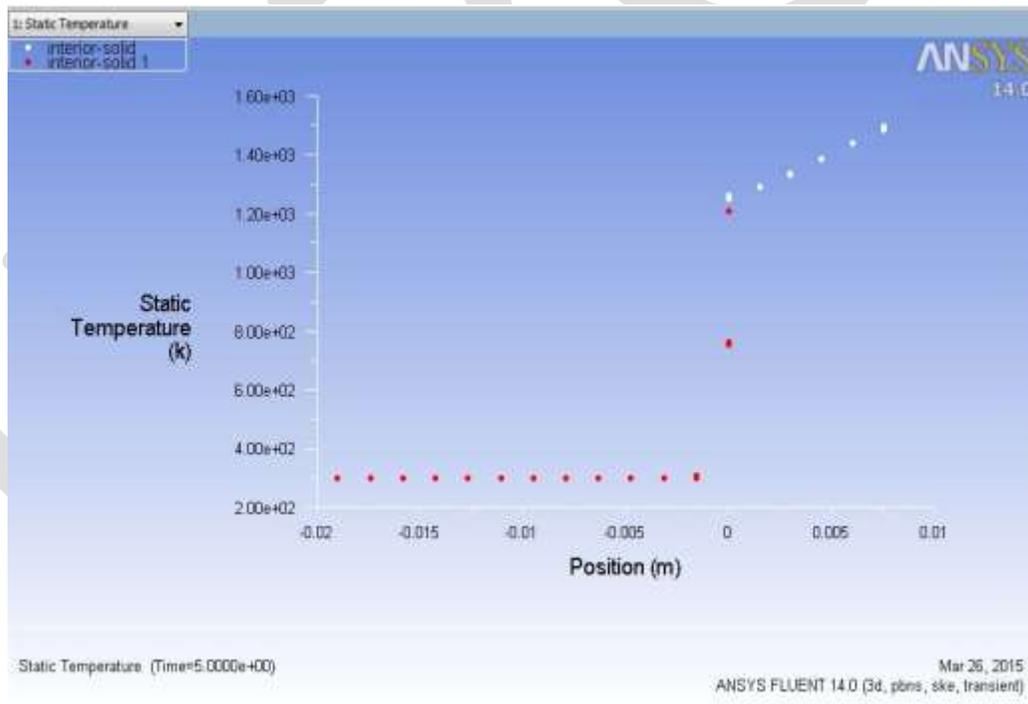


Fig 3 : Grey CI grade 60

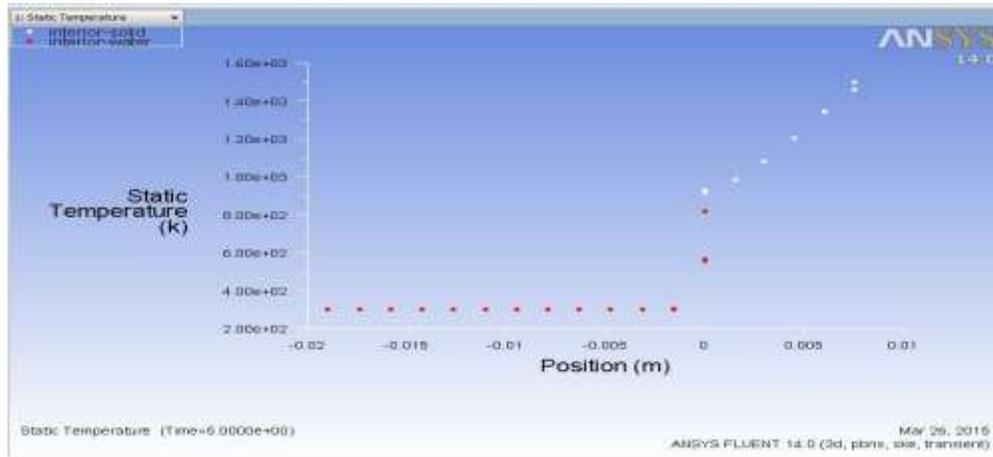


Fig 4 : Cast SS17 PH

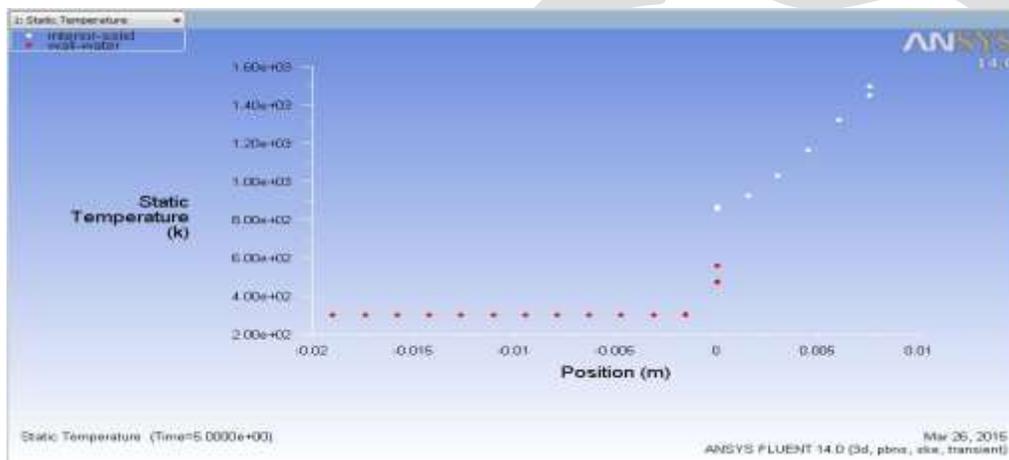


Fig 5 : Inconel 713C

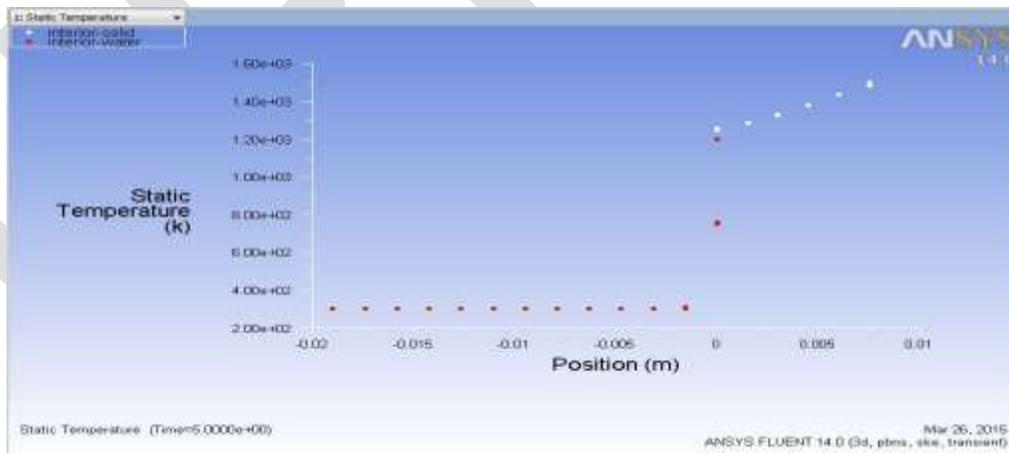


Fig 6 : Carbon steel AISI 1095

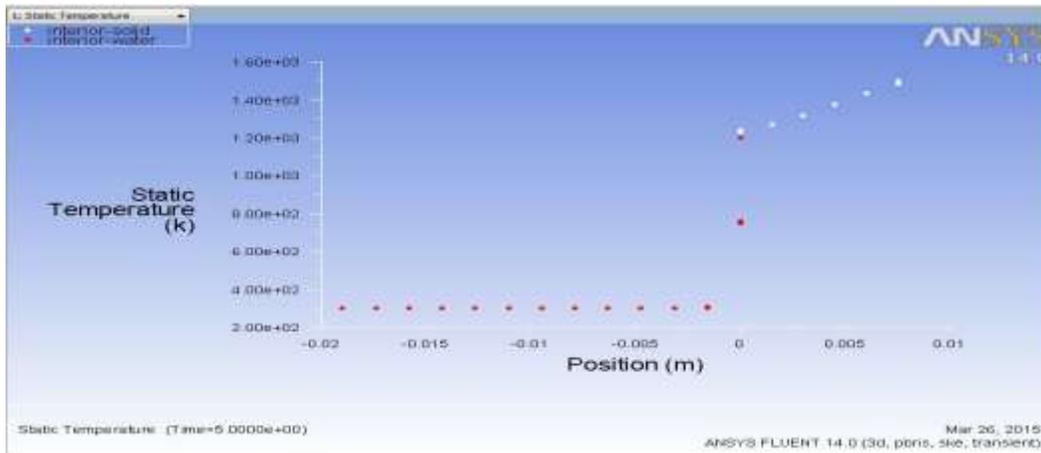


Fig 7 : Nickel Aluminium bronze alloy

From the above plotted result the Inconel 713C material transfer heat in lesser amount when compared to Grey CI grade 60 and Cast SS17PH , Nickel aluminium bronze alloy, Carbon steel AISI 1095materials.

Table 1. Comparison table for Different materials for temperature

Materials	Processing temperature	Convection Temperature
	°K	°K
Grey Cast Iron ASTM 60	1500	1128
Cast SS17 PH	1500	820
Inconel 713C	1500	610
Carbon steel AISI 1095	1500	1100
Nickel Aluminium bronze alloy	1500	1090

RESULTS

In table 1 comparison for five materials for temperature is shown. The counter plot images for component for three different materials are shown below

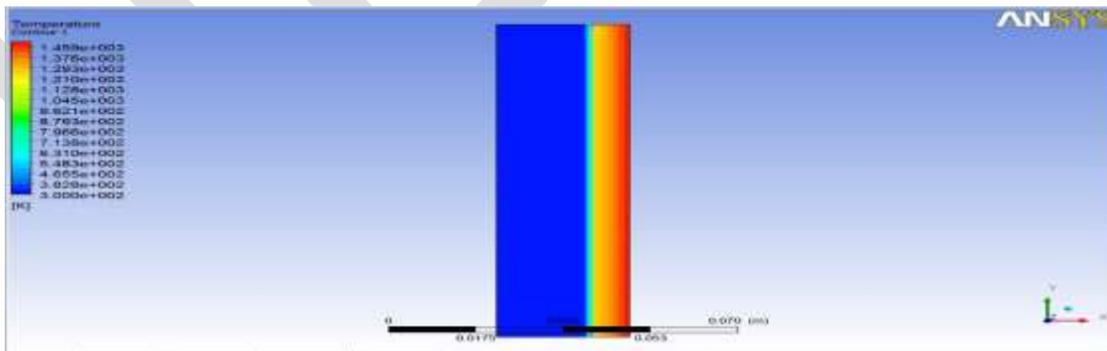


Fig 8 : counterplot for Grey CI grade 60

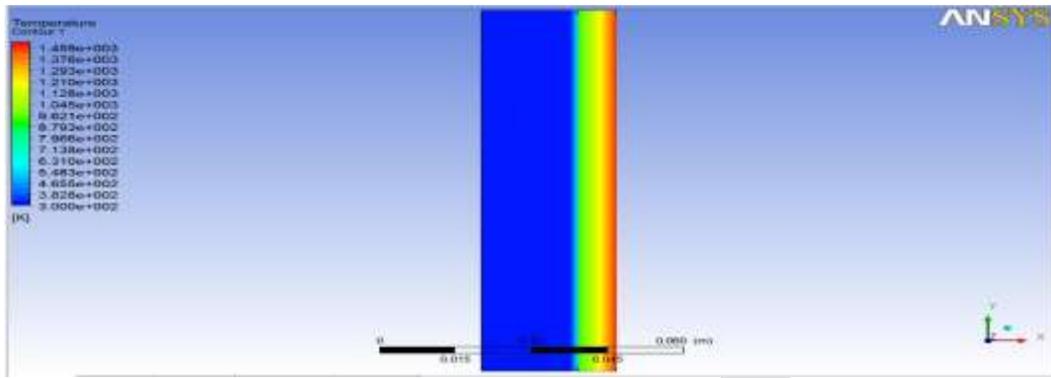


Fig 9 : counterplot for Cast SS17 PH

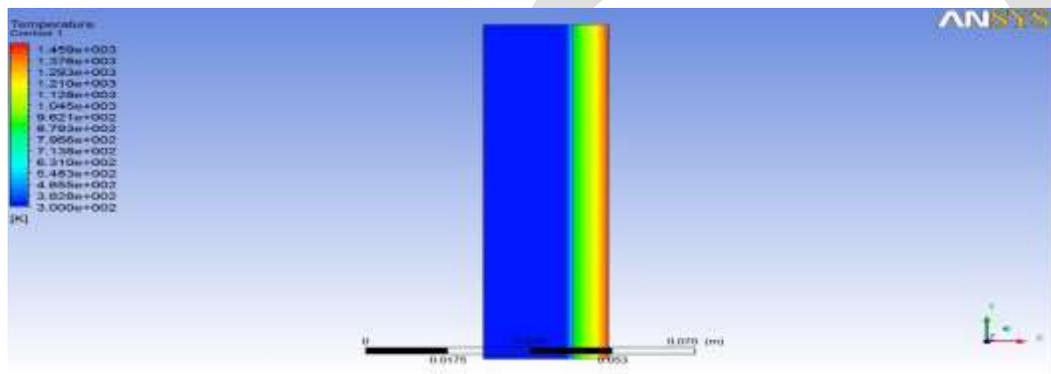


Fig 10 : counterplot for Inconel 713C

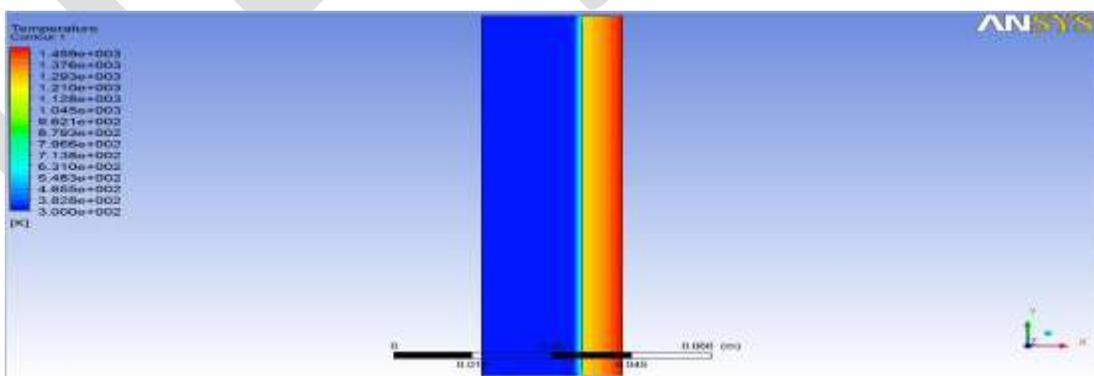


Fig 11 : counterplot for Carbon steel AISI 1095

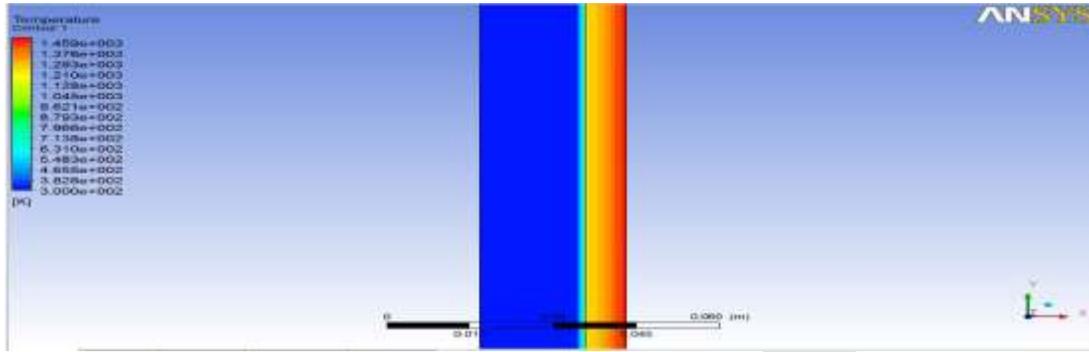


Fig 12 : counterplot for Nickel Aluminium bronze alloy

From the above fig's its is shown that the temperature distribution for Inconel 713C is minimum when compared to other two materials.

Table 2. Table of Mechanical and Thermal factors

Materials		Unit	Grey CastIron ASTM grade 60	Inconel 713C	Carbon steel AISI 1095	Nickel Aluminium bronze alloy	Cast SS17 PH
Mechanical factors	Tensile Strength	Mpa	430	990	1070	660	1000
	Yeild Strength	Mpa	276	900	635	360	914
	Youngs Modulus	Gpa	206	216	215	140	207
Thermal factors	Thermal Conductivity	W/mK	46	17	50	42	19
	Maximum service temperature	°C	551	982	1465	1100	320

Mechanical Factors

The normal operating pressure is around 5 Mpa to 9 Mpa, but this normal operating pressure depends on air fuel mixture also. In some extreme conditions, the pressure may also exceed 12 Mpa. So it is important that the cylinder should withstand the high pressure



Fig 13 : Mechanical Factors for Grey cast iron ASTM 60



Fig 14 : Mechanical Factors for Cast SS17 PH

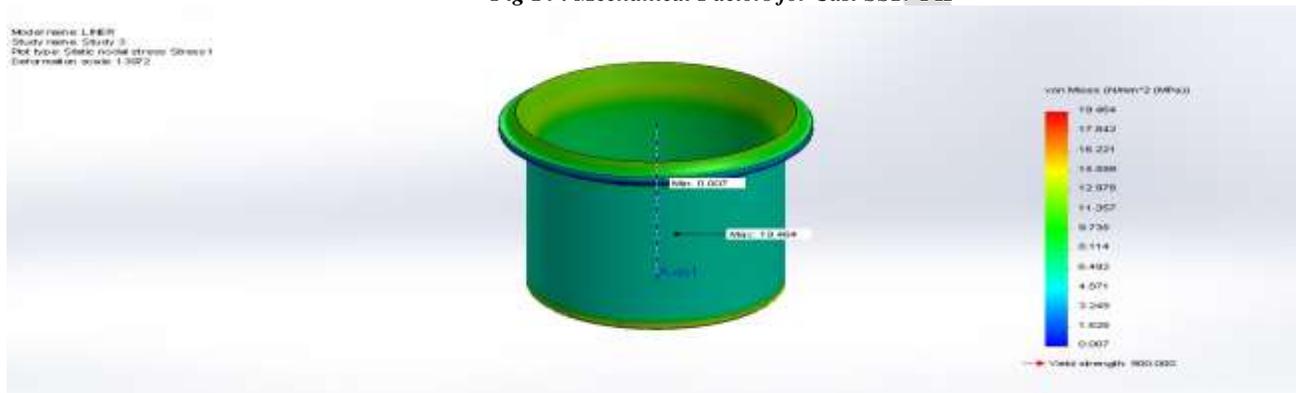


Fig 15 : Mechanical Factors for Inconel 713C

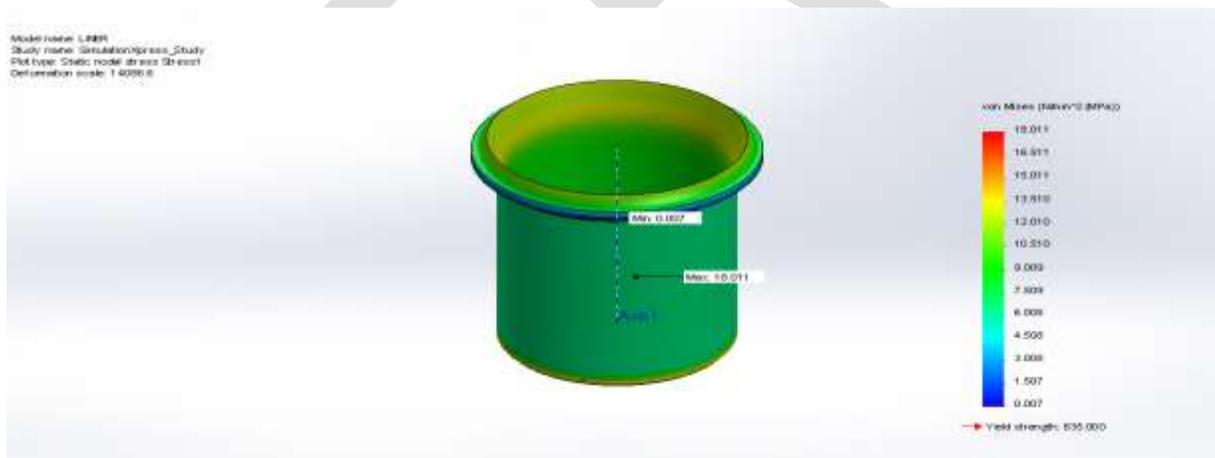


Fig 16 : Mechanical Factors for Carbon steel AISI 1095

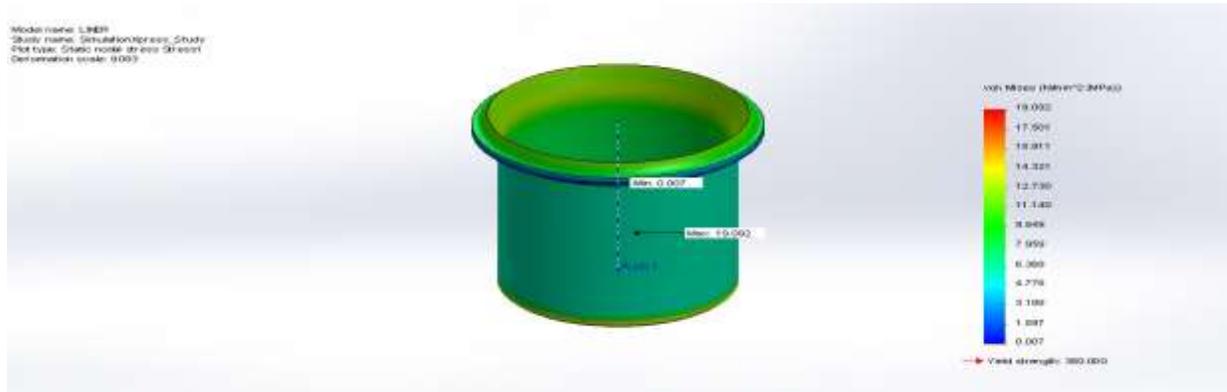


Fig 17 : Mechanical Factors for Nickel aluminium bronze alloy

The pressure analysis is done in solidworks 2012 for the selected materials and the result are tabulated below. According to the tabulation all the material is capable of withstanding the 12.5 Mpa maximum pressure. But when compared the thermal analysis also, then Inconel 713C is best suited material for liners.

Table 3. Result of minimum and maximum pressure

Materials	Minimum	Maximum
	Mpa	Mpa
Grey cast-iron ASTM 60	0.0073	17.32
Cast SS17 PH H1100	0.0069	18.36
Inconel 713C	0.0065	19.46
Carbon steel AISI 1095	0.0070	18.011
Nickel Aluminium bronze alloy	0.0071	19.092

CONCLUSION AND DISCUSSION

1) Mechanical factors

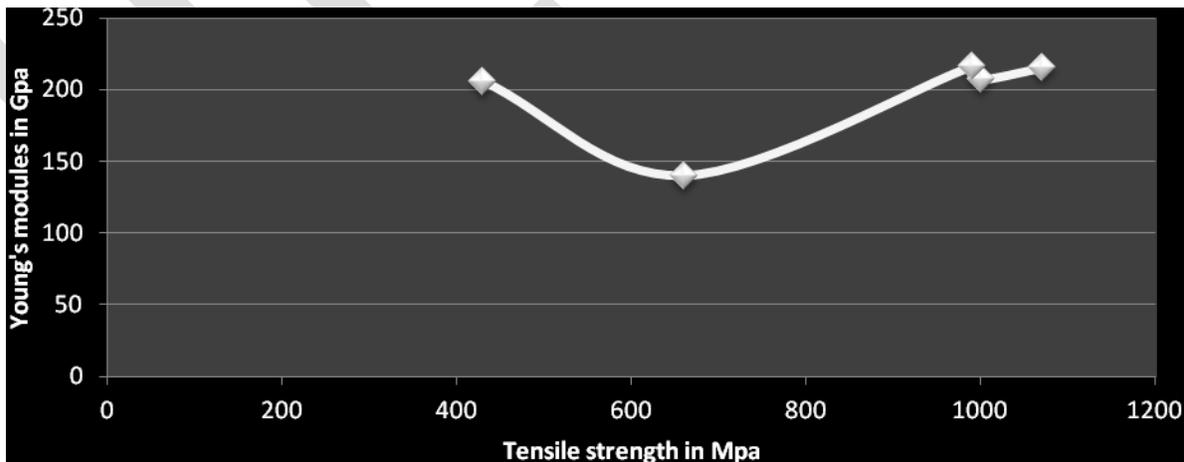


Fig 18 : Youngs modulus Vs Tensile strength

From the above graph and tabulation the tensile strength of materials Inconel 713C and carbon steel 1095 is higher than the grey cast iron Grade 60, nickel aluminum bronze alloy, and Cast ss17 PH, H1100 materials. So it is well shown that both the Carbon Steel and Inconel 713C can withstand the high pressure.

2) Thermal factors

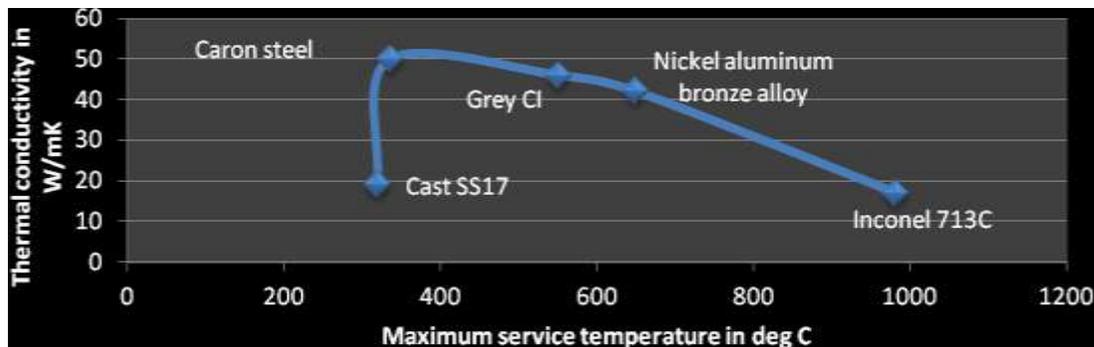


Fig 19 : Thermal conductivity Vs Maximum service temperature

It is observed that the operating temperature may vary from 550 °K to 1700 °K, so the material with higher service temperature can be used. From the above graph it is shown that the Inconel 713C material has the operating temperature 850 to 980 °C with thermal conductivity of 17 W/mK, therefore Inconel 713C material will transfer the lesser amount of heat when compared to other materials.

It is concluded based on the above analysis that the Inconel 713C material can transfer lesser amount of heat energy, that means the excess heat energy may be converted into work done. In the mean while it should be noted that the other important component of the engine like piston, connecting rod, cylinder head, etc should also be considerably designed.

REFERENCES:

- [1] AhmadFakaruddin.M.F, MohdHafiz & Karmegam. (2012), 'Materials selection for wet cylinder liner', IOSR Journal of Engineering (IOSRJEN), Vol 2, Issue 9, PP 23-32
- [2] Yu-kang zhou, jiu-gen he and F. G. Hammitt (1981), 'cavitation erosion of cast iron diesel engine liners', Wear, 76 (1982) 329 – 335, Vol 1.
- [3] Anbumani.K and Ajit Pal Singh,(2010), 'Performance of mustard and neem oil blends with diesel fuel in c.I. Engine', APRN Journal of engineering and applied science, Vol 5, No 4
- [4] Ariz Ahmad,(2014), 'Analysis of Combustion Chambers in Internal Combustion Engine', Gopal Science and Technology Journal, Vol 2, No 1, PP 12-21
- [5] Branco. C.M., V. Infante, A. Sousa e Brito, R.F. Martins (2001), 'A failure analysis study of wet liners in maritime diesel engines', PERGAMON-Engineering Failure Analysis, Vol 9
- [6] John Lenny Jr.,(2011), 'Replacing the Cast Iron Liners for Aluminum Engine Cylinder Blocks: A Comparative Assessment of Potential Candidates'
- [7] Abani.N, S Bakshi and Rvrvikrishna,(2007), 'Multi-dimensional modelling of spray, in-cylinder air motion and fuel-air mixing in a direct-injection engine', Vol 32, Part 5, PP 597-617
- [8] Bonollo.F, A. Moret, S. Gallo, C. Mus,(2003), 'Cylinder liners in aluminium matrix composite by centrifugal casting', International Seminar on experimental techniques and design in composite materials, Vol 6
- [9] Gustof.P, A. Hornik, (2008), 'Determination of the temperature distribution in the wet cylinder sleeve in turbo diesel engine', AMME Journal of achievements in materials and manufacturing engineering, Vol 27.
- [10] Ravindra R. Navthar,(2012), 'Design and Analysis of Cylinder and Cylinder head of 4-stroke SI Engine for weight reduction', International Journal of Engineering Science and technology, Vol 4, No 3
- [11] Yahia H. Ahmad and Adel M. A. Mohamed,(2014), 'Electrodeposition of Nanostructured Nickel-Ceramic Composite Coatings', International journal of Electrochemical Science, Vol 9
- [12] John J. Truhan a, Jun Qu b, Peter J. Blaub,(2005), 'A rig test to measure friction and wear of heavy duty diesel engine piston rings and cylinder liners using realistic lubricants', Tribology International, Vol 38, PP 211-218
- [13] Dr Ing.Gotthard, DI.Emst Gschweii,(2010), 'Development of a calculation Procedure Including fluid structure coupling to assess cavitation efforts', Company for internal combustion engines and instrumentation Ltd

Database Driven Reverse Mapping:-Dictionary

Vaishali Chande, Snehal Pawar, Akanksha Goel

Department of Information Technology, ISB&M School of Technology, Pune 412115, Maharashtra

vaisuchande12@gmail.com, 9175825816

Abstract— In this paper, the design and put into effect of a reverse dictionary is being described. Uncharacteristic of a traditional forward dictionary, which maps from single meaningful unit of language to their definitions, a reverse dictionary perform an action a user input a small group of words forming a unit describing the desired concept, and go back a set of candidate single meaningful unit of language that satisfy the input phrase. This work has significant application not only for the general public, particularly those who work closely with words, but also in the general field of conceptual search. This present a set of algorithms and the thing caused or produced by something else of a set of experiments make with no errors the retrieval accuracy of the methods on the runtime response time performance of its implementation. The experimental results show that the approach of the system can provide significant improvements in carry out scale without sacrificing the quality of the result. The experiments comparing the quality of its approach to that of currently available reverse dictionaries show that of it approach can provide significantly higher quality over either of the other currently available implementations. We facilitate reverse dictionary in which for any phrase or word the appropriate single word meaning is given. This system also facilitates to provide the relevant meaning even if that word not able to be used in the database. It will also produce instant output for the user inputs.

Keywords— Dictionaries, Thesauruses, Search Process, Web based Services, Clustering.

INTRODUCTION

"This dictionary lists occurring words and phrases that can be found in reverse speech. It is not complete and never will be. Updated regularly, it is constantly develop gradually a new words that are found and further research existing entries allows definition to be sharpened and refined". Data mining uses having experience and taste in matters of culture mathematical algorithm to segment the data evaluate the probability of future events. Data mining is also called as 'knowledge discovery in Data (KDD)'. Data is extracted from RD database. Data warehouse support this concept by implementing multiple database i.e. Antonym database, Hyponym database etc. It is a central repository of data which is created by integrating database from one or more disparate sources.

With the very large availability of words in usage it is always being a challenge to find the meaning. Even the able to do speaker may thrash about finding a meaning for certain unheard words. In such cases they need some source for reference like Lexicon. In traditional model for using dictionary, forward concept is implemented where set of definition and it may produce a comprehensive phases. This may even confuse the user with the different concept of understanding or sometimes user could not understand the detailed concept. To overcome this concept, we facilitate reverse dictionary in which for any phrases or word, the appropriate single word meaning is given. This system also facilitates to provide the relevant meaning even if that word not available in the database. It will also produce instant output for the user input.

REMAINING CONTENTS

Data mining is the process of discovering actionable information from large sets of data. Data mining uses mathematical analysis to derive patterns and trends that exist in data.

Basic Terminology:

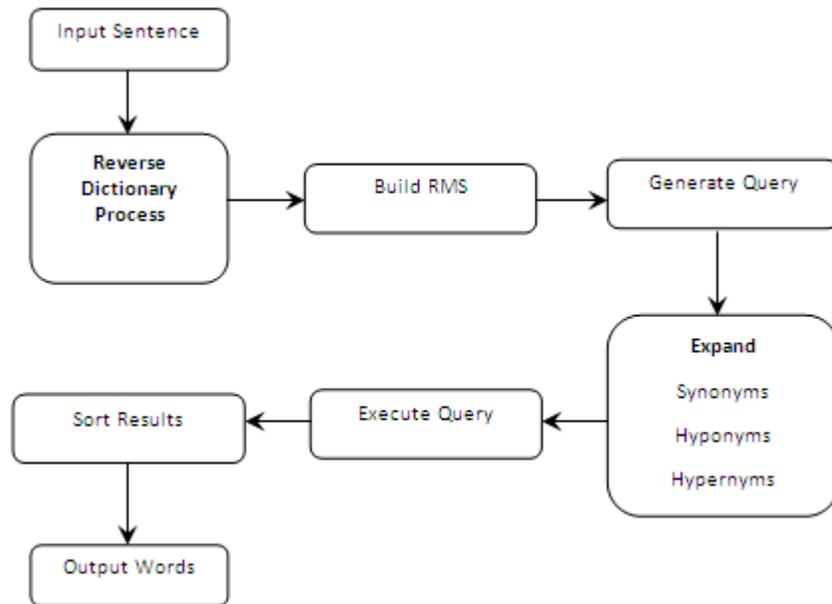
Forecasting: Estimating sales, predicting server loads or server downtime.

Risk and Probability: Choosing the best customers for targeted mailings, determining the probable break-even point for risk scenarios, assigning probabilities to diagnoses or other outcomes.

Finding Sequences: Analyzing customer selections in a shopping cart, predicting next likely events.

Grouping: Separating customers or events into cluster of related items, analyzing and predicting affinities.

Recommendations: Determining which products are likely to be sold together, generating recommendations.



System Architecture

Applications

Education: Student will get exact or relevant meaning of phrase or set of words which will help to improve knowledge.

Business: There is meeting conducted in every business and everyone write the notes sometime phrase or some set of words are use so the exact meaning is known.

Puzzling: Answer basic identification questions to solve crossword puzzle clues, or find words if you only know few letters.

Modules and algorithm

K-Means Algorithm:

K-means clustering tends to find clusters of comparable spatial extent, while the expectation maximization mechanism allows clusters to have different shapes.

Description:

Given a set of observations $(X_1, X_2, X_3 \dots X_n)$

where each observation is d-dimensional real vector

K-mean clustering partition the no. of observation into K cluster ($k < n$) sets

Where $S = S_1, S_2, S_3 \dots S_k$ so as to minimize the within cluster sum of square

Regarding computational complexity, finding the optimal solution of k-means clustering problem for observation in d-dimensions:

1. NP hard in general Euclidean d even for two Clusters.
2. NP hard for a general no. of cluster k even in plane.

Algorithm Build RMS:

RMS stands for Reverse Mapping Set. It is a mapping algorithm designed to map the word to words of similar meaning. It improves the quality of word mapped i.e. not vulnerable to the input phrase. For an input dictionary D a mapping R is created for all term appearing in the sense phrase. The RMS algorithm describe this reverse mapping pattern.

Algorithm GenerateQuery:

Here we generate a query for all the Set Type that are mean to be used for mapping and retrieval of reversed term for the given input phrase. Here Query Q is generated for all other algorithm that are returned to get the meaning for the given set of terms in the phrase. The is the building algorithm for the Set Type and Sorted queries.

Algorithm Execute Query:

For a given query Q if u have phrase that contain terms $T_1, T_2, T_3, \dots, T_k$, it performs AND/OR operations in query. If it performs OR operation then the terms of the phrase are union with reverse term and if it performs AND operation then the term of the phrase intersect with the reverse term and we returned the union or intersection of the reverse term.

Algorithm Expand Antonyms:

Given: A query Q of the form $T_1, T_2, T_3, \dots, T_k$, it creates a copy of the query and perform negation to create a sub query to replace all the terms and negated terms. If copy of the query is not equals to the copy of the original query the return copied query or else return its negated terms.

Algorithm Expand Query:

Given: A query Q of the form $T_1, T_2, T_3, \dots, T_k$, we perform AND/OR operation for all t_i in the query If AND is perform in Set Type as synonyms, antonyms and hyponyms, hyponyms to create a subquery q for the above Set Type respectively. For OR the term are replaced in query q from Q and at last it return Execute Query.

Algorithm Sort Results:

Create an empty list K and all the term are arranged in order of its retrieval priority for ease mapping. The sorted term are arrange according to it searched priority i.e. term importance, semantic and weighted similarity factor to generate a candidate set that must be ranked using mathematical computation.

Mathematical models

NP: - NP means we can solve it in polynomial time if we can break the normal rules of step-by-step computing.

NP-Hard:-NP-hard (Non-deterministic Polynomial-time hard), in computational complexity theory, is a class of problems that are, informally, "at least as hard as the hardest problems in NP".

NP-Complete:-In computational complexity theory, a decision problem is NP-complete when it is both in NP and NP-hard. The set of NP-complete problems is often denoted by NP-C or NPC. The abbreviation NP refers to "nondeterministic polynomial time".

Future Scope

The reverse dictionary works in such a way that, given an input phrase, a word related to that phrase is given as output. For the inflected forms, an algorithm is used. According to which, the inflected forms will be converted into a root form. Example: Sleeplessness during night time, in this example the verb Sleeplessness plays a very important role. But it is an inflected form of Sleep. So we have to use the Algorithm to convert the inflected form Sleeplessness to its root form sleep. For which, an algorithm called Porter-stemming algorithm is used. According to which a word which is in its inflected form is converted to its root form

CONCLUSION

Thus, the system work in developing a meaning-to-word dictionary. Depending on the phrase input there may be variation of the results shown. With our feature of finding words from an abstract string given as an input empowers the concept of reverse dictionary Parts of Speech classification feature also add quality. Improving the efficiency by holding the results makes the access fast. Adding new features like words searching enhances our work from previously available.

REFERENCES

[1] Ryan Shaw, Member, IEEE, Anindya Datta, Member, IEEE, Debra VanderMeer, Member, IEEE, and Kaushik Dutta, Member,

- IEEE, Building a Scalable Database-Driven Reverse Dictionary IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING, VOL. 25, NO. 3, MARCH 2013.
- [2] Balachandra Reddy Kandukuri, Ramakrishna Paturi V, Dr. Atanu Rakshit, "Data mining and clustering", IEEE International Conference on Services Computing, pp. 517- 520, September 2009.
- [3] T. Hofmann, Probabilistic Latent Semantic Indexing, SIGIR 99: Proc. 22nd Ann. Intl ACM SIGIR Conf. Research and Development in Information Retrieval, pp. 50-57, 1999.
- [4] T. Korneius, J. Laurikkala, and M. Juhola, On Principal Component Analysis, Cosine and Euclidean Measures in Information Retrieval, Information Sciences, vol. 177, pp. 4893-4905, 2007.
- [5] D.M. Blei, A.Y. Ng, and M.I. Jordan, Latent Dirichlet Allocation, J. Machine Learning Research, vol. 3, pp. 993-1022, Mar. 2003
- [6] R. Baeza-Yates and B. Ribeiro-Neto, Modern Information Retrieval. ACM Press, 2011.
- [7] T. Korneius, J. Laurikkala, and M. Juhola, "On Principal Component Analysis, Cosine and Euclidean Measures in Information Retrieval," Information Sciences, vol. 177, pp. 4893-4905, 2007.
- [8] J. Kim and K. Candan, "Cp/cv: Concept Similarity Mining without Frequency Information from Domain Describing Taxonomies," Proc. ACM Conf. Information and Knowledge Management, 2006.
- [9] R. Mihalcea, C. Corley, and C. Strapparava, "Corpus-Based and Knowledge-Based Measures of Text Semantic Similarity," Proc. Nat'l Conf. Artificial Intelligence, 2006.
- [10] D. Milne and I. Witten, "Learning to Link with Wikipedia," Proc.17th ACM Conf. Information and Knowledge Management, pp. 509-518, 2008.
- [11] U. of Pennsylvania, "The Penn Treebank Project," <http://www.cis.upenn.edu/treebank/>, 2009.
- [12] C. Manning, P. Raghavan, and H. Schutze, Introduction to Information Retrieval. Cambridge Univ. Press, 2008.

Induction Motor Speed Control Using Android Application

Trupti S Bobade¹, Anushri S. sastikar³, Anushri S. Garud³, U. W. Kaware⁴, R. K. Dehankar⁵

¹Department of electronics and telecommunication, J.D.I.E.T.Yavatmal, India

²Department of electronics and telecommunication, J.D.I.E.T.Yavatmal, India

³Department of electronics and telecommunication, J.D.I.E.T.Yavatmal, India

⁴Assistant professor of Department of electronics and telecommunication, J.D.I.E.T.Yavatmal, India

⁵Assistant professor of Department of electronics and telecommunication, J.D.I.E.T.Yavatmal, India

Abstract - “Android” the world’s most popular mobile platform which is tool for creating application that look great and take advantage of hardware capabilities. The advantage of android is that it is an open source operating system is used in terms of mobile application that is smart phone which will act as a remote controller. Here the proposed system is designed to controlling the speed of induction motor using android application where the remotely controlling speed of induction motor is achieved.

Android mobile act as a transmitter and the received by Bluetooth receiver interfaced to AVR microcontroller of 8051 family. AVR is an advanced version of 8051 microcontroller. Each time data is sent by android application as per code written is executed by AVR to deliver supply signal to triac through optical isolation. Hence the power to load connected in series with triac is controlled based on received signal and speed control of induction motor is achieved.

Keywords- triac, zero crossing detector, AVR microcontroller, optocoupler

INTRODUCTION

For the improvement of quality product many industrial application requires adjustable speed and constant speed. Due to rapid advance in automation and process control the field of adjustable speed drives continuously. In recent technology, various alternate techniques are available for the selection of speed of drive system. Up to the 1980’s the dc motor was the choice for variable speed drive application. Induction motors are using any application such as Industrial drives control, automotive control, etc. In past few years there has been a great demand in industry for adjustable speed drives. Fan, pump, Compressors, domestic applications and paper machines etc... In this area DC motor was very popular but having many disadvantages so that microcontroller transformed research and development toward control of ac drive [1].

When the three phase supply is not available for domestic and commercial application, there we are using single phase induction motor which is one of the most widely used type of low power motor in the world An induction or asynchronous motor is a type of AC motor where power is supplied to the rotor by means of electromagnetic induction, rather than by slip rings and commutator as in slip-ring AC motors. It has a squirrel-cage rotor identical to a single phase and 3-phase motor winding on the stator. There are various methods for controlling the speed of AC motors [1]. There are several of method is available for speed control of ac motor one of the method is two vary frequency and voltage of motor. Speed modulation of a single-phase motor is usually achieved either by some electrical means, such as reducing supply voltage by auto-transformer, or by switching windings to change the number of motor poles for different operating condition as required.

For changing the speed of capacitor run motor as shown in fig.1 voltage control is best method, but it allows only limited speed range to be obtained. Now frequency acts as interesting alternative to voltage control.

The most appropriator actuators for variable speed drive is seem to be capacitor run drive. In our project the speed of induction motor, control with the help of android apps that comes under wireless technology. Android application use here as a transmitter and remote control in order control the speed of induction motor with the help of Bluetooth as a receiver.

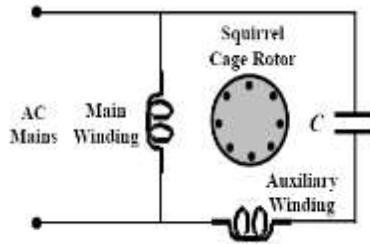


Figure1: Capacitor run single phase induction motor

SYSTEM ARCHITECTURE

In this project, the hardware and software function are combined to make the system reliable. Figure 2 shows the block diagram representation of the systems to be designed and implemented. The Block diagram consists of: Microcontroller, LCD Display, Bluetooth module, Switching assembly, Power supply, Load (either ac motor or bulb), Android application

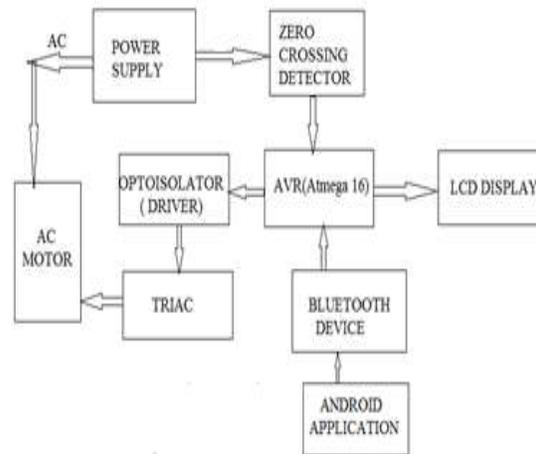


Figure 2: Block Diagram

BLOCK DIAGRAM DESCRIPTION

Microcontroller is the heart of the system. We have used Atmega16 microcontroller in this project. It is getting a 5V power supply from transformer. It is also interfaced with the 16x2 LCD Display, Bluetooth module, optoisolator, triac & induction motor [3].

Atmega16 is high-performance, low-power 8-bit Microcontroller provided by ATMEL AVR. It is having a modified Harvard architecture. Power supply is provided through microcontroller. The atmega 16 that is microcontroller will be interfacing with the Bluetooth module that will act as transmitter for the microcontroller and it will act as receiver to the android application. The necessary data to control the speed of induction motor will be provided to the controller and with the help of android application remotely controlling speed of induction motor is achieved. The optoisolator is used to drive the triac which provides complete pulse to the motor in order to rotate and to control the speed of inductor motor via android application.

WORKING

As shown in above figure transformer T1 step downs 230 V AC into 9 V AC and this is given to bridge rectifier. This rectified output is directly fed to base of Q1 through resistors R1 & R2. Same rectified output is filtered through C1 and given to voltage regulator IC 7805. Output of 7805 is regulated 5 VDC that is given as biasing voltage for both transistors Q1 & Q2 (same regulated 5 V supply is given to main control section also). Both transistors are connected in switch configuration. The final output 'C' is given to main control section.

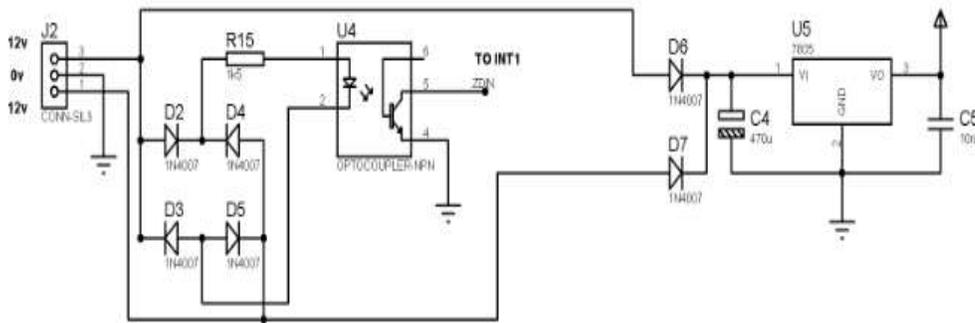


Figure 3: zero crossing detector

As shown in below figure micro controller ATmega16 along with opto-coupler MOC3011 (for triggering TRIAC) and common Anode type bar graph display (for indicating angle) are used for changing firing angle of TRIAC. Signal 'C' from zero crossing detector circuit is directly given to pin no 13 (INT1) that is external interrupt 1 (PD.3) pin. All port PA pins are connected with cathode of bar graph display It is used to show the status of the motor power and zero cross circuit.

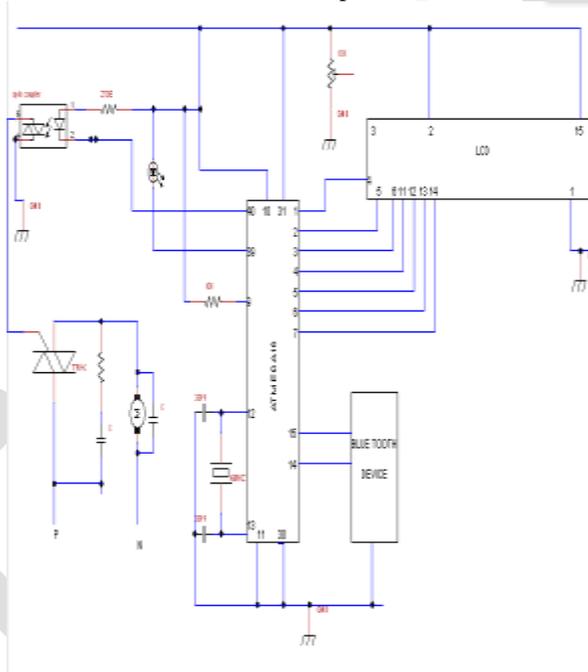


Figure 4: Basic circuit diagram

PD.7 is connected with input of opto-coupler MOC3011. Output of MOC3011 is connected with gate of TRIAC. TRIAC is connected in loop with AC motor and 230 VAC supply as shown. RC snubber circuit is connected in parallel with TRIAC..A 16MHz crystal along with two 22pf capacitor is connected with crystal input pins. Capacitor C2 with Resistor R6 performs power on reset.

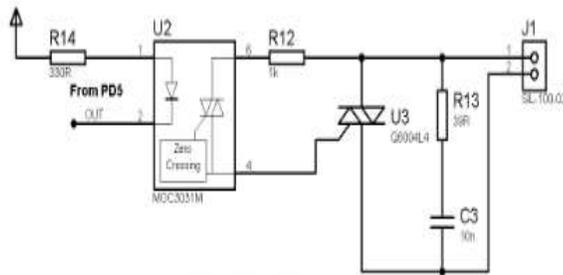


Figure 5: firing angle circuit

APPLICATIONS

1. In home automation application, convinced of remotely controlling the speed of fan is achieved.
2. Many industrial applications require adjustable speed and constant speed for improvement of quality product.
3. Intensity of light can also be controlled with the help of android application.
4. Bell drive application like small conveyors, large blowers, pumps as well as many direct drive or geared application.
5. Wood working machinery air compressors, high processors, water pumps, vaccum pump and high torque application.

ADVANTAGES

1. Remote operation is achieved by any smart-phone /tablet etc. With android os.
2. Technically expert controller is not required.
3. Android app is an open source system to develop any programming code.
4. Programming code is not always required to change for different input parameters.
5. Bluetooth consumes less power so more preferable.
6. More useful for the patient and disabled person.

DISADVANTAGES

1. It is of short range as we are using Bluetooth as transmitter.
2. Android app we are using consumes more battery of users phone.
3. High complexity i.e. device and application impact.

CONCLUSION

The objective of a project has been achieved which has been developing the hardware and software for controlling speed of induction motor using android application. The demand for wireless operating device increases, it is more preferable over wired devices. Here we are controlling speed of induction motor using Bluetooth and android application wirelessly.

FUTURE SCOPE

The future scope will be controlling the speed of three phase induction motor likewise that of the single phase induction motor using android application. Also we can use GSM module instead of Bluetooth technology to control the speed of induction motor. The speed can also be controlled automatically using temperature sensor LM 35.

REFERENCES:

- [1] Rakesh Parekh (2003). AC Induction Motor Fundamentals. Microchip Technology Inc.
- [2] Muhammad H. Rashid: "Power Electronics Circuits, Devices & Application" PHI, New Delhi, 2001.
- [3] Salivahanan, S.Suresh, N., and Vallavaraj, A. "Electronic Devices and Circuit", Fourth Edition, Tada Seventh Edition, 2000, McGraw-Hill Publishing Company Limited.
- [4] Bayindir R., Sefa İ., "Novel approach based on microcontroller to online protection of induction motors", *Energy Conversion and Management*, 48 (3): 850-856, (March 2007).
- [5] Zero Crossing Detectors by SUNPLUS.
- [6] Petermutschler Darmstadt University Of Technology Department Of Power Electronics And Drives: A New Speed Control Method For Induction Motors
- [7] Atul M.Gajare Nitin R.Bhasme A Review On Speed Control Techniques Of Single Phase Induction Motors, ISSN 2249-6343, International Journal Of Computer Technology And Electronics Engineering, Volume 2, Issue 5, October 2012
- [8] *Stephen L. Herman, electric Motor Control, 9th edition.*
- [9] J. Zhang, "Single phase input cycloconverters driving an induction motor" Ph.D. thesis, University of Technology, Sydney.
- [10] Modern Applied Science Vol 5, No 3 (2011). A Novel Approach to Analog Signal Isolation through Digital Opto-coupler (YOUTAB)
- [11] Agilent Technologies Introduces Industry's Fastest Optocouplers. Business Wire. December 2, 2002.
- [12] Safety Considerations When Using Optocouplers and Alternative Isolators for Providing Protection Against Electrical Hazards. January 2010. Retrieved November 5, 2010.
- [13] M.D. Singh, K.B. Khanchandani, Power Electronics, Second Edition, Tata McGraw-Hill, New Delhi, 2007, pages 148-152.

- [14] "Philips Semiconductors Product specification Triacs BT138 series". 090119 nxp.com
- [15] www.bluetooth.com
- [16] www.palowireless.com
- [17] *Johansson and Gerla's Bluetooth Tutorial at Mobicom 2001.*
- [18] *Discovering Bluetooth by Brent A. Miller.*
- [19] <http://en.wikipedia.org/wiki/Bluetooth>
- [20] <http://www.bluetooth.com/bluetooth>

IJERGS

A SOFTWARE APPROACH AND ANALYSIS IN VOLTAGE STABILITY AND IMPROVEMENT OF A POWER NETWORK

1. Suparna Pal, Asst Prof EE dept, JIS College of Engineering, Kalyani, Nadia, sprndeb@yahoo.com

2. Avirup Ghosh, EDPS Student, EE dept, JIS College of Engineering, Kalyani, Nadia, avirup.ghosh90@gmail.com

ABSTRACT-Power demand increases steadily while the expansion of power generation, transmission has been severely limited due to inadequate resource and environmental forces. As demand is increasing day by day, the generation cannot be increased with matching of demands because fossil fuel is restricted and cost factors are there. The load area are far away from generation side so only one possibility to give the power to load area by minimizing the losses of transmission lines by proper analyzing of transient stability. The voltage stability is not match standard values for all period of times when the line is heavily loaded severe transient oscillations will occurs. In peak hour period, at that period if fault is also occurred due to unbalance current flow through the transmission network as a result a severe voltage oscillation occurred in transmission lines. As we are not get enough tariff from distribution section, then loss will become more costly. So it is very much necessary to analyses transient stability, voltage stability and power flow through power network systems. There are several methods for analyzing voltage and transient stability like FACTS devices etc. But all these methods create extra cost for transmission and Generation Company which will be bear by them only. So here we analyses simulation method i.e. capacitor improvement method for voltage stability.

Keywords:- Voltage Stability, line Compensation, load compensation, Series capacitor, Dynamic stability, Stability Analysis, Load Analysis.

INTRODUCTION

Voltage control and stability problems are very much familiar to the electric utility industry but are now receiving special attention by every power system analyst and researcher. With growing size along with economic and environmental pressures, the possible threat of voltage instability is becoming increasingly pronounced in power system networks. In recent years, voltage instability has been responsible for several major networks collapses in New York, France, Florida, Belgium, Sweden and Japan, even in India also. Research workers, R and D organizations and utilities throughout the world, are busy in understanding, analyzing and developing newer and newer strategies to cope up with the menace of voltage instability/collapse.

As in all power systems, the larger machines are of the synchronous type; these include substantially all the generators and condensers, and a considerable part of motors. On such systems it is necessary to maintain synchronism will not be achieved. The transient disturbances are caused by the changes in loads, switching operations and, particularly, faults and loss of excitations. Thus, maintenance of synchronism during steady state conditions and regaining of synchronism or equilibrium after a disturbance are of prime importance to the electrical utilities. The term 'stability' can be interpreted as 'maintenance of synchronism.

At any point of time, a power system operating condition should be stable, meeting various operational criteria, and it should also be secure in the event of any credible contingency. Present day power systems are being operated closer to their stability limits due to economic and environmental constraints. Maintaining a stable and secure operation of a power system is therefore a very important and challenging issue.

Voltage stability implies that to maintain a steady acceptable voltages at all buses in the system. A system enters a state of voltage instability when a disturbance, increase in load demand inability of a power system to meet the demand for reactive power. A criterion for voltage stability is that, bus voltage magnitude increase as reactive power injection at the same bus increase.

The present trend is towards interconnection of the power systems; resulting into increased lengths and increased reactance's of the system, this presents an acute problem of maintenance of stability of the system. The term 'Power limit' is also sometimes interpreted as 'Stability' because to have the maximum utility of the system it should be capable of supplying maximum power without causing instability. Power system stability, in general terms, and may be defined as it's to respond to a disturbance from its normal operation by returning to a condition where the operation is again normal.

ADVANTAGES OF POWER COMPENSATIONS IN POWER NETWORKS

For reduction of cost and improved reliability, most of the world's electric power systems continue to be interconnected. Interconnections take advantages of diversity of loads, availability of sources and fuel price for supplying power to loads at minimum cost and pollution with a required reliability. In a deregulated electric service environment, an effective electric grid is essential to the competitive environment of reliable electric service.

Now a day, greater demands have been placed on the transmission network, and these demands will continue to rise because of the increasing numbers of non utility generators and greater competition among utilities themselves. It is not easy to acquire new rights of way. Increased demands on transmission, absence of long term planning and the need to provide open access to generating companies and customers have resulted in less security and reduced quality of supply.

Compensation in power systems is, therefore, essential to alleviate some these problems, series/shunt compensations has been use for past many years to achieve this objective. In power system, the insignificant electrical storage, power generation and load must be balanced at all times. In some extent, we can say that, the electrical system is self regulating, when transient oscillations occurred in any transmission lines, system has ability to overcome the oscillation, but if it is not possible to overcome oscillations then voltage instability occurs. Another reasons of instability occurs in power system is if the generation is less than load, voltage and frequency drop will occurred. To overcome from these problems used to reduce load levels or increases generation by manuals or automatic controlling of load frequency and automatic voltage controller, by controlling the inputs of boilers and excitations, then only the instability can be improved. If voltage is propped up with reactive power support, then load increase with consequent drop in frequency may result in system collapse or inadequate reactive power, the system voltage collapse. So here we have used series compensations for improved the voltage stability.

LOADING CAPABILITY

There are three kinds of limitations for loading capacity of transmission system

- i) Thermal
- ii) Dielectric
- iii) Stability

Thermal Capability of an overhead line is a function of the ambient temperature, wind conditions, conditions of the conductor and ground clearance. There is a possibility of converting a single circuit to a double –circuit line to increase the loading capability.

Dielectric limitations:-From insulation point of view, many lines are designed very conservatively. For a given nominal voltage rating it is often possible to increase normal operating voltages by 10% (400 KV-440 KV). So one should however, ensure that dynamic and transient over voltages are within limits.

Stability issues:- There are certain stability issues that limit the transmission capability. These include steady-state –stability, transient stability, dynamic stability, frequency collapse, voltage collapse and sub synchronous resonance.

The load and Line compensations are mainly used in stability analysis.

Load Compensations

Load compensation is the management of reactive power to improve power quality i.e, V profile and P.F. Here the reactive power to improve power quality i.e. V profile and P.F. Here the reactive power flow is controlled by installing shunt compensating devices (capacitors/reactors) at the load end bringing about proper balance between generated and consumed reactive power. This is most effective in improving the power transfer capability of the system and its voltage stability. It is desirable both economically and technically to operate the system near unity power factor. This is why some utilities impose a penalty on low pf loads.

Yet another way of improving the system performance is to operate it under balanced conditions so as to reduce the flow of negative sequence currents thereby increasing the system's load capability and reducing power loss.

Line Compensations

Ideal voltage profile for a transmission line is flat, which can only be achieved by loading the line with its surge impedance loading while this may not be achievable, the characteristics of the line can be modified by line compensators so that

1. Ferranti effect is minimized
2. Under excited operation of synchronous generators is not required
3. Power transfer capability of the line is enhanced. Modifying the characteristics of a lines is known as line compensations.

Various compensating devices are

1. Capacitors
2. Capacitors and inductors
3. Active voltage source

When a number of capacitors are connected in parallel to get the desired capacitance, it is known as a bank of capacitors, similarly, a bank of capacitors and inductors can be adjusted in steps by switching (Mechanical). capacitors and inductors are passive line compensators.

Shunt compensation is more or less like load compensation with all advantages associated with load compensation. It needs to be shunt Capacitors/inductors cannot be distributed uniformly along the line. These are normally connected at the end of the line and or at midpoint of line.

Shunt capacitors raised the load pf which greatly increases the power transmitted over the line as it is not required to carry the reactive power. There is a limit to which transmitted over the line as it is not required to carry the reactive power. There is a limit to which transmitted power can be increased by shunt compensation as it would require very large size capacitor bank, which would be impractical. So for increasing power transmitted over the line, other and better means can be adopted. When switched capacitors are employed for compensation, these should be disconnected immediately under light load conditions to avoid excessive voltage rise and Ferro resonance in presence of transformer.

The purpose of series compensation is to cancel part of series inductive reactance of the line using series capacitors. This helps in 1) increase of maximum power transfer ii) reduction in power angle for given amount of power transfer iii) increased loading.

From practical point of view, it is desirable not to exceed series compensation beyond 80%. If the line is 100% compensated, it will behave as a purely resistive element and would cause series resonance even fundamental frequency. The location of series capacitors is decided by economical factors and severity of fault currents. Series capacitor reduces line reactance thereby level of fault currents.

Compensation

Compensation controls the power flow in transmission lines.

- i) Controlling the sending and receiving end voltages V_s and V_r (through voltage regulations at the respective buses)
- ii) Controlling the angle between V_s and V_r (maximum angle is selected depending upon the stability margins)
- iii) Controlling the series reactance (series connected capacitors increase the maximum power transfer capacity). These 3 parameter is controlled by connecting series shunt compensation in the transmission system.

STABILITY ANALYSIS

A power system stability improvement is very important for large scale system. The AC power transmission system has diverse limits, classified as static limits and dynamic limits [2, 3]. Traditionally, fixed or mechanically switched shunt and series capacitors, reactors and synchronous generators were being used to enhance same types of stability augmentation [2]. For many reasons desired performance was being unable to achieve effectively.

For the purpose of analysis there are three stability conditions that must be considered.

The development of the modern power system has led to an increasing complexity in the study of power systems, and also presents new challenges to power system stability, and in particular, to the aspects of transient stability and small-signal stability. Transient stability control plays a significant role in ensuring the stable operation of power systems in the event of large disturbances and faults, and is thus a significant area of research. The classification of stability

- Steady State Stability.
- Transient Stability.
- Dynamic Stability.

1. STEADY STATE STABILITY.

It may be defined as the capability of an electric power system to maintain synchronism between machines within the system and external lines following a small slow disturbance (normal load fluctuations, the action of automatic voltage regulators and turbine governors). In case the maximum power transfer exceeds under this condition, individual machines or groups of machines will cease to operate in synchronism, violent fluctuations of the voltage will occur and the steady state limit for the system as a whole would have been reached. The Steady state stability limit refers to the maximum power which can be transferred through the system without loss of stability.

2. TRANSIENT STABILITY

Transient stability is the ability of the system to remain in synchronism during the period following a disturbance and prior to the time that the governors can act. Ordinarily the first swing of machine rotors will take place within about one second following the disturbance, but the exact time depends on the characteristics of the machines and the transmission system. Following this period, governors begin to take effect, and dynamic stability conditions are effective.

3. DYNAMIC STABILITY

It is the ability of a power system to remain in synchronism after the 'initial swing' (transient stability period) until the system has settled down to the new steady state equilibrium condition. When sufficient time has elapsed after a disturbance, the governors of the prime movers will react to increase or decrease energy input, as may require re-establishing a balance between energy input and the existing electrical load. This usually occurs in about 1-1.5 seconds after the disturbance. The period between the time governors begin to react and the time that steady state equilibrium is re-established is the period when dynamic stability characteristics of a system are effective. It is possible to have transient stable but dynamically unstable conditions. Immediately after a disturbance, the machine rotors will go through the first swing (before governor action) successfully, and then after governor control is initiated, the oscillations will start increasing until the machine falls out of synchronism. Such action can occur if the time delays of the governor control are such that, following the sensing of necessity for increasing or reducing energy input, action is delayed sufficiently in time to augment rather than diminish the next swing. If such a condition exists, the oscillations of the machine rotor can continue to build up until the machine falls out of synchronism

RESEARCH ANALYSIS

The many papers are to present an analysis of reactive power control and voltage stability in power systems. The steady state voltage and reactive power control in distribution systems can be properly controlled by coordinating the available voltage and reactive power control equipment, such as on-load tap-changers, series capacitors, substation shunt capacitors and feeder shunt capacitors. It began with an overview of reactive power and voltage stability in transmission, distribution and load, and the importance of providing reactive power locally.

PROBLEM IDENTIFICATIONS AND ANALYSIS

The main problem that has been encountered in a load area network is transient current. Due to transient current, the voltage drop of the transmission lines reduces as a result the losses increase which contribute to reduced supply. Since the tariff is a fixed constraint so it increases a burden for the additional inadequate supply. And customers need to face economic crisis

AIM OF THE PAPER

The aim of this paper is the clear idea of instability. Now a day's loads are increasing gradually but we will not increase our generation due to economical, financial and political reasons. Today's power world has main aim to supply uninterrupted and reliable power to our authorized load centers. But same time our unauthorized loads are also increasingly rapidly due to financial and political reasons. So it is very difficult to maintain reliable supply to our load area. Due to unauthorized and uncertain load demand

but we cannot stop to supply reliable power to load area. For that reason we adopt many other ways to maintained reliable supply to load area.

With increasing demand of power in load area(authorized/unauthorized) will affect the stability of the transmission lines by increasing (producing) reactive powers in transmission network, as transmission power through lines are almost fixed(as demands) so increasing loads creates a unbalanced in transmission lines because as demands (un authorized, due to power theft)are increasing, so active power demands are also increases but it is not possible to supply extra active power demands by transmission lines always .But loads draw the required active powers from transmission lines as a results generators are affected due to meet the demands by increasing the speed of generators to supply that active power and generators runs as a super synchronous speed and generators are run as synchronous motors that generators are not supply the powers to transmission lines, they draws the power from transmission lines, and reverse power flow occurred. In the generating station reverse power flow relay is used to give protections for such cases but reverse power flow is very dangerous fault in transmission lines and generators also. Due to reverse power flow, generators may be damaged. In our power networks most costly device is generators, So we cannot do this, not only for that reasons, if generators are getting fault then whole system will be black outs. So reverse power flow protection is only depends upon reverse power flow relay only. If it is failure due to mal operation of relay, it is very dangerous to power networks.

So, it is not the good sign always for this type of faults that we should always depends upon this relay. We should think about other ways also. We should analysis the causes of this fault and find out the ways to overcome from this situation.

As load is increasing and generation is fixed then extra burden occurred in generators and transmission lines, to maintained transmission line voltage stability ,generators will run as synchronous speed not in super synchronous speed ,We can prevent that by two ways i)to compensated reactive powers by compensation devices or ii)supply extra powers from other sources. Then only stability can improve.

The aim of our project is to find out how to overcome from this problem.

PROBLEM IDENTIFICATIONS

As power system stability is burning problems always, many scientist and researchers are work out in this problems. Voltage control and stability problems are not new to the electric utility industry but are now receiving special attention in many systems. Once associated primarily with weak systems and long lines, voltage problems are now also a source of concern in highly developed networks as a result of heavier loadings. In recent years, voltage instability has been responsible for several major network collapses.

So we have taken a voltage stability problem and analysis it by mat lab simulink and verify and compare outputs with desired results. We are tried to give a clear idea of voltage in stability through this demo power network. Hope that it will help to further researchers.

Here we have take a power network with heavily loaded (35 MW) line with power supply (MW) and analysis of stability. We have see that the system will go through instability region due to reactive power generations of the line. After that we can improved the stability of that system by analysing of several cases.

These analyses are give us clear idea of instability and stability of a system.

PROBLEM STATEMENT

1ST step:-

At first we have taken a 100 MW generator with 11 KV, The voltage has been step up in KV voltage to supply the load 30 MW by a transmission network. And analysis the voltage stability of load area, where we see that voltage level is sharply fall down and system will go through the instability region.

2ND step:-

As output voltage is sharply fall down due to insufficient of supply or increasing reactive vars .So in sconded case we give another extra supply from grid network or by other parallel operation. Then we see that the voltage has improved with positive value but is totally transient or oscillatory of exponential with lower magnitude. So we can conclude that only increasing of power the voltage stability will not improved completely.

3RD step:-

So in third step we compensated the transmission lines by connecting a series Capacitors (super Capacitors) through the transmission lines. We see that the voltage stability of the transmission lines has been improved tremendously.

4TH step:-

After improving the stability of the voltage again we connected extra load to the transmission lines to check out the stability degree. We see that stability has not fall down and power network maintained its stability.

Thus we have analysis stability and instability of a power network.

Research Analysis and Scope

Stability analysis is the burning problems for researchers, scholars. Many papers are published regarding this. Maximum cases stability analysis and improve by compensation network designs by FACTS controllers etc. Our research work is starting cases of stability analysis by series capacitors, this analysis will be continuing by analyzing other facts devices in networks.

ANALYSIS OF PROBLEMS (Software approach)

Different Case Study:

In this paper we have studied different cases of stability in a loaded network.

Software approach

CASE 1: PROBLEM ANALYSIS:

230 Mw generation is supplied the load area by step-up voltage levels by two winding transformer .Generator has supplied 30 MW load. And AGC is connected through the generator. So when we run the simulation we see that output voltage is not maintaining stability before and after the transformer but the generator is controlled by AGC unit. As AGC is controlled the voltage fluctuation by load changing and give the stable output. Here we will not get stable output. So we concluded that in power network to maintain voltage stability others things also required that is compensations.

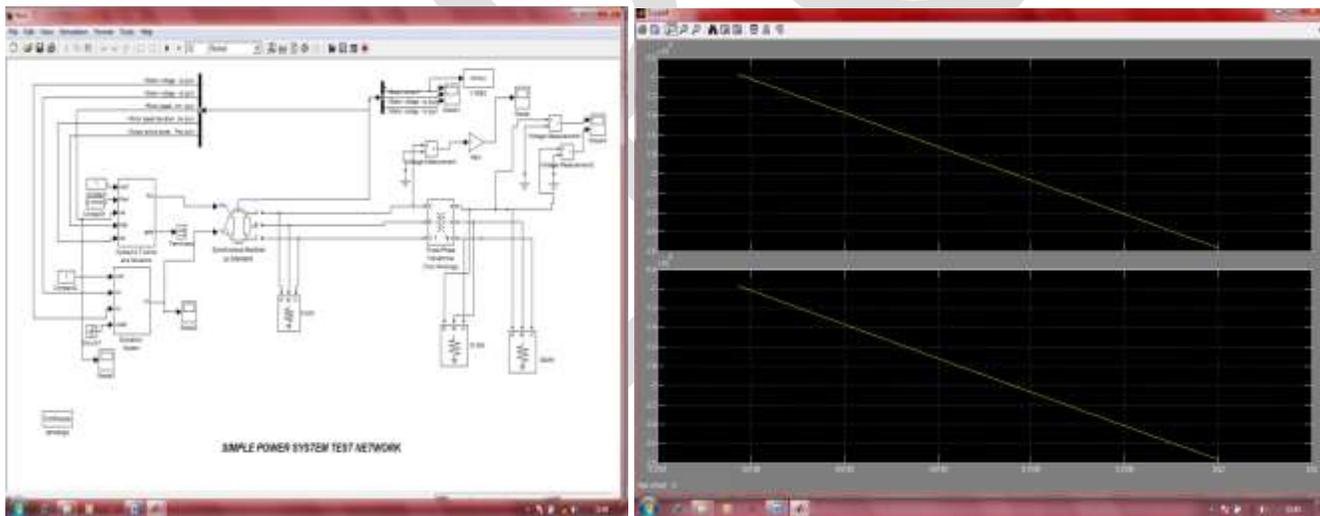


figure 1&figure2-it is the voltage measured across the 10 as well as 20 mw load.

RESULT: Output voltage has sharply fall down, So system has not maintaining stability The dynamic stability falls due to lack of source; as a result the voltage stability of the system is reduced. In the second case a Three Phase Supply is added in order to compensate the loss of voltage due to transient currents which would lead to improvement of voltage stability. This supply has denoted from infinite source or grid.

We can observe that now output (voltage) is rising but transient oscillation there because the curve is ramp nature. So there is required further improvement.

CASE 2:

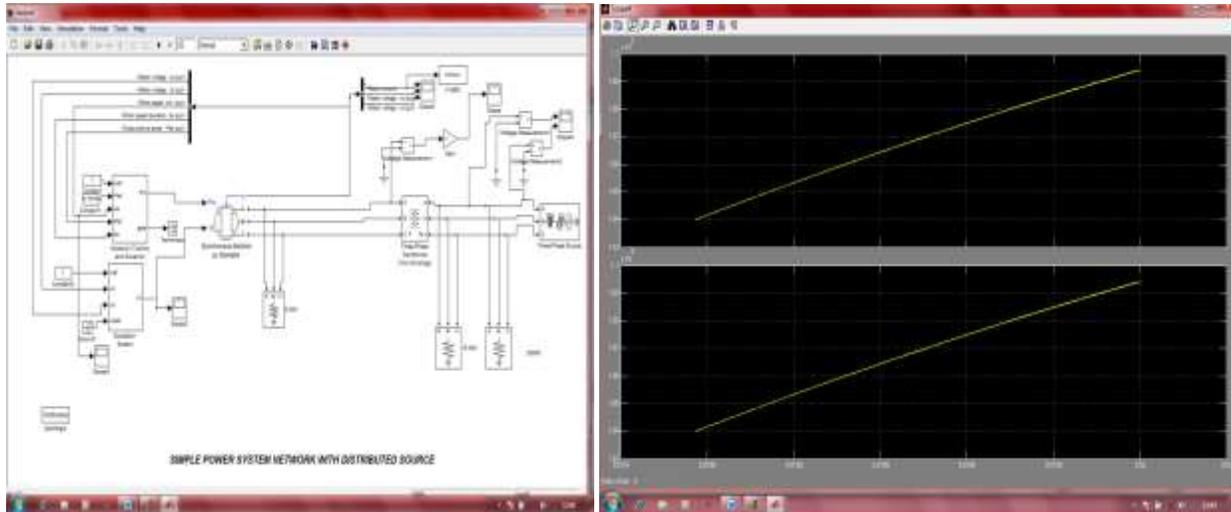


figure 1 & figure2-it is the voltage measured across the 10 and 20mw load with the three phase supply connected across the far end of the total 30mw load.

RESULT: Voltage level is increasing but it is now ramp function, so we concluded that some oscillations are still present and need to improvement.

Case3:-Problem analysis:

Voltage stability have been improved in case 2 but due to transients the losses are more hence it is required to future improvement. So here we have introduces the series capacitors in the transmission lines that reactive power will consume by capacitor vars

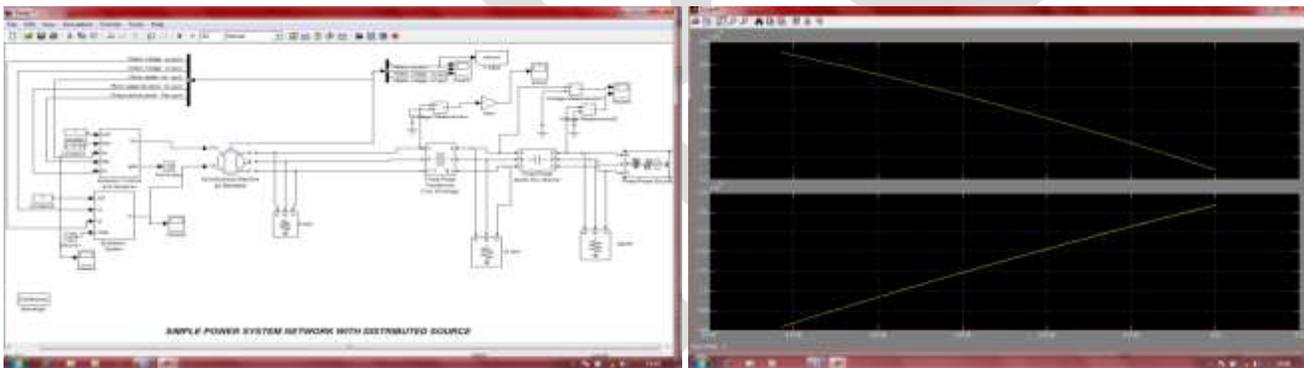


Figure 1 & 2- output response of transmission line voltage. Here we see that after applying capacitors and voltage stability is improved

Case4 :-Problem analysis:

Although a capacitor has been incorporated in the system but it has been observed that in case3 that voltage has not compensated ,So here given extra sources from grid network.We observe that the voltage stability has been improved with oscillations.

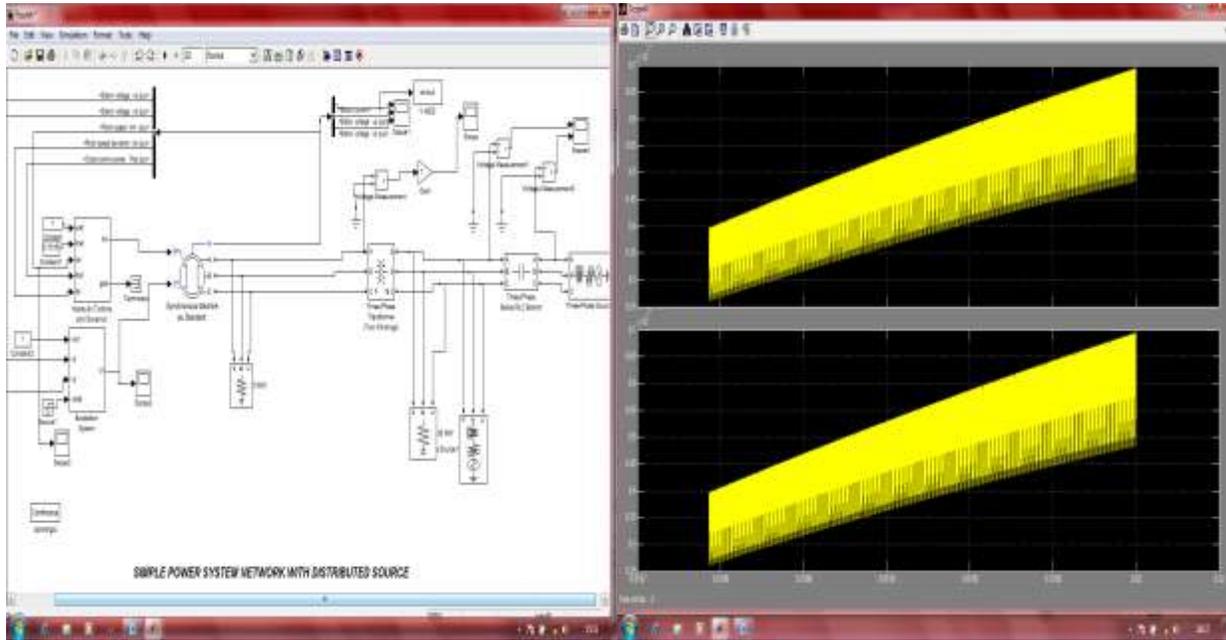


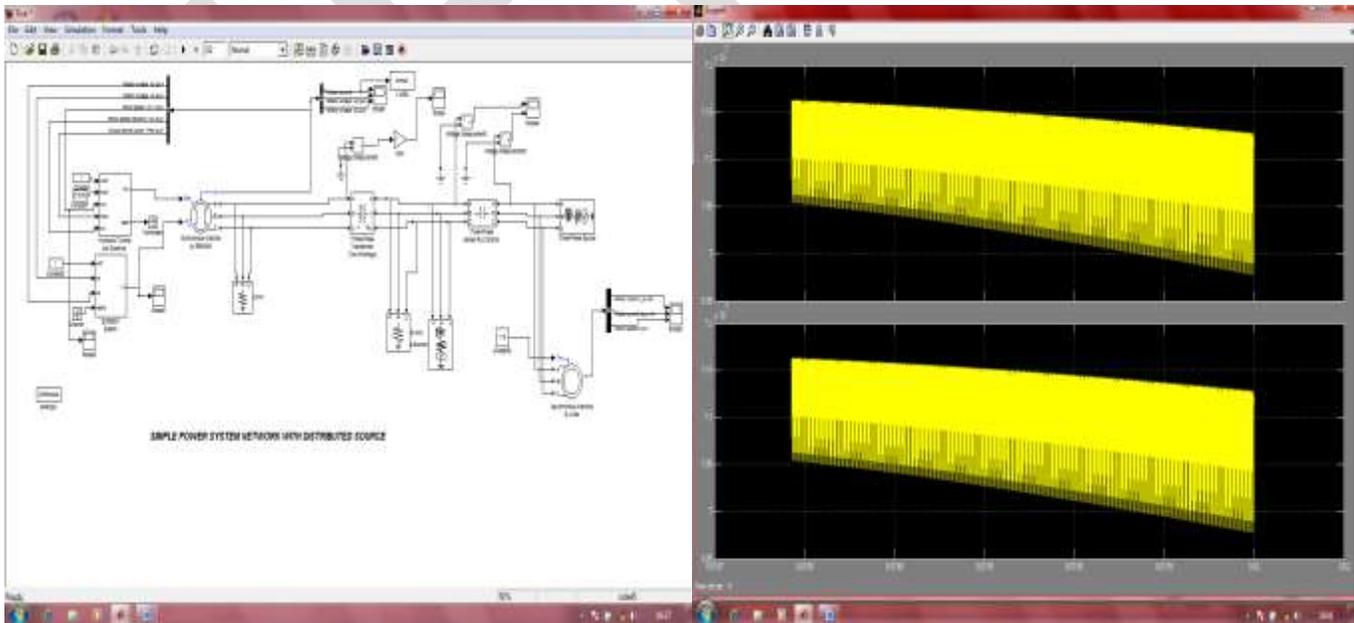
Fig1 & fig2-the voltage is measured across the capacitor which is employed as well as a three phase source is connected to prevent disruption of voltage stability.

CASE5

PROBLEM ANALYSIS:

The voltage stability has improved ,so we make the system in real demo system by supplying motor loads in the same network and analysis the output

CASE 5:

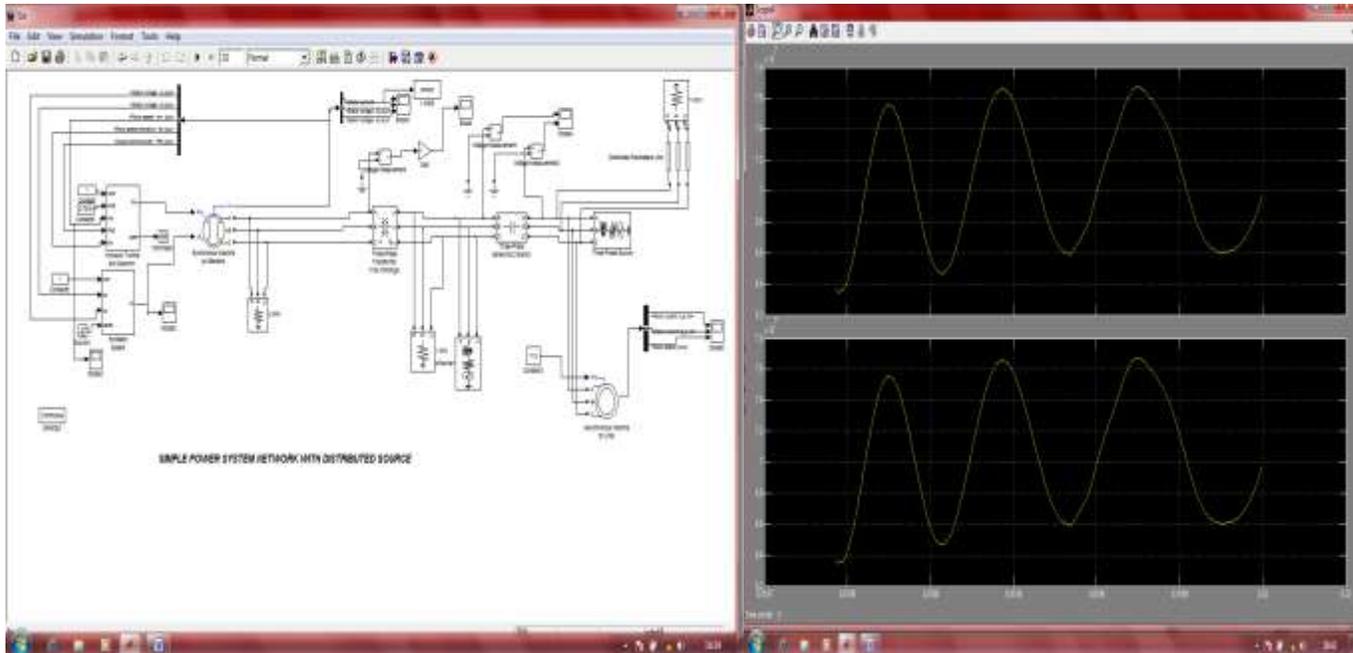


RESULT:

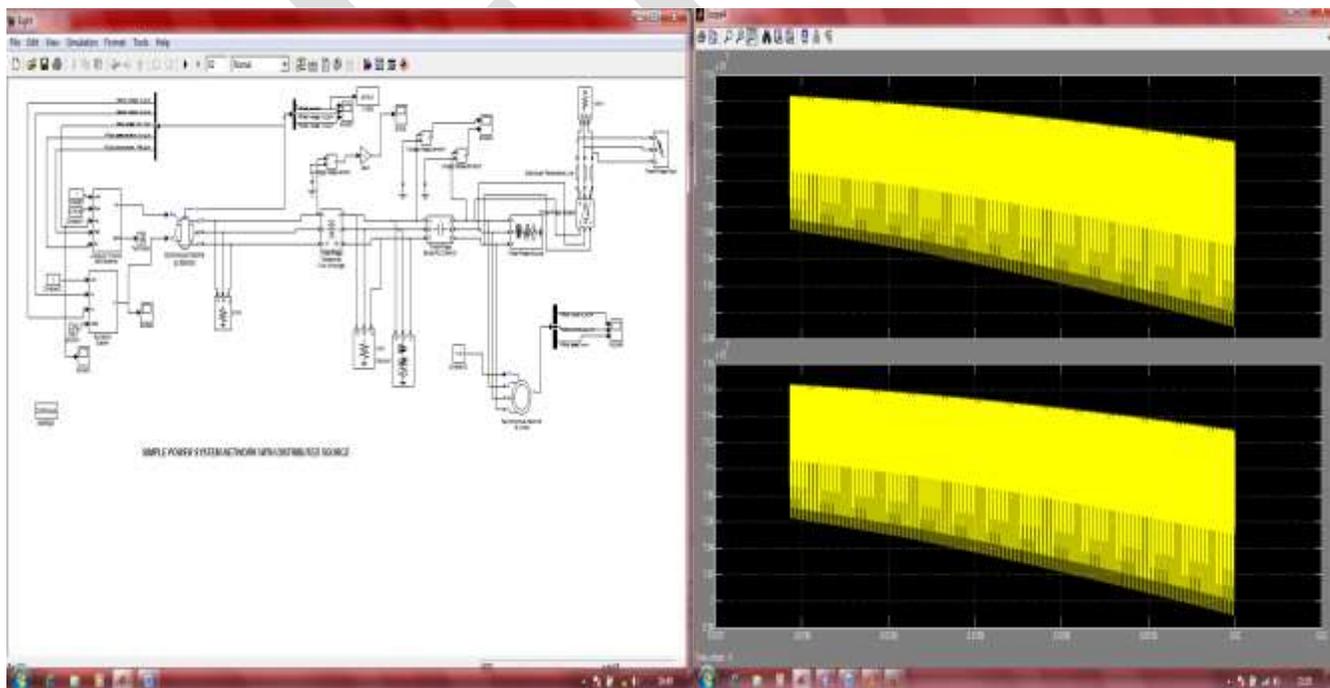
We observed that after supplying motor load the voltage stability has not dropout but some oscillatory nature. So we again studied the system in case6.

CASE 6:

The oscillation can be occurred also if load is lesser than generation, so in this case we have connected a asynchronous load to the line and get a stable output, which is aim of this analysis.



RESULT: We get stable output.



OVERALL ANALYSIS

This paper is a part of work in dynamic voltage stability. Here we have studied a demo real network and analysis different kind of stability. That is how a network system become unstable and how can we bring back its stability. After researching we can concluded a idea that the system instability occur due to high load and lack of supply if in the transmission line has low power then load then extra burden occur in the generators and system (line) voltage has sharply fall down though generation has been controlled by automatic generation. As load is increasing system transient oscillation are not minimize which creates dynamic instability. So at that time required extra source if supply power from grid network or other supply by parallel operation than system voltage will be improved but some oscillation present due to reactive power generation by load side. So to get better stability line has required compensation ,then only the system voltage will be in stable limit. Thus we can improve the dynamic stability of a real power network system also.

FUTURE SCOPE

The future scope of this paper is that this idea can be implemented in real system network. We can easily analysis of a heavily network circuit very easily. This research work can be further proceed by using others facts device also and analysis system stability

APPLICATIONS & FUTURE SCOPE OF THIS PAPER

The main application of this paper to researcher is get a clear and simple idea of voltage and overall dynamic stability idea. This idea can be implemented in any power network for stability analysis.

CONCLUSION

We get clear concepts of voltage and dynamic stability, the load characteristics in a bulk power network. As the power system is a vast network and now days to give highly reliable power to load side, we make our system more complex, so stability is always hampered. If we not analysis stability of the system always then unstable voltage breakdown the longevity of the load side. So unstable voltage is creates unstable current to load area which is very harmful as load area and also transmission network also. Unstable voltage creates reactive vars in transmission lines which is harmful for transmission and generation also. So to supply the stable voltage to our load area is our prime objectives. For that reason we should always analysis the system stability.

ACKNOWLEDGEMENT

This paper is funded by TEQIP PHASE2 of JIS COLLEGE OF ENGINEERING. We are grateful to JIS COLLEGE OF ENGINEERING. We are acknowledge the TEQIP grant scheme of JIS COLLEGE OF ENGINEERING.

REFERENCES:

Books:-

- 1.Chakraborti,A, D.P. Kothari and A.K.Mukhopadhyay ,”Performance ,Operation and Control of EHV Power Transmission Systems”, Wheeler Publishing,New Delhi,1995
- 2.Taylor,C.W,”Power System Voltage Stability,”McGraw-Hill ,New York,1994.
- 3.Nagrath,I.J. and.P.Kothari,Power System Engineering, Tata McGraw-Hill ,New Delhi,1994
- 4.Kundur,P.”Power System Stability and Control”John Wiley,Singapore,1996
- 5.Padiyar,K.R “Power System Dynamics Stability and Control,John Wiley.

Papers:-

- 1.Concordia,C(ED) “Special Issue on Voltage Stability and Collapse”,Int J of Electrical Power Energy Systems”,Vol.15 no 4 August 1993.

An Automated Feature Extraction and Classification from Retinal Fundus Images

Subashree.K1, Keerthana.G2

PG Scholar1, Associate Professor2

Sri Krishna College of Engineering and Technology, Coimbatore
subashreeskcet@gmail.com

Abstract- The first and fundamental step is the automatic classification method, which is still a complex problem. There are several reasons make the accurate classification in retinal image difficult. Firstly, the image is always very noisy and the partial volume effect causes the retinal boundary ambiguous. Secondly, the overlaps result in gaps and cavities. Thirdly, there are large variations in retinal geometric properties like retinal size and shape between patients, this can be worse if the patient retinal operations, The graph based method is a well known algorithm that has been successfully applied to a wide variety of problems. However, its application has usually been restricted to small datasets. The graph extracted from the segmented retinal vasculature is analysed to decide on the type of intersection points and later one of the two labels are assigned to each vessel segment. This paper presents some results of on going research.

Keyword- Arteries/veins classification, center line, graph based classification, AVR value, graph modification, optic disc.

INTRODUCTION

The various Process Implementation Systems play important role for obtaining the accuracy in the performance and time-complexity based processes. Various Technical Systemic processes, approaches, methodologies, techniques are used in various related to retinal images published recently. The Mathematical Morphology technique based processes used in the construction of a synthetic adaptive contrast function from regional maxima and minima and by considering the connected components of the set and the semi-automatic method to measure and quantify the geometrical and topological properties of retinal blood vessels. It enables fast tracking of retinal structures and ensures proper administration of the treatment in case of eye movement.

The initial step of vessel centerline detection combines local information, used for early pixel selection, with structural features, as the vessel length. An effective retinal vessel segmentation technique based on supervised classification using an ensemble classifier of boosted and bagged decision trees with 9-D feature vector which consists of the vessel map obtained from the orientation analysis of the gradient vector field, Morphological transformation; line strength measures and the Gabor filter response which encodes information to successfully handle both normal and pathological retinas.

The overview of this project deals with the classification of retinal vessels into artery/vein (A/V) is an important phase for automating the detection of vascular changes, and for the calculation of characteristic signs associated with several systemic diseases such as diabetes, hypertension, and other cardiovascular conditions. An automatic approach for A/V classification based on the analysis of a graph extracted from the retinal vasculature. The proposed method classifies the entire vascular tree deciding on the type of each intersection point (graph nodes) and assigning one of two labels to each vessel segment (graph links). Final classification of a vessel segment as A/V is performed through the combination of the graph-based labeling results with a set of intensity features.

A/V CLASSIFICATION

There are certain features that enable the differentiation between arteries and veins. where the arteries are bright red in color while the veins are darker. Mostly artery calibers are smaller than vein calibers. mostly vessel calibers can be easily affected by certain diseases such as diabetes, hypertension and several cardio pathological disorders.

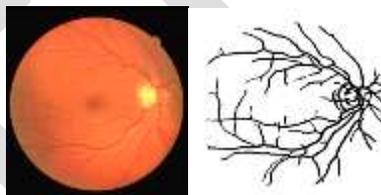
Mostly the Arteries are having the thicker walls, Which it reflects the light as a shiny central reflex strip [1]. The main characteristic of the retinal vessel tree is that in the region near the optic disc (OD), veins not oftenly cross veins and arteries not oftenly cross arteries, but both types can bifurcate to narrower vessels, and veins and arteries can cross each other. For this particular reason, tracking of arteries and veins in the vascular tree is easily possible, and has been used in some methods to analyze the vessel tree and classify the vessels as arteries and veins

Tracking A/V classification technique that classifies the vessels only in a defined concentric zone that is the region around the optic disc. vessel structure gets reconstructed by tracking, later the classification is propagated outside this zone, where there s no data to differentiate arteries from veins. This type of algorithm is not designed to consider the all vessels in the zone together, it partitions the one zone into four quadrants, and works separately.

An automatic method used for classifying retinal vessels into arteries and veins .A set of centerline features gets extracted and a soft label is assigned to each centerline, indicating the vein pixel. Then the average of the soft labels of connected centerline pixels is assigned to each centerline pixel method was enhanced as a step in calculating the AVR value.

GRAPH-BASED A/V CLASSIFICATION

In the region near the optic disc, veins rarely cross veins and arteries rarely cross arteries. Different types of intersection points: bifurcation, crossing, meeting, and connecting points. A bifurcation point is an intersection point where a vessel bifurcates to narrower parts. In a crossing point a vein and an artery cross each other. In a meeting point the two types of vessels meet each other without crossing, while a connecting point connects different parts of the same vessel. Fig. 1 depicts the block diagram of the extraction and classification from retinal fundus images The important phases are: 1) graph generation; 2) graph analysis; and 3) vessel classification



Graph generation a)Original image b)vessel segmentation

Graph Generation

A graph is a representation of the vascular network, where each node denotes an intersection point in the vascular tree, and each link corresponds to a vessel segment between two intersection points

1) Vessel Segmentation: The vessel segmentation is used for extracting the graph and also for estimating vessel calibers. This method follows a pixel processing-based approach with three phases. The first one is the pre-processing phase, where the intensity is normalized by subtracting an estimation of the image background, obtained by filtering with a large arithmetic mean kernel. In the next phase, centerline candidates are detected using information provided from a set of four directional Difference of Offset Gaussian filters, then connected into segments by a region growing process, and finally these segments are validated based on their intensity and length characteristics. The third phase is vessel segmentation, where multiscale morphological vessel enhancement and reconstruction approaches are followed to generate binary maps of the vessels

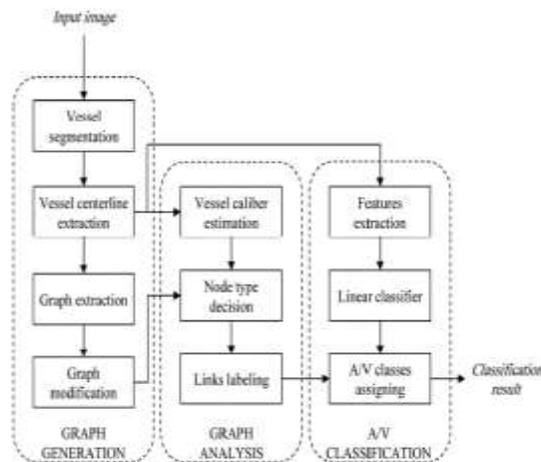
at four scales. The final image with the segmented vessels is obtained by iteratively combining the centerline image with the set of images that resulted from the vessel reconstruction.

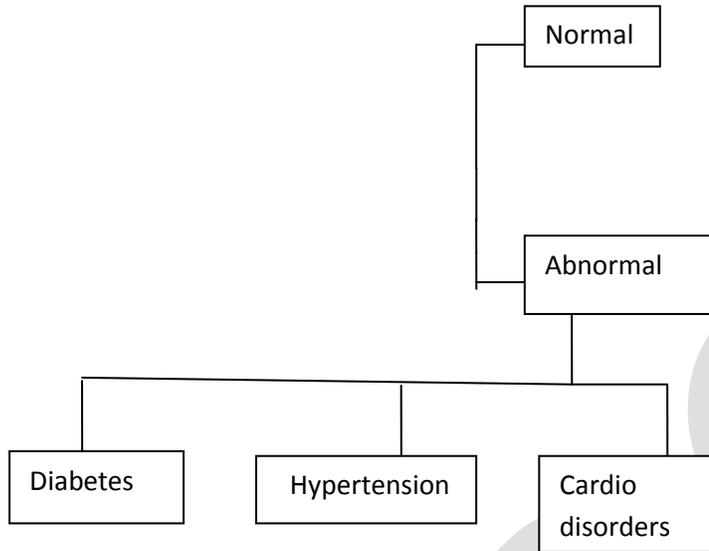
2) *Vessel Centerline Extraction*: The centerline image is obtained by applying an iterative thinning algorithm described in [7] to the vessel segmentation result. This algorithm removes border pixels

3) *Graph Extraction*: The graph nodes are extracted from the centerline image by finding the intersection points (pixels with more than two neighbors) and the endpoints or terminal points (pixels with just one neighbor). In order to find the links between nodes (vessel segments), all the intersection points and their neighbors are removed from the centerline image and as result we get an image with separate components which are the vessel segments.

4) *Graph Modification*: The extracted graph may include some misrepresentation of the vascular structure as a result of the segmentation and centerline extraction processes. As a result [3], the typical errors are (1) the splitting of one node into two nodes; (2) missing a link on one side of a node; (3) false link. The extracted graph should be modified when one of these errors is identified

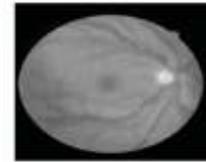
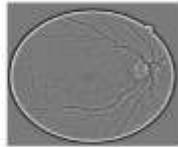
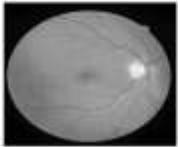
Fig 1. Block diagram for Extraction and classification from retinal fundus images





RESULTS

DIFFERENCE OF GUASSIAN MODEL

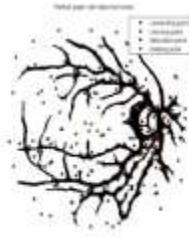


ENHANCEMENT OF VESSELS

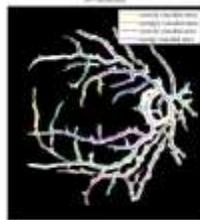
EXTRACTION OF VESSELS



RETINAL GRAPH WITH NODES



A/V CLASSIFICATION



CONCLUSION

The classification of arteries and veins in retinal images is important for the automated assessment of vascular changes. It is the fact that our method is able to classify the whole vascular tree and does not restrict the classification to particular regions of interest, normally around the optic disc. The graph-based method with LDA outperforms the accuracy of the LDA classifier using intensity features, by which it shows the relevance of using structural information for A/V classification. Further research is planned using the graph that represents the vessel tree and the A/V classification method for AVR calculation, as well as identifying other vascular signs, such as vascular bifurcation angles, branching patterns, and fractal-based features, which can have significant impact on the early detection and followup of diseases, namely diabetes, hypertension, and cardiovascular diseases.

REFERENCES:

- [1] R. S. Snell and M. A. Lemp, *Clinical Anatomy of the Eye*. New York, NY, USA: Wiley, 1998.
- [2] M. E. Martinez-Perez, A. D. Hughes, A. V. Stanton, S. A. Thom, N. Chapman, A. A. Bharath, and K. H. Parker, "Retinal vascular tree morphology: A semi automatic quantification," *IEEE Trans. Biomed. Eng.*, vol. 49, no. 8, pp. 912–917, Aug. 2002.
- [3] K. Rothaus, X. Jiang, and P. Rhiem, "Separation of the retinal vascular graph in arteries and veins based upon structural knowledge," *Image Vis. Comput.*, vol. 27, pp. 864–875, Jun. 2009.
- [4] E. Grisan and A. Ruggeri, "A divide et impera strategy for automatic classification of retinal vessels into arteries and veins," in *Proc. 25th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc.*, Sep. 2003, pp. 890–893.
- [5] S. Vazquez, B. Cancela, N. Barreira, M. Penedo, and M. Saez, "On the automatic computation of the arterio-venous ratio in retinal images: Using minimal paths for the artery/vein classification," in *Proc. Int. Conf. Digital Image Comput., Tech. Appl.*, 2010, pp. 599–604.
- [6] M. Niemeijer, X. Xu, A. Dumitrescu, P. Gupta, M. A. B. van Ginneken, and J. Folk, "Automated measurement of the arteriolar-to-venular width ratio in digital color fundus photographs," *IEEE Trans. Med. Imag.*, vol. 30, no. 1, pp. 1941–1950, Nov. 2011.

[7] Ana Maria Mendonça, *Senior Member, IEEE*, and Aurélio Campilho, *Member, IEEE*

“Segmentation of Retinal Blood Vessels by Combining the Detection of Centerlines and Morphological Reconstruction”.

[8] D. E. Becker, A. Can, J. N. Turner, H. L. Tanenbaum, and B. Roysam, “Image processing algorithms for retinal montage, synthesis, mapping and real-time location determination,” *IEEE Trans. Biomed. Eng.*, vol.45, no. 1, pp. 115–118, Jan. 1998.

[9] L. Zhou, M. S. Rzeszotarski, L. J. Singerman, and J. M. Chokreff, “The detection and quantification of retinopathy using digital angiograms,” *IEEE Trans. Med. Imag.*, vol. 13, no. 4, pp. 619–626, Dec. 1994.

[10] T. Teng, M. Lefley, and D. Claremont, “Progress towards automated diabetic ocular screening: A review of image analysis and intelligent systems for diabetic retinopathy,” *Med. Biol. Eng. Comput.*, vol. 40, pp. 2–13, 2002.

[11] R. M. Cesar, Jr and H. F. Jelinek, “Segmentation of retinal fundus vasculature in nonmydriatic camera images using wavelets,” in *Angiography and Plaque Imaging. Advanced Segmentation Techniques*, J. S. Suri and S. Laxminarayan, Eds. Boca Raton, FL: CRC, 2003, pp.193–224.

[12] J. Staal, M. D. Abramoff, M. Niemeijer, M. A. Viergever, and B. van

“Ridge-based vessel segmentation in color images of the retina,” *IEEE Trans. Med. Imag.*, vol. 23, no. 4, pp. 501–509, Apr. 200

APPLICATION OF IMAGE PROCESSING FOR DEVELOPMENT OF AUTOMATED SHAPE SEPARATION SYSTEM

1. RAVIKUMAR KHIMANI
ELECTRICAL ENGG. DEP
BABARIA INSTITUTE OF TECHNOLOGY
(Affiliated to Gujarat Technological university)
E-MAIL: ravikhimani1393@gmail.com
VADODARA (GUJARAT), INDIA.
MOBILE: +919825352739

2. AKASH SHAH
ELECTRICAL ENGG. DEPT.
BABARIA INSTITUTE OF TECHNOLOGY
(Affiliated to Gujarat Technological University)
E MAIL: akash3193@yahoo.com
VADODARA (GUJARAT), INDIA
MOBILE: +917405090336

3. Dr. Dipesh. M .Patel
E-Mail: dipesh_ee@yahoo.co.in

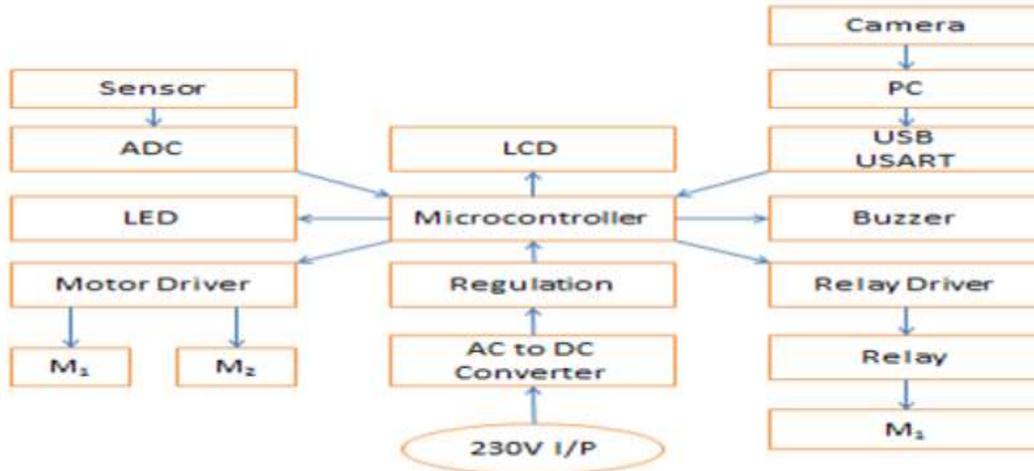
Abstract— Efficiency and Effectiveness of industrial work mostly depend on Labour work, manufacturing time, fixed cost and variable cost. The main aim of this paper is to decrease Labour work as well as cost. So high efficiency can be obtained. The two key aspects of this paper are:-

- 1) Automated System: - In industry the labour work required for segmenting object of different shapes (such as triangular, square, round etc.) one by one which are moving on conveyer belt. So it increases labour cost and work time. So, the goal of this paper is to design a system which automatically sense shape of object and separates them automatically so work efficiency can be improved.
- 2) Machine Vision: - In industries if manufacturers producing different shapes of objects then machine requirement for producing each shaped object is different. This paper is also deals with production of every shaped machine in just single machine and separating them after production. Thus this research is helpful for Industrial Economization.

Keywords— MATLAB, Image processing, Shape separation, Automated System

Introduction:- An Automated inspection system is continuously conveyed in the manufacturing process. The systems mention in this paper offers computing of shapes, Image processing, analyzing image in MATLAB, software computing and determining that which shape of object it is. Since, Humans are also able to find shape with prior knowledge. Human judgment is influenced by expectations and prior knowledge. However, it is tedious, laborious, costly and inherently unreliable due to its subjective nature. Therefore, traditional visual quality inspection of shape performed by human inspectors has the energy to be replaced by software computation and making system totally reliable as well as flexible. These systems employ image processing techniques and can quantitatively analyze sizes, shapes, and the color and textural properties of products. Accurate automated shape separation and segmentation can reduce human workloads and labor costs. Machine vision has been used to detect the part and take the image of the part which compares it with the standard dimensions given to it through programming language The research work carried out in this paper is very helpful in Automatic Inspection, Process control and Robot Guidance I \n industrial application. The system block diagram and stepping action for making this system is follows as. The step includes

- 1) Acquisition of Image: - Typically using camera analysis of different shapes such as Rectangular, square, circular etc is to be carried out through MATLAB image processing and the data obtained for each shape is stored in a storing device such as microcontroller.
- 2) After storing each data, when conveyer belt is in running mode, sensor (camera) senses shape of objects and data is given to microcontroller from other input port.
- 3) Now Microcontroller compares data which stored in step 1 and step 2. if any comparison matches then object of that particular shape will be separated by some pushing device(for ex. CD drive) on conveyer belt and segmentation takes place.
- 4) if comparison doesn't match then pusher will not operate and hence belt continues to rotate. separation will not be carried out. the control system will blow buzzer which will give indication to user that the shape of object is invalid. so, corrupted shape can't be segmented. This is great advantage that corrupted shape will not come in manufacturing process.



DESCRIPTION:-

1) Image Processing for shape separation: -

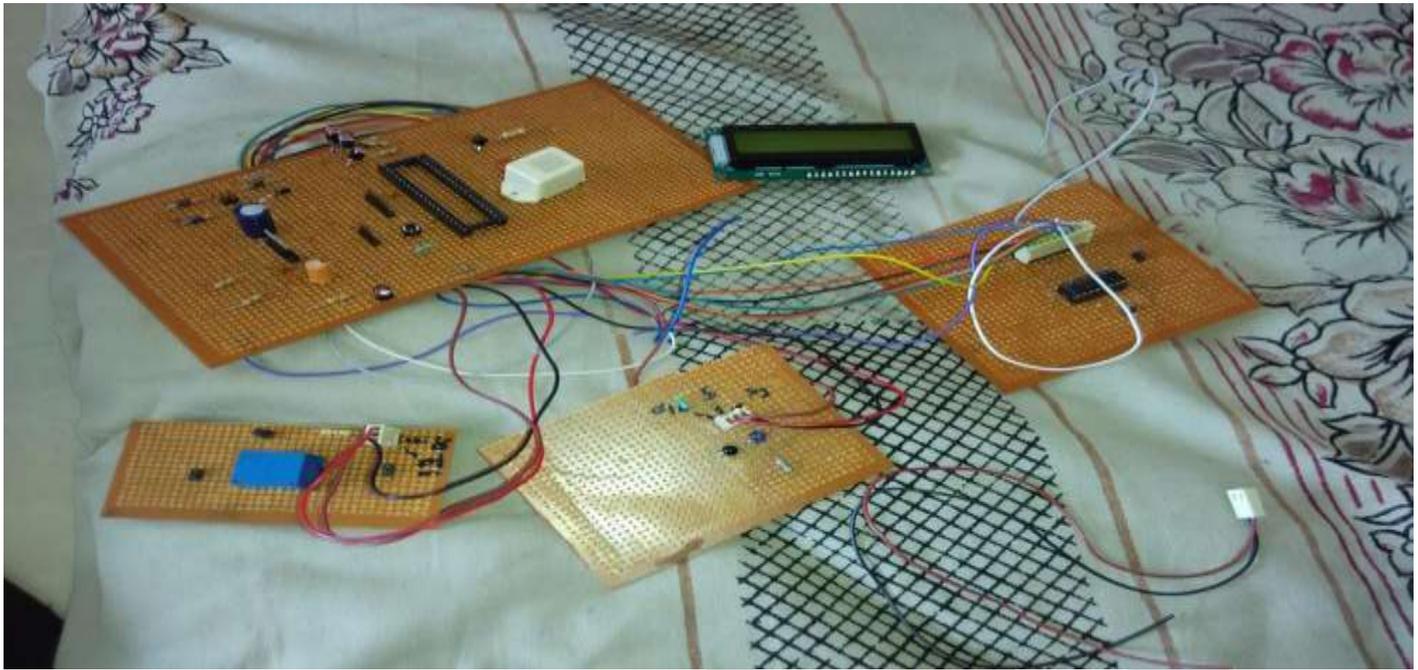
Fundamental steps in image processing:

1. Image acquisition: This is the first step of image processing. In this a digital image is acquired
2. Image preprocessing: In the second step image is improved in a way that increases the chances for success of the other processes.
3. Image segmentation: It partitions an input image into its constituent parts or objects.
4. Image representation: It converts the input data to a form suitable for computer processing.
5. Image description: In this step features are extracted that result in some quantitative information of interest or features that are basic for differentiating one class of objects from another.
6. Image recognition: It assigns a label to an object based on the information provided by its descriptors.
7. Image interpretation: A meaning is assigned to an ensemble of recognized objects in this step.

2) Different Power electronics Block to construct system:

- Power supply block
- Micro controller Block
- PC implementation Block
- Sensor
- Motor driver Block (for conveyer belt mechanism)
- Relay driver block

The image consists of different blocks which we prepared during research



Shape Detection

The shape detection algorithm performs checking/detection of some simple geometrical shapes for provided set of points (edge points of a blob). During the check the algorithms goes through the list of all provided points and checks how accurately they fit into assumed shape. During image processing, especially for blob analysis, it is often required to check some objects shape and depending on it might perform further processing for a particular object shape. For example, some applications may finding only circles from all the detected objects, or quadrilaterals, rectangles, etc. AForge.net describes some basic techniques, which allows detecting such simpler shapes like circles, triangles and quadrilaterals (plus their subtypes, like rectangle, rhombus, triangle, etc.).

The shape checking algorithm allows some deviation of points from the shape with given parameters. In a nutshell, it is permitted that specified set of points may form a little bit distorted shape, which might still be recognized. The allowed range of distortion can be controlled by two properties (Min-Acceptable-Distortion and Relative-Distortion-Limit), which allow higher distortion level for bigger shapes and smaller amount of distortion for smaller shapes. In order to check specified set of points, the algorithm calculates mean distance between specified set of points and edge of the given shape. If the mean distance is equal to or less than maximum Permitted distance, then a shape is recognized. For simple shape detection, we have taken the assistance from AForge.net Framework. We have used simple shape Class under the framework during implementing the application. Simple shape class finds the blob points of the objects and preserves these points within an array named blob-array. During implementation we have invoked separate methods for rectangular/square and circular objects.

Rectangular or Square Shaped Objects

The blob points are used to find four corner points for Rectangular or Square shaped object. The centre point of the object is calculated from these corner points. As the expected dimension of the object is known and fixed for a batch, there is provision to provide expected length and width of the object as input values. We have kept provision that calculated value (actual) may deteriorate +/-10% with respect to given input parameter values. That means if the actual object deteriorates

Maximum 10% with respect to given dimensions, the algorithm will be able to report the object as valid within the acceptable limit. The deterioration percentage can be tuned to more or less if anybody wants.

Circular Shaped Objects

The idea of circle detection algorithm is based on the assumption, that all circle's edge points have the same distance to its center, which equals to circle's radius. It may happen that circles may have some distortion of their shape, so some edge pixels may be closer or further to circle's center. The blob points have been considered to find the radius and centre for the circular object. The algorithm distortion is too big, than most probably the object has other than circle shape. Finding circular object is easier compare to square or

rectangular object due to homogeneity of circular objects. The algorithm is able to process doughnut (one type of baked product) image which is having common centre but different radius (outer and inner circle). Thus it is able to calculate the thickness.

ACKNOWLEDGMENT:-

The authors sincerely acknowledge the support extended by Babaria Institute of Technology, Varnama, Vadodara, where this project had been carried out by students of Final Year, B. E. (ELECTRICAL Engineering) during the academic year 2014-15 for partial fulfillment of the degree of Bachelor of Electrical Engineering, under the guidance of the author, Prof. Dipesh M Patel And Prof. Milan Chaudhari. At present, two other students are working on the project for further improvements in it. They are Shailesh Khemchandani and Deep Shah.

CONCLUSION:-

In this paper, the shape separation is being developed. This system is advantageous for industrial economization. Different types of geometries can be used for image processing. This system is more advantageous for small scale industries. Different types of models or objects can be used as a work piece for separation

REFERENCES:

- [1]. Mirark1, Jesse S. Jin1, Sherlock L. Au2, Suhui Luo1, and Yue Cui1,1 The School of Design, Communication & IT, The University of Newcastle, Australia, 2Multi Base Ltd, Hong Kong, "Automated Defect Inspection Systems by Pattern Recognition", International Journal of Signal Processing, Image Processing and Pattern Recognition Vol. 2, No. 2, June 2009.
- [2]. Costa, C. E. and Petrou, M., Automatic registration of ceramic tiles for the purpose of fault detection, Machine Vision and Applications, 11:225-230, 2000.
- [3]. Elbehiery, H., Hefnawy, A. and Elewa, M., Surface defects detection for ceramic tiles using image processing and morphological techniques, Proceedings of World Academy of Science, Engineering and Technology, 5:1307-6884, 2005.
- [4]. Yeh, J. C. H., Hamey, L. G. C., Westcott, T. and Sung, S. K. Y., Colour bake inspection system using hybrid artificial neural networks, IEEE International Conference of Neural Networks:37-42, 1995.
- [5]. Braxakovic, D., Beck, H. and Sufi, N., An approach to defect detection in materials characterized by complex textures, Pattern Recognition, 23(1/2):99-107, 1990.
- [6]. H. C. Abril, M. S. Millan, R. Navarro, " Pilling evaluation in fabrics by digital image processing". Vision system: applications. SPIE Vol. 2786. pp. 19-28. 1996.
- [7]. Zhang, Y. F. and Bresee, R. R., Fabric defect detection and classification using image analysis, Textile Research Journal, 65(1):1-9, 1995.
- [8]. Chi-ho Chan, Hugh Liu, Thomas Kwan, Grantham Pang, Dept. of Electrical and Electronic Engineering, The University of Hong Kong, Pokfulam Road, Hong Kong, "AUTOMATION TECHNOLOGY FOR FABRIC INSPECTION SYSTEM".
- [9]. M. Dar, W. Mahmood, G. Vachtsevanos, "Automated pilling detection and fuzzy classification of textile fabrics". Machine in industrial inspection V. SPIE Vol. 3029. pp. 26-36. 1997.
- [10] O. Golan, S. Kiro, and I. Horovitz, "Method and System for Edge Detection," U.S. Patent 20 120 243 793, September, 2012.
- [11] P. Hough, "Method and means for recognizing patterns represented in logarithmic polar coordinates," Tech. Rep., 1962.
- [12] I. S. Icon Group International and I. G. Ltd., Keyence Corp.: Labor Productivity Benchmarks and International Gap Analysis, 1st ed. Icon Group International, Incorporated, 2000.
- [13] B. Kamgar-Parsi and A. Rosenfeld, "Optimally isotropic Laplacian operator," Image Processing, IEEE Transactions on, vol. 8, no. 10, pp. 1467-1472, 1999.
- [14] A. Kirillov, "AForge .NET framework," 2009. [Online]. Available: <http://www.aforgenet.com>
- [15] G. Kundacina and M. Kundacina, "More automation solution inc. ," 2012. [Online]. Available: <http://www.moreautomation.com>
- [16] X. Li, H. Zhao, X. Jin, and X. Qin, "Real-Time Image Smoothing Based on True Edges," in Computer-Aided Design and Computer Graphics (CAD/Graphics), 2011 12th International Conference on, sept. 2011, pp. 141 -145.
- [17] J. Maldacena, "Gravity, particle physics and their unification," International Journal of Modern Physics A, vol. 15, no. supp01b, pp. 840-852, 2000.
- [18] MathWave Technologies, "Easyfit: Distribution Fitting Software," 2012. [Online]. Available: <http://www.mathwave.com>
- [19] I. Mayergoyz, "Mathematical models of hysteresis," Magnetics, IEEE Transactions on, vol. 22, no. 5, pp. 603-608, 1986.
- [20] J. Milnor, "Eigenvalues of the Laplace operator on certain manifolds," Proceedings of the National Academy of Sciences of the United States of America, vol. 51, no. 4, p. 542, 1964.
- [21] S. Nabavi, B. Vijaya Kumar, J. Bain, C. Hogg, and S. Majetich, "Application of Image Processing to Characterize Patterning Noise in Self-Assembled Nano- Masks for Bit-Patterned Media," Magnetics, IEEE Transactions on, vol. 45, no. 10, pp. 3523 -3526, oct. 2009.
- [22] R. ONeil, "Convolution operators and $L(p; q)$ spaces," Duke Mathematical Journal, vol. 30, no. 1, pp. 129-142, 1963.

- [23] O. Paquet-Durand, D. Solle, M. Schirmer, T. Becker, and B. Hitzmann, "Monitoring baking processes of bread rolls by digital image analysis," *Journal of Food Engineering*, vol. 111, no. 2, pp. 425 – 431, 2012. 104 Bibliography
- [24] I. K. Park, N. Singhal, M. H. Lee, S. Cho, and C. Kim, "Design and Performance Evaluation of Image Processing Algorithms on GPUs," *Parallel and Distributed Systems, IEEE Transactions on*, vol. 22, no. 1, pp. 91 –104, jan. 2011.
- [25] M. Reiser and M. VandenBerg, "Validity of the chi-square test in dichotomous variable factor analysis when expected frequencies are small," *British Journal of Mathematical and Statistical Psychology*, vol. 47, no. 1, pp. 85–107, 1994.
- [26] E. Sandra, L. and I. Sheila, M., "Bakery foods are the major dietary source of trans-fatty acids among pregnant women with diets providing 30 percent energy from fat," *Journal of the American Dietetic Association*, vol. 102, no. 1, pp. 46 – 51, 2002.
- [27] H. Shin, Y. Jung, C. Jeong, and J.-H. Heo, "Assessment of modified AndersonDarling test statistics for the generalized extreme value and generalized logistic distributions," *Stochastic Environmental Research and Risk Assessment*, vol. 26, pp. 105–114, 2012.
- [28] K. Takahasi, "Note on the multivariate burrs distribution," *Annals of the Institute of Statistical Mathematics*, vol. 17, pp. 257–260, 1965.4

IJERGS

High-Impedance Fault Detection Using Wavelet Transform

Priyanka Biradar, Prof.V.R.Sheelvant

PG Scholar , Electrical & Electronics Engineering Department, SDMCET, Dharwad, Karnataka, India.

ppriyankabiradar@gmail.com, +91-8050309548

Professor , Electrical & Electronics Engineering Department, SDMCET, Dharwad, Karnataka, India.

Abstract— This paper presents a wavelet transform based technique for the detection of High impedance Faults in the distribution feeders. In this study electrical models for a high impedance fault on a power system networks are developed and simulated using Mi-power. The analysis of resulted current signals, using Discrete Wavelet Transform (DWT) is done proving better performance than conventional relays for the detection of high impedance fault.

Keywords— High Impedance Faults, Wavelet Transform, Multi-resolution analysis, detail coefficient, daubachies wavelets, Mi-power software, wavelet toolbox.

INTRODUCTION

Detection of High impedance Faults present still important and unsolved protection problem. HIFs on distribution feeders are abnormal electrical conditions that cannot be detected by conventional relays such as over current relays, impedance relays etc. because of low fault current due to the high impedance fault at the point of fault. These faults often occur when an overhead conductor breaks or touches a high impedance surface such as asphalt road, sand, cement or trees and pose a threat on human lives when neighboring objects come in contact with bare and energized conductors.

HIF can occur in two cases. In case one , a conductor breaks and fall to ground and fallen phase current decreases and protection relays cannot detect fault because because current is not more than setting current of relays. In other case conductor is not break but it touches a high impedance material such as tree branches. In this case feeder current increases but it is not enough to detect by conventional protection relays. Therefore this type of fault is very difficult to detect[1].

The wavelet transform technique recently proposed as a new tool for monitoring and protection of power system[2-6] has received considerable interest in field of power system signal processing[7-8]. The WT well suited to wide band signals that may not be periodic and may contain both sinusoidal and non-sinusoidal components. This is due to the ability of wavelets to focus on short time intervals for high frequency components and long time intervals for low frequency components.

In this paper the output currents for the various impedances during fault are used as the medium for fault detection. A three phase to ground fault is considered. A Mi-power software is used to generate the three phase to ground fault current data for the various impedances. A wavelet analysis using daubechies wavelet is than applied to currents. The coefficients of the detailed scales are examined to determine the high impedance fault.

This paper is organized as follows. Section 2 presents wavelet transform and multi resolution analysis. Section 3 deals with modeling of HIF in Mi-power used for generation of fault currents for various impedances. The implementation of wavelet analysis on the signals generated from the simulations is carried out. Section 4 conclusion is made.

WAVELET TRANSFORM AND MULTI RESOLUTION ANALYSIS

The wavelet transform is a recently developed mathematical tool that provides a non- uniform division of data or signal, into different frequency components, and then studies each component with a resolution matched to its scale [9-10]. It is often used in the analysis of transient signals because of its ability to extract both time and frequency information simultaneously, from such signals. The comparison of the WT with the Fourier transforms (FT) and why it is preferred to the FT has been documented in [11].

Multi-resolution Analysis (MRA) is an alternative approach used to analyze signals to overcome the time and frequency resolution problems, since these problems persist regardless of the transform employed. MRA analyses the signal at different frequencies with different resolutions. It does not resolve every spectral component of the signal equally. It is designed to produce good time resolution and poor frequency resolution at high frequencies and vice versa. The rationale behind this is that the signals that are encountered in practical applications have high frequency components for short durations and low frequency components for long durations.

In DWT, a time scale representation of a digital signal is obtained using digital filtering techniques, developed by [12]. DWT uses filters of different cut-off frequencies to analyze the signal at different scales. The signal is passed through a series of high pass filters to analyze the high frequencies, and it is equally passed through a series of low pass filters to examine the low frequencies. Filtering a signal is synonymous with the mathematical operation of convolution of the signal with the impulse of the filter as presented in equation (1).

$$x[n] * h[n] = \sum_{k=-\infty}^{\infty} x[k] * h[n - k] \quad (1)$$

where $x[n]$ is a discrete time function, n is an integer and $h[n]$ is the low pass filter impulse. Really the most important part of many signals is the low frequency content. It is what gives the its identity. The high frequency content, on the other hand, only impacts flavor. This is what brings into wavelet analysis, *approximations* and *details*. *Approximations* are the high-scale, low frequency components of the signal, while *details* are the low-scale, high frequency components. Approximations (also known as **the scaling coefficients**) are computed by taking the inner products of the function $f(t)$, the signal, with the scaling basis $\phi_{j,k}$, achieved with equation (2).

$$A_{j,k} = \langle f(t), \phi_{j,k}(t) \rangle = \int_{-\infty}^{\infty} f(t) \cdot \phi_{j,k}(t) dt \quad (2)$$

$$D_{j,k} = \langle f(t), \psi_{j,k}(t) \rangle = \int_{-\infty}^{\infty} f(t) \cdot \psi_{j,k}(t) dt \quad (3)$$

This is obtained by passing the original signal through a low pass filter while *details* (also known as **the wavelet coefficients**) are obtained by passing the signal through a high pass filter. This operation is computed mathematically by taking the inner products of the function $f(t)$ with the wavelet basis as in equation (3).

Where the scale function $\phi_{j,k}(t)$ and the wavelet function $\psi_{j,k}(t)$ are determined by the particular mother wavelet $\psi_{a,b}$ selected [3]. Unfortunately, performing the above operation on a real digital signal leads to twice the data one started with. Correcting this problem created by the filtering operations, the original signal must be **down sampled**. *Down sampling* a signal is synonymous with reducing the sampling rate, or removing some of the samples of the signal.

As mentioned earlier, the DWT analyses signals at different frequency bands with different resolutions by decomposing the signal into coarse approximation and detail information. DWT uses *scaling functions* and *wavelet functions* in achieving this. These two sets of functions are associated with low pass and high pass filters, respectively. The original signal $x[n]$ is first passed through a half band high pass filter $g[n]$ and a low pass filter $h[n]$. As said previously, after the filtering exercise, half of the samples would be eliminated. The signal can therefore be sub sampled by two. This constitutes one level of decomposition and can be expressed, mathematically as follows

$$D_j[n] = \sum_k x[n] * g[2n - k] \quad (4)$$

$$A_j[n] = \sum_k x[n] * h[2n - k] \quad (5)$$

where D_j is the output from the high-pass filter called Detail and A_j is the output from the low-pass filter called Approximation, at resolution j , $j=1, 2, \dots, J$; $k=1, 2, \dots, K$, where K is the length of the filter vector, after down sampling by two. The signal decomposition process can be done iteratively with successive approximations being decomposed in turn, so that one signal is broken down into many lower-resolution components. Fig. 1 [11] illustrates a multiple level decomposition procedure for a signal $x[n]$.

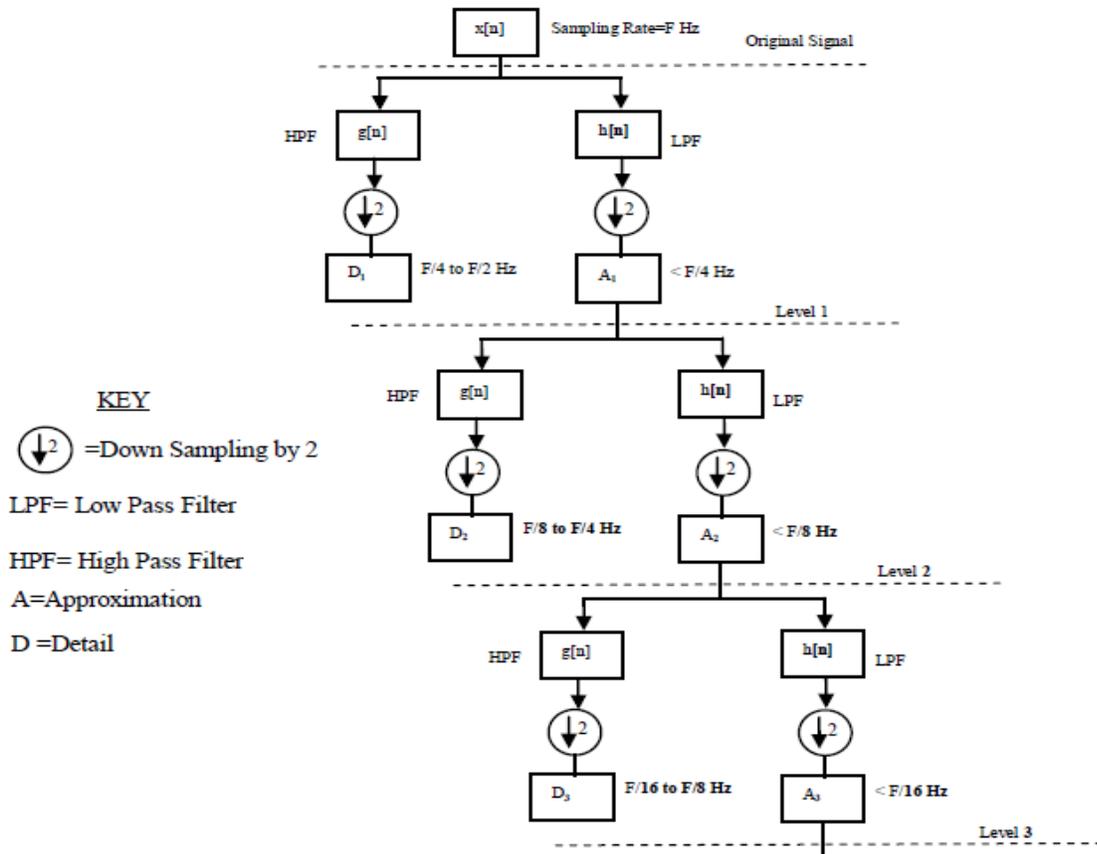


Fig1. Schematic Diagram of Multi-resolution Analysis of DWT Decomposition

SYSTEM MODEL

A sample ten bus system considered for the study. The system consists of three generators, seven lines, three transformers and three loads. System data is on 100MVA base and 60 Hz . this is Simulated for various impedances for the detection of HIFs. A model is developed using Mi-power software for the analysis.

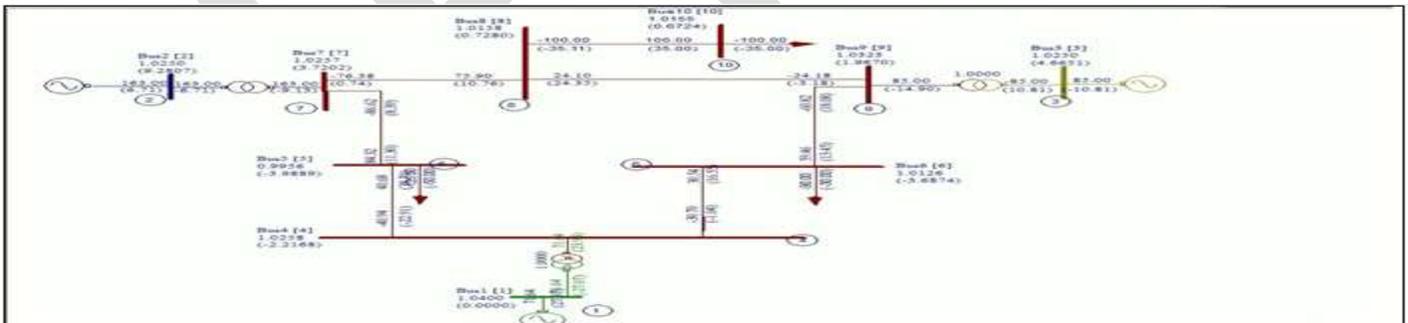


Fig2: HIF model of ten bus system developed using Mi-power software

Case(i): Normal operating condition



Fig 3(a): Current waveform during normal operating condition



Fig 3(b): Current waveform during normal operating condition using Wavelet transform

In case (i) it can be observed that, during normal operating condition there is no change in load current, hence when analyzed with wavelet transform, there no variation of current.

Normal operating current= 3497.35A

Case (ii): Fault with Z=0 Ohm

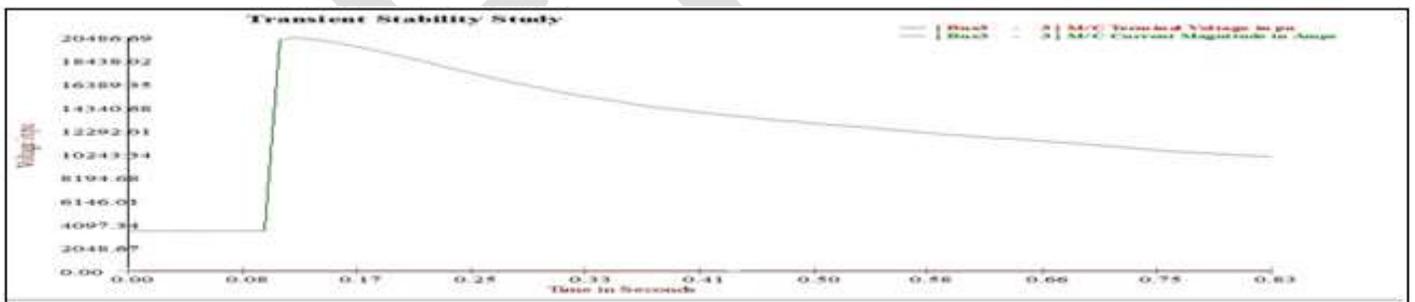


Fig 4: Current and voltage waveforms (Z=0 ohm)

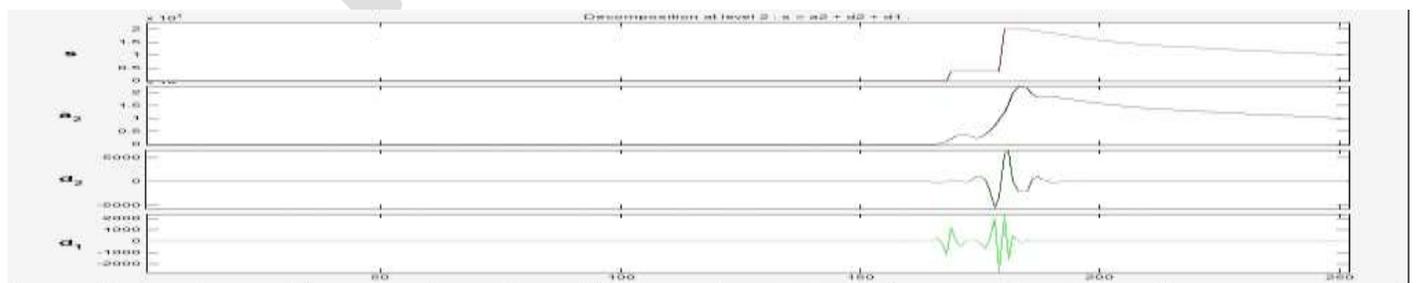


Fig 5: Fault current waveform with $Z=0$ ohm

Case (iii): Fault with $Z=10$ Ohm

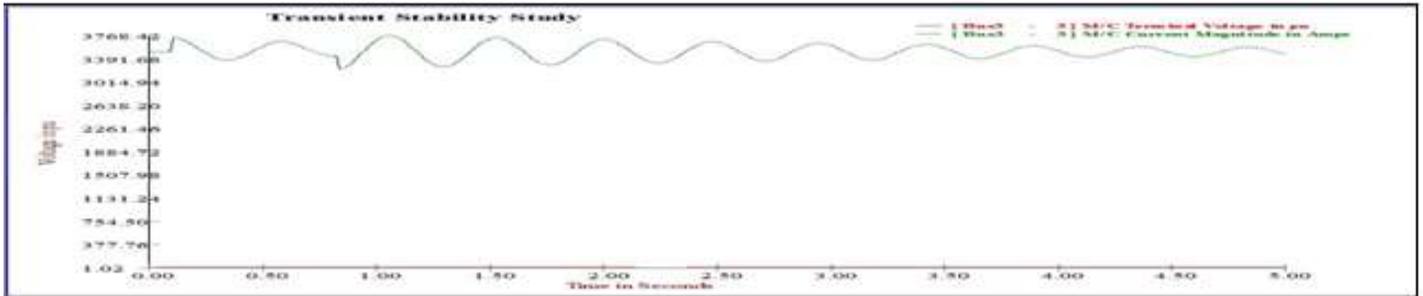


Fig 6: Current waveform with $Z=10$ ohm

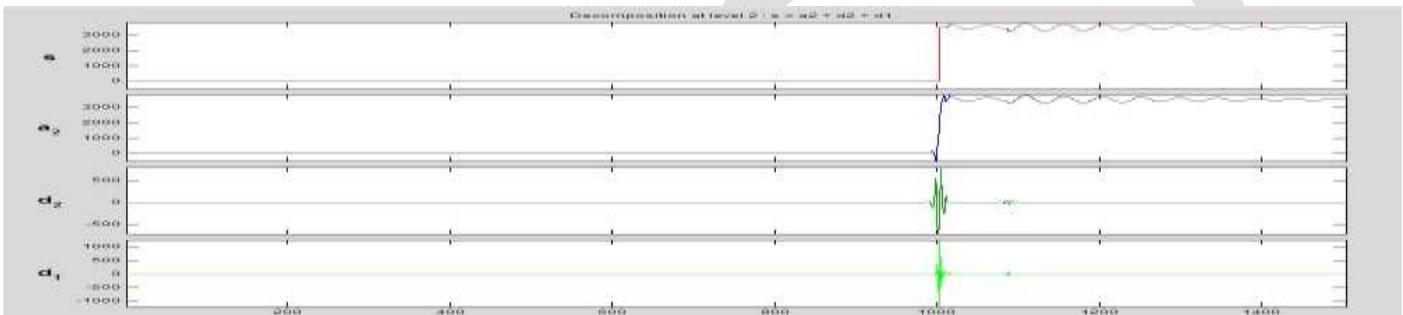


Fig 7 : Current waveform with $Z=10$ ohm using Wavelet transform

Case(iv). Fault with $Z=100$ ohm

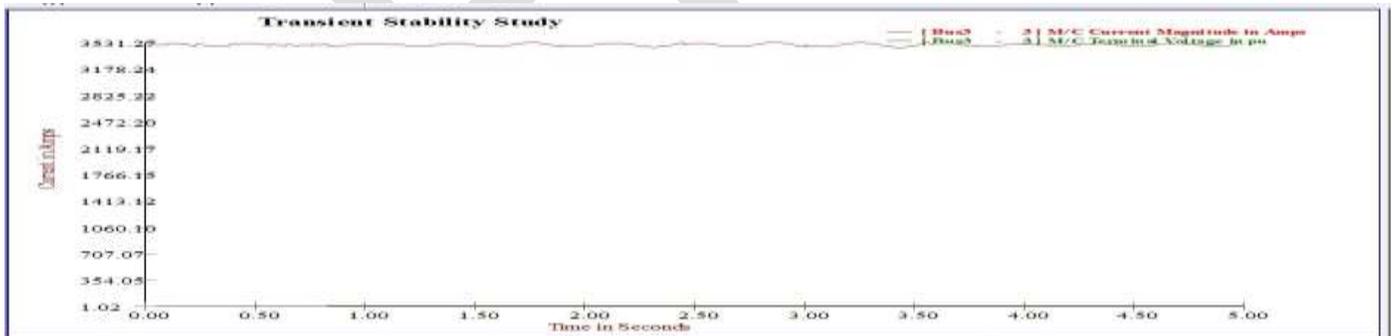


Fig 8: Current waveform with $Z=100$ ohm

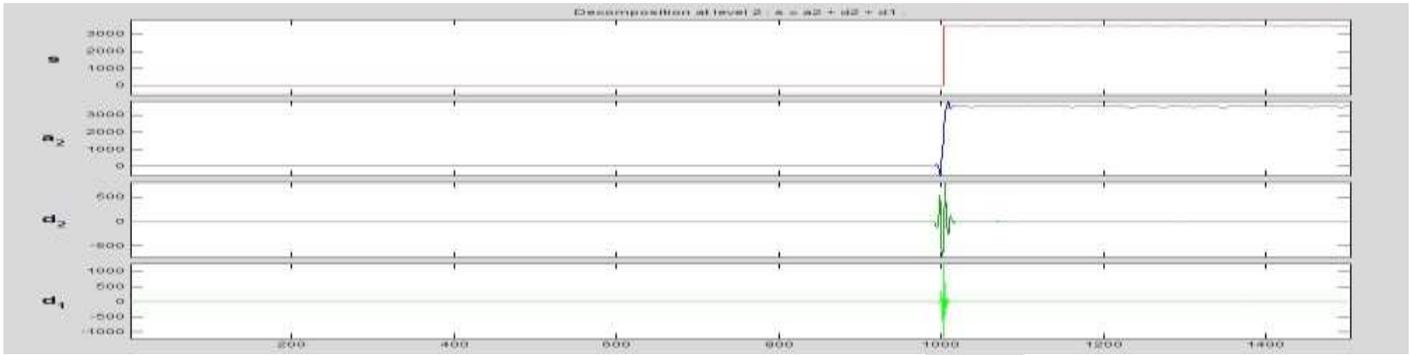


Fig 9: Current waveform with Z=100 ohm with using Wavelet transform

Case(v). Fault with Z=1k Ohm

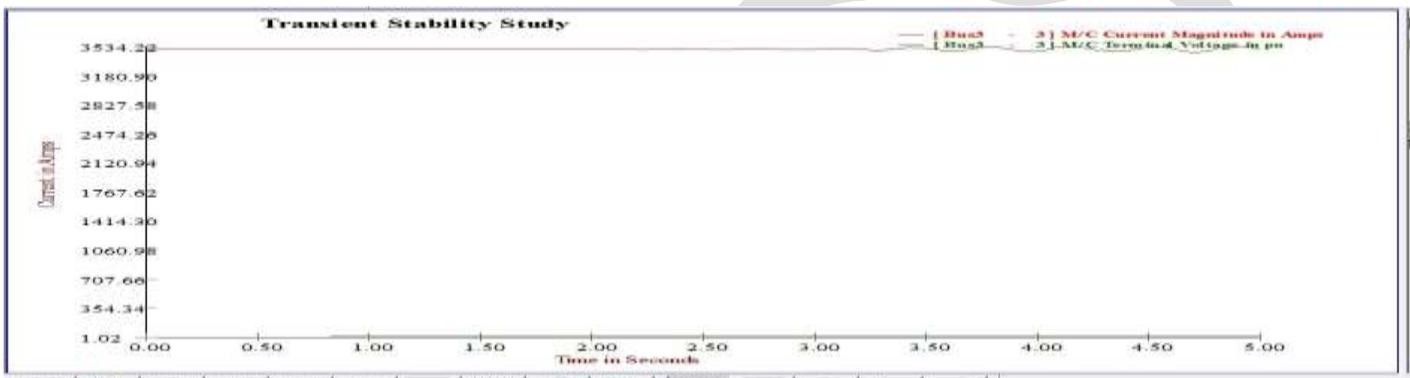


Fig 10: Current waveform with Z=1k ohm

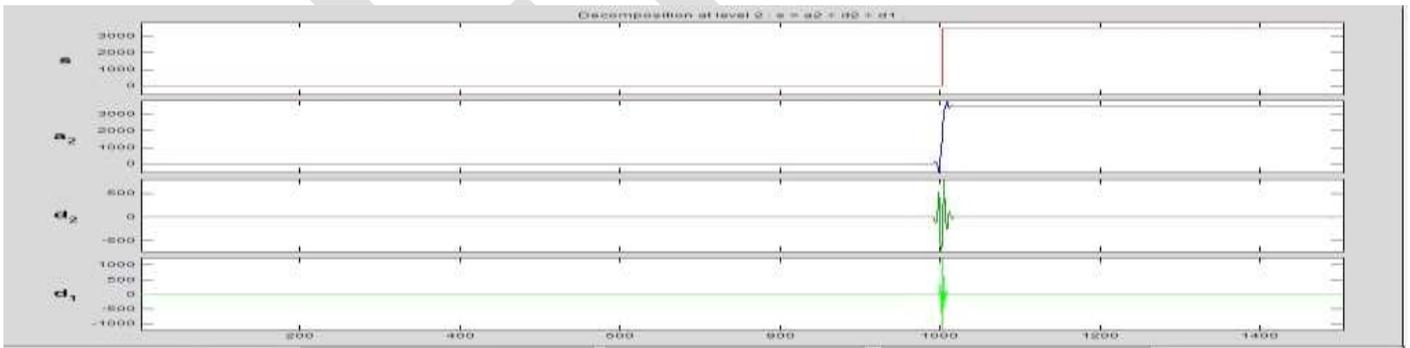


Fig11: Current waveform with Z=1k ohm with using Wavelet transform

When energized conductor breaks or comes in contact with the non-conducting foreign object High impedance fault occurs. Because of this high impedance during fault, fault current is very low which cannot be easily detected by conventional relays. Hence a wavelet transform is used for detection of high impedance fault. Discrete 1D-Wavelet with two-stage decomposition of the signals obtained, using db4 wavelet level 2 detail and approximation coefficients are plotted. From waveforms obtained from wavelet transform, small variations in the current can be easily detected.

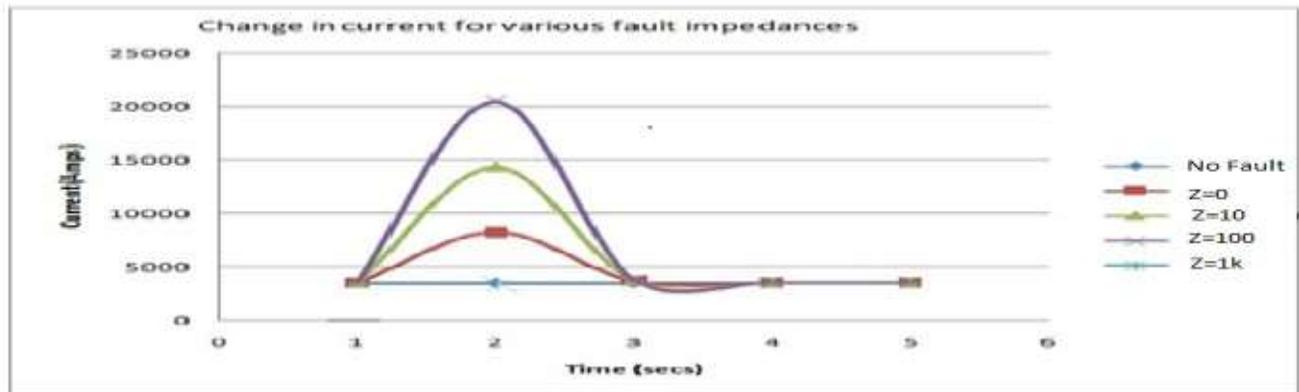


Fig 12: Current waveforms for the faults of various impedances

In case (iv) and (v) fault is created for high impedance values (100 and 1k ohms) this high impedance resist the increase in load current during fault hence it become difficult for the over current relays and other conventional relays to detect the presence of fault. Current signals obtained from these simulations are analyzed using wavelet transform which are very useful in detection of these high impedance faults.

The waveforms of voltage and current generated in the simulations carried out in and are transferred to discrete wavelet transform toolbox of MATLAB to analyze the frequency characteristics of the signals. Performing two-stage decomposition on these signals, using db4 wavelet, yields level 2 detail and approximation coefficients plotted.

Normal operating current= 3497.35 A		
Fault Impedance	Increase in current	
	From	To
Z=0 ohm	3497.35A	20486.69A
Z=10 ohm	3497.35A	3768.42A
Z=100 ohm	3497.35A	3541.12A
Z=1k ohm	3497.35A	3534.20A

Table 1. Increase in load current during fault for various impedances

CONCLUSION

This paper presented a wavelet transform based technique for the detection of high impedance faults in power system network. In this paper a 10 bus system is developed using Mi-power and faults are created for various impedances. Current waveforms are obtained as output of computer simulation. The discrete wavelet transform is used for the analysis of these obtained current waveforms which helps in detection of high impedance faults.

REFERENCES:

[1] "High impedance fault detection of distribution network by phasor measurement units" Vol.4, No.3(2013).
 [2] Y. Sheng and S. M. Rovnyak, "Decision Tree-Based Methodology for High Impedance Fault Detection," *IEEE Transactions on Power Delivery*, Vol.19, No. 2, 2004, pp. 533-536.
 [3] Cui, X. Z. Dong, Z. Q. Bo and S. Richards, "Integrated Scheme for High Impedance Fault Detection in MV Distribution System," *Latin America IEEE/PES Transmission and Distribution Conference and Exposition*, Bogota, 13-15 August 2008, pp. 1-6.
 [4] A. R. Sedighi and M. R. Haghifam, "Simulation of High Impedance Ground Fault In Electrical Power Distribution Systems," *International Conference on Power System Technology*, Hangzhou, 24-28 October 2010, pp. 1427- 1435.

- [5] C. L. Huang, H. Y. Chu and M. T. Chen, "Algorithm Comparison for High-Impedance Fault Detection Based on Staged Fault Test," *IEEE Transaction on Power Delivery*, Vol. 3, No. 4, 1988, pp. 1427-1435.
- [6] H. Calhoun, M. T. Bishop, C. H. Eiceler and R. E. Lee, "Development and Testing of an Electro-Mechanical Relay to Detect Fallen Distribution Conductors," *IEEE Transaction on Power Apparatus and Systems*, Vol. PAS-101, No. 6, 1982, pp. 1643-1650.
- [7] Scheme for High Impedance Faults in Distribution and Utilization Networks," *Proceedings of Canadian Conference on Electrical and Computer Engineering*, Halifax, 7-10 March 2000, pp. 740-744.
- [8] A. Lazkano, J. Ruiz, L. A. Leturiondo and E. Aramendi, "High Impedance Arcing Fault Detector for Three-Wire Power Distribution Networks," *10th Mediterranean Electrotechnical Conference*, Lemesos, 29-31 May 2000, pp. 899-902.
- [9] "Wavelet Transform Based Algorithm for High-Impedance Faults Detection in Distribution Feeders". *European Journal of Scientific Research* ISSN 1450-216X Vol.41 No.2 (2010), pp.238-248 © EuroJournals Publishing, Inc. 2010.
- [10] Huang, S. and C. Hsieh, 1999. "High-impedance Fault Detection Utilizing A Morlet Wavelet Transform Approach," *IEEE Transactions on Power Delivery*, vol. 14, no. 4, pp. 1401-1410.
- [11] Polikar, R. "The Wavelet Tutorial," 1994. Retrieved on April 14, 2008 from <http://engineering.rowan.edu/~polikar/WAVELETS/Wtutorial.html>
- [12] Wavelet. Wikipedia, 2004. Retrieved on April 14, 2009 from <http://en.wikipedia.org/wiki/wavelet>

CYBER BULLING – THE REPERCUSSION OF LACK CYBER GOVERNENCE IN INDIA

DR.AARTI TOLIA

B.COM.,M.A.,LL.M., PhD (through National Law School of India University) Practicing law and Professor of Law in Mumbai.

Abstract: From the pre-technology age explicating ethics has always attracted the attention of philosophers globally. With distinct decipherment in various nations and cultures throughout the globe the field of ethics involves organizing, safeguarding, and advocating theories to evaluate and bisect right and wrong behavior. The rudimentary interpretation of online dictionary elucidates ethics to be the body of moral principles or values governing of a particular culture or group reflecting dharma. From the birth the parents, the schools & the statute incorporate ethical standards to which all individuals abide and draw line between the limits and boundaries to adhere.

Post technology the basic human needs have seen a radical change where ‘food, clothing and shelter’ have now an added element to its definition as in ‘food, clothing, shelter and internet’. The internet has enveloped every phenomenon in all walks of life, from banking to shopping, from education to projects and research. The paper accentuates the incompetency of the parents, teachers and statute to incorporate online ethical standards in children thereby escalating the chances of reckless use of the cyber space. Internet savvy users are also in dilemma on analyzing what amounts to ethical on the World Wide Web. Parents, educators, administrators across the globe are struggling to explore appropriate approaches to demonstrate and inculcate cyber ethics in the new generation.

Keywords: Cyberbullying, Cyberspace, Ethics, Social Networking Sites, Indian Penal Code 1860, Information Technology Act 2000.

INTRODUCTION

Preclude:

The development of information technology escalates oodles of issues like computer intrusion, security, privacy infringement, intellectual property legitimacy, defamation, cheating, fraud and impersonation and so on. The innate feature of anonymity comforts the perpetrator to behave unethical on internet with no cyber-censorship. In short the cyber ethics may be defined as a responsible use of internet or responsibilities for information on internet. This paper is divided into two sections where part one highlights on the careless & bold access of Social Networking Sites (SNS) by children and youth on internet the second part illuminates the role of statute i.e. pitfall in the cyber governance of India to inculcate cyber-ethics in the pre-stages.

Part I

Logical interpretation of cyber ethics means principles or standards of human conduct thereby obeying laws applicable to online behavior for a safe and healthy browsing. It may be addressed with different names like cyber citizenship or netiquettes and sheds light on what user does online when no one is watching. The moral behavior and true virtues that one follows offline in the real world on daily basis when practiced online it defines cyber ethics. It is very essential for a user to understand what are the causes and consequences of accessing technology in haphazard manner.

New generation-children and teens who otherwise may think several times before committing an offence offline like pick pocketing, robbing etc. don't take a second to cross the cyber ethical boundaries and being accountable to a cybercrime due to lack of cyber regulations. The availability of internet on cheap and handy devices round the clock supplemented with anonymity is no less than 'genie and the magic lamp' for children and teens to fulfil their unlimited wishes at a click of the mouse. Technology continuous to change rapid than a blink of eye as such it brings new dimensions to the responsibilities of parents, teachers and legislation. Today the education system is reliant on internet for projects, homework, research and filling of online forms is a part of routine work. Children use a computer and internet at very early stage of education, maybe on their own, or through the educational institutes where schools provide free access to internet in the libraries or on cell phones, as such practically what steps have been adapted to coach ethical use of technology in schools.

Bullying has been a concern in schools and colleges for ages but the pre-technology period saw innocent peer-to-peer harassment or mischief within the control of the teacher but the post technology has marked a violent online behavior creating totally a new subject of concern, study and research coined as 'cyberbullying.' Bullying may be verbal, physical, sexual, prejudicial, and emotional and when all this is done using technology it is cyberbullying the demon form of bullying. Cyberbullying can be briefly defined as "sending or posting harmful or cruel text or images using the Internet or other digital communication devices" (Willard, 2004b, p. 1).

The free access to Google and unmonitored profile creation on social networking sites has led children to use internet recklessly. Playing mischief and posting remarks on peers profiles have become a customary obsession in children and youth. The soft and light remarks advance to be heavy and harsh when children form hate groups and target a single victim with abusive messages and online comments. A person is judged on how many friends he or she has on SNSs or how many likes & comments one receive on the SNSs. In the bid to add and increase the friend-count online children have accepted and added strangers to their profile. They do not hesitate to chat and give out all the personal information to such strangers escalating unknown dangers to them or their family and friends. The weak and shy child in the class or society is the target of such bullying. Many children join the group with the fear that they may be secluded from the group if they don't join their peers, while others are those who themselves have been a victim to cyberbullying in their past.

The aftereffects of cyberbullying show psychological irreparable harm and may ruin the future of the victim, he may show poor results in studies and inflict in low self-esteem, school failure, anger, anxiety, depression, school avoidance, school violence, and suicide. The victim has no escape as the abusive content posted takes no time to reach multitudinous online audience leaving the child with a fear, insult, defamation & drive to suicide. A survey conducted by Patchin and Hinduja (2006) of under 18, highlighted various forms of bullying including being ignored (60.4%), disrespected (50.0%), called names (29.9%), threatened (21.4%), picked on (19.8%), made fun of (19.3%) and having spread rumors about them (18.8%). A study conducted by McAfee states that 52% of school going children in India have an account on SNS wherein 50% have experienced cyberbullying, 92% children have done something risky online, and 70% have posted their personal information online. The SNSs have set 13 years of age as criteria to open an account but as per The Social Age Study by knowthenet.org.uk- 59% have an account on SNSs before the age of 10. The 13 years of age limitation is set according to the Children's Online Privacy Protection Act (COPPA) 1998 which restricts online service providers from collecting personal information and protects against collecting and sharing information of children with third parties.

The Anti-bullying charity's findings in 2013 states that 69% young people have been victims of cyber bullying-a number much higher than its previous reports, young children are likely to be bullied as twice on Facebook as on any other social networking

site.¹ A survey report of NSPCC states 93% of users in 2013 were between the ages 5-15 years, 82% were of 5-7 years, 96% were 8-11 years and 99% were 12-15 years old.²

Creating of fake profile by children under 13 is an offence as per the COPPA. As per the Indian Act 18 years is considered as the age of majority, with innumerable clan of children opening an account below 18 years of age is against the Indian Majority Act, the Indian contract Act, and also the Information Technology Act thereby coming into the gamut of cybercrime, accounting to punishable offences. A Public Interest Litigation (PIL) was filed by the former Bhartiya Janata Party ideologue K.N.Govindacharya in concern of an incident where several minors involved in 'sex and smoke' party in Gurgaon gathered through Facebook. The Delhi High Court through a division of bench directed Facebook and other SNSs to put a disclaimer in bold letter stating children below 13 years of age cannot open an account on it. Senior advocate appearing for the Facebook assured that Facebook will upload a disclaimer for the same. YES- All is assured- all are directed but - *WHERE IS THE MECHANISM TO VERIFY THE AGE OF THE USER?* In practical bureaucracies and their norms are necessary for implementation of the law without which law remains inadequate and crippled. The synergy between the normative order of law and the normative order of bureaucratic norms is mandatory on global platform for cyber-safety.

Part II

The European Union³ has taken outstanding initiative and is the only international Council that has framed guidelines for cyber ethics i.e. protect online -freedom, security and human rights, and aids to protect societies worldwide from the risk of cyber-crimes. The draft TWO of the EU Human Rights Guidelines on Freedom of Opinion & Expression Online and Offline in its clause A(6) states that every signatory state member of the EU are committed to protect and ensure freedom of opinion and expression, within their boundaries and all over the world. India, United Kingdom (UK) & USA has ratified the treaties and various global documents to administer cybercrimes in their local Legislations. The discussion of online offences related to children always directed to cyber child pornography, but thanks to the legislation of India for its initiative in bringing child pornography under statute. Child Pornography has been addressed wisely in Information Technology Act 2000 (ITA-2000) as amended in 2008 wherein first time the Act has used and introduced the word children in Section 67B which read as:

67 B Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form.

Whoever,-

(a) publishes or transmits or causes to be published or transmitted material in any electronic form which depicts children engaged in sexually explicit act or conduct or

(b) creates text or digital images, collects, seeks, browses, downloads, advertises, promotes, exchanges or distributes material in any electronic form depicting children in obscene or indecent or sexually explicit manner or

¹ CYBERBULLYING STATISTICS: THE ANNUAL CYBERBULLYING SURVEY 2013

<http://www.ditchthelabel.org/cyberbullying-statistics/accessed> on 18/3/2014.

² Statistics on online safety

http://www.nspcc.org.uk/Inform/resourcesforprofessionals/onlinesafety/statistics-online-safety_wda93975.html, accessed on 18/3/2014.

³ You are here: [Home](#) » [National](#) » India, allies to combat cybercrime India, allies to combat cybercrime Anirban Bhaumik, New Delhi, May 16, 2012, DHNS:Website: <http://www.deccanherald.com/content/249937/india-allies-combat-cybercrime.html>, last accessed on 24/3/2014.

(c) cultivates, entices or induces children to online relationship with one or more children for and on sexually explicit act or in a manner that may offend a reasonable adult on the computer resource or

(d) facilitates abusing children online or

(e) records in any electronic form own abuse or that of others pertaining to sexually explicit act with children,

This Section has addressed online child pornography and is welcome amendment to the ITAA 2008. The same concern towards children can be noticed by the Government of India's ratification of the Convention on the Rights of children leading administration of conventional laws to boost the new landmark legislation - Protection of Children from Sexual Offences Act, 2012 (POCSO). POCSO is the outcome of the basic fundamentals enshrined in the UNCRC whence the appropriate national, bilateral and multilateral measures to encourage protection of children from sexual offences and assaults is addressed. The Act has no mention of bullying or cyberbullying and online offences related to children. In India the Information Technology Act and the Indian Penal Code are the legislations under which cybercrimes are addressed. If the perpetrator is an adult then criminal and civil laws attracting punishment and compensation to the victim child and aggrieved family members is the relief. But if the wrong doer and the target both are children then along with the IT Act & IPC the Juvenile Justice (care and protection of children) Act, 2000 has to be looked into. The Amendment of the Information Technology Act in 2008 has put efforts to combat cyber-crimes but if seen through the children protection perspective it does not have much to offer other than Sec 67 B as discussed above. No other offences related to children have been addressed in the IT Act in spite of child cases been brought to notice before the amendments and online mischief been played by children prior to 2008.

The following table shows the legislations in India that attract cyber-crimes

Information Technology Act-2008	Section	Indian Penal Code	Section
<i>Tampering with computer source documents</i>	Sec. 66	<i>Sending threatening messages by email</i>	Sec. 503
<i>Punishment for sending offensive messages through communication service, etc.</i>	Sec. 66 A	<i>Sending defamatory messages by email</i>	Sec. 499
<i>Publishing obscene information</i>	Sec. 67	<i>Forgery of electronic records-</i>	Sec.463
<i>Un-authorized access to protect system</i>	Sec. 70	<i>Bogus websites, cyber frauds</i>	Sec 420
<i>Breach of Confidentiality and Privacy</i>	Sec. 72	<i>Email spoofing & Web-Jacking</i>	Sec 383
<i>Publishing false digital signature certificates</i>	Sec. 73	<i>E-mail Abuse-</i>	Sec. 500

The Information Technology Amendment Act has some eminent elements as follows:

- Data privacy
- Information Security

- Defining cyber café
- Making digital signature technology neutral
- Defining reasonable security practices to be followed by corporate
- Delineating the role of intermediaries
- Defining the role of Indian Computer Emergency Response Team
- Inclusion of some additional cybercrimes like child pornography and cyber terrorism
- Authorizing an Inspector to investigate cyber offences

Technology changes at a rapid pace, cybercrimes emerge with new ways to fraud and play with the law, unfortunately the online victimization of users is on rise. Undoubtedly the Information Technology Amended Act of 2008 is a masterpiece compared to its antecedent the Information Technology Act 2000 but the Amendment has overlooked concrete tough measures for inculcating cyber ethics and creating awareness. The Amendment has focused more on e-commerce while other issues like defamation, privacy infringement and torts have been overlooked. India has no statute directly addressing the guarantee to privacy of an individual but ingredient of right to privacy as traditionally contained in the common law and in criminal law is recognized in courts which include defamation, harassment, nuances and breach of confidence. The Juvenile Justice (Care and Protection of Children) Act 2000 prohibits the publications of names and other particulars of children involved in the proceeding under the Act thereby managing to secure the privacy of the child in the trial. Article 21 of the Indian Constitution has a provision which reads '*No person shall be deprived of his life or personal liberty except according to procedure established by law*' this Article is deemed to have within its ambit inter-alia- the Right to Privacy'- the right to be left alone⁴. Where the Supreme Court laid down that right to privacy is implicit in the right to life and liberty guaranteed to a citizen under Article 21 of the Constitution, which guarantees the citizen the right to safeguard the privacy of own life, family, marriage and procreation, motherhood, childbearing and education among others. As such children in India being the citizens of India are at risk of their privacy being infringed online and target to online bullying, with no special law addressing the 'invasion of online privacy' of children to mitigate the inadequacies in the IPC & IT Act.

Cyberbullying is a new area of concern bothering the parents, teachers and the society an initiative in the Act with provisions of awareness would go far long creating cyber ethics as technology has to be understood and learnt by all the stalk-holders like the parents, teachers, educational institutes, Non-Government Organizations, Judicial officers, legal professional, litigant public and the society at large. Lack of tech-savvy staff and knowledge of the adjudication process including the investigating agencies further widens the issue. India needs to strengthen the high-tech crime units and incident response teams, with more effective interagency. A joint effort of public-private and international cooperation on local, national and international level will surely help to curb the menace of cyberbullying and strengthen a healthy online experience. An amendment in The Juvenile Justice (Care and Protection of Children) Act 2000, to discipline and counsel the juvenile on cyber ethics and cyber in the reformatory term has to be added. The child offender may or may not have been booked for online offences, but maybe online or offline-the Act needs to have counselors to coach the use of cyber space as it is very likely that once released the child will have a cell-phone with an internet from tomorrow.

Conclusion:

'ignorantia legis neminem excusat' – A simple rule of ignorance of law excuses no one thereby not knowing the laws and limits on internet does not make a wrong doer skip liability of law merely on the basis of its unawareness of the content.

A mixed percentage of children and adult user's access internet, it is impractical to teach cyber ethics to adults' elders but to washout the cyberbullying and other offences from the grass root level steps should be taken to implement rules and regulations in schools and institutions. Cyber ethics should form a compulsory part of the curriculum without which schools and colleges should not receive their grants and aids. The childish nature of child if molded in a proper direction in proper time-there are fair and full chances

⁴ (Rajgopal v State of TN, 1994 (6) SCC 632)

of a safe online future with moral cyber ethics. An emphasis on the role of the local educational institutes to draft policies and guidelines to create cyber ethic awareness for effective implementation of the international human rights norms will surely prove to be gainful. The Government also needs to set proficient curator organizations and not rules and regulations in schools for the name sake. Stringent pre-school and school awareness, safety policies and guidelines will surely prove to be effective tools to establish and ensure a child friendly cyber space with healthy browsing experience.

REFERENCES:

- 1) ETHICS AND THE HISTORY OF INDIAN PHILOSOPHY, SEE-
[HTTP://BOOKS.GOOGLE.CO.IN/BOOKS/ABOUT/ETHICS_AND_THE_HISTORY_OF_INDIAN_PHILOSO.HTML?ID=X89I_ZEGPHKC](http://books.google.co.in/books/about/Ethics_and_the_history_of_Indian_philoso.html?id=x89I_zEGPhkC)
- 2) The Handbook of Information and Computer Ethics.
- 3) *EU External Freedom of Express Policy*- see- [F\]EU External Freedom of Expression Policy - WikiLeaks](#)
- 4) Cyberbullying Among Adolescents: Implications for Empirical Research- Journal of adolescence health.
- 5) The edition of Commentary on Information Technology Act by Apar Gupta, 2nd edition 2011

Design of a Healthcare Monitoring System Using Wearable and Environmental Sensor

Snehalatha D¹, Shruti Malgatti²

UG Student, Dept. of IT, R.V. College of Engineering, Bangalore, Karnataka, India ^{1&2}

1-snehu.d@gmail.com

Abstract— As the healthcare industry has evolved, technology provides readily accessible health data that may facilitate people to deal with health concerns. Wearable sensors are commonly used for this purpose. Wearable systems are used for exercise regimes for health and rehabilitation are notably helpful. The benefits wearable kind sensors have include quick response times, minimum sample pre-treatment and high turnout. Wearable sensory devices connected to smart phone apps are already a part of sports personnel. Sportspersons use wearable systems like a pulse oximetry (a non-invasive way to monitor O₂ saturation), that helps them to optimize their performance. Normally wearable sensors and portable computing devices present the prospect to produce timely health information of the patient to doctors as well as customers.

By supplying real time health information, a sensor primarily based health care information infrastructure that's based on relatively static based sparsely collected information can be used to maintain the patient medical records effectively. The solution projected for this method combines environmental and wearable sensors so as to monitor both the surrounding space of the patient and the patient's health status at the same time. This would allow a comprehensive understanding of the patient's condition by both the specialist caring for the subject and the patient themselves.

Keywords—: Healthcare, Wearable sensors, Environmental sensors, healthcare monitoring system, health status, and health concerns

INTRODUCTION

The purpose of this paper is to design a health care system that integrates both wearable sensors and environmental sensors, that offers a comprehensive diagnosis of the patient's condition in remote healthcare monitoring.

Common healthcare monitoring systems thus far involved the use of electronic sensors for the sensing and monitoring of the various physiological parameters of the human body. Even though these systems do offer the necessary data for the medical practitioner to help the patient, it still might not be enough for the most effective treatment. Thus a more thorough information of the patient is needed, to the extent that even the environmental factors play a significant role.

Different methods with similar goals have been researched and implemented.[1] Shibu J and Ramkumar.R proposed a technique that provides a non-invasive approach to health care monitoring that allows the individual to keep record of their own health records, by use of smart card.This methodology effectively reduces the time of the patients to be spent within the hospitals additionally it permits us to access the health parameters from anyplace by swiping the smart card in the smart card reader.

Marco Messina, Yen yang Lim, Elaine, Lawrence, Don Martin and Frank Kargl's paper [8] describes the implementation and validation of a prototype of an environmental and health monitoring system based on a Wireless sensor Network (WSN).The solution projected by their system combines environmental and medical sensors so as to observe both the surrounding space of the patient and also the patient's health status at the same time. A series of experimental situations were developed and enforced in a very laboratory setting. The conclusion considers the implementation of future enhancements to the health observance network by introducing new sensors and placement pursuit capabilities, and by group action alarm triggering algorithms and advanced security techniques.

Ming-ZherPoh, Kyunghee Kim, AndrewGoessling, Nicholas Swenson and Rosalind Picard's paper [7] showed the development of wearable sensors suitable for comfortable and continuous cardiovascular assessment. Heartphones, a snug, even fashionable system for measuring the bilateral blood volume pulse (BVP) that fits within normal earbuds by adopting a smart phone as a part of the platform. Heartphones solely think about rely on earphones and a cellular phone, common pocket things, to supply measurements like pulse and beat-to-beat changes in heart rate variability (HRV).

Jayalakshmi R, Mahalingam D and Rajeswari's [2] talked about a healthcare solution that combines android mobile and IPv6 techniques in a wireless sensor network to monitor the health condition of patients and provide a good range of effective healthcare services by using global network. With the help of GSM human body level can be accessed from anyplace. A low-power embedded wearable device measures the health parameters dynamically and is connected according to the concept of IPv6 over low-power wireless personal space network to the M2M node for wireless transmission through the internet or external IP-enabled networks via the M2M gateway.

VeyselAslantas, RifatKurban and tuba Caglikantar [9] created a Pocket pc based, low-cost, portable, wireless health monitoring and alarm system. Human's electrocardiogram (ECG), temperature and pulse data are acquired and sent to a personal digital assistant (PDA) using IEEE 802.15.1 Bluetooth. Although this approach appeared well rounded and convenient as it serves a portable way to monitor electrocardiogram (ECG), temperature and pulse data, in the present day and age, there are several devices that don't need any extra device that needs carrying around.

RESEARH GAP

Several healthcare monitoring systems only look at the prospect of limited sensing capabilities and have also not taken into consideration the necessity of including the environmental factors. The many systems involved in healthcare monitoring mainly pertain to using a closed space approach with uncomfortable sensors that many do not like to wear continuously. Or they involve carrying an extra communicating PDA in order to make it portable. Proper alerting mechanism has not been thoroughly implemented.

BLOCK DIAGRAM

Transmitter:

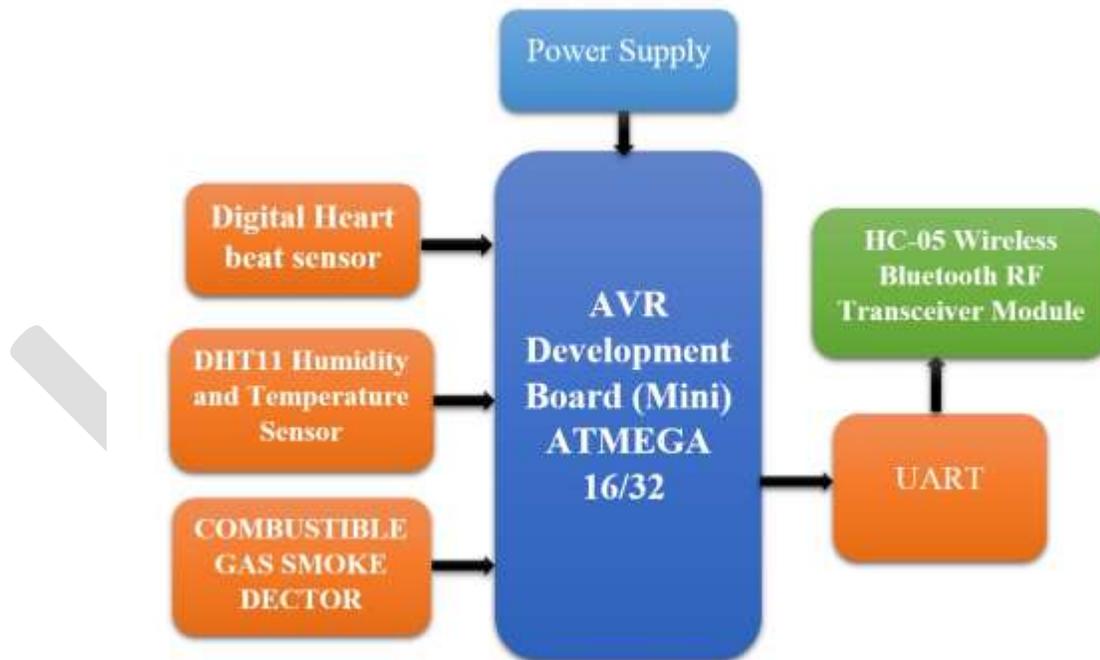


Figure 1: Block Diagram and Transmitter end of M2M (Machine to Machine) System

Receiver:



Figure 2: Receiver end of M2M (Machine to Machine) System

METHODOLOGY

To implement a remote healthcare monitoring system. In these sensors to monitor the medical parameters such as Blood Pressure, Heart Rate and Temperature are designed and interfaced to the microcontroller ATmega16. This microcontroller having inbuilt ADC which converts the sensors input analog signals to digital signals.

These days, wearable sensors such as heart rate monitors and pedometers are in common use. Several products are already on the market, such as the Lifeshirt, developed by Vivometrics, the body monitoring system developed by BodyMedia and the Nike-Apple iPod Sports kit which facilitates individualized feedback control of performance during exercise periods.

The Heart Beat Sensor provides a simple way to study the heart's function. This sensor monitors the flow of blood through Finger. As the heart forces blood through the blood vessels in the, the amount of blood in the Finger changes with time. Heart beat sensor is designed to give digital output of heart beat when a finger is placed on it. It consists of a super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector. When the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This digital output can be connected to microcontroller directly to measure the Beats per Minute (BPM) rate. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is also indicated by a LED which blinks on each heartbeat.

The proposed design has a significant advantage: introducing environmental sensors that collect context information will help in analysis of the medical data. When, e.g., a patient is doing sports, medical parameters like heart rate or O₂ saturation have to be interpreted differently compared to the same person sleeping in bed. It is estimated that 70% of all illnesses are preventable, and if suitable screening measurements were introduced, this could produce dramatic reductions in costs for treatments and medication.

The environmental sensors mainly include temperature sensors, humidity sensors, and in case of emergency, an alarm signal from smoke detectors. It happens to be very important that the inclusion of special circumstances sensors such as smoke detectors be included so that the attending physician may communicate the appropriate course preventive diagnosis even when the patient is remotely stranded.

The processed signals from the respective medical sensors and the environmental sensors are now sent to ATmega16 Microcontroller that process the received signal and displays on the development kit, but more importantly now proceeds to the next phase of the monitoring system, that is to communicate the received results to the patient and physician. The received data is communicated by simple means of Bluetooth via UART serial communication. In the proposed system we use two RF Bluetooth that are Transceivers and may act as either a transmitter or a receiver. We should note that communication is possible only when one Bluetooth acts as a transistor and the other as a receiver. Communication is not possible for a pair of transmitters or a pair of receivers. The received information is sent to the respective Smart Phones via UART. The Smart Phone is capable of displaying, monitoring, recording and sharing the received information, thus saving cost on display, and recording devices. This solution not only gives patient more freedom, but also provides early diagnosis of cardiac diseases with its alarming properties.

CONCLUSION

A lot of research and effort has gone into the making of a better and well improved healthcare monitoring system, even for remotely located patients. Only a few of these researches have taken into consideration of the environmental factors that affect the human health state. Thus, this paper puts forth the necessity, method and various trends in using both medical and environmental sensors. Further, taking advantage of the advanced technology available to the general public, a remote healthcare monitoring system that is capable of providing health parameters by wireless means to Smart Phones of both patient and physician, it is possible to provide immediate diagnosis simply through the click of a button.

FUTURE SCOPE

In order to implement future improvements to the health monitoring network we can introduce new sensors such as cameras, ECG sensors as well as location tracking capabilities. We can also plan to integrate alarm triggering algorithms and advanced security techniques in Wireless Sensor Networks which would be essential in a health monitoring environment. Another aspect to consider is involving wearable sensors or wearable sensors that may well be cheaper and more diverse in utility which can lend a hand in improving the already existing systems.

REFERENCES:

- [1] Shibu J, Ramkumar.R, "ATM Based Remote Healthcare Monitoring System", 2014, Electronics and Communication Systems (ICECS), 2014 International Conference.
- [2] Jayalakshmi R, Mahalingam D, Rajeswari A, "Advanced Health Monitoring and Receiving Using Smartphone in Global Networks", 2014, International Journal of Engineering Development and Research.
- [3] S.Saravanan, "Remote Patient Monitoring in Telemedicine using computer communication network through Bluetooth, Wi-Fi, Internet Android Mobile", International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 7, July 2014
- [4] PrathameshDinkar, Abhishek Gulavani, SourabhKetskale, Pratik Kadam, SheetalDabhade, "Remote Health Monitoring using Wireless Body Area Network", International Journal of Engineering and Advanced Technology (IJEAT), ISSN: 2249 – 8958, Volume-2, Issue-4, April 2013
- [5] Sandeep Kumar Vashist, E. Marion Schneider and John H.T. Luong, "Commercial Smartphone-Based Devices and Smart Applications for Personalized Healthcare Monitoring and Management", Diagnostics 2014, 4, 104-128; doi:10.3390/diagnostics4030104
- [6] Ademola Philip Abidoye, NureniAyofeAzeez, AdemolaOlusolaAdesina, Kehinde K. Agbele, Henry O. Nyongesa, "Using Wearable Sensors for Remote Healthcare Monitoring System", Journal of Sensor Technology, 2011, 1, 22-28
- [7] Ming-ZherPoh, Kyunghye Kim, Andrew Goessling, Nicholas Swenson, Rosalind Picard "Cardiovascular Monitoring Using Earphones and a Mobile Device", 2010, IEEE Pervasive Computing
- [8] Marco Messina, Yen Yang Lim, Elaine, Lawrence, Don Martin, FrankKargl, "Implementing and Validating an Environmental and Health Monitoring System" 2008 IEEE, Information Technology: New Generations, 2008. ITNG 2008. Fifth International Conference on Information Technology: New Generations.
- [9] Veysel Aslantas, Rifat Kurban, Tuba Caglikantar, "A LOW-COST WIRELESS HEALTHCARE MONITORING SYSTEM AND COMMUNICATION TO A CLINICAL ALARM STATION", 2007, Journal of the Faculty of Engineering and Architecture of Gazi University

Survey of Seam Carving Techniques

S.Rajeswari¹, A.Rafega beham²

raji_sura@yahoo.com, +919008477628¹,

Assistant. Professor, Information Science and Engineering, New Horizon College of Engineering, Bangalore, India¹

Assistant Professor, Information Science and Engineering, New Horizon College of Engineering, Bangalore, India²

Abstract- Development of novel mobile devices in the electronic world, built the need for developing display unit with appropriate aspect ratio. Image of various size and resolution undergo several modifications to get displayed in varying display size. This modification which is image resizing leads to important detail or content of the image to be lost. Image retargeting considered as the content-aware image resizing become very challenging to achieve visually better image while resizing. In this paper, the various forms of Seam Carving (SC) which indeed referred as a dazzling image retargeting technique are discussed precisely as a survey. For better accomplishments on image retargeting, the seam carving that undergone huge changes for the past is emphasized upon to impart a concise understanding of various models of contemporary seam carving techniques. This paper also provides significant insights into the seam carving technique by exploring its various methodologies and includes a comprehensive survey of the relatively new ground-breaking seam carving models for comparing with the state-of-the-art seam carving models.

General Terms

Digital Image Processing, Computer graphics, Computer Vision, Pattern Recognition

Keywords

Image Resizing, Content-Aware, Image Retargeting, Seam Carving, Region of interest, Discrete wavelet transform, Spatial orientation tree.

1. Introduction

Frequent progress in novel display devices with discriminate aspect ratio and resolution is demanding the display of multimedia contents. Some standards like HTML allow dynamic changes in text and page layouts but the images remain inflexible in size and cannot distort to fit different layouts automatically. So versatility of the images on different display sizes is challenging. As the display device varies in the display screen size, the content of the image is not displayed effectively by visually distorting the Region of Interest (ROI) which is referred to contain sub-images. Image resizing thus has to face many challenges to display the image with high quality. Conventional image resizing methods such as scaling and cropping are used for resizing ROI. However they are ineffective when used on content-aware resizing of overall image.

When images from high-resolution display are displayed in low-resolution display it then leads to distortions of important contents in the displayed image. To avoid the loss of important image features a better method introduced to remove uninterested pixels while preserving the region of interest of the image. This leads to the development of image retargeting [1] techniques. The major retargeting objectives are to preserve content, preserve structure and prevent artifacts. Image retargeting resizes the image to utilize the full screen size of the display device without the quality and content decrease. Scaling and cropping are the standard content unaware image retargeting techniques. Scaling can be applied only uniformly to retain the image without the loss of any pixels but oblivious to the image content. Cropping or re-sampling can only remove pixels which lead to visual distortion and artifacts. This method does not produce satisfactory results and introduces significant visual distortions. This situation emphasizes to induce novel operators for image retargeting. Conventional methods for image resizing like scaling and cropping introduces distortions when the aspect ratio changes, can generate artifacts due to aliasing, and can make important objects unrecognizable due to the change in size. To address these issues, techniques are taken into account the images content while resizing attempt to preserve important regions while maintaining an aesthetically pleasing image. Seam carving (SC) [2] is referred as content-aware image resizing technique that results in better image quality by preserving the details.

2. Seam Carving

Seams which are considered as the 8 connected paths of pixels is inserted or removed iteratively to accomplish the target display size. This technique is robust for any kind of images and it provides satisfactory results by considering the contents of the image and

removes image distortion and visual artifacts. Beyond traditional sampling theory, image resizing not only considers on geometric constraints but on image content as well. Content aware image retargeting, image feature enhancement, object insertion and object removal, object preservation, image resizing like image shrinking and image enlarging are the main scope of applications of Seam carving technique.

2.1 Seam Carving Techniques

In this dissertation the seam carving which is one of the content aware images retargeting technique is presented as a survey.

□ **Multi-view Image Seam Carving:** Multi-view image [3] resized to display in a single liquid-crystal display (LCD) unit using the pixel intensity and the depth information. The combination of 2D image and depth map gives inter and intra object boundaries very precisely when used with L1 norm to generate the energy function that provides improved seam carving algorithm. Authors proved that the proposed SC would provide better result than the Vanilla SC which concentrated only on the pixel intensity. And concluded that the idea can be extended to 3D multi-view video streams.

□ **Balanced Seam Carving:** A novel energy called as balanced energy map [4] is introduced by combining the merits of edge map and saliency map. Edge map which is considered as a governing map spreads energy more smoothly and proved to be robust. Whereas, the saliency map which is considered as a complement allocates visually prominent regions with higher energy and detects pixel saliency values from the low-level features rather than the intensity values. New insight in to forward energy is introduced by 8-connected energy measurement that accurately measures the vertical, horizontal and diagonal artifacts. Later they used dynamic programming and graph cut to carve out the seams. However limitations like more user interactions to reset the weight parameter for saliency map is required and the straight edges are distorted in the structure dominant image.

□ **Multi-scale Seam Carving:** Authors, improved SC technique by providing general filter bank frame work [5]. Multiple scales of image structures are enabled by designing novel filters that worked for variety of images irrespective of their types. Authors introduced guidance vectors in cumulative energy map that designate which pixels are to be selected for driving the seam. Experiments done by redefining backward energy seam carving filters and forward energy seam carving filters bank by passing each level of image through the designed novel filters. It has been shown that the importance of a pixel not only lies in the energy at a particular scale but also in the number of scales as shown in Fig.1 and the coarser scales are preferred for resizing. Authors conducted various experiments and concluded that Roberts filters at 5 levels and forward-energy filters at 3 to 4 levels produced desired results and one of the results is shown in Fig.2.

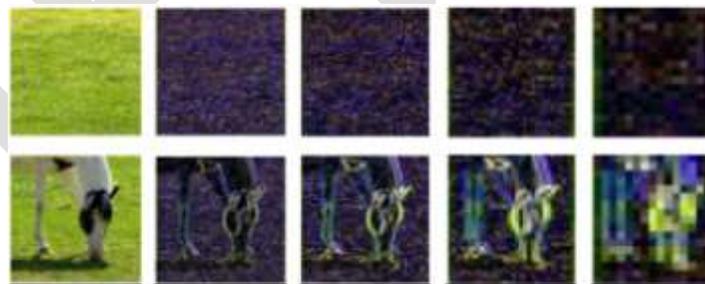


Fig.1: (Top) Grassy Image and its 4 Levels of High Pass Coefficients from Fine to Coarse. (Bottom) Part of Horse Head and its 4 Levels of High Pass Coefficients.



(a) (b)

Fig.2: (a) Original Image. (b) 30% Width Reduction of the Original Image Using Bfwd Filter Bank and Scale Depth $N=4$.

(c) **Reverse Seam Carving:** Authors found that there is an affiliation between the two processes of seam insertion and seam deletion [6]. To and fro usage of these two processes resulted in aliasing which means removing seam and inserting seam lead to artifacts and distortions as shown in Fig. 3 where the original image and the expanded image are slightly different. The authors proposed energy functional composed of two parts to determine the importance of the pixels. The first part is the straight one that defines the unimportant pixels. The second part is the inverse one that defines the perceptible space in seam insertion process. The forward energy is expanded using virtual points for determining the cost for seam Insertion. And for examining the similarities between two images, Scale-invariant feature transform (SIFT) based method is used. As the limitation the proposed system works better only for resizing the image in a small scale. Any retargeting techniques other than the seam carving can be implemented using reverse idea.

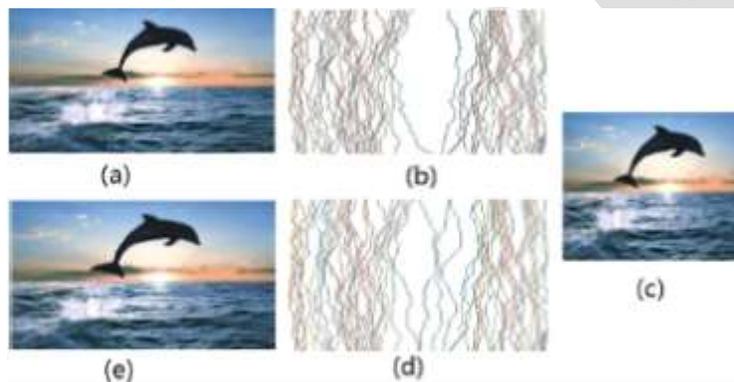
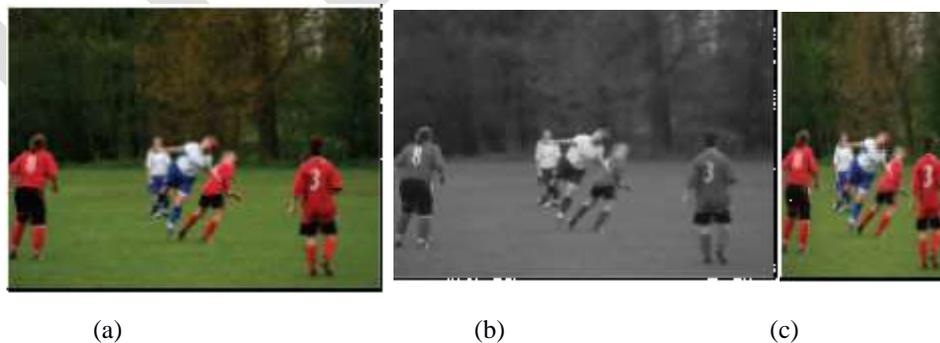


Fig.3: Seam Removing and Inserting Process To and Fro. (a) Original Image. (b) Optimal Seams for Removal. (c) Reduced Image. (d) Optimal Seams for Insertion. (e) Expanded Image.

□ **Improved Seam Carving:** The authors addressed the retaining of both image content and image structure in the reduction and enlargement processes by using improved seam merging [7]. For image reduction new pixel is obtained by merging a 2 pixel-width seam and for image enlargement a new pixel is inserted between the 2 pixels. A cumulative seam merging history is used in the resizing process. The pixel importance is used to generate the importance energy and the pixel context. Cartoon image of an original image is used to calculate the structure energies. To obtain excessive resizing and suppressive distortions the authors introduced additional new energies in the interactive merging or inserting process. The result of the proposed system showed in Fig.4 for image reduction and for image enlargement.





(d)

Fig.4 (a) Original Image. (b) Cartoon Image of (a). (c) Reduced Image. (d) Enlarged Image.

□ **Adaptive Seam Carving:** Novel design of saliency detection algorithm and adaptive image retargeting algorithm are implemented in the compressed domain [8]. The features of the joint photographic experts group (JPEG) images are extracted using discrete cosine transform (DCT) coefficients for the saliency detection. The performance of saliency map is evaluated using receiver operating characteristic (ROC). The obtained saliency map is used to determine the visual significance map which is one of the performance factors of image retargeting algorithm. The multi-operators such as block based SC and image scaling are used as the another performance factor of the image retargeting algorithm in an adaptive manner for the JPEG images. Fig.5 shows the original image, saliency map and retargeted image of 75% reduced width. Adaptive seam carving method assumed to be out performed the state-of-the-art saliency detection algorithm and the width of the retargeted image is reduced by 75% to 80% of the original image by preserving regions of interest (ROI).



(b)

(c)

Fig. 5: (a) Original Image, (b) Saliency Map of (a), (c) Retargeted Image of 75% Reduced Width.

□ **Enhanced Seam Carving:** Authors provided enhanced SC [9] by using non-8-connected seams and proved to have better computational performance and quality. To punish the temporal artifacts the video frames are processed dependently. Spatial and temporal energy map generated for the current frame from which they determined spatial cost and temporal cost for each pixel. The cumulative cost of each pixel is determined by summing up the spatial and temporal cost in an adaptive search window size that depends on the video contents and temporal weight so as to reduce the computational time. Using dynamic programming the seam with minimum cumulative cost is carved out to the desired video frame size.

□ **Seam Carving Principle:** The authors introduced a novel image coding scheme that provided content based spatial scalability [10] of the image. At the encoder side the original image undergoes discrete wavelet transform (DWT) with the resultant spatial orientation tree (SOT) of ordered coefficients. Even at the encoder side the block-based seam used to generate the energy map which directs the DWT coefficients scanning and encoding orders in a content-based manner. At the decoder side the side information and bit-streams of the DWT coefficients are decoded to obtain the content-aware image in arbitrary display unit. Seam based SPIHT scheme is used which differs from the conventional scanning and coding order in low frequency sub-band. The side information which constitutes SOTs roots, ROI size, etc. are also encoded using SPIHT and then the bit-streams are transmitted in a content-aware fashion. As the encoder was implemented in the cloud, the computational complexity became less in the mobile devices. Thus the proposed novel codec resulted in a better compression technique for transmission.

□ **Video Seam Carving:** Image SC is transformed into video SC by accomplishing both temporal and spatial coherence than any other methods for video retargeting [11]. Video seam carving method explained that the seam from the previous frame is used to compute the key point in the current frame. The energy map of the current frame is adjusted to determine reward and punish regions and then SC is applied on newly generated energy map.

□ **Depth Seam Carving:** Authors proposed a new method by extending the SC approach for single image to a pair of stereo images [12] to retain geometric consistency in the pair of image. In their approach they considered the disparity energy map, occluded and occluding pixels relationship visually in the image pair. The resulted pair of the images are geometrically intact with 3D scene and had high percentage of similarity with the original image. However it has limitation on the amount of occluded and occluding pixels and on the quality of input disparity map.

3. Acknowledgments

We would like to thank Information Science and Engineering Department of New Horizon College of Engineering Bangalore, for the immense support and encouragement.

4. Conclusion

Many seam carving techniques are not mutually exclusive. A combined method of various retargeting technique may result in a better image since various attributes of image can affect the performance of any seam carving techniques. Many authors dissertations mentioned in this paper as a survey is considered to be the best methods for image re-sizing by optimally selecting the seams that may result in undistorted image.

REFERENCES:

- [1] Daniel Vaquero, Matthew Turk, Kari Pulli, Marius Tico, and Natasha Gelfand, "A survey of image retargeting techniques," in Proc. SPIE 7798, Applications of Digital Image Processing XXXIII, San Diego, California, September 07, 2010.
- [2] Avidan, S. and Shamir, A., "Seam carving for content-aware image resizing," ACM Trans. Graph., vol. 26, issue 3, no. 10, pp. 10-19, July 2007.
- [3] Ramachandra, V. , Zwicker, M. , Nguyen, T.Q. , " Combined image plus depth seam carving for multiview 3D images," in IEEE Int. Conf. Acoustics, Speech and Signal Processing, Taipei, pp 737 – 740, April 2009.
- [4].K. Sullivan, U. Madhow, S. Chandrasekaran, and B. Manjunath. Steganalysis for Markov cover data with applications to images. IEEE Transactions on Information Forensics and Security, 1(2):275–287, Jun 2006.
- [5]D. Conger, M. Kumar, and H. Radha, "Generalized multi-scale seam carving," in Proc. IEEE Int. Workshop, Multimedia Signal Processing, Saint Malo, pp. 367–372, Oct. 2010.
- [6]Gang Pan, Weishu Li, Wei Bai, Jinyan Chen and Luyuan Li, " Reverse Seam Carving," in proc. 6th Int. IEEE Conf. Image and Graphics , Hefei, Anhui , pp. 50 - 55, Aug. 2011.
- [7] K. Mishiba and M. Ikehara, " Image resizing using improved seam merging," in proc. IEEE Int. Conf. Acoustics, Speech and Signal Processing, Kyoto, pp. 1261 – 1264, March 2012.
- [8] Yuming Fang, Chen, Z., Weisi Lin, Lin, C.-W. , "Saliency Detection in the Compressed Domain for Adaptive Image Retargeting," iee trans. image processing, Vol. 21 , Issue 9 , pp. 3888 – 3901, Sept. 2012.
- [9] Tzu-Hua Chao , Jin-Jang Leou , Han-Hui Hsiao , "An enhanced seam carving approach for video retargeting," in APSIPA ASC, Hollywood, CA, pp. 1 – 5, Dec. 2012

[10] Chenwei Deng , Weisi Lin , Jianfei Cai ,”Content-Based Image Compression for Arbitrary-Resolution Display Devices,” IEEE Trans. Multimedia, Vol.14 , Issue 4, pp. 1127 – 1139, Aug. 2012.

[11] Bo Yan, Kairan Sun , Liu Liu, “ Matching-Area-Based Seam Carving for Video Retargeting,” IEEE trans. Circuits and Systems for Video Technology, vol. 23, issue 2, pp. 302-310, Feb. 2013.

[12] Basha, T., Moses, Y. , Avidan, S., “ *Stereo Seam Carving A Geometrically Consistent Approach* ,” IEEE trans. Pattern Analysis and Machine Intelligence, vol. pp, issue 99, pp. 1, Feb. 2013

IJERGS

Review on investigation of “Buckling behaviour of composite plates”

Mohammed Gouse^{1*}, Ravi kumbar .^{2*}, T. Madhusudhan^{3*}

¹Mechanical Department, M.Tech student, Machine Design, ²Mechanical Department, Professor,

³Mechanical Department, H.O.D,

*S J B Institute of Technology, Visvesvaraya Technological University, Belagavi, Karnataka, India.

(mohdgouse20@gmail.com, Kumbarmr@gmail.com, mechhod@sjbit.edu.in)

Abstract- Composite material is one the most widely used material when strength to weight ratio is considered, this make it more ideal material in the Aerospace industries where strength to weight ratio is more important. These composite material is used to make many aircraft components like skins, rudder, fuselage and panels. Buckling behavior of laminated composite plates subjected to compressive loading is an important parameter in the preliminary design of aircraft components. This review represent the some attempts made to understand the buckling behavior of composite plates by experimental and numerical methods and various parameters which effects the buckling behavior.

Keyword: Composite material, aircraft, Woven glass/epoxy, aspect ratio, fiber orientation, Cutouts and buckling analysis with Experimental and FEA

INTRODUCTION

Composite materials have such an influence on our lives that many researches invested a great deal of time and effort for a better understanding of their behavior. Composite materials [1] have been used for a while in many industries such as: aerospace, automotive, marine and civil engineering applications one can say that composite materials usage is limited by the individual imagination.[2] One type of composite materials is cross-ply laminated plates with cutouts, where cutouts are introduced for accessibility reasons or to just lighten the structure. These plates are more explore to buckle when subjected to in plane compressive loads, therefore it is very important to under fully the various parameter which effect the buckling failure. The buckling behavior of plates has been studied by many researchers in structural mechanics for aircraft and other structural parts over a Century. Steel, Aluminium, Titanium plates are often used as the main components of aircraft structures such as fuselage, elevators, panels, skins, rudder etc. So to make optimum structural components material must possess best characteristics then other conventional materials. So composite materials are widely used for this purpose, like carbon fiber reinforced polymer (CFRP), Glass fiber reinforced polymer (GFRP), Aramide fiber reinforced polymer (AFRP), etc. There are various cutouts, vents, holes and passage are provided for different purpose, to provide access for inspection, maintenance, or simply to reduce weight. Due to this cutouts in plate components leads to change in stress distribution within the member and variations in buckling characteristics of the plate element. The effects of the shape, size, location and types of applied load on the performance and buckling behavior of such perforated plates have been investigated by several researchers over the past two decades. Many researcher explore such results for their research work.

Literature survey;

The fibers used in composite materials are glass, aramid, carbon which are synthetic fibers. The use of natural fibers is increasing due to its unique properties. They are easily available at less cost compared to synthetic fibers. Epoxies are best known for their excellent adhesion, chemical and heat resistance, mechanical properties, and outstanding electrical insulating properties. The chemical resistance of epoxies is excellent against basic solutions. Epoxies are more expensive than polyesters, and cure times are longer, but their extended range of properties can make them the cost/performance choice for critical applications. This is a best choice for products where strength and toughness are paramount, as the material offers both outstanding flexural and tensile modulus.

The following are some of the review of journal papers based on study of buckling behavior of composite plates.

I Ramu, et al.,[3] He has investigated the buckling analysis of functionally graded material (FGM), by using classical plate theory. He used a FEM for modelling and buckling analysis of functionally graded material (FGM), by changing aspect ratio (a/b) of the (FGM) plates under biaxial and uniaxial compression the effective material properties are computed using the simple power law equation of the volume fraction of the plate constituents. He found that the critical buckling load of the rectangular plate under uniaxial compression is greater than the biaxial Compression and the critical buckling load increases by increasing the thickness, he also used MATHLAB for accuracy of results.

Arun kumar R,[4] has investigated Buckling Analysis of Woven Glass epoxy Laminated Composite Plate, In this study, the influence of cutout shape, length/thickness ratio, and ply orientation and aspect ratio on the buckling of woven glass epoxy laminated composite plate is examined experimentally. From the present analytical and experimental study, the following conclusions can be made. He found results, The buckling load decreases as the L/t (length to thickness) ratio of plate increases, As the aspect ratio increases, the critical buckling load of the plate decreases. When the fiber angle increases, the buckling load decreases. The reduction of the buckling load due to the presence of a cutout is found. It is noted that the presence of cutout lowers the buckling load and it varies with the cutout shape. The plate with circular cutout yielded the greatest critical buckling load.

Dr. P. Ravinder Reddy, et al.,[5] He investigated the buckling behavior of a 4-ply orthotropic carbon/epoxy symmetrically laminated rectangular composite plate under the square and rectangular cutouts and $[0^\circ/45^\circ/45^\circ/0^\circ]$ fiber orientation and aspect ratio. Results showed that the magnitudes of the buckling loads decrease with increasing cutout positioned angle as well as c/b and d/b ratios for plates with a rectangular cutout. The magnitudes of the buckling loads of a rectangular composite plate with square/rectangular cutout decrease with increasing plate aspect ratio (a/b) and the buckling factors at various t/b ratio's such as $1/20$, $1/40$, $1/60$, and $1/80$ is investigated using ANSYS software. He concludes that the buckling factor are largely affected by aspect ratios, fiber orientation and cutout shapes.

M Mohan Kumar, et al.,[6] He investigated the buckling behavior of woven glass epoxy by varying aspect ratio (a/b), fiber orientation. By using hand layup technique he fabricated the glass epoxy planes with thickness 3mm and 6mm with the circular, square and rectangular cutouts. He used the FEA analysis using NASTRAN, and analysis of buckling behavior of aluminium plate and compared the results those with composite plate and results shows that. The buckling load decreases as the a/t ratio increases. The rate of decrease of buckling load is not uniform with the rate of increase of a/t ratio. When the aspect ratio changed from 1.0 to 1.7. The rate of change of buckling load with a/b ratio is almost uniform.

Patrick E. et al.,[7] He studied for the stiffened panel selected for the analysis, the paper shows that the three dimensional model shows a substantial increase in skin initiated buckling if the fillet is taken account. Results shows that A 5 mm radius leads to an increase of 34% increase in local buckling load performance for a skin portion of breath to thickness ratio of 100. The associated overall buckling load increases by 1.8%. The mass penalty for a 5 mm radius is 5.1%. To avoid local and overall buckling interaction an accurate measure of both buckling loads is very important and may have impact for designers. The three dimensional models with no fillets show very good agreement with the two dimensional models.

X. L. Xue, et al.,[8] research on process of buckling of thin compressed films deposited on polymethylmethacrylate (PMMA) substrates under mechanical and thermal loadings has been investigated utilizing an optical microscope. Particularly, thermal cycling analysis on thin film/substrate system under compression has been characterized to discuss the thermal fatigue property of aluminum film on PMMA substrate This study reveals that thermal cycling of films may cause horizontal cracks on the buckles of aluminum film. Thermal stresses T play a key role on the membrane deformation and damage.

Husam Al Qablan et al.,[9] has studied the effect of various parameters on the buckling load of square cross-ply laminated plates with circular cutouts and three types of in-plane loading considered namely, uniaxial compression, biaxial compression and shear loading. He found for relatively small size cutouts, a better performance was achieved if the cutout is kept close to the edge of the plate, however, for relatively large size cutouts, a higher buckling load is achieved if the cutout is kept in the middle of the plate. The best performance was achieved by $[45, -45]$ fiber orientation and the worst was observed in the $[0, 90]$ fiber orientation.

Murat Yazici [10] studied the influence of square cut-out upon the buckling stability of multilayered, steel woven fiber-reinforced polypropylene thermoplastic matrix composite plates are studied by using numerical and experimental methods. The laminated plates

under uniform pressure are formed by stacking three composite layers bonded symmetrically. The FE and experimental results are presented for various fiber orientation angles and plate boundary conditions.

Buket Okutan Baba [11] studied the influence of boundary conditions on the buckling load for rectangular plates. Boundary conditions consisting of clamped, pinned, and their combinations are considered. Numerical and experimental studies are conducted to investigate the effect of boundary conditions, length/thickness ratio, and ply orientation on the buckling behaviour of E-glass/epoxy composite plates under in-plane compression load. Buckling analysis of the laminated composites is performed by using finite element analysis software ANSYS. Tests have been carried out on laminated composites with circular and semicircular cut-outs under various boundary conditions. Comparisons are made between the test results and predictions based on finite element analysis.

Zahari and Azmee [12] a progressive failure analysis algorithm has been developed by and implemented as a user subroutine in a finite element code (ABAQUS) in order to model the non-linear material behavior and to capture the complete compressive response of woven composite plates made of glass-epoxy material. Tsai-Hill failure theory has been employed in the progressive failure methodology to detect failure of the woven composite laminates.

A. Ghorbanpour Arani, et al., [13] has studied the buckling analysis of laminated composite plates reinforced by single-walled carbon nanotubes (SWCNTs) is carried out using an analytical approach as well as the finite element method. The critical buckling loads for the symmetrical layup are determined for different support edges, The Mori-Tanaka method is employed to calculate the effective elastic modulus of composites having aligned oriented straight nanotubes. The results show that the critical buckling load obtained from FEM is in good agreement with those obtained by the analytical solution. For all of the boundary conditions considered, the aspect ratio of $a/b = 2$ and the orientation angle of 45° yield the highest critical buckling load.

s.j. guo [14] has investigated the effect of reinforcements around the cutout stress concentration and buckling behavior of carbon/epoxy under in plane compressive loading. He made a four sample; un-reinforcement cutout, single composite ring reinforcement, double composite ring and double steel ring. All are performed in plane compressive loads and experimental results are compared with FEA analysis and results shows that the, reinforcement type 1 is most effective for metallic shear planes and sample 2 & 3 shows the for small and medium sized cutouts metallic panels more effective then composite and sample 4 is best for composite shear panels.

Results

Glass/epoxy composite plates, maximum buckling load for different parameters.

Experiment	Different parameters	Buckling load Expt, (KN)	ANSYS
(L/t) ratio	34%	33.4	34
Aspect ratio	50%	25.2	27
Fiber orientation	0°	23	23.5
Cutout shapes	circular	24.5	25.75

ACKNOWLEDGMENT

I would like to thank my parents to support and to praise me during this work, by their support I am able to stand at today's position. I am very glade to thank my dissertation supervisor, Professor Anil kumar G and Professor Ravi Kumbar, Dept of mechanical engg. SJBIT Bangalore. They has led me into the area of research where I have growing interests. Their expertise, vision and diligence coupled with his flexibility and patience has formed the excellent tailored guidance needed for this work and the preparation of this paper. I would also thankful to all my friends who encourage me a lot for study as well as life purpose. For all those I am most grateful.

CONCLUSION

The review shows that there is lot of research work going on buckling analysis of composite plates to understand the various parameters to avoid failure of composite materials under compressive loading. The following may be concluded based on review.

1. Buckling load decreases with the introduction of cutouts.
2. Buckling strength shows decreases with the rectangular cutouts and shows high for circular holes
3. Buckling strength is more for 45° in compares to 90° for fiber orientation.
4. Buckling strength is more if the cutouts are near the plate edges.
5. Critical buckling load of the rectangular plate under uniaxial compression is greater than the biaxial Compression and the critical buckling load increases by increasing the thickness.

6. Straining rate of 1.3mm is give more accurate results.

Based on above conclusion, its noticed that study of buckling behavior of hybrid composite plates is very limited, therefore it's important to understand the buckling behavior of hybrid composite plates which as a wide applications in aerospace, automobiles, civil engineering etc.

REFERENCES:

- [1] Mudhujit Mokhopadhyay, "mechanics of composite materials and structures". university press,2008,2009.2012,2013.
- [2] "Maya JACOB JOHN CSIR Materials Science and Manufacturing",2000.
- [3] Arun kumar R , . "Buckling Analysis of Woven Glass epoxy Laminated Composite Plate", 2014; 2(3): 35-42
Published online June 10, 2014
- [4] I Ramu and S.C. Mohanty "Buckling Analysis of Rectangular Functionally Graded Material Plates under Uniaxial and Biaxial Compression Load" 1877-7058 © 2014 The Authors. Published by Elsevier Ltd.
- [5] Dr. P. Ravinder Reddy1,et al.,," Buckling Analysis of Orthotropic Laminated Composite Plate With Rectangular Cut-Outs By Using FEA" IJETCAS 14-719; © 2014, IJETCAS
- [6] M Mohan Kumar, et al.,[6]. "Buckling Analysis of Woven Glass Epoxy Laminated Composite Plate." (AJER) e-ISSN :2320-0847 p-ISSN : 2320-0936 Volume-02, Issue-07, pp-33-40
- [7] Patrick E.et al., FEA buckling analysis of stiffed plates with filleted junctions 0263-8231 & 2012 Elsevier Ltd.
- [8] X. L. Xue, et al.,"Experimental Investigation on Buckling of Thin Films in Mechanical-Thermal Coupled-Field"1875-3892 © 2011 Published by Elsevier B.V.
- [9] Husam Al Qablan et al.,,"Assessment of the Buckling Behavior of Square Composite Plates with Circular Cutout Subjected to In-Plane Shear" Jordan Journal of Civil Engineering, Volume 3, No. 2, 2009
- [10] Murat Yazici , " buckling analysis of woven glass epoxy by changing orientations experimental and FEA " in year 2012
- [11] Buket Okutan Baba "investigating of buckling behavior of woven glass epoxy under in plane compressive loads" issn in year 2011
- [12] Zahari and Azmee,. "progressive failure analysis to capture the complete compressive response of woven composite plates made of glass-epoxy material" International Journal of Engineering and Technology, Vol. 4, No. 2, 2007, pp.260-265
- [13] A. Ghorbanpour Arani, et al., " Buckling analysis of laminated composite rectangular plates reinforced by SWCNTs using analytical and finite element methods" KSME & Springer 2011.
- [14] S.j. guo "Stress concentration and buckling behavior shear loaded composite panels with reinforcement cutouts" composite structure (80) 2007 1-9

FPGA IMPLEMENTATION OF FIR FILTER IN SIGNAL PROCESSING

*Saranya.S, Anand Kumar.V

M.E(Applied Electronics),Sri Eshwar college of Engineering Anna University, Coimbatore

Email: saranyasoundher15@gmail.com

Abstract-Multiple constant multiplication scheme is the most effective common sub expression sharing technique which is used for implementing the transposed FIR filters. Ripple carry operation allows adder tree to minimize hardware cost, unfortunately it detriment timing and gives low speed operation. To outperform this high speed adder is proposed and analyzed for real time speech signal applications. The resource minimization problem in the scheduling of adder tree operation based mixed integer programming (MIP) algorithm for more efficient multiple constant multiplication (MCM)based implementation of FIR filters are identified. The proposed adder tree consist of carry select adder to improve the speed of the fir filter. By using Graph based algorithm to choose the particular partial product in the multiple constant multiplication block. Which reduces number of adders in the scheduling of adder tree for FIR filter

Keywords— Adder tree optimization, multiple constant multiplication, MCM, Transposed finite impulse response filter, FIR

INTRODUCTION

Digital signal processing has many advantages over analog signal processing. Digital signals are more robust than analog signals with respect to temperature and process variations. The accuracy in digital representations can be controlled better by changing the word length of the signal. Furthermore, DSP techniques can reduce noise and interference while amplifying the signal. In contrast, both signal and noise are amplified in analog signal received, processed and manipulated, all virtually without error. While analog signal processing is indispensable for systems that require extremely high frequencies such as the radio frequency transceiver in wireless communications, or extremely low area and low power such as micro machine sensors used to detect cracks and other stress-related material defects, many complex systems are realized digitally with high precision, high signal to noise ratio (SNR), repeatability, and flexibility. The DSP systems can be realized using programmable processors or custom designed hardware circuits fabricated using very large scale integrated (VLSI) technology. The goal of digital design is to maximize the performance while keeping the cost down. Two important features that distinguish DSP from other general purpose computations are the real time throughput requirement and the data driven property.

The finite-impulse response (FIR) filter has been and continues to be one of the fundamental processing elements in any digital signal processing (DSP) system. FIR filters are used in DSP applications that range from video and image processing to must be a low-power circuit, capable of operating at moderate frequencies. Parallel, or block, processing can be applied to digital FIR filters to either increase the effective throughput or reduce the power consumption of the original filter. FIR filters are digital filters with finite impulse response. They are also known as non-recursive digital filters as they do not have the feedback (a recursive part of a filter), even though recursive algorithms can be used for FIR filter realization. FIR filters can be designed using different methods, but most of them are based on ideal filter approximation. FIR filter transfer function can be expressed as

$$H(z) = \frac{Y(z)}{X(z)} = \sum_{n=0}^{N-1} h[n] \cdot z^{-n}$$

The frequency response realized in the time domain is of more interest for FIR filter realization (both hardware and software). The transfer function can be found via the z-transform of a FIR filter frequency response. FIR filter output samples can be computed using the following expression:

$$y(n) = \sum_{k=0}^{N-1} h[k] \cdot x[n - k]$$

Where

$x[k]$ are FIR filter input samples;
 $h[k]$ are the coefficients of FIR filter frequency response; and
 $y[n]$ are FIR filter output samples.

FIR realized using two forms

- a) Direct Form
- b) Transposed Form

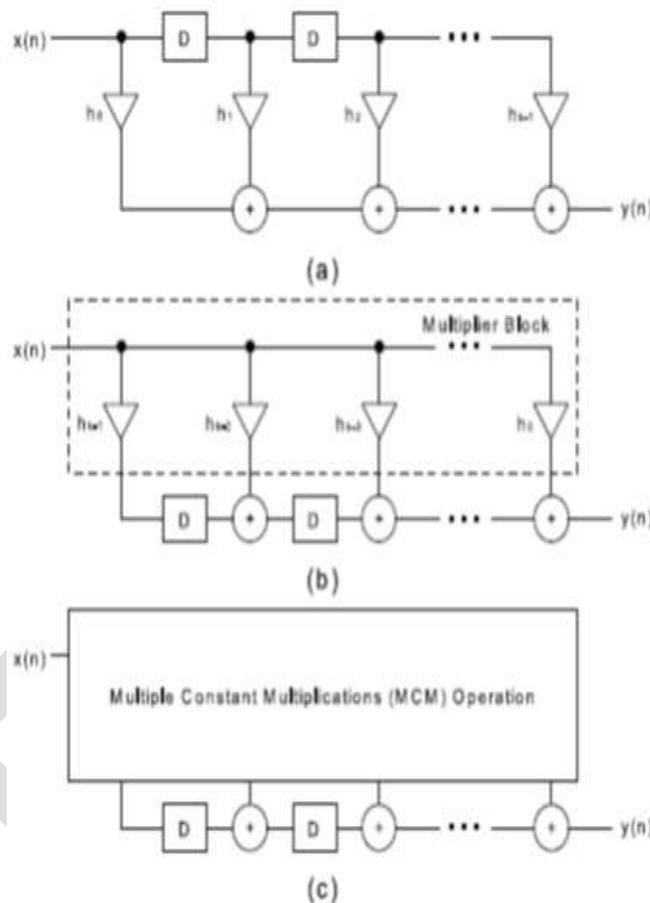


Figure 1.1 (a) Direct form (b) Transposed form (c) Transposed form with MCM block

In direct form delay units are present between the multipliers. But in transposed form delay units are between adders so that multipliers can be fed directly. The main drawback of direct form is that it consumes more power. So transposed form is preferred due to its higher performance and power efficiency.

MCM Concept

Efficient FIR filters use more number of multipliers. Multipliers are used for the multiplication of filter coefficients. But a multiplier occupies more area. Due to this, an FIR filter consumes large chip area. A multiplier block of an FIR filter performs multiplication of filter input with the set of filter coefficients. This is known as Multiple Constant Multiplication (MCM), i.e., multiplication of a variable by a set of constants. Example: $29x, 43x$. For the multiplier-less realization of constant multiplications, the fundamental operation is called A-operation. It is an operation with two integer inputs and one integer output that performs a single addition or subtraction, and an arbitrary number of shifts. It is defined as follows. For the multiplier-less realization of constant multiplications, the fundamental operation is called A-operation. It is an operation with two integer inputs and one integer output that performs a single addition or subtraction, and an arbitrary number of shifts. It is defined as follows

where

1) $s \in [0, 1]$ is the sign, which determines if an addition or a subtraction operation is to be performed.

2) $l_1, l_2 \geq 0$ are the integers denoting left shifts of the operands.

3) $r \geq 0$ is an integer indicating a right shift of the result.

$$w = A(u, v) = [2^{l_1}u + (-1)^s 2^{l_2}v] 2^{-r}$$

Shift-Add Architecture

Multiple constant multiplication (MCM) can be realized using "Shift-Add Architecture" which includes shifting and adding operations.

There exist several techniques to implement this shift-add architecture. While implementing occurs many problems.

PROPOSED SYSTEM

Approximate GB Algorithm

In the solution of Exact CSE algorithm all possible implementations are found from its representation, hence it is not the global minimum. The optimization of gate level area problem in digit-serial MCM design is an NP-complete problem due to the NP-completeness of the MCM problem. Exact CSE algorithm always generate 0-1 ILP problems which is difficult to handle by the current 0-1 ILP solvers. Hence GB heuristic algorithms, which provide a good solution using less computational resources are necessary.

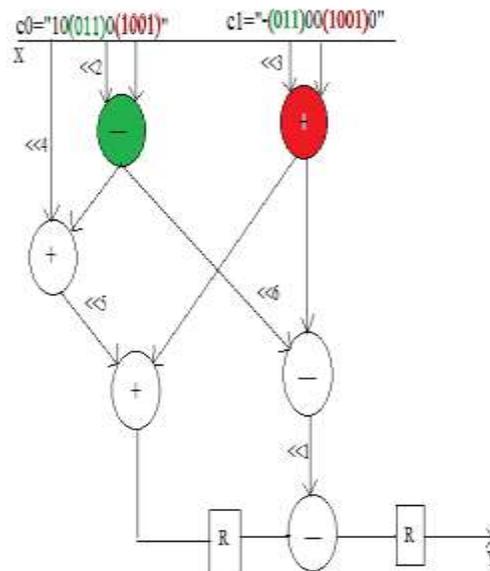


Figure 1.2 Adder tree of the FIR Filter

In MINAS-DS algorithm designed for the MCM problem, few number of intermediate constants are found. All the targets and intermediate constants are synthesized using a single operation. While selecting an intermediate constants for the implementation of not yet synthesized target constants we choose the one that can be synthesized using least hardware. This enable us to implement the not-yet synthesized target constants in a smaller area with the available constants. After the set of target and intermediate constants are found, each constant is synthesized using a A-operation that yields the minimum area in the digit-serial MCM design. Usually GB is based on MINAS-DS algorithm.

In MINAS-DS, the ready set $R = \{1\}$ is formed initially. The target constants, which can be implemented using a single operation are found and moved to the ready set using the Synthesize function. If unimplemented constants exist in the target set, then an intermediate constant is added to the ready set until there is no element in the target set. The MINAS-DS algorithm considers positive and odd constants that are not included in the current ready and target sets. These constants are implemented with the elements of current ready set using a single operation. The Compute Cost Function searches all A-operation that computes the constant with the elements of the current ready set. Then the cost of each operation under the digit-serial architecture is determined and returns minimum implementation cost among possible operations. Else it returns a 0 value, indicating that the constant cannot be synthesized using an operation with the elements of the current ready set.

After a possible intermediate constant is found, it is added into the working ready set A and its effect on the current target set are found using ComputeTCost function. Using this function the minimum digit-serial implementation costs of the target constants that can be synthesized with the elements of the working ready set are determined. The cost of intermediate constant is determined which is equal to its minimum implementation cost plus the cost of the not-yet synthesized target constants. After the cost value of each possible intermediate constant is found the one with the minimum cost is added to the current ready set and its effect on the current target set are found using the Synthesize function.

When no elements are left in the target set, the Synthesize MinArea function is applied on the final set to find the set of A-operations that yields a solution with the optimal area. The size of 0-1 ILP problem is much smaller than the 0-1 ILP generated by the exact CSE algorithm. Finding the minimum solution of this 0-1 ILP problem is much simpler because the possible implementations of a constant are limited to the elements in the final ready set.

CONCLUSION

In this project, the resource minimization formalization for designing digit-serial MCM operation with optimal area at the gate level by considering the implementation costs of digit-serial addition, subtraction, and shift operations was introduced. Since there are still instances with which the exact greedy algorithm cannot cope, an approximate GB algorithm that finds the best partial products in each iteration which yield the optimal gate-level area in digit-serial MCM design was proposed. The experimental results indicate that the complexity of digit-serial MCM designs can be further reduced using the high-level optimization algorithms proposed in this project. It was shown that the realization of digit-serial FIR filters under the shift-adds architecture yields significant area reduction when compared to the filter designs whose multiplier blocks are implemented using digit serial constant multipliers.

REFERENCES:

- [1] Yu Pan and Pramod Kumar Meher, Senior Member, IEEE, "Bit-Level Optimization of Adder-Trees for Multiple Constant Multiplications for Efficient FIR Filter Implementation," *IEEE transaction on circuits and systems-1: Regular papers*, vol. 61, no. 2, Feb 2014.
- [2] P. K. Meher and Y. Pan, "Mcm-based implementation of block fir filters for high-speed and low-power applications," in *Proc. VLSI and System-on-Chip (VLSI-SoC), 2011 IEEE/IFIP 19th Int. Conf.*, Oct. 2011, pp. 118–121. [7]
- [3] L. Aksoy, C. Lazzari, E. Costa, P. Flores, and J. Monteiro, "Design of digit-serial FIR filters: Algorithms, architectures, and a CAD tool," *IEEE Trans. Very Large Scale Integration (VLSI) Syst.*, vol. 21, no. 3, pp. 498–511, Mar. 2013. [8]
- [4] P. Prashanti, Dr. B. Rajendra Naik, "Design and Implementation of High Speed Carry Select Adder" *International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 9- Sep 2013.*
- [5] Paulchamybalaiah and Dr. Ila Vennila, "A Proficient Design of Hybrid Synchronous and Asynchronous Digital FIR Filter using FPGA", *IJCSI International Journal of Computer Science Issues*, Vol. 9, Issue 4, No 1, July 2012, ISSN (Online): 1694-0814
- [6] M. B. Gately, M. B. Yeary, and C. Y. Tang, "Multiple real-constant multiplication with improved cost model and greedy and optimal searches," in *Proc. IEEE ISCAS*, May 2012, pp. 588–591. [7] M. Kumm, P. Zipf, Faust, and C. H. Chang "Pipelined adder graph for MCM" *IEEE*, May 2012.

DETECTION OF INTRUDER NODES IN AUTONOMOUS MOBILE MESH NETWORKS

* Kiruthika Devi. M, Rama Rajan

*M.E Applied Electronics, Sri Eshwar College of Engineering, Coimbatore.

Project Engineer, VESTAS Power system

Abstract— In this paper, we describe the Autonomous Mobile mesh network with security. In MANET nodes move from one place to another place in free directions. The movement of the nodes may split the network and form more than one group. In this case communication between two nodes will be disconnected. To maintain the communication between all nodes even they are in different groups Mesh Nodes are used. Mesh Nodes which have the capability of changing its nature into Inter-group router or Intra-group router. Even it can act as a bridge router. To make the communication effective One-hop neighbor information update is used to find the shortest path between any two nodes. Since nodes move from one place to another place intruder may join the group. To avoid this problem private key is assigned for all the nodes in the network and it is shared among the nodes. If any node want to communicate with the other node first private key must be exchanged. Only if private key matches nodes can communicate. If key does not matches then the node ID will be registered in the Blacklist. If any node registered in the blacklist says the private key wrongly, then the node will be removed from the network. In this way security can be provided to the network.

Keywords— adhoc network, quality of service, MANET, AMMNET, location tracking, network security, group key management

INTRODUCTION

A wireless network is any type of computer network that uses wireless data connections for connecting network nodes. Wireless networking is a method by which homes, telecommunications networks and enterprise installations avoid the costly process of introducing cables into a building, or as a connection between various equipment locations. Wireless telecommunications networks are generally implemented and administered using radio communication. This implementation takes place at the physical level of the OSI model network structure. Examples of wireless networks include cell phone networks, Wi-Fi local networks and terrestrial microwave networks.

Wireless technology has been one of the most transforming and empowering technologies in recent years. In particular, mobile ad hoc networks (MANETs) are among the most popularly studied network communication technologies. In such an environment, no communication infrastructure is required. A mobile ad hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless.

This paper proposes a mechanism that allows non-GPS-equipped nodes in the network to derive their approximated locations from a limited number of GPS-equipped nodes. In our method, all nodes periodically broadcast their estimated location, in term of a compressed particle filter distribution. Non-GPS nodes estimate the distance to their neighbors by measuring the received signal strength of incoming messages. A particle filter is then used to estimate the approximated location from the sequence of distance estimates.

Typically, routing protocols are classified according to the route discovery philosophy, into either reactive or proactive. Reactive protocols are on-demand. Route-discovery mechanisms are initiated only when a packet is available for transmission, and no route is available. On the other hand, proactive protocols are table-driven. Routes are pre-computed and stored in a table, so that route will be available whenever a packet is available for transmission.

Ad hoc networking is an attractive concept and has various possibilities for different kinds of applications. In some application environments, such as battlefield communications, disaster recovery etc., the wired network is not available and multi-hop wireless networks provide the only feasible means for communication and information access. This kind of network is called Mobile Ad hoc network (MANET). It is also expected to play an important role in civilian forums such as campus recreation, conferences, and electronic classrooms etc. A MANET can be seen as an autonomous system or a multi-hop wireless extension to the Internet. As an autonomous system, it has its own routing protocols and network management mechanisms. As a multi-hop wireless extension, it should provide a flexible and seamless access to the Internet.

RELATED WORK

Mobile ad hoc networks (MANET) are constructed on-the-fly as nodes move in and out of the transmission range of each other. A major challenge in protocol design for MANETs is to provide mechanisms that deal with this dynamic topology change. Constant topology change has an inverse effect on fundamental tasks such as routing since routing algorithms cannot simply rely on previous knowledge of the network topology. Furthermore, even after a route has been successfully established, it can still be disrupted at any time due to the movement of the intermediate nodes. For this reason, most protocols originally designed for static networks cannot be adopted to ad hoc networks without significant change. Thus, many protocols have to be redesigned for ad hoc networks in order to cope with the topology change.

One great challenge in designing robust MANETs is to minimize network partitions. As autonomous mobile users move about in a MANET, the network topology may change rapidly and un-predictably over time; and portions of the network may intermittently become partitioned. This condition is undesirable, particularly for mission-critical applications such as crisis management and battlefield communications. We address this challenging problem in this paper by proposing a new class of robust mobile ad hoc network called Autonomous Mobile Mesh Networks (AMMNET). The AMMNET has the following additional advantages. The mobility of the mesh clients is confined to the fixed area serviced by a standard wireless mesh network due to the stationary mesh nodes. In contrast, an AMMNET is a wireless mesh network with autonomous mobile mesh nodes[1].

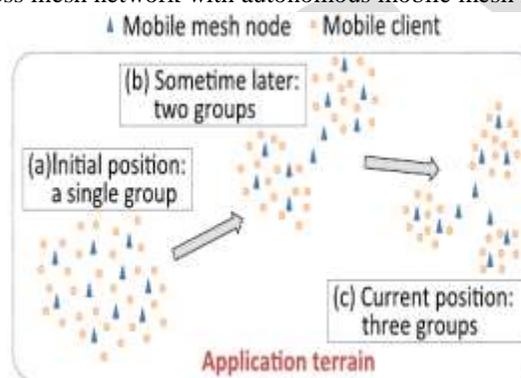


Fig.1. Partition and its topology adaptation

We classify the works related to AMMNET into three categories: 1) stationary wireless mesh networks: AMMNET is a new type of mesh networks, but supports dynamic topology adaptation, 2) sensor covering: the techniques for sensor covering is related to the design of covering mobile clients in AMMNET, and 3) location tracking: tracking mobile clients in AMMNET is an application of location tracking.

Given a network graph $G = (V, E)$ in which the number of location-aware nodes (also called *anchor nodes*) $|V_{gps}| \cdot |V|$, the objective of the location tracking algorithm is to find the locations of *non-anchor nodes* $\{V\} - \{V_{gps}\}$. In this section we survey the previous work on the location tracking problem in ad hoc networks.

The algorithms listed earlier all rely on the availability of reasonably accurate location information. This assumption is valid for networks in which some location sensing devices, such as GPS receivers, are available at all nodes. However, in reality this is rarely the case; although GPS receivers are increasingly cheaper to produce and becoming more widely available [6], they are still relatively expensive and power-hungry, and it is too general to assume that they will be available to every node in ad hoc networks. For this reason, different algorithms have been proposed to derive approximated locations of all nodes based on the relaxed assumption that direct location sensing devices are available to some nodes.

ONE-HOP ROUTING

To make the communication effective One-hop neighbor information update is used to find the shortest path between any two nodes. For communication between the nodes or between groups initially the source enables the route discovery process to find the shortest path based on one hop neighbor information.

Algorithm

Step 1: Nodes share and store information (id, position, distance, mobility) of its neighbors who are in closer than others in its coverage range.

Step 2: Source enables route discovery process. While receiving discovery packet each node forwards to its one hop neighbors.

Step 3: source receives acknowledgement (intermediate hop ids, distance) from intermediate hops(relays) and destination.

Step 4: source finds shortest path by received acknowledgement from destination.

Step 5: Sends data through that path.

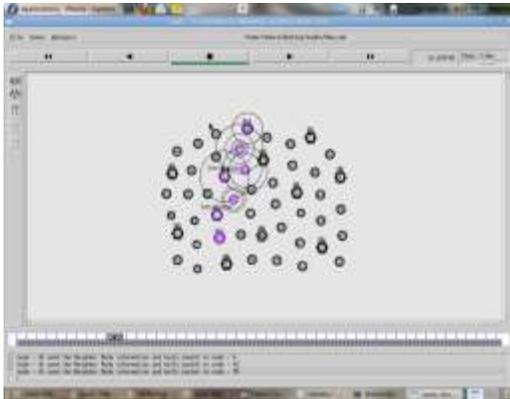


Fig.2. communication inside the group

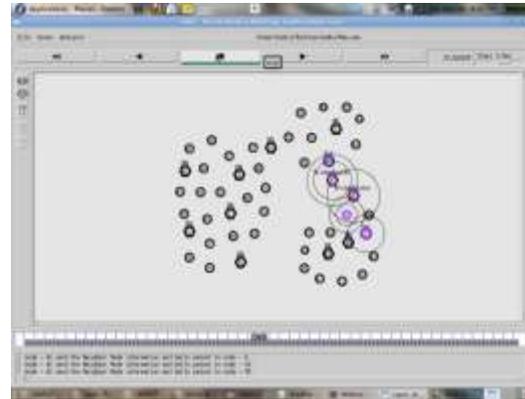


Fig.3. communication between the group

LOCATION TRACKING

This paper presents a solution to the location tracking problem based on particle filters. Given an ad hoc network with limited number of location-aware nodes, our solution estimates the locations of all other nodes by measuring the received signal strength indication (RSSI) from neighbors. For each node, the estimated location is viewed as a probabilistic distribution maintained by a particle filter. Unlike other location tracking methods, our solution has low overhead because it is purely based on local broadcasting and does not require flooding of the location information over the entire network[11]. Simulation studies show that even without flooding, our solution can still generate good estimates comparable to other existing methods, given that the network is well connected and the percentage of anchors is not extremely low. In addition when connectivity is low and the percentage of anchors is small, our algorithm is still able to derive location information which is not the case with most of the other approaches.

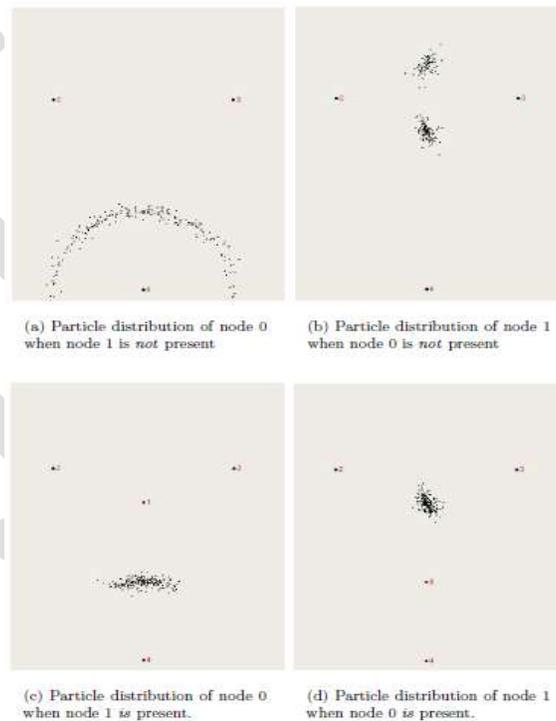


Fig.4. Location distributions in simple ad hoc scenarios

Generally speaking, there are two categories of localization methods depending on whether sensory data are used. The methods that do not use sensory data are simpler but tend to perform poorly especially when anchor ratio is low or the network is [12] sparse. The methods that do use sensory data generally perform better but tend to be significantly more complex. The performance in the latter case is also largely affected by the noise introduced to the sensory data which tends to aggregate rapidly as sensory data is propagated through the network.

Figure 4 demonstrates how our method solves the localization problem in a simple scenario. Here, nodes 2, 3 and 4 are GPS nodes, and node 0 and 1 are non-GPS nodes. Of the non-GPS nodes, node 0 may receive signals from nodes 1 and 4, and node 1 may receive signal from nodes 0, 2, and 3. The probability distribution of the estimated location is represented by the particles in the graph. In case (a), node 0 can only receive a signal from node 4. Thus, as the particle densities indicate, the probability distribution of node 0's location is on a circle around node 4. In Figure 1(b), node 1 can receive signals from node 2 and 3. Thus, node 1 is probably located where circles around nodes 2 and 3 intersect. Intuitively, in order to localize itself a node needs to receive location information from a minimum of three other nodes. In both case (a) and case (b), the location of nodes 0 and 1 cannot be derived because they do not receive location information from three other nodes. In Figures 1(c) and (d), node 0 and 1 are able to communicate to each other and exchange their probability distributions. Thus, their locations can be identified even though neither node receives location information from all three GPS nodes directly.

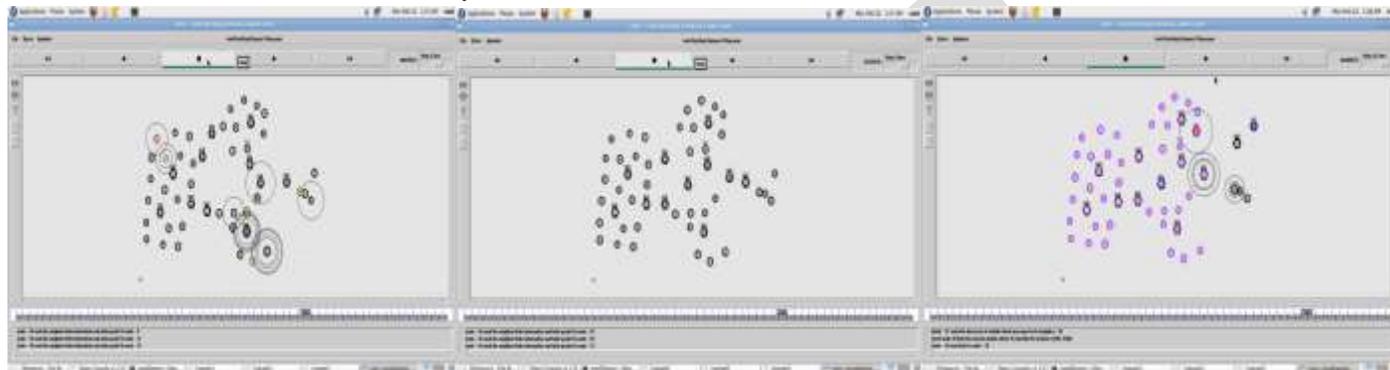


Fig.5. Node Movement

Fig.6. Star Formation

Fig.7. Track the node

SECURITY

Group communications are created all over the network in the form of videoconferences, on-line chatting programs, games, and gambling. Security plays an important role in these instances of group communication. According to [13], member authentication processes and key distribution take place at the beginning of a group communication. The group size tends to be less than 100 [14]. However, the Group Key (GK) generation takes a relatively long time to complete. For achieving a high level of security, the GK should be changed after every member joins and leaves so that a former group member has no access to current communications and a new member has no access to previous communications [13]. The group key agreement protocol focuses on the GK generation, which consists of evaluating a function of modular exponentiations.

The idea of the proposed algorithm relies on the premise that the members in the distributed computing do not have equal computing power. The higher the level in the key generation tree needs to longer time to compute the key. The key node $\langle 0,0 \rangle$ is taking more computation times than any other nodes' computations. Fig. 2 illustrates the reordering of members in the key generation tree.

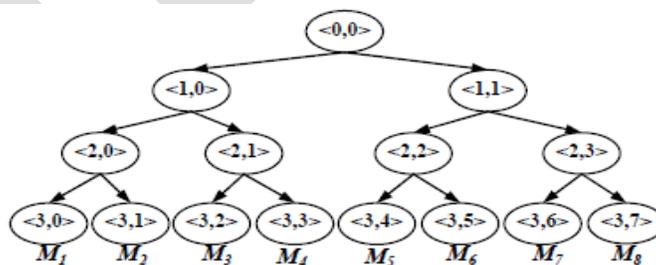


Fig.8. Reordering of Members in the Key Generation Tree

To illustrate the reordering mechanism an eight-member tree as shown in Fig. 2 is used. The leaf nodes represent members ($M_1, M_2, M_3, M_4, M_5, M_6, M_7,$ and M_8). The sibling nodes in the tree are $\langle M_1, M_2 \rangle, \langle M_3, M_4 \rangle, \langle M_5, M_6 \rangle,$ and $\langle M_7, M_8 \rangle$. Each member generates a secret key and calculates a blind key. Also he/she measures the elapsed time for generating the keys, and then each member starts to exchange their keys using the Diffie-Hellman key exchange. For example, M_1 and M_2 exchange the public keys $BK_{\langle 3,0 \rangle} (g^{K_{\langle 3,0 \rangle}} \text{ mod } p)$ and $BK_{\langle 3,1 \rangle} (g^{K_{\langle 3,1 \rangle}} \text{ mod } p)$ to generate sub-group key $g^{K_{\langle 3,0 \rangle} K_{\langle 3,1 \rangle}} \text{ mod } p$. Other sibling nodes ($\langle M_3, M_4 \rangle, \langle M_5, M_6 \rangle,$

and $\langle M_7, M_8 \rangle$ exchange their blind keys as the same way M_1 and M_2 did. After completing the leaf level computation, the next level in the key tree is ready to be calculated. A Group Controller (GC) who is the last member to join the group determines which member goes to the next level with comparing each member's elapsed times, $T_c(M_i, v_s)$.

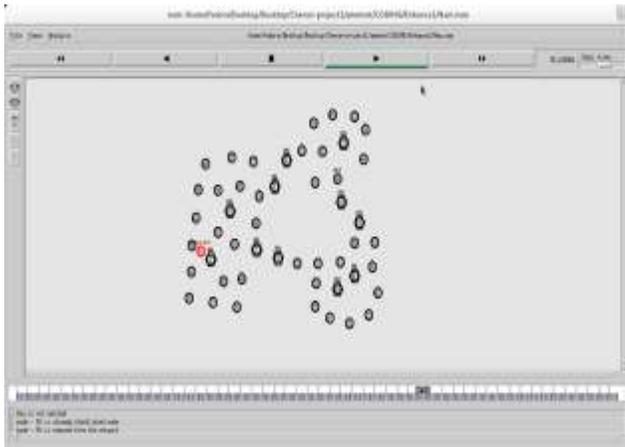


Fig.9. Attacker node

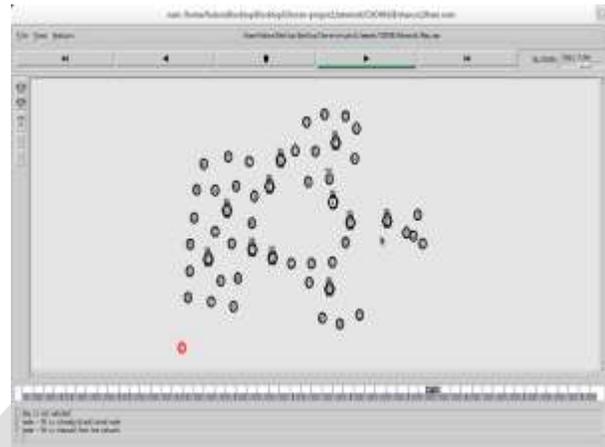


Fig.10. separate intruder node from network

CONCLUSION

Generally, the conventional mobile ad-hoc network suffer from network partitioning, this problem was solved in the AMMNET. It supports both intra-routing and inter-routing. Here, the mobile mesh routers of an AMMNET track the users and dynamically adapt the network topology and perform routing. It simply forwards the data from source to destination via multiple hops. This infrastructure provides full connectivity without need of high cost of network coverage.

This paper also describes a novel solution to the location tracking problem for mobile ad hoc networks. The estimated location for nodes is regarded as a probability distribution represented by a collection of sample points. The location information from the anchors is propagated through the network via local broadcasting of the location estimates. When a node receives the location estimates from neighbors, it updates its location distribution using the particle filtering method. And security can be provided by assigning separate key to all the nodes in the network, it can be done by group key management.

REFERENCES:

- [1] Wei-Liang Shen, Chung-Shiuan Chen, Kate ChingJu Lin, "Autonomous Mobile Mesh Networks", *IEEE Transactions on Mobile Computing*, 2014.
- [2] G.S. Kasbekar, Y. Bejerano, and S. Sarkar, "Lifetime and Coverage Guarantees through Distributed Coordinate-Free Sensor Activation," *Proc. ACM MobiCom*, 2009.
- [3] Y. Bejerano, "Simple and Efficient k-Coverage Verification without Location Information," *Proc. IEEE INFOCOM*, 2008.
- [4] C.-F. Huang and Y.-C. Tseng, "The Coverage Problem in a Wireless Sensor Network," *Mobile Networks and Applications*, 2005.
- [5] X. Wang, G. Xing, Y. Zhang, C. Lu, R. Pless, and C. Gill, "Integrated Coverage and Connectivity Configuration in Wireless sensor Networks," *Proc. ACM First Int'l Conf. Embedded Networked Sensor Systems (SenSys)*, 2003.
- [6] T. Camp, J. Boleng, and V. Davies, "A Survey of Mobility Models for Ad Hoc Network Research," *Wireless Comm. and Mobile Computing*, 2002.
- [7] p. Bahl, and V.N. Pamanbhan, "RADAR: An in-Building RF-Based User Location and Tracking System," *Proceedings of the IEEE INFOCOM'00*, March 2000.
- [8] N. Bulusu, J. Heidemann, and D. Estrin, "GPS-less low cost outdoor localization for very small devices," *IEEE Personal Communications Magazine*, vol. 7, no. 5, pp.28-24, October 2000.
- [9] L. Girod and D. Estrin, "Robust Range Estimation using Acoustic and Multimodal Sensing," *In Proceedings of IROS 01*, Maui, Hawaii, October 2001.
- [10] F. Kuhn, R. Wattenhofer, Y. Zhang, and A. Zollinger, "Geometric Ad Hoc Routing of Theory and Practice," *PODC 2003*, pp. 63-72, 2003.

- [11] W.-H. Liao, Y.-C. Tseng, and J.-P. Sheu, "GRID: A Fully Location-Aware Routing Protocol for Mobile Ad Hoc Networks," Telecommunication Systems, vol. 18(1) pp. 37–60, 2001.
- [12] W.-H. Liao, Y.-C. Tseng, K.-L. Lo, and J.-P. Sheu, "Geogrid: A Geocasting Protocol for Mobile Ad Hoc Networks Based on Grid," Journal of Internet Technology, vol. 1(2) pp. 23–32, 2000.
- [13] C. Wong, M. Gouda, and S. Lam, "Secure group communications using key graphs", IEEE / ACM Transactions on Networking, vol. 8, no. 1, February 2000.
- [14] M. Steiner, G. Tsudik and M. Waidner, "Key agreement in dynamic peer groups", IEEE Transactions on Parallel and Distributed Systems, vol. 11, no. 8, pp.769-780, August 2000.

IJERGS

Simulation Based Comparative Study on EIGRP/ IS-IS and OSPF/ IS-IS

Nisha Pandey,
M-Tech. Student
Department Of Computer Science
Shri Ram College of Engineering and Management,
Palwal, Haryana, India

Dr. Dinesh Kumar
Head of Department
Department Of Computer Science
Shri Ram College of Engineering and Management,
Palwal, Haryana, India

Abstract— Developing of Internet networks and increasing demand of real-time applications, such as voice, video conferencing and routing algorithms play important roles in the real network in recent years. Considering rate and type of the demanding traffic, choosing of the routing protocol can cause the best performance in function of a network. In modern communication networks, routing protocols are used to determine the shortest path to the destination. Open Shortest Path First (OSPF), Enhanced Interior Gateway Routing Protocol (EIGRP) and Intermediate System to Intermediate System (IS-IS) are the dominant interior routing protocols for such networks. This paper presents a simulation based analysis of these protocols. We used the combination of EIGRP&IS-IS, OSPF&IS-IS routing protocols on the same network in order to reveal the advantage of one over the other as well as the robustness of each protocol combination and how this is measured. To carry out the network simulations, we used Optimized Network Engineering Tool (OPNET). The comparison analysis is based on several parameters that determine the robustness of these protocols. The routing protocol convergence time is one important parameter which determines the time needed by the routers to learn the new topology of the network whenever a change occurs in the network. The routing protocol which converges faster is considered a better routing protocol. Point-to-point link throughput, HTTP object response time, database response time and e-mail download response time are other parameters we used to measure the routing performance of the network.

Keywords— EIGRP, IGRP, IS-IS, OSPF, RIP, OPNET.

I. INTRODUCTION

Internet Protocol (IP) is the most widely used network layer protocol for interconnecting computer networks. Intra domain routing protocols, also known as Internet Gateway Protocols (IGP), organize routers within Autonomous Systems (ASs). Nowadays, the most widely used intra domain routing protocols are Open Shortest Path First (OSPF), Enhanced Interior Gateway Routing Protocol (EIGRP) and Intermediate System to Intermediate System (IS-IS).

This paper provides detailed simulation analysis of the robustness of OSPF/IS-IS and EIGRP/IS-IS routing protocols. We analyze the impacts of using OSPF and IS-IS together as compared to using OSPF alone or IS-IS alone on the same network topology. In the same manner, we analyze the impacts of using EIGRP and IS-IS together as compared to using IS-IS or EIGRP alone. The simulations are carried out by using the OPNET-Modeler simulator [3].

II. PROBLEM DESCRIPTION

Interior networks mainly use the following three routing protocols: EIGRP, OSPF and IS-IS. Due to its scalability, OSPF is used more often than EIGRP [1]. OSPF and IS-IS are link state protocols. These protocols consume high bandwidth during network convergence. Both protocols are relatively complicated to setup on the network but they are the preferred protocols for larger networks. On the other hand, EIGRP has a faster convergence time than OSPF and IS-IS, it can be used in different network layer protocols and it is relatively easy to setup on the network. However, EIGRP is a CISCO proprietary protocol, which means that it can only be used on CISCO products. In this paper, we will look at the advantages of using OSPF and IS-IS on one network and EIGRP and IS-IS on another network. The comparison analysis of the routing protocols will be performed on OPNET.

III. ROUTING PROTOCOL OVERVIEW

In IP networks, the main work of a routing protocol is to carry data packets and forwarded from one node to another. In a network, routing can be defined as transmitting data from a source to a destination by hopping one-hop or multi hop. Routing protocols should provide minimum two facilities: firstly selecting routes for different pairs of source/destination nodes and, successfully transmitting data to a given destination. Routing protocols are used to describe how routers communicate to each other, build routing tables, make routing decisions and share information among neighbors. Routers are used to connect multiple networks and to provide packet forwarding for different types of networks. The main aim of routing protocols is to find the optimum path from a source to a destination. A routing algorithm uses different metrics based on a single or on several properties of the path in order to determine the best way to reach a given network. Traditional routing protocols used in interior gateway networks are categories as Distance Vector Routing Protocols and Link State Routing Protocols.

3.1 Distance Vector Routing

As the name indicates, distance vector routing protocol advertise routes as a vector of distance and direction. Here, the distance is represented in terms of hop count metrics and direction is represented by the next hop router or exit interface. Distance Vector Routing (DVR) is based upon the Bellman Ford algorithm. In DVR, the paths are calculated using the Bellman Ford algorithm where a graph is built in which nodes takes position of the vertices and the links between the nodes takes position of the edges of the graph. In DVR, each node maintains a distance vector for each destination. The distance vector consists of destination ID, next hop and shortest distance. In this protocol, each node sends a distance vector to its neighbors periodically informing about the shortest paths. Hence, each node discovers routes from its neighboring nodes and then advertises the routes from its own side. For information about the routes each node depends upon its neighbor which in turn depends on their neighboring nodes and so on. Distance vectors are periodically exchanged by the nodes and the time may vary from 10 to 90 seconds. For every network path, when a node receives the advertisement from its neighbors indicating the lowest-cost, the receiving node adds this entry to its routing table and re-advertises it on its behalf to its neighbors.

Methods of Routing

Distance vector routing protocol is one kind of protocol that uses the Bellman Ford algorithm to identify the best path. Different Distance Vector (DV) routing protocols use different methods to calculate the best network path. However, the main feature of such algorithms is the same for all DV routing protocols. To identify the best path to any link in a network, the direction and distance are calculated using various route metrics. EIGRP uses the *diffusion update* algorithm for selecting the cost for reaching a destination. Routing Information Protocol (RIP) uses hop count for selecting the best path and IGRP uses information about delay and availability of bandwidth as information to determine the best path [6]. The main idea behind the DV routing protocol is that the router keeps a list of known routes in a table. During booting, the router initializes the routing table and every entry identifies the destination in a table and assigns the distance to that network. This is measured in hops. In DV, routers do not have information of the entire path to the destination router. Instead, the router has knowledge of only the direction and the interface from where the packets could be forwarded [5].

Properties of Distance Vector Routing

The properties of DV routing protocol include [1]

- DV routing protocol advertise its routing table to all neighbors that are directly connected to it at a regular periodic interval.
- Each routing tables needs to be updated with new information whenever the routes fail or become unavailable.
- DV routing protocols are simple and efficient in smaller networks and require little management. DV routing is base on hop counts vector.
- The algorithm of DV is iterative.
- It uses a fixed subnet masks length.

Advantages and Disadvantages of DV Routing

DV routing protocol suffers from the problem of count to infinity and Bellman Ford algorithm has a problem of preventing routing loops [4]. The advantages of DV routing protocols are:

- Simple and efficient in smaller networks.
- Easy to configure
- Requires little management.
- The main disadvantages of DV routing protocols
- Results in creating loops.
- Have slow convergence.
- Problems with scalability.
- Lack of metrics variety.
- Being impossible for hierarchical routing.
- Bad performance for large networks.

3.2 Link State Routing

Link State Routing (LSR) protocols are also known as Shortest Path First (SPF) protocol where each router determines the shortest path to each network. In LSR, each router maintains a database which is known as link state database. This database describes the topology of the AS. Exchange of routing information among the nodes is done through the Link State Advertisements (LSA). Each LSA of a node contains information of its neighbors and any change (failure or addition of link) in the link of the neighbors of a node is communicated in the AS through LSAs by flooding. When LSAs are received, nodes note the change and the routes are recomputed accordingly and resend through LSAs to its neighbors. Therefore, all nodes have an identical database describing the topology of the networks. These databases contain information regarding the cost of each link in the network from which a routing table is derived. This routing table describes the destinations a node can forward packets to indicating the cost and the set of paths. Hence, the paths described in the routing table are used to forward all the traffic to the destination. Dijkstra's algorithm is used to calculate the cost and path for each link. The cost of each link can also be represented as the weight or length of that link and is set by the network operator.

By suitably assigning link costs, it is possible to achieve load balancing. If this is accomplished, congested links and inefficient usage of the network resources can be avoided. Hence, for a network operator to change the routing the only way is to change the link cost.

3.2.1 OSPF

Open Shortest Path first (OSPF) is a link state routing protocol that was initially developed in 1987 by Internet Engineering Task Force (IETF) working group of OSPF [17]. In RFC 1131, the OSPFv1 specification was published in 1989. The second version of OSPF was released in 1998 and published in RFC 2328. The third version of OSPF was published in 1999 and mainly aimed to support IPv6.

Characteristics of OSPF

Following characteristics are associated with OSPF [24].

- OSPF provides load balancing by distributing traffic through multiple routes to a given destination [24].
- It allows maximum flexibility and provides transfer and tagging of external routes injected into AS.
- It helps exchange information obtained from external sites.
- Runs directly over IP.
- Provides authenticated routing updates using different methods of authentication.
- It has low bandwidth utilization and ensures less processing burden on routers because updates are only sent when changes occur.

Advantages and Drawbacks of OSPF

The advantages of OSPF are

- OSPF is not a proprietary protocol.
- Fast and loop less convergence
- Low bandwidth utilization
- Precise metrics are supported and if needed multiple metrics can be used.
- Multiple paths are supported.
- External routes are represented separately.
- No hop count limit.
- Supports VLSM.
- Supports larger networks.

Drawbacks of OSPF are

- Complex to configure
- Memory overhead.
- Processing overhead is high when topology changes occur.

3.2.2 Intermediate system to Intermediate system (IS-IS) is a link state routing protocol introduced by ISO [5]. To exchange routing information, IS-IS routers calculate the cost for the route based on a single metric. IS-IS routing protocol is very similar to OSPF. IS-IS is designed to provide intra domain routing or routing within an area. IS-IS network includes end systems, intermediate system, areas and domains. In IS-IS network, routers are intermediate systems organized into local groups known as areas. Several area are grouped together to form domains. User devices are End systems. IS-IS and OSPF are link state routing protocols that can be used for larger networks. IS-IS uses Dijkstra algorithm to determine the shortest path and utilizes a link state database to route packets between intermediate systems. IS-IS usually use two level hierarchical routing in which a level 1 router can identify the topology in the area including every router and host. However, a level 1 router cannot know the identity of routers outside their area. Level 1 routers of are similar to OSPF intra area routers since it has no connections outside.

Advantages and Drawbacks of IS-IS

Advantages

- Fast convergence. For transmitting routing information, IS-IS utilizes a low number of packet types.
- Support large areas of several intermediate systems without degradation of SPF performance.
- It does not implement virtual links
- Scalable. Backbone is not an area in IS-IS but instead is a collection of contiguous ABRs.
- Simple to implement.

Drawbacks

- Metrics are 6 bit wide (0-63). Default metric is 10 if it is not manually specified.
- All areas in IS-IS networks are stub areas which may result in suboptimal routing between areas.
- All ISs must have identical views of an area.
- For node identification, NSAP addresses are needed in combination with Connectionless Network Protocol (CLNP) as an additional network layer protocol.

3.2.2 EIGRP

Enhanced Interior Gateway Routing Protocols (EIGRP) is a CISCO proprietary protocol and it is an enhancement of the interior gateway routing protocol (IGRP). EIGRP was released in 1992 as a more scalable protocol for medium and large scale networks. It is a widely used interior gateway routing protocol which uses Diffusion Update Algorithm (DUAL) for computation of routes. EIGRP is also known as hybrid protocol because it has the properties of a link state protocol for creating neighbor relationships and of a distance vector routing protocol for advertisement of routes.

Advantages and Drawbacks of EIGRP

EIGRP provides the following advantages

- Loop free routes are provided.
- It additionally saves a back up path to reach the destination.
- Multiple network layer protocols are supported
- Convergence time for EIGRP is low which in turn reduces the bandwidth utilization.
- Supports VLSM, discontinuous network and classless routing.
- Routing update authentication is supported by EIGRP.
- Topology table is maintained instead of the routing table and consist of best path and an addition loop free path.
- Drawbacks of EIGRP are
- It's a Cisco proprietary routing protocol.
- Routers from other vendors cannot utilize EIGRP.

IV Simulation Tool Used

In our dissertation work we are using the Optimized Network Engineering Tool (OPNET v16.0) software for simulating selected routing protocols. OPNET is a network simulator. It provides multiple solutions for managing networks and applications e.g. network operation, planning, research and development (R&D), network engineering and performance management.

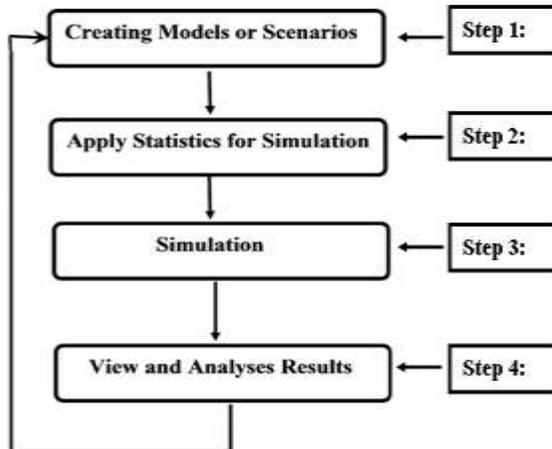


Figure: 4.1 Flow chart of OPNET

OPNET 16.0 is designed for modeling communication devices, technologies, and protocols and to simulate the performance of these technologies. It allows the user to design and study the network communication devices, protocols, individual applications and also simulate the performance of routing protocol. It supports many wireless technologies and standards such as, IEEE 2002.11, IEEE 2002.15.1, IEEE 2002.16, IEEE 2002.20 and satellite networks. OPNET IT Guru Academic Edition is available for free to the academic research and teaching community.

V. Simulation Scenarios

In our paper, we used five different scenarios. The scenarios are created based on the routing protocols presented. The network topology consists of the following network devices and configuration utilities:

5.1 OSPF Scenario

This scenario implements OSPF as a routing protocol on the selected network topology. As a first step, we created the network topology without a routing protocol and then, we duplicated it to five scenarios so that we could simulate OSPF, EIGRP, IS-IS, OSPF/IS-IS and EIGRP/IS-IS on each of them. So, on one of the duplicated scenarios, OSPF is configured as a routing protocol for the whole routers in the network. After configuring the routing protocol, we choose the statistics that will be viewed on the result.

These statistics are: OSPF Traffic received (bits/s), HTTP object response time, E-mail download response time, Database response time and point to point throughput

5.2 EIGRP Scenario

On this scenario, EIGRP is configured as routing protocol for the selected network topology. We used one of the duplicated scenarios with no routing protocol and configure EIGRP on it. Then, we choose the statistics that will be viewed on the result: EIGRP Traffic received (bits/s), EIGRP Convergence duration, HTTP object response time , E-mail download response time and point to point throughput.

5.3 IS-IS Scenario

On this Scenario, IS-IS is configured as routing protocol for the network topology. Then, we choose the statistics that will be viewed on the result: IS-IS Traffic received (bits/s), IS-IS Convergence activity, HTTP object response time, E-mail download response time , Database response time and point to point throughput.

5.4 EIGRP/IS-IS Scenario

One of the main focuses of our paper is to analyze the network that is configured with EIGRP and IS-IS routing protocols together and deduce the advantages of using both protocols together. This scenario is a little different from the others because two routing protocols are configured on the network.

As shown in Figure, some part of the network uses EIGRP and the other part uses IS-IS. Both protocols use route redistribution for exchanging route information for each other. Route redistribution is a feature that allows for the exchange of route information among multiple protocols and multiple sessions [3]. The characteristics of each routing protocols is analyzed, while using both protocols together.

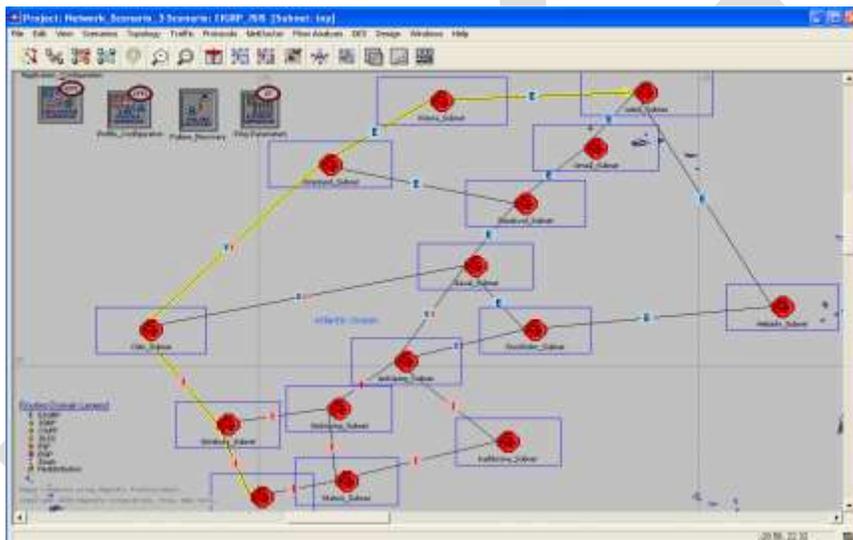


Figure: 5.1 EIGRP/IS-IS Scenario

The statistics chosen for this scenario: IS-IS Traffic received (bits/s), IS-IS Convergence activity , HTTP object response time, E-mail download response time, Database response time, EIGRP convergence activity, EIGRP traffic sent (bits/s) and point to point throughput (packet/s).

5.5 OSPF/IS-IS Scenario

The other main focus of our paper is the combination OSPF/IS-IS, which analyzes the implementation of OSPF and IS-IS together on the topology network. As shown in Figure, some part of the network uses OSPF and the other part uses IS-IS

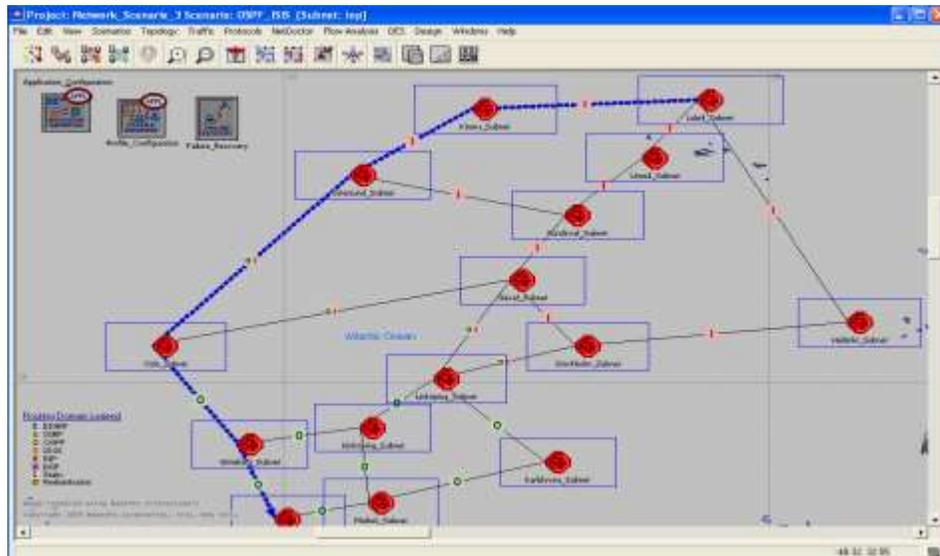


Figure: 5.2 OSPF/IS-IS Topology

VI. Simulation Result and Analysis

As we mentioned earlier, we have five simulation scenarios: OSPF, EIGRP, IS-IS, OSPF/IS-IS and EIGRP/IS-IS. This helps us compare one protocol with the other. So, we select a specific parameter and compare the results of all protocols on one graph based on the selected parameter. In all the scenarios, router are setup to fail at 250 s and 350 s.

6.1 OSPF Traffic

Figure 6.1 shows the OSPF traffic sent in bits per Sec. On the graph OSPF traffic is higher at the time of first convergence in OSPF/IS-IS protocol than in OSPF. At the time when router fails, there will be a network topology update; therefore the routers will exchange route information with the whole network. Again, the second time, when router fails, it will update the network tables, so there will be another route information exchange. At the second and third convergence, the OSPF traffic will be higher in OSPF than OSPF/IS-IS.

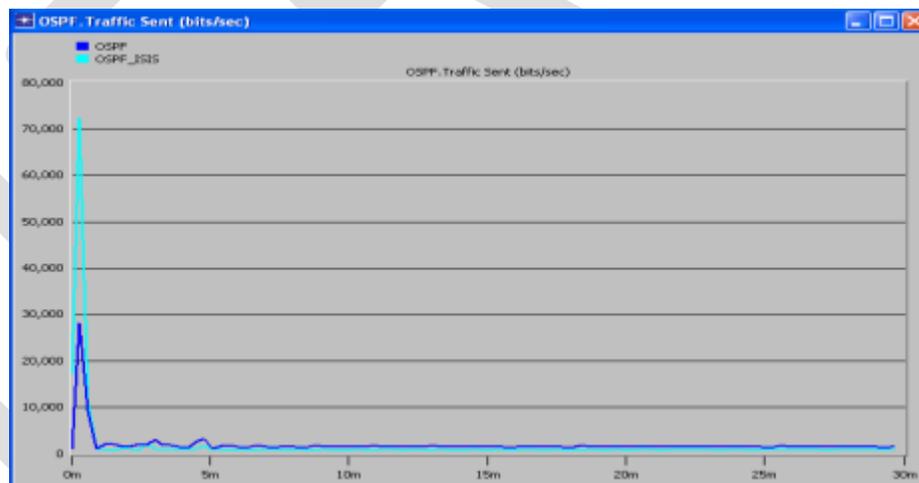


Figure 6.1: OSPF Traffic.

6.2 EIGRP Traffic

Figure 6.2 shows EIGRP traffic sent in bits/s. It is shown that during the time of convergence, the EIGRP traffic is much higher in EIGRP network than of EIGRP/IS-IS network. In EIGRP/IS-IS network, the EIGRP route information will be lower because the EIGRP traffic is exchanged within the interface that uses EIGRP protocol. The network that use EIGRP for the whole network will have more interfaces that use EIGRP, so there will be more EIGRP traffic than a network that use EIGRP and IS-IS in the network.

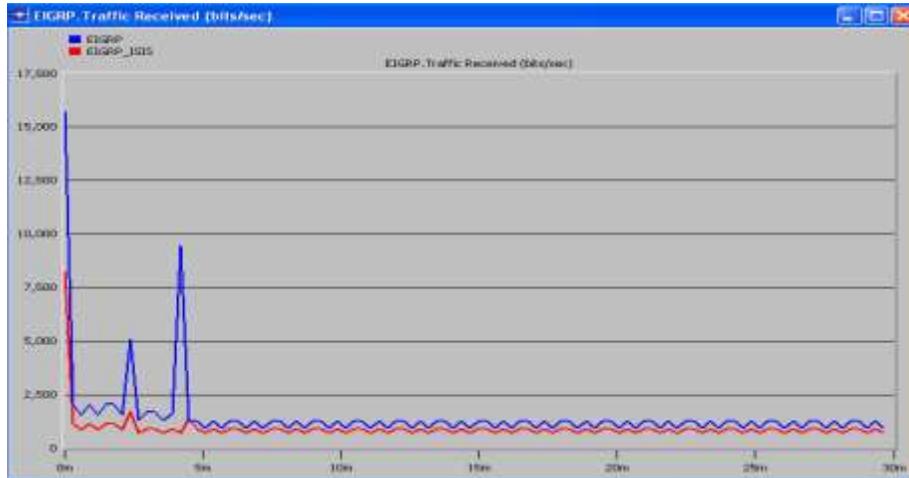


Figure: 6.2 EIGRP Traffic.

6.3 EIGRP Convergence Time

Figure 6.3 shows the convergence time of EIGRP in the network that uses EIGRP routing protocol and EIGRP/IS-IS routing protocol. As it's shown in Figure, the convergence time of EIGRP in EIGRP/IS-IS network is relatively smaller than the network that uses only EIGRP. EIGRP route information update will be advertised within the interface that use EIGRP routing protocol, since the interfaces enabled to use EIGRP are smaller in EIGRP/IS-IS than EIGRP, it will take a smaller time to update the topology table, routing table and neighbor table. The first convergence time of EIGRP/IS-IS is 5.9 s, whereas for EIGRP it is around 0.025 s. The second convergence time, it is 0.079 s for EIGRP, whereas for EIGRP/IS-IS it is 0.027 s. The third convergence time is 0.066 s for EIGRP, whereas for EIGRP/IS-IS it is around 0.007 s.

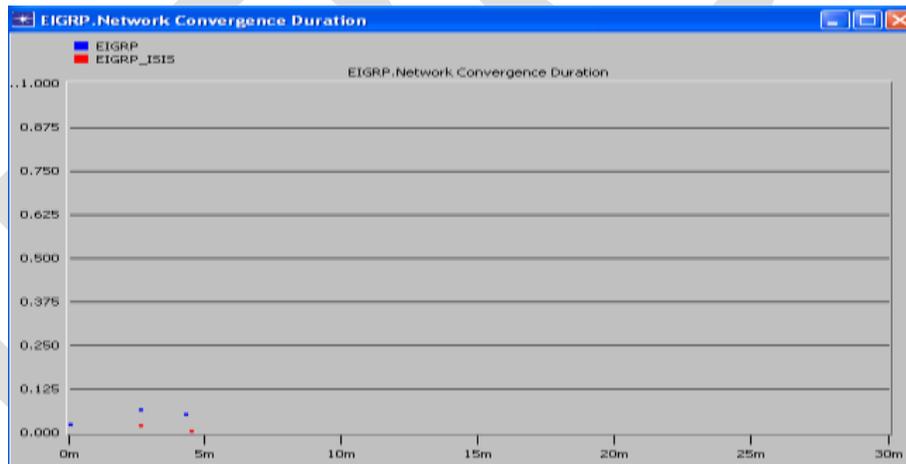


Figure: 6.3 EIGRP Convergence Time

6.4 IS-IS Convergence Time

As it is shown in Figure 6.4, the elapsed time to converge the network on IS-IS network is slower than OSPF/IS-IS network and EIGRP/IS-IS network. On the other hand, the network convergence time for EIGRP/IS-IS network is faster than the other networks. The first convergence time of IS-IS is 12 s, whereas for EIGRP/IS-IS is around 0.9 s and for OSPF/IS-IS is 13 s. The second convergence time of IS-IS is 11 s, whereas for EIGRP/IS-IS it is around 0.9 s and for OSPF/IS-IS it is 6 s. The third convergence time of IS-IS is 11 s, whereas for EIGRP/IS-IS is around 6 s and for OSPF/IS-IS is 7 s.

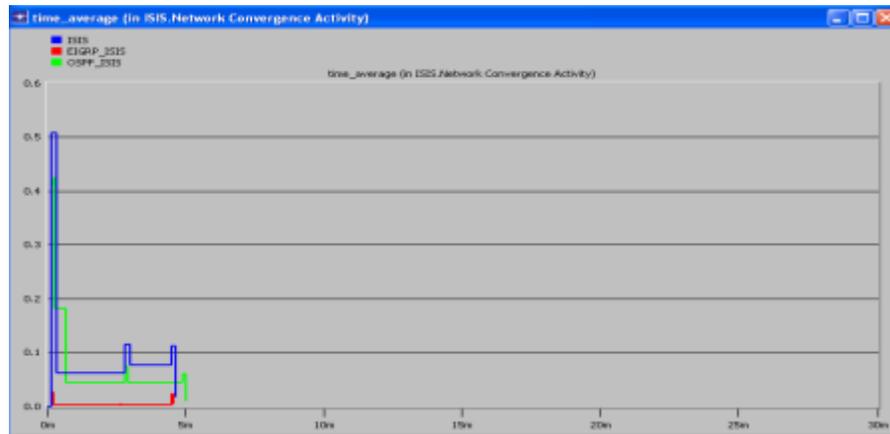


Figure 6.4 IS-IS Convergence Time

6.5 Database Query Response Time

Figure 6.5 shows the database query response time in the second scenario. The LAN network is able to access the database from the server, so in this scenario we show how the protocols affect the performance to access the database from the server. In the comparison of these protocols in database query response time, EIGRP/IS-IS shows a better response time than of the other protocols at the whole time. On the other hand, OSPF/IS-IS shows a slower response time than of all the other protocols. At the beginning, the response time of OSPF, IS-IS, OSPF/IS-IS and EIGRP is almost similar but as time increases, OSPF/IS-IS becomes slower in response time. On the other hand EIGRP shows better performance than the other three protocols. OSPF and IS-IS protocols show almost similar database response time in the whole time.



Figure: 6.5 Database Query Response Time

6.6 E-mail Download Response Time

E-mail application is heavily used by the users in the LAN network, the E-mail access is done from the mail server in the network. Figure 6.6 shows E-mail download response time in s. The graph shows that the EIGRP/IS-IS protocol performs very well for the whole simulation time. On the other hand, OSPF/IS-IS performs bad compared to the other protocols. In the first 4 minutes, IS-IS shows better E-mail download response time than of EIGRP and OSPF. After 4 minutes OSPF, EIGRP and IS-IS show almost similar performance for E-mail download response time.

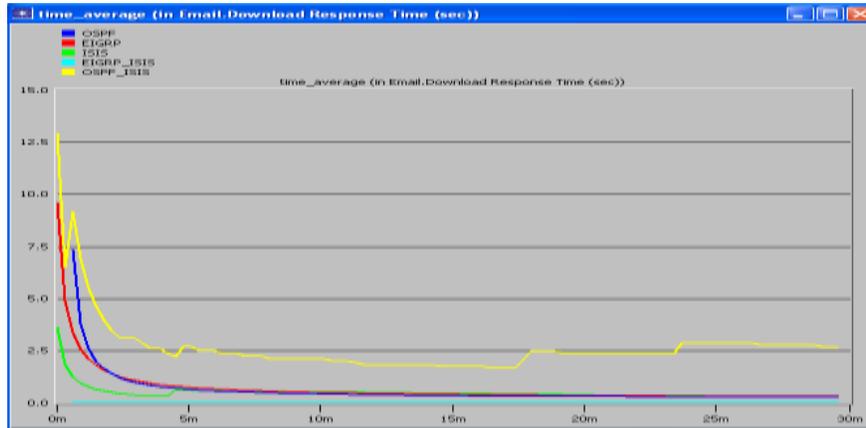


Figure: 6.6 E-mail Download Response Time

6.7 HTTP Object Response Time

Figure 6.7 shows HTTP object response time in s. Heavy HTTP application is used by the users in the network and the application service is supported by the server. The graph shows that EIGRP/IS-IS shows a shortest object response time in the whole simulation time. For the first 3 minutes, OSPF/IS-IS has a better object response time than of OSPF, IS-IS and EIGRP. But as time increases, OSPF/IS-IS object response time increases, and instead IS-IS become better than the other four protocols.

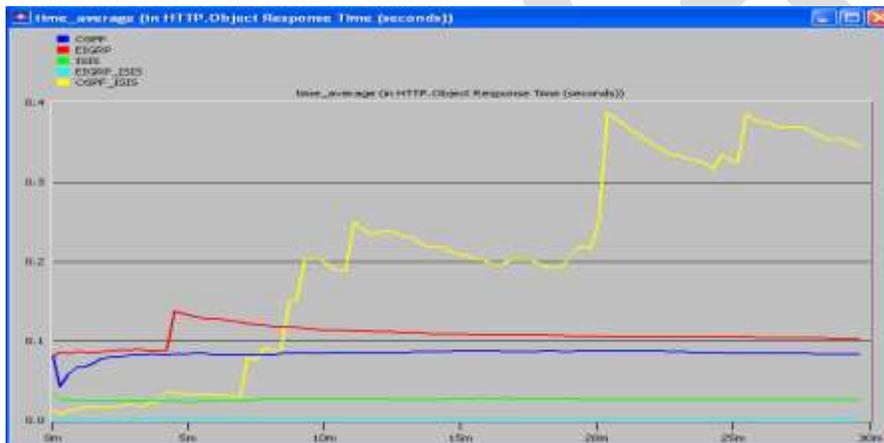


Figure: 6.7 HTTP Object Response Time

6.8 Throughput

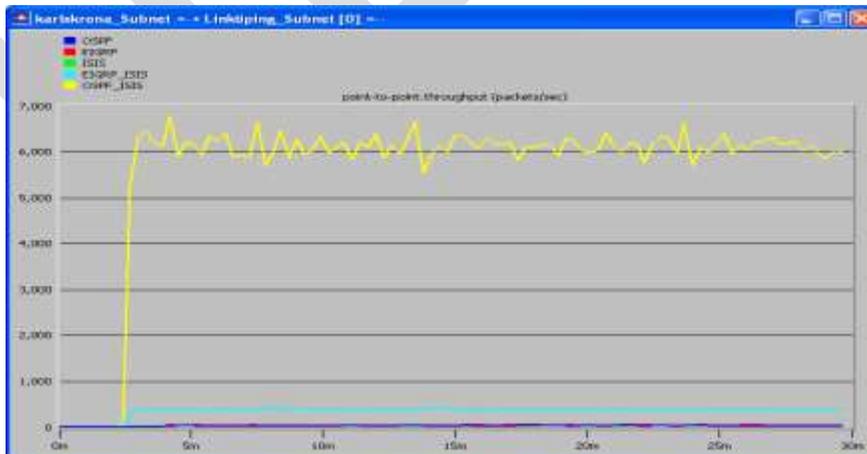


Figure: 6.8 Throughput

Figure 6.8 shows point to point throughput between the Karlskrona router and Link router measured in packets/s. The graph shows OSPF/IS-IS has high throughput in this link. On the other hand IS-IS, OSPF, EIGRP/IS-IS and EIGRP have a lower packet throughput in this link. EIGRP/IS-IS has are relatively better performance on point to point packet throughput than of the other three protocols.

VII Conclusions and Future Work

The objective of this paper was to configure multiple routing protocols on a selected network topology and analyze the performance improvement of the network. We aimed to configure OSPF and IS-IS together in one network, then EIGRP and IS-IS together in one another network. After configuring the protocols we analyzed the network performance improvements as compared to the network that use OSPF alone, EIGRP alone or IS-IS alone. The OSPF traffic in the network using OSPF/IS-IS is smaller than of network using only OSPF. This indicates that the bandwidth utilization of OSPF is better and the link congestion probability is smaller in OSPF/IS-IS network than that of network using only OSPF. The EIGRP traffic in the network using EIGRP/IS-IS is lower than of network using only EIGRP. This indicates that the bandwidth utilization of EIGRP is better in the EIGRP/IS-IS network than that of network using only EIGRP. Convergence time of EIGRP in the network using EIGRP/IS-IS network is much faster than in the network using only EIGRP. Therefore the nodes in EIGRP/IS-IS network learn the topology faster than the nodes in the EIGRP network.

IS-IS convergence time in EIGRP/IS-IS network is much faster than in IS-IS network or OSPF/ISIS network. On the other hand, IS-IS network shows lower convergence time than the EIGRP/IS-IS network or the OSPF/IS-IS network. Then we conclude, EIGRP/IS-IS network learns all nodes in the whole network faster than of IS-IS network or OSPF/IS-IS network. And IS-IS network learns slower than of the other two networks. Database response time is better in the network which uses EIGRP/IS-IS combination as compared to other networks using OSPF, IS-IS, EIGRP, OSPF/IS-IS. Network using OSPF/IS-IS combination shows slower database response time. Therefore database access is much faster in EIGRP/IS-IS networks and very slow in OSPF/IS-IS network. The network using EIGRP/IS-IS shows faster HTTP object response time, E-mail download response time than of other networks using OSPF, EIGRP, IS-IS, OSPF/IS-IS. On the other hand network using OSPF/IS-IS combination shows slow response in both the cases. Hence, EIGRP/IS-IS provides the end users access to the HTTP applications and e-mails faster than networks using OSPF, EIGRP, IS-IS, OSPF/IS-IS. The overall throughput performance of all networks is similar at the beginning of the simulation. But after few minutes, network using OSPF/IS-IS combination shows much better throughput performance than of all other networks. In our paper, we analyzed the performance of different routing protocols and have found EIGRP/IS-IS performed better than the other protocols. So, as a future work, we recommend any interested researcher to combine EIGRP and IS-IS routing protocols performs on MANET and Hybrid networks, and make one advanced routing protocol. This can be done by analyzing the source code of each protocol and make a modification on the codes.

REFERENCES:

- [1] Merlin Sheeba, G.; Nachiappan, A.; Gokulnath, P.S.L. presents "Improving link quality using OSPF routing protocol in a stable Wi-Fi mesh network," *Communications and Signal Processing (ICCSP), 2012 International Conference on* , vol., no., pp.23,26, 4-5 April 2012
- [2] Rosenberg, Eric, and James Uttaro presents "A Fast Re-Route Method.",*IEEE Communication Letters* VOL:17 NO: 8 YEAR 2013, pp. 1-4.
- [3] Michael, N.; Ao Tang; DahaiXu presents "Optimal link-state hop-by-hop routing," *Network Protocols (ICNP), 2013 21st IEEE International Conference on* , vol., no., pp.1,10, 7-10 Oct. 2013.
- [4] Ibanez, G.; Rojas, E. presents "All-path bridging: Path exploration as an efficient alternative to path computation in bridging standards," *Communications Workshops (ICC), 2013 IEEE International Conference on*, vol., no., pp.1280,1285, 9-13 June 2013.
- [5] Jagdeep Singh, Dr. Rajiv Mahajan presents" Simulation Based Comparative Study of RIP, OSPF and EIGRP"Volume 3, Issue 8, August 2013.
- [6] Neha Singh presents"A Review of IS-IS Intrarouting Protocol" *International Journal of Emerging Science and Engineering (IJESE)* ISSN: 2319-6378, Volume-2, Issue-1, November 2013.
- [8] Lee, Seung Hwan, and SeungHyong Rhee presents "Efficient flooding for reliability in link-state routing protocols." In *ICT Convergence (ICTC), 2012 International Conference on*, pp. 787-788. IEEE, 2012.
- [9] Xu, Dahai, Mung Chiang, and Jennifer Rexford presents "Link-state routing with hop-by-hop forwarding can achieve optimal traffic engineering." *IEEE/ACM Transactions on Networking (TON)* 19, no. 6 (2011): 1717-1730
- [10] Brun, Olivier, and J. Garcia presents "Dynamic IGP Weight Optimization in IP Networks." In *Network Cloud Computing and Applications (NCCA), 2011 First International Symposium on*, pp. 36-43. IEEE, 2011.

- [11] Wijaya, C. presents "Performance Analysis of Dynamic Routing Protocol EIGRP and OSPF in IPv4 and IPv6 Network," *Informatics and Computational Intelligence (ICI), 2011 First International Conference on* , vol., no., pp.355,360, 12-14 Dec. 2011
- [12] Sun Jian; Yin Ya Fang presents "Research and implement of OspfV3 in Ipv6 network," *Cross Strait Quad-Regional Radio Science and Wireless Technology Conference (CSQRWC), 2011* , vol.1, no., pp.743,746, 26-30 July 2011 doi: 10.1109/CSQRWC.2011.6037060
- [13] Guangyu Pei; Spagnolo, P.A.; Templin, F.L. presents "Enabling OSPFv3 MANET extensions over IPv4 encryptors," *Military Communications Conference, 2008. MILCOM 2008. IEEE* , vol., no., pp.1,6, 16-19 Nov. 2008.
- [14] NehaGrang and Anuj Gupta presents" Compare OSPF Routing Protocol with other Interior Gateway Routing Protocols" *IJEBEA* 13-147; 2008.
- [15] Performance Evaluation of Hybrid Network using EIGRP and OSPF for different application. Inderjeet Kaur, Manju Sharma *International Journal of Engineering Science and Technology (IJEST)*
- [16] Performance Analysis of RIP, OSPF, IGRP, and EIGRP Routing protocols in the Network. Pankaj Rankheja, Prabhjot kaur, Anjali Gupta, Aditi Sharma *International Journal of Computer Applications (0975 – 888) Volume 48– No.18, June 2012*
- [17] Investigation and Performance Evaluation of Dynamic Routing Protocol with New Proposed protocol for WAN Vasudha, Dr. Jindal *International Journal on Computer Science and Engineering (IJCSE)*
- [18] Performance Comparison of EIGRP/IS-IS and OSPF/IS-IS by Wendwossen Angelo and Esuendale Lemma
- [19] Talal Mohamed Jaffar, "Simulation-Based Routing Protocols Analysis (Thesis)" Ph.D. Dept. Elect. Eng., Georgia Institute of Technology, 2007.
- [20] R K Bansal, Vikas Gupta, Rahul Malhotra, "Performance Analysis of Wired and Wireless LAN Using Soft Computing Techniques- A Review" *Global Journal of Computer Science and Technology*, Vol. 10 Issue 8 Ver.1.0 September 2010 pp67 -71
- [21] Ahmed Mahmoud, "OSPF traffic Routing Protocol in Hybrid Network", *International Conference on Network and Parallel Computing Workshop*, pp 676-682, Sept 2007.
- [22] Mohammad Nazrul Islam and Md. A. Ullah, "Simulation-Based Comparative Study of EIGRP and OSPF for Real Time Applications", 2010

Optimum Static Analysis of Retaining Wall with & without shelf /Shelve at different level using finite Element analysis

Prof. Dr. D.N.Shinde(Guide)¹, Mr.Rohan R. Watve(Student)²
Civil Department,PVPIT Budhgaon,/Shivaji University,India
Email: rohanrtr1418@gmail.com, M-9421224635.

Abstract— Retaining wall with pressure relief shelves is one of the special types of retaining wall. High reinforced concrete retaining walls may be used economically by providing relief shelves on the back fill side of wall. Such walls may be termed as the retaining wall with relief shelf. lateral earth pressure on wall and increasing overall stability of the structure. This results in an economical design because less material goes into the wall as compared to massive structure of cantilever or even counterfort retaining walls without the shelves.

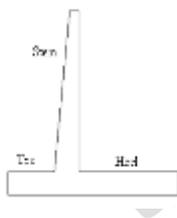
Keywords- Retaining Wall ,Retaining Wall with shelve,Stadd pro V8i.

INTRODUCTION

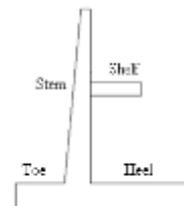
A retaining wall is a structure designed to sustain the lateral pressure of earth behind it. It retains a steep faced slope of an earth mass against rupture of slopes in cuts and fills and against sliding down. The retained material exerts a push on structure and this tends to overturn and slide it. The weight of retaining wall is considerable significance in achieving and maintaining stability of entire system. Earth retaining structures may be retaining walls, sheet piling, bulkheads, and basement walls, other permanent, temporary structures used in earth works and foundation engineering that retain vertical or almost vertical slopes of earth masses.

The lateral force acting between retaining structure and retained earth mass is termed as lateral earth pressure which is predominant force for analysis of retaining wall. Retaining walls are encountered and constructed in various fields of engineering such as roads, harbors, dams, subways, railroads, tunnels, mines, and military fortifications.

A continuous investigation and study is going on the various types of retaining walls for achieving optimum economy, developing speedy and easy construction processes, reducing section of wall components and ultimately to get the wall of maximum strength and durability. This is possible only by reducing the earth pressure behind the wall. Various techniques have been developed for reducing the earth pressure behind wall.



1)Retaining wall Without Shelve (Fig no. 1a)



2) Retaining Wall With Shelve(Fig no.1b)

STRUCTURE MODELING

A design example is given here to understand the procedure used in the analysis of retaining wall in this study. Analysis and design has been carried out by considering the stated properties of cohesion less backfill and also height of backfill to be retained for cantilever retaining wall and cantilever retaining wall with relief shelf at center of height of retaining wall. The tentative dimensions for cantilever retaining wall are adopted based on prevailing thumb-rules. The detail calculations for cantilever retaining wall and

cantilever retaining wall with relief shelf at center of height of retaining wall are given and the calculated results have been presented. At the end the calculated results for different cases are presented in the tabular form.

MODEL DISCRIPTION : 1) CONVECTIONAL METHOD:

a) Cantilever Retaining Wall without Shelf : (Following data is assumed.)

Height of backfill to be supported (H)	= 7 m
Unit weight of soil (γ)	= 20 KN / m ³
Angle of internal friction (ϕ)	= 30 ⁰
Coefficient of friction at base (0.5)	= 0.5
Bearing Capacity of soil (q_f)	= 200 KN / m ²
Unit weight of reinforced cement concrete	= 25 KN / m ³
Grade of concrete: M 20 and grade of steel: Fe 415	
Section of retaining wall:	
Width of base slab (B)	= 3.8 m (0.4 H to 0.7 H)
Thickness of stem at top of retaining wall (T_0)	= 0.40 m (200 mm minimum, preferably 400 mm)
Thickness of stem at intersecti of stem and base slab (T_s)	= 0.8 m (H/12 to H/8)
Thickness of base slab (T_b)	= 0.8 m (H/12 to H/10)
Height of stem (h) = $H - t_b$	= 7.00 - 0.80 = 6.2 m
Projection of base slab towards toe	= 1 m (0.20 B to 0.40 B)

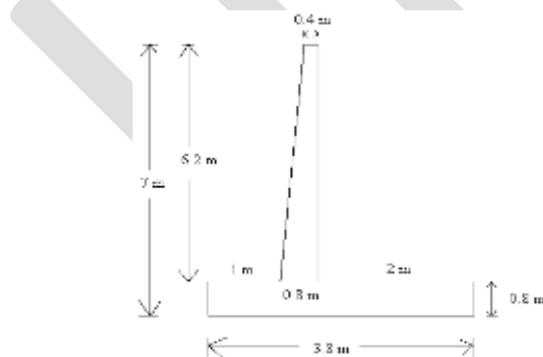
b) Cantilever Retaining Wall with Relief Shelf at mid height of Retaining wall: (Following data is assumed.)

- a) Height of backfill to be supported (H)* = 7
- Unit weight of soil (γ) = 20 KN / m³
- Angle of internal friction (ϕ) = 30°
- Coefficient of friction at base (0.5) = 0.5

- Bearing Capacity of soil (q_f) = 200 KN / m²
- Unit weight of reinforced cement concrete = 25 KN / m³
- Grade of concrete: M 20 and grade of steel : Fe 415

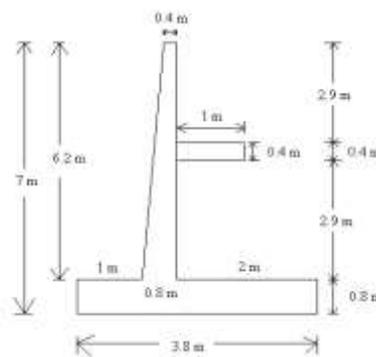
Section of retaining wall

- Width of base slab (B) = 3.8 m (0.4 H to 0.7 H)
- Thickness of stem at top of retaining wall (T_0) = 0.40 m (200 mm minimum preferably 40mm)
- Thickness of stem at intersection = 0.8 m (H/12 to H/8)
- of stem and base slab (T_s)
- Thickness of base slab (T_b) = 0.8 m (H/12 to H/10)
- Height of stem (h) = $H - t_b$ = 7.00 - 0.80 = 6.2 m
- Projection of base slab towards toe (0.20 B to 0.40 B) = 1 m
- Relief Shelf projection towards backfill (b) = 2/2 = 1 m
- Thickness of relief shelf = Base slab thickness / 2 = 0.80 / 2 = 0.4 m



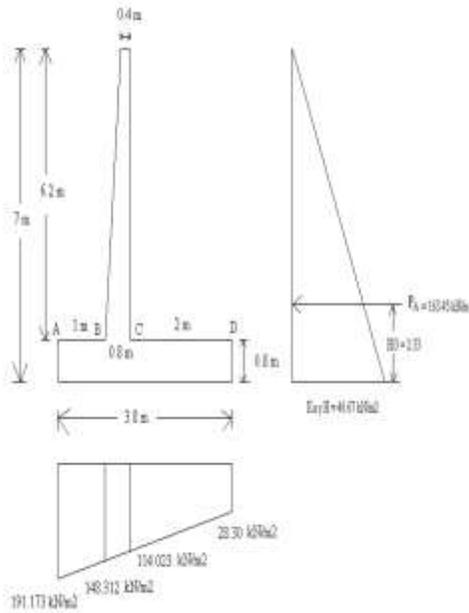
(a)
(Unsafe against Sliding)

(Fig no.2a)

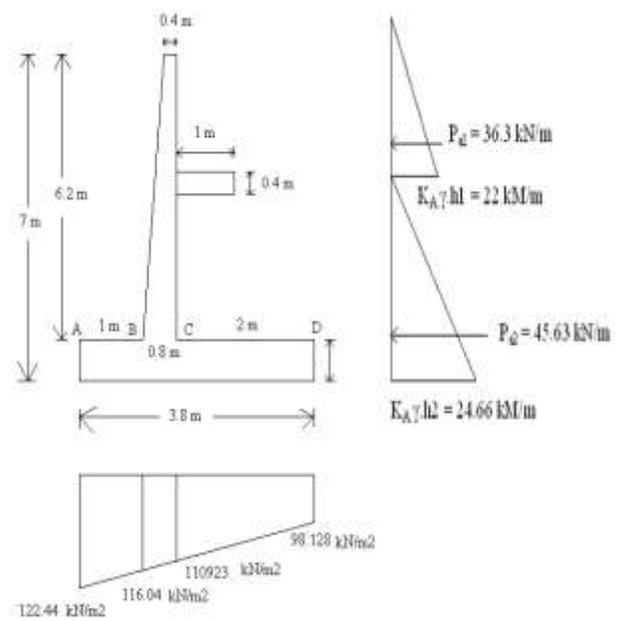


(b)
(Safe Against Sliding)

(Fig no.2b)



Pressure distribution diagram for Retaining wall without shelf(Fig no 3a)



Pressure distribution diagram for Retaining wall without shelf(Fig no 4b)

RESULTS AND DISCUSSION

Table No1) Comparison between retaining wall without and with shelf

Sr. No	Description	Retaining Wall without Shelf	Retaining Wall with Shelf
01	Eccentricity from toe	0.47	0.0698
02	P_{max} (Pressure intensity at Toe)	191.173 kN/m ²	122.42 kN/m ²
03	P_{min} (Pressure intensity at Heel)	28.30 kN/m ²	98.128 kN/m ²
04	Active Earth Pressure	163.34 kN/m	64.34 kN/m
05	Factor of safety against sliding	1.27 (Unsafe)	3.25
06	Factor of safety against overturning	2.56	4.63
07	Volume of concrete		

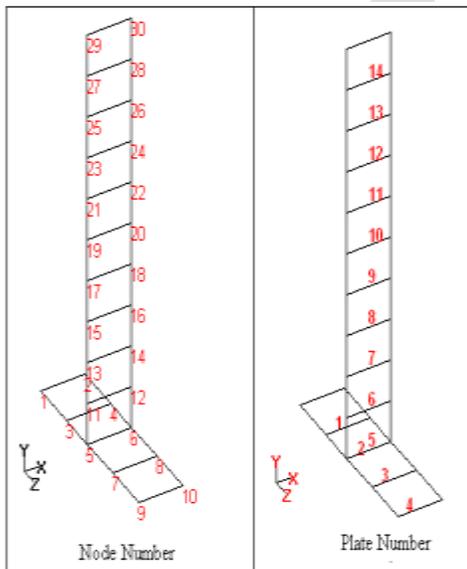
	i) Base slab	3.04 m ³	3.04 m ³
	ii) Stem	3.72 m ³	3.72 m ³
	iii) Shelf	-----	0.4 m ³
	Total volume of concrete required	6.76 m ³	7.16 m ³
08	Area of reinforcement		
	a) Toe of base slab		
	i) Longitudinal steel	930.60 mm ²	879.08 mm ²
	ii) Distribution steel	960 mm ²	960 mm ²
	b) Heel of base slab		
	i) Longitudinal steel	1418.63 mm ²	720.66 mm ²
	ii) Distribution steel	960 mm ²	960 mm ²
	c) Stem		
	i) Longitudinal steel	1736.20 mm ²	1410 mm ²
	ii) Distribution steel	720 mm ²	720 mm ²
	d) Relief Shelf		
	i) Longitudinal steel		

	ii) Distribution steel	-----	622.34 mm ²
		-----	480 mm ²
	Total area of reinforcement required	6725.43 mm ²	6752.08 mm ²

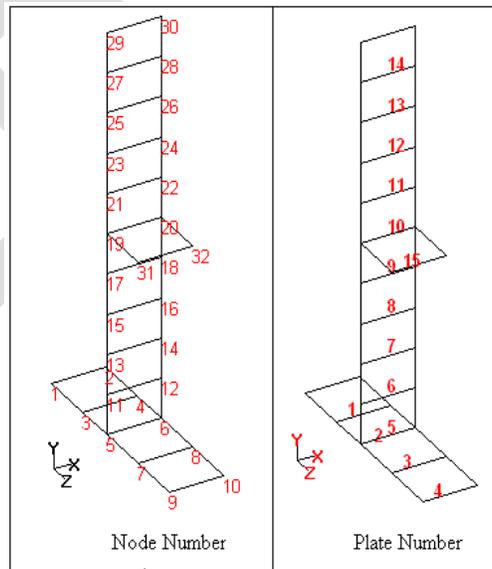
STADD PRO METHOD:

Model of retaining wall without and with shelf in STAAD-Pro :

STAAD-Pro is used to perform finite element analyses of retaining wall without and with shelf. The model of the cantilever reinforced concrete retaining wall without and with shelf is generated in Space structure (which is a three-dimensional framed structure with loads applied in any plane) and using four noded plate element. The model of the retaining wall without shelf includes 30 nodes and 14 plates and the wall with shelf includes 32 nodes and 15 plates. Node no. 1 to 6 on toe slab, node no. 5 to 10 on heel slab, node no. 5, 6, 11 to 30 on stem on node no. 31 & 32 on shelf. Node no. 5 & 6 is common for toe, heel and stem. Plate no. 1 & 2 on toe slab, plate no. 3 & 4 on heel slab, plate no. 5 to 14 on stem on plate no. 15 on shelf. Figure no. 4.1 and 4.2 show the Node no. and plate no. for retaining wall without and with shelf.



Node no. and plate no. for retaining wall without shelf (Fig no.4a)



Node no. and plate no. for retaining wall with shelf (Fig no.4b)

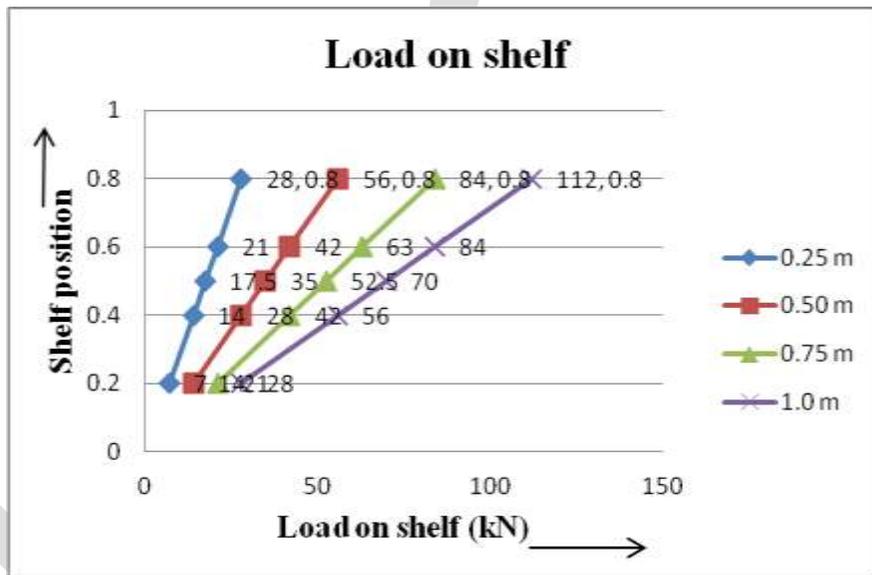
Analysis of retaining wall with shelf by changing the locations and width of shelf

The analysis of retaining wall with shelf is performed by changing locations i.e. shelf is located at 0.2h, 0.4h, 0.5h, 0.6h & 0.8h from top where h is height of retaining wall and also by changing width i.e. shelf width is provided 0.25 m, 0.50 m, 0.75m & 1.0m.

Combination of location and width

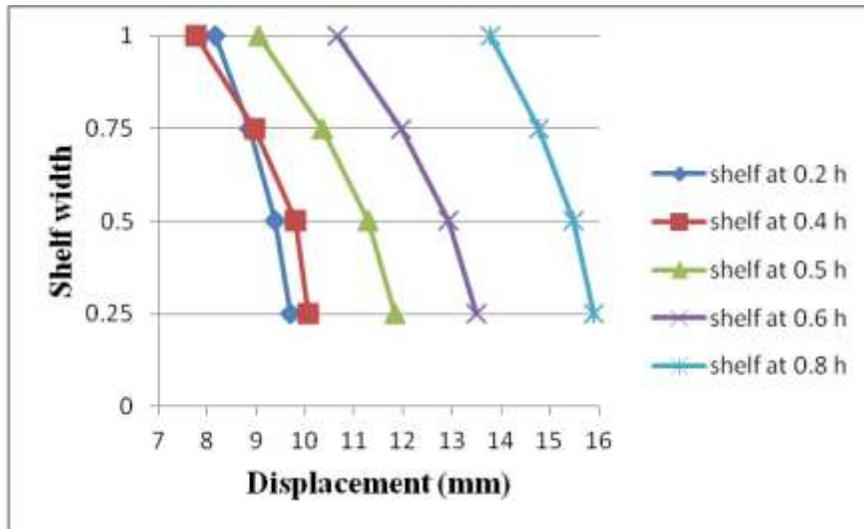
Table No2) : Combination of location factor and shelf factor

Combination	Shelf width	Shelf location from top				
		0.2 h	0.4 h	0.5 h	0.6 h	0.8 h
Combination 1	0.25 m	0.2 h	0.4 h	0.5 h	0.6 h	0.8 h
Combination 2	0.50 m	0.2 h	0.4 h	0.5 h	0.6 h	0.8 h
Combination 3	0.75 m	0.2 h	0.4 h	0.5 h	0.6 h	0.8 h
Combination 4	1.0 m	0.2 h	0.4 h	0.5 h	0.6 h	0.8 h



Load on shelf (Graph 1)

Graph1: shows the values of load on shelf due to earth pressure. Load on shelf increases with changing the location of shelf as well as with increasing the shelf width.



Displacement of top node for shelf width :(Graph 2)

Table No3): Displacement of top node

Shelf width	Shelf position (Displacement in mm)				
	0.2 h	0.4 h	0.5 h	0.6 h	0.8 h
0.25 m	9.699	10.076	11.838	13.494	15.902
0.50 m	9.390	9.806	11.278	12.925	15.480
0.75 m	8.876	8.959	10.345	11.977	14.776
1.0 m	11.156	7.773	9.038	10.651	13.792

CONCLUSION

The retaining wall with relief shelf is proved to be advantageous over the cantilever and counterfort retaining wall. The finite element analysis of 2-D model of retaining wall by using STAAD-Pro is performed in this work. The software STAAD-Pro can be suitably applied for the structural analysis of such type of wall. The study of deflections, bending moment, support reactions, etc. on various components of retaining wall can be easily performed by this software.

Following are the concluding remarks.....

1. The best location for the single shelf is observed to be in between 0.4 h to 0.5 h for the maximum reduction in earth pressure, less bending moments and less deflection.
2. The deflection of the stem is reduced by about 41.50% by providing shelf at 0.5 h than the deflection given without shelf.
3. The deflection of the stem depends mainly on the shelf location and it increases for the shelf located from 0.2 h to 0.8 h.
4. The deflection reduces by increasing the width of the shelf but the variation is less.
5. The pattern of occurrence of bending moment on toe for all the shelves (0.25 m, 0.50 m, 0.75 m, 1.0 m) is same in X & Y direction.
6. Displacement of shelf reduces as the width of shelf increases at a particular location.
7. Self weight of retaining wall with shelf increases due to which stability force increases and retaining wall become more stable.

REFERENCES:

- [1] Suliman B.A.Mohamed,Kuo-Hsing Yang.(2014):Finite element analyses of two-tier geosynthetic reinforced soil wall comparison involving centrifuge test and limit equilibrium results.
- [2] Padhye R. D. (2010),Ph.D. thesis on "Analysis and Design of Retaining Walls with Pressure Relief Shelves".

- [3] Syed Mohd. Ahmad and P. K. Basudhar, (2008) "*Behaviour of reinforced soil retaining wall under static loading using finite element method*" The 12th International Conference
- [4] Kevin Abraham (2007), "*Three dimensional behavior of retaining wall systems,*" A Dissertation for the degree of Doctor of Philosophy. The Department of Civil and Environmental Engineering. M.S., MississippiStateUniversity.
- [5] P.E.Pinto and C.G.Lai (2006) "Numerical Modelling & Seismic Behavior of Earth Retaining Walls".
- [6] Padhye R. D. &Ullagaddi P. B., (2005), "*Retaining Walls with Pressure Relief Shelf – A Review Study*", All India Seminars on, "Advances in Geotechnical Engineering". National Institute of Technology, Rourkela. pp 62 – 68.
- [7] Varghese P.C. (2005), "*Foundation Engineering*", Prentice Hall of India Pvt. Ltd. New Delhi.
- [8] Seung –Hoon Lee, Buhm soo Chang (2004) Two-Parameter Beam-column model and back analyses for flexible Earth retaining walls.
- [9] J.R.Blake, J.P.Renaud ,M.G.Anderson,(2003)Prediction of rainfall-induced transient Water pressure behind a retaining wall using a high resolution finite element model.
- [10] Ray Chaudhuri P. et al (1973), Paper No. 295. "*Design of Retaining Walls with relieving shelves*" IRCJournal, Volume 35, part 2, pp 289 - 325.
- [11] G. Wayne Clough and James M. Duncan, (1971) "*Finite Element Analyses of Retaining Wall Behavior*"Vol. 97, No. 12, pp. 1657-1673.
- [12] Jumikis A. R. (1964), "*Mechanics of Soils*", D. Van NostrandCompanInc, PrincetonNJ.

Analysis of Braced Panel and Laced Structure Using Finite Element Simulation

Prof. Dr. D.N.Shinde(Guide)¹, Mr.Suhas A.Kumbhar (Student)²
Civil department, PVPIT Budhgaon/Shivaji University, India
Email: suhaskumbhar7291@gmail.com, M-9673067111.

Abstract— Observation of damage after earthquakes has shown that torsional vibration of buildings Induced by lateral seismic ground motion may cause serious distress in a structure, sometimes leading to its collapse. Therefore, when designing a building for lateral loads such as those generated by wind or earthquakes, a design engineer may have several alternatives. Lateral loads may be transferred to the foundation via shear wall, braced frames or rigid frames, or other methods. The design system should be strong enough to resist the seismic forces and light enough to keep the existing structural elements far from needing further reinforcement.

Keywords— Braced Panel (Shear wall), Framed Structure, Laced Structure (Steel Bracings), Staad Pro V8i.

INTRODUCTION

Although the increase of earthquakes of destructive intensity has been confined to a relatively few areas of the world. The catastrophic consequences attending the few that have struck near centers of population have focused attention on the need to provide adequate safety against this most awesome of nature's quirks. The satisfactory performance of a large number of reinforced concrete structures subjected to severe earthquakes in different areas of the world has demonstrated that it is possible to design such structures to successfully withstand earthquake of major intensity.

Early attempts to provide for earthquake resistance in building were based on rather crude assumption about structural behavior and were handicapped by a lack of proper analytical tools as well as reliable earthquake records. Observations of the behavior of reinforced concrete structures subjected to actual earthquake, analytical studies, and laboratory experiment by a number of investigators over the last three decades or so have all contributed towards putting the subject of earthquake –resistant design on a firm rational basis. Steel bracing is a highly efficient and economical method of resisting horizontal forces in a frame structure. Bracing has been used to stabilize laterally the majority of the world's tallest building structures as well as one of the major retrofit measures. Bracing is efficient because the diagonals work in axial stress and therefore call for minimum member sizes in providing stiffness and strength against horizontal shear. A number of researchers have investigated various techniques such as infilling walls, adding walls to existing columns, encasing columns, and adding steel bracing to improve the strength and/or ductility of existing buildings. A bracing system improves the seismic performance of the frame by increasing its lateral stiffness and capacity. Through the addition of the bracing system, load could be transferred out of the frame and into the braces, bypassing the weak columns while increasing strength.

BUILDING MODELING-

A 15- storied reinforced concrete building with shear wall, without shear wall and with different types of bracing in zone V has been considered for the illustration .The main emphasis in this chapter is on calculation of base shear, frequency, period and displacement for different story, and comparing this with shear wall and bracing for different 9 types of cases as given below in figure.

Building description- Analyze a 15- storied RC building as shown in fig. The live load on all the floors is 2KN/m² and soil below the building is hard. The site lies in zone V. All the beams are of size 400 x 500 mm and slabs are 150 mm thick. The sizes of columns are 600 x 600 mm in all the story and the wall around is 150 mm thick. (SP : 22- 1982), Building is analysis on STAAD-PRO using response spectrum method .Using this software frequency, period, base shear, displacement is calculated.

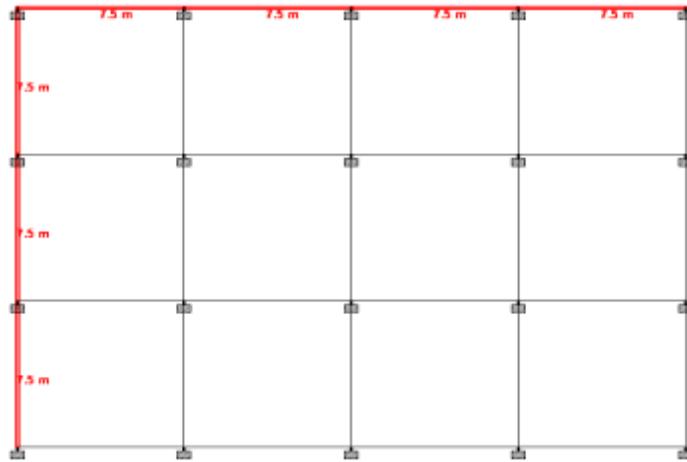


FIG.-1 PLAN

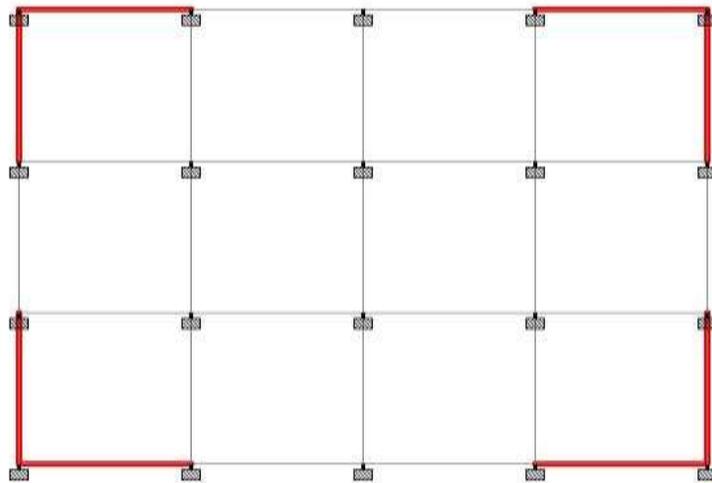


FIG.-2 BRACED PANEL (SHEAR WALL) AT CORNER

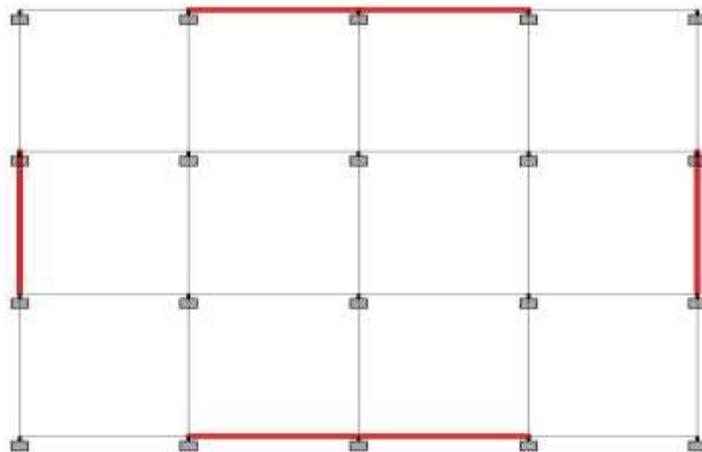


FIG.-3 BRACED PANEL (SHEAR WALL) AT MID BAY

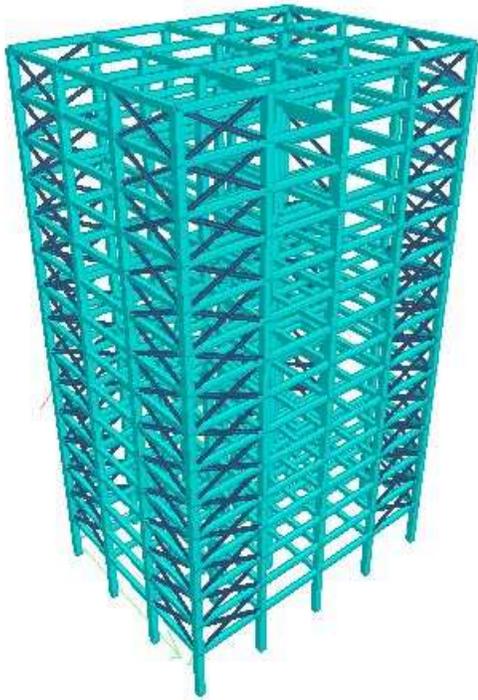


FIG.-4 CROSS BRACING AT CORNER

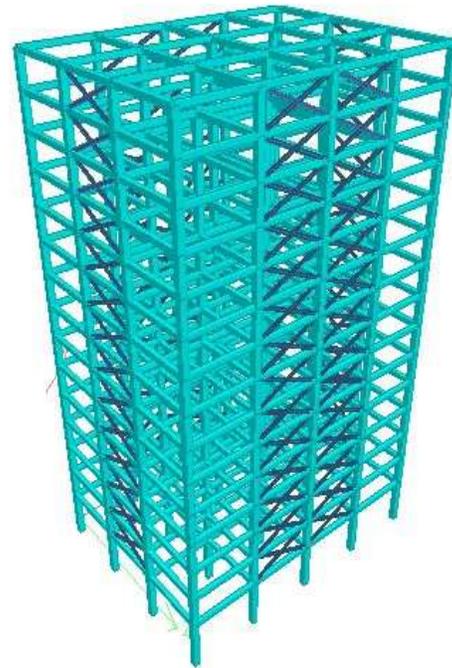


FIG.-5 CROSS BRACING AT MID BAY

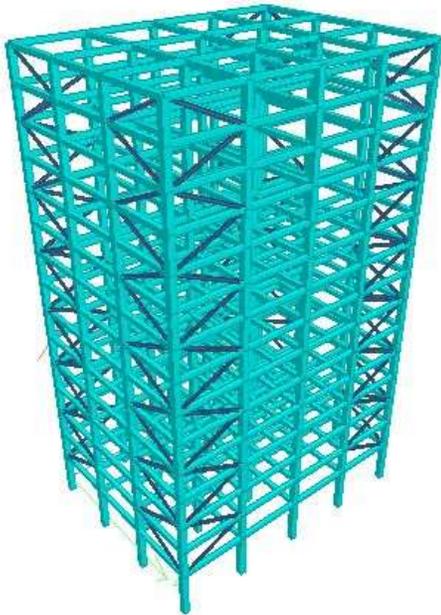


FIG.-6 DIAGONAL BRACING AT CORNER

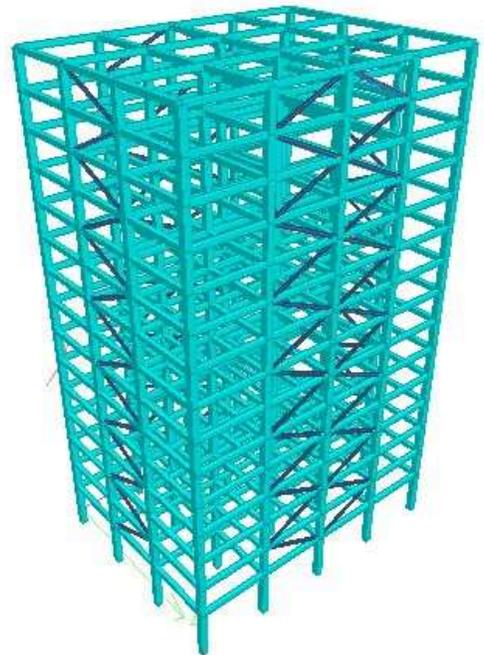


FIG.-7 DIAGONAL BRACING AT MID BAY

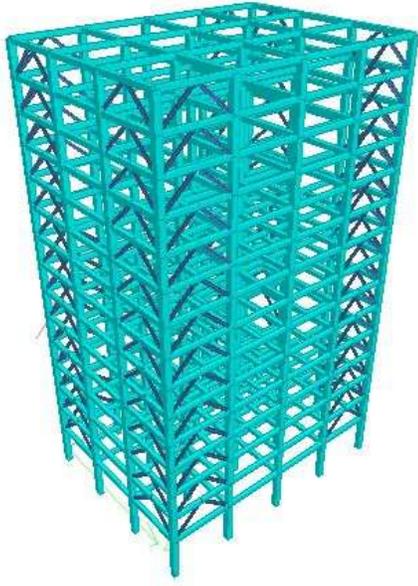


FIG.-8 INVERTED V BRACING AT CORNER

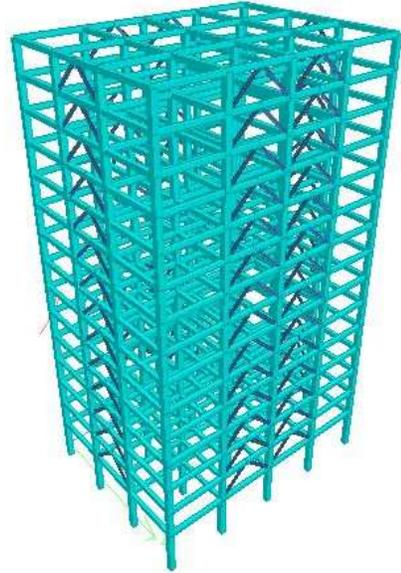


FIG.-9 INVERTED V BRACING AT MID BAY

RESULTS AND DISCUSSION

BASE SHEAR- 2187 kN

Table -1 - Frequency and Period for Regular Frame

Mode	Frequency Hz	Period seconds
1	0.067	14.84
2	0.069	14.40
3	0.079	14.13

BASE SHEAR – 5721 kN

Table -2 - Frequency and Period for Braced Panel at Corner

Mode	Frequency Hz	Period seconds
1	0.088	11.38
2	0.089	11.29
3	0.111	9.03

BASE SHEAR – 5397 kN

Table -3 - Frequency and Period for Braced Panel at Mid Bay

Mode	Frequency Hz	Period seconds
1	0.080	12.48
2	0.109	9.14
3	0.112	8.89

BASE SHEAR – 4919 kN

Table -4 - Frequency and Period for Cross Steel lacing at Corner

Mode	Frequency Hz	Period seconds
1	0.067	14.85
2	0.068	14.62
3	0.081	12.34

BASE SHEAR – 4731 kN

Table -5 - Frequency and Period for Cross Steel lacing at Mid Bay

Mode	Frequency Hz	Period seconds
1	0.064	15.67
2	0.079	12.68
3	0.080	12.42

BASE SHEAR – 3631 kN

Table -6 - Frequency and Period for Diagonal Steel lacing at Corner

Mode	Frequency Hz	Period seconds
1	0.074	13.59
2	0.076	13.16
3	0.092	10.85

BASE SHEAR – 3900 kN

Table -7 - Frequency and Period for Diagonal Steel lacing at Mid Bay

Mode	Frequency Hz	Period seconds
1	0.066	15.20
2	0.080	12.47
3	0.082	12.13

BASE SHEAR – 3180 kN

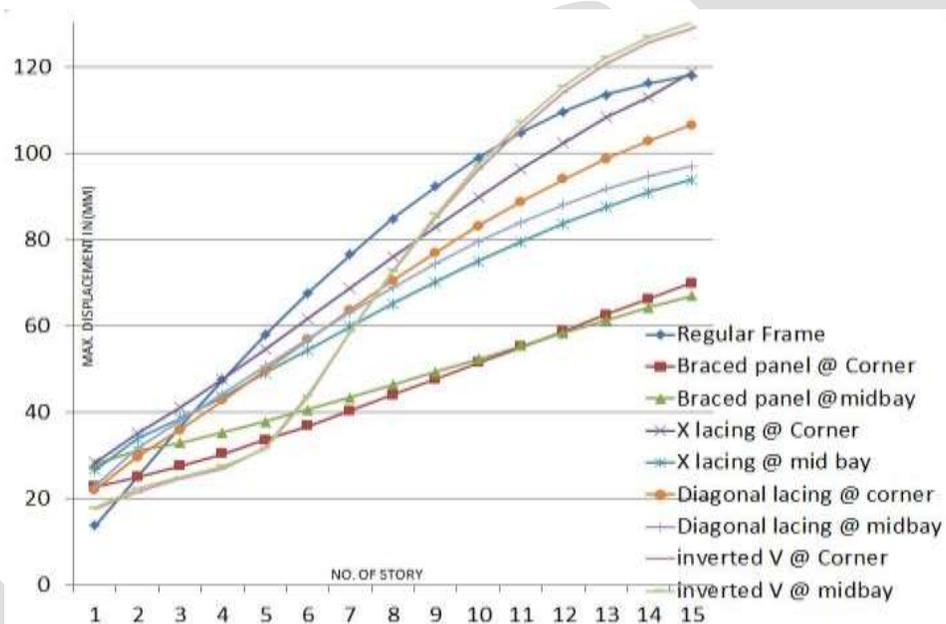
Table -8 - Frequency and Period for Inverted V Steel lacing at Corner

Mode	Frequency Hz	Period seconds
1	0.063	15.92
2	0.066	15.14
3	0.070	14.26

BASE SHEAR – 3312 kN

Table -9 - Frequency and Period for Inverted V Steel lacing at Mid Bay

Mode	Frequency	Period seconds
	Hz	
1	0.059	16.91
2	0.065	15.33
3	0.067	14.93



GRAPH

CONCLUSION

The fifteenth story Unsymmetrical RC frame is extensively studied for seismic loading by response spectra method using STAAD-PRO software .

The following conclusions are drawn based on present study.

- 1) When shear wall is provided, displacement and storey drift reduces and storey shear and base shear increases.
- 2) When shear wall is placed unsymmetrical and well distributed along the periphery the displacements reduce.
- 4) The concept of using steel bracing is one of the advantageous concepts which can be used to strengthen or retrofit the existing structures.
- 5) Steel bracings can be used as an alternative to the other strengthening or retrofitting techniques available as the total weight on the existing building will not change significantly.
- 6) The lateral displacement of building reduced by the use of braced panel at mid bay system.
- 7) Steel bracing reduces flexure and shear demand on beams and columns and transfer the lateral loads through axial load mechanism.

REFERENCES:

- [1] Mahmoud R. Maheria, H. Ghaffarzadeh “ Connection overstrength in steel-braced RC frames”
- [2] A.Massumin,M.Absalan“Interactionbetweenbracingsystemandmomentresisting frameinbracedRCframes”
- [3] Mark fintel , fazlur khan “Handbook of concrete engineering”
- [4] Astaneh-Asl “Seismic Behavior and Design of Steel Shear Walls” SEAONC Seminar, November 2001, San Francisco
- [5] H.Ghaffarzadeh and M.R. Maheri “cyclic tests on the internally braced RC frames “JSEE FALL 2006 Vol.8 no.3/177.
- [6] M. A. Youssef, H. Ghaffarzadeh, M. Neheli “Seismic performance of RC frames with concentric internal steel bracing “ Engineering structures 29 (2007)1561-1568 oct 2006.
- [7] M. R. maheri & A. Saheri. “Use of steel bracing in reinforced concrete frames.” Engineering structures vol. 19 no.12 oct 1996.
- [8] A.K.Chopra (2007), “Dynamics of Structure”, Prentice Hall, Englewood cliffs, New Jersey, 2007
- [9] IS 1893 (part 1): 2002, Indian Standard Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi
- [10] Shrikande and Agrawal “Earthquake Resistant Structures”
- [11] Ashraf Hasan El-Zanaty, Ahmed Tawfik Essa, Mohamed Kotb Badr “Effect of infill wall on the ductility and behavior of high strength reinforced concrete frames”
- [12] Kulkarni J. G., Kore P. N., Tanawade S. B., “ Seismic Response Of Reinforced Concrete Braced Frames”
- [13] Bureau of Indian Standard, IS-456(2000), “Plain and Reinforced Concrete Code of Practice”.

Natural Language Generation

Girija Godbole

Student of Computer Engg at PICT college of Pune University,

gsgodbole@gmail.com , +919823617208

Abstract— Many a times it is needed to produce understandable texts in English or other human languages from some underlying non-linguistic representation of information. This is achieved by Natural Language Generation (NLG). NLG systems have a wide range of applications in the fields of media, medicine, computational humor, etc. In this paper, 'pipeline architecture' is explained which contains steps involved in the process of NLG. Throughout, the emphasis is on established techniques that can be used to build simple but practical working NLG systems.

Keywords— Computational Linguistics, natural language processing, pipeline architecture, natural language processing,

INTRODUCTION

NLG or Natural Language Generation is the process of constructing natural language outputs from non-linguistic inputs. NLG system is a translator that converts a computer based representation into a natural language representation. Natural Language Generation is the inverse of natural language understanding (NLU). NLG maps from meaning to text, while NLU maps from text to meaning. The input to NLG system varies widely from one application to another.

The existing NLG systems include FOG- generates textual summaries of weather forecast since 1992, STOP system- produces a personalized smoking-cessation leaflet, ANA generates summaries of stock market activity, LFS, SUMGEN, TEMSIS, TREND, etc. In this paper, we describe the process of NLG, the basic steps involved and the algorithms used to carry out these steps.

The first architecture of NLG was proposed in 1980's which consisted of only two stages- text planning and linguistic realization. Later in 1990's an advanced model consisting of three major steps- Document planner, Micro-planner and Surface Realizer was proposed which proved to be useful in building proper working NLG systems. In this paper, a modified version of this architecture is explained which consists of six steps- content determination, document structuring, lexicalization, aggregation, referring expressions generation and linguistic realization.

The structure of the paper is as follows- the design and analysis of the system which gives an idea about the architecture of NLG in detail, the discussion on implementation results, the conclusion and future enhancement of the topic and the references.

DESIGN AND ANALYSIS OF SYSTEM

Inputs and Outputs of NLG:

Language as goal-driven communication:

NLG is often viewed as a goal-driven communication. The generation of any form of text (word or sentence) is seen as an attempt to satisfy some communicative goal. Communicative goals include informing the hearer of something, requesting or persuading the hearer to do something and of obtaining some information from the user.

Inputs of NLG:

In general, the input set of any NLG system can be thought of a four-tuple (k , c ,u ,d) where, 'k' is 'knowledge source', 'c' is 'communicative goal', 'u' is 'user model' and d is 'discourse history'.

1) knowledge source(k):

It may be represented in different ways in different systems depending upon the nature of the host application eg, one system may use tables of numbers or other may use information encoded in some knowledge representation language. So, there is no specific defined representation for k. But, in a broad sense, we can categorize it in two cases: 1.) information is precisely defined already(directly use k) 2.) information is to be selected from a vast k (part of k is to be used).

2) communicative goal(c):

c depends upon what type of k we are using. For eg if it is of type 1 as mentioned above, then, as the information to be output is already defined, 'c' will be just 'express the specified information'. If k is of type 2, 'c' will be 'express the relevant information'.

3)user model(u):

It is the identification of the intended audience for whom the text is to be generated. The consideration of u is important because the output may depend in the technical knowledge of the user. For instance, if the user is novice, then the output should also contain explanations of technical terms.

4) discourse history(d):

It is keeping track of whatever information the system has given to the user so far. This is generally useful in dialogue systems and single-interaction systems. For other applications, it is kept null.

Output of NLG:

The output of any NLG system is fragments of text. Fragments are the collection of sentences. The length of text may differ from application to application. For example, in dialogue systems, output is only one word 'yes' or 'no' whereas in single-interaction systems, the output may be of several pages.

Architecture of NLG:

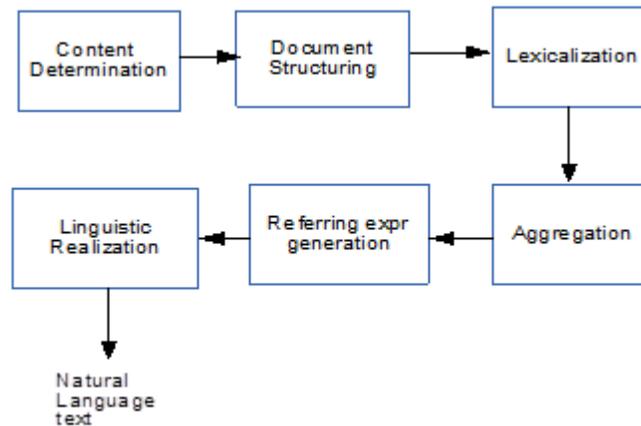


fig. 1. Pipeline architecture of NLG

STAGES OF THE PIPELINE :

Content Determination:

It is deciding what information is to be communicated in the text. Either the host application will tell what information is to be taken or the NLG has to itself figure it out and select the relevant information. The choice of what information is to be expressed depends on the following factors:

- 1) The communicative goals may require different information to be expressed eg if NLG describes weather over a period and also gives explanation of different technical terms, then different content will be required in each case.
- 2) It depends on the user or hearer. If he/she is novice, then more explanation is needed.
- 3) There may be constraints on output eg, the text is needed to be fit only within the given area.
- 4) It depends on the underlying information source. What is worth saying will depend on the nature and content of information available.

Ultimately, what information is to be included and circumstances under which it is to be included is completely dependent on the application.

Document Structuring:

Structuring is important because an unstructured text can be thought of a story which is starting in the middle, then has the conclusion and then the introduction; which is meaningless. Structuring is nothing but proper sequencing of sentences in the text. There are three approaches:

- 1) Schemas : They are templates which explicitly specify sentence ordering and grouping for a document. Schemas work well in practice for texts which are short and/or have a standardized structure, but have problems in generating texts which are longer and do not have a fixed structure.
- 2) Corpus-based: use statistical corpus analysis techniques to automatically build ordering/grouping models.
- 3) Heuristic-based: structuring is based on heuristic rules which can come from theories of rhetoric, psycholinguistic models, etc.

Lexicalization:

It means choosing the content words like nouns, verbs, adjectives and adverbs for the generated text. There are two types:

- 1) Conceptual Lexicalization: This includes slight modification of information. The words are slightly changed or at sometimes even the completely new word is used.
- 2) Expressive Lexicalization: It gives the output as it is with correct verbs, nouns, etc.

For example, we have three words- 'male', 'unmarried' and 'adult'. Now, using expressive lexicalization, the output will be- 'unmarried adult male' . But, with conceptual lexicalization, the output will be- 'bachelor'.

Aggregation:

It is a process in which two or more sentences are merged to form a single sentence. Aggregation helps to build sentences which communicate several pieces of information at once.

Algorithm of aggregation:

k-way hyper-graph partitioning:

Input is a conceptual graph. A conceptual graph is a set of propositions or sentences. The vertices indicate propositions. Each hyper edge connects one or more proposition. The weight of each hyper edge is found by Context Sensitive Discrimination Model. After this, the hyper graph with edge weights is the input to multilevel k-partitioning algorithm.

Referring Expressions Generation:

Any domain consists of entities. Entities are things that can be talked about whether concrete or abstract. Referring expressions generation is concerned with how we produce a description of the entity for the hearer in the given context.

When an entity is mentioned for the first time, it is called 'initial reference' and after that, it is called 'subsequent reference'. The content of the referring expression is determined with the help of discourse history. Once we have determined which properties of entity should be used in a description, we still have to consider how those properties should be realized in the output.

Linguistic Realization:

Aim of linguistic realization is to produce a text which is syntactically, morphologically and orthogonally correct. For instance, consider a sentence "It rained for 8 days from 11th to 18th."

- 1) Syntactic: The syntactic component of realizer will add the words like 'for', 'from', 'to', etc.
- 2) Morphological: The morphological component will produce the past tense of 'rain' and give output 'rained'.
- 3) Orthogonal: The orthogonal component adds full stop, capital letters at start of sentence, etc.

DISCUSSION ON IMPLEMENTATION RESULTS

For generating simple sentences and paragraphs Simplenlg, a JAVA API was used. Simplenlg is intended to function as a 'realization engine' for Natural Language Generation architectures, and has been used successfully in a number of projects, both academic and commercial. It is a tool to perform two of the above tasks of the pipeline architecture namely 'aggregation' and 'linguistic realization'. The version of simplenlg used is v4.4 which is integrated with Eclipse editor.

The input and outputs are specified in the following table:-

Sr no	function	Input	Output
1	createSentence ()	A sentence eg ("my dog is happy")	Stored in NLGElement object s1
2	realiseSentence(s1)	s1	Orthographically correct sentence ("My dog is happy.")
3	CreateClause() setSubject(subject) setVerb(verb) setObject(object)	Subject, verb, object	A full sentence

Table 1

CONCLUSION

We have thus, described a six-stage architecture for natural language generation. The NLG system architectures have evolved since 1980 till date with significant modifications in the general steps of the method to generate text. Currently, we have used Simplenlg realizer to generate simple sentences and paragraphs which is a JAVA API with inbuilt functions for almost all tasks. The future scope for this implementation will be writing codes ourselves for these inbuilt functions which means not using Simplenlg but writing java classes for carrying out all the NLG functions.

REFERENCES:

- [1] A.Ramos-Soto, A. Bugareim, S. Barro, and J.Taboada, "Linguistic Descriptions for Automatic Generation of Textual Short-Term Weather Forecasts on Real Prediction Data", IEEE trans. on fuzzy syst., vol. 23, no. 1, pp 44-57, February 2015
- [2] H. Leopold, J. Mendling and A.Polyvyanyy, "Supporting Process Model Validation through Natural Language Generation", IEEE trans. on soft. Engg., vol 40, no 8, pp 818-840, August 2014
- [3] H. Banaee, M. Uddin Ahmed, A. Loutfi, 2013, "A framework for automatic text generation of trends in physiological time series data" IEEE Inter. Conf.on Syst., Man, and Cybernetics 1-6
- [4] E. Reiter and R. Dale, "Building Natural Language Generation Systems", Cambridge, U.K.: Cambridge Univ. Press, 2000.
- [5] Paul Semaan, "Natural Language Generation: An Overview", Journal of Computer Science & Research (JCSCR) - ISSN 2227-328X, Vol. 1, No. 3, Pages. 50-57, June 2012
- [6] Goldberg E, Driedger N, Kittredge R, "Using Natural-Language Processing to Produce Weather Forecasts", IEEE Expert, vol. 9, no.2, pp. 45-53, 1994.
- [7] Hemanth Sagar Bayyarapu, "Efficient Algorithm for Context Sensitive Aggregation in Natural Language Generation", Proceedings of Recent Advances in Natural Language Processing, pages 84-89, Hissar, Bulgaria, 12-14 September 2011.
- [8] Regina Barzilay, Mirella Lapata, "Aggregation via Set Partitioning for Natural Language Generation", Proceedings of the Human Language Technology Conference of the North American Chapter of the ACL, pages 359-366, New York, June 2006. c 2006 Association for Computational Linguistics
- [9] Anne H. Schneider Alasdair Mort Chris Mellish Ehud Reiter Phil Wilson, "MIME - NLG in Pre-Hospital Care", Proceedings of the 14th European Workshop on Natural Language Generation, pages 152-156, Sofia, Bulgaria, August 8-9 2013. c 2013 Association for Computational Linguistics
- [10] Rafael L. de Oliveira, Eder M. de Novais, Roberto P. A. de Araujo, Ivandré Paraboni, "A Classification-driven Approach to Document Planning", International Conference RANLP 2009 - Borovets, Bulgaria, pages 324-329
- [11] Robert Dale, Sabine Geldof and Jean-Philippe Prost, "Using Natural Language Generation in Automatic Route Description", Journal of Research and Practice in Information Technology, Vol. 37, No. 1, February 2005, pages 89-105
- [12] Donna Byron, Alexander Koller, Kristina Striegnitz, Justine Cassell, Robert Dale, Johanna Moore, Jon Oberlander, "Report on the First NLG Challenge on Generating Instructions in Virtual Environments (GIVE)", Proceedings of the 12th European Workshop on Natural Language Generation, pages 165-173, Athens, Greece, 30-31 March 2009. c 2009 Association for Computational Linguistics

Integrated Class Scheduling System for Selected State Universities and Colleges with Satellite Campuses in the Philippines

Digna S. Evale

Bulacan State University, Philippines, digna.evale@bulsu.edu.ph

Abstract— Today, higher education in the Philippines is made up of more than two thousand higher education institutions which include public and private colleges and universities. Most of those institutions have one or more local satellite campuses from different locations or regions, some even have international satellite campuses. This slowly is becoming a trend in education, where colleges and universities are expanding their reach to provide their clients a growing choice of locations. One of the main advantages of this system is that it resolves the problem of distance as one of the major barriers why students especially in far-flung areas sometimes lose their opportunity to earn a college degree. Through the effort of Commission on Higher Education, monitoring and accreditation are being implemented to ensure that those satellite campuses are subject to the same strict quality control as its parent school. Expensive academic resources such as the laboratory rooms as well as the expertise of some faculty members are usually being shared too. However, problems regarding sharing and consolidation of school resources usually arises between and among those parent and satellite campuses. One of which stems from the conflict in class schedules prepared by the school administrators every semester. Currently, most of those parent universities are manually collating the class schedules from their different satellite campuses. It's very important that class schedules be accurate and reliable for so many obvious reasons. Thus, this study aimed to develop a new system that will provide those colleges and universities with satellite campuses a new, easy and quick way of creating and generating room, class and individual faculty time-table and at the same time allows users to automatically detect and prevent conflicts upon the creation of schedule. The study used an appropriate development method for the system design and analysis. Then, the researchers chose the most suitable programming language and database that were utilized in the development of a reliable scheduling system intended for deployment via a suitable on-line access. The output was evaluated based on the ISO 9126 Software Quality Assurance Model.

Keywords— Information technology systems, class scheduling, integrated software, time-table, satellite campus, software model, higher education, online school system

INTRODUCTION

The world seems to be rapidly evolving towards modernization and continuously gearing up on becoming a technology-driven planet because of the changes information technology offers. IT infrastructures have already invaded various facets of our lives. They have become vital instruments in our activities [1]. More and more establishments, institutions and organizations both public and private, are instituting IT systems in their operations to achieve better speed, accuracy and efficiency in the quality of their works [2]. Obviously, the academe is one of the sectors that if would be granted the appropriate information systems could benefit most from the modernization brought about by the technology [3]. And an information system that would eliminate the tedious task of manual scheduling or time tabling of the availability of faculty, students and classrooms is one of the greatest contribution that the IT could impart in a school specially in larger universities where there are vast amount of resources [4].

The general area of scheduling has been the subject of intense research for a number of decade [5]. Scheduling and timetabling are typically viewed as two separate activities, with the term scheduling used as a generic term to cover specific types of problems in this area. Consequently, timetable construction can be considered as a special case of generic scheduling activity [6].

Class scheduling of universities is a large, complex, and time-consuming task [7]. Along the time line of each, classroom slots must be able to be allocated to instructors and their classes of different departments without violating any predefined rules or constraints.

Class Scheduling System is a software that improves and speeds up the process of room utilization and scheduling of classes by making it more accurate, efficient and suitable to everyone impacted by these processes [8]. The system has features that can provide a database for storing records and information. It allows the end-user to add, edit, delete, save and update records or information if

some changes occur. It can generate reports such as class schedule, faculty schedule, room schedule, instructors list, room list and section list.

Background of the Study

According to the National Statistics Office, Philippines with an estimated annual population growth rate of 1.9 % is one of the fastest growing countries in Asia in terms of population and still expected to continue its growth for the next few years [9]. These population increases will consequently demand access to higher education opportunities. As of Academic Year 2011-2012, Philippines has 2,299 public and private Higher Education Institutions (HEIs) including 110 state universities and colleges all over the country [10]. Most of these SUCs are strategically located in the urban areas of different regions. However, growth on the main campuses or parent campuses may soon jeopardize their ability to fulfill their function as a state College or University. Thus the construction of satellite campuses appears to be the answer. Currently, there are 437 satellite or external campuses in the Philippines scattered within or beyond the locality.

Satellite campuses definitely benefit the community. They target specific population areas normally underserved by main campuses. They allow more direct access to higher education for targeted populations. These branch campuses also serve as a benefit to the main campus. As students utilize services offered at branch campuses, congestion or overcrowding on the main campus decreases. This means an ease in parking situations as well as reduced traffic on campus roadways. Further, branch campuses reduce the commuting costs for faculty, staff and students. The closer the services, the less time spent on crowded roadways [11]. Finally, the more sites opened to students, the more students would be given the chance to pursue and finish a professional degree.

Problem Statement

Indeed there are so many advantages that could be brought by the expansion of main schools thru the construction of satellite campuses. However, constructing external campuses means decentralizing school resources e.g., pool of faculty members and laboratory rooms. Expensive laboratory rooms for specialization might be required to be shared among the other satellite campuses. Same thing, Professors handling specialized or major subjects might be required now to render his service both on the main campus and on external campuses. Further, this might also set off difficulties in consolidating the schedules of faculty members since they maybe given teaching loads either in the main campus or in any of its satellite sites, and all those teaching hours should be consolidated in a single file for the purpose of keeping daily time records and processing of payroll matters. The fact that class scheduling must be done every semester still added into the difficulties involved in the time-tabling task [12].

Given this scenario, the university should be equipped with an efficient scheduling scheme that would handle smooth time tabling of the above-mentioned resources, otherwise, students' schedules might be negatively affected as well [13]. Thus, the circumstance would entails the need for a computerized scheduling algorithm which covers all aspects of the activity of allocating resources such as instructors, lecture rooms and laboratory rooms to each class or section, at the same time, satisfying some predetermined academic rules or constraints and objectives of the school [14].

Indeed, the development of an application system which is capable of generating class schedules automatically would be of great help to universities and colleges in the Philippines with satellite campuses; however, there may be impediments to its realization, thus, this study specifically aimed to determine what are the different IT infrastructures required for the development of the system as well as the significant features that should be integrated into it to optimize the performance of its intended functions. Further, this study also wanted to verify the system's level of acceptability in terms of several software criteria.

SYSTEM DEVELOPMENT

This part presents the theoretical consideration in developing the system.

Conceptual Framework

Figure 1 presents the process of the system development. The study was presented using the three dimensions of conceptual paradigm: input, process and output.

The first stage includes the gathering of primary inputs for the Integrated Scheduling System in order to develop the application. System requirements were considered which basically include the infrastructures needed for the development. Other external resources were also considered.

The second frame is the Process stage. In this study, the researcher adopted the Systems Development Life Cycle (SDLC) Waterfall Model which is a conceptual model used in project management that describes the stages involved in an information system development project, from an initial feasibility study through maintenance of the completed application [15].

Lastly, for the Output stage, this is the developed system, the Integrated Scheduling System for Selected State Colleges and Universities with Satellite Campuses in the Philippines.

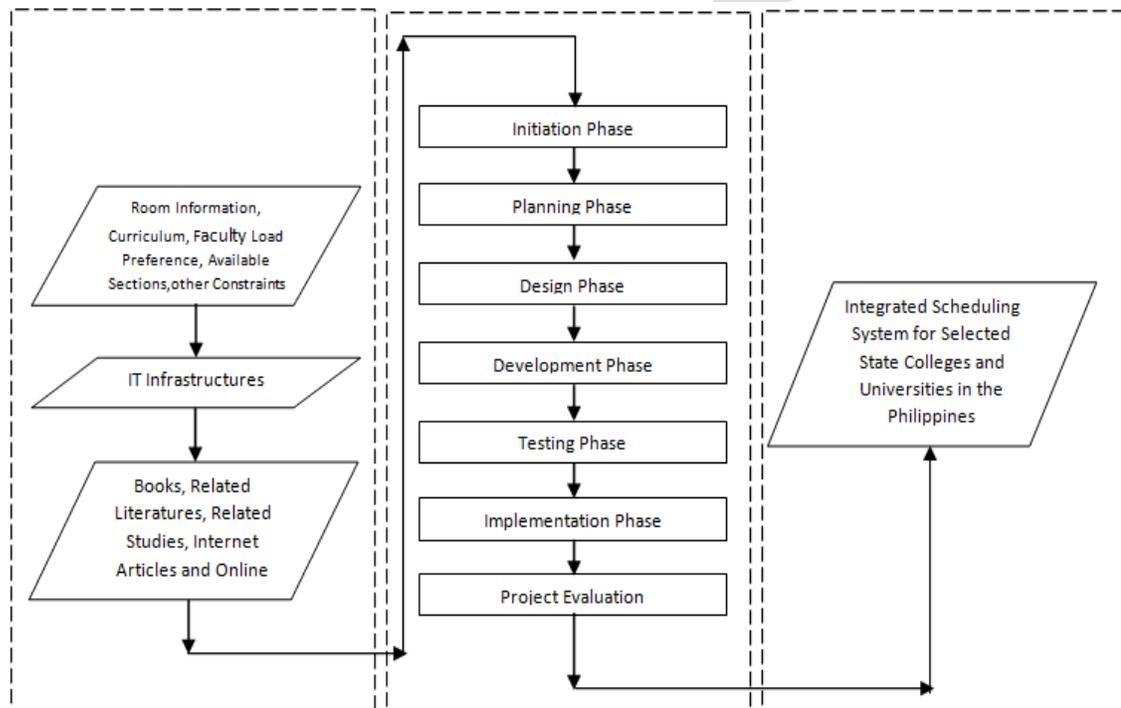


Figure 1. Conceptual Process of the System Development

Project Methodology

The researcher used the Unified Modeling Language (UML) in specifying, constructing and communicating the design of the system. Among the different UML diagrams, the researcher used the Use Case Diagram and Sequence Diagram. Figure 2 shows the functionality of the system. The system administrator is responsible for identification and classification of valid users according to their access level as well as for the maintenance of the whole system. The power user is in-charge for the implementation and management of all the important modules responsible for scheduling per se. Execution of all rules and constraints in designing schedules under the Class Builder Module is one of his major functions. Technically, the power user must be granted access to all system modules, thus he is also allowed to log in on the System Maintenance and User Access Details Module. Limited access was given too to some office staff who would be performing data entry. Lastly, faculty members are allowed to view their own schedule generated by the system.

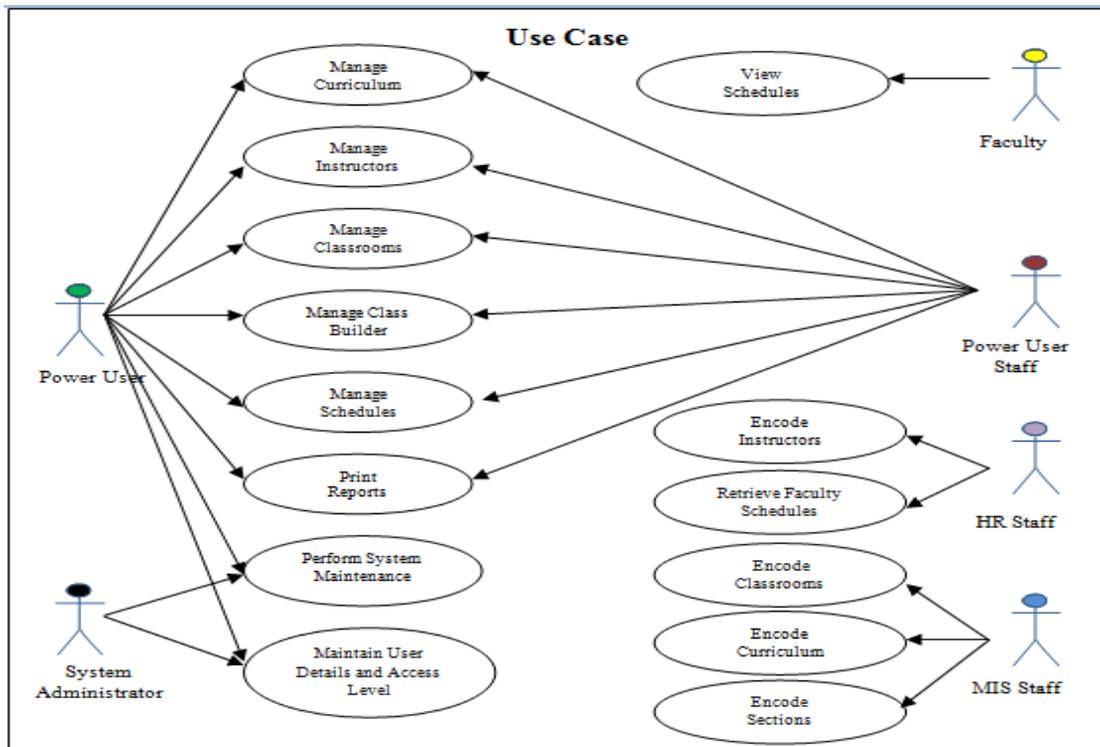


Figure2. Use Case Diagram of the Integrated Scheduling System

To show the interaction between the objects: Power User, MIS Staff, HR Staff, Server Computer via private virtual network over the progression of time, a sequence diagram as shown in Figure 3 was developed. The HR Staff is provided with user name and password that will be used in encoding faculty profile while the MIS Staff is also provided with user name and password so as to be able to encode all the available sections and classrooms in their College or University. Curriculum for each course Offerings is to be encoded to by the MIS Staff. After all those required entities are entered into the system, the power user could now manage those inputs using the appropriate system module for the generation of schedules and other pertinent reports.

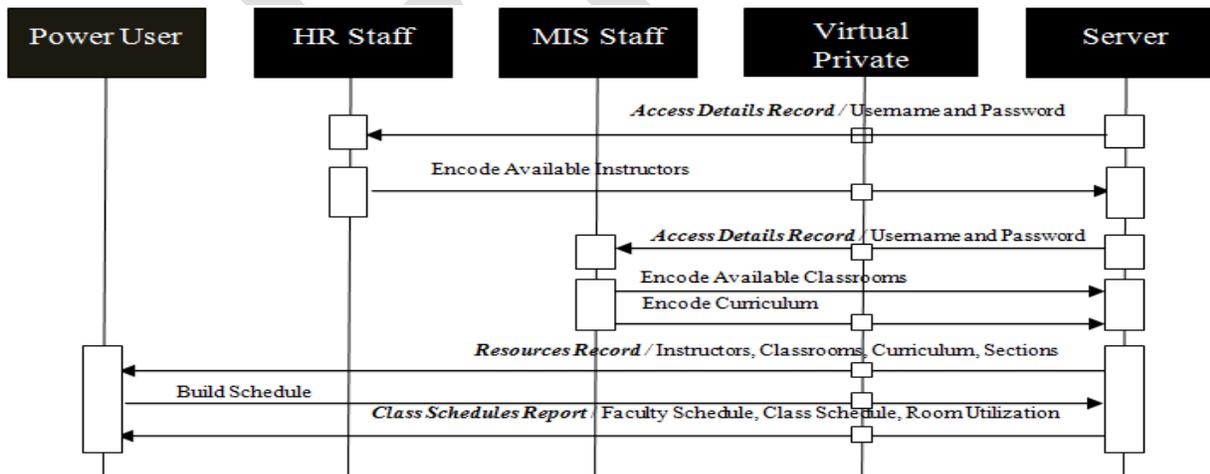


Figure 3. Sequence Diagram of the Integrated Scheduling System

Testing and Evaluation

After the development process, the system was tested and evaluated using ISO 9126 Software Quality Assurance Model. Prototype testing was conducted in a State University with several satellite campuses within the same province. Ten system specialists, fifteen Department Heads under the supervision of the Office of the Academic Affairs who are directly responsible for the manual creation of schedules and five personnel from the Human Resource and MIS Department who are also among the end users were tasked to test and evaluate the system. Thirty faculty members also participated in the testing and evaluation. System’s functionality, usability, reliability, and performance were rated using the Likert Scale.

RESULTS AND DISCUSSION

The researcher used the Microsoft VB.Net Framework 2.0 from Visual Studio 2008 Professional Edition because it is designed for the developers working with users both in a stand-alone and in a networked setting. For the back-end application, MS SQL Server 2008 was used. In order for the system to be deployed securely from the main campus across different satellite campuses, data must pass through a Virtual Private Network.

The developed Integrated Scheduling System provides a faster and more effective way of creating class schedules for selected Colleges and Universities in the Philippines with satellite campuses than the traditional manual system. The system is designed to enable users from different campuses who are creating schedules to have a flexible and guided access to all resources such as rooms, sections and instructors; thus providing a more balance schedules for each resource.

Through the implementation of Virtual Private Network, any updates and changes in the schedules from the main system or server (ideally located at the parent campus) will be reflected immediately on all other client computers at satellite location since real-time data can be retrieved from the system's central database.

The following features and functionalities are integrated into the system to achieve maximum performance:

1. The user can configure the connection settings if the main system is transferred or in another computer. The main system has the capability to search for the SQL server connected to the LAN or VPN set-up.
2. The system has capability to auto generate the section list and starting of new school year given the details by user.
3. The system has the capability to switch between the current semester and the upcoming semester, and allow user to set schedules in advance without affecting the current schedules.
4. The user can specify the teaching loads and working days of each instructor.
5. The user can set the subjects of an instructor based on their preferred subjects to teach.
6. The user can set the section or group for a particular instructor. The system has the capability to check availability of each instructor based on their teaching loads set in the module of instructor constraints.
7. The user can switch to different tabs while viewing the schedules of each instructor and section. This tab helps the user to easily view and compare while plotting specific schedules.
8. The user can easily choose what schedule to edit, using either the instructor module or the section module.
9. The user can choose whether to split a class into two meetings in two different days, or join two classes of the same subject with different days in one day.
10. The system has the capability to update all schedules involved when a schedule is edited by the user.
11. The system has the capability to detect conflicts automatically while plotting schedules.
12. The system has the capability to prompt or notify the user immediately after plotting in an unavailable schedule slot.
13. The system can generate specific reports for instructor, section or room schedule.
14. The system has capability to export specific schedule reports into MS Excel Application.
15. The user can specify the columns to print in the details of instructor and room.
16. The system has ability to save the users activities such as adding and editing of records. The activity logs can only be viewed and printed by the system administrator.
17. The system has the capability to limit actions or activities of user by setting access rights in each module. Access rights include actions such as adding and editing records and viewing and printing particular reports.
18. The user can do database back-up and restore.
19. Users could change the current themes of the system and could also upload their own school logo.

Figures 4, 5, 6 and 7 show some sample screen shots of the system featuring its major functionalities.



Figure 4. Main Module of the System



Figure 5. Resource Manager for Management of Instructors, Classrooms, and Curriculum

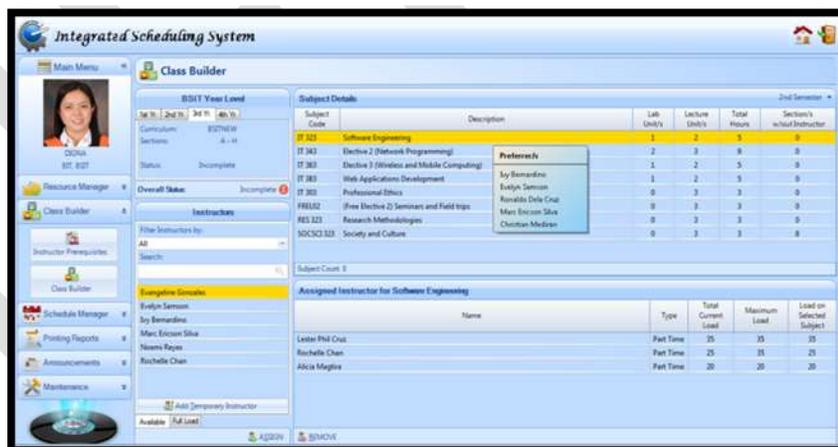


Figure 6. Module for the Class Builder

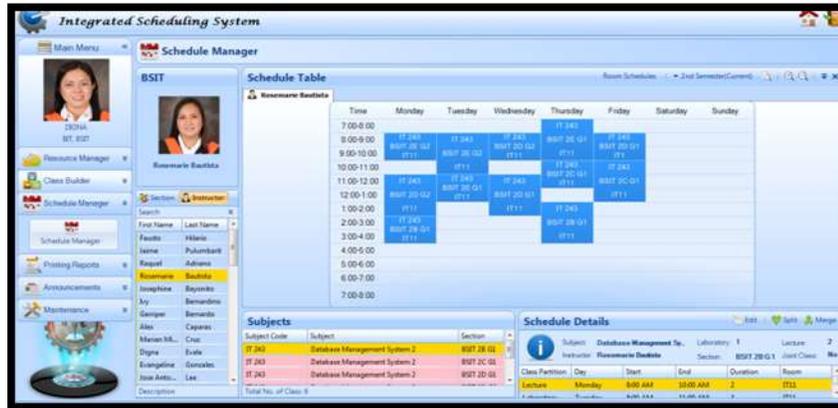


Figure 7. Module for the Schedule Manager

All system modules and functionalities were tested by the respondents who were chosen both from the main campus of the university and from its satellite campuses. The overall rating is 4.54 interpreted as Excellent or Highly Acceptable.

ACKNOWLEDGMENT

The author wishes to express her gratitude to the College of Information and Communications Technology of Bulacan State University for the inspiration and support in pursuing this research work. An equal amount of appreciation must be extended too to the University Research Office for all the encouragement and motivation they are giving to all who wants to pursue research endeavor.

CONCLUSION

The system is equipped with powerful features that offer numerous advantages. The system will provide information or reports such as class schedules, instructors' schedules and room schedules in a more efficient way which makes this computerized scheduling be potentially cheaper than that of the traditional manual way in the long term. Aside from providing a new, easy and quick way of creating and generating schedules, it also allows users to automatically detect and prevent conflicts upon the creation of timetable.

The system which was developed using VB.Net and MS SQL should be implemented across different campuses via Virtual Private Network. This network infrastructure would allow seamless access of information from the database anytime whenever needed.

In terms of acceptability to the end users, an Excellent or Highly Acceptable rating was given by the respondents.

REFERENCES:

- [1]. Bunag, E. H., Dionisio, A. A., Fajardo N. C., Natividad, L. P., & Villanueva, C. C. (2006). Scheduling System of Liceo de Pulilan HS Department. Bulacan State University. Malolos City, Bulacan.CICT, p. 10, 18. (Unpublished undergraduate thesis).
- [2]. Dela Cruz, R. S., Gatchalian, C. B., Meneses, M. C., Puno, P. C., & Salamat, J. D., (2009).Online Class Scheduling System for CICT. Bulacan State University. Malolos City, Bulacan. CICT. p. 56. (Unpublished undergraduate thesis).
- [3].Aldala, R. B., Angeles, A. L., Epifanio, C. R., Faustino, J., & Jose, J. P., (2006). College of Industrial Technology Scheduling System. Bulacan State University. Malolos City, Bulacan. CICT. pp. 3-4. (Unpublished undergraduate thesis).
- [4]. Gagno, P. A. M., Naval, R. T. B., Batista, P. C. Jr., Sarmiento, L. M., & Tesoro, S. K. M. (2006) CSS: Multi-Objective Course Scheduling System. University of the Philippines – Diliman. (Unpublished undergraduate thesis).
- [5] Cambazard, H., F. Demazeau, N. Jussien, and P. David. (2004). *Interactively Solving School Timetabling Problems Using Extensions of Constraint Programming. Practice and Theory of Automated Timetabling V*. LNCS. Springer-Verlag. pp.190-207.

- [6] Wren, A. (2006). *Scheduling, timetabling and rostering - a special relationship?* Practice and Theory of Automated Timetabling. First International Conference. Selected Papers. Springer-Verlag, Berlin, Germany; pp. 379.
- [7] Abdennadher, S. & Marte M. (2000). *University Course Timetabling Using Constraint Handling Rules*. Journal of Applied Artificial Intelligence. 14(4), pp. 311.
- [8] Ali Al-zou'bi, S. M. (2008): *Web Based Timetable Scheduling System for Applied Sciences at the College of Arts and Sciences (CAS)*, Universiti Utara Malaysia.
- [10] Jose, Alberto Ramon, (n.d), *Beyond the Numbers :Understanding the Changes in Philippine Population*, [Web log post]. Retrieved June 20, 2013. http://www.nscb.gov.ph/beyondthenumbers/2012/11162012_jrga_popn.asp
- [11] Higher Education in Numbers. (n.d.). *Higher education Institutions*. Retrieved June 20, 2013 from <http://www.ched.gov.ph/index.php/higher-education-in-numbers/higher-education-institutions/>
- [12] *Florida Gulf Coast University Charlotte Campus – Why need for a Satellite Campus?* Retrieved from <http://fgcucharlottecampus.tripod.com/id4.html> on July 17, 2013
- [13] Burke, E., Elliman, D. Weare, R. (2000). *Automated Scheduling of University Exams*. Department of Computer Science, University of Nottingham.
- [14] Schaerf, A. (2005). *A Survey of Automated Timetabling*. Artificial Intelligence Review. 13(2). pp.87-127.
- [15] Carter, M., and Laporte G. (2006). *Recent Developments in Practical Course Timetabling in Practice and Theory of Automated Timetabling II*. Springer-Verlag : LNCS 1408. pp 3-19.
- [16] Blanchard, B. S., & Fabrycky, W. J.(2006) “*Systems Engineering And Analysis*”,(4th ed.) New Jersey: Prentice Hall. p.31

The Malicious Insiders Threat in the Cloud

Atulay Mahajan, Sangeeta Sharma

Lovely Professional University, atulaymahajan@gmail.com, 7837830737

Abstract — Cloud Computing, which once provided locally, has seen a technical and cultural shift of computing service provision to being provided remotely, and en masse, by third-party service providers. The data has now been placed under the protection of the service provider that was once placed under the security domain of the service user. Our data is no longer kept under our own watchful eyes as we have lost control over the protection of our own data at the hands of cloud service providers. While Cloud computing relieves various organizations from the burden of the data management and storage costs, security in general and the malicious insider threats in particular is the main concern in cloud environments. Insider threat has become a serious security issue within the organizations. The problem of insider threats has been analyzed in this research paper and work has been done towards the detection and conception of strategies to solve these malicious insider threats.

Keywords — Cloud Computing, Cloud, Security, Insider, Malicious Insider, Insider Threat, Data Security, Iaas, Saas, Paas.

Introduction

→ Defining The Term Cloud Computing

Cloud computing is internet based where shared resources; software and information are provided to computers and other devices on-demand. Cloud computing is a new computing paradigm that attracted many users, businesses, and governments all over the world. Cloud computing, being the buzz word of the IT industry is the future of the computing. Cloud computing is the most demanded because of its performance, high availability and low cost.

According to the National Institute of Standards and Technology (NIST), Cloud computing has been defined as:

“Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models.” [13]

The above definition clearly states that Cloud Computing helps in minimizing an organization's expenditure towards managing resources and also reduces the burden of maintaining software or hardware by its user. When burden of management, maintaining a software/hardware is reduced, the companies' expenditure and time spent towards infrastructure management is reduced and time saved can be utilized in doing some creative work. This is a huge advantage for users/organizations, which not only saves time but also boosts the performance of company by saving time spent on infrastructure.

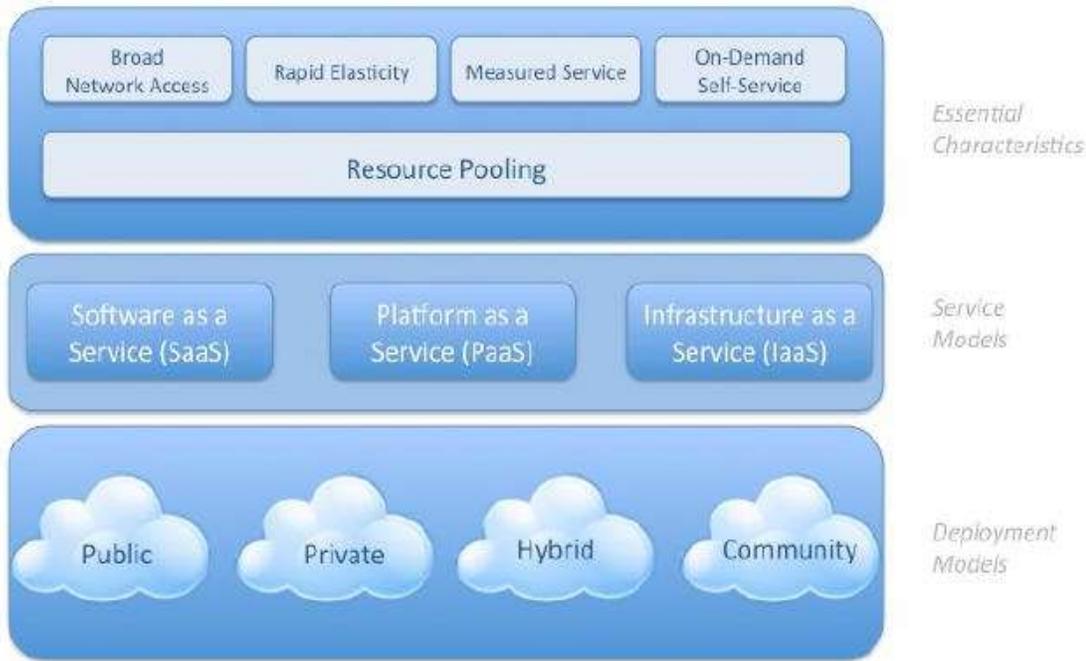


Figure 1 – “Visual Model of NIST Working Definition of Cloud Computing”.

→ **Benefits of Cloud Computing**

Some common benefits of Cloud Computing are -

- **Reduced Cost:** Since cloud technology is implemented incrementally, it saves organizations total expenditure.
- **Increased Storage:** When compared to private computer systems, huge amounts of data can be stored than usual.
- **Flexibility:** Compared to traditional computing methods, cloud computing allows an entire organizational segment or portion of it to be outsourced.
- **Greater mobility:** Accessing information, whenever and wherever needed unlike traditional systems (storing data in personal computers and accessing only when near it).
- **Shift of IT focus:** Organizations can focus on innovation (i.e., implementing new products strategies in organization) rather than worrying about maintenance issues such as software updates or computing issues.

→ **Essential Characteristics**

A comprehensive list of the “essential characteristics” is given below –

1. On-demand self service
2. Broad network access
3. Rapid Elasticity
4. Pay-per-use
5. Connectivity
6. Resource pooling
7. Abstracted infrastructure
8. Little or no commitment

→ **Service Models**

• **Software as a Service (SaaS)**

A SaaS provider typically hosts and manages a given application in their own data centre and makes it available to multiple tenants and users over the Web. Some SaaS providers run on another cloud provider’s PaaS or IaaS service offerings. Oracle CRM On Demand, Salesforce.com, and Netsuite are some of the well-known SaaS examples.

The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. [11]

• **Platform as a Service (PaaS)**

Platform as a Service (PaaS) is an application development and deployment platform delivered as a service to developers over the Web. It facilitates development and deployment of applications without the cost and complexity of buying and managing the underlying infrastructure, providing all of the facilities required to support the complete life cycle of building and delivering web applications and services entirely available from the Internet.

This platform consists of infrastructure software, and typically includes a database, middleware and development tools. A virtualized and clustered grid computing architecture is often the basis for this infrastructure software.

• **Infrastructure as a Service (IaaS)**

Infrastructure as a Service (IaaS) is the delivery of hardware (server, storage and network), and associated software (operating systems virtualization technology, file system), as a service. It is an evolution of traditional hosting that does not require any long term commitment and allows users to provision resources on demand. Unlike PaaS services, the IaaS provider does very little management other than keep the data centre operational and users must deploy and manage the software services themselves - just the way they would in their own data centre. Amazon Web Services Elastic Compute Cloud (EC2) and Secure Storage Service (S3) are examples of IaaS offerings.

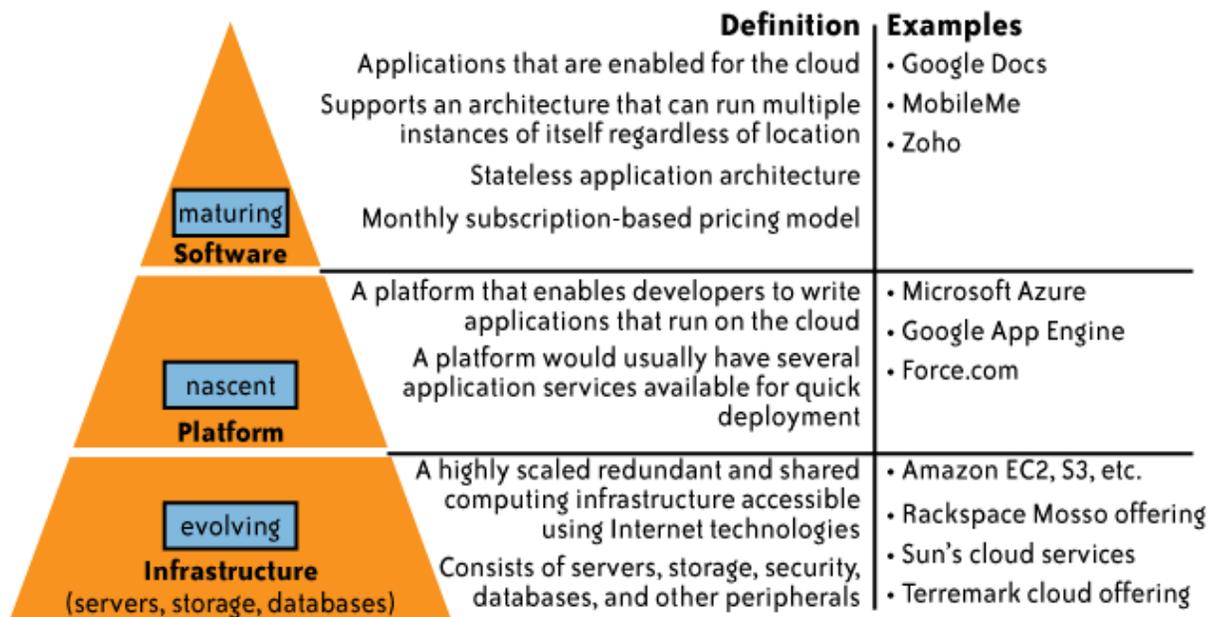


Figure 2 – Cloud Service Models

→ **Deployment Models**

Private cloud: In a private cloud, the infrastructure for implementing the cloud is controlled completely by a single organization (e.g., enterprise). Typically, private clouds are implemented in the enterprise's data centre and managed by internal resources. A private cloud maintains all corporate data in resources under the control of the legal and contractual umbrella of the organization.

Community cloud: The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.

Public cloud: In a public cloud, external organizations provide the infrastructure and management required to implement the cloud. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider. Public clouds dramatically simplify implementation and are typically billed based on usage. This transfers the cost from a capital expenditure to an operational expense and can quickly be scaled to meet the organization's needs.

Hybrid cloud: The hybrid model may combine the best of the public and private cloud models that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).

The Cloud Computing model offers the promise of massive cost savings combined with increased IT agility. However, cloud computing technology challenges many traditional approaches to datacenter and enterprise application design and management. Cloud computing is currently faced by barriers like security, interoperability, and portability which hamper its broader adoption [8].

→ **Importance of Security In Cloud Computing**

Security is one of the most important issues which hamper the growth of cloud. The idea of delivering important data to another company is worrisome; such that the consumers need to be vigilant in understanding the risks of data breaches in this new environment.

Regardless of the technical and operational countermeasures deployed in an infrastructure, defending against accidental or malicious human actions is difficult to do. The insider threat affects almost every infrastructure and remains an issue till date.

In the context of cloud computing, "a malicious insider with access to cloud resources can cause considerably more damage to the organization". Furthermore, as the attack can affect a large number of cloud users, the impact of such attack will be vital.

Malicious Insider Threat is #3 in the Cloud Security Alliance (CSA) top threats list. [14]

A malicious insider is an employee of the Cloud Service Provider who abuses his or her position for information gain or for other nefarious purposes e.g. a disgruntled employee. The threat of a malicious insider is well-known to most organizations.

This threat is amplified for consumers of cloud services by the convergence of IT services and customers under a single management domain, combined with a general lack of transparency into provider process and procedure. To complicate matters, there's usually very little or no visibility into the hiring standards and practices for cloud employees. This kind of situation clearly creates an attractive opportunity for an adversary - ranging from an amateur hacker, to organized crime, to corporate espionage, or even nation-state sponsored intrusion. The extent of access granted could enable such an adversary to reap confidential data or gain complete control over the cloud services with little or no risk of detection. [15]

The impact that malicious insiders can have on an organization is substantial, given their level of access and ability to infiltrate organizations and assets. Brand damage, monetary impact, and productivity losses are just some of the ways a malicious insider can affect an operation. As organizations adopt cloud services, the human element takes on an even more profound importance. It is critical therefore that the consumers of cloud services understand what providers are doing to detect and defend against the malicious insider threat. [5]

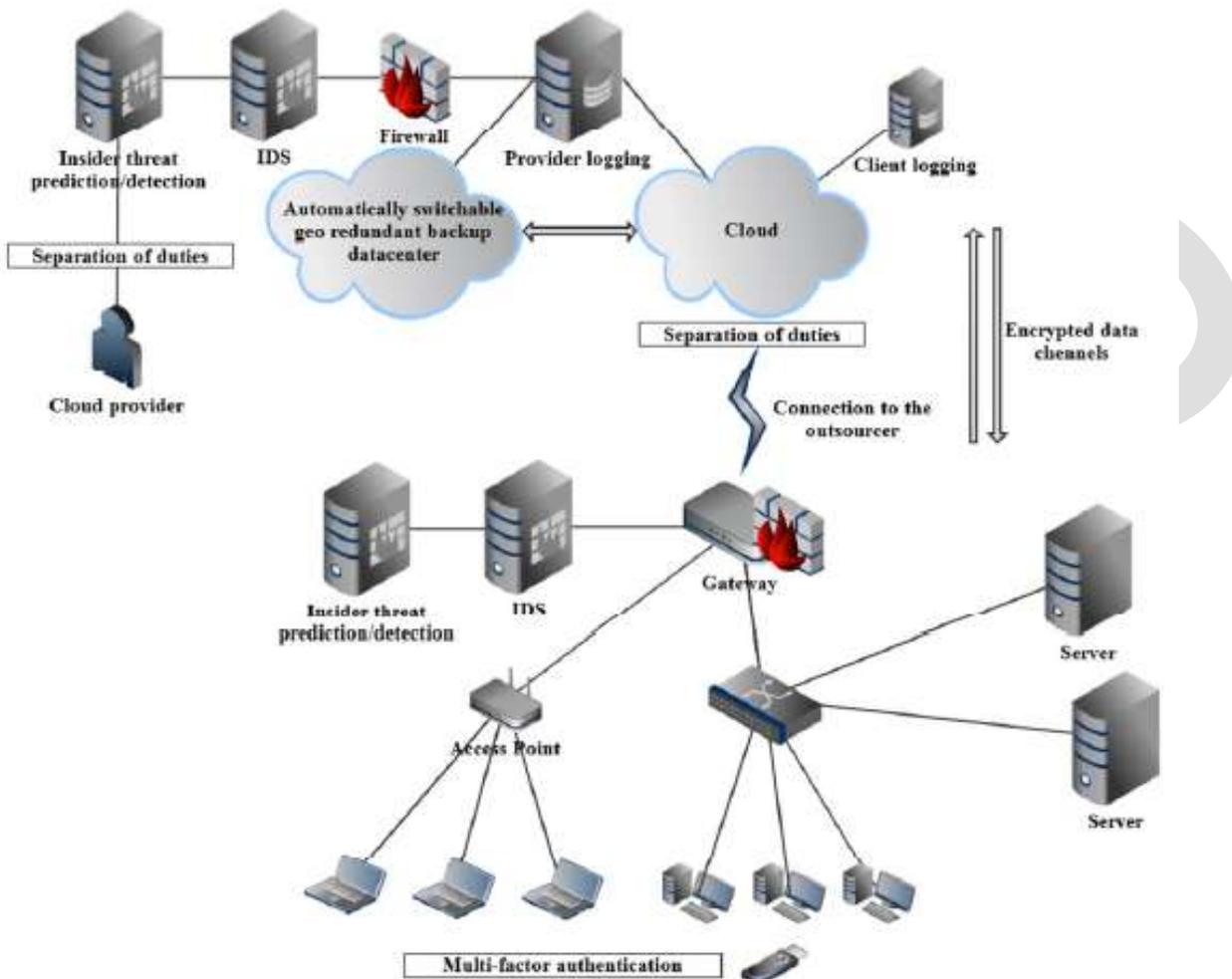


Figure 3 - Visualization of all security countermeasures versus insider threat.

→ The Motives of A Malicious User

In reality, there are many different types of attackers with different reasons to attack users. The following contains some examples.

- To steal valuable data - Hackers love to steal data as some data stored in the internet are valued millions of dollars. With access to valuable data, they can then generate revenue, for example, WikiLeaks.
- To cause controversy - Some attackers purely love the thrill and excitement of causing chaos and the internet, and similarly the Cloud, is one of the best mediums to target mainly because of the popularity of the internet as well as it being more likely to steal data over the internet in comparison to a personal computer system.
- To get revenge - Former workers who were recently stripped of their position at an organization may express their dissatisfaction by hacking the organization's network. When an organization makes use of the Cloud, this becomes all too easy for the former employee and there have been many cases of this happening in the real-world.

- To help - A hacker, in contrast, may also try to help an organization by identifying the security flaws in their system. A hacker may be confident enough to bypass the existing security protocol and implant his or her own mechanisms to expose the protocol.
- To prove intellect and gain prestige - Attackers may also want to show off their skills and gain prestige among their social skills if they were able to hack a large organization with solid security mechanisms. Some hackers make a career out of hacking organizations.
- Are just curious - Some hackers are curious to learn something about a company and/or organization. These kinds of hackers don't usually have malicious intent as they may not be aware of breaking security rules however it does not mean these hackers are less dangerous whatsoever.

Scope of The Research

This research paper focusses on the malicious insider threat. A malicious insider threat to an organization is a current or former employee, contractor, or other business partner who has or had authorized access to an organization's network, system, or data and intentionally exceeded or misused that access in a manner that negatively affected the confidentiality, integrity, or availability of the organization's information or information systems. [1]

A malicious insider could be, for example, an administrator of the cloud that goes rogue and as root access to the servers that compose the cloud. This type of attacker can violate data confidentiality without the need of high technical skills. A malicious insider can steal confidential data of the cloud user, so the user is mostly left with trusting the cloud provider. [9]

Malicious insider problem is through PaaS based services. If the service provider offers a platform that allows developers the ability to interact with user's data, i.e. Social Networking Applications, users may unknowingly allow access of all their data to these developers. [7]

The findings of this paper suggest that "all cloud types (IaaS, PaaS, SaaS) are equally affected by insider attacks as long as the insider has (or can gain) access to the datacenters or cloud management systems". Hence, it is worthwhile to formulate a security strategy which will enable the Cloud providers and customers alike to fight against this threat of malicious insider. [2]

Objectives of The Research

Since an insider attack in the cloud is easier to perform and has far greater impact than an attack in a traditional infrastructure, hence this paper aims to identify the various malicious insiders' threat faced during cloud computing and aims to find the solutions for the challenges that still do not have proper mitigation strategies identified through literature review.

So, basically I am performing the steps below-

1. Studying the malicious insider threat in the cloud,
2. Then detecting the malicious insiders present in a cloud, and hence,
3. Preventing those malicious insiders from doing any nefarious activity inside the cloud.

Research Methodology

Collecting Data From Literature

To identify which areas of cloud computing security need more research, initially CC challenges are found (this is done by searching the literature). Literature review is used to find all available data relevant to a particular research area, for collecting information to satisfy our questions. Based on the information gathered from literature review, an analysis was employed to develop general

explanations. This helped to identify the key concepts, terms and also resources used by other researchers. This data is used to develop alternative designs or find out need for further research.

Literature review using online databases involves a series of steps -

- i. Identifying the keywords for the topic.
- ii. Creating a list of possible search terms.
- iii. Using search engines, electronic databases to find information.
- iv. Modify the list of terms and repeat step iii.

Studying The Context of The Problem

In order to study the problem, it is suggested that it should be studied in two distinct contexts:

- i. “Insider threat in the cloud provider”: Where the insider is a malicious employee working for the cloud provider. He/she could cause great deal of damage to both the provider and its customers.
- ii. “Insider threat in the cloud outsourcer”: The insider is an employee of an organization which has outsourced part or whole of its infrastructure on the cloud.

Though responsibilities may be different, there are few elementary differences between a rogue administrator at the cloud provider and a rogue administrator within the customer organization; both insiders have root access to systems and data, and both may employ similar types of attacks to steal information. [4]

i. Insider Threat In The Cloud Provider

This is the worst-case scenario for both cloud providers and cloud clients, i.e. a malicious system administrator working for the cloud provider. Because of his/her business role in the cloud provider, the insider can use his/her authorized user rights to access sensitive data.

For example, an administrator responsible for performing regular backups of the systems where client resources are hosted (virtual machines, data stores), could exploit the fact that he/she has access to backups and thus, exfiltrate sensitive user data. Detecting such indirect access to data, can be a challenging task.

Depending on the insider’s motives, the result of such an attack in a cloud infrastructure will vary from data leakage to severe corruption of the affected systems and data. Either way, the business impact for the provider will be significant.

Countermeasures

→ Client side

1. Confidentiality/Integrity
2. Availability

→ Provider Side

1. Separation of Duties
2. Logging
3. Legal Binding
4. Insider Detection Models

Table 1. Countermeasures

Countermeasures	Implemented by:
Cryptographic techniques	Client
Geo-redundant data centers	Client and Provider
Separation of duties	Provider
Logging and Auditing	Provider
Legal contracts	Provider
Insider detection models	Provider

Client: Client side countermeasures, Provider: Provider site countermeasures.

ii. Insider Threat In The Cloud Outsourcer

In this scenario, the insider is an employee of an organization, which has moved part (or the whole) IT infrastructure into the cloud.

Countermeasures

→ Provider Side

1. Anomaly detection
2. Separation of Duties
3. Multi-Factor Authentication

→ Client Side

1. Log Auditing
2. Host Based Intrusion Detection/ Prevention Systems (IDS/IPS)

Table 2. Countermeasures

Countermeasure	Implemented by:
Identity and Access management	Client and Provider
Multi factor authentication	Client and Provider
Log analysis and auditing	Client
IDS/IPS	Client
Insider prediction/detection models	Client

Client: Client side countermeasures, Provider: Provider site countermeasures.

We also have Socio-Technical Approaches and Predictive Models [10]. “A socio-technical approach to insider threats associated with cloud computing isn’t directly applicable from the perspective of an organization concerned with the rogue administrator at the cloud provider, but it is helpful when looking for employees who exploit cloud weaknesses or use the cloud against the employer”.

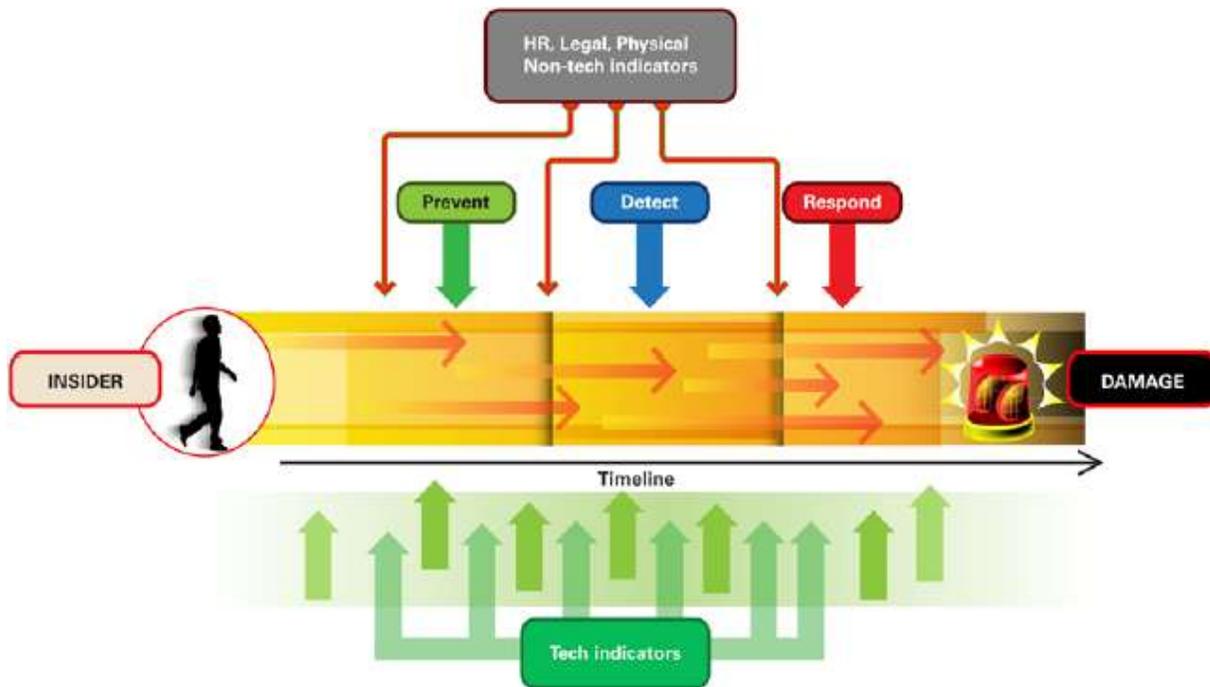


Figure 3 - Opportunities for prevention, detection, and response for an insider attack.

But we need a different kind of solution for solving the malicious insider threat. So, I have shown three different types of attacks and then provided their mitigation techniques too. The attacks are –

- i. **Changing The Contents of Users' Files Without Their Knowledge,**
- ii. **Obtaining The Private Keys of Users' Encrypted Files, and**
- iii. **Web Template Poisoning.**

Detecting The Attacks

Starting with the **first attack technique**, I created a cloud environment in which the user can upload a file to his/her private cloud and since the administrator has access to all the users' files, he/she can become a malicious insider and make any type of change to the users' file(s) without their knowledge.

Proceeding towards the **second attack technique**, the users have the option of encrypting their files using AES algorithm which provides added security. The users can upload the file(s), either directly or by encrypting it with a private key. The key would also be stored on the cloud server itself, so any malicious insider who has root level access (administrator) can easily gain entry to the private key of users, decrypt the data and steal vital information or make any changes not intended by the owner of the files.

Finally, the **third attack technique** demonstrates the attack on public template. Employees who have access privilege to storage server or cloud management web interface (Web UI) can download the default public templates. Template poisoning attack assumes

the scenario when malicious insiders, who have enough privileges to access the storage server or Cloud management Web UI, download the template and deploy the downloaded template in his/her private storage with the attempt to poison the template. The poisoned template will be uploaded back into the Cloud. After the malicious insiders successfully uploaded the poisoned template, the users' data deployed from the poisoned template is vulnerable to the Malicious Insiders. [3]

The objective of this paper is to show that how a malicious insider can steal confidential data of the cloud user. A cloud environment has been developed in which the threat of Rogue Administrator has been detected by performing three attacks stated above and solutions have been provided below so as to prevent further stealing of the users' data. The attacks here show that a malicious insider can easily compromise passwords, files, and other confidential data. It is assumed that the attacks are performed by a malicious insider who has root access to the management of the servers that compose the cloud.

Flowchart - How A Malicious Insider (Rogue Administrator) Can Get Confidential Information of Cloud Users

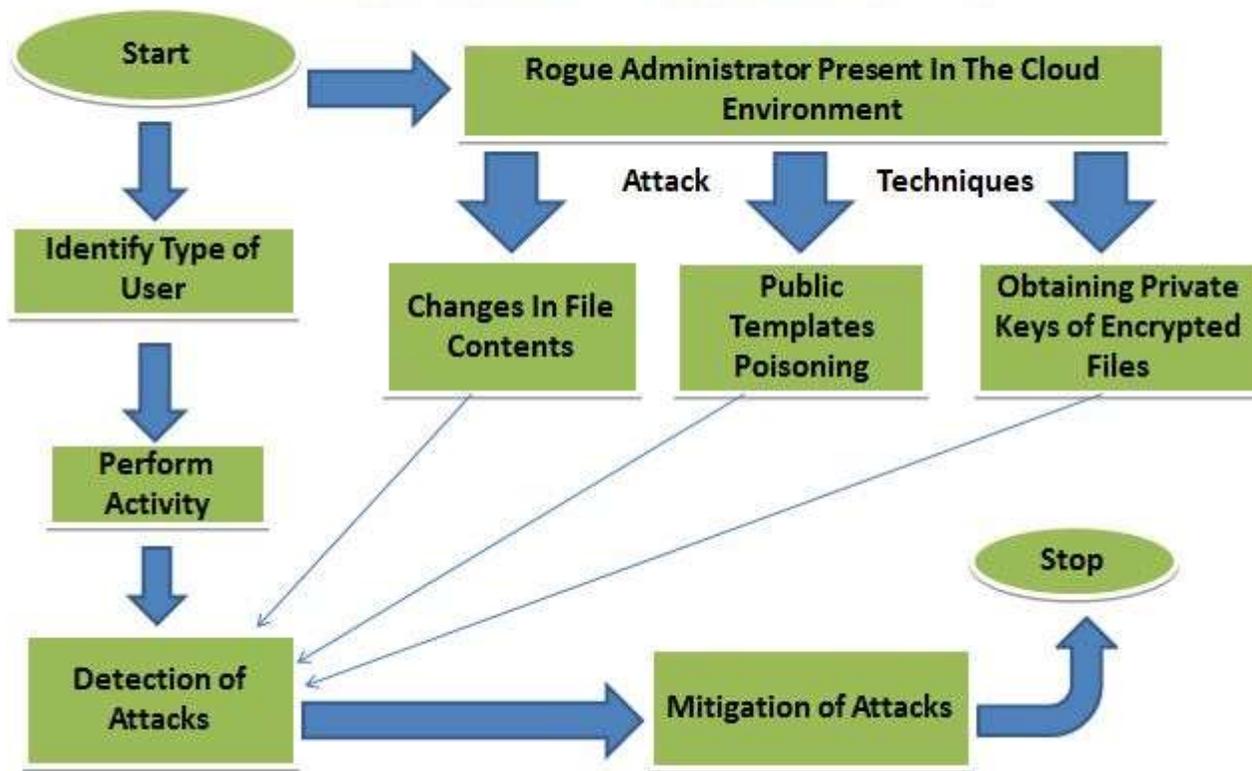


Figure 4 - Flowchart for solving the Malicious Insiders Threat.

No approach till now has offered a satisfactory path towards any solution for preventing or solving this type of threat. Therefore, in order to tackle the problem, I have created a virtual cloud environment in which the cloud is deployed locally in the system itself.

There are three types of attacks that a malicious insider can perform to access the user's data. The above stated attacks clearly demonstrate that it is currently possible to violate the confidentiality of the cloud user's data. The test environment was a single machine, with an Intel Core i7 Q740 Processor and 4 GB RAM. The machine had an emulated cloud infrastructure by using Cloud Sim v 3.0.3. There were 2 types of users of the system – administrator and users. The cloud server has a mode of encryption using AES

in which private key is used for authentication and establishing secure channels with the clients.

Mitigation Strategies & Results

For mitigating the **first type of attack**, the user will get a notification as a pop-up window that the file contents have been changed along with a pop-up showing the list of changes too. Hence, the attack can be easily detected by the cloud user and prevented further.

For the **second and third type of attack**, I have used the concept of OTP (One Time Password) to tackle the problem of Rogue Administrator as a malicious insider. As soon as the malicious insider tries to access some other users' data, the respective user will get a One-Time-Password (OTP) on their registered e-mail address which would prevent the malicious insider from accessing users' data. Also, a cloud-based rogue administrator would have access to the encrypted data, but not the associated private keys, and a local rogue administrator would have access to the locally-stored keys, but not the encrypted data.

Hence, after applying the above solutions, I aim to develop a way to prevent the malicious insider threat in the cloud.

Acknowledgment

A research is a combination of views and ideas, suggestions and contributions of many people. I take this opportunity to present my vote of thanks to all those who really acted as lightning pillars to enlighten my way to successful and satisfactory completion of this report. I am highly thankful to my mentor and co-author of this paper, **Ms. Sangeeta Sharma** for her active support, valuable time and advice, whole-hearted guidance, sincere cooperation and involvement during the whole process.

And last but not the least, I find no words to acknowledge the financial assistance & moral support rendered by my parents in making my efforts, a success. All this has become reality because of their blessings and above all, by the grace of Almighty God.

Conclusion

The cloud computing with such great offering such as storage, infrastructure and application designing capabilities on the go to the IT industry still fail to have proper standards for interoperability with other cloud service providers. This failure to provide concrete security standards, common underlying framework for data migration and global standards for cloud interoperability, make the leading technology "the cloud computing" still a vulnerable option for aspiring users. Malicious activity from within the Cloud provider system is tough to observe when there are collusion and collaboration between multiple insiders, insiders and outsiders within the Cloud environment.

Insider threats are a persistent and increasing problem. Insiders steadily continue to abuse organizational trust in other ways, such as using cloud services to carry out attacks. Organizations should know about vulnerabilities exposed by the utilization of cloud services and mindful of the availability of cloud services to employees within the organization.

Malicious insiders' attacks that exist in the Cloud system pose a critical threat to the organizations. With the flexibility of Cloud system, the malicious insiders can manipulate the privileges access the sensitive information remotely. [6]

In my opinion, if one is considering using the cloud, he/she should be certain to identify what information would be put out in the cloud and what one needs to make sure it is protected. Additionally, one should know the options in terms of what type of cloud would be best for one's needs, what type of provider would be most useful, and what are the reputation and responsibilities of the providers that one is considering before signing up. [12]

Therefore, by this paper, the suitable solutions to overcome this threat of malicious insider are briefly presented.

REFERENCES:

- [1] Ilgun, Koral, Richard A. Kemmerer, and Phillip A. Porras. "State transition analysis: A rule-based intrusion detection approach." *Software Engineering, IEEE Transactions on* 21, no. 3 (1995): 181-199.
- [2] Magklaras, G. B., S. M. Furnell, and Phillip J. Brooke. "Towards an insider threat prediction specification language." *Information management & computer security* 14, no. 4 (2006): 361-381.
- [3] Rocha, Francisco, and Miguel Correia. "Lucy in the sky without diamonds: Stealing confidential data in the cloud." In *Dependable Systems and Networks Workshops (DSN-W), 2011 IEEE/IFIP 41st International Conference on*, pp. 129-134. IEEE, 2011.
- [4] Claycomb, William R., and Alex Nicoll. "Insider threats to cloud computing: Directions for new research challenges." In *Computer Software and Applications Conference (COMPSAC), 2012 IEEE 36th Annual*, pp. 387-394. IEEE, 2012.
- [5] F. Greitzer, L. Kangas, C. Noonan, A. Dalton, and R. Hohimer, "Identifying at-risk employees: Modeling psychosocial precursors of potential insider threats," in *45th Hawaii International Conference on System Science (HICSS)*, January 2012.
- [6] Kandias, Miltiadis, Nikos Virvilis, and Dimitris Gritzalis. "The insider threat in Cloud computing." In *Critical Information Infrastructure Security*, pp. 93-103. Springer Berlin Heidelberg, 2013.
- [7] Sundararajan, Sudharsan, Hari Narayanan, Vipin Pavithran, Kaladhar Vorungati, and Krishnashree Achuthan. "Preventing Insider attacks in the Cloud." In *Advances in Computing and Communications*, pp. 488-500. Springer Berlin Heidelberg, 2011.
- [8] Bamiah, Mervat Adib, and Sarfraz Nawaz Brohi. "Seven deadly threats and vulnerabilities in cloud computing." *International Journal of Advanced Engineering Sciences and Technologies (IJAEST)* 9, no. 1 (2011): 87-90.
- [9] Ho, S. Mary, and Hwajung Lee. "A thief among us: the use of finite-state machines to dissect insider threat in cloud communications." *Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, JoWUA* 3, no. 1/2 (2012).
- [10] Jansen, Wayne A. "Cloud hooks: Security and privacy issues in cloud computing." In *System Sciences (HICSS), 2011 44th Hawaii International Conference on*, pp. 1-10. IEEE, 2011.
- [11] Chou, Te-Shun. "Security threats on Cloud Computing vulnerabilities." *International Journal of Computer Science & Information Technology* 5, no. 3 (2013): 79-88.
- [12] Mahajan, Harshal, and Nupur Giri. "Threats to Cloud Computing Security." In *VESIT, International Technological Conference-2014 (I-TechCON)*. 2014.
- [13] NIST Definition of Cloud Computing. <http://www.nist.gov/itl/cloud>
- [14] <https://cloudsecurityalliance.org/topthreats/csathreats.v1.0.pdf>
- [15] <http://www.cert.org/blogs/insider-threat/post.cfm?EntryID=105>

SMART HUMAN TRACKING ROBOT

Akshay Deshpande, Mayur Kate

*B.E (Electronic & Telecommunication). Student, ISB&M School Of Technology, Pune- 41.
Department of Electronics and Telecommunication Engineering, ISB&M School of Technology, Pune- 41.*

akshaydeshpande.india@gmail.com, +91-8975843458

Abstract— Human life safety holds its preference in comparison to any other objective in the world. Nowadays with increase in danger to their life, in the form of natural disaster and fluctuation in weather cycle, leaves their life at high risk. Human safety and their rescue holds first preference if any of these mishaps happen in any part of the world, but with lagging useful techniques to get the first information which plays a critical role in rescue team, it is essential to get these information as early as possible without any loss to human life.

The aim of the project is to make a human tracking robot which will work on the principle of wireless communication technology. Human tracking robot find's its application in various fields like flood hit areas; landslide hit zones and various military surveillance zones. Human tracking robot has the special ability to sense human beings and to send its location through global positioning system (GPS), which helps the rescuers to see directly where the people are stuck and need to be rescued. Also, this robot sends the live pictures of those areas along with the details which are mentioned above. This whole process is done through wireless communication.

We see nowadays that whenever any disaster happen there is no as such great technology or device to give the accurate update or we can call it as first information about the crash site, which make it difficult for the rescue teams to plan their rescue operation. Our robot will help those rescue teams to get the latest update, first information as well as it will cost them no loss of life to get these details.

Keywords—Human, rescue, detection, disaster, location, rescue, android, wireless, connection, robot.

INTRODUCTION

A robot is a man made machine which is designed to implement one or more tasks repeatedly, with speed, accuracy and high precision. An important aspect of robotics can be in human safety & security, where these robots can used for doing surveillance of specific location. Interesting application can be seen in as robot scanning areas to find injured humans, and find their location and sending their live images to the rescue operations team. Protection of assets and location using robots allows hands-free operation through pre-operational programming, so that it can response to external stimuli. Over all it can be said that, safety robots can be very efficient and can be cost savings also, but they can never replace a human safety personal, but the places with high level safety and places such as nuclear reactors, the robots still are not used. Due to this increasing security and safety requirements nowadays, safety managers are now turning towards the robots to help them and get their job done. These works mainly focus on perception and identification of the target body and localization of robot. Robot is a very important aspect in conditions like Earthquake, landslide, forest fire where we need to identify living human beings as early as possible, so as to save their life. In such situations, human rescuer's team must make quick decisions and actions, and try to get victims to safety even if they have to keep themselves at risk. They must be able to gather the location information and condition of victims and the stability remaining in the surrounding structures as quickly as possible so that medical teams and fire-fighters can reach the disaster area and save victims. Generally these kinds of tasks are performed usually by human rescuers and trained dogs, often in very critical & dangerous and risky and critical situations. For these reasons, self or partially controlled robots have been proposed to help these rescue teams and to perform the tasks that neither human's, dogs nor any existing tools can do.

The idea of this project is to track the location of the living being using the robot which is controlled through Wi-Fi communication with the server. If it detects any human presence in a particular location then it will takes its coordinates i.e., its longitude and latitude position through GPS and will send them to the destination server using android module. This project is applicable in military and security areas where without any presence of human's we can know the actual situation of the other side which is in dangerous

condition. This project can also be implemented to manoeuvre around the disaster location and try to find people who need help and which can be rescued. Specially made passive infrared sensor is used for human detection or presence. Infrared proximity sensor used here is for obstacle detection, so that robot moves properly. The data obtained by the sensors are displayed in the remote user using GPS technologies. Also, as we are using the android module we will get the live feed of the location through images or videos from the camera available at the android module, which will help the rescue operations team to plan out better and much efficient rescue strategy. The android module/phone will be positioned upon dummy buggy or on a quad copter so that land or air surveillance can be possible. Here we are implementing our robot on a three wheeled buggy, which will be used for the ground surveillance.

METHODOLOGY

First step of any project is to acquire the knowledge of the project i.e. what is the objective of the project and how we will apply it in real time situations. Then the next step which we moved ahead was that we researched on various standard journals/papers published related to our project topic. Based on those references we came out with much more effective yet innovative idea to develop this project and create a robot. We used many concepts based on those papers and implemented our own ideas with latest technology which we have with us today. Based on this idea a general block diagram was prepared which interpreted the basic flow model of the robot and how it will be look alike (block diagram is shown in fig. 1). Then after preparation of block diagram, we moved towards our next and most important criteria in the preparation of robot that is selection of components. The important aspect while selecting the components was that the components should fulfill all the necessary criteria of the project and must be cost effective also.

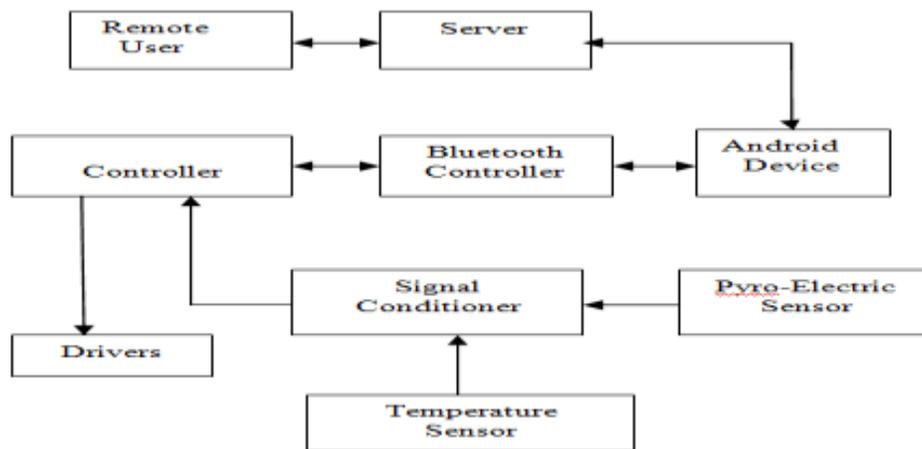


Fig. 1: Block diagram

The main component used in our project is microcontroller and there are many families of microcontrollers available in the market like 8051 family, PIC microcontroller, ARM family, AVR etc. We chose Atmega32 microcontroller which is much superior to conventional 89C51 microcontroller and fulfilled all our project needs. As our project was communication related so we are using various software platform for its functioning like Net beans, Eclipse for Java and android and Embedded C for Atmega32. The next stage is preparation of rough circuit diagram. The circuit diagram helps us to get the actual connections between every block of the robot. It also determines what should be the ideal electrical connections and how the connections should be made for the working of robot practically. Here we will be using 8 numbers of batteries with voltage range of 1.5V each, instead of designing a separate power supply. After circuit diagram we started making or prepared schematic diagram for printed circuit board (PCB). We used software named express PCB and express schematic for developing the PCB layout. After making PCB layout we got PCB etched and drilled to make practical connections and install the PCB on the robot. After getting the PCB our next aim will be mounting IC's and other analog components like resistors, capacitors etc. After mounting the IC's we will now emphasize on writing the codes and burning them into IC's. After burning the code we will go robot testing based on some semi real or dummy situation (as our project is just a prototype) and based on those testing results we will do some modifications if required.

Now here we will brief you with the basic software's and languages which we are using in our robot coding

- Embedded C:-

The Embedded C is used as coding language tool for AVR microcontroller family. The Embedded C language is an next level of the conventional C language i.e. Embedded C has all or we can say most of the features of normal C language, and have some more added features which are not there in conventional C language. It can be used for atmega8/16/32/128 and soon series of AVR family microcontroller. The coding depends on the Embedded C programming, which is done with .c extension. Embedded C uses most of the semantics as of standard C language and syntax are also similar to standard C language, for e.g., macros, data type

declaration, main function, conditional statements (if, switch, case), variable definition, functions, structures and union, loops (while, for), bit operations, arrays and strings, etc. Compiler for Embedded C which we have used is mikroC pro for AVR. The Embedded C programs requires a cross compiler to compile the code & generate HEX code from C code, which is also done by this compiler. So, we used this language to control and operate the features of microcontroller, the main commands used were DDR X, PORT X & PIN, where X is the name of the port used in the microcontroller.

- **Java:-**

The JAVA is basically used as computer programming language. It is use to transfer the data from client or host to server in the form of code. A JAVA programmed is build by a JAVA compiler (which is previously installed in a computer) which generates its own binary code. This binary code is not dependent on any hardware and operating system.

- **Eclipse:-**

Android system offers a customized plug-in for the Eclipse IDE, called Android Development Tools (ADT). This plug-in system provides a powerful, integrated environment in which we can develop Android apps. ADT helps to extends the capabilities of Eclipse so that we can quickly set up new Android applications or build up an app user interface, debug the applications, and export signed (or unsigned) applications packages (APKs) for distribution. As in our project we are using android module which will be mounted on buggy of robot so we require this software to setup the android module, so that android module can be operated.

- **NetBeans IDE:-**

NetBeans is used as the interfacing tool between the server and the android module used. It is basically used to interface our java code and the graphical user interface and creates an r.java file, which helps the server to respond to the request given to or from the android module. Here we are using tomcat apache as web server and as a servlet container. Java Servlet has the open source software implantation in the form of Apache Tomcat and glass fish. The Java Servlet and Java Server Pages specifications are developed under the [Java Community Process](#). In this project we are using Apache Tomcat for making it work as default web server. Apache Tomcat is also used as a default HTTP connector on port number 8080 in the computer network, i.e., Tomcat Apache can also be used as HTTP server. Basically Tomcat Apache is used to the run the Java code.

Now, let's see to the graphical image of the robot. Figure 2 show the graphical image of the robot, which is allowing us to visualize the overall idea behind the robot. The cuboidal shaped box can be imagined as the chassis of the robot which will include the PCB mounted with on-board integrated circuits. The microcontroller IC (Atmega 32), motor driver IC (L293D), interfacing IC between low level digital circuitry and high voltage/current circuitry (ULN2803), Bluetooth module (HC-05), sensors (IR, pyro-electric, temperature) are all mounted on the robot chassis and the two motors with 60 rpm will are used to move the robot, a caster wheel is used in the front to simplify the working of the robot related to its movement.

An android module will also be mounted on the chassis, which will be interfaced with the Bluetooth module via Bluetooth connectivity. The Bluetooth module will interact with microcontroller for the functioning of the android module. The android module will be interfaced with server through any common available internet connectivity and will send the images to it.

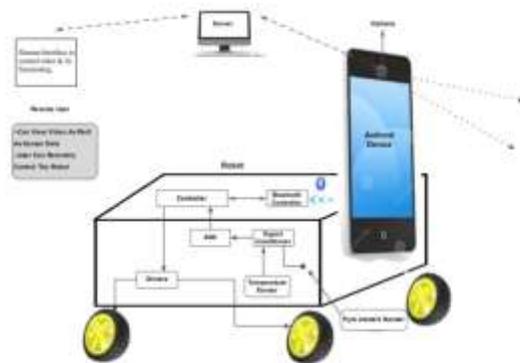


Fig. 2: Graphical image of the Robot

The server will be linked with the remote user, which will be used for controlling the whole functioning of the robot (like navigating the robot, controlling the flow of data through sensors etc).

RESULT

A human tracking robot is purposely built rescuing human when they are in disaster zone. Here we are attaching images of results which we found after making the robot. We can see that at server we are getting the information regarding the sensor output and the live feed as well as the intrusion we faced while controlling the robot. Also we are getting the latitude and longitude information of the area where the robot is located on the server. These all things will help the rescue teams and help them to plan up their acts of rescue.



Fig. 3: Image at server when human is detected



Fig. 4: Image at server when there is no human presence.



Fig. 5: Actual image of robot in human presence.

ACKNOWLEDGMENT

It is a great pleasure for us to express our sincere thanks to our principal & head of department Prof. **J.N. SHINDE** for giving the encouragement that helped us to complete the paper successfully.

We record with pleasure our deep sense of gratitude to our beloved paper guide **Prof. P.A. KALE**, Assistant Professor for his simulating guidance and profuse assistance, valuable suggestions throughout the project. We shall always cherish our association with him for his encouragement and freedom of thought and action. We also want to thank our paper coordinator **Prof. SITARAM LONGANI** for his throughout support and help which was required while preparing this paper.

We are highly indebted to our parents (**Mr. Avinash Deshpande & Mr. Macchindra Kate**) for their constant support and encouragement they offered throughout our career. Without their blessings it could not have been possible to achieve our goal.

CONCLUSION

Hence we conclude that this Robot is a suitable tool for human detection and can find various applications in many fields like flood affected areas, landslide hit zone and many other disaster prone areas. This robot is a very good for getting first information of any disaster affected area which play very crucial role in any situation of rescue operations. As, this project finds many applications in day to day life and real time operations it can be demand for many security related areas like banks, National record offices. As this robot is highly feasible with android technology we have used many inbuilt android features like GPS, camera which helped us throughout to maintain the connectivity and get the live feed.

REFERENCES:

- [1] Md Athiq UR Raza Ahamed M., Wajid Ahamed "A domestic robot for security systems by video surveillance using zigbee Technology" International Journal of Scientific Engineering and Technology, ISSN : 2277-1581, Volume 2 Issue 5, pp : 448-453 1 May 2013.
- [2] Helly Patel & Mahesh Wankhade "Human tracking in video surveillance" International Journal of Emerging Technology and Advanced Engineering ,ISSN 2250-2459,December 2011.
- [3] A. Bruce, I. Nourbakhsh, R. Simmons, "The Role of Expressiveness and Attention in Human-Robot Interaction," IEEE Intl Conference on Robotics and Automation, 2002.
- [4] . Ravindra Thamma, Dr. Luke H. Huang, Dr. Shi-Jer Lou and Dr. C. Ray Diez "Controlling Robot through Internet Using Java" Journal of Industrial Technology Volume 20, Number 3 - June 2004 through August 2004.
- [5] Bruce, I. Nourbakhsh, R. Simmons, "The Role of Expressiveness and Attention in Human-Robot interaction," IEEE Intl Conf on Robotics and Automation, 2002.
- [6] R. Burrige, Graham, "Providing robotic assistance during extra-vehicular activity", SPIE, 2001.
- [7] L. Davis, V. Philomin, R. Duraiswami, "Tracking humans from a moving platform," 15th Intl Conf on Pattern Recognition, Vol. 4, pp. 171-78, 2000.
- [8] Alpher Yilmaz, Omar Javed, Mubarak Shah, —Object Tracking : A Survey, ACM Computing Surveys, Vol. 38, No.4, Article 13, December 2006, pp. 1-4 .
- [9] Fod, A. Howard, M. Mataric, "A Laser-Based People Tracker," IEEE Intl Conf on Robotics and Automation, 2002.
- [10] G. Song, Z. Wei, W. Zhang and A. Song ,” A hybrid sensor network system for home monitoring applications”, IEEE Trans Consumer Electronics, Vol. 53, No. 4,pp. 1434-1439, 2007.
- [11] G. Song, Z. Wei, W. Zhang and A. Song ,” A hybrid sensor network system for home monitoring applications”, IEEE Trans Consumer Electronics, Vol. 53, No. 4,pp. 1434-1439, 2007.
- [12] Y. W. Bai, L. S. Shen and Z. H. Li, “Design and implementation of an embedded home surveillance system by use of multiple ultrasonic sensors”, IEEE Trans Consumer Electronics, Vol. 56, No. 1, pp. 119-124, 2010.
- [13] W. Lao, J. Han and Peter H.N. de With, “Automatic video-based human motion analyzer for consumer surveillance system”, IEEE Trans Consum Electron, Vol. 55, No. 2, pp. 591-598, 2009.

Fractional Frequency Transmission System

Ashish Ramesh Banasawade, Suyog Bhausahab Patil, Dipali Sukumar Jatte, Kajal Sunil Kholkumbe.

Department Of Electrical Engineering, SITCOE Yadrav (Ichalkaranji)

abanasawade18@gmail.com,

Abstract— The fractional frequency transmission system (FFTS) is a recently developing trend in power transmission. In such a system, electrical power is transmitted at a reduced frequency (One third of the rated frequency= $50/3$ Hz). This approach would be effective in long-distance transmission of electrical power. Transmitting power at a reduced frequency reduces the electrical length of the transmission line (i.e., more amount of power can be transmitted using the same length of the line at reduced frequency than at rated frequency). This paper introduces the experimental installation of FFTS and primary experiment results. The experiment uses cycloconverter as a frequency changer, which is used at the sending end to step the frequency down to $50/3$ Hz. Similarly, at the receiving end another cycloconverter is used to step-up the frequency back to 50Hz. The FFTS approach proposes new method of increasing the transmission capacity.[1]

Keywords— Fractional frequency Transmission System, Frequency converter, Transmission System, Computer Simulation.

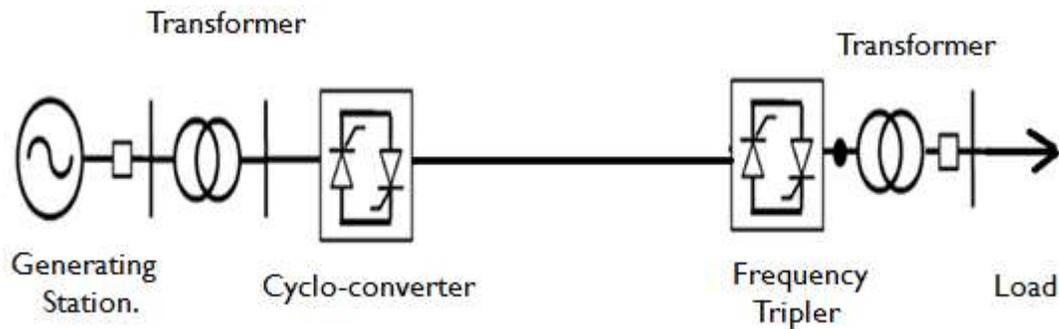
INTRODUCTION

In the history of the ac transmission system, increasing distance and capacity mainly depends on raising voltage level of transmission lines. At present, the highest voltage level of the ac power transmission line in operation is 750 kV. To further upgrade, the voltage level encounters difficulties of material and environment issues. The transmission and distribution losses in India currently stand at 27% of the total power being generated. Another method i.e., employed to increase the transmission capacity is the high voltage DC (HVDC) transmission. A HVDC system transmits DC power at a very high voltage. However, at the generation is in AC, it has to employ current converters at transmitting and the receiving ends and these current converters are very expensive. Apart from that, up to now the HVDC practices have been limited to the point-to-point transmission. It is difficult to operate a multi-terminal HVDC system. In 1994, the fractional frequency transmission system (FFTS) was established, which uses lower frequency ($50/3$ Hz) to reduce the electrical length of the ac transmission line, and thus, its transmission capacity can be increased.[1]

This paper introduces the experimental installation of FFTS and primary experiment results. The experiment uses cycloconverter as a frequency changer, which is used at the sending end to step the frequency down to $50/3$ Hz. Similarly, at the receiving end another cycloconverter is used to step-up the frequency back to 50Hz.[13] Thus, a new FACTS device is successfully established in this experiment.

SYSTEM DETAILS

After transformer was invented, it became very easy to transform voltage from one level to another level. Transforming frequency was not as easy as transforming voltage. But now-a-days due to advancement in power electronic & materials it became very easy to transform from one frequency to another frequency. For instance, the lower frequency electricity can be used to transmit larger power for longer distance, and the higher frequency electricity can be used more efficiently to drive the electric tools.



The basic phenomenon of FFTS can be established by using the following two concepts-

1. Three factors limiting the transmission capacity of a line-

Thermal limit, Stability Limit, Voltage drop Limit (Voltage Regulation). For the long-distance ac transmission, the thermal limitation is not a significant impediment. Its load ability mainly depends on the stability limit and voltage drop limit the stability limit of an ac transmission line can be approximately evaluated by-

$$P_{\max} = \frac{V^2}{X}$$

Where V is the normal voltage, and X is the reactance of the transmission line. From above equation we see that, transmission capacity is directly proportional to the square of the normal voltage and inversely proportional to the reactance of the transmission line.

The voltage drop ΔV % can be evaluated by-

$$\Delta V\% = \frac{QX}{V^2} \times 100$$

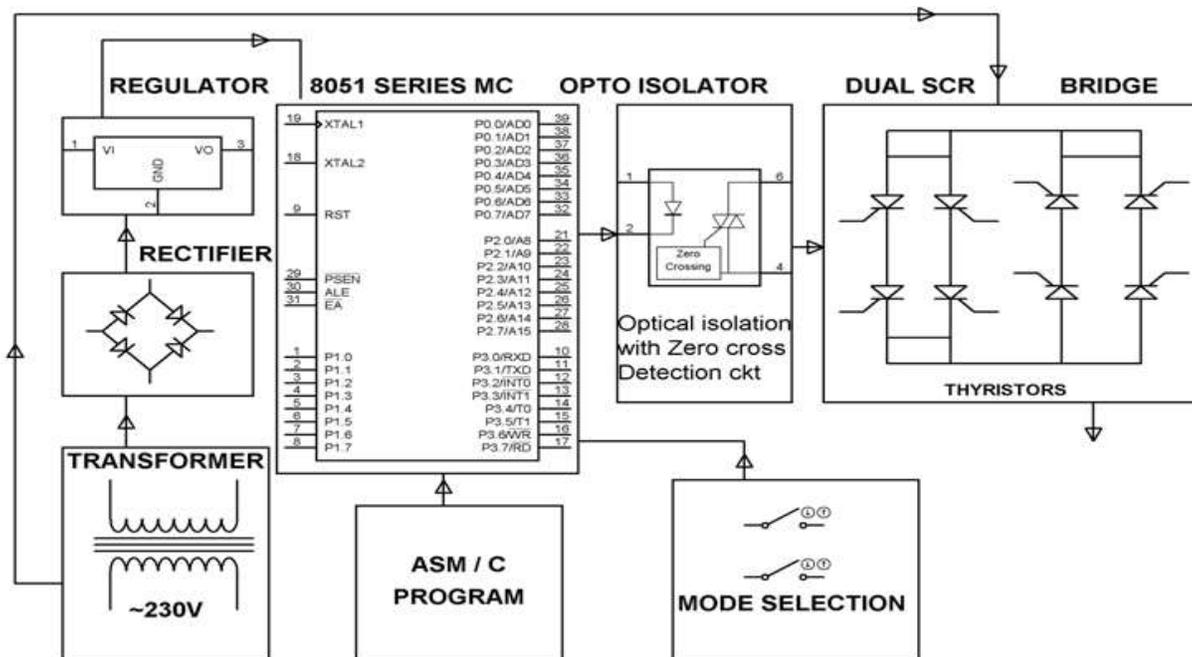
Where Q is the reactive power flow of transmission line. Thus, the voltage drop is inversely proportional to the square of voltage and directly proportional to the reactance of the transmission line. Hence, in order to boost the transmission capacity, either the nominal voltage level can be increased or the reactance of the transmission line can be reduced. As we know, the reactance is directly proportional to power frequency and is given by-

$$X = 2\pi fL$$

Where L is the total inductance of transmission line, calculated by multiplying the inductance per kilometer of the line by length of the line. The inductance per length is calculated based on the type of conductor used. Hence, decreasing the electrical frequency can proportionally increase transmission capacity.

Thus FFTS uses reduced frequency to reduce reactance of the transmission system. For instance, when the 50 Hz frequency is reduced by three times, then theoretically, transmission capacity increases three times.[1]

HARDWARE DESIGN



The circuit uses standard power supply comprising of a step-down transformer from 230V to 12V and a bridge rectifier that delivers pulsating dc which is then filtered by an electrolytic capacitor. The filtered dc being unregulated, IC LM7805 is used to get 5V DC constant. The regulated 5V DC is further filtered by a small electrolytic capacitor of $10\mu\text{F}$ for any noise so generated by the circuit. One LED is connected of this 5V point in series with a current limiting resistor of 330Ω to the ground. i.e., negative voltage to indicate 5V power supply availability. The unregulated 12V point is used for other applications as and when required.

Zero voltage cross detection means the supply voltage waveform that passes through zero voltage for every 10msec of a 20msec cycle. We are using 50Hz ac signal, the total cycle time period is 20msec ($T=1/F=1/50=20\text{msec}$) in which, for every half cycle (i.e. 10ms) we have to get zero signals. Here Op-amp is used as comparator. As we know the principle of a comparator is that when non-inverting terminal is greater than the inverting terminal then the output is logic high (supply voltage). The o/p of this comparator is fed to the inverting terminal of another comparator. Thus we get ZVR (Zero Voltage Reference) detection. This ZVR is then used as input pulses to microcontroller. [9] The output of microcontroller is fed to thyristor circuit. [11] SCR's used in full bridge are in anti-parallel with another set of 4 SCR's as shown in the diagram. Triggering pulses so generated by the MC as per the program written provides input condition to the Opto – isolator that drive the respective SCR. For F/3 the conduction takes place for 30ms in the 1st bridge and next 30ms from the next bridge, such that a total time period of 1 cycle comes to 60ms.

Similarly, at the receiving end another cycloconverter is used to step-up the frequency back to 50Hz. [12]

Results and Discussions

MATLAB Simulation Results

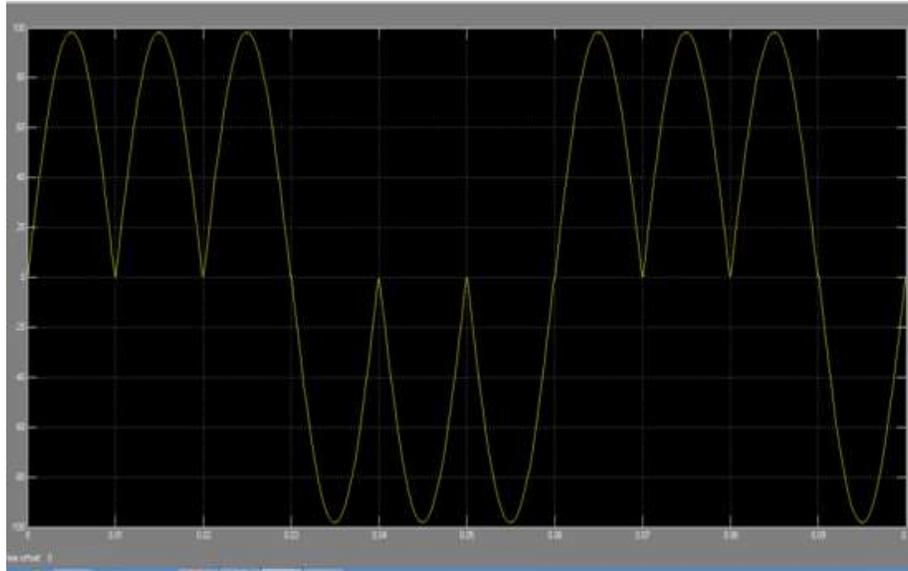


Fig: MATLAB Simulation of down- conversion (50/3Hz)

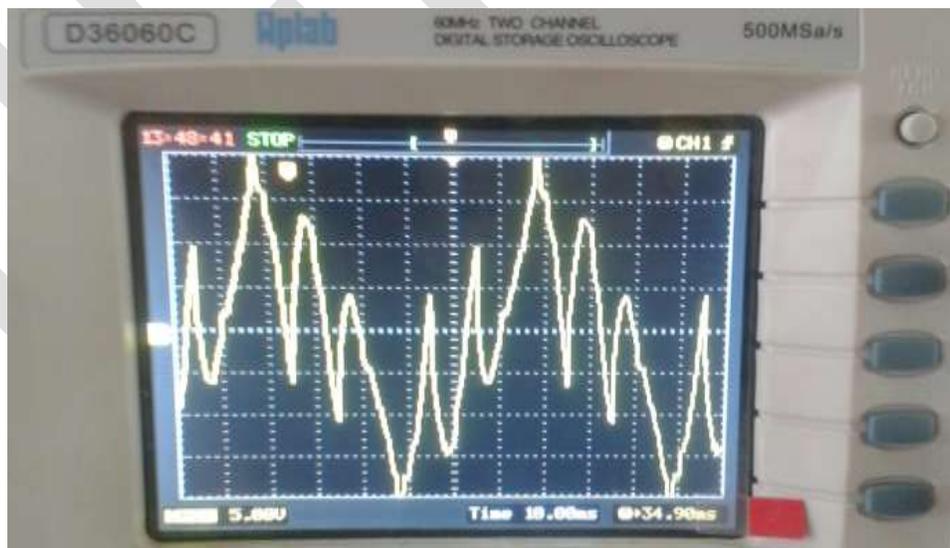


Fig: Output waveform of down-conversion circuit(50/3Hz)

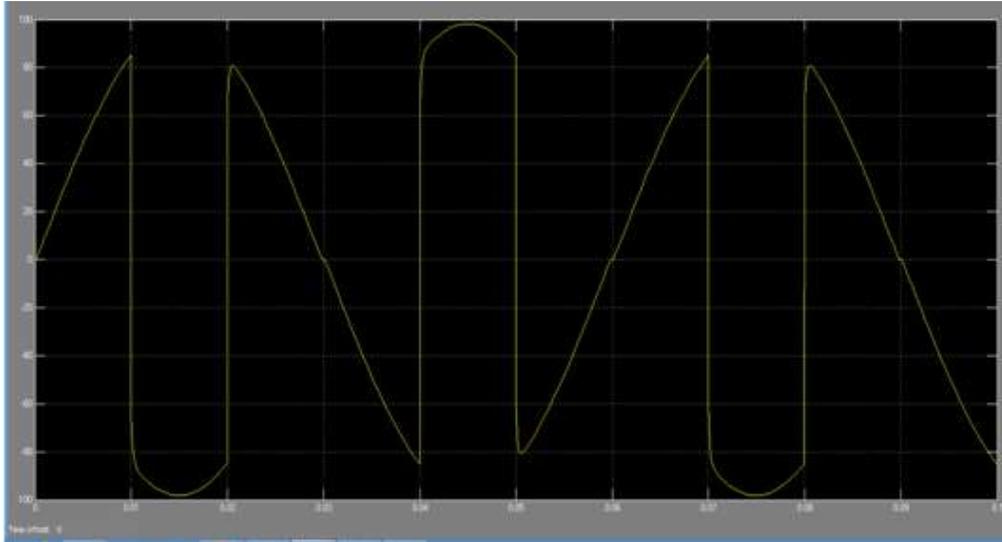


Fig: MATLAB Simulation of up-conversion (50Hz)

The power loss in FFTS is less as compared to the normal transmission system .This can be proved by following formula,

$$P_c = 241 \times 10^{-5} \times \frac{f+25}{\delta} \sqrt{\frac{r}{d}} (V_p - V_c)^2 \text{ kW/phase/km}$$

Where,

V=Phase voltage (rms Value)

Vd=disruptive critical voltage (rms value)

r=radius of conductor in meter

d=spacing between conductors in meter

f=frequency in Hz

From above equation corona loss is directly proportional to frequency. Hence, as frequency reduces the corona loss also reduces which in turn minimizes the power loss.[7]

CONCLUSION

From MATLAB Simulation we found that FFTS is practically feasible. The electrical length of ac transmission line is reduced and hence the transmission capability is increased to several folds. The reduced length of the transmission line leads to the reduction in the cost of transmission and improvement in the general characteristics. In FFTS, we use reduced frequency for transmission system and therefore losses in the form of corona discharge get reduced hence improving stability and performance characteristics.

REFERENCES:

- [1] Wang Xifan, Cao Chengjun, Zhou Zhichao, "Experiment on Fractional Frequency Transmission System", IEEE Transaction on Power System, vol.21, no.1, Feb 2006.
- [2] X.Wang and X Wang, "Feasibility Study of Fractional Frequency Transmission System", IEEE transaction on Power System, vol.11, no.2, pp.962-967, May 1996.
- [3] Satpute U S, Jangamshetti S H, Joshi D R, X.Wang and X Wang, "Feasibility Study of Fractional Frequency Transmission System", IEEE transaction on Power Electronics, Drives and Energy System & 2010 Power India, 2010 Joint International Conference, Dec 2010
- [4] Zhuoyan Song; Xifan Wang; Yufei Teng; Lianhui Ning; Yongqing Meng "Optimal Control Study for Fractional Frequency Wind Power System", Power and Energy Engineering Conference (APPEEC), 2012 Asia-Pacific
- [5] M. D. Singh and K B Khanchandani, Power Electronics, Tata McGraw-Hill Publishing Company Limited, New Delhi.
- [6] D Roy Choudhary, Shail Jain, Linear Integrated Circuits, Wiley Eastern Limited, New Age International Limited, Publishers Third Reprint, June 1995.
- [7] V K Mehta and Rohit Mehta, Principles of Power Systems, S Chand Publication, Fourth Reprint, 2010.
- [8] www.livemint.com
- [9] www.cleantechindia.com
- [10] www.alldatasheets.com
- [11] www.beyondlogic.com
- [12] www.atmel.com
- [13] B. K. Bose, *Modern Power Electronics and AC Drives*. Englewood Cliffs, NJ: Prentice-Hall, 2002
- [14] M. H. Rashid, *Power Electronics Handbook*. New York: Academic, 2001.

Automation in Tree Clamping

Smitesh Bobde, Arman Bhaisare, Nitish Bahe

armanbhaisare33@gmail.com, 7507119055

Abstract— The aim of this project is to minimize the work and reduce the danger encountered during cutting the branches of the tree. This project aims at building an assembly which can cut the branches of the side road trees which under normal conditions grow to a longer branch. The longer branches have the risk of breaking and may fall on the people driving the vehicles. This project uses a clamping device to get fixed on the trunk and a cutter to cut the branches of the tree. The whole project is concerned with using proper assembly and mechanism to get the whole work done.

Keywords— Branch Cutting, Cutting assembly, Cutter, Base, Height Adjustment Base, Clamping Device,

INTRODUCTION

The project focuses on cutting the branches of the road side trees using automation in tree clamping for providing fixed support on the trunk of the tree. The road side trees are dangerous mostly in rainy season. So there is a risk of falling the branches of the trees. In most of the cases instead of cutting the branches of the tree people cut the whole tree to avoid any future disturbance. This creates an adverse effect on the environment. Our project focuses on doing the whole work with minimum man power required, minimum risk and minimum time. Similarly in case of fruit bearing tree some branches of trees become dead due to some reasons. So if we carry out pruning operation on these branches i.e. cutting of the dead branches of fruit bearing trees to enhance the strength of wood and improve light environment and healthy growth of trees it means increasing the fruit gaining efficiency.

Cutting the whole tree instead of cutting the branches of the tree is not a smarter thing to do. Another point is that cutting the branches of the tree includes high amount of risk of climbing and holding the tree branch during cutting. There is another risk of falling the branches of the tree on the people standing besides the tree.

So by considering all the risk of cutting a branch and importance of tree we have designed an assembly which consists of clamping device which plays the role of holding a trunk and provide support to the cutting operation, a height adjustment base which is based on scissors mechanism helps to move up the cutter assembly and a rotary cutter which cuts the branches of tree.

● CONSTRUCTIONAL DETAILS



Fig 2. Proposed model

BASE/BODY

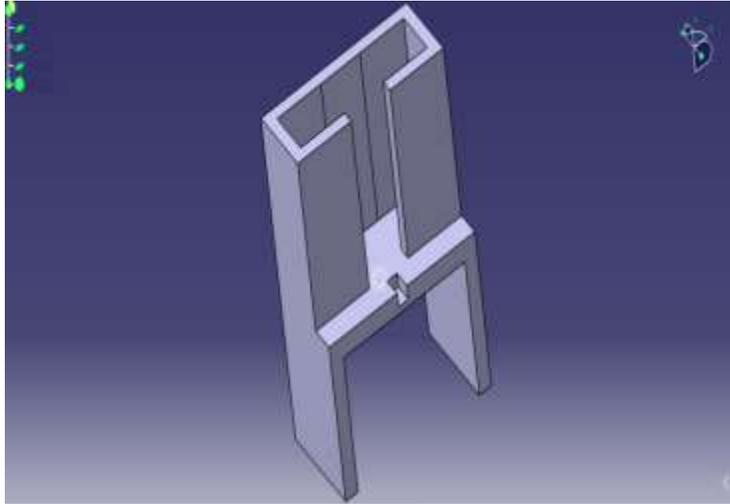


Fig 3. Proposed base

It is the lowermost portion of the assembly. It is the portion upon which whole assembly will be mounted. The base can be provided with wheels in order to move the assembly. The base is also provided with dampers which will be fixed under the ground and will provide a strong base and will also reduce the vibrations. The dampers can be seen in heavy earth moving vehicles like excavator.

CLAMPING DEVICE



Fig 4. Clamping device

It is the fixing device of the assembly. The whole assembly will be fixed on to the trunk with the help of this device. The clamping device arrangement is made on the base. This clamping device will hold the trunk of the tree and will provide the necessary support in order to reduce the vibrations.

The gripping diameter of the clamp can be varied according to the size of the trunk. Various types of clamp are available in market that can be operated mechanically and pneumatically. For higher power requirements pneumatic clamp can be

HEIGHT ADJUSTMENT BASE

The vertical movement of the cutter is provided by this component. This component will give the necessary height required to cut the branches. Various mechanism can be used to give the height adjustment. In our prototype model we are using rack and pinion arrangement to give the required height. In actual model we can use hydraulics or a scissor mechanism to give the required height.



Fig 5. Height adjustment base

ROTARY CUTTER BASE



Fig 6. Rotary cutter base

The horizontal movement of the cutter is provided by this component. This component will give the feeding movement of the cutter required to give the depth of the cut and will provide the required force to cut the branch.

CUTTER

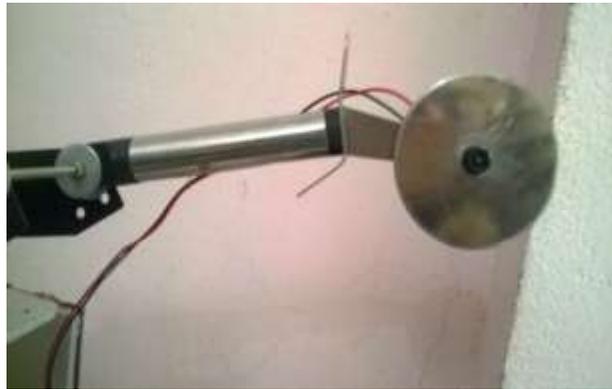


Fig 7. Cutter

The cutting operation will be performed by the cutter. The cutter can be circular cutter or chain saw cutter. In our prototype model we are using circular one. Different types of cutter are used for different types of wood as shown in the following figure

ACKNOWLEDGMENT

I am indebted to many persons for their help and contributions during the preparation of this prototype. I am very thankful to my guide **Prof. S.R. Bobde** for his help in providing reviews, ideas and suggestion that improved my project work. Because of inspiring and guidance provided by him, the project work is reached up to success level.

I also acknowledge with gratitude **Dr. S. V. Prayagi**, HOD Mechanical Engineering Department, DBACER, Nagpur, for his constant support and encouragement throughout the course work.

I am obliged to **Dr. V. H. Tatwawadi**, Principal, DBACER, Nagpur, for his constant support in overcoming various different I faced during the course work.

I would like to thank my all professor for their guidance from time to time and inspiration at different stages of my B.E. Studies.

I am grateful to the institution D.B.A.C.E.R. and R.T.M. Nagpur University for granting permission to me to undertake this project.

CONCLUSION

1] It is very difficult to cut the branch of a tree without any support on trunk. So for that we have made a clamping device which holds the trunk of a tree. This clamping device was made by using DC motor and link. Here we have also used lead screw operated by hydraulic and actuator.

2] Our second motive is to eliminate the use of man power during cutting operation. The problem is overcome by using automatically operated branch cutter which is operated by a single person by keeping a distance from cutting site.

3] As there is a problem to move a cutter up to the location of branch. So this is done by using hydraulics in actual model or by using scissors mechanism.

4] The another task is to cut the branch and this was done by using a cutter which is rotated at a certain angle so it is possible to cut the branch located at any side. Here in actual practice we make a sliding base so that it can cut the branch at any required length.

5] Another problem is that the cutting force is different for different trees. So we made a removable cutter so that according to requirement we may change the cutter.

REFERENCES:

- [1] Rostam mousavi, “ Cost analysis of the manual tree felling” published in, “Journal of Forestry Research” volume 22, date 31 October 2011.
- [2] Paper published by Ishigure Y. Kachi on “pruning machine with mechanism for preventing branch bite” in July 11 ,2010,Padova-Italy
- [3] Chonnaramutt W., Kawasaki H., Ueki S., Murakami S., and Koganemaru K. (2009a).” Development of a Timberjack-like Pruning Robot” Climbing Experiment and Fuzzy Velocity Control, Proceedings of ICCAS-SICE 2009, 1195-1199.
- [4] Chonnaramutt W. and Kawasaki H. (2009b). “Fuzzy Systems for Slippage Control of a Pruning Robot”, Proceedings of FUZZ-IEEE 2009, 1270-1275.
- [5] Kawasaki H., Murakami S., Kachi H., and Ueki S. (2008).”Novel Climbing Method of Pruning Robot”, Proceedings of SICE Annual Conference 2008, 160-163.
- [6] Saito T., Saito N., Sasaki K., Chishima T., Hirano K. (1991). Working efficiency of automatic pruning machine, Report of technical staffs of University Forests of the University of Tokyo University, 63-68
- [7] Takeuchi M. et al. (2009). Development of Street Tree Climbing Robot WOODY-2, Proceedings of Robomec 2009, 1A2-D07 (In Japanese)
- [8] Yamada et al. T. (2004). Study on a Pruning System Using Robots -Proposal of a Fundamental Concept, Proceedings of SI2004 (In Japanese)
- [9] Elise Stole on “Edmonton Journal” published in 16 march 2015.
- [10] Steve Casimiro said in “adventure journal” published in 19 may 2014.
- [11] Sunset aditors, (1995) western garden book, Sunset book inc, ISBN 978-0-376-03851-7
- [12] Shigo, 1991 ,Modern arboriculture companion, third printing, Durham, New Hampshire, USA
- [13] Lonsdale D 1999, Principle of tree hazard assessment and management, 6th impression 2008,forestry commission, Great Britain

Performance Parameters Analysis of Three phase Full Controlled Converter using PSIM Simulation

S.Vivekanandan¹ G.Saravanan¹ P.Kamalakannan¹ S.Krishnaprabhu¹

¹Assistant professors, EEE Department, KPR Institute of Engineering and Technology, Coimbatore, Tamilnadu, India
vivekanandan.me@gmail.com 9095062900

Abstract – This paper presents the modeling and simulation of power electronic circuits and their analysis on the basis of performance parameters. It deals with the simulation analysis of three phase full converter by calculating performance parameters. For large power dc loads, three phase ac to dc converters are commonly used. Three phase half wave converter is rarely used because it introduces dc component in the supply current. Three phase full converter model is prepared on PSIM software and simulation waveforms are generated. Simulation waveforms are obtained with different firing angles.

Keywords- AC to DC converter, Firing angle, R, RL, RLE loads, PSIM software, Distortion factor.

INTRODUCTION – Power electronics concerns the application of electronic principles into situations that are rated at power levels rather than signal level. The development of new power semiconductor devices, new circuit topologies with their improved performance and their fall in prices have opened up wide field for the new applications of power electronic converters. Power electronic converters are used for the conversion of AC to DC, DC to AC, AC to AC and DC to DC power. Any power semiconductor device can act as a switch. Mostly thyristor used as a power switch in power converters. The thyristor can be triggered at any angle α in positive half cycle and the output voltage can be controlled.

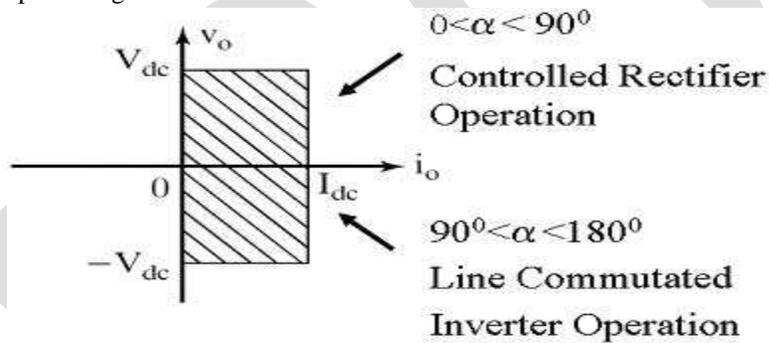


Fig-1 Rectifier quadrant operation.

PSIM FOR SIMULATION- PSIM is Simulation software specially designed for Power electronics and Motor control applications. With fast Simulation and User friendly interface, PSIM provides powerful Simulation environment for power electronics, control loop design and motor drive system studies. A circuit is represented in PSIM has four blocks: power circuit, control circuit, sensors, and switch controllers. Fig.2 shows the relationship between these blocks.

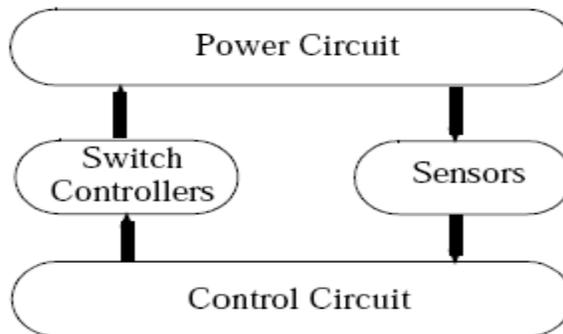


Fig.2 PSIM Simulation process

Power circuit consists of RLC branches, switches, Transformers, Motor drive modules and Renewable energy module. Control circuit has logic elements, digital control module, PI regulator etc. Sensors measure power circuit voltages and currents and pass the values to the control circuit. Control signals are generated from the control circuit and given to the power circuit through the switch controllers.

PERFORMANCE PARAMETERS- All the theoretical discussions of converters are assumed the a.c input supply is purely sinusoidal. In practical, the current at the a.c input terminal of the converters consists of a fundamental component with superimposed harmonic components. So the performance parameter evaluation is important in converter analysis. The following performance parameters are used in the analysis of three phase fully controlled converter.

1. Distortion factor (DF) = $\frac{I_{s(fund)}}{I_{s(rms)}}$
2. Harmonic factor HF) = $\sqrt{\frac{1}{DF^2} - 1}$
3. Supply power factor (PF) = $\frac{3}{\pi} \cos \alpha$
4. Efficiency = $\frac{P_{dc}}{P_{ac}}$

THREE PHASE CONVERTER- The three phase fully controlled bridge converter has been probably the most widely used power electronic converter in the medium to high power applications. The controlled rectifier can provide controllable output dc voltage in a single unit instead of a three phase autotransformer and a diode bridge rectifier. The controlled rectifier is obtained by replacing the diodes of the uncontrolled rectifier with thyristors. Control over the output dc voltage is obtained by controlling the conduction interval of each thyristor. In phase controlled rectifiers though the output voltage can be varied continuously the load harmonic voltage increases considerably as the average value goes down. Of course the magnitude of harmonic voltage is lower in three phase converter compared to the single phase circuit. Three phase converter is shown in fig.3.

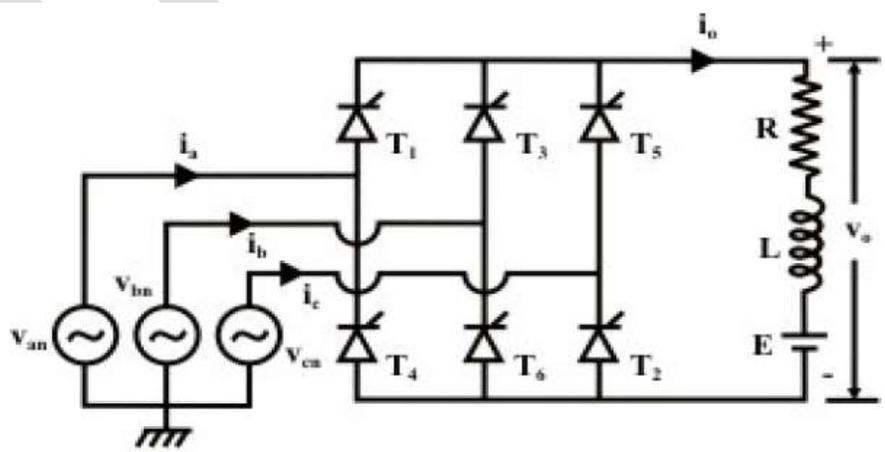


Fig.3 Three phase converter

For any current to flow in the load at least one device from the top group (T_1, T_3, T_5) and one from the bottom group (T_2, T_4, T_6) must conduct. Then from symmetry consideration it can be argued that each thyristor conducts for 120° of the input cycle. Now the thyristors are fired in the sequence $T_1 \rightarrow T_2 \rightarrow T_3 \rightarrow T_4 \rightarrow T_5 \rightarrow T_6 \rightarrow T_1$ with 60° interval between each firing. Therefore thyristors on

the same phase leg are fired at an interval of 180° and hence cannot conduct simultaneously. This leaves only six possible conduction mode for the converter in the continuous conduction mode of operation. These are $T_1T_2, T_2T_3, T_3T_4, T_4T_5, T_5T_6, T_6T_1$. Each conduction mode is of 60° duration and appears in the sequence mentioned. Table.1 shows the firing sequence of SCRs

S.No	Firing angle	Conducting pair	Incoming SCR	Outgoing SCR	Line voltage (Load)
1	$30 + \alpha$	T_6, T_1	T_1	T_5	V_{ab}
2	$90 + \alpha$	T_1, T_2	T_2	T_6	V_{ac}
3	$150 + \alpha$	T_2, T_3	T_3	T_1	V_{bc}
4	$210 + \alpha$	T_3, T_4	T_4	T_2	V_{ba}
5	$270 + \alpha$	T_4, T_5	T_5	T_3	V_{ca}
6	$330 + \alpha$	T_5, T_6	T_6	T_4	V_{cb}

Table 1: Firing Sequence of SCR

Fig.4 shows the waveforms of different variables. To arrive at the waveforms it is necessary to draw the firing sequence table which shows the interval of conduction for each thyristor. If the converter firing angle is " α " each thyristor is fired " α " angle after the positive going zero crossing of the line voltage with which it's firing is associated. Once the conduction diagram is drawn all other voltage waveforms can be drawn from the line voltage waveforms. It is clear from the waveforms that output voltage and current waveforms are periodic over one sixth of the input cycle. Therefore this converter is also called the "six pulse" converter. The input current on the other hand contains only odds harmonics of the input frequency other than the triplex ($3^{rd}, 9^{th}$ etc.) harmonics.

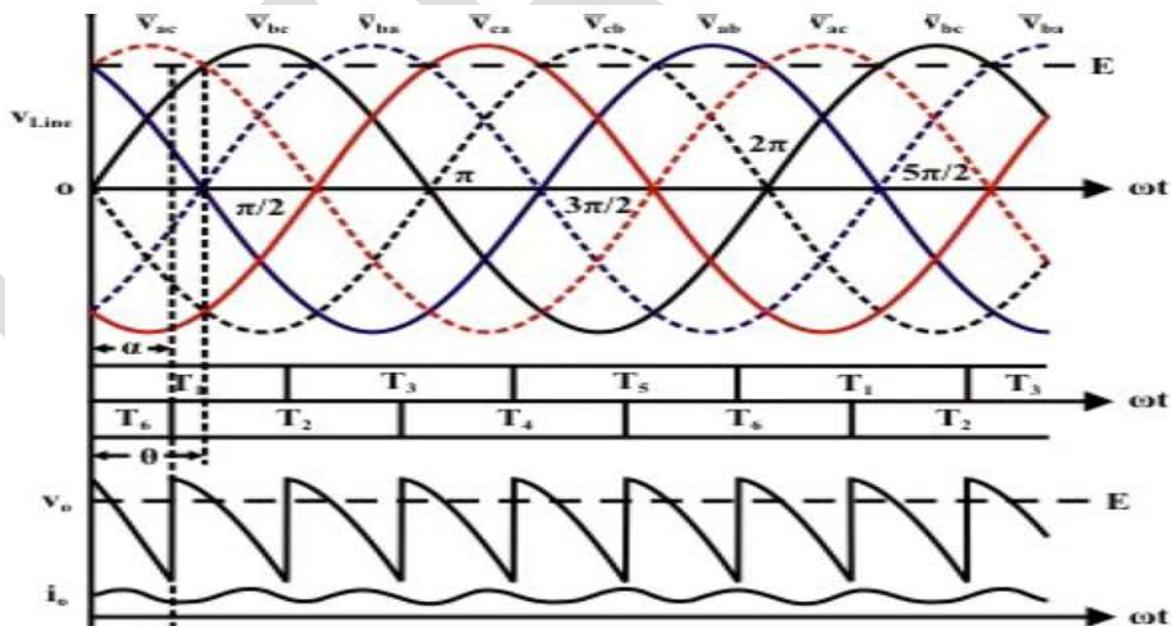


Fig.4. waveforms of three phase converter

SIMULATION- The PSIM simulation model and waveforms of three phase full controlled converter is shown if fig.5, fig.6 and Fig.7.

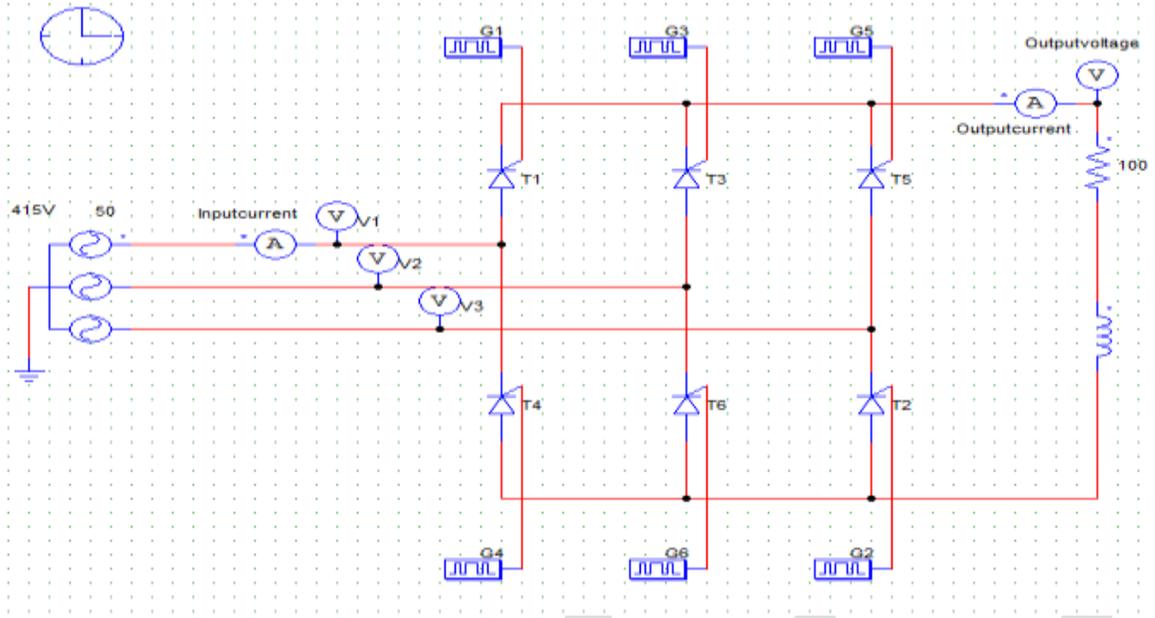


Fig.5 Simulation model of three phase full converter

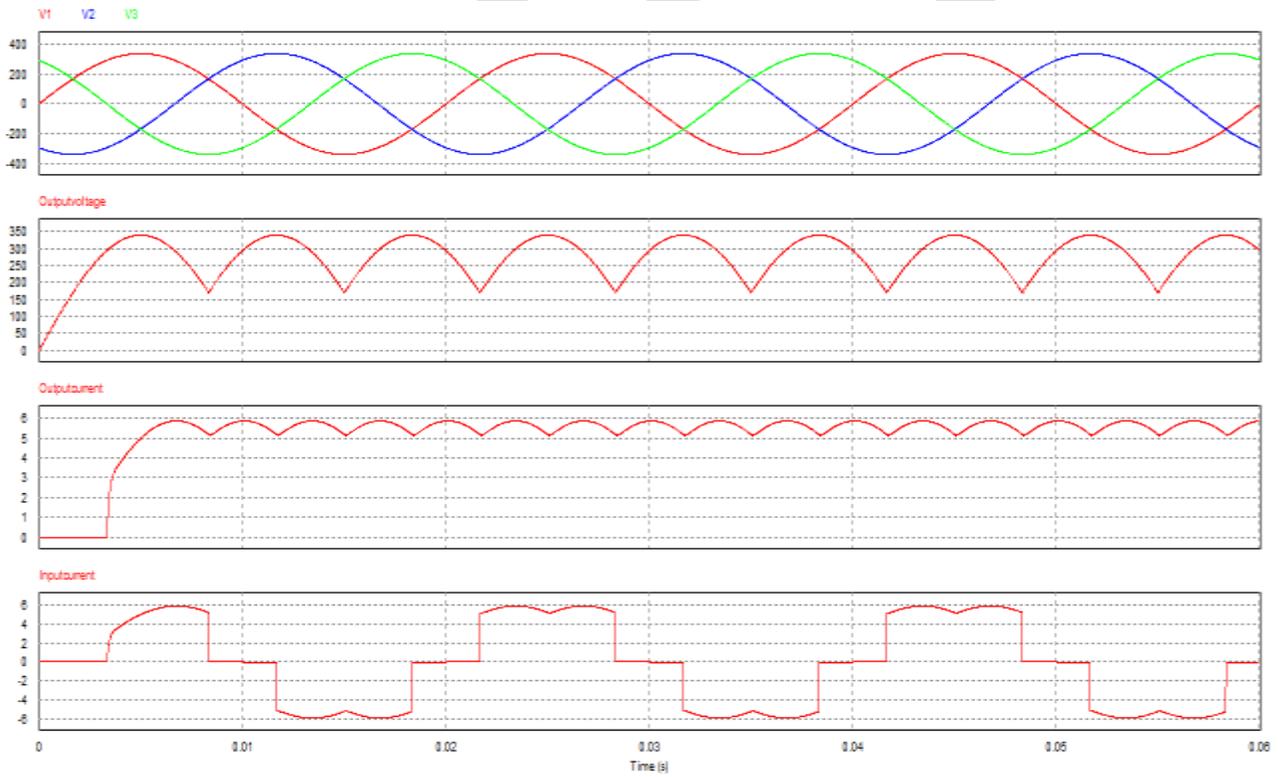


Fig.6 Simulation results: Input current, output voltage, output current, input current.

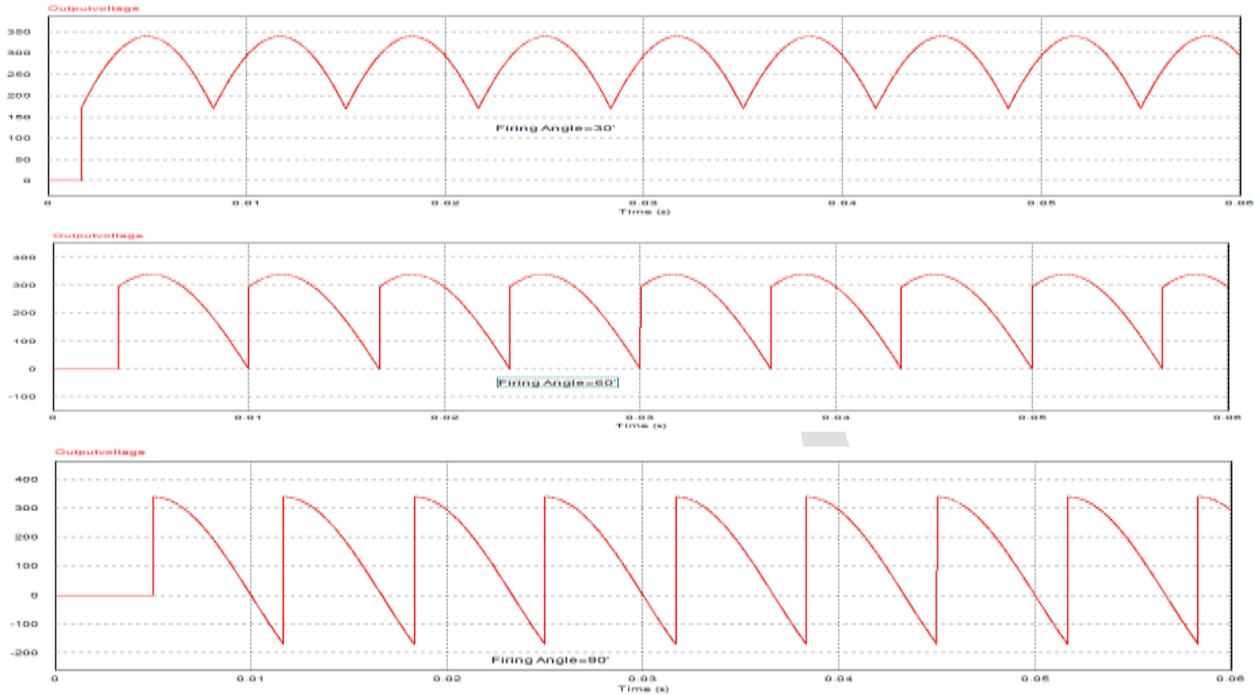


Fig.7 Simulation results: Output voltage waveforms at $\alpha=30^\circ, 60^\circ, 90^\circ$

RESULTS- The performance parameters of three phase fully controlled converter are obtained by using the simulation waveforms. The following table shows the results obtained.

Firing Angle	DF	HF	PF	Efficiency
0°	94.8%	30.5%	0.952	73.28%
30°	94.9%	30.7%	0.821	68.17%
60°	95.4%	30.7%	0.438	59.37%
90°	95.4%	30.7%	0	31.08%
120°	95.4%	30.7%	-0.447	12.68%

Table 2: Performance Parameters of Three phase full converter

CONCLUSION- As power electronic systems are getting more complex today, the simulation used for analysis is requiring more features. The performance parameters of three phase full converter were calculated by using PSIM simulation. Different types of waveforms were obtained by designing the firing circuits. The performance parameters are tabulated for various firing angles. The waveforms are obtained from the simulation are compared with the actual waveforms of three phase full converter. These results are useful where controlled dc power required.

REFERENCES:

[1] Amit Solanki, "Simulation and performance Parameters Analysis of Single-phase half controlled converter using PSIM published in International Conference at Mangalmy Institute of Engineering and Management, Delhi During 1-2nd March- 21014, (Paperback ISBN : 978-93-5156-339- 6), Online ISSN: 2230-729X).

- [2] Sameer Khader, Alan Hadad and Akram A, Abu. The application of PSIM & MATLAB /SIMULINK in Power Education Conference (EDUCON), Jordan 118-121.
- [3] "Power Simulator Software (PSIM) user guides".
- [4] Dr. P.S. Bimbhra. "Power Electronics" Khanna Publishers Fifth Edition ISBN No.-978-81-7409-279-3.
- [5] Aslam P. Memon, Ahsan Zafar, M. Usman Keerio, Waqar Ahmad Adil, Asif Ali. A . "Experimental Study and Analysis of Harmonics Generation in Uncontrolled and Controlled Rectifier Converters" International Journal of Scientific & Engineering Research, Volume 5, Issue 1, January-2014 ISSN 2229-5518.
- [6] Prof. Sabyasachi Sengupta and et.all, "NPTEL Power Electronics Notes" [Online]. Available: nptel.iitm.ac.in.
- [7] M.D. Singh, K.B.Kanchadani "Power Electronics" TMH Publishers, 2008
- [8] Bimbhra, P. S., Power Electronics, 4th Ed., Khanna Publication, 2007.
- [9] Muhammad H. Rashid, Power electronics, circuit devices and application, 3rd Ed., Pearson education Inc., 2007.
- [10] P.C. Sen, Power electronics, Tata McGraw-Hill publishing company, 2008

Study of Differential Amplifier using CMOS

Mr. Bhushan Bangadkar
PG Scholar
Electronics and Communication
Engineering
G H Raisoni Academy of
Engineering and Technology,
Nagpur, Maharashtra, India
bhushanbangadkar@gmail.com
9595058949

Mr. Amit Lamba
Assistant Professor
Electronics and Communication
Engineering
G H Raisoni Academy of
Engineering and Technology,
Nagpur, Maharashtra, India
amit.lamba@raisoni.net

Mr. Vipin Bhure
Assistant Professor
Electronics and Communication
Engineering
G H Raisoni Academy of
Engineering and Technology,
Nagpur, Maharashtra, India
vipin.bhure@raisoni.net

Abstract— The Differential amplifier is one of the versatile circuits in analog circuit design. A differential amplifier is a circuit that can accept two input signals and amplify the difference between two input signals. The circuit consists of NMOS and PMOS devices, where n-channel MOSFET is used to form differential pair and p-channel current mirror load is used. The technology used, is 0.18 μm and 1.8V supply voltage is applied. The design and simulation has been carried out in ADS tool.

Keywords— Differential Amplifier, CMOS, NMOS, PMOS

INTRODUCTION

The amplifier, which amplifies the difference between two voltages is called Differential Amplifier. It is used to provide high voltage gain and high common mode rejection ratio. It has another characteristic such as very low input bias current, very low offset voltage and very high input impedance. Differential amplifier can operate in two modes which are differential mode and common mode. Common mode type gives result of zero output while differential mode gives a result of high output, hence this amplifier has high common mode rejection ratio. If two input voltages are equal, then the differential amplifier gives an output voltage of almost zero volt and if the two input voltages are not equal the differential amplifier gives high output voltage.[1]

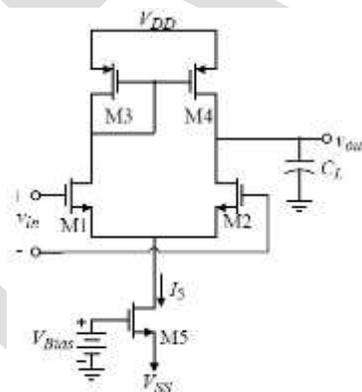


Fig.1.Circuit diagram of Differential amplifier

II. Circuit Operations

The figure shown above is an active load MOSFET differential amplifier. MOSFET M1 and M2 formed differential amplifier pair. MOSFET M5 is a current sink used to provide bias current to the amplifier. MOSFET M3 and M4 form a current mirror. Considering that all transistors are in saturation region. The Bulk of all transistor connected to their sources. The current flowing from transistor M5 is divided into two equal parts and flows through M1, M3 and M2, M4 respectively. Transistor M3, M4 connects to the V_{DD} supply, whereas transistor M5 connected to V_{SS} . The circuit is made up of NMOS and PMOS hence their design and simulation results are given below.[2]

1. NMOS

The NMOS transistor is biased with positive gate to source voltage ($V_{gs}=1.8V$) and drain to source voltage ($V_{ds}=1.5V$) whereas the body is connected to a source. The I-V characteristics show the result between I_d vs V_{ds} for different values of V_{gs} and another graph of I_d vs V_{gs} . As the gate to source voltage is positive the current I_d flows only when V_{gs} voltage is greater than the threshold voltage. The NMOS transistor is simulated using the BSIM-3 model as all parameter values are taken from model file of TSMC with 0.18 micron technology. The length of NMOS is considered as $1\mu m$ and width is $10\mu m$. After simulation, we are getting values of threshold voltage, β which will be used in future calculations.[1,2]

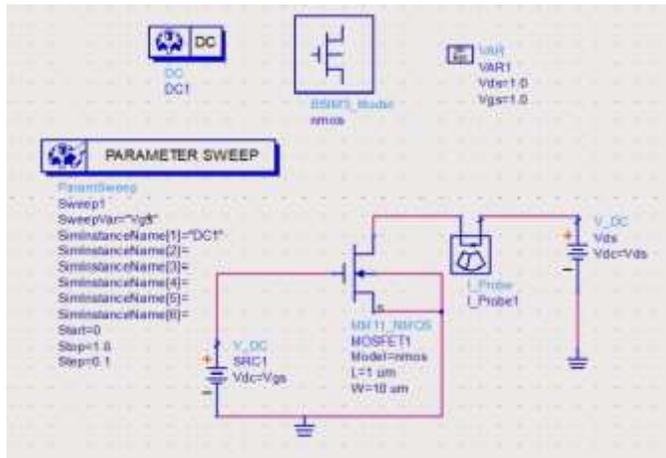


Fig.2. NMOS Design

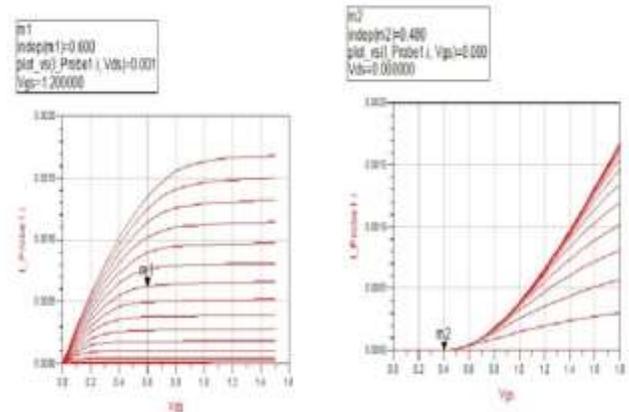


Fig.3. NMOS Simulation

The simulation result shows that when positive gate voltage is applied to NMOS with $V_{gs}=0$, I_d is non-existent even when some positive V_{ds} voltage is applied. It is found that for getting significant amount of drain current I_d , we have to apply sufficiently high positive gate voltage V_{gs} . The minimum gate to source voltage which produces an N-type inversion layer and hence drain current flows is called threshold voltage when $V_{gs}=V_t$. When $V_{gs}<V_t$, $I_d=0$. Drain current only starts when $V_{gs}>V_t$. For a given V_{ds} , as V_{gs} is increased, the virtual channel deepens and I_d increases.[4]

1. PMOS

The PMOS transistor is biased with negative gate to source voltage ($V_{gs}=-1.8V$) and drain to source voltage ($V_{ds}=-1.5V$) whereas the body is connected to source. The I-V characteristics show the result between I_d vs V_{ds} for different values of V_{gs} and another graph of I_d vs V_{gs} . As the gate to source voltage is negative the current I_d flows only when V_{gs} voltage is greater than the threshold voltage. The PMOS transistor is simulated using the BSIM-3 model as all parameter values are taken from model file of TSMC with 0.18 micron technology. The length of PMOS is considered as $1\mu m$ and width is $10\mu m$. After the simulation, we are getting values of threshold voltage, β which will be used in future calculations.[1,2]

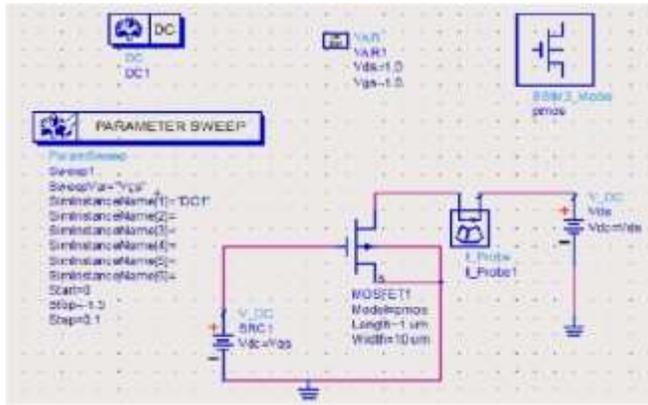


Fig.4. PMOS Design

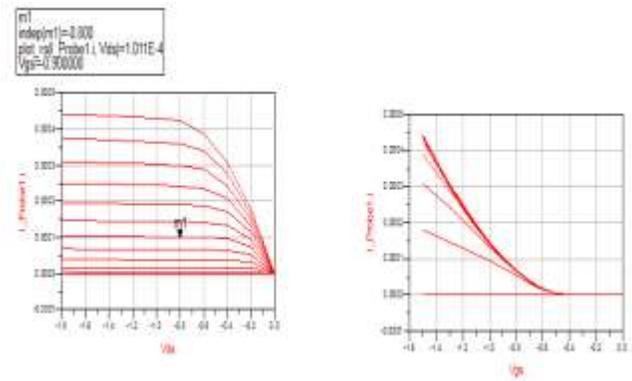


Fig.5. PMOS Simulation

The simulation result of PMOS is shows that when negative gate voltage applied with $V_{GS}=0$, I_D is non-existent even when some negative V_{DS} is applied. It is found that for getting significant amount of drain current I_D , we have to apply sufficiently high negative gate voltage V_{GS} . The minimum gate to source voltage which produce P-type inversion layer and hence drain current flows is called threshold voltage when $V_{GS}=V_t$. When $V_{GS}<V_t$, $I_D=0$. Drain current only start when $V_{GS}>V_t$. For a given V_{DS} , as V_{GS} is increased, virtual channel deeps and I_D increases

1. Differential Amplifier Design

The Differential amplifier design consists of NMOS, PMOS transistor. The NMOS current mirror circuitry is used to provide constant current to differential amplifier. Whereas all transistor body are connected to source of respective transistors. The V_{DD} supply voltage is given as 1.8V. Both input terminal of the differential amplifier i.e V_{in1} and V_{in2} connect to sine wave having $V_{dc}=0.8V$ with amplitude 1mv and $V_{dc}=0.5v$ having an amplitude 1mV with 180 phase shift respectively. The output is taken from the V_{out} terminal where 10pf capacitive load is connected. Similarly here BSIM3 NMOS and PMOS model are used to simulate differential amplifier. Considering all MOS are in saturation region. Transient analysis is done and simulation graph shows output V_{out} vs Time. For calculation of gain AC analysis also done and result shown below.[3]

From slew rate and capacitance we can find current flowing through transistor. Assuming slew rate is $10v/\mu sec$.

$$slew\ rate\left(\frac{dv}{dt}\right) = \frac{I}{CL} \quad \dots\dots\dots 1$$

By $ICMR+$ we can find (W/L) for M3 and M4 considering $ICMR+=1.6v$ and $ICMR-=0.6v$.

As M1 and M2 are in saturation region using equation $V_{ds}>V_{gs}-V_t$, as $V_t=0.4v$

The current equation in saturation region is(2 &3)

$$I_{ds} = \frac{\beta}{2(V_d - V_s)^2} \quad \dots\dots\dots 2$$

$$I_{ds} = \frac{\mu C_{ox} w}{2L(V_d - V_s)^2} \quad \dots\dots\dots 3$$

$$g_m = \frac{\partial I_{ds}}{\partial V_{gs}} \quad \dots\dots\dots 4$$

$$Gain\ bandwidth = \frac{g_m}{2\pi f C_l} \quad \dots\dots\dots 5$$

$$\frac{W}{L} = \frac{gm^2}{2I_{ds}\mu Cox} \dots\dots\dots 6$$

For calculating (W/L) ratio of M3 & M4 eq. (1&2) will used. For M1 & M2 eq.(3,4,5,6) will used and for M5,M6 eq.3 will used. Where $I_{ds6}=100\mu A$, $V_{dd}=1.8v$, Gain bandwidth=4Mhz.

$(W/L)_{1,2} = 4$, $(W/L)_{3,4} = 28$, $(W/L)_{5,6} = 5$ respectively.

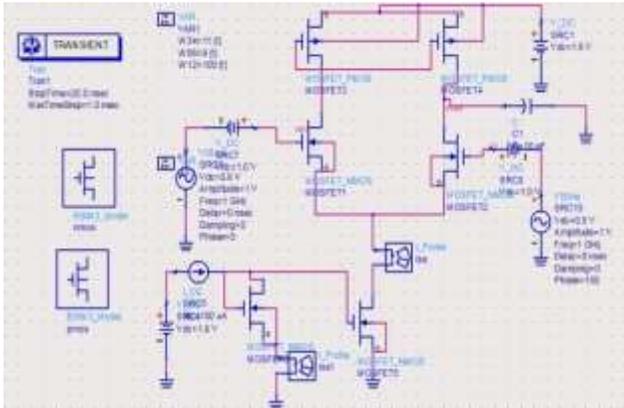


Fig.6. Transient Analysis

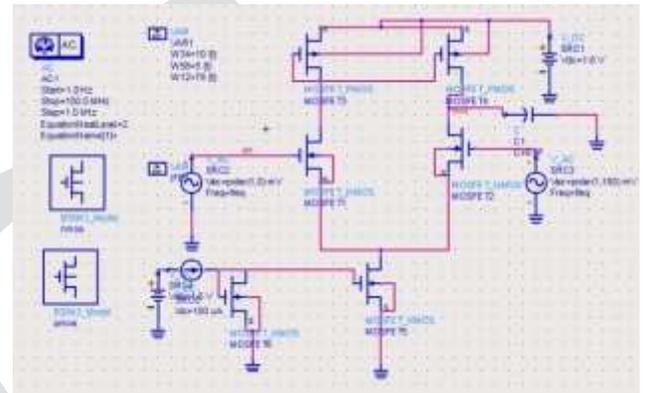


Fig.7. AC Analysis

Differential Amplifier Simulation

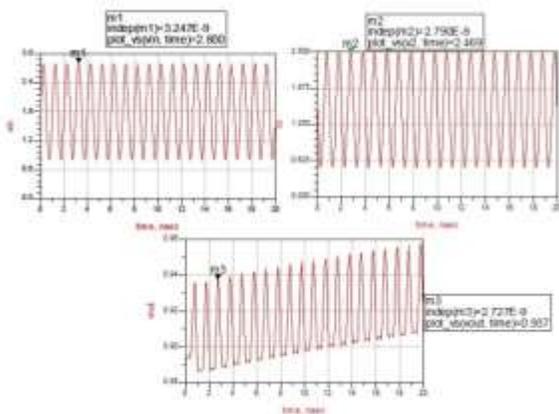


Fig.8. Simulation of Transient Analysis

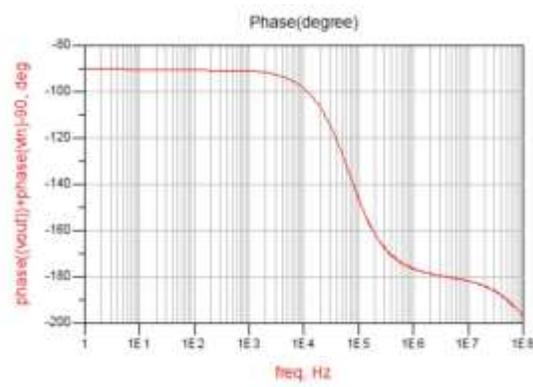
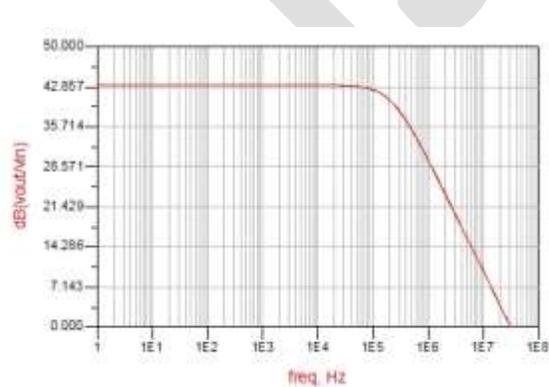


Fig.9. Simulation of AC Analysis

CONCLUSION

In this work differential amplifier is designed for the opamp application. The specifications are decided as required for OPAM application. The theoretically W/L ratios are decided for amplifier. By using this values amplifier is designed. The accuracy of results are improved by Agilent ADS.

REFERENCES:

- [13] Baker, R. J., CMOS: Circuit Design, Layout, and Simulation, Second Ed, John Wiley & Sons
- [14] Philip E. Allen, Douglas R. Holberg, CMOS Analog Circuit Design, Second Ed, oxford University Press
- [15] Jacob Millman and Arvin Grabel, "Microelectronics", second edition, McGraw-Hill International Editions, 1987.
- [16] Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits", fourth edition, Oxford University Press, 1998

A Secure Computing Environment

Avantika Dhavale¹, Aditi Halgekar², Snehal Wayse³, Pavan Kulkarni⁴

^{1 2 3} Students, Computer Department, Trinity College of Engineering, Pune.

⁴ Professor, Department of Computer Engineering, Trinity College of Engineering, Pune.

Contact Email- avantika.dhavale@gmail.com Contact number- 7387709896

Abstract

With the advent of various attack vectors on various computing devices, it is vital that we design a secure computing environment which would be resilient to such said attacks. However, there is always a tradeoff between securing a device and incorporating various functionalities into the device to make it more versatile. The more we secure a device, the tougher it becomes to add ad-hoc features to it. Moreover, this tradeoff is very subjective to the needs at hand. It is incumbent on the administrator of the said device to manage the tradeoff between securing the device and providing diverse functionality. In this paper, we describe our approach to securing a computing environment and explain our rationale. This would be of course one of the multiple layers of security with which we would secure the device.

Keywords— White-list, Hardened OS, environment, locked down OS, REL-ID,.

INTRODUCTION

A security system identifies and mitigates the system vulnerabilities, by either removing them, or restricting access to them, to a very small group. The competition between inventing new security measures to protect data and inventing hacking techniques in conjunction with discovering and leveraging pre existing vulnerabilities is infinite. Therefore, securing data and resources is becoming more and more challenging day by day.

Nevertheless, there exist several different techniques to secure the data being transferred over a network and also that on a user machine. Uniken India Pvt. Ltd. specializes in securing data in motion through the use of the patented REL-ID based mutual authentication scheme.

SSL is one such tool to secure data sent over a network, using cipher text. Using SSL data is kept confidential and message integrity is maintained. However, recently there have been network security breaches, including the famous "HEARTBLEED" bug.

But, the question that remains is "what if the user machine itself is hacked?" REL-ID by Uniken India Pvt. Ltd. can be used to ensure that the end user is secured as well as the tunnel. It also uses techniques of authentication to assure to each end user that it is communicating with an authorized user and not a fake one.

Such security measures are used to secure data in motion, meaning data that has been shared between computers. They may prove to be of minimum value, if the operating system on which it resides is compromised. It is therefore crucial to understand and remove the security flaws in the operating system itself. We, on the other hand, are trying to secure data at rest, by coming up with various approaches, one of which is application white listing.

In this paper, we will discuss ways to do this in the Linux Ubuntu operating system. Firstly, we try to harden the operating system. Hardening is a technique to reduce vulnerabilities of the existing operating system. It aims to eliminate security risks in an operating system. This is done by turning off all those services of the operating system which are not used or are risky and allowing only those which are secure for users data. Thus, this environment becomes a kind of locked down or reduce version of a fully fledged operating system.

While the services which are "turned off" in hardening may be useful or beneficial in some or other way, if through their use there exist back-doors to the system they must be shut down. Operating system hardening is a technique which allows us a security on the machine level. A hardened operating system can be considered as a smaller version of an otherwise compromised operating system.

Secondly, we implement a technique called as application white-listing. It is the technique of preparing a list of all applications that are safe to execute. All applications that excluded from this list are disallowed to spawn.

RELATED WORK

In our research related to data security we have discovered many ways to secure a transaction over a network. This research has led to an understanding of topics like PGP,PKI, various encryption algorithms like RSA,SSL. We also studied about significant ways to provide security to the end system.

Rel-Id, developed by Uniken India Pvt Ltd is one such infrastructure to secure the end system. This system along with an application is currently being used for various banking systems. In this in client server architecture both the client as well as the server are assured of the identity of the end system they are talking to. However, no matter how secure the application is, if the operating system is compromised in some or the other manner, there exist a constant threat of the data being watched or stolen or hacked.

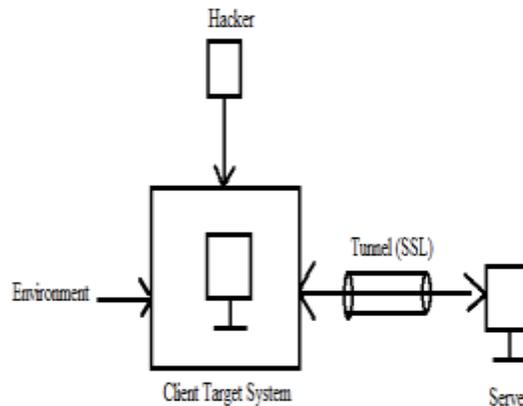


Figure 1: Secure Tunnel but Insecure End Point

METHODS

Hardening

For operating system hardening we may try to reformat the operating system and install only those parts of the operating system which are required for the users program to run. Hence hardening is depend upon the particular application for which it was done in the first place.

We may also consider disabling guest login as an added security measure. This is done because even if the guest user is not authorized, some kinds of penetration are always possible.

Also we may consider turning off services such as resource sharing, file sharing, printer sharing.

Whitelisting

In white-listing all applications that are found to be suspicious, or might be containing possible back-doors are denied permission to execute. This minimizes the threats to operating system.

This may start by preparing a list of names of applications which are safe to execute and checking the name of each spawned application against this list. If a match occurs we need not take any action. If the application name does not match with any of the supposed white-listed application, it is killed immediately. On a higher level, it should not be allowed to spawn in the first place.

RESULT AND DISCUSSION

As a result of the implementation of the above mentioned methods, we obtain a secure environment, which the user may trust for handling of confidential data. This environment can be depicted by the following figure

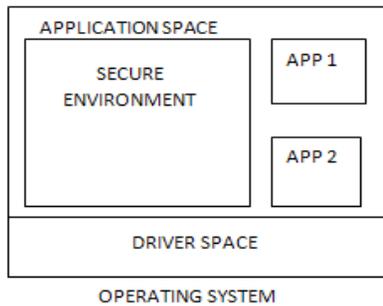


Figure 2: A secure environment

Examining the results of above mentioned methods, it became clear that unwanted applications and services of an operating system can indeed be stopped from exploiting the vulnerabilities of a system. If the operating system is in fact vulnerable to malicious applications, these methods can definitely provide a way to reduce these vulnerabilities.

CONCLUSION

Examining the results of above mentioned methods, it became clear that unwanted applications and services of an operating system can indeed be stopped from exploiting the vulnerabilities of a system. If the operating system is in fact vulnerable to malicious applications, these methods can definitely provide a way to reduce these vulnerabilities.

ACKNOWLEDGMENT

First of all, we would like to thank our guide, Prof. Pavan Kulkarni, for the motivation and guidance that he has provided us. Secondly, we thank our head, Mr. Vamshi Krishna Ramaka for his help and support. Finally, we thank our friends Miss Mehak Daftari, Miss Vrushali Deshpande, and Mt. Delwin John for their timely help and assistance.

REFERENCES:

- [1] Chunxiao Li, Anand Raghunathan, and Niraj K. Jha, "A secure user interface for web applications running under untrusted operating system" 10th IEEE International Conference on Computer and Information Technology, 2010.
- [2] Uniken Systems Pvt Ltd, <http://www.uniken.com/reliid-platform>
- [3] Bei Guan, Yanjun Wu, Yongji Wang, "A novel security scheme for online banking based on virtual machine", IEEE Sixth International Conference on software security and reliability companion, 2012.
- [4] Daojing He, Sammy Chan, Yan Zhang, Mohsen Guizani, Chun Chen, Jiajun Bu, "An enhanced public key infrastructure to secure smart grid wireless communication networks", IEEE Network, January-February 2014.
- [5] Xiongwei Xie, Weichao Wang, "Rootkit Detection on virtual machines through deep information extraction at hypervisor-level", 4th International Workshop on Security and Privacy in Cloud Computing, 2013.
- [6] Ngangbam Herojit Singh, A. Kayalvizhi, "Combining Cryptographic Primitives to Prevent Jamming Attacks in Wireless Networks"

- [7] Khoa Dang Pham, Abhishek kumar Jain, Jin Cui, Suhaib A. Fahmy, Douglas L. Maskell, "Microkernel Hypervisor for a Hybrid ARM-FPGA Platform", IEEE, 2013.
- [8] Chunxiao Li, Anand Raghunathan, and Niraj K. Jha, "A Trusted Virtual Machine in an Untrusted Management Environment", IEEE Transactions on services computing, Vol. 5, No. 4, October-December 2012.
- [9] Sujit Sanjeev, Jatin Lodhia, Raghunathan Srinivasan, Partha Dasgupta, "Protecting cryptographic keys on client platforms using virtualization and raw disk image access", IEEE International Conference on Privacy, Security, Risk and Trust, And IEEE International Conference on Social Computing, 2011.
- [10] VMware Player, <http://www.vmware.com/products/player>, 2012.
- [11] T. Garfinkel, B. Pfaff, J. Chow, M. Rosenblum, and D. Boneh, "Terra: A Virtual Machine-Based Platform for Trusted Computing," Proc. ACM Symp. Operating Systems Principles, pp. 193-206, Oct. 2003.
- [12] J. Yang and K.G. Shin, "Using Hypervisor to Provide Data Secrecy for User Applications on a Per-Page Basis," Proc. ACM Int'l Conf. Virtual Execution Environments, pp. 71-80, Mar. 2008.
- [13] Sujit Sanjeev, Jatin Lodhia, Raghunathan Srinivasan, Partha Dasgupta, "Protecting cryptographic keys on client platforms using virtualization and raw disk image access" IEEE International Conference on Privacy, Security, Risk, and Trust, and IEEE International Conference on Social Computing, 2011.
- [14] Jan Just Keijser, "OpenVPN 2 Cookbook: 100 simple and incredibly effective recipes for harnessing the power of the OpenVPN 2 networks", Edition 1, published in 2011.
- [15] Markus Feilner, Norbert Graf, "Beginning OpenVPN 2.0.9", Edition 1, published: December 2009.
- [16] Pavan Kulkarni, Aditi Halgekar, Avantika Dhavale, Mehak Daftari, Snehal Wayse, "Prototype of Computing Device That Aims TO Secure User Data on a Compromised O. S. ", IJSR, Vol. 3, Issue 10, October 2014.

WATER JET MACHINING: AN ADVANCE MANUFACTURING PROCESS

Abhishek Dixit, Vikas Dave, M.R. Baid

Department of Mechanical Engineering, JIET Jodhpur

Email: abhishek.dixit@jiетjodhpur.ac.in,

Contact number: 09799870872

Abstract: - Use of water jet has been in existence for over twenty years, but it is yet to reach its full potential in the construction industry. This study examines the role of water jet in heavy construction in general and particularly how it affects the regional contractors in the northeast. A survey was conducted among 215 civil contractors of the Northeast region of the United States and the results were documented in various categories. The paper presents aspects regarding an innovative nonconventional technology, abrasive water jet machining. The study also presents results regarding other technological operations possible to be performed with abrasive water jet.

Keywords— water jet, abrasive, nonconventional, technological, construction, innovative, industry

I. INTRODUCTION

Water jets were introduced in the United States during the 1970's, and were utilized merely for cleaning purposes. As the technology developed to include abrasive water jets, new applications were discovered. However, until recently this tool had not been used to a great extent in the construction industry.

In the battle to reduce costs, engineering and manufacturing departments are constantly on the lookout for an edge. The Water jet process provides many unique capabilities and advantages that can prove very effective in the cost battle. Learning more about the Water jet technology gives us an opportunity to put these cost-cutting capabilities to work.

Beyond cost cutting, the water jet process is recognized as the most versatile and fastest growing process in the world (as per Frost & Sullivan and the Market Intelligence Research Corporation). Water jets are used in high production applications across the globe. They complement other technologies such as milling, laser, EDM, plasma and routers. No toxic gases or liquids are used in water jet cutting, and water jets do not create hazardous materials or vapors. No heat affected zones or mechanical stresses are left on a water jet cut surface. It is truly a versatile, productive, cold cutting process.

The water jet has shown that it can do things that other technologies simply cannot. From cutting thin details in stone, glass and metals; to rapid hole drilling of titanium; to cutting of food, to the killing of pathogens in beverages and dips, the water jet has proven itself unique

II. DEFINITION AND CONSTRUCTION

Water jet machining is a mechanical energy based non-traditional machining process used to cut and machine soft and non-metallic materials. It involves the use of high velocity water jet to smoothly cut a soft work piece. In water jet machining, high velocity water jet is allowed to strike a given work piece. During this process its kinetic energy is converted to pressure energy. This induces a stress on the work piece. When this induced stress is high enough, unwanted particles of the work piece are automatically removed. The apparatus of water jet machining consists of the following components:

- a) **Reservoir:** It is used for storing water that is to be used in the machining operation.

- b) **Pump:** It pumps the water from the reservoir. High pressure intensifier pumps are used to pressurize the water as high as 55,000 psi. For the abrasive water jet, the operating pressure ranges from 31,000 to 37,000 psi. At this high pressure the flow rate of the water is reduced greatly.
- c) **Intensifier:** It is connected to the pump. It pressurizes the water acquired from the pump to a desired level.
- d) **Accumulator:** It is used for temporarily storing the pressurized water. It is connected to the flow regulator through a control valve.
- e) **Control Valve:** It controls the direction and pressure of pressurized water that is to be supplied to the nozzle.
- f) **Flow regulator:** It is used to regulate the flow of water.
- g) **Nozzle:** It renders the pressurized water as a water jet at high velocity. Once the water is pressurized, it is forced through a sapphire nozzle which is composed of the natural sapphire stone due to the strength of the stone. The diameter of the nozzle can be varied depending on the application for which the water jet is being used. A damaged nozzle leads to poor cohesion of the stream, thereby reducing the cutting ability greatly. The nozzle typically lasts 100 to 200 hours before it needs to be replaced.
- h) **Mixing Tube:** The stream of water which emerges from the nozzle is then mixed with the abrasive. This takes place in the mixing tube, which is usually constructed out of tungsten-carbide. Wear of the mixing tube, due to the abrasive, is a problem and it needs frequent replacement. When the tube becomes worn, the jet no longer is cohesive and loses power and cutting ability rapidly.
- i) **Catchers:** After the cut has been made, the water abrasive material is collected in a catcher. In a field situation there are still problems catching the waste material. Often catchers need to be custom designed for a specific job

III. WORKING OF WATER JET MACHINING

The water jet machining follows the following procedure:

1. Water from the reservoir is pumped to the intensifier using a hydraulic pump.
2. The intensifier increases the pressure of the water to the required level. Usually, the water is pressurized to 200 to 400 MPa.
3. Pressurized water is then sent to the accumulator. The accumulator temporarily stores the pressurized water.
4. Pressurized water then enters the nozzle by passing through the control valve and flow regulator.
5. Control valve controls the direction of water and limits the pressure of water under permissible limits.
6. Flow regulator regulates and controls the flow rate of water.
7. Pressurized water finally enters the nozzle. Here, it expands with a tremendous increase in its kinetic energy. High velocity water jet is produced by the nozzle.
8. When this water jet strikes the work piece, stresses are induced. These stresses are used to remove material from the work piece.
9. The water used in water jet machining may or may not be used with stabilizers. Stabilizers are substances that improve the quality of water jet by preventing its fragmentation

IV. SOME APPLICATIONS OF WATER JET MACHINING

In metal cutting, in the construction industry, the abrasive water jet will most likely be used for cutting steel beams and concrete sections. For steel, the cutting rates are slower with the water jet than for other tools, such as plasma arcs. However, often the cost is offset by the time saved by reducing or eliminating finishing steps. This is because there is no heat affected zone with the water jet. The water jet has also been able to cut through thick slabs of concrete. This will save in the cost of buying diamond tipped saws and sharpening them. Abrasive water jets are ideally suited for tough and lucrative applications such as titanium, brass, and tool steel, with aluminium and steel being the most commonly cut materials. Abrasive water jets cut material from 1/16" inch to 8" inches thick, in high or low volume. Typical part tolerances range from between 0.003" and 0.005" of an inch, although tolerances as close as 0.001" of an inch can be achieved as well. Because there is absolutely no mechanical stress, heat distortion or heat-affected zone (HAZ), secondary processing can be eliminated in many cases. Material can be stacked to increase productivity. Setup and fix Turing are complete in just minutes.

With unique ability to cut intricate design, whether you're cutting granite, marble, slate, limestone, soapstone, travertine, engineered stone or any other material for floors and counters; porcelain or ceramic tile for inlays or medallions; or glass and metal for artistic accents and signage, the abrasive water jet's unique ability to cut very intricate designs at high speed without breakage frees your imagination and expands your business.

Cutting and piercing delicate glass works is not a problem with Flow water jet technology. From cutting of intricate stained glass to piercing holes in glass, users from a variety of industries have discovered the versatility and cost-effectiveness of cutting with water jets from Flow.

Hurricane Glass is a growing area for water jets as well. New laws are requiring the installation of hurricane glass for glass windows and doors for all new construction in specific locations. Because of its composition of glass clad/polycarbonate structure, a laminate material, hurricane glass is very difficult to cut by traditional methods such as score and fracturing, or diamond saws. Flow water jets are the superior method for cutting hurricane glass! And, because Flow water jets are Omni-directional, cutting complex patterns is easy!

Water jets have changed the way the paper industry does business. Thirty years ago, paper manufacturers faced the same concerns many manufacturers have today: reliability, redundancy, 24-hour operation.

In many tissue and towel applications, water jet slitting eliminates rewinding so you save on capital equipment expense by slitting on-line. A water jet slitter can be installed directly on the machine, and the edge meets all requirements for converting operations.

Manufacturers working with the military are constantly exploring advanced applications for the latest in lightweight, high strength materials. Cutting these exotic materials can pose a serious challenge to traditional methods. However, we do it with ease.

Flow water jets effortlessly cut through the toughest materials including Super alloys, Ceramic matrix composites, Armor, Carbides, Titanium, Kevlar, Ballistic materials and more.

From automated assembly to material handling and parts feeders to state-of-the-art water jet cutting machines, Flow Robotics is a leader in developing technology designed to address manufacturing challenges head on.

V. SOME ADVANCE APPLICATIONS OF WATER JET MACHINING

Printed Circuit Boards: For circuit boards, waterjet cutting is mostly used to cut out smaller boards from a large piece of stock. This is a desired method, since it has a very small kerf, or cutting width, and does not waste a lot of material. Because the stream is so concentrated, it can also cut very close to the given tolerances for parts mounted on the circuit board without damaging them. Another benefit is that waterjet cutting does not produce the vibrations and forces on the board that a saw would, and thus components would be less likely to be damaged.

Wire Stripping: Wire stripping is another application that can be used effectively in waterjet cutting. If no abrasives are used, the stream is powerful enough to remove any insulation from wires, without damaging the wires themselves. It is also much faster and efficient than using human power to strip wires.

Food Preparation: The cutting of certain foods such as bread can also be easily done with waterjet cutting. Since the waterjet exerts such a small force on the food, it does not crush it, and with a small kerf width, very little is wasted.

Tool Steel: For abrasive water jet cutting, tool steels are one application, although a limited one. It can be very useful though because tool steel is generally very difficult to cut with conventional machining methods, and may cause an unwanted byproduct: heat. Abrasive water jets, however, do not produce heat that could alter the structure of the material being cut, and thus the strength of the tool is retained.

Wood Cutting: Woodworking is another application that abrasive water jet machining can be used for. Since wood is a softer material compared to steel, almost all wood can be cut, and the abrasive particles sand surface, leaving a smooth finish that doesn't require sanding.

Rivet Removal: Water jet cutting was found to be a feasible method for removing rivets with thicknesses less than 2 inches. At greater thickness the quality of the cut became unacceptable, and a tool that could be inserted into the cut would be needed to perform the job. It was concluded that it is conceivable to design such a tool that would allow deeper cuts without sacrificing edge quality

Paint Removal: In the United States the removal of lead-based paint from bridges is causing big problems. Traditionally, sand blasting was carried out in the open with no concern for the surrounding environment. Today many states require the complete containment of the removed produce as well as the waste generated from blasting. Water jet technology has been used successfully for coating removal

VI. ADVANTAGES AND DISADVANTAGES

The Advantages of WJM are:

- a) Water jet machining is a relatively fast process.
- b) It prevents the formation of heat affected zones on the work piece.
- c) It automatically cleans the surface of the work piece.
- d) WJM has excellent precision. Tolerances of the order of $\pm 0.005''$ can be obtained.
- e) It does not produce any hazardous gas.
- f) It is eco-friendly.

As like the advantages the WJM has following disadvantages which are:

- a) Only soft materials can be machined.
 - b) Very thick materials cannot be easily machined.
- Initial investment is high

VII. CONCLUSIONS AND LIMITATIONS

It appeared after studying the advantages and disadvantages of the waterjet, that this is a tool that the construction industry should find very useful. Unfortunately, this does not seem to be the case. Many of the regional companies do not seem to have any significant knowledge of the waterjet, thus remaining unwilling to employ this technology.

The responses that we have received have left us with the inability to comment on the cost effectiveness of the water jet in the construction industry. The majority of companies that we contacted do not employ the water jet in their companies, nor do most of them have any knowledge of the abrasive water jet. These companies seem to be conservative to new technology and unwilling to take risks. This may also be due to the fact that many companies are unwilling to invest in a new technology that is not widely used.

The contractors that do employ the abrasive water jet technology did not provide us with the percentage of cost benefit to their company.

VII. REFERENCES

- [I] Behringer -Plosonka, Catherine A., "Waterjet Cutting - A Technology Afloat on a Sea of Potential", Manufacturing Engineering, Vol. 99, Nov. 1987, pp. 37-41
- [II] Steinhauer, John, "Abrasive Waterjets: on the 'Cutting Edge' of Technology", Flow Systems, Inc.

[III] Medeot, R., "History, Theory and Practice of Hydro demolition", 5th American Waterjet Conference, Aug 1989

IV] Peart, John W., "Lead-Pigmented Paints - Their Impact on Bridge Maintenance Strategies and Costs", Public Roads, Vol. 52 Sept. 1992, pp. 47-51

[V] Ayers, Gary W., "Principles of Waterjet Cutting", Tappi Journal, Vol. 70, Sept 1993, pp. 91-94

IJERGS

Attacks and Preventions in Wireless Sensor Network

Sampada A. Khorgade, Namrata D. Ghuse

Department of Computer Science and Engineering, P.R. Pote (Patil) College of Engineering Amravati, India

sampadakhorgade111@gmail.com, 8421725251

Abstract— Wireless sensor networks have become a growing area of research and become more practicable solution to many challenging applications. Wireless Sensor Network is emerging technology with their limited energy and communication capabilities. WSN provides security and is particularly challenging and its mechanisms are also being the greatest concern to deploy sensor network and monitoring the real world application. The problem of security is due to the wireless nature of the sensor networks. Furthermore, wireless sensor networks have an additional vulnerability because nodes are often placed in a dangerous environment where they are not physically protected. The inclusion of wireless communication technology also incurs various types of security threats.

Keywords— WSN, Attacks, Prevention, Architecture, Confidentiality, Authenticity, Security.

INTRODUCTION

Sensor networks are highly distributed networks of small, lightweight wireless nodes, deployed in the system taken the measurement of physical parameters such as temperature, pressure or relative humidity. Wireless Sensor Network is a promising platform for a variety of application areas such as environmental monitoring, battlefield surveillance, and homeland security domains and many researchers willing to work on various problems related to this domain. In many applications without providing the security to WSN would result in disastrous consequences. Security allows Wireless Sensor Networks used to maintain data integrity and availability of all messages in the presence of resourceful adversaries. The main objective of confidentiality and authenticity is expected in sensor networks to safe guard the information traveling among the nodes of the network. In a typical application, a WSN is scattered in a region where it is meant to collect data through its sensor nodes. In this paper an overview on various WSN attacks are mentioned and summary on the attacks and possible preventive measures. In this it addresses the security concerns in wireless sensor networks.

I. RELATED WORK

A. WSN Architecture

In a typical WSN we see following network components [3] –

- Gateway or Access points :-

Communication between Host application and field devices is possible because of these access points.

- Network manager :-

Configuration of the network, scheduling communication between devices and management of the routing tables these are done by Network Manager.

- Security manager :-

The Security Manager is responsible for the storage, and management of keys.

Each sensor network node has typically several parts:- a radio transceiver with an internal to external connection, a microcontroller etc. Base stations are more distinguished components of the WSN with much more computational, energy and communication

resources and acts as a gateway between sensor nodes and the end user as they forward data from the WSN to a server. Many techniques are used to connect to the outside world including mobile phone networks, satellite phones, radio modems, high power Wi-Fi links etc. Figure shows the architecture of WSN.

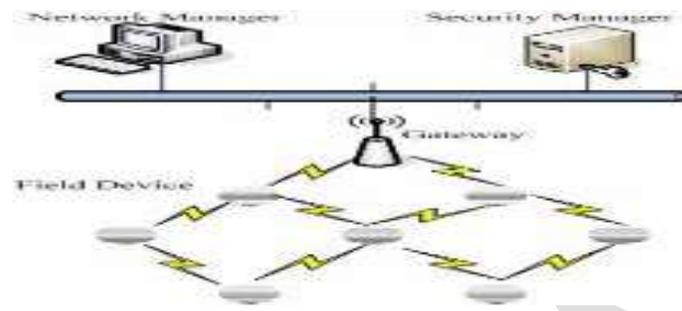


Fig 1. Architecture of WSN.

B. Types of Attacks:-

1. Denial of Service (DoS):

A Denial of Service attack in sensor networks is any event that diminishes the network's capacity to perform its desired function. The simplest DoS attack brings the resources available to the victim node by transmitting additional unwanted packets and prevent correct sensor network users from tapping resources to which these nodes are inserted [4]-[5]. This occurs by the unintentional failure of sensor nodes and malicious action. Denial of Service (DoS) attack is means that not only to destroy a sensor network, but also for any event that reduce a sensor network's capability to provide a service [4]. In WSNs, various types of Denial of Service attacks might be performed in different layers. At physical layer -the Denial of Service attacks could be jamming and tampering, at link layer-collision, exhaustion, unfairness at network layer -neglect and greed, homing, misdirection, black holes and at transport layer this attack could be performed by malicious flooding.

- **DoS prevention:**

In [4] Wood and Stankovic explained different Denial of Service (DoS) attacks that can cause problems to different layers of sensor networks. The simplest DoS attack tries to drain the resources required to the victim sensor node, by forwarding additional unwanted packets and thereby prevents legitimate sensor network users from accessing network resources to which they are authorized.

2. Wormholes Attacks:

In the network one of its node i.e. sender sends a message to another node i.e. receiver, then the receiving node attempts to send the message to its neighbors. The neighboring node thinks the message was sent from the sender node so they attempt to send the message to the starting node, but it does not arrive as it is far. Wormhole attacks are difficult to encounter because routing information supplied by a node is difficult to verify. Wormhole attack is a noticeable threat to wireless sensor networks; because this kind of attack does not require a sensor in the network rather it could be performed even at the starting phase when the sensors start to discover neighboring information [6].

- **Wormhole attack prevention:**

The mechanism to overcome the wormhole attack include DAWWSEN [7] a proactive routing protocol which is based on the construction of a hierarchical tree where root node and leaf node is present where the base station is the root node, and the sensor nodes are the leaf nodes of the tree. Advantage of DAWWSEN is it does not require any geographical information about the sensor nodes.

3. The Sybil attack:

In Sybil attack a single malicious node will appear to be a set of nodes i.e. the attacker can appear in multiple places at a time, by creating fake identities of nodes located at the edge of the communication range will send the false information to a node in the network. The false information can be the position of nodes, signal strengths, pretending nodes that do not exists [8]. Insider attack can prevent by public key cryptography but it is too expensive to be used in a networks. And the outsider attack can be prevented by authentication and encryption techniques by launching a Sybil attack on the sensor network. In WSN the routing protocols in network has a unique identity. The figure demonstrates Sybil attack where an attacker node 'AD' is present with multiple identities. 'AD' appears as node 'F' for 'A', 'C' for 'B' and 'A' as 'D' so when 'A' wants to communicates with 'F' it sends the message to 'AD'.

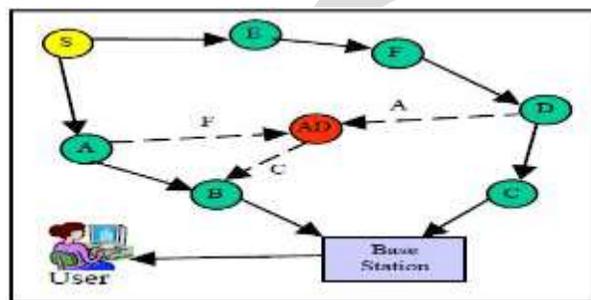


Fig 2. Sybil Attack

- **Sybil prevention:**

For preventing against the Sybil attack the mechanism is to utilize the identity certificates [9]. Unique information is assigned to each sensor node before any deployment. The server then creates an identity certificate binding the nodes identity to the assigned unique information and downloads the information into the node. To securely demonstrate its identity, a node first shows its identity certificate, and then proves that it possesses the associated unique information. This process requires the exchange of several messages. This way the Sybil attack gets prevented.

4. HELLO flood attacks:

An attacker sends or replays a routing protocol's HELLO packets from one node to another. This attack uses HELLO packets as a weapon to convince the sensors in WSN. This attack can be caused by a node which sends a Hello packet with very high power, so that a large number of nodes in the network can able to choose its parent [6]. All messages now need to be routed multi-hop to this parent. The figure demonstrates how the attacker node 'AD' broadcast hello packets to convince nodes in the network as neighbor of 'AD'. Though some nodes like I, H, F are far away from 'AD' they link 'AD' as their neighbor and try to forward packets, through it which results in wastage of energy and data loss.

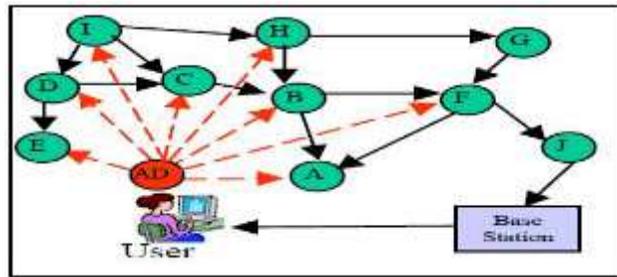


Figure 3. HELLO flood attack

- **Hello flood attack prevention:**

To avoid Hello flood attack requires checking of bidirectional link, so that the nodes ensure that they can reach their parent within one hop. To prevent the hello flood attack cryptographic technique is employed [9]. This technique uses two sensors as same secret key. During the communication the new encryption key is generated. This ensures that only reachable nodes can decrypt and checks the message and thereby prevents the adversary from attacking the sensor network. The disadvantage of this technique is that any attacker can spoof its identity and then starts attacks.

5. Sinkhole attacks

Sinkhole attacks are difficult to encounter because routing information supplied by a node is difficult to identify. As an example, a laptop-class adversary has a strong power radio transmitter that allows it to provide a high-quality route by transmitting with enough power to reach a wide area of the network. In this case a compromised sensor node tries to influence the information to it from each and every neighboring node. In this attack, a malicious node acts as a black hole to attract all the traffic in the sensor network. In fact, this attack can affect even the nodes those are considerably far from the base stations. Figure shows the conceptual view of a black hole or sinkhole attack.

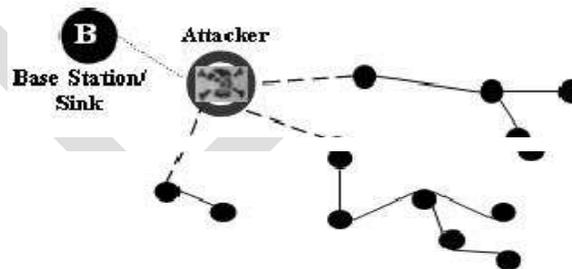


Fig 4. Sinkhole attack

- **Sinkhole prevention:**

One class of protocols resistant to these attacks is geographic routing protocols. These attacks are difficult to resist. Geographic protocols construct a topology on demand using only localized interactions and information and without initiation from the base station [11].

6. Passive Information Gathering Attack:

The information if it is not encrypted intruder with an appropriately powerful receiver and well-designed antenna can easily pick off. Strong encryption technique is needed to minimize the threats of Passive Information. Interception of the messages which contains the physical locations of sensor nodes allows an attacker to locate the nodes and destroys it. [12] - [13].

- **Passive information gathering prevention:**

To minimize the threats of passive information gathering, strong encryption techniques need to be used.

CONCLUSION

All of the previously mentioned security threats, the Hello flood attack, wormhole attack, Sybil attack, sinkhole attack, serve one common purpose that is to compromise the integrity of the network they attack. Although some solutions have already been proposed, there is no single solution to protect against every threat. In our paper we mainly focus on the security threats in WSN. We have presented the summery of the WSNs threats affecting different layers along with their defense mechanism. We conclude that the defense mechanism presented just gives guidelines about the WSN security threats; the exact solution depends on the type of application the WSN is deployed for.

REFERENCES:

- [1] Jamal N. Al-Karaki& Ahmed E. Kamal, (2004) "Routing Techniques in Sensor Networks: A survey", IEEE communications, Volume 11, No. 6, Dec. 2004, pp. 6-28.
- [2] M. Tubaishat, S. Madria, (2003) "Sensor Networks : An Overview ", IEEE Potentials, April/May 2003
- [3] International Journal of Information & Computation Technology. ISSN 0974-2239 Volume 4, Number 8 (2014).
- [4] A.D. Wood and J.A. Stankovic, (2002) "Denial of Service in Sensor Networks," Computer, vol. 35, no. 10, 2002, pp. 54–62.
- [5] David R. Raymond and Scott F. Midkiff, (2008) "Denial-of- Service in Wireless Sensor Networks: Attacks and Defenses," IEEE Pervasive Computing, vol. no. 1, 2008, pp. 74-81.
- [6] ZawTun and AungHtein Maw,(2008),"Worm hole Attack Detection in Wireless Sensor networks", proceedings of world Academy of Science, Engineering and Technology Volume 36, December 2008, ISSN 2070-3740.
- [7] Rouba El Kaissi, AymanKayssi, Ali Chehab and ZaherDawy, (2005)'DAWSEN: A Defense Mechanism against Wormhole attack In Wireless Sensor Network", Proceedings of the Second International Conference on Innovations in Information Technology (IIT'05).
- [8] Adrian Perrig, John Stankovic, and David Wagner, (2004) "Security in wireless sensor networks", Commun.ACM,47(6):53-57.
- [9] J. R. Douceur, (2002) "The Sybil Attack," in 1stInternational Workshop on Peer-to-Peer Systems (IPTPS'02).
- [10] ZoranS.Bojkovic, Bojan M. Bakmaz, and Miodrag R. Bakmaz, "Security Issues in Wireless Sensor Networks", International Journal of Communication, Issue 1, Volume 2, 2008
- [11] M. Zorzi and R. R. Rao, (2003) "Geographic Random Forwarding (GeRaF) for Ad Hoc and Sensor Networks: Multihop Performance," IEEE Transactions on Mobile Computing, vol. 2, no. 4, pp. 337-348, 2003.

- [12] Al-Sakib khan Pathan et.al, (2006) "Security in wireless sensor networks: Issues&challenges" in feb.20 22, 2006, ICACT2006, ISBN 89-5519-129-4 pp(1043-1048)
- [13] C. Karlof and D. Wagner, (2003). "Secure routing in wireless sensor networks: Attacks and counter measures," AdHoc Networks Journal, vol.1,no.2-3, pp.293-315, September 22, 2006, ICACT2006, ISBN 89-5519-129-4 pp(1043-1048).

IJERGS

Performance of 14nm SOI FinFET with ZrO₂ dielectric: A Comparative Study

PushpaK¹, Dr.Kiran Bailey², Sowmya Sunkara³

¹M.Tech student, BMSCE, Bangalore

²Asst.Professor, Department of ECE, BMSCE, Bangalore

³Asst.Professor, Department of ECE, BMSCE, Bangalore

Email:- pushpaachar@gmail.com

Abstract— In this work the High-K dielectric material Zirconium Dioxide (ZrO₂) has been used as the gate oxide in 14nm SOI FinFET structure. The Sentaurus TCAD simulations are used to examine the impact of a High-K gate dielectric on the device short channel performance and scalability of nanoscaleTrigateFinFET. The simulations performed on the device shows that gate leakage is significantly reduced which results in further possible device scale down. The device performance is compared with the conventional structure in which SiO₂ is used as dielectric material. The process variability analysis has been done on both the structures.

Keywords— Zirconium dioxide, SOI FinFET, High K dielectric, gate leakage, TCAD, Process variability, DoE.

INTRODUCTION

Over the past few decades it has been attempted to reduce the size of transistors on the basis of Moore's Law, which states that the number of transistors per chip doubles every 18 months. But this reduction in the transistor dimensions is obstructed by the short-channel effects. The FinFETs are the promising candidates to replace conventional planar MOSFETs[1]. The leakage current of the device has been increasing with the continuous device scaling resulting on a huge increase in static power dissipation which became a significant portion of the power dissipation in CMOS circuits. Therefore High-K is needed to replace SiO₂ to reduce the gate leakage current, thus reducing the static power dissipation. Different types of High-K materials are barium strontium titanate (BST), tantalum oxide (Ta₂O₅), titanium oxide (TiO₂), hafnium oxide (HfO₂), zirconium oxide (ZrO₂), silicon nitride (Si₃N₄) and aluminium oxide (Al₂O₃). The problems in selecting High K include defects in the material that lead to undesired transport through the dielectrics and trapping-induced instabilities. These problems can be minimized by inserting a thin SiO₂ interfacial layer between the silicon substrate and the High-K Dielectric [2]. The earlier studies show that Hafnium based and Zirconium based materials are compatible with Silicon. The novel material ZrO₂ has a dielectric constant of 23[4].

FINFET STRUCTURE

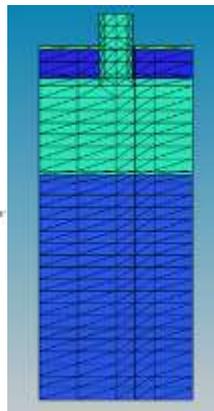
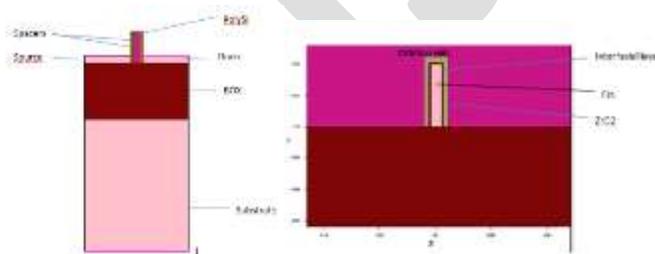


Fig. 1. Schematic showing the 3-D FinFET

Fig. 2. Meshing in Sentaurus Structure Editor

Fig.1 shows the structure of 14nm SOI FinFET created using Sentaurus TCAD tool. Fig.2 is the meshing of the device, to apply suitable physical models and corresponding current equations on the device.

Table 1 Device Design Specifications

Parameters	Values
Length of the gate (Lg)	14nm
EOT	0.82nm
Thickness of fin (Tfin)	4nm
Doping Concentration of source and drain (cm ⁻³)	1e+20
Doping Concentration for Channel(cm ⁻³)	1e+16
Dielectrics Used	SiO ₂ ,ZrO ₂

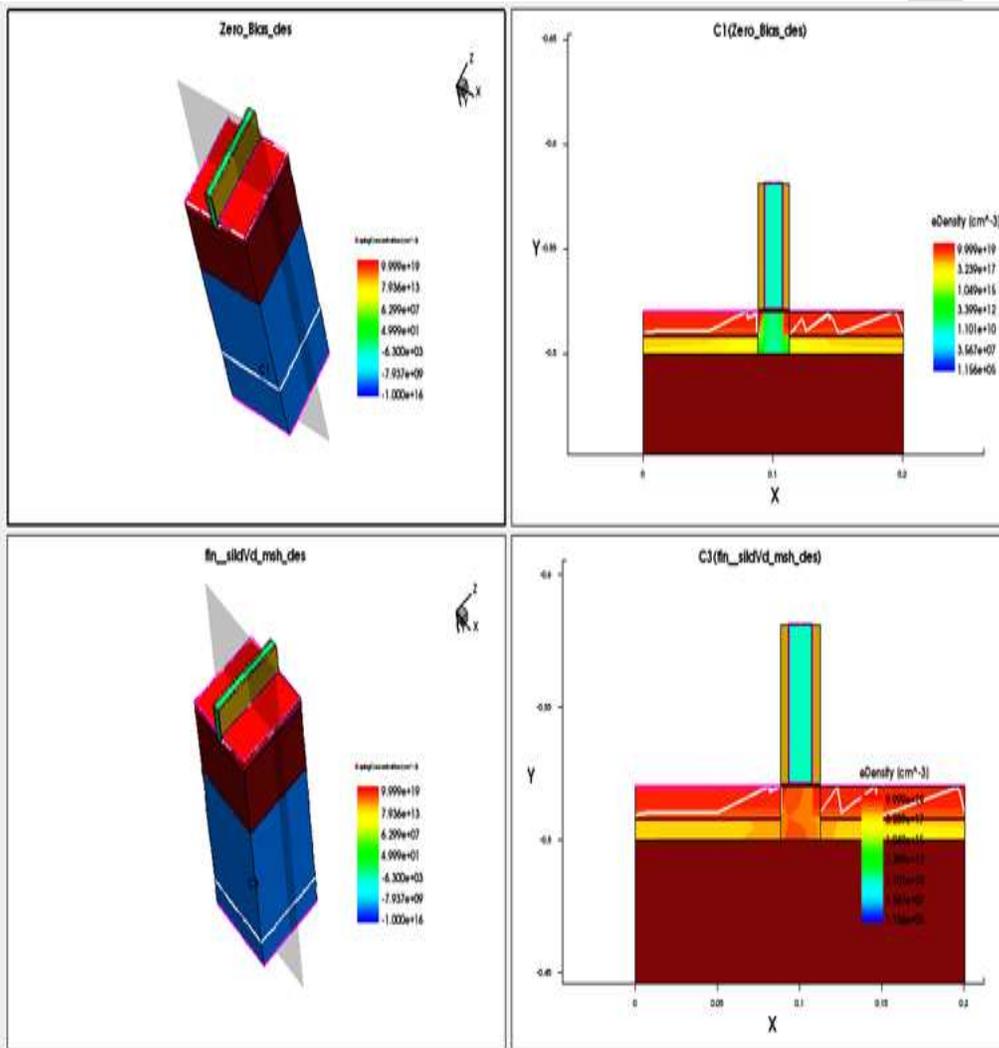


Fig. 3. Electron Density in channel at $V_g=0v$ and at $V_g=0.8$

Fig.3 shows how channel is formed below the gate for $V_g=0.8V$ (Electron Density)

RESULTS AND DISCUSSION

DC Analysis

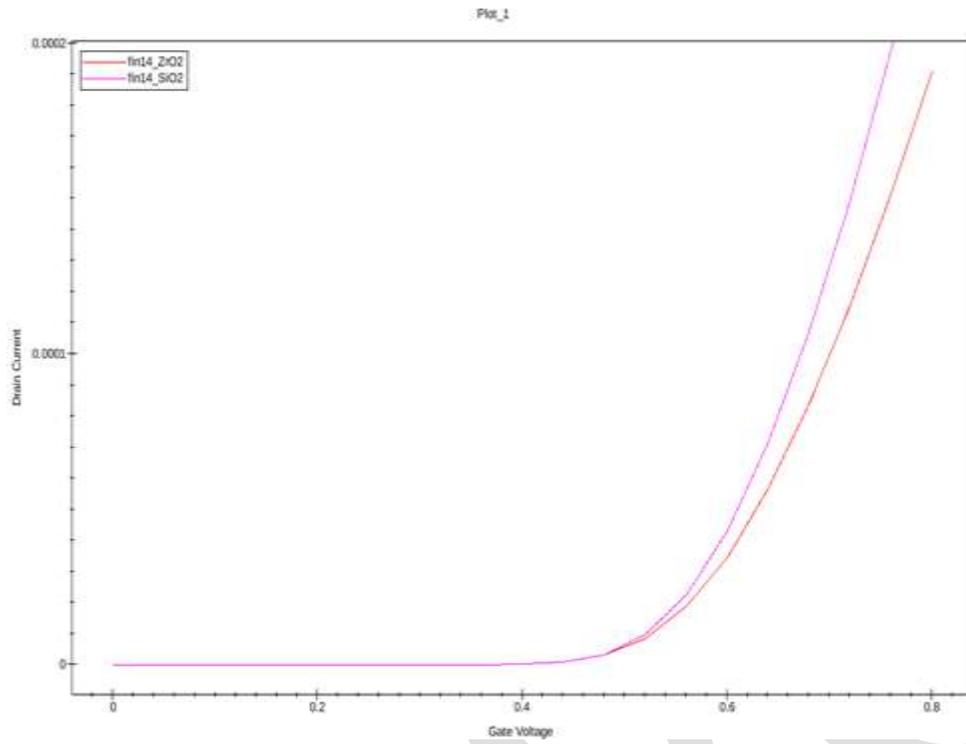


Fig. 4. I_d - V_g Characteristics

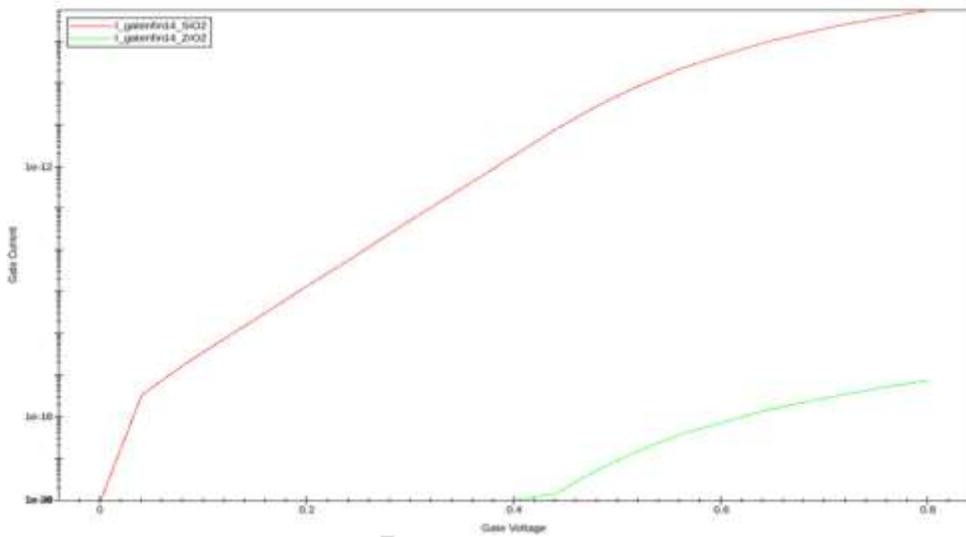


Fig. 5. Gate leakage current Vs Gate voltage

Small Signal AC Analysis

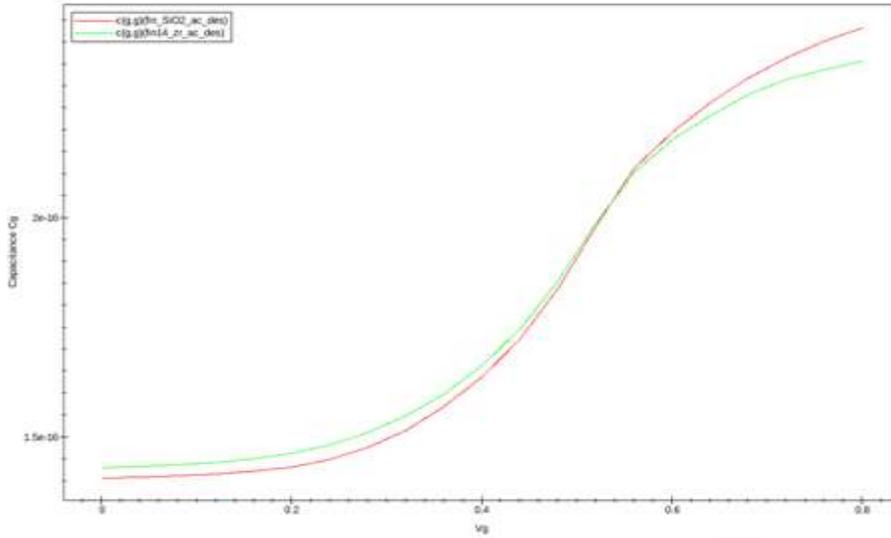


Fig. 6.Capacitance Curve

The characteristics of these devices can be plotted using svisual or inspect. Fig.4 Id vs Vg and Fig.5 IgVs Vg are the results of DC analysis in which both ZrO2 as well as SiO2 dielectric FinFETs are compared. Another important AC characteristic which gives Gate capacitance is shown in the Fig.6 .

Table 2.Comparison of Results

FinFET	Gate Oxide	
	SiO2	ZrO2
Threshold Voltage(V)	0.604528	0.598723
Gmax	0.001272	0.000941
Ion(A)	0.0002514	0.0001912
Rout(Ω)	9.56E+07	8.01E+07
Ron(Ω)	0.747161	1.01684
DIBL	0.0240247	0.026483
SS(mV/dec)	64.118	65.135
Ioff(A)	1.2299E-13	1.4846E-13
Gate Leakage Current(A)	5.67E-09	7.70E-18

3.3 Process Variability Analysis

Process variation is quite natural in the attributes of transistors when integrated circuits are fabricated. It becomes especially important at smaller process nodes (<60nm). In this work Channel length, Width of the Fin, Oxide thickness, Height of the Fin and Channel doping are the process parameters. The variations will strongly impact the performance metrics of a circuit, such as delay, dynamic power and static power consumptions, which may exhibit greater variability leading to the degradation of yield, increased cost and time to market in modern technologies and their applications.

TABLE 3. Geometric Corner Values of Process Variations For Process Parameters

Process parameters	Nominal Values	Deviation from the nominal values[4]	Range of values(in nm)
L_g	14	10%	12.6 – 15.4
W_{fin}	4	20%	3.2 – 4.8
T_{ox}	0.82	10%	0.738 – 0.902
H_{fin}	20	12%	17.6 – 22.4
$N_{ch}(cm^{-3})$	1×10^{16}	10%	0.9×10^{16} – 1.1×10^{16}

3.4 Design of Experiments

A systematic method for experiment planning is used in this technique in order to conduct the experiments in an efficient way and help construct empirical models from which the output responses can be determined as a function of the input factors or parameters.

3.4.1 Full factorial design

Full factorial design is one of the most basic techniques in experimental design. In this method, all of the possible combinations of the main parameters or factors and their interactions are considered. Two-level factorial designs are the most widely used method for modelling main effects and interactions as they need a smaller number of experimental runs compared to higher order factorial designs.

In this work, the 5 factors are gate length, width of the fin, Oxide thickness, height of the fin and channel doping. Therefore the total number of experiments equal to 32. The following Table.3 shows the result analysis of 2 level full factorial designs on device responses.

The TABLE.4 shows that the variation of Length of the channel, Oxide thickness and Width of the fin affect more on the performance of the devices.

TABLE 4. Results of Full Factorial Design Analysis

Parameters	Dielectric		Variance
	SiO ₂	ZrO ₂	
V _{th} (V)	0.61 +1.701E-3*A +4.367E-3*B -1.165E-3*C	0.6 +1.535E-3*A -2.137E-3*B -1.515E-3*C	* Effect of variation of L_g and W_{fin} on V_{th} is more in SiO ₂ than ZrO ₂ dielectric. * Effect of variation of T_{ox} on V_{th} is less in SiO ₂ than ZrO ₂ dielectric.
Ion(A)	2.565E-4 -1.0512E-5*A +2.22E-5*B -1.084E-5*C	2.35E-4 -2.757E-5*B -1.1E-5*C	* Effect of variation of L_g on Ion is more in SiO ₂ . * Effect of variation of W_{fin} and T_{ox} on Ion is more in ZrO ₂ .
DIBL	0.024 -1.537E-3*A +2.775E-3*B +1.21E-3*C	0.027 -1.638E-3*A +2.937E-3*B +2.812E-3*C	* Effect of variation of L_g , W_{fin} and T_{ox} on DIBL is more in ZrO ₂ .
SS(mV/dec)	64.17 -0.34*A +0.53*B +0.29*C	65.30 -0.44*A +0.53*B +0.66*C	* Effect of variation of L_g and T_{ox} is more on SS in ZrO ₂ .
Gate Leakage(A)	gate leakage = +2.082E-008 +1.319E-008 * A -1.173E-008 * B -1.917E-008 * C +1.397E-008 * D -1.245E-008 * AB -1.306E-008 * AC +1.263E-008 * AD +1.191E-008 * BC -1.207E-008 * BD -1.380E-008 * CD +1.246E-008 * ABC -1.248E-008 * ABD -1.262E-008 * ACD +1.209E-008 * BCD +1.248E-008 * ABCD	Sqrt(Gate leakage) = +3.623E-008 +1.579E-009 * A -3.609E-008 * C +2.109E-009 * D -1.573E-009 * AC -2.100E-009 * CD	* Effect of Variation of all the factors (except channel doping) on gate leakage is more in SiO ₂ . * Gate length is less effective in ZrO ₂ . * Effect of interactions also less in ZrO ₂ .
I _{off} (A)	I _{off} = +1.415E-013 -3.283E-014 * A +6.291E-014 * B	I _{off} = +1.825E-013 -4.777E-014 * A	* I _{off} is affected more by variation of L_g in ZrO ₂ . * Changes in W_{fin} will not affect much on I _{off} in ZrO ₂ .

The below Figures shows the performance dependency on the 3 important factors A-channel length, B-width of the fin and Oxide thickness C-Tox .

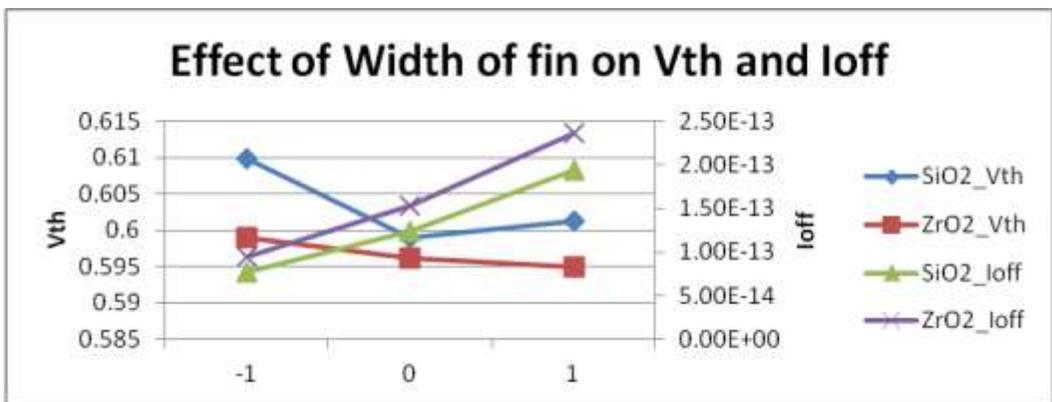


Fig.7.Width vs Vth and Ioff

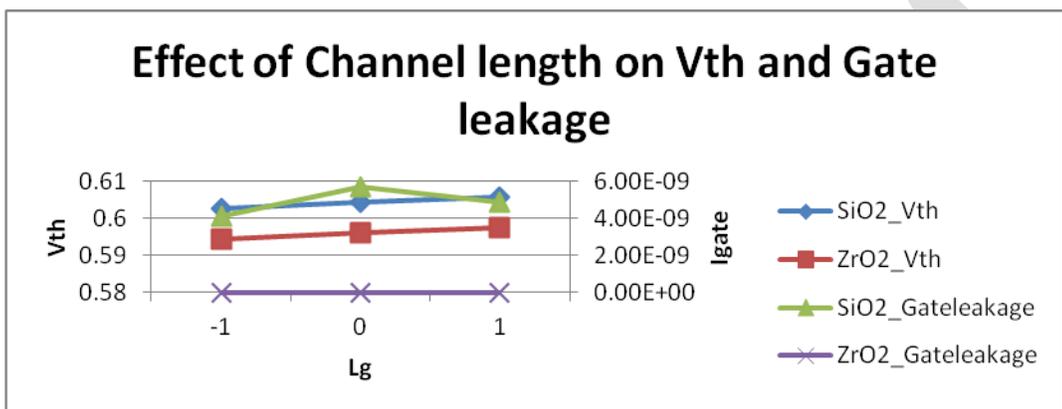


Fig.8.Channel length vs Vth and Igate

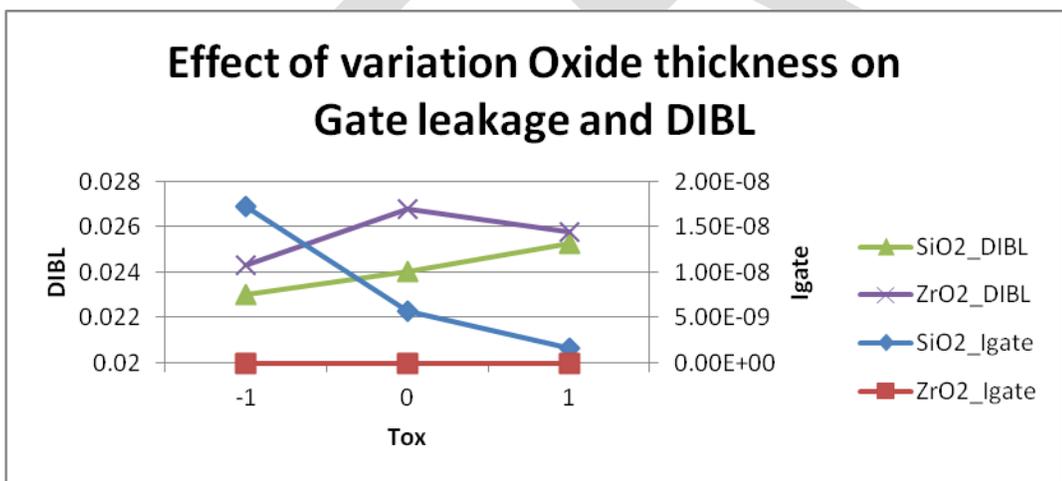


Fig.9.Channel length vs Vth and Igate

Acknowledgment

The authors wish to acknowledge the support of BMS college of Engineering in providing TCAD tool to make the simulation possible.

CONCLUSION

The above analysis shows that effect of variation of channel length on Vth, Ion and gate leakage in ZrO2 dielectric is less compared to SiO2 dielectric. Similarly the effect of width of the fin will not affect the responses Ioff, gate leakage and Vth much in ZrO2. The overall conclusion of the work is the use of High K material ZrO2 reduces the gate leakage current considerably with less variance effect on the responses like Vth, Ion and Gate leakage of the device. This work can be used for further device scale down.

REFERENCES:

- [1] DighHisamoto, Wen-Chin Lee, JakubKedzierski, Hideki Takeuchi, Kazuya Asano, Charles Kuo, Erik Anderson, Tsu-Jae King, Jeffrey Bokor, Chenming Hu,"A Self-Aligned Double-Gate MOSFET Scalable to 20 nm" *IEEE Trans. Electron Devices*, vol. 48, pp. 2861–2869, Dec. 2001.
- [2] G.Ribes, J. Mitard, M. Denais, S. Bruyere, F. Monsieur, C. Parthasarathy, E. Vincent, and G. Ghibaudo," Review on High-k Dielectrics Reliability Issues," *IEEE Trans. Electron Devices*,and reliability.vol.5, no.1, march 2005.
- [3] NagaratnaShanbhag, Kiran Bailey, Dr. K.S. Gurumurthy,"Process Variability Analysis in 14-nm SOI FinFETInverters,"*International Journal ofScience,Engineering and Technology Research (IJSETR)*, Volume 3, Issue 5, May 2014.
- [4] D. Nirmal and P. VijayaKumar,"Fin Field effect Transistors Performance in Analog and RF for High-k Dielectrics," *Defence Science Journal*, Vol. 61, No. 3, pp. 235-240,May 2011.
- [5] International Technology Roadmap for Semiconductors, 2012 updates.
- [6] Lucian Shifren et al., "Predictive Simulation and Benchmarking of Si and GepMOSFinFETs for Future CMOS Technology", *IEEE Transaction on Electron Devices*, vol. 61, no. 7, July 2014.
- [7] S.mittal et al., "Epi Defined (ED) FinFET: An alternate device architecture for high mobility Ge channel integration in PMOSFET"IEEE 2013.
- [8] KhairulAffendiRosli et.al., "A Comparative Study on SOI MOSFETs for Low Power Applications", *Research Journal of Applied Sciences, Engineering And echnology* 5(8):2586-2591, 2013 ISSN: 2040-7459; e-ISSN: 2040-7467©Maxwell Scientific Organization, 2013.
- [9] Chen et al., "High-performance III-V MOSFET with nanostacked high-k gate dielectric and 3D fin-shaped structure" *Nanoscale Research Letters* 2012.
- [10]Ramanathan et al.,"CMOS-Compatible Vertical-Silicon-Nanowire Gate-All-Around p-Type Tunneling FETs With \leq 50-mV/decade SubthresholdSwing"IEEE *Electron Device Letters*, vol. 32, no. 11, November 2011.
- [11]Stephen W. Bedell et.al., "Mobility Scaling in Short-Channel Length Strained Ge-on-Insulator P-MOSFETs"IEEE *Electron Device Letters*, vol. 29, no. 7, July 2008.
- [12] Two-Dimensional Analytical Threshold VoltageModel of Nanoscale Fully Depleted SOI MOSFETWith Electrically Induced S/D Extensions.IEEE *Transaction on Electron Devices* Vol. 52, NO. 7, July 2005.

INVESTIGATIVE STUDY ON IMPACT STRENGTH VARIATION IN DIFFERENT COMBINATION OF POLYMER COMPOSITES

Bhanu praksh N1*, T. Madhusudhan2*

1Mechanical Department, M.Tech student, Machine Design, 2 Mechanical Department, H.O.D,

*S J B Institute of Technology, Visvesvaraya Technological University, Belagavi, Karnataka, India.

(bhanuprsh2901@gmail.com, mechhod@sjbit.edu.in)

Abstract - The present work describes the development of impact strength of different types of polymer composites with glass fiber reinforcement, epoxy resin and different filler ranging from fibers, particulates and flakes. The results shows that out all other type of reinforcement the epoxy resin with glass fiber reinforcement and filler materials shows the better results than epoxy resin with any other type of reinforcement . The experiments were conducted for different mechanical characteristics of polymer composites but in the present study are fully concentrated on the impact strength of the composites. This study is only restricted to the glass epoxy composites with different filler the composites polymer composites consisting of glass fiber reinforcement, epoxy resin and filler materials

Keyword: Composite material, aircraft, Woven glass/epoxy, aspect ratio, impact strength, fiber orientation, filler, flakes, hybrid composites

Introduction

Composites materials have found wide range of application in modern day engineering and day to day life. In composite material polymer composites play a vital role in aeronautical field applications. Among that impact strength of the composites materials also play a vital role in automobile and aeronautical field. Among the polymer composites there are two types one is thermoset polymer and other is thermosetting polymer composites. Epoxy resin is in one of the thermosetting polymer resin and it has higher durability strength and most commonly used resin. Glass fibers of different grade are available for the fabrication of composites as a fiber reinforcement generally E glass fiber used for hand layup fabrication technique. Sic carbide has very good thermal stability and mechanical strength and hence it can be used to enhance the mechanical property of the composites. Generally hybrid composites show higher strength than single fiber reinforced composite. Higher composites are of two two they can be either multiple type of fiber reinforcement or fiber reinforcement along with filler can be used The impact strength is defined as the ability of a material to absorb impact energy or shock without breaking. The impact energy is calculated as the ratio impact energy absorbed to cross-section area of the specimen. Impact energy of the composite plates is calculated using Charpy or Izod impact test.

Literature survey

- 1.glass fiber reinforced polymer composites are frequently used now a days for engineering applications such as aerospace, automotive and marine application where mechanical and tribological properties are of primary concern. [3]
- 2.The performance of the composites can further be improved by adding particulate fillers to them. In the present investigation, physio-mechanical, two-body abrasive wear and analysis of glass-fiber reinforced epoxy composites filled with different proportion of graphite powder / alumina oxide are studied. [2]
- 3.As comparison, physio-mechanical ,two-body abrasive wear and fem analysis of unfilled G-E composites are evaluated under identical test conditions. Physio-mechanical properties such as density, hardness, tensile properties are investigated accordance with ASTM standards. [1]
- 4.Two-body abrasive wear test with different loads and abrading distance should be performed at room temperature by using a pin on a disc apparatus. The experiments must be evaluated by using Taguchi's experimental design approach to make a parametric analysis of wear behavior of selected composites must be studied. [1]

Specimen preparation

All the materials in the present study are prepared by hand layup technique which is the oldest method used to fabricate the laminated composites. The materials used are epoxy as the resin and the glass fiber as the reinforcement with different filler material combination. The resin material used was (Lapox L-12) matrix material with medium viscosity. The glass fiber reinforcement are used in the form of woven fabric as it has higher strength than other form of glass fiber. Different hardener are used according to the requirement of the filler material. This matrix is chosen because it provides good resistance to alkalis and has good adhesive properties.

Experimental setup

The materials are cut according to ASTM standards for particular test specimen. There are two different methods for measuring impact strength of the materials: Charpy impact test and Izod impact test. These two methods have different ways of testing according to Charpy the test specimen is supported at both ends, according to Izod the specimen is clamped only on one side like a cantilever. The dimension of the testing component is done as per ASTM standard.

Results and discussion:

Comparing the results of impact strength of the different material combinations, the following data have been collected. On comparing all the data obtained for different material combinations with particulate and flakes reinforcement, lower impact strength than the material with hybrid composites. Materials with lower impact strength are neglected (matrix material other than epoxy resin are neglected).

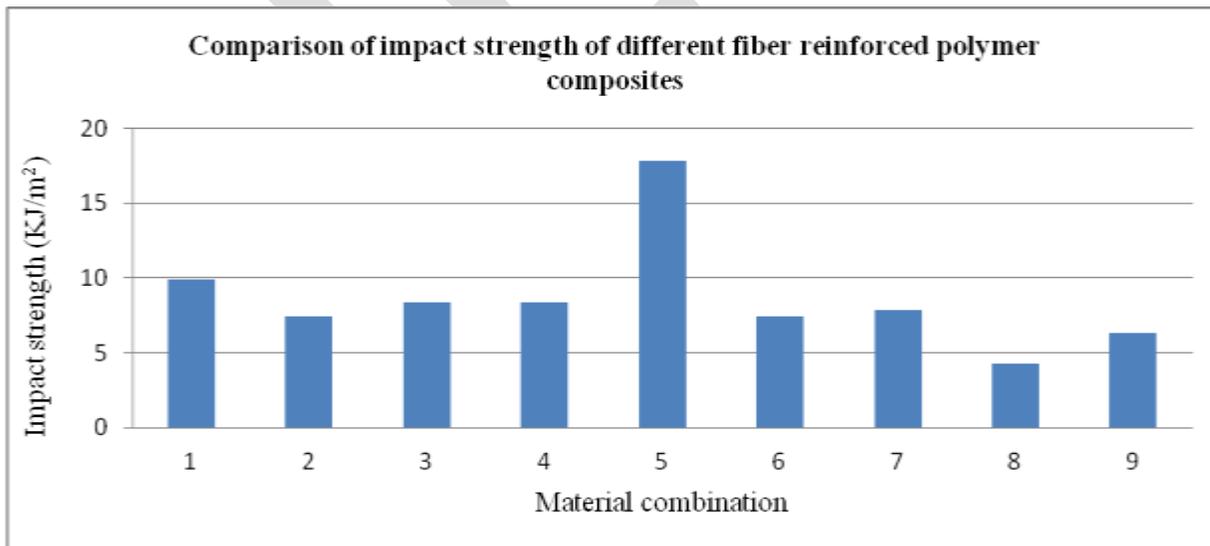
Impact strength of fiber reinforced polymer composites

Sl. No	Materials	Impact strength (KJ/m ²)
1	Ukamb fibre Lamina	9.89
2	Banana fibre laminate	7.47
3	Sisal fibre laminate	8.36
4	Coconut fibre laminate	8.37
5	E-glass laminate	17.82
6	Hemp fibre laminate	7.41
7	Kevlar Fiber Reinforced Polymer Matrix Composites	7.89
8	Polyester resin with basalt fiber	4.32
9	Epoxy resin with polyimide fibers	6.32

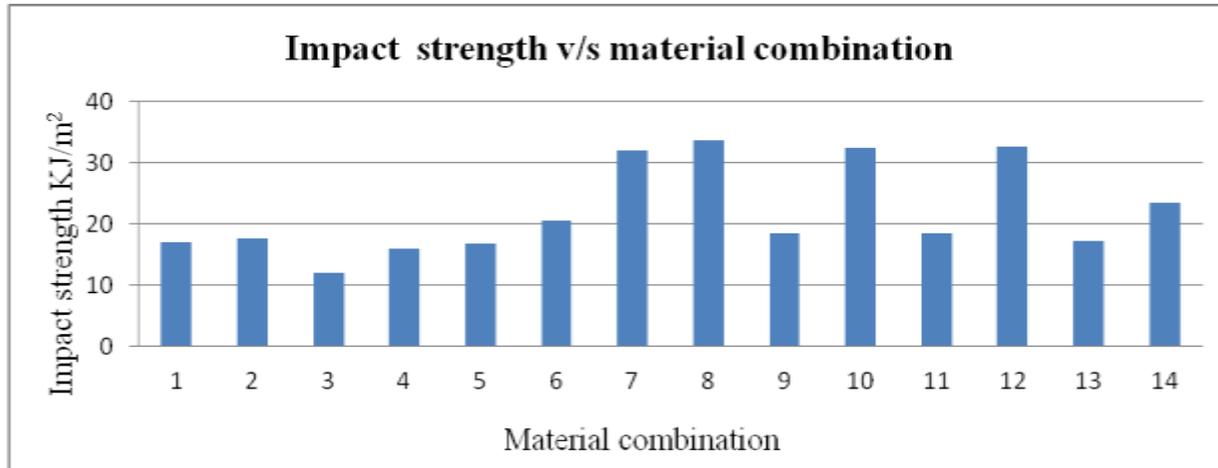
Impact strength of hybrid polymer composites

Sl. No	Material combination	Impact strength (KJ/m ²)
1	Glass epoxy with 10% Mg(OH) ₂	16.87
2	Glass epoxy with 5.1% fly ash	17.6
3	Glass epoxy with 3.9% CaCO ₃	12
4	Glass epoxy with 15% Hematite Powder	15.83
5	Glass epoxy with 10% Al ₂ O ₃	16.81
6	Glass epoxy with 10 % fly ash	20.41
7	Epoxy glass & sisal fiber	32.02
8	Epoxy glass & sisal fiber with Sic filler	33.71
9	Glass epoxy with coal ash	18.5
10	Glass epoxy with silicon carbide	32.3
11	Glass epoxy with titanium oxide (across)	18.5
12	Glass epoxy with ZnS (across)	32.5
13	Glass epoxy with titanium oxide (along)	17.2
14	Glass epoxy with ZnS (along)	23.5

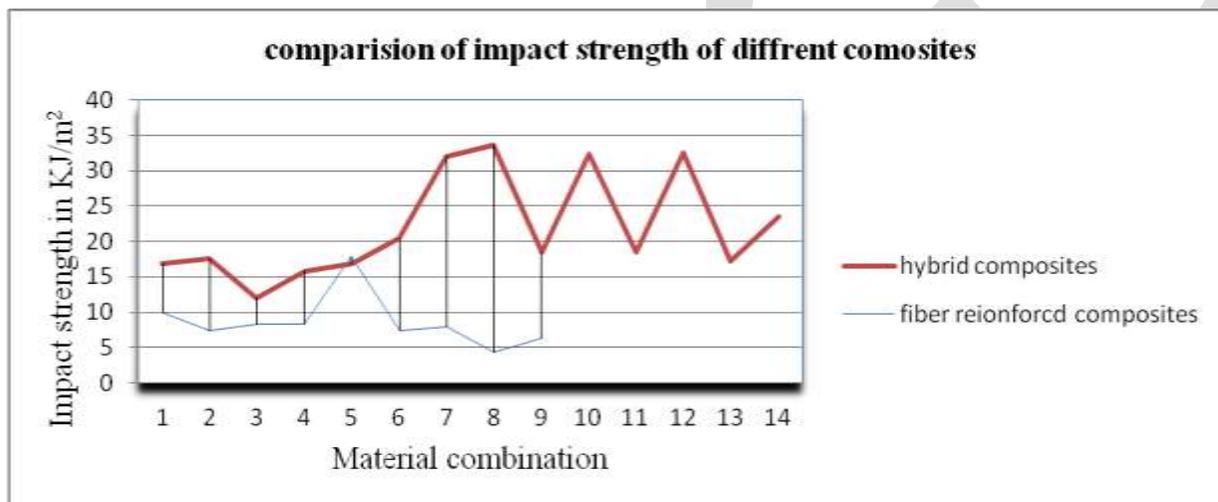
Impact strength comparison of fiber reinforced polymer



Impact strength comparison of hybrid composites



Impact strength comparison of different material combination



When compared to impact strength all other material combination fiber reinforced polymer composites show higher strength than other individual reinforced polymer composites such as flakes and particulate reinforcement. Natural fiber reinforced polymer composites shows lower strength because of loose bonding with matrix material due to the presence of hemicellulose this can be improved to certain extent by treating those natural fiber with acidic and alkali solutions. Fiber other than glass does not bond with epoxy resin so easily because of difference in interphase. Following data shows that out of all other fiber reinforcement glass fiber reinforced epoxy resin shows higher strength hence in the present paper detailed study of glass epoxy with other combination are studied and some material combination of glass epoxy composites with other filler materials are neglected because of their lower strength. Explanation of the higher strength of hybrid composites is given below.

GE composites filled with fly ash

These composite has shown 3 times higher impact strength than the unfilled composites of the same material. When the small particles are reinforced as a filler material in the matrix the crack length considerably increases during the process of facture. For same volume smaller the size of the particle larger will be the surface area. This increase is observed up to certain limit of the filler material and further increase in the filler material may lead to deterioration of the impact strength.

GE composites filled with CaCO₃ (calcium carbonate)

When impact strength of the above mentioned composites were done it was absorbed that the impact strength was increased by 1.5 times when compared to the unfilled composites. Calcium carbonate is as crystalline material hence the size the particles will be higher when compared to fly ash. So impact strength of these composites is found increased by half of that when compared to same composites filled with fly ash.

GE composites filled with cOAL ASH

When impact strength of these composites was conducted there was no much significant changes occur in the impact strength of the composites with up to 20 % wt of the filler composites. The use coal ash as a filler material does not bring any change in the bonding of the composites

GE composites filled with sic (silicon carbide)

Experimental results indicated that SiC filled composites having high impact strength when compared with other filled composites this due to that good bonding strength between filler, matrix and fiber and flexibility of the interface molecular chain resulting in absorbs and disperses the more energy, and prevents the cracks initiator effectively.

GE composites filled with alumina (AL₂O₃)

These composites show slight increase in the impact strength in comparison with unfilled composites as partially dispersion of the filler material in the composite.

Epoxy composite with sisal and glass fiber

The hybrid composite shows higher impact strength on comparison with GE composites or epoxy sisal composites. They show higher strength when sisal and glass fibers are used in 1:1 ratio. The composite with sisal and glass fiber combination has almost 1.9 times higher impact strength as the composites with the glass and epoxy composites.

GE composite with Hematite

When hematite is used as a filler material for glass epoxy composites the impact strength of the composites increased till 10% wt of the filler used. Any further increase in filler content has harmful effect on impact strength of the composites due to improper bonding between the matrix and the filler, material and increased embrittlement of the composite

GE composite with titanium oxide (TiO₂)

Impact strength of composite were done in two ways along the notch of the specimen and across the notch of the specimen for same Wt% of the filler the impact strength across the notch is higher as compared to the impact strength of the of the composites tested along the notch. N both the tested it shoes that TiO₂ filled compsites have higher strength than GE composites due close bonding of composites.

GE composite with zinc sulphate zns

Impact strength of the ZnS filled composites is higher than TiO₂ filled composites for both tests that were conducted across the notch and along the notch. The ZnS filled composites shows almost 3 times higher impact strength when tested across the notch. The ZnS filler will easily dispersed along the matrix material and increases the strength of the composites till optimum wt % of the filler used and further any increase in wt % of the filler the strength decreases.

Epoxy RESIN WITH treated and untreate natural fibers(pseudo stem of banana)

Impact test were conducted for different % of natural fibers with both treated and untreated fiber. The fiber that are chemically treated shows higher impact strength as compared to untreated fibers for all three % of fiber because alkali treatment not cleans surface it also removes the impurities and hemicelluloses from the fiber. These cause fiber surface to better interface between fiber and blend with the matrix. This results in obtaining the enhanced Impact properties

Epoxy composite with jute and glass fiber

These hybrid composites show slightly higher impact strength when compared to both unfilled GE composites and epoxy jute composites.

Acknowledgment

I would like to thanks for, SJBIT, Bangalore for their kind and continuous support.

Conclusion

1. Present investigation gives information of the impact strength of glass composites with different material combination.
2. Use of silicon carbide as a filler gives higher impact strength to glass epoxy componensts as compared to all the combination.
3. These materials can be used in car bumpers and dash boards as they have higher impact strength.
4. Glass epoxy composites with sic carbide can be used as casing for cold and hot storage boxes as SiC has less Thermal expansion.
5. Future work can be done for using these composites in break disc by performing necessary alteration

Appendix

Table 1

1. Effect of Alkali Treatment on Impact Behavior of Areca Fibers Reinforced Polymer Composites Srinivasa CV et al.,
2. Assessing Mechanical Properties of Natural Fibre Reinforced Composites for Engineering Applications. Olusegun David Samuel et al.,
3. Investigation of Low velocity Impact Properties of Kevlar Fiber Reinforced Polymer Matrix Composites. S. Channabasavaraju et al.,
4. Mechanical Properties of Natural Fibre (Banana, Coir, Sisal) Polymer Composite M.SAKTHIVE et al.,

Table 2.

- 1.Evaluation of mechanical properties of Abaca-glass-banana fiber reinforced hybrid composites. H.Venkatasubramanian et al .,
2. An Investigation of Mechanical Properties of Hybrid Polymer Composites S. Bhargavi Devi et al .,
3. Characterization of Ceramic Filled Polymer Matrix Composite Used for Biomedical Applications. WaleedAsim Hanna et al .,
- 4.Determination Of Mechanical Properties Of Al₂O₃, Mg (OH)₂ And Sic Filled E-Glass/ Epoxy Composites K.Devendra et al.,
- 5.Mechanical Properties of Bamboo Fibre filled with Fly Ash filler R einforced Hybrid Composite sVenkateswaraRao T et al.,
- 6.Mechanical and Electrical Behavior of Polymer Matrix Composite and their Hybrids Reinforced with (Carbon Black–Boron) Particles. R. S. Al-Khafaji
- 7.A Review on Potentiality of Nano Filler/Natural Fiber Filled Polymer Hybrid Composites Naheed Saba et al.,

REFERENCES:

- [1]. A review of the tribological properties of PTFE composites filled with glass, graphite carbom or bronze by *Milos Stankovic*
- [2]. Friction and wear properties of polymeric composite materials for bearing applications by *A.A. El-Sayed*
- [3]. Mechanical properties of composite material reinforcing by glass fiber by *Ali I. Al-Mosawi*
- [4]. Nathaniel Chisholm, Hassan Mahfuz, Vijaya, (2004) Rangari, Reneé Rodgers and Shaik eelani. Synthesis & Mechanical Characterization of Carbon/Epoxy Composites Reinforced with SiC Nano Particles. NSTI-Nanotech, www.nsti.org, ISBN 0-9728422-9-2 Vol. 3, 302-304.
- [5]. Y-X Lin, C.Gao and M.Chen, 2009, "Thermomechanical properties and tribological behavior of CaCO₃ whisker-reinforced polyetheretherketone composites", *Proc. Inst. Mech. Engrs. Part D: J. Engg. Tribol.* Vol 223, pp. 1013-1018.
- [6]. Y. Zhang, C.A.Pickles and J.Cameron, 1992, "The production and mechanical properties of silicon carbide and alumina whisker-reinforced epoxy composites", *J. Reinf. Plast.Compos.* 11, pp. 1176–1186.
- [7]. M.Avella, E.Martuscelli, M.Raimo, R.Parch and S.G. Gangolli, 1997, "Polypropylene reinforced with silicon carbide whiskers", *J. Mater. Sci* 32, pp. 2411-2416.
- [8]. Shibo Wang, Shirong Ge and Dekun Zhang, 2009, "Comparison of tribological behavior of nylon composites filled with zinc oxide particles and whiskers", *Wear* 266, pp. 248-254.
- [9]. B.Z.Jang, J.Y.Liau, L.R.Hwang and W.K.Shih, 1989, "Structure-property relationships in thermoplastic particulate- and ceramic whisker-modified epoxy resins", *J. Reinf. Plast.Compos.* 8, pp. 312–333.
- [10]. K. Sukanuma, T. Fujita, K. Nihara and N. Suzuki, 1989, "AA6061 composite reinforced with potassium titanate whisker", *J. Mater. Sci. Lett.* Vol.8, No. 7, pp. 808–810.
- [11]. Feng Xin, Wang Huaiyuan, Shi Yijun, Chen Donghui and Lu Xiaohua, 2007, "The effects of the size and content of potassium titanate whiskers on the properties of PTW/PTFE composites", *Mater. Sci. Eng. A* 448, pp. 253–258.
- [12]. L.F.Chen, Y.P.Hong, Y.Zhang and J.L.Qiu, 2000, "Fabrication of polymer matrix composites reinforced with controllably oriented whiskers", *J. Mater. Sci.*, 35, pp. 5309-5312.

Pursuance of 36-bit RISC processors in collaboration with application of DSP using FPGA

M A Manjushree, Savita S Patil

MTech in Digital Electronics, ECE Dept., GMIT, Davangere-05, INDIA, mshree778@gmail.com and mob 9738664347

Abstract— Abstract—RISC has become main stream in scientific and engineering applications. The demand for (DSP) has increased with advent of computer, smartphone, gaming and other multimedia devices. Today, FPGA s has become an important platform to implement high end DSP processors due to their inherent parallelism and fast operating speed. This paper focuses on Pursuance of three stage 36-bit RISC processor with some of the applications of DSP using FPGA.The coding is done in Verilog synthesized by Xilinx ISE 12.2 and simulated using ISim.

Keywords—Arithmetic Logic(AL); Central Processing Unit(CPU);Control Unit(CU); Field Programmable Logic Array(FPGA); General Purpose Register(GPR); Program Counter(PC); Instruction Register(IR); Reduced Instruction Set Computer(RISC); Register Set(RS); Configurable Logic Blocks (CLBs).

INTRODUCTION

This is the era of high speed computing systems, the need for real-time embedded systems operate within rigorous requirements are often at the conflict between speed and area. Increasing complexity of signal, image or control processing in real-time applications requires high computational power witch can be achieved by high performance programmable components like RISC, DSPs and non-programmable specific chips such as FPGA based hardware. Thus RISC has become main stream in scientific and engineering applications. The demand for (DSP) has increased with advent of computer, smartphone, gaming and other multimedia devices. Todays, FPGA s has become an important platform to implement high end DSP processors due to their inherent parallelism and fast operating speed. This paper focuses on Pursuance of 36-bit RISC processor with some of the applications of DSP using FPGA .The coding is done in Verilog, synthesized by using Xilinx ISE 12.2 and simulated using ISim .

REMAINING CONTENTS

You can add the remaining content as it is but the heading must be Time New Roman Front of size 11 with bold and the content must be as of introduction i.e. time new roman of size 10 and must be justified alignment

What is the Reduced Instruction Set Computer (RISC)?

RISC-Reduced Instruction Set Computer is a microprocessor architecture which exploits a small, simple and highly-optimized set of instructions; these simple instructions fairly take the same amount of time for execution, making them ideal for pipelining

Main features of a RISC processor are-

- Most instructions are register based.
- Less number of addressing modes.
- Enhanced computation.
- Fixed length easily decoded and fixed instruction format.
- All operation done within the registers.
- Efficient and optimized instruction due to pipelining
- Best suited for parallelism, pipelined and superscalar architectures.

What is the Field Programmable Gate Array (FPGA)?

FPGA - Field Programmable Gate Array. Hypothetically it can be considered as an array of Configurable Logic Blocks (CLBs) that are connected together to form complex digital circuits by vast inter connection matrix. It is an Integrated circuit designed which can be configured either by a customer or by a designer after manufacturing hence the name "field programmable". The FPGA configuration is generally specified by using a hardware description language like Verilog.

Main features of FPGA are-

- FPGAs are Simple Programmable Logic Blocks.
- FPGAs have innovative logic structure.

- Larger Logic Functions can be built up by connecting many smaller Logic Blocks together.
- FPGAs support Massive Fabric of Programmable Interconnection.
- FPGAs include rich feature set such as high-performance DSP blocks and on-chip memories.
- FPGAs are best suited for rapid prototyping of digital circuits.

What is the Digital Signal Processor (DSP)?

DSP-Digital Signal Processor is a specialized microprocessor developed for fast operational needs of digital signal processing. A Digital Signal Processor is predominantly for those applications which cannot tolerate delays because the main feature of DSP is to process the data in real time. The different kinds of programmable digital signal processors are image signal processor, radar processor, pixel processor, piccolo processor ARM versatile cortex processor.

Main features of DSP are-

- Performs special arithmetic operations like Multiply accumulates (MACs)
- Implements DCT (Discrete Cosine transform) and IDCT (Inverse Discrete Cosine transform).
- Executes FFT (Fast Fourier Transform) and IFFT (Inverse Fast Fourier Transform).
- Uses VLIW (Very Large Instruction Word) techniques such that each instruction drives multiple arithmetic units in parallel.

1. DESIGN ARCHITECTURE

This proposed Design is of 36 bit RISC Processor using Verilog HDL, the designed module will be synthesized using Xilinx ISE 12.2 Web pack, [4] and the verification will be done on Isim simulator, the architecture attempt to produce more CPU power by simplifying the instruction set of the CPU. Figure: 1.1 shows the Block Diagram of RISC system [4]. It includes Decoder, fetch machine, Arithmetic and logic machine, and register set.

The control unit generates all the control signals required to control the coordination amongst the component of the processor. This is basically carried out through three main steps viz, 1) Fetch an instruction; 2) Decodes the instruction; and 3) Executes the instruction. Each step is finished within a single state of the finite-state machine and each instruction is usually executed in one clock cycle, while some of the memory access instructions may oblige two or more clock cycles to complete, henceforth they may require quite a few states for correct timing. For fetching the instruction the control unit basically reads the memory location stated by the Program Counter (PC), and copies the content of that location into the instruction register (IR). The Program Counter (PC) is now incremented by 1. For decoding, the control unit abstracts the opcode bits from the instruction register and defines what the current instruction is jumping to the state which is assigned for executing the instruction. Once in that particular state, the control unit performs execution by simply emphasizing the appropriate control signals for controlling the data path to execute that instruction. Control unit consists of controller, instruction register, multiplexer, program counter [1].

• BLOCKDIAGRAM

The block diagram of 36 - bit RISC processor is shown in Fig. 1. The RISC processor architecture consists of Arithmetic Logic Unit (ALU), Control Unit (CU), Barrel Shifter, Booth's Multiplier, Register File and Accumulator. RISC processor is designed with load/store (Von Neumann) architecture, signifies that all operations are executed on operands held in the processor registers and the main memory can be accessed only through the load and store instructions. One shared memory for instructions (program) and data with one data bus and one address bus between processor and memory. Fetching instruction and data in sequential order so that the latency acquired between the machine cycles can be reduced. For increasing the speed of operation RISC processor is designed with three stage pipelining. The pipelining stages are Instruction Fetch (IF), Instruction Decode (ID), Execution (EX),

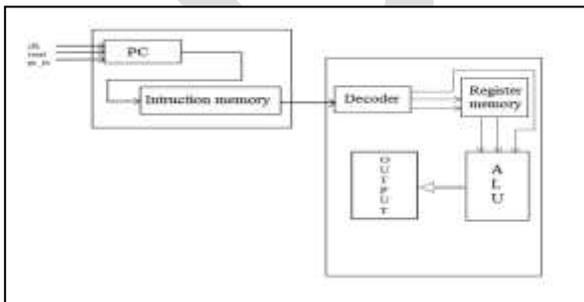


Fig. 1. Block diagram of RISC processor

• WORKING

Instruction Fetch Machine: This machine fetches an instruction from external memory, using the address that is currently being stored in the Program Counter (PC), and upon completion of the instruction fetch cycle this machine signals the decoder to decode the instruction. On the completion of the fetch operation, the Program counter (PC) points to the successive instruction that will be read at the subsequent cycle.

Decoder: Upon accomplishment of the instruction fetch cycle, the instruction is decoded. This machine utilizes a 7-bit up counter with an active low reset. The decoder reads 4-bits of the IR and decides which of the sixteen operations the CPU requests to perform, and signals one of the next states to initiate its operation.

Execution of the instruction: The control unit of the CPU decoded the information as a sequence of control signals to the relevant function units of the CPU for execution of the actions which are required by the instruction such as reading values from registers, passing them to the ALU etc.,. On the basis of opcode the ALU can carry out Arithmetic, Logic and DSP operations. If the opcode obtained after decoding the instruction represents the DSP operation the input data is obtained from DSP memory by enabling RISC_DSP signal and writing the back the results into a register.

• **INSTRUCTION SET AND INSTRUCTION FORMAT**

RISC & DSP System perform 16 operations. It comprises of 11 Arithmetic and Logic operations and 4 DSP Operations. The instruction set use 4 bit Opcode to perform various operations for selection of instructions as shown in table below

TABLE I. INSTRUCTION SELECTION

<i>Instruction</i>	<i>Opcode</i>	<i>Operation undertaken</i>
OR	0000	OR operation of two registers
AND	0001	AND operation of two registers
NAND	0010	NAND operation of two registers
NOR	0011	NOR operation of two registers
XOR	0100	XOR operation of two registers
XNOR	0101	XNOR operation of two registers
ADD	0110	ADD operation of two registers
SUBTRACT	0111	SUBTRACT operation of two registers
NOT	1000	NOT operation
INCREMENT	1001	Increment the value by 1
DECREMENT	1010	Decrement the value by 1
FFT	1011	Perform FFT Operation
IFFT	1100	Perform IFFT Operation
DCT	1101	Perform DCT Operation
IDCT	1110	Perform IDCT Operation

2. DSP OPERATIONS

• **DFT and FFT**

The discrete Fourier transform is the technique of interpreting any sequence of discrete values into its frequency domain, FFT is the more efficient method of generating a DFT. An FFT calculates the DFT and produces precisely the same results as that of calculating the DFT and the vital dissimilarity is that an FFT is much faster. The formula for DFT is defined as,

$$X(k) = \sum_{n=0}^{N-1} x(n) \cdot e^{-j\left(\frac{2\pi}{N}\right)nk} \quad (k = 0, 1, \dots, N - 1)$$

The calculation of $X(k)$ requires N complex multiplications and $N(N-1)$ complex additions. In order to avoid this complication, Radix-2 DIT FFT Algorithm is used. The butterfly method of 8-point radix-2 DIT FFT algorithm is shown below

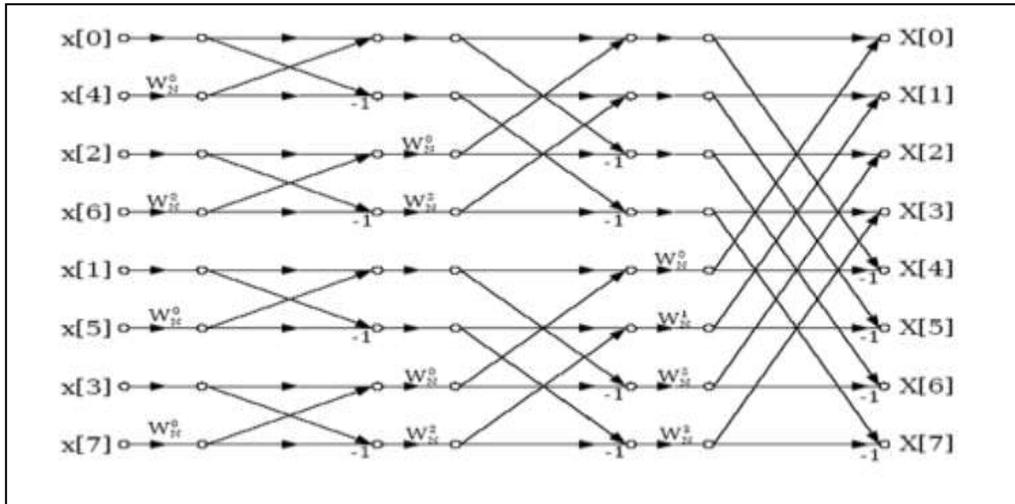


FIG 2.1 Butterfly method.

• DCT AND IDCT

The discrete cosine transform is similar to the discrete Fourier transform; DCT transforms a sequence or an image from the spatial domain to the frequency domain. The N point 1-D DCT is defined as

$$F(u, v) = \frac{2}{N} C(u)C(v) \sum_{x=0}^{N-1} \sum_{y=0}^{N-1} f(x, y) \cos \frac{(2x+1)u\pi}{2N} \cos \frac{(2y+1)v\pi}{2N}$$

The N -point 1-D IDFT is defined as

$$f(x, y) = \frac{2}{N} \sum_{u=0}^{N-1} \sum_{v=0}^{N-1} C(u)C(v)F(u, v) \cos \frac{(2x+1)u\pi}{2N} \cos \frac{(2y+1)v\pi}{2N}$$

$$C(u), C(v) = \begin{cases} \frac{1}{\sqrt{2}} & \text{for } u, v = 0 \\ 1 & \text{otherwise} \end{cases}$$

3. RESULTS

The proposed operation of RISC processor and DSP processor is been simulated and synthesized using Xilinx ISE version 12.2. and the RISC RTL schematics is shown in figure 3.1. The RISC-DSP System executes 4 DSP operations viz, FFT, IFFT, DCT & IDCT. Firstly the 8 point FFT is designed and simulated using Decimation in Time Radix-2 Algorithm using designed 2- point FFT with the help of butterfly diagram. The design of 4 point FFT is done using two 2-points FFT and so on. Simulation of 8-Point FFT and IFFT are shown in figure 3.2 and 3.3. Simulation result of various ALU operations and DSP operations performed by the RISC system is shown figure 3.4.



FIG 3.4 Simulation of ALU and DSP operations .

ACKNOWLEDGMENT

I feel my honoured to place my warm salutation to the DEPT .of E&C, G M INSTITUTE OF TECHNOLOGY, Davanagere for the support rendered to me in carrying out this work and also shaping my profession. It gives me immense pleasure to thank Prof SAVITHA.S.PATIL, my Project Guide for her keen interest, and invaluable help throughout the course of this work. I take this opportunity to express my deep sense of gratitude to my parents who are the source of inspiration for this project. .

CONCLUSION

The design of 36-bit RISC processor is implemented using the Xilinx ISE 12.2 and it is been realized using Verilog and simulated with ModelSim. This paper helps in understanding the processor development using Verilog. The Instructions are all executed the in one clock cycle, comprising of jumps, returns from subroutines and even external accesses. The simulations and results of this processor provide various features including ALU, DSP operations. The processor also supports signal processing applications. The design implemented can be easily seen in the Xilinx window. The value of the output and input bits is effortlessly elevated by increasing the memory of the processor.

REFERENCES:

- [1] J.Poornima, G.V.Ganesh, M.jyothi, M.Sahithi, A.jhansi, Rani B, Raghu Kanth “Design and Implementation of Pipelined 32-bit Advanced RISC Processor for Various D.S.P Applications” International Journal of Computer Science and Information Technologies, Vol.3 (1) , 2012,3208-3213 ISSN :0975-9646.
- [2] Anand Nandakumar Shardul “16-Bit RISC Processor Design for Convolution Application” International Journal of Advancements in Research & Technology, Volume 2, Issue 9, September-2013 ISSN 2278-7763.
- [3] Amit Kumar Singh Tomar, Rita Jain “20-Bit RISC & DSP System Design in an FPGA” Computing in Science and Engineering IEEE 2013
- [4] Jivin M, Anas.A.S “FPGA Based RISC and DSP System Design” International Journal of Engineering Research & Technology (IJERT) Vol. 3 Issue 2, February – 2014 IJERT/IJERT ISSN: 2278-0181

Distributed Intrusion Detection System Using Mobile Agent Technology

Kajal K. Nandeshwar, Komal B. Bijwe

Department of Computer Science and Engineering, P. R. Pote (Patil) College of Engineering, Amravati, India

kajal.nandeshwar.02@gmail.com , 9420304508

Abstract— The one of the most serious threats to computer security is the unauthorized intrusion into a computer system or network. Due to the rapid growth of the network application, new kinds of network attacks are emerging endlessly. The distributed intrusion detection systems detecting the intrusion activity spread over the network. A distributed intrusion detection system may need to deal with different audit record format. The mobile agents are captures the audit records and are best suited for remote information retrieval. The distributed intrusion detection system used mobile agents which defends a distributed collection of hosts supported by a LAN or internetwork.

Keywords— Intruders, IDS, DIDS, DIDSMA, Mobile Agent, LAN, Attack

INTRODUCTION

The several hosts are connected by a network and the intruders attack on the several computing nodes and may move between several nodes in the network [1]. The IDS defines to be the problem of detecting individual who are unauthorized user of a computer system [6]. The IDS which identify computer system intrusions and misuse by collecting and analyzing data mainly focus on single system, however the DIDSMA is proposed which consisting of a multiple IDS over a large network. The DIDSMA uses the set of software entities known as mobile agents that can move between one node to another node within a network. Mobile agents are provides a new and useful paradigm for distributed computing and capable of suspending processing on one platform and moving onto another where they resume execution of their code [7]. DIDS that combines distributed monitor at every host and data reduction with the centralized data analysis to monitor heterogeneous network of computer [6].

WEAKNESSES IN EXISTING SYSTEM

Traditional IDS have a central coordinator with a static hierarchical architecture, which indicate the failure of existing of single point and hierarchy vulnerability [3]. The DIDS were introduced to overcome this susceptibility where mobile agents are considered in the implementation of such technology to play a prominent role [9].

- Limited flexibility: For the specific environment, IDS have typically been written.
- Limited response capability: IDS have traditionally focused on identify attacks.
- High number of false positive: False alarms are high and recognition of attack is not perfect.

RELATED WORK

A. DIDS

A number of IDSs have been proposed for a networked or distributed environment. Early systems included ASAX [11], NSTAT [12]. These systems require the audit data collected from different places to be sent to a central location for an analysis. NetSTAT [13] is another example of such a system. In NetSTAT attack scenarios are modeled as hyper graphs and places are probed for network activities. Although NetSTAT also collects information in a distributed manner, it analyses them in a central place. The scalability of such systems is limited due to their centralized nature. To improve scalability later systems such as EMERALD [14], GriDS [16] and AAFID [15], deployed intrusion detection systems at different locations and organized them into a hierarchy such that low-level IDSs send designated information to higher level IDSs. EMERALD uses both misuse detection and statistical anomaly detection techniques. This system employs a recursive framework, which allows generic components to be deployed in a distributed manner [14]. To detect intruders, GriDS aggregates computer and network information into activity graphs which reveal the causal structure of network activity [16]. AAFID consists of agents, filters transceivers and monitors organized in a tree structure [15]. DIDS are simply a superset of the conventional IDS implemented in a distributed environment.

DIDS Architecture

DIDS consist of three different components: a single host monitor per host, a single LAN monitor for each broadcast LAN segment and a system director [4].

The overall architecture of DIDS consisting three main components which are as follows:

- **Host agent module:** An audit collection module operating as a background process on a monitored system. Its purpose is to collect data on security related events on the host and transmit these to the central manager.
- **LAN monitor agent module:** Operates in the same fashion as a host agent module except that it analyzes LAN traffic and reports the results to the central manager,
- **Central manager module:** Receives reports from LAN monitor and host agents and processes and correlates these reports to detect intrusion [2] - [8].

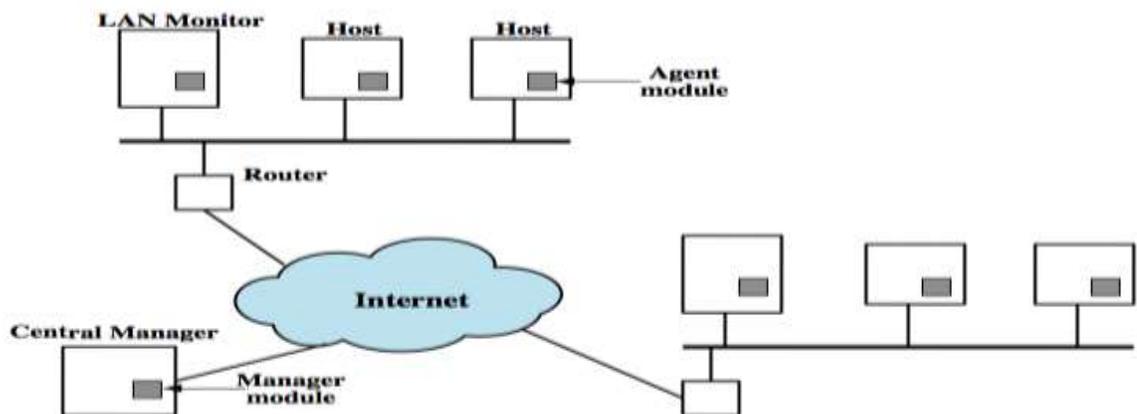


Fig1: Architecture for Distributed Intrusion Detection System

A. Introduction to mobile agent

Mobile agent is a composition of computer software and data which is able to migrate from one computer to another autonomously and continue its execution on the destination computer [3]. Mobile agent technology can potentially overcome a number of weaknesses, intrinsic to existing IDSs that employ only static components [7]. The intelligent agents for intrusion detection project [10], have developed IDS using distributed multiple layers of lightweight intelligent mobile agents that apply data mining techniques to detect intrusions.

Fig2 illustrate the architecture of mobile agent.

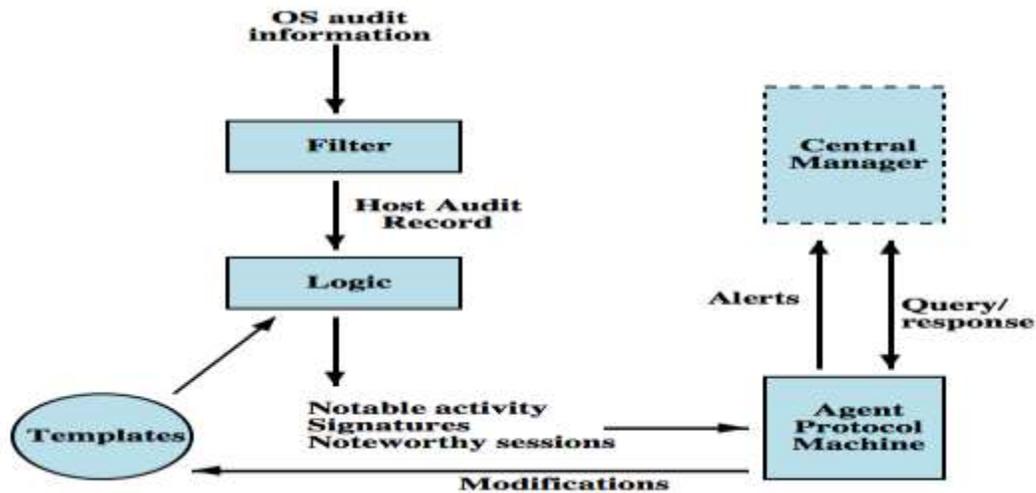


Fig2: Mobile Agent Architecture

The native audit collection system produced each audit record produced by the agent. A filter is applied that retains only those records that are of security interest. These records are then reformatted into a standardized format referred to as the host audit record (HAR). Next, a template-driven logic module analyzes the records for suspicious activity. At the lowest level, the agent scans for notable events that are of interest independent of any past events. Examples include failed file accesses, accessing system files, and changing a file's access control. At the next higher level, the agent looks for sequences of events, such as known attack patterns (signatures). Finally, the agent looks for anomalous behavior of an individual user based on a historical profile of that user, such as number of programs executed, number of files accessed, and the like. An alert is sent to the central manager when suspicious activity is detected. The central manager may query single systems for copies of HARs to correlate with those from other agent. The LAN monitor agent also provides data to central manager and audits host-host connections, service used [2] - [8]. There are multiple attacks are implemented. The Fig3 shows the result. The database stores the history of all nodes [1].

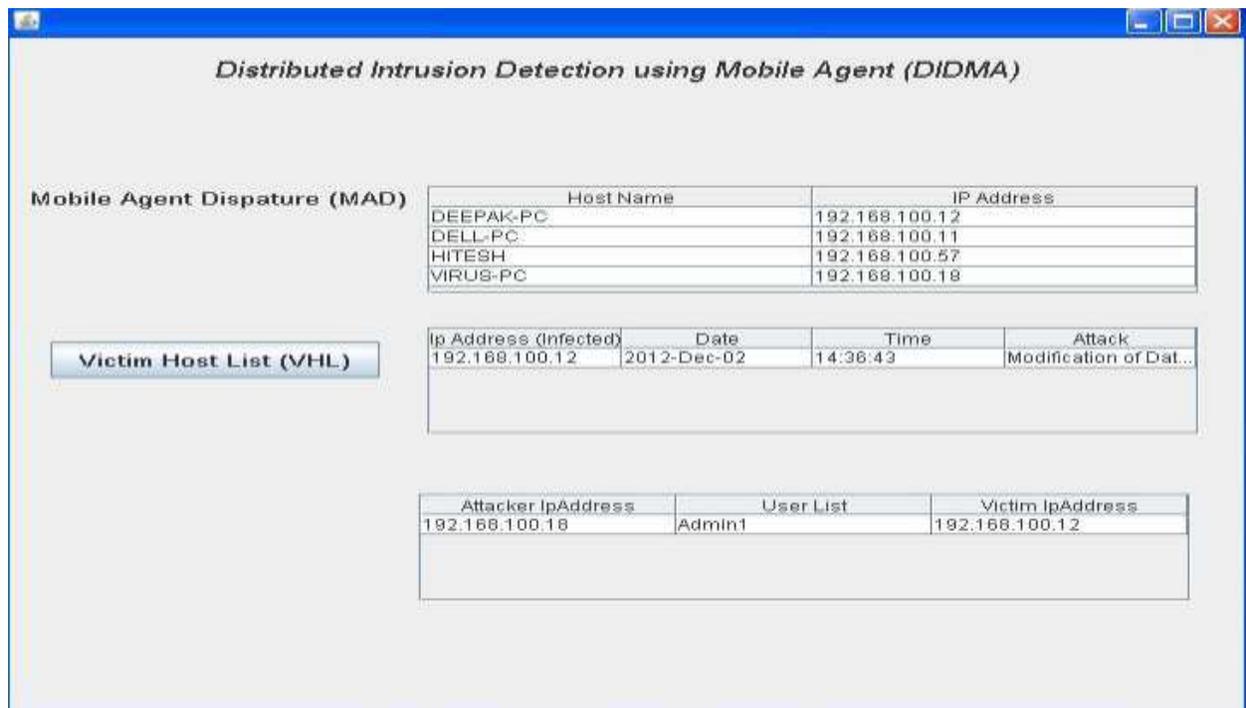


Fig3: Distributed intrusion detection using mobile agent

CONCLUSION

The DIDSMA are offers a foundation for a machine independent approach that can expand from stand alone intrusion detection to a system which can be correlate activity from a number of sites and networks to identify malicious activity that would remain undetected. Use of mobile agents in DIDSMA makes application advantageous such as it reduces load of network. Mobile agents are more realistic and can find intruder in distributed system and take action against malicious activities. DIDSMA are flexible and provides facilities and advantages which are beneficial. DIDMA can be easily extended to detect new attacks by adding new MAs.

REFERENCES:

- [1] Trushna T. Khose Patil, C.O.Banchhor, "Distributed Intrusion Detection System using mobile agent in LAN Environment", Department Of Information Technology ,SCOE, Pune, India, Assistant Professor Department Of the Information Technology, SCOE, Pune, India, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 2, Issue 4, April 2013.
- [2] William Stallings, Network Security Essentials: Applications and Standards, 4th ed, Pearson Education, Inc., 2011, pages 305-322.
- [3] Kamaruzaman Maskat, Mohd Afizi Mohd Shukran, Mohammad Adib Khairuddin & Mohd Rizal Mohd Isa, "Mobile Agents in Intrusion Detection System: Review and Analysis", Faculty of Science and Technology Defense, Department of Computer Science, National University Defense University of Malaysia, Sungai Besi Camp 57000 Kuala Lumpur, Malaysia.

- [4] James Brentano, Steven R. Snapp, Gihan V. Dias, Terrance L. Goan, L. Todd Heberlein, Che-Lin Ho, Karl N. Levitt, Biswanath Mukherjee, Stephen E. Smaha, "An Architecture for a Distributed Intrusion Detection System", Division of Computer Science, university of California, Davis, California 95616.
- [5] Abhijit Dwivedi, Y. K. Rana, B. P. Patel," A Literature Review on Agent Based Intrusion Detection System, "Department of CSE Department of the CSE REC, Bhopal (M.P), India REC, Bhopal (M.P), India REC, Bhopal (M.P), India, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 10, October 2014 ISSN: 2277 128X.
- [6] Steven R. Snapp, James Brentano, Gihan V. Dias, Terrance L. Goan, L. Todd Heberlein, Che-Lin Ho, Karl N. Levitt, Biswanath Mukherjee, Stephen E. Smaha, Tim Grance, Daniel M. Teal, and Doug Mansur,"DIDS (Distributed Intrusion Detection System) -Motivation, Architecture and An Early Prototype", Computer Security Laboratory Division of Computer Science, University of California, Davis, Davis, California 95616.
- [7] Wayne A. Jansen, "Intrusion Detection with Mobile Agents", National Institute for Standards and Technology Gaithersburg, MD 20899.
- [8] Mr. Suryawanshi G.R. Prof. Vanjale S.B," Mobile Agent for Distributed Intrusion detection System in Distributed System", B.V.U.C.O.E, Pune, International Journal of Artificial Intelligence and Computational Research (IJACR.) ", Jan -June 2010, ISSN-0975-3974.
- [9] M. Eid, "A New Mobile Agent-Based Intrusion detection System Using distributed Sensors", Inproceeding of FEASC, 2004.
- [10] G. Helmer, J. Wong, Y. Wang, V. Honavar, and Les Miller, "Lightweight Agents for Intrusion Detection," Journal of Systems and Software, Elsevier, vol. 67, pp. 109- 122, 2003.
- [11] R A Kemmerer, "NSTAT: a Model-based Real-time Network Intrusion Detection System", Technical Report TRCS97-18, Reliable Software Group, Department of Computer Science, University of California at Santa Barbara, 1997.
- [12] A Mouinji, B L Charlier, D Zampunieris, N Habra, "Distributed Audit Trail Analysis", Proceedings of the ISOC 95 Symposium on Network and Distributed System Security", pp. 102-112, 1995.
- [13] G Vigna, R A Kemmerer, "NetSTAT: A network-based intrusion detection system", Journal Computer Security, Vol. 7, No. 1, pp. 37-71, 1999.
- [14] P A Porras, P G Neumann, "EMERALD: event monitoring enabling response to anomalous live disturbances", Proceedings 20th National Information Security Conference, NIST 1997.
- [15] E. H. Spafford, D Zamboni, "Intrusion detection using autonomous agents", Computer Networks, 34, pp. 547-570, 2000.
- [16] S Staniford -Chen, S Cheung, R Crawford, M Dilger, J Frank, J Hoagland, K Levitt, C Wee, R Yipi, D Z Erkle, "GriDS – a large scale intrusion detection system for large networks", Proceedings 19th National Information Security Conference, Vol. 1, pp. 361-370, 1996.

A Review on Variable Compression Diesel Engine with Turmeric Leaf Oil-based Biodiesel

Ankit K. Bawaskar^[1], Prof. C. S. Choudhari^[2]

M. E. Automotive Engineering, AISSMS COE, Pune^[1]
Asst. Professor, Mechanical Engineering, AISSMS COE, Pune^[2]

Mob. no.: +91-9766468743
e-mail_id: ankitkbawaskar.444@gmail.com

Abstract— The rapid depleting ores of petroleum, sharply escalating fuel prices and the environmental problems have triggered the need of alternatives and renewable energy sources. The situation is even graver in developing countries such as India. Currently, India ranks the second largest by population in the world as well as places herself second in the list of petroleum consumers. India imports 70% of the required fuel and spends around 30% of her foreign exchange over it. Besides that, transportation and agricultural sectors are major consumers of fossil fuels as well as biggest contributors to pollution, too. This has forced the individuals to search for alternatives in order to overcome the consequences of the conventional fuels.

Presently, a lot of researches have been carried out over the performances of various alternatives to evaluate their eligibility to partially or completely replace the conventional fuels. Though a lot of research is carried over various alternatives like ethanol, alcohols, cottonseed oil, palm oil, jatropha oil, mustard oil, etc., there has been no such promising alternative yet which can replace diesel, leaving a huge scope in this area. This paper describes yet another experimental investigation to search for the promising alternative to diesel. It comprises of the turmeric leaf biodiesel blended in varying proportions with diesel and at varying compression ratios. The results consist of the investigation of various performance parameters based on varying load conditions and its effect over the emissions. These results are then compared with the performance of neat diesel to prove its eligibility.

Keywords— Biodiesel, turmeric leaf oil, variable compression ratio, diesel engine, emissions, alternate fuels, performance, combustion

INTRODUCTION

India is abode of 1.3 billion people which is 17% of the total world population having rapid growing thirst for energy. For the last two decades, there has been a tremendous increase in demand of conventional fossil fuels for engine, especially gasoline and diesel. The ores of these fossil fuels are quoted to become extinct in a couple of decades. This is leading to rapid increase in the costs and as well as the consequences of global warming. Only a few countries have reservoirs of usable fossil fuels and thus countries like ours have to be dependable on them. According to the Statistical Review of World Energy (2010), India produces 826000 barrels of oil per day and requires 3319000 barrels per day. This is a huge energy gap that needs to be bridged. These have freed us with liberty to try alternatives to diesel.

Thinking of the gaseous fuels, hydrogen appears to be the most promising one in future as it yields the highest amount of energy on combustion. Also it produces only energy and water when burnt. The consequences at current moment are its production, storage, distribution and transportation problem. These are claimed to be solved by 2020. While considering the liquid fuels, alcohol fuels are easy to produce. These are produced by fermentation of crops like corn. But, alcohols are highly corrosive and require certain expensive replacements in existing parts. Also, compatibility is another problem, as they may have certain effects. For an instance, production of corn-based ethanol has created an increased demand for feedstock, causing increased prices in all that is made from corn. So, we remain left to experiment with the biodiesels.

BIODIESEL

More than a century ago, Rudolf Diesel had predicted that plant oils could be used in engines. Biodiesel can be stated as a fuel that is made up of a mono alkyl ester of a long chain of fatty acids that are derived either from vegetable oil or animal fat. Vegetable oils have good ignition quality as they have very long chained structures which are not branched. Inversely, the higher composition of oxygen content, carbon residue and larger molecular mass makes the heating value of biodiesels significantly lower than diesel. They have higher flash point and are around 10% denser than diesel, making them safe to store. But these have higher cold point causing them to thicken or even freeze at low ambient temperatures. Their poor volatility due to higher viscosity is responsible

for their lower cetane numbers. Further, biodiesels are biodegradable and reduce the CO₂ cycle. Also, they do not contain sulfur and any carcinogens, thus they are not harmful to living beings. An associated problem could be that, growing crops requires lot of time and high investment and transportation to local stations which makes the more expensive than diesel.

Benefits of biodiesel

- The combustion of biodiesel causes 80% less CO₂ emissions and no sulfur dioxide.
- The proportion of unburnt hydrocarbons is reduced by 90% of unburned.
- It is totally non-toxic and biodegradable.
- It has almost similar cetane number as that of diesel.
- Also, it imparts relatively better lubricity.

Disadvantages of biodiesel

- The biodiesel acts as an excellent solvent and thus the deposits at the filter section could get dissolved into it. This may cause severe degradation of engine parts.
- The biodiesel can cause problems in winter as the cold point is relatively higher as compared to the diesel. This means that the fuel can solidify and choke up the engine.

LITERATURE SURVEY

Mr. S. I. Meshram worked over the turmeric leaf biodiesel and found that when the turmeric leaves oil was used the engine power slightly decreased for all engine speeds. The loss of power occurred because of the lower calorific value. A brake thermal efficiency of engine with turmeric leaves oil is found to be slightly less as compared to gasoline. The brake specific fuel consumption for lower engine speed is more. The CO and HC concentrations using turmeric leaves oil was decreased by 13.7% and 16.94% respectively in comparison to gasoline, while the NO_x concentration was increased by 10%.

Dr V. Naga Prasad Naidu, Prof. V. Pandu Rangadu, Krishna Reddy, R. Anand, G. R. Kannan, K. Rajasekhar Reddy and S. Velmathi investigated the use of cottonseed oil as biodiesel over a 4-stroke compression ignition engine in two different experimental setups and working conditions. The blending ratio was varied within a range of 5-40%. Both the experimentations concluded that the brake thermal efficiency was more for diesel, but the emissions were much reduced by the use of biodiesel. This happened because the oxygen content in biodiesel is higher, thus ensuring closer to complete combustion. They also found that, the biodiesel with 20% blending ratio earned to be the most economical one. It resembled the performance of diesel with lower emissions. Sunilkumar Kumbhar tried thumba oil over a variable compression ratio diesel engine. He observed that, at compression ratio 18, the brake thermal efficiency and brake specific fuel consumption for 10% blend and 20% blend while brake power with 40% blend showed better performance. The HC, CO and NO_x emissions were least for the 10% and 20% blend, thus proving best.

N. Manikanda Prabu, Dr. S. Nallusamy K. Thirumalai Ra, Pavanendra Kumar, Niraj Kumar, Vineet Tirth, Sejal Narendra Patel and Ravindra Kirar and Hani Chotai investigated the use of jatropha seed-based oil over the 4-stroke diesel engine and observed the performance and emission characteristics. The compression ratio 18:1 showed the better experimental results for diesel as well as blends with least fuel consumption during the blending ratio of 20%, while the exhaust gas temperature, which is the indication of effectiveness of utilization of heat energy, was the most with the blends whereas, pure diesel giving the least exhaust temperature. The pure biodiesel being used showed the highest exhaust gas temperature, which means it exhibited highest brake thermal efficiency. But the problem associated with this was that, the engine would be modifies to the compression ratio of 20 or above. The emissions showed lower amounts of CO, CO₂ and HC when compared with the exhaust gases using pure diesel, while the NO_x was inherently slightly higher because of higher oxygen content and exhaust gas temperature using biodiesel. Conversely, in other experimentation, the fuel with 50% blend showed the least emissions in expense to the performance characteristics of engine.

Ramchandra S. Jahagidar Eknath R. Deore, Milind S. Patil, Purushottam S. Desale executed an experimentation over the performance diesel engine fueled with karanja biodiesel. He tested different fuel blends of karanja biodiesel, pure diesel and pure karanja biodiesel. Results showed that the brake power of the engine did not vary much with any of the fuel combinations and was almost same for all the loads. However, brake thermal efficiency was improved for the karanja biodiesel from 3 to 8% along with volumetric efficiency, but it caused reduction in exhaust gas temperature. It was also observed that the blends of 40% and 60% had the optimum performance for the given conditions.

Similarly, the experimentations have been carried over the bio-products such as soya-bean seed, canola oil, tamanu seed, jujube seed, mahua oil, fish oil, and palm oil, mixtures of two or more oil-based biodiesels. More of these are easy to cultivate, cheap in cost, less attention for farming.

A. K. Azad, S. M. Ameer Uddin and M. M. Alam investigated whether it is feasible to experiment over a diesel engine using the biodiesel with and without trans-esterification process. For this purpose, the mustard oil-based biodiesel was used. When the chemical properties of the two samples, i.e. one with trans-esterified biodiesel and other without it, were tested, it was observed that the biodiesel without trans-esterification process had higher viscosity, density and moisture content and lower calorific heat content as compared to the other. When the experimentation was carried out, it was observed that, the heating value of the biofuel gradually tended to reduce with increase in bio-fuel blends. At low load conditions, the bio-fuel blends had higher brake specific fuel consumption than diesel. But, as the load was increased and the blend ratio was raised to 30%, it was seen that the brake specific fuel consumption was least. Also, the fuel without the trans-esterification process showed higher brake specific fuel consumption than the other one.

TURMERIC LEAF OIL

i. Production of turmeric

Turmeric is cultivated in India, China, Myanmar, Nigeria and Bangladesh. However, authentic figures about area and production are not available. Major production area is in India which constitutes 82% followed by China (8%), Myanmar (4%), Nigeria (3%) and Bangladesh (3%). The main turmeric producing states in India are Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, West Bengal, Gujarat and Kerala.

Table 1: Area and production of turmeric in India

Year	Area (in hectares)	Production (in tonnes)
2008-09	162.9	552.3
2009-10	149.8	526.4
2010-11	150.7	567.2
2011-12	158.4	718.1
2012-13	177.5	846.7

The biological name of turmeric is *Curcuma Longa*. The rhizomes of *C. Longa* are preferably used in Indian systems for medical purposes, such as antiseptic, carminative, stomachic, appetizer, etc. It also finds its widest use as a constituent of food curry powders and food colourant but not as a condiment due to its bitterness. Its aroma has also been used to cure pimples, skin whitening as well as blood purification. The leaves of *C. Longa* have been observed to be a waste product which has traditionally been used for culinary preparation which are aromatic and contain oil. The leaves were cut into small pieces and hydro-distilled; major volatile constituents were identified under the chromatogram. These showed 1.32% of essential oil containing α -phellandrene 38.24%, C_8 -aldehyde 20.58%, 1,8-cineole 8.64, α -pinene 2.88% and β -pinene 2.36%. Out of these, α -pinene and β -pinene are the hydrocarbons and these burns in the process of combustion. Earlier, it was reported that the turmeric leaf oil is mixture of ketones and alcohols. In later studies, it was seen that the main constituent is phenol, which is a kind of alcohol. Moreover, the local experiences show that turmeric leaves are readily explosive, which proves it to have higher calorific content. In spite of this, the use of turmeric leaf oil has been less used for the purpose of producing heat energy in automobiles.

Nilesh Mundle, a pharmacy student from eastern Maharashtra advocated the use of turmeric leaf oil as possible alternative for biodiesel. He posted a related article when he found that the leaves could burn easily. This clicked that the turmeric leaves could contain some amounts of oil content. The turmeric leaf oil has less viscosity than as compared to gasoline. So it can undergo even better combustion than the gasoline, thus could be able to improve the performance.

ii. Turmeric leaf biodiesel

a. Preparation of biodiesel

The vegetable oil when extracted from the resources contains fatty acids, water, sterols, phospholipids, odorants and impurities. If it is directly injected into the diesel engine, it may cause numerous severe problems. These may occur because of high viscosity, low volatility and poor cold low properties. These may lead to engine deposits, injector choking, piston ring sticking, etc. Thus, it becomes mandatory to make some chemical processes over the oil in order to make it suitable for the engine without any

modifications in existing parts. For this purpose, various chemical methods are used. The effective methods used for fulfilling the objective are:

- 1) Pyrolysis
- 2) Micro-emulsification
- 3) Dilution
- 4) Trans-esterification

Trans-esterification Process

The trans-esterification process involves certain number of reactions and processes as shown in the figure above. The steps involved in the trans-esterification process are as follows:

- 1) **Mixing of alcohol and catalyst:** A specified amount of methanol is added with a measured quantity of NaOH, which acts as catalyst, into a flask.
- 2) **Reaction:** This mixture is then added into a closed reaction vessel and the respective vegetable oil is added and heated to 60-80°C. This reaction converts the fats into the esters. Sometimes, an extra amount of fuel can be added in order to ensure complete conversion of fats to esters.

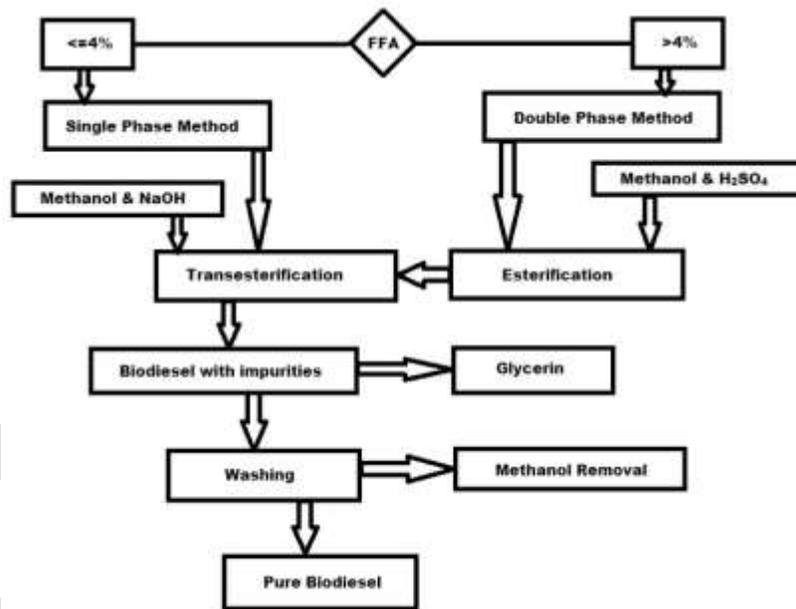


Fig 1: Trans-esterification process

- 3) **Separation of biodiesel and glycerin:** After the completion of reaction, two products exist: biodiesel and glycerin. The quantity of glycerin varies as per the kind and quantity of vegetable oil.
- 4) **Removal of alcohol:** The mixture of biodiesel and glycerin is heated up to 60°C, thus producing the steams, which separates the amount of glycerol from the mixture. The methanol is sufficiently dry in order to recirculate it back into the reaction.
- 5) **Glycerin neutralization:** The glycerin byproduct contains unwanted quantity of catalyst and soap and needs to be neutralized with an acid.
- 6) **Methyl ester wash:** This is the final phase which ensures the complete removal of unwanted contents from the biodiesel, so as to make it compatible with the diesel engine.

The single phase method is applicable only if the amount of free fatty acids (FFA) in vegetable oil is less than 4%. This involves a measured amount of alcohol as methanol and the catalyst NaOH and the mixture is heated and maintained at 65°C. In case of fatty acids more than 4%, double phase method is applicable. It involves mixture of H₂SO₄ and methanol to be taken and added and supplied to esterification process first and then it is heated and maintained at 65°C. This is then passed onto and previous process is carried out.

b. Properties of turmeric leaf biodiesel:

The chemical properties of the biodiesel play very important role. The following section compares the various properties of turmeric leaf oil with diesel:

Table 2: Comparison of properties of turmeric leaf oil with diesel

Properties	Diesel	Turmeric leaf oil	Acceptable range
Chemical formula	C ₁₂ H ₂₃	C ₂₁ H ₂₀ O ₆	-
Molecular weight	196.23	368.379	-
Density (m ³ /kg) a 20°C	842	925	800-950
Kinematic viscosity (mm ² /s) at 40°C	2.5	7.82	1.9-8.0
Calorific value (kJ/kg)	44000	43672	-
Flash point (°C)	70	102	>130

It can be observed that the calorific value of turmeric leaf oil is comparable to that of diesel. Also its density is within the acceptable range as per the ASTM norms. The viscosity is the factor which signifies whether the engine parts needs to be modified or not. Since, it is also in the acceptable range, there is no such issue. This makes the turmeric leaf biodiesel to be experimentally fit without any modifications in parts of the engine.

SUMMARY

- As per the study concluded, it is feasible to work over the turmeric leaf biodiesel in a variable compression ratio engine.
- Though, the experimentation would show the results including relatively less performance as compared to diesel, it would definitely produce similar brake power with slightly higher fuel consumption.
- It is better to use the trans-esterified biodiesel with or without blending in the diesel engine as it would add an advantage of fuel flexibility without making changes in existing parts along with assurance for extended engine life.
- It should be noted that, the range of blending that should be considered during experimentation is 10-30%, as it can be seen from literature survey to obtain satisfactory results.
- The emissions using the biodiesel could be satisfactorily reduced; the CO, CO₂, and HC reduce while the NO_x emissions should increase because of higher oxygen content and higher exhaust gas temperature as compared to that with diesel.

REFERENCES:

- [17] Sachin I. Meshram, Prof. M. S. Deshmukh, "Evaluation of Performance and Emission Characteristics of Turmeric Leaves-based Fuel on 4-stroke SI Engine", Third International Conference on Emerging Trends in Engineering and Technology
- [18] Dr V. Naga Prasad Naidu, Prof. V. Pandu Rangadu. "Experimental Investigations on a four stroke Diesel engine operated by Cotton seed biodiesel blended with Diesel", International Journal of Engineering and Innovative Technology (IJEIT) Volume 3, Issue 10, April 2014
- [19] A. V. Krishna Reddy, M. Shiva Shankar, K. Apparao, "Experimental Determination of Brake Thermal Efficiency and Brake Specific Fuel Consumption of Diesel Engine Fuelled With Biodiesel", International Journal of Engineering and Technology Vol.2 (5), 2010, 305-309
- [20] R. Anand, G. R. Kannan, K. Rajasekhar Reddy and S. Velmathi, "The Performance and Emissions of a Variable Compression Ratio Diesel Engine Fueled with Biodiesel from Cottonseed Oil", ARPN Journal of Engineering and Applied Sciences VOL. 4, NO. 9, NOVEMBER 2009 ISSN 1819-6608
- [21] R. Senthil Kumar, R. Manimaran, "Performance and Emission Characteristics on 4-Stroke Single Cylinder C. I. Engine using Cottonseed Bio Fuels", Asian Journal of Engineering Research ISSN-2319-2100

- [22] N. Manikanda Prabu, Dr. S. Nallusamy and K. Thirumalai Rasu, “*Experimental Analysis of Jatropha Curcas Bio-Diesel for Optimum Blend Characteristics*”, Bonfring International Journal of Industrial Engineering and Management Science, Vol. 3, No. 2, June 2013
- [23] Pavanendra Kumar, Niraj Kumar, Vineet Tirth, “*Comparative Analysis of Performance and Emission of Diesel Engine by Varying Compression Ratio Using Different Fuels*”, MIT International Journal of Mechanical Engineering, Vol. 3, No. 2, August 2013, pp. 86–90 ISSN No. 2230–7680
- [24] Sejal Narendra Patel, Ravindra Kirar, “*An Experimental Analysis of Diesel Engine Using Biofuel at Varying Compression Ratio*”, International Journal of Emerging Technology and Advanced Engineering (ISSN 2250-2459, Volume 2, Issue 10, October 2012)
- [25] Hani Chotai, “*Review on Effect of Varying Compression Ratio on Performance & Emissions of Diesel Engine fueled with Biodiesel*”, International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 2, Issue 4, July 2013
- [26] Ramchandra S. Jahagidar, Eknath R. Deore, Milind S. Patil, Purushottam S. Desale, “*Performance Characterization of Single Cylinder DI Diesel Engine Fueled with Karanja Biodiesel*”, Proceedings of the World Congress on Engineering 2011 Vol III WCE 2011, July 6 - 8, 2011, London, U.K.
- [27] A.H. Zaibunnisa, S. Norashikin, S. Mamot, H. Osman, “*An experimental design approach for the extraction of volatile compounds from turmeric leaves (Curcuma domestica) using pressurised liquid extraction*”, LWT - Food Science and Technology 42 (2009) 233–238
- [28] Mohamed F. Al-Dawody and S.K. Bhatti, “*Effect of Variable Compression Ratio on the Combustion, Performance and Emission Parameters of a Diesel Engine Fuelled with Diesel and Soybean Biodiesel Blending*”, World Applied Sciences Journal 30 (12): 1852-1858, 2014 ISSN 1818-4952 © IDOSI Publications, 2014 DOI: 10.5829/idosi.wasj.2014.30.12.338
- [29] Sunilkumar R. Kumbhar, H. M. Dange, “*Performance Analysis Of single Cylinder Diesel Engine, Using Diesel Blended with Thumba Oil*”, International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-4, Issue-1, March 2014
- [30] Anbarasu.A, Karthikeyan.A., “*Performance and Emission Characteristics of Direct Injection Diesel Engine Running On Canola Oil / Diesel Fuel Blend*”, American Journal of Engineering Research (AJER) e-ISSN : 2320-0847 p-ISSN : 2320-0936 Volume-03, Issue-08, pp-202-207
- [31] Sayi Likhitha S S1, B. Durga Prasad2, Ch. R. Vikram Kumar, “*Investigation on the Effect of Diethyl Ether Additive on the Performance of Variable Compression Ratio Diesel Engine*”, International Journal of Engineering Research ISSN:2319-6890(online),2347-5013(print) Volume No.3 Issue No: Special 1, PP: 11-15 22nd March 2014

An Enhanced (31,11,5) Binary BCH Encoder and Decoder for Data Transmission

P.Mozhiarasi, C.Gayathri, V.Deepan

Master of Engineering, VLSI design, Sri Eshwar College of Engineering, Coimbatore- 641 202, arasi.mozhi91@gmail.com
Assistant Professor, Electronics and Communication Engineering, Sri Eshwar College of Engineering, Coimbatore- 641 202,
gayathrichandran28@gmail.com
System administrator, Mahle Behr India Pvt. Ltd., Kancheepuram, Dist.-603002, deepan2100@yahoo.co.in

Abstract— This paper describes the design of (31,11,5) BCH encoder and decoder using mathematical derivation where 31, 11 and 5 represents the block length(n), data length(k) and maximum number of correctable errors(t) respectively. By the use of Galois Field $GF(2^5)$ the encoding and decoding are carried out with an irreducible polynomial of x^5+x^2+1 . The codeword is formed in encoder side by appending redundant bits(R(X)) with the message bit and transmitted through the channel to the decoder side. In the meanwhile, the Flash memory is used to store codeword, later for correction part in decoder side. Decoder involves 3 important steps: 1) The Syndrome calculation(SC), 2) Berlekamp Massey Algorithm (BMA), 3)The Chain Search(CS). The result shows that maximum of 5 errors in any position of 31 bits can be corrected effectively.

Keywords— Bose Chaudhuri Hocquenghem (BCH), BCH Encoder, BCH Decoder, Berlekamp Massey Algorithm (BMA), Chain Search(CS), Galois Field (GF), Syndrome Calculation(SC).

INTRODUCTION

A block of memory can store a sequence of 0's and 1's which, depending on the context, can represent a number, a fragment of text or a piece of graphics. The digital systems represents values using two voltage levels (usually 0V and +5V). With two such levels one can represent exactly two different values. These could be any two different values, but by convention we use the values 0 and 1. These two values coincidentally, correspond to the two digits used by binary numbering system. Bit is abbreviated for Binary Digit, which can hold either a 0 or a 1. Bits are combined to form some meaningful data[1]. When eight bits are grouped together they are represented as a byte. Code is a symbolic representation of an information transform. Bit combinations are referred to as "Code words". When binary information can be transmitted from one device to another by electric wires or other communication medium, the system cannot guarantee that the same data is received by device on other side[2]. Therefore, Error Correcting Techniques were introduced to avoid such bit reversal errors. Error Correcting Control is very important in modern communication systems. There are two correcting codes, that are BCH (*Bose, Chaudhuri, and Hocquenghem*), Turbo, LDPC and RS (*Reed-Solomon*) codes, are being widely used in satellite communications, computer networks, magnetic and optic storage systems.

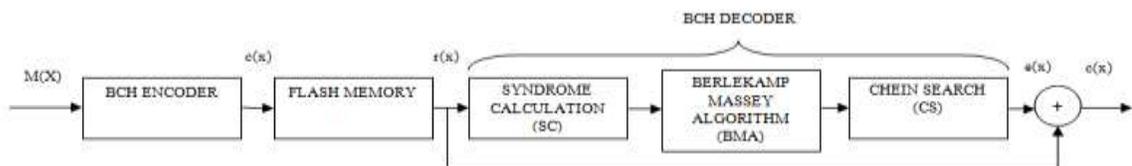


Figure 1 Block Diagram of BCH Encoder and Decoder

BCH codes are one of the most powerful random-error correcting cyclic codes. BCH codes can be defined by two parameters that are code size n and the number of errors to be corrected t [4]. BCH codes are polynomial codes that operate over Galois fields (or finite fields) [3]. In this paper, (31,11) BCH encoder and decoder are designed and they can detect and correct upto five errors. In early stage, each character is a text message which is converted to a 11 bit binary data and is encoded to form 31 bit codeword. The BCH decoder is implemented with Berlekamp Massey Algorithm(BMA) and Chien Search (CS) Algorithm as shown in Fig. 1.

BCH CODES

The BCH abbreviation stands for the discoverers, Bose and Chaudhuri (1960), and independently Hocquenghem (1959). These codes are multiple error correcting codes and generalization of the Hamming codes. The most common binary BCH codes are characterized for any positive integers m (equal to or greater than 3) and the number of errors detected and corrected t by following parameters.

Codeword length, $n = 2^m - 1$
 Number of parity check bits, $n - k \leq mt$
 Minimum distance, $d_{\min} \geq 2t + 1$
 where, m – primitive polynomial
 k – data length
 t – maximum number of correctable errors

Let us construct a generator polynomial for BCH (31,11) where, the code has 31 codeword bits, 20 redundant bits, corrects 5 errors ($t=5$). The generator polynomial of this code is generated using primitive polynomial $x^5 + x^2 + 1$ over Galois Field GF(32)[3] as shown in Table 1.

Table I Field of 32 Elements Generated by $x^5 + x^2 + 1$

Power Form	Polynomial Form	4-Tuple Form $\alpha^i, \alpha^2, \alpha^4$	Minimal polynomial
0	0	00000	0
$\alpha^{31}, 1$	1	00001	1
α	α	00010	$x^5 + x^2 + 1$
α^2	α^2	00100	$x^2 + x^2 + 1$
α^3	α^3	01000	$x^3 + x^4 + x^3 + x^2 + 1$
α^4	α^4	10000	$x^2 + x^2 + 1$
α^5	$\alpha^2 + 1$	00101	$x^3 + x^4 + x^2 + x + 1$
α^6	$\alpha^3 + \alpha$	01010	$x^3 + x^4 + x^3 + x^2 + 1$
α^7	$\alpha^4 + \alpha^2$	10100	$x^3 + x^3 + x^2 + x + 1$
α^8	$\alpha^3 + \alpha^2 + 1$	01101	$x^3 + x^2 + 1$
α^9	$\alpha^4 + \alpha^2 + \alpha$	11010	$x^5 + x^4 + x^2 + x + 1$
α^{10}	$\alpha^4 + 1$	10001	$x^3 + x^4 + x^2 + x + 1$
α^{11}	$\alpha^2 + \alpha + 1$	00111	$x^3 + x^4 + x^3 + x + 1$
α^{12}	$\alpha^3 + \alpha^2 + \alpha$	01110	$x^3 + x^4 + x^3 + x^2 + 1$
α^{13}	$\alpha^4 + \alpha^3 + \alpha^2$	11100	$x^3 + x^4 + x^3 + x + 1$
α^{14}	$\alpha^4 + \alpha^3 + \alpha^2 + 1$	11101	$x^3 + x^3 + x^2 + x + 1$
α^{15}	$\alpha^4 + \alpha^3 + \alpha^2 + \alpha + 1$	11111	$x^3 + x^3 + 1$
α^{16}	$\alpha^4 + \alpha^3 + \alpha + 1$	11011	$x^5 + x^4 + 1$
α^{17}	$\alpha^4 + \alpha + 1$	10011	$x^3 + x^4 + x^3 + x^2 + 1$
α^{18}	$\alpha + 1$	00011	$x^3 + x^4 + x^2 + x + 1$
α^{19}	$\alpha^2 + \alpha$	00110	$x^3 + x^3 + x^2 + x + 1$
α^{20}	$\alpha^3 + \alpha^2$	01100	$x^3 + x^4 + x^2 + x + 1$
α^{21}	$\alpha^4 + \alpha^3$	11000	$x^3 + x^4 + x^3 + x + 1$
α^{22}	$\alpha^4 + \alpha^2 + 1$	10101	$x^3 + x^4 + x^3 + x + 1$
α^{23}	$\alpha^3 + \alpha^2 + \alpha + 1$	01111	$x^3 + x^3 + 1$
α^{24}	$\alpha^4 + \alpha^3 + \alpha^2 + \alpha$	11110	$x^3 + x^4 + x^3 + x^2 + 1$
α^{25}	$\alpha^4 + \alpha^3 + 1$	11001	$x^3 + x^3 + x^2 + x + 1$
α^{26}	$\alpha^4 + \alpha^2 + \alpha + 1$	10111	$x^3 + x^4 + x^3 + x + 1$
α^{27}	$\alpha^3 + \alpha + 1$	01011	$x^3 + x^3 + 1$
α^{28}	$\alpha^4 + \alpha^2 + \alpha$	10110	$x^3 + x^4 + x^2 + x + 1$
α^{29}	$\alpha^2 + 1$	01001	$x^3 + x^3 + 1$
α^{30}	$\alpha^4 + \alpha$	10010	$x^5 + x^3 + 1$

Let α be a primitive element in GF (2^m). The generator polynomial $g(x)$ of the t error-correcting BCH code of length $2^m - 1$ is the lowest-degree polynomial over GF(2)[5] which has $\alpha, \alpha^2, \alpha^3, \dots, \alpha^{2t}$ as its roots [i.e., $g(\alpha^i) = 0$ for $1 \leq i \leq 2t$].

Consider $f_i(x)$ be the minimal polynomial of α^i . Then $g(x)$ must be the least common multiple of $f_1(x), f_2(x), \dots, f_{2t}(x)$, that is, $g(x) = \text{LCM} \{f_1(x), f_2(x), \dots, f_{2t}(x)\}$. But, $g(x)$ is simplified to $g(x) = \text{LCM} \{f_1(x), f_3(x), \dots, f_{2t-1}(x)\}$ because every even power of primitive element will have same minimal polynomial as some odd power of the elements having the number of factors in the polynomial.

Lin and Costello, Pless, and Rorabaugh exhibit algorithms for finding them using cyclotomic cosets[6]. From Lin and Costello, the first four odd power of α minimal polynomials are:

$$\begin{aligned} \alpha : f_1(x) &= x^5 + x^2 + 1 \\ \alpha_3 : f_3(x) &= x^5 + x^4 + x^3 + x^2 + 1 \\ \alpha_5 : f_5(x) &= x^5 + x^4 + x^2 + x + 1 \\ \alpha_7 : f_7(x) &= x^5 + x^3 + x^2 + x + 1 \end{aligned}$$

Therefore, $g(x) = \text{LCM} \{f_1(x), f_3(x), f_5(x), f_7(x)\} = f_1(x) f_3(x) f_5(x) f_7(x)$ (since these are irreducible). So

$$\begin{aligned} g(x) &= (x^5 + x^2 + 1)(x^5 + x^4 + x^3 + x^2 + 1)(x^5 + x^4 + x^2 + x + 1)(x^5 + x^3 + x^2 + x + 1) \\ &= x^{20} + x^{18} + x^{17} + x^{13} + x^{10} + x^9 + x^7 + x^6 + x^4 + x^2 + 1 \\ &= 1011000100110110101010 \end{aligned}$$

1. BCH ENCODER:

Let us consider a binary word 1000100 which represents “D” and it is placed in 11-bit information which is then appended with 20 bit sequence. Thus, 31 bit sequence is divided with generator polynomial to obtain a remainder. By combining the message sequence with the remainder sequence, the codeword is obtained (i.e., $c(x) = X^{n-k} M(x) \text{ mod } g(x) = X^{20}M(x) = 0000100010011001100100001101101$). This type of encoding is called systematic encoding where message bit and check bits were placed one after the other.

When the encoded data is transmitted through a noisy channel, errors are included into the codeword[10]. This is because the data which is transmitted in the form of electromagnetic signal over a channel whenever an electromagnetic signal flows from one point to another, it is subjected to unpredictable interference from heat, magnetism and other forms of electricity. This interference can change the shape or timing of signal. If the signal is carrying encoded binary data, such changes can alter the meaning of data[11].

Therefore, the codewords can be tested by dividing the codeword sequence by generator polynomial. If the remainder produced is zero then we confirm that there is no error in the codeword or else error is present[7].

2. BCH DECODER:

Five errors are introduced to the codeword for applying the error correcting algorithm to detect those errors and to correct them. The received sequence is represented by $r(x) = 0101100000011001100101001101111$ (bits in bold represents the error). The primitive polynomials are denoted as

$$\begin{aligned} f_1(x) &= f_2(x) = f_4(x) = f_8(x) = 100101 \\ f_3(x) &= f_6(x) = 111101 \\ f_5(x) &= f_{10}(x) = f_9(x) = 110111 \\ f_7(x) &= 101111 \end{aligned}$$

2.1 SYNDROME CALCULATION

The number of syndrome elements is $2*t = 10$, to find $t=5$ errors[8]. Those syndrome elements are represented as $S_1, S_2, S_3, S_4, S_5, S_6, S_7, S_8, S_9, S_{10}$ and they can be calculated by

$$\begin{aligned} S_1(x) &= r(x) \text{ mod } f_1(x) = r(x) \text{ mod } f_1(x) = \alpha^{23} \\ S_2(x) &= r(x) \text{ mod } f_2(x) = r(x) \text{ mod } f_1(x) = \alpha^{15} \\ S_3(x) &= r(x) \text{ mod } f_3(x) = r(x) \text{ mod } f_3(x) = \alpha^{20} \\ S_4(x) &= r(x) \text{ mod } f_4(x) = r(x) \text{ mod } f_1(x) = \alpha^{30} \\ S_5(x) &= r(x) \text{ mod } f_5(x) = r(x) \text{ mod } f_5(x) = \alpha^7 \\ S_6(x) &= r(x) \text{ mod } f_6(x) = r(x) \text{ mod } f_3(x) = \alpha^9 \\ S_7(x) &= r(x) \text{ mod } f_7(x) = r(x) \text{ mod } f_7(x) = \alpha^{15} \\ S_8(x) &= r(x) \text{ mod } f_8(x) = r(x) \text{ mod } f_1(x) = \alpha^{29} \\ S_9(x) &= r(x) \text{ mod } f_9(x) = r(x) \text{ mod } f_5(x) = \alpha^{25} \\ S_{10}(x) &= r(x) \text{ mod } f_{10}(x) = r(x) \text{ mod } f_5(x) = \alpha^{14} \end{aligned}$$

Each syndrome equation is a function only of the errors in the received codeword.

2.2 BERLEKAMP MASSEY ALGORITHM (BMA)

Error locator polynomial is calculated iteratively by Berlekamp. Using Lin and Costello, a table is formed.

The “Key Equation” is given by

$$\sigma^{(\mu+1)}(x) = \sigma^\mu(x) + d_\mu d_p^{-1} x^{2(\mu-\rho)} \sigma^{(\rho)}(x) \quad \text{-----equation 1}$$

$$l_{\mu+1} = L = \text{deg}(\sigma^{(\mu+1)}(x)) \quad \text{-----equation 2}$$

$$d_{\mu+1} = S_{2\mu+3} + \sigma_1^{(\mu+1)} S_{2\mu+2} + \sigma_2^{(\mu+1)} S_{2\mu+1} + \dots + \sigma_L^{(\mu+1)} S_{2\mu+3-L} \quad \text{-----equation 3}$$

Steps:

- (i) Initialize $\mu = 0, d_\mu \neq 0, \rho = -1/2$

(ii) Substitute $\sigma^{(\mu)}(x) = \sigma^{(0)}(x) = 1$, $d_\mu = d_0 = S_1$, $d_\rho^{-1} = d_{-\frac{1}{2}}^{-1} = 1$, $\sigma^{(\rho)}(x) = \sigma^{(-\frac{1}{2})}(x) = 1$ in equation 1

$$\begin{aligned} \sigma^{(1)}(x) &= \sigma^0(x) + d_0 d_{-1/2}^{-1} x^2 \left(\frac{1}{2}\right) \sigma^{(-\frac{1}{2})}(x) \\ &= 1 + \alpha^{23} (1)^{-1} x(1) \\ &= \alpha^{23} x + 1 \end{aligned}$$

(iii) Substitute $\sigma^{(1)}(x) = \alpha^{23} x + 1$ in equation 2

$$\begin{aligned} l_1 &= \deg(\sigma^{(1)}(x)) \\ &= \deg(\alpha^{23} x + 1) = 1 \end{aligned}$$

(iv) Substitute $S_3 = \alpha^{20}$, $S_2 = \alpha^{15}$, $\sigma_1^{(4)} = \alpha^{23}$ in equation 3

$$\begin{aligned} d_1 &= S_3 + \sigma_1^{(4)} S_2 \\ &= \alpha^{20} + (\alpha^{23}) (\alpha^{15}) \\ d_1 &= \alpha^{21} \end{aligned}$$

(v) In similar way, for $\mu = 1$, $d_\mu \neq 0$, $\rho = 0$, $\sigma^{(2)}(x) = \alpha^{29} x^2 + \alpha^{23} x + 1$, $l_2 = 2$ and $d_2 = \alpha$

for $\mu = 2$, $d_\mu \neq 0$, $\rho = 1$, $\sigma^{(3)}(x) = \alpha^3 x^3 + \alpha^{12} x^2 + \alpha^{23} x + 1$, $l_3 = 3$ and $d_3 = \alpha^{15}$

for $\mu = 3$, $d_\mu \neq 0$, $\rho = 2$, $\sigma^{(4)}(x) = \alpha^{12} x^4 + \alpha x^3 + \alpha^{17} x^2 + \alpha^{23} x + 1$, $l_4 = 4$ and $d_4 = \alpha^7$

for $\mu = 4$, $d_\mu \neq 0$, $\rho = 3$, $\sigma^{(5)}(x) = \alpha^{26} x^5 + \alpha^{24} x^4 + \alpha^{14} x^3 + \alpha^{13} x^2 + \alpha^{23} x + 1$

The last polynomial $\sigma^{(5)}(x) = \alpha^{26} x^5 + \alpha^{24} x^4 + \alpha^{14} x^3 + \alpha^{13} x^2 + \alpha^{23} x + 1$ represents the final error locator polynomial. The Lin and Costello, a table [9] is finally formed using above calculations as shown in Table II.

Table II Lin and Costello Table

μ	$\sigma^{(\mu)}(x)$	d_μ	l_μ	$2\mu - l_\mu$
-1/2	1	1	0	-1
0	1	α^{23}	0	0
1	$\alpha^{23} x + 1$	α^{21}	1	1
2	$\alpha^{29} x^2 + \alpha^{23} x + 1$	α	2	2
3	$\alpha^3 x^3 + \alpha^{12} x^2 + \alpha^{23} x + 1$	α^{15}	3	3
4	$\alpha^{12} x^4 + \alpha x^3 + \alpha^{17} x^2 + \alpha^{23} x + 1$	α^7	4	4
5	$\alpha^{26} x^5 + \alpha^{24} x^4 + \alpha^{14} x^3 + \alpha^{13} x^2 + \alpha^{23} x + 1$	-	-	-

Note: 1) Lin and Costello notations were used
 2) d_μ represents discrepancy value

2.3 CHIEN SEARCH (CS) ALGORITHM

The roots of $\sigma^{(\mu)}(x)$ in GF (2^5) should be found out by trial and error substitution [12]. If $\sigma^{(\mu)}(x) = \sigma^{(5)}(x) = \alpha^{26} x^5 + \alpha^{24} x^4 + \alpha^{14} x^3 + \alpha^{13} x^2 + \alpha^{23} x + 1 = 0$ is obtained by substituting $x = 0, 1, \alpha, \alpha^2, \dots, \alpha^{30}$ then they are considered as roots.

Example: $\sigma^{(5)}(0) = \alpha^{26}(0)^5 + \alpha^{24}(0)^4 + \alpha^{14}(0)^3 + \alpha^{13}(0)^2 + \alpha^{23}(0) + 1 = 1 \neq 0$

...

$$\sigma^{(5)}(\alpha^2) = \alpha^{26}(\alpha^2)^5 + \alpha^{24}(\alpha^2)^4 + \alpha^{14}(\alpha^2)^3 + \alpha^{13}(\alpha^2)^2 + \alpha^{23}(\alpha^2) + 1 = 0$$

...

$$\sigma^{(5)}(\alpha^4) = \alpha^{26}(\alpha^4)^5 + \alpha^{24}(\alpha^4)^4 + \alpha^{14}(\alpha^4)^3 + \alpha^{13}(\alpha^4)^2 + \alpha^{23}(\alpha^4) + 1 = 0$$

...

$$\sigma^{(5)}(\alpha^9) = \alpha^{26}(\alpha^9)^5 + \alpha^{24}(\alpha^9)^4 + \alpha^{14}(\alpha^9)^3 + \alpha^{13}(\alpha^9)^2 + \alpha^{23}(\alpha^9) + 1 = 0$$

...

Therefore, $\alpha^2, \alpha^4, \alpha^9, \alpha^{22}, \alpha^{30}$ are the roots. The bit position of error location will be the inverse of their roots ($\alpha^2, \alpha^4, \alpha^9, \alpha^{22}, \alpha^{30}$) i.e., 0101000010000000000001000000010. Thus, the error pattern polynomial can be written as $e(x) = x^{29} + x^{27} + x^{22} + x^9 + x$. As a result, the transmitted or original data is recovered by performing modulo-2 addition for $r(x)$ and $e(x)$.

$$\begin{aligned} c(x) &= r(x) + e(x) \\ &= 0101100000011001100101001101111 + 0101000010000000000001000000010 \\ &= \underbrace{0000100010011001100100001101101}_{M(x)} \end{aligned}$$

CONCLUSION

The error correcting technique plays an important role in modern communication and digital storage systems. (31,11,5) BCH encoder and decoder are designed with mathematical derivations and upto 5 errors can be detected and corrected by using Berlekamp Massey Algorithm (BMA) and Chien Search (CS).

REFERENCES:

- [1] Berlekamp.E.R, "Algebraic Coding Theory", Mc GrawHill, New York, 1968.
- [2] Claude E. Shannon and Warren Weaver, "The Mathematical theory of Communication", Chicago: University of Illinois Press, p.71, 1963.
- [3] Goresky, M. and Klapper, A.M. Fibonacci, "Galois representations of feedback-with-carry shift registers", *IEEE Transactions on Information Theory*, Volume: 48, p. 2826 –2836, Nov 2002.
- [4] Hank Wallace, "Error Detection and Correction using BCH Codes", Copyright © 2001 Hank Wallace.
- [5] Oliver Pretzel, "Error Correcting Codes and Finite Fields", Oxford: Oxford University Press, p. 77, 1992.
- [6] P.Mozhiarasi , Ms.C.Gayathri, "A Mathematical Derivation for Error Correction and Detection in Communication using BCH Codes", *IPASJ International Journal of Electronics & Communication*, Vol. 2, Issue 10, p. 7-12, Oct. 2014.
- [7] R.C.Bose, D.K.Ray-Chaudhuri, "On a class of error correcting binary group codes", *Inf. Cntrl*, 3, p. 68-79, March 1960.
- [8] R.L. Miller, "Generalized BCH codes", *Information and Control*, Vol.40, Issue 1, p. 61-75, Jan. 1979.
- [9] Shu Lin and Daniel J. Costello, Jr., "Error Control Coding", Englewood Cliffs, New Jersey: Prentice Hall, Chapter 1, 1983.
- [10] Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons, Inc.
- [11] W.W.Peterson, "Encoding and Error-Correction procedures for the Bose-Chaudhuri Codes", *IRE Trans. Inf. Theory*, IT-6, p. 459-470, Sep. 1960.
- [12] Yunghsiang S. Han, "BCH Codes", Graduate Institute of Communication Engineering, National Taipei University Taiwan.

Implementation of the Highly Secured H.264/AVC Bit-Streams Using Correlated Motion (Cm) Estimation for High Video Quality of Service (Qos)

DHIVYA G, RAJESWARI A

Graduate student, M.E – Applied Electronics, DSCET, ANNA UNIVERSITY, Tamilnadu, INDIA

dhivya711@gmail.com +91 9445154038

Abstract— Quality of Service (QoS) is the important criteria in the video processing in H.264/AVC Bit-streams. In this paper, the encryption based bit streams transmitted to improve the security of the bit streams. So the proposed system mainly considered reduction of the de-blocking filter effect in the Mean Square Estimation (MSE). The Correlation Motion (CM) based MSE estimation method derives elaborate distribution models for the transform coefficients in H.264/AVC bit-streams. The MSE between the input and decrypted frames split into two terms. They are quantization error and deblocking effect in H.264/AVC. The quantization parameters and the deblocking effect in MPEG-2 I-frames are estimated with an overall accuracy of 99.9 % and the MSE is estimated with an overall average error of 0.3 dB. The MATLAB simulation results confirms the effectiveness of proposed method over the existing PSNR estimation.

Keywords— Correlation Motion (CM), Deblocking, Discrete Cosine Transform (DCT), Mean Square Estimation (MSE), Motion Estimation, Peak Signal to Noise Ratio (PSNR), Quality of Service (QoS).

INTRODUCTION

Wireless network infrastructure is the key technology for better video communication from one place to another. It uses the greater portion of electromagnetic spectrum for fast transfer. Hence, the internet service providers and mobile network provider updates their strategy in order to provide the best experience to the users based on traffic. With the rapid increase in the demand for high quality video services, Quality of Service (QoS) has become an important issue; thus, intensive study of accurate quality assessment methods on video is essential. The Video Quality Expert Group (VQEG) specifies several guidelines to measure video quality. Traditionally, quality assessment methods are classified into three depending on the availability of original reference data. Full Reference (FR) methods measures the quality by referencing the video data. Reduced-Reference (RR) methods are similar to the full-reference except that the original data are limitedly transmitted or partially used at receiver sides and No-Reference (NR) methods makes Visual Quality Assessment (VQA) without the original data, which are very practical in many applications.

RR methods requires less information than the full-reference methods where the visual quality of delivered video can be estimated by the limited amount of features that reflect the original video. Edge in the image is considered an important feature in the RR method. Human eyes are known to be sensitive to edge features for image perception. In MPEG-7, there is a descriptor for edge distribution in the image. This edge histogram descriptor proposed for MPEG-7 consists only the local edge distribution in the image. That is, since it is important to keep the size of the histogram as small as possible for the efficient storage of the metadata, the normative edge histogram for MPEG-7 is designed to contain only local edge distribution with 80 bins. These 80 histogram bins are the only standardized semantics for the MPEG-7 edge histogram descriptor. However, with the local histogram bins only, it is not sufficient to represent global features of the edge distribution. Note that to improve the retrieval performance, we need global edge distribution as well. In this paper, we generate the semi-global and global edge histograms from the local histogram bins. Then, the global, semi global, and local histogram bins are used to evaluate the similarity between images.

There are two quality evaluation methods in the video quality assessment. They are subjective and objective quality evaluation. Subjective quality evaluation is based on the ratings of pole of human viewers. But, it is not feasible in real time due to complexity. Objective quality assessment methods estimates the video quality without using human observers. Majority of video traffic are based on HTTP / TCP based one due to the reliable delivery and without distortion. The Peak Signal to Noise Ratio (PSNR) mostly used to quantify the encoding the video streams on sender due to low saturation and high PSNR regions. The NR matrices operates in pixel domain and bit stream domain. In pixel based approaches, the video encoded fully which leads to high complexity. Hence, it is not considered in applications. On the other hand, the bit stream based approach based on the statistical properties of the transformed coefficients. Here the comparison between the quantized coefficients with the original transform coefficients constitutes the distortion. The bit stream based video encode is extended with the use of deblocking filter. The discontinuities in homogeneous regions leads to blocking artifact in highly compressed videos. This blocking effect is efficiently removed with the help of deblocking filter.

In this paper, the efficient Correlation Motion (CM) based MSE on highly secured H.264/AVC Bit-Streams is proposed. The system uses the CM model of the Bit stream network to measure the MSE between the input and decrypted frame. The comparison results confirm the effectiveness of the proposed method over existing approaches using the NR measurement. The rest of the paper is organized as follows. Section II presents a description about the previous research which is relevant to the highly secured H.264 / AVC bit streams and the possible solutions. Section III involves the detailed description about the proposed method. Section IV presents the performance analysis. This paper concludes in Section V.

RELATED WORK

This section deals with the works related to the highly secured H.264/AVC Bit-Streams, estimation technique implemented to enhance the performance of CR network. *Panayides et al* [1] described the efficient video communication for H.264 / AVC medical video over the mobile network. The performance of the system was validated using OPNET simulations of mobile access control. They also provided the guidelines for the design of diagnostic based encoding of High Efficiency Video Coding standard. The diagnostic based HEVC yielded the high computational complexity. *Schroeder et al* [2] presented the No Reference (NR) based Peak Signal to Noise Ratio (PSNR) estimation based on average bit rate and mean quantization parameter. The low complexity of this approach is most suitable in real time applications. They also investigated the effect of encoding techniques on the PSNR estimation. The prediction of weak textured patches from the noisy image was difficult task. *Xinhao et al* [3] proposed the novel patch based noise level estimation algorithm to predict the weak textures from noisy image based on the gradients and statistics. The noise level of the image was estimated using Principle Component Analysis (PCA) technique. This model was not suitable where the partial information of original image was available. Reduced Reference (RR) was the alternative tool for the applications with partial information. *Rehman et al* [4] presented the RR Image Quality Assurance (IQA) model which estimated the structural similarity index and the features were extracted using multistate multi orientation divisive normalization transform. *Chaofeng et al* [5] developed the NR IQA with the use of General Regression Neural Network (GRNN). The functional relationship between the features such as entropy of phase congruency image, distorted image and the gradient of the distorted image with subjective mean opinion scores. The experimental results confirmed the closeness to human subjective judgment. The computational model was needed to predict the human perceived quality of distorted image without using the knowledge of reference. *Peng et al* [6] presented the general purpose NR-IQA based on visual code books. The complex statistics of image captured by using the Gabor filter based feature extraction. The tracking of moving objects was the necessary task in the video bit streams. *Sabirin et al* [7] presented spatio-temporal graph-based method of detecting and tracking moving objects in video bit streams. The temporal connections between the sub graphs in two consecutive frames were computed to remove the false positive blocks. The best approximation of real shape and position of objects given by varying the size of rectangular region of interests. The power factor was considered in design of high accuracy H.264 / AVC. *Zhan et al* [8] presented the complexity reduction model which is formed by decomposing the decoder into number of decoding modules. The power level achievement in Intel and ARM chip was discussed. The optimal quality near end users to be enhanced for high accuracy. *Staelens et al* [9] presented novel no-reference bitstream-based objective video quality metric which was constructed by genetic programming-based symbolic regression. The suitable scheme was required for transparent encryption in real time applications. *Deng et al* [10] presented the Block Based Encryption Scheme (BBES) for transparent encryption. The complexity and compression of this model was very low.

Pourazad et al [11] proposed the design methodologies of High Efficiency Video Coding (HEVC). They also explained the processes such as prediction, frame estimation, encoding and decoding schemes were available in the HEVC. Several fast algorithms

developed for reduction of energy consumption in HEVC system. *Sadhvi et al* [12] presented the improved 8 point Discrete Cosine Transform (DCT) on multitude of compression standard for reduction of complexity and the energy consumption in HEVC system. The sharing architecture for complexity reduction was needed in HV.264 bit streams. Yu-Lin et al [13] presented the hardware sharing architecture for efficient multi-standard deblocking strategy. The existing deblocking strategy was reorganized according to H.264 / VP 8. Then the multi sharing architecture was developed for reduction of complexity and energy consumption. The integration of several CPU cores and GPU accelerators called heterogeneous platforms. The parallel operation of CPU+GPU for high performance analyzed. *De Souza et al* [14] aimed the exploitation of multi parallelism level in HEVC deblocking filter by following processes: The implementation of highly optimized CPU parallel operation, the implementation of GPU for HEVC deblocking filter and implementation of hybrid, load balanced CPU+GPU. The code structure unit to be reduced in HEVC based deblocking filter. *Liquan et al* [15] presented the Coding Unit (CU) size utilization algorithm for HEVC Model (HM) for complexity reduction. The CU depth range was calculated and rarely used depth features were skipped. The video content acquired and distributed in digital format. *Bestagini et al* [16] presented the video codec and analysis of video codec done on the basis of foot prints. The algorithm based approach in video codec used for lossy compression. The experimental setup was constructed to validate the results. But, the suitable model was needed to estimate the perceived video in codecs. *Joskowicz et al* [17] proposed the better estimation model for perceived video. The model was operated on low bit ranges. The error estimation also performed against the International Telecommunication Units (ITU) standards. The parametric model has four parameters for codec. Two of them were related to video movement, the third parameter related to display format and the fourth parameter related to codec performance. The quality estimation of proposed model computed with standard model. The research works concentrated on the video quality estimation for complexity and energy consumption. Chikkerur et al [18] presented the classification based model for FR and RR model where the classification based on natural visual characteristics and sub classification based on natural features. The media layer objective model was analyzed based on classification scheme. The classification scheme based on the feature extraction. *Shengbin et al* [19] presented the NR Scalable Video Coding (SVC) bitstream extraction problem and the solution to an approximately optimal extraction. The packet's priority assignment was done using the greedy algorithm. The Quantization-Distortion model required for the video quality estimation. *Wang et al* [20] presented the QD model for quality estimation of H.264 / SVC. The CM model based MSE estimation was proposed in this paper.

PROPOSED METHOD

The No Reference (NR) based model of H.264 / AVC video streams is proposed in this paper. The input video is passed through the several processes such as transformation, quantization and deblocking filtering for efficient encryption and decryption. The block diagram of proposed H.264 / AVC is shown in Fig. 1.

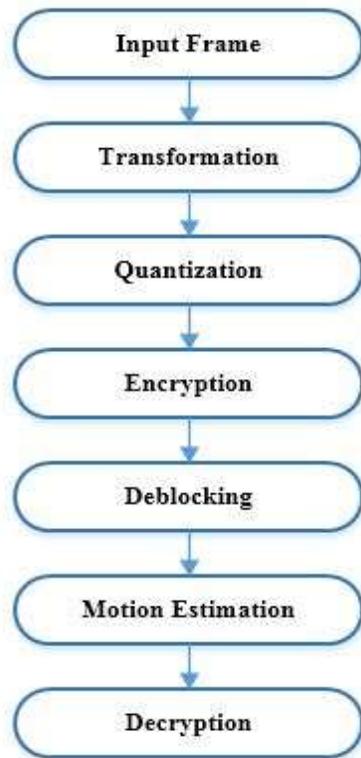


Fig. 1 Block diagram of proposed method

The input video is arranged in number of frames initially. Then the spatial domain of input frames are converted to frequency domain using DCT. The smooth regions are identified in adaptive quantization. The missing pixels in the quantization methods are recovered by deblocking filter. The good estimator of random variables of DCT coefficients is to minimize the mean square error of the frame levels. The correlation between the video bits and neighboring bits are calculated in the motion estimation process. The shifted position of row and columns in encryption process are move back to original position in decryption process. The flow of H.264 / AVC bitstream encryption with deblocking is shown in Fig. 2

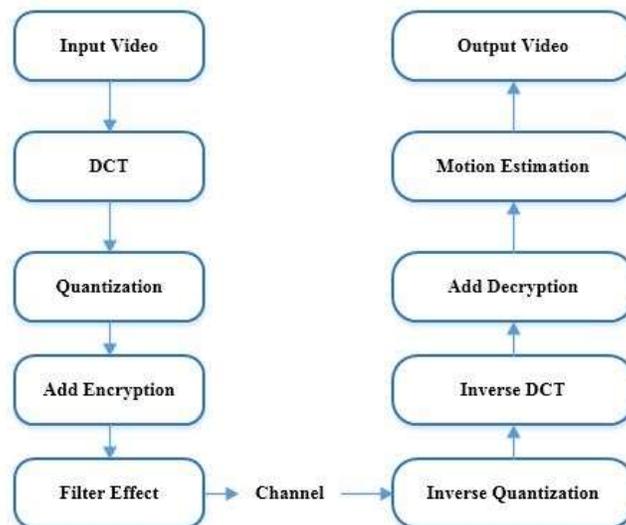


Fig. 2 Flow of proposed method

Input Frame

The initial process in the video encryption is frame conversion. The input video is converted to I and P frames in this stage. In general, the video stream refers to display of moving pictures in the monitor by progression of images with changing positions. A single frame of video is split into thin lines called scan lines. The conversion of video into frames using two methods called interlacing and progressive method. Interlacing method split the video into two fields odd and even. The odd and even fields transmitted in alternate fashion and displayed in the device. On the other hand, progressive method displays the entire scan lines i.e first to last in a single frames. Hence, large bandwidth is required for P frames. After conversion of video into frames the frames are transferred to encryption process.

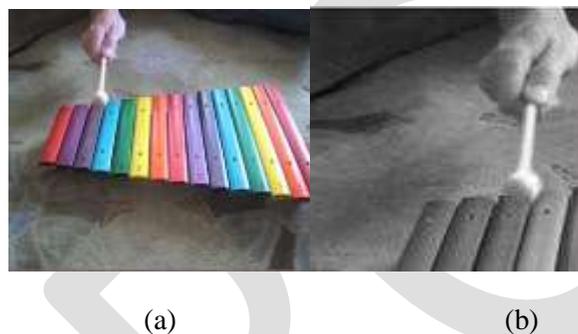


Fig. 3 Frame Conversion

Fig. 3(a). Fig. 3(b) describes the input original video to the frame conversion process and the output resize frame after the conversion process.

Transformation

The I frames of video be the intra coded with no reference to other frames. P frames of video are predictively coded using neighboring frames I or P. the video coding is split into three processes such as transform coding, macro block and interpolation. The frames of video represents two dimensional array of RGB triplets. This triplets are transformed to YCrCb triplets using transform coding. The Y value represents luminance and Cr /Cb value represents the chrominance levels. Then the frames converted to macro blocks which corresponds to 16 x16 pixel area of original image. Finally, the interpolation process produces the forward prediction vector for P frame and backward prediction vector for I frame.

The frames are converted to frequency components by the suitable transformation technique called Discrete Cosine transformation (DCT). Let us consider the list of numbers be x of length n . The transformed coefficients of $s(x)$ is given by

$$s(u) = \sqrt{\frac{2}{n}} c(u) \sum_{x=0}^{n-1} s(x) \cos\left(\frac{(2x+1)u\pi}{2n}\right), u = 0 \dots n \quad (2)$$

$$\text{Where } c(u) = \begin{cases} 2^{-0.5} & u = 0 \\ 1 & \text{otherwise} \end{cases}$$

The element of list $s(u)$ is the dot product of input and base vector. The one dimensional transform is used to process the 1 D signals such as speech signals. There is a need of 2 D transform to process the images. Hence the 2D transform of input values given by following equation.

$$s(u, v) = \sqrt{\frac{2}{n}} c(u) c(v) \sum_{x=0}^{n-1} s(x, y) \cos\left(\frac{(2x+1)u\pi}{2n}\right) \cos\left(\frac{(2y+1)v\pi}{2m}\right),$$

$$u = 0 \dots n \quad v = 0 \dots m \quad (3)$$

$$\text{Where } c(u) = \begin{cases} 2^{-0.5} & u = 0 \\ 1 & \text{otherwise} \end{cases}$$

$$c(v) = \begin{cases} 2^{-0.5} & v = 0 \\ 1 & \text{otherwise} \end{cases}$$

The application of DCT to the image converts the image into block of transformed coefficients.

Quantization

Quantization is the process of reducing the possible values of quantity thereby reducing the number of bits represent it. The functions for quantize the image are developed and the level of compression by quantization also calculated in this process. In video encoding process, the DCT coefficients are quantized using the weight which represents the frequencies to respective coefficient. The input videos are converted to frames, then they are transformed and they are quantized to bit streams. The higher spatial frequencies are less visible to human eye. Hence, the large quantization factors are chosen for high frequencies.

The overall energy resides in the particular section of array of transformed digital image. Adaptive quantization methods are suitable for prior knowledge of smooth regions by using minimum quantization levels in these areas. Hence the smaller number of bits required for representation of quantization levels.

Encryption

The sign bits for the pixel positions are encrypted for secure video transmission. The Advanced Encryption Standard (AES) algorithm is used for encryption and decryption of video. AES is the iterative block cipher in which one dimensional array of plain text converted to the state matrix. Transformation round key is generated from cipher key for each round. The objective of video encryption is to prevent the unauthorized receivers in the process. The general scheme for encryption is to apply the transformation E_{k1} to video stream S called plain text. Then the C is called cipher text is given by following equation:

$$C = E_{k1}(S) \quad (1)$$

Where $k1$ is the encryption key. The proposed AES algorithm is a selective encryption algorithm which operates on the coefficients of Discrete Cosine Transform (DCT). Hence, the encrypted cipher text transformed with DCT in the next process.

Deblocking

The artifacts are originated in video coding systems by the prediction and decoding strategies called blocking artifacts. The deblocking filter is required to remove the blocking artifacts and improve the video quality. The global filtering strength is modulated to the specific characteristics of video sequence. The amount of filtering is increased or decreased by adjusting the value of pair of quantization dependent parameters. Based on the key values, the filtering parameters are modified. The coefficient values are EX-ORed with 128 and complemented for key value is 1. The coefficients EX-ORed with 64 and then complemented for the key value is 0. Block-based DCT coefficients followed the Laplacian distributions for which the optimal distribution parameters are estimated using quantized coefficients. Due to the DCT and quantization the some pixel are missed due to that transformation. The de-blocking filter is used to remove the missed pixel and it is recovered by de blocking filters.

Motion Estimation

The macroblocks (16 x 16) are decomposed into 4x4 blocks in the motion estimation process. The motion vector is calculated for each block. The motion vector prediction and the motion vector differences are calculated to minimize the Mean Square Error

(MSE) of the original and decrypted video. During the deblocking, some pixels are altered to new position. The pixel intensity correlation with the original intensity is calculated. Finally, the motion of video bit is found by measuring the correlation between the neighboring bits.

A good estimator is required to minimize the MSE between the pixel intensity correlation calculations. The frame level of overall MSE is given by following equation:

$$MSE^{(n)} = \frac{1}{N_R N_C} \sum_{i=0}^{N_R-1} \sum_{j=0}^{N_C-1} \{f^{(n)}(i, j) - \hat{f}_{DF}^{(n)}(i, j)\}^2 \quad (4)$$

Where N_R, N_C are the number of frames of reference and Correlation between the estimators.

Decryption

The reverse process of encryption called decryption. In this process, the authorized user with key k_2 decrypt the video by the transformation.

$$D_{k_2} = E_{k_1}^{-1} \quad (5)$$

The decryption process is given by the following equation:

$$D_{k_2}(C) = E_{k_1}^{-1}(C) = E_{k_1}^{-1}(E_{k_1}(S)) = S \quad (6)$$

The sign bit is changed based on the key and the changes are applied to the Inverse DCT coefficients in decoding process. The shifted positions in the row and column of image moved back to the original position if the key is matched.



Fig. 4 Decrypted Video

Fig. 4 shows the final decrypted H.264 / AVC bit streams into video. The CM based model for H.264 / AVC is proposed and the performance measures confirms the effectiveness in encryption of video over the existing methods.

PERFORMANCE ANALYSIS

This section presents the performance analysis of the proposed Correlation Model (CM) based video encryption. The proposed estimation scheme used Motion Estimation (ME) for MSE measurements. The proposed scheme is also compared with the Reduced Reference (RR) based PSNR estimation on the ME performance. The evaluation of the motion estimation for various frame index values done and also compared with the PSNR estimation.

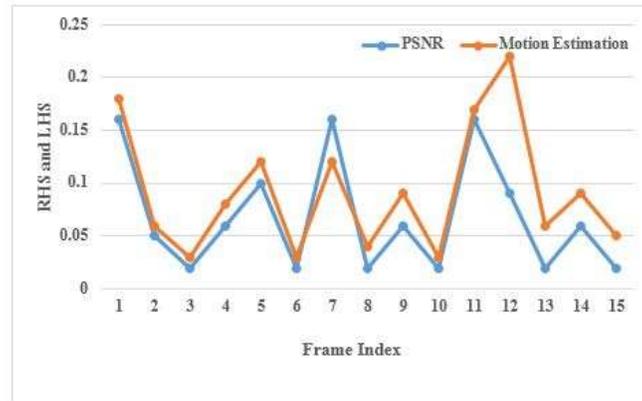


Fig. 5 Motion Estimation Vs. PSNR Estimation

Fig. 5 describes the comparison between the existing PSNR and proposed motion estimation are carried out by Right Hand Side (RHS) and Left Hand Side (LHS) estimation. The estimation done for each frame index shows the efficiency of the proposed work in the encryption.

CONCLUSION

Secure and efficient transfer considered as the important criteria in the video processing in H.264/AVC Bit-streams. In this paper, the Advanced Encryption Standard (AES) and Correlation Model based bit streams transmitted the security of the transmitted bit streams are improved. So the proposed system mainly considered reduction of the de-blocking filter effect in the Mean Square Estimation (MSE). The quantization parameters and the deblocking effect in MPEG-2 I-frames are estimated with an overall accuracy of 99.9 % and the MSE is estimated with an overall average error of 0.3 dB. The MATLAB simulation results proved the effectiveness of proposed method over the existing PSNR estimation. The comparative analysis between Advanced Encryption Standard (AES) and DES also carried out in future to confirms the effective secure transmission of video signals over the existing methodologies.

REFERENCES:

- [1] A. Panayides, Z. C. Antoniou, Y. Mylonas, M. S. Pattichis, A. Pitsillides, and C. S. Pattichis, "High-Resolution, Low-Delay, and Error-Resilient Medical Ultrasound Video Communication Using H.264/AVC Over Mobile WiMAX Networks," *IEEE Journal of Biomedical and Health Informatics*, vol. 17, pp. 619-628, 2013.
- [2] D. Schroeder, A. El Essaili, E. Steinbach, D. Staehle, and M. Shehada, "Low-Complexity No-Reference PSNR Estimation for H.264/AVC Encoded Video," in *20th International Packet Video Workshop (PV)*, 2013 2013, pp. 1-6.
- [3] L. Xinhao, M. Tanaka, and M. Okutomi, "Noise level estimation using weak textured patches of a single noisy image," in *19th IEEE International Conference on Image Processing (ICIP)*, 2012 2012, pp. 665-668.
- [4] A. Rehman and W. Zhou, "Reduced-Reference Image Quality Assessment by Structural Similarity Estimation," *IEEE Transactions on Image Processing*, vol. 21, pp. 3378-3389, 2012.
- [5] L. Chaofeng, A. C. Bovik, and W. Xiaojun, "Blind Image Quality Assessment Using a General Regression Neural Network," *IEEE Transactions on Neural Networks*, vol. 22, pp. 793-799, 2011.
- [6] Y. Peng and D. Doermann, "No-Reference Image Quality Assessment Using Visual Codebooks," *IEEE Transactions on Image Processing*, vol. 21, pp. 3129-3138, 2012.

- [7] H. Sabirin and K. Munchurl, "Moving Object Detection and Tracking Using a Spatio-Temporal Graph in H.264/AVC Bitstreams for Video Surveillance," *IEEE Transactions on Multimedia*, vol. 14, pp. 657-668, 2012.
- [8] M. Zhan, H. Hao, and W. Yao, "On Complexity Modeling of H.264/AVC Video Decoding and Its Application for Energy Efficient Decoding," *IEEE Transactions on Multimedia*, vol. 13, pp. 1240-1255, 2011.
- [9] N. Staelens, D. Deschrijver, E. Vladislavleva, B. Vermeulen, T. Dhaene, and P. Demeester, "Constructing a No-Reference H.264/AVC Bitstream-Based Video Quality Metric Using Genetic Programming-Based Symbolic Regression," *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 23, pp. 1322-1333, 2013.
- [10] R. Deng, X. Ding, Y. Wu, and Z. Wei, "Efficient block-based transparent encryption for H.264/SVC bitstreams," *Multimedia Systems*, vol. 20, pp. 165-178, 2014/03/01 2014.
- [11] M. T. Pourazad, C. Doutre, M. Azimi, and P. Nasiopoulos, "HEVC: The New Gold Standard for Video Compression: How Does HEVC Compare with H.264/AVC?," *Consumer Electronics Magazine, IEEE*, vol. 1, pp. 36-46, 2012.
- [12] U. Sadhvi Potluri, A. Madanayake, R. J. Cintra, F. M. Bayer, S. Kulasekera, and A. Edirisuriya, "Improved 8-Point Approximate DCT for Image and Video Compression Requiring Only 14 Additions," *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 61, pp. 1727-1740, 2014.
- [13] C. Yu-Lin and W. Chung-Bin, "A hardware sharing architecture of deblocking filter for VP8 and H.264/AVC video coding," in *IEEE International Symposium on Circuits and Systems (ISCAS), 2012* 2012, pp. 1915-1918.
- [14] D. F. De Souza, N. Roma, and L. Sousa, "Cooperative CPU+GPU deblocking filter parallelization for high performance HEVC video codecs," in *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2014* 2014, pp. 4993-4997.
- [15] S. Liquan, L. Zhi, Z. Xinpeng, Z. Wenqiang, and Z. Zhaoyang, "An Effective CU Size Decision Method for HEVC Encoders," *IEEE Transactions on Multimedia*, vol. 15, pp. 465-470, 2013.
- [16] P. Bestagini, A. Allam, S. Milani, M. Tagliasacchi, and S. Tubaro, "Video codec identification," in *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2012*, 2012, pp. 2257-2260.
- [17] J. Joskowicz and J. C. Ardao, "A parametric model for perceptual video quality estimation," *Telecommunication Systems*, vol. 49, pp. 49-62, 2012/01/01 2012.
- [18] S. Chikkerur, V. Sundaram, M. Reisslein, and L. J. Karam, "Objective Video Quality Assessment Methods: A Classification, Review, and Performance Comparison," *IEEE Transactions on Broadcasting*, vol. 57, pp. 165-182, 2011.
- [19] M. Shengbin, S. Jun, D. Yizhou, and G. Zongming, "An efficient method for no-reference H.264/SVC bitstream extraction," in *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2014*, 2014, pp. 1981-1985.
- [20] R.-J. Wang, Y.-T. Jiang, J.-T. Fang, and P.-C. Chang, "Quality Estimation for H.264/SVC Inter-layer Residual Prediction in Spatial Scalability," in *Advances in Image and Video Technology*. vol. 7088, Y.-S. Ho, Ed., ed: Springer Berlin Heidelberg, 2012, pp. 252-261.

Website Structure Improvement through Web Mining

Chhaya N. Shejul¹, Prof. B. Padmavathi²

¹ Computer Engineering Department, GHRCEM,
Pune University, Pune, India

chhauu.s@gmail.com

² Asst .Prof. in Computer Engineering Department, GHRCEM,
Pune University, Pune, India

bpadma_cse@yahoo.com

Abstract— facilitating effective user navigation through designing well-structured web site becomes a big challenge. This is because gap between users expectations and web developers understanding of how the website should be structured. The numbers of methods have been proposed to reorganize website to improve user navigation. As they completely reorganize website, new structure becomes unpredictable. We propose a mathematical programming method to reorganize Web structure with minimum changes in order to achieve better navigation efficiency. Heavily disoriented user should get more benefit from less disoriented user.

Keywords— Mathematical programming, Web mining, Website design, User navigation

INTRODUCTION

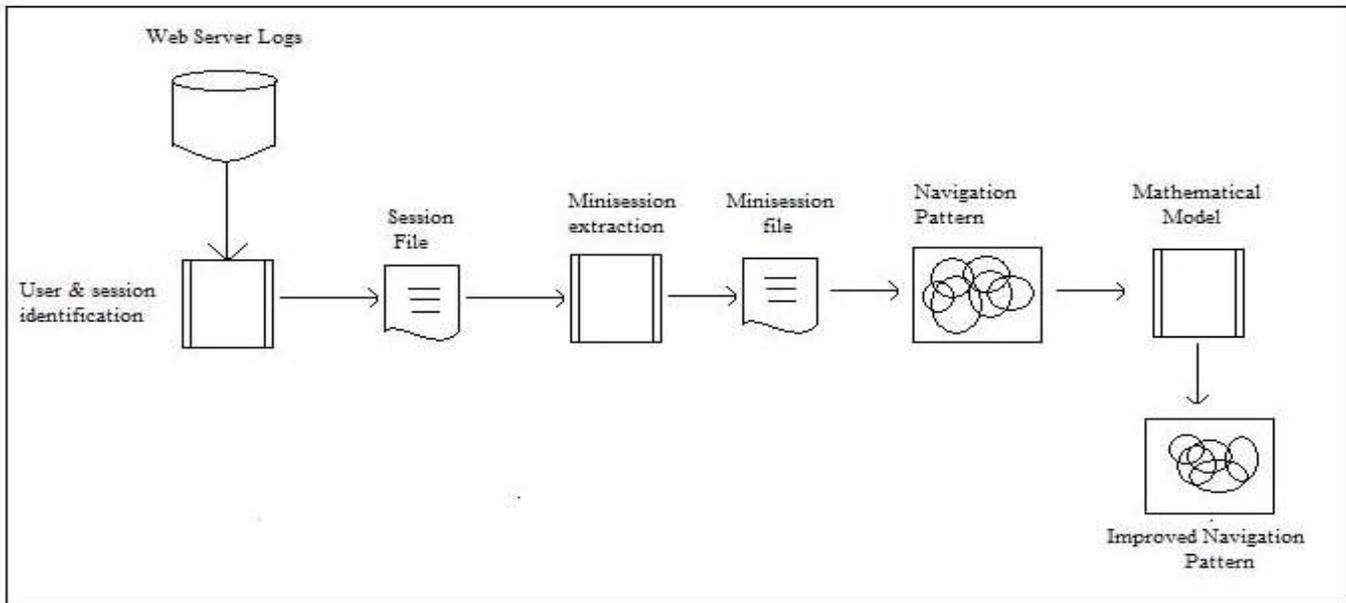
There are three most important activities on web i.e. search, navigation, and transaction. When users find Website which he wants using search engines then before making transactions, Navigation is very important. As the Internet growing rapidly, it is quite difficult to find the desired information on the web. So users having difficulty in locating the targets are very likely to leave a website even if its information is of high quality. The reason behind poor website design is that difference in user expectations and the web developers understanding of how website should be structured. Because of this, user cannot get their desired information. This problem is difficult as developers may not have a clear understanding of users' expectations.

Previous proposed method has focused on various issues, such as extracting template from web pages, finding relevant pages of given page. Our proposed system is closely related to improving user navigation using user navigation data. Generally, there are two classes for improving navigation efficiency i.e. web transformation and web personalization.

Web personalization is dynamically reconstituting web pages for particular users using their profile and navigation data. In our proposed system we are concerned primarily with web transformations which reorganize link structure of website. Web transformation approaches are more appropriate for websites that have a built-in structure and store relatively static and stable contents. Web transformation approaches create or modify the structure of a website used for all users.

LITERATURE SURVEY

Web personalization is the process of customizing a website according to needs of specific user. Perkowitz and Etzioni [8] propose a method that automatically synthesizes index pages. These pages contain links to pages pertaining to particular topics which based on the co-occurrence frequency of pages in user navigation. Mobasher et al. [18], [19], [20]



proposed a method which create clusters of user's profiles from weblogs. After that, dynamically generate links for users who are classified into different categories according to their access patterns. Nakagawa and Mobasher [21] propose a hybrid personalization system. This system can dynamically switch between the user's position in the site and recommendation models based on degree of connectivity.

Web transformation involves altering the structure of a website to facilitate the navigation for a large no. of users [22] instead of personalizing pages for specific users. Fu et al. [23] describe a method to reorganize webpages so as to provide users with their desired information in fewer clicks and have easy navigation. But, this method considers only local structures in a website instead of the site as a whole, so the new structure may not be always optimal. Gupta et al. [25] propose a heuristic method based on simulated annealing. In this method webpages are relink to improve navigability. Use of the aggregate user preference data can improve the link structure in websites for both wired and wireless devices. However, this approach takes relatively a long time (10 to 15 hours) to run even for a very small website. Lin [26] design an integer programming models to reorganize a website based on the cohesion between pages to reduce search depth for users and information overload. There are many differences between web transformation and personalization approaches. First, personalization approaches dynamically reconstitute pages for individual users while, transformation approaches create or modify the structure of a website used for all users. So, there is no predefined/built-in web structure for personalization approaches. Second, Personalization approaches need to collect information associated with individual users (known as user profiles) in order to understand the preference of individual users. This is time-consuming process is not required for transformation approaches.

Fig1. Proposed System Architecture

Third, transformation approaches make use of aggregate usage data from weblog files and do not require tracking the past usage for each user while dynamic pages are typically generated based on the users' traversal path. Thus, personalization approaches are more suitable for dynamic websites whose contents are more volatile and transformation have a built-in approaches are more appropriate for websites that structure and store relatively static and stable contents

III IMPLEMENTATION

Architecture

We use web server log files as input to our system, which consist of user navigation data. In order to examine the interaction between user and a website, the web log files must be broken up into user sessions file. A session is a group of activities performed by a user during his visit to a site. Previous studies propose timeout methods to demarcate sessions

from raw weblog files. A session may include one or more target pages, as a user may visit several targets during a single session. The metric used in our propose system is the number of paths traversed to find one target; we use a different term mini session to refer to a group of pages visited by a user for only one target. So, a session may contain one or more mini sessions, each of which comprises a set of paths traversed to reach the target. The page-stay timeout heuristic algorithm is use to demarcate mini sessions. If the time spent on a web page is greater than a timeout threshold then that page is considered as target page. The intension is that a user generally spends more time reading on the page that they find relevant than those they do not. Though it is not possible to identify user sessions unerringly from weblog files, we find the page-stay heuristic algorithm an appropriate method for the context of our problem. After extracting mini session, we build navigation graph. On that various constraints and mathematical model is applied to get improved navigation pattern with minimal changes.

Mathematical MODEL

Our problem can be regarded as a special graph optimization problem. We consider a website as a directed graph, with nodes representing pages and arcs representing links. Let N be the set of all webpages and λ_{ij} , where $i, j \in N$, denote page connectivity in the current structure, with $\lambda_{ij} = 1$ indicating page i has a link to page j , and $\lambda_{ij} = 0$ otherwise.

The current out-degree for page i is denoted by $W_i = \sum_{j \in N} \lambda_{ij}$ From the log files, we obtain the set T of all mini sessions. For a mini session $S \in T$, we denote $\text{tgt}(S)$ the target page of S . Let $L_m(s)$ be the length of S , i.e., the number of paths in S , and $L_p(k, s)$, for $1 \leq k \leq L_m(s)$, be the length of the k^{th} path in S , i.e., the number of pages in the k^{th} path of S . We further define $\text{docno}(r; k; S)$, for $1 \leq k \leq L_m(s)$ and $1 \leq r \leq L_p(k, s)$, as the r^{th} page visited in the k^{th} path in S . Take the mini session S in Fig. 2 for example, it follows that $L_m(s) = 3$; $L_p(1, s) = 3$, and $\text{docno}(1; 1; S) = A$, as this mini session has three paths and the first path has three pages (A, D, and H) in which page A is the first page.

We define $E = \{(i; j): i, j \in N \text{ and } \exists S \in T \text{ such that } i \in S \text{ and } j = \text{tgt}(S)\}$ and $N_E = \{i: (i, j) \in E\}$. In essence, E is the set of candidate links that can be selected to improve the site structure to help users reach their targets faster. Our problem is to determine whether to establish a link from i to j or $(i, j) \in E$. Let $x_{ij} \in (0, 1)$ denote the decision variable such that $x_{ij} = 1$ indicates establishing the link.

As explained earlier, Webmasters can set a goal for user navigation for each target page, which is denoted by b_j and is termed the path threshold for page j . Given a mini session S with target page j and a path threshold b_j , we can determine whether the user navigation goal is achieved in S by comparing the length of S , i.e., $L_m(S)$, with path threshold (b_j) for the target page of S . If the length of S is larger than b_j , it I indicates the user navigation in S is “below” the goal. Then, we need to alter the site structure to improve the user navigation in S to meet the goal. Otherwise, no improvement is needed for S .

Intuitively, given path thresholds, we can determine which mini sessions need to be improved and hence are relevant to our decision (termed relevant mini sessions). Table 1 provides a summary of the notations used in this paper. The problem of improving the user navigation on a website while minimizing the changes to its current structure can then be formulated as the mathematical programming model below:

Minimize

TABLE 1
 Summary of Notation

Notation	Definition
S	A mini session that contains the set of paths traversed by a user to locate one target page.
T	The set of all identified mini sessions.
T ^R	The set of all relevant mini sessions.
N	The set of all web pages
Δ_{ij}	1 if page i has a link to page j in the current structure; 0 otherwise
E	The set of candidate links which can be selected for improving user navigation.
E ^R	The set of relevant candidate links
N _E	The set of source node of links in set E
W _i	The current out degree of page i
C _i	The out degree threshold for page i
P ⁱ	The no. of links that exceed the out-degree threshold c _i in page i
M	Multiplier for penalty term in the objective function
b _j	The path threshold for mini session in which page j is the target page
a ^s _{ijk_r}	1 if I is the r th path and j is the target page in mini session s; 0 otherwise
x _{ij}	1 if the link from page i to j is selected , 0 otherwise
C ^s _{kr}	1 if in mini session s, a link from r th page in the k th path to the target is selected; 0 otherwise
Tgt(s)	The target page of mini session s

$$\sum_{(i,j) \in E} x_{ij} [1 - \lambda_{ij}(1-\epsilon)] + m \sum_{i \in N_E} p_i$$

Subject to

$$c_{kr}^s = \sum_{(i,j) \in E} a_{ijk_r}^s x_{ij}; r = 1, 2, \dots, L_p(k, s), \dots (1)$$

$$k = 1, 2, \dots, L_m(s), \forall s \in T^R$$

$$\sum_{k=1}^{b_j} \sum_{r=1}^{L_p(k,s)} c_{kr}^s \geq 1; \forall s \in T^R, j = \text{tgt}(s) \quad \dots (2)$$

$$\sum_{j:(i,j) \in E} x_{ij} (1 - \lambda_{ij}) + w_i - p_i \leq c_i; \forall i \in N_E \quad \dots (3)$$

$$x_{ij} \in \{0,1\}, p_i \in \{0\} \cup Z^+, \forall (i,j) \in E, i \in N_E \quad \dots (4)$$

The objective function minimizes the cost needed to improve the website structure, where the cost consists of two components: 1) the number of new links to be established (the first summation), and 2) the penalties on pages containing excessive links, i.e., more links than the out-degree threshold (C_i), in the improved structure (the second summation).

We have noted that some existing links may often be neglected by users due to poor design or ambiguous labels. Such links should be improved first before any new links are established. Therefore, we introduce $[1 - \lambda_{ij} (1 - \varepsilon)]$, where ε is a very small number, in the objective function to let the model select existing links whenever possible. Note that if $(1 - \varepsilon)$ is not present, then there is no cost in choosing an existing link, and this could lead to a number of optimal. As an extreme example, if $(1 - \varepsilon)$ is removed and the penalty term is not included, the costs of establishing new links, i.e., $\sum_{j:(i,j) \in E} x_{ij} (1 - \lambda_{ij})$ when selecting all existing links are the same as the costs when none of them is selected. This occurs because there is no cost in selecting an existing link, i.e., $(1 - \lambda_{ij}) = 0$, when $\lambda_{ij} = 1$. Thus, we add $(1 - \varepsilon)$ to impose a very small cost on improving an existing link such that the model will select the minimal number of existing links for improvement.

Choice of Parameter Values for the Model

a. Path Threshold

The path threshold represents the goal for user navigation that the improved structure should meet and can be obtained in several ways. First, it is possible to identify when visitors exit a website before reaching the targets from analysis of weblog files. Hence, examination of these sessions helps make a good estimation for the path thresholds. Second, surveying website visitors can help better understand users' expectations and make reasonable selections on the path threshold values. For example, if the majority of the surveyed visitors respond that they usually give up after traversing four paths, then the path threshold should be set to four or less. Third, firms like comScore and Nielsen have collected large amounts of client-side web usage data over a wide range of websites. Analyzing such data sets can also provide good insights into the selection of path threshold values for different types of websites.

Although using small path thresholds could result in more improvements in web user navigation in general, our experiments showed that the changes (costs) needed increase significantly as the path threshold decreases. Sometimes, additional improvements in user navigation from using a small threshold are too little to justify the increased costs. Thus, Webmasters need to cautiously consider the tradeoff between desired improvements to user navigation and the changes needed when selecting appropriate values for path threshold. A cost benefit analysis that compares "benefits" and "costs" of using different path thresholds can be useful for this purpose. In the context of our problem, we can view the number of new links needed as the cost and the improvement on user navigation (this, for instance, can be measured as the average number of paths shortened by the improved structure) as the benefit. The benefit-cost ratio (BCR) that is used for the analysis of the cost effectiveness of different options can be expressed as (improvement on user navigation)/ (number of new links).

b. Out-Degree Threshold

Webpages can be generally classified into two categories: index pages and content pages. An index page is designed to help users better navigate and could include many links, while a content page contains information users are interested in and should not have many links. Thus, the out-degree threshold for a page is highly dependent on the purpose of the page and the website. Typically, the out-degree threshold for index pages should be larger than that for content pages. In general, the out-degree threshold could be set at a small value when most webpages have relatively few links, and as new links are added, the threshold can be gradually increased. Note that since our model does not impose hard constraints on the out-degrees for pages in the improved structure, it is less affected by the choices of out-degree thresholds as compared to those in the literature.

c. Multiplier for the Penalty Term

The use of the penalty term can prevent the model from adding new links to pages that already have many links. This helps keep the information load low for user at the cost of inserting more new links into other pages with small out-degrees. Generally, if a website have both pages with small out-degrees and pages with very large out-degrees, then it is reasonable to use a large multiplier (m) to avoid clustering too many links in a page. If the out-degrees are relatively small for all pages, then it could be more appropriate to use a relatively small multiplier to minimize the total number of new links added. When our model is used for website maintenance, a small multiplier could be used in the beginning when out-degrees are generally small for most pages, and as new links are inserted, a larger multiplier is needed to prevent adding extra links to pages that already have many links.

IV RESULT SET

We experimented the model with two out-degree thresholds, i.e., $C = 20$ and $C = 40$, and two multipliers for the penalty term, i.e., $m = 0$ and $m = 5$, on each synthetic data set. Noticeably, the times for generating optimal solutions are low for all cases and parameter values tested, ranging from 0.05 to 24.727 seconds. This indicates that the MP model is very robust to a wide range of problem sizes and parameter values. Particularly, the average solution times for website with 1,000, 2,000, and 5,000 pages are 0.231, 1.352, and 3.148 seconds. While the solution times do go up with the number of webpages, they seem to increase within a reasonable range.

Besides these data sets, two large websites with 10,000 and 30,000 pages were generated and experimented with 300,000, 600,000, and 1.2 million mini sessions to emphasize the fact that the model presented here is scalable to an even larger extent. The solution times are also remarkably low even in this case, varying from 1.734 to 33.967 seconds. In particularly, the average solution times for websites with 10,000 and 30,000 pages are 3.727 and 6.086 seconds, respectively. While the solution times also increase with the size of the website, they seem to increase linearly or slower.

TABLE 2

Evaluation Result on Improved Website Using Number of Paths per Mini Session for T=5 Min

Multiplier for penalty	Avg. no. of paths improved Website and no. of new link needed	
	Out-degree threshold	Out-degree threshold $c=40$

term(m)	c=20					
	b=1	b=2	b=3	b=1	b=2	b=3
0	1.335 (5,794)	1.589 (1145)	1.785 (467)	1.335 (5794)	1.589 (1145)	1.785 (467)
1	1.436 (5794)	1.632 (1166)	1.825 (482)	1.439 (5813)	1.650 (1214)	1.827 (502)
5	1.346 (5794)	1.693 (1182)	1.855 (514)	1.351 (5839)	1.680 (1399)	1.840 (555)

V Conclusion

We proposed a mathematical programming model to improve the navigation effectiveness of a website while minimizing changes to its current structure, a critical issue that has not been examined in the literature. The MP model was observed to scale up very well, optimally solving large-sized problems in a few seconds in most cases on a desktop PC. The comparison showed that our model could achieve comparable or better improvements than the heuristic with considerably fewer new links. To validate the performance of our model, we have defined two metrics and used them to evaluate the improved website using simulations.

VI Future Scope

The paper can be extended in several directions in addition. For example, techniques that can accurately identify users' targets are critical to our model and future studies may focus on developing such techniques. As another example, our model has a constraint for out-degree threshold, which is motivated by cognitive reasons. The model could be further improved by incorporating additional constraints that can be identified using data mining methods. For instance, if data mining methods find that most users access the finance and sports pages together, then this information can be used to construct an additional constraint.

Acknowledgement

I express true sense of gratitude towards my project guide **Prof. Padmavathi B.**, of computer department for her invaluable co-operation and guidance that she gave me throughout my research. I specially thank our **P.G coordinator Prof. Vidhya Damdhare** for inspiring me and providing me all the lab facilities, which made this research work very convenient and easy. I would also like to express my appreciation and thanks to our principal **Dr. D. D. Shah** and all my friends who knowingly or unknowingly have assisted me throughout my hard work

REFERENCES:

- [1] D. Dhyani, W.K. Ng, and S.S. Bhowmick, "A Survey of Web Metrics," ACM Computing Surveys, vol. 34, no. 4, pp. 469-503, 2002.
- [2] X. Fang and C. Holsapple, "An Empirical Study of Web Site Navigation Structures' Impacts on Web Site Usability," Decision Support Systems, vol. 43, no. 2, pp. 476-491, 2007.
- [3] J. Lazar, Web Usability: A User-Centered Design Approach. Addison Wesley, 2006.
- [4] D.F. Galletta, R. Henry, S. McCoy, and P. Polak, "When the Wait Isn't So Bad: The Interacting Effects of Website Delay, Familiarity, and breadth," Information Systems Research, vol. 17, no. 1, pp. 20- 37, 2006.
- [5] J. Palmer, "Web Site Usability, Design, and Performance Metrics," Information Systems Research, vol. 13, no. 2, pp. 151-167, 2002.
- [6] V. McKinney, K. Yoon, and F. Zahedi, "The Measurement of Web-Customer Satisfaction: An Expectation and Disconfirmation Approach," Information Systems Research, vol. 13, no. 3, pp. 296-315, 2002.
- [7] T. Nakayama, H. Kato, and Y. Yamane, "Discovering the Gap between Web Site Designers' Expectations and Users' Behavior," Computer Networks, vol. 33, pp. 811-822, 2000.

- [8] M. Perkowski and O. Etzioni, "Towards Adaptive Web Sites: Conceptual Framework and Case Study," *Artificial Intelligence*, vol. 118, pp. 245-275, 2000.
 - [9] Y. Yang, Y. Cao, Z. Nie, J. Zhou, and J. Wen, "Closing the Loop in Webpage Understanding," *IEEE Trans. Knowledge and Data Eng.*, vol. 22, no. 5, pp. 639-650, May 2010.
 - [10] J. Hou and Y. Zhang, "Effectively Finding Relevant Web Pages from Linkage Information," *IEEE Trans. Knowledge and Data Eng.*, vol. 15, no. 4, pp. 940-951, July/Aug. 2003.
 - [11] H. Kao, J. Ho, and M. Chen, "WISDOM: Web Intrapage Informative Structure Mining Based on Document Object Model," *IEEE Trans. Knowledge and Data Eng.*, vol. 17, no. 5, pp. 614-627, May 2005.
 - [12] H. Kao, S. Lin, J. Ho, and M. Chen, "Mining Web Informative Structures and Contents Based on Entropy Analysis," *IEEE Trans. Knowledge and Data Eng.*, vol. 16, no. 1, pp. 41-55, Jan. 2004.
 - [13] C. Kim and K. Shim, "TEXT: Automatic Template Extraction from Heterogeneous Web Pages," *IEEE Trans. Knowledge and Data Eng.*, vol. 23, no. 4, pp. 612-626, Apr. 2011.
 - [14] M. Kilfoil et al., "Toward an Adaptive Web: The State of the Art and Science," *Proc. Comm. Network and Services Research Conf.*, pp. 119-130, 2003.
 - [15] R. Gupta, A. Bagchi, and S. Sarkar, "Improving Linkage of Web Pages," *INFORMS J. Computing*, vol. 19, no. 1, pp. 127-136, 2007.
 - [16] C.C. Lin, "Optimal Web Site Reorganization Considering Information Overload and Search Depth," *European J. Operational Research*, vol. 173, no. 3, pp. 839-848, 2006.
 - [17] M. Eirinaki and M. Vazirgiannis, "Web Mining for Web Personalization," *ACM Trans. Internet Technology*, vol. 3, no. 1, pp. 1-27, 2003.
 - [18] B. Mobasher, H. Dai, T. Luo, and M. Nakagawa, "Discovery and Evaluation of Aggregate Usage Profiles for Web Personalization," *Data Mining and Knowledge Discovery*, vol. 6, no. 1, pp. 61-82, 2002.
 - [19] B. Mobasher, R. Cooley, and J. Srivastava, "Automatic Personalization Based on Web Usage Mining," *Comm. ACM*, vol. 43, no. 8, pp. 142-151, 2000.
 - [20] B. Mobasher, R. Cooley, and J. Srivastava, "Creating Adaptive Web Sites through Usage-Based Clustering of URLs," *Proc. Workshop Knowledge and Data Eng. Exchange*, 1999.
 - [21] M. Nakagawa and B. Mobasher, "A Hybrid Web Personalization Model Based on Site Connectivity," *Proc. Web Knowledge Discovery Data Mining Workshop*, pp. 59-70, 2003.
 - [22] B. Mobasher, "Data Mining for Personalization," *The Adaptive Web: Methods and Strategies of Web Personalization*, A. Kobsa, W. Nejdl, P. Brusilovsky, eds., vol. 4321, pp. 90-135, Springer-Verlag, 2007.
 - [23] C.C. Lin and L. Tseng, "Website Reorganization Using an Ant Colony System," *Expert Systems with Applications*, vol. 37, no. 12, pp. 7598-7605, 2010.
 - [24] Y. Fu, M.Y. Shih, M. Creado, and C. Ju, "Reorganizing Web Sites Based on User Access Patterns," *Intelligent Systems in Accounting, Finance and Management*, vol. 11, no. 1, pp. 39-53, 2002.
 - [25] R. Gupta, A. Bagchi, and S. Sarkar, "Improving Linkage of WebPages," *INFORMS J. Computing*, vol. 19, no. 1, pp. 127-136, 2007.
- C.C. Lin, "Optimal Web Site Reorganization Considering Information Overload and Search Depth," *European J. Operational Research*, vol. 173, no. 3, pp. 839-848, 2006

SMART METERING AND DYNAMIC TARIFF: THE WAY TO SMART CONSUMPTION

Vaishnavi Ramasundaram¹ Anushree Ashtikar² Sayali Wavhal³ Ashwini Budhane⁴ Sushma Sekhar⁵
^{1,2,3,4,5} B.Tech Students

Department of Electrical Engineering,
Veermata Jijabai Technological Institute,
Matunga, Mumbai.

Abstract— Advanced metering Infrastructure (AMI) involves automatic collection of data from the meters without any human intervention. The smart meter is designed to calculate real-time aspects like accurate meter reading, tariff calculation and alerts in the event of excessive consumption. This data is communicated to the utility as well as the consumer and a graphical analysis of the consumer use pattern as well as the tariff in combined form, is displayed to the consumer via an in-home display.

Smart metering makes the consumer aware of his electricity usage patterns, the different tariffs applicable to him based on his consumption slab, and extrapolating from the data collected, a usage pattern which would help the consumer manage consumption. This management of consumption is 'Demand Response' and it incorporates pricing programs (dynamic pricing), efforts to encourage peak-duration load reduction in order to obtain a flat voltage profile. It is observed that consumers lack the resources to 'know' their bill. An aware consumer can make informed choices of his tariff plans and understands his real-time consumptions rather than paying end-estimated bills.

Keywords— AMI, Demand response, dynamic tariff, real-time consumption, peak-duration reduction, end-estimated bills, flat voltage profile

INTRODUCTION

Demand response (DR) is the development and extension of traditional demand-side management or load management practices and is recognized as a key application of the smart grid. The definition of DR is: "Changes in electric use by demand-side resources from their normal consumption patterns in response to changes in the price of electricity, or to incentivize payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized [1]."

The paper discusses demand response, AMI and its importance in demand response and a prototype of a smart meter. The following objectives were defined for the course of the study:

- To conduct a survey in all the houses of a housing society in order to gauge consumer awareness with regards to their electricity bill, i.e., consumption and tariffs
- To build a prototype of a smart meter and a synchronized display, incorporating features such as- real-time consumption and tariff calculation, and graphical analysis of power consumed on monthly basis
- To propose the inclusion of smart meters and dynamic tariff programs to engage and educate the customer and thereby enable 'smart consumption.'

OBJECTIVES OF DEMAND RESPONSE

The objective of deploying DR has been to go further than simply improving system reliability, and extend towards improving system efficiency and then system flexibility.

2.1 DR for improving system reliability

The earliest and most commonly practiced DR focuses on system reliability. A customer, often a large industrial facility, agrees to reduce load to guarantee system reliability under peak demand conditions or other emergency system events, and is paid an incentive for doing so. Since they are designed for emergency use, these DR programs are infrequently called upon.

2.2 DR for improving system efficiency

More recently, the focus of DR has been increasingly placed on system efficiency. Many DR programs have begun to focus on non-crisis peak shaving – flattening load curves to improve the efficiency of long-term power system capacity use, since the generation, transmission and distribution capacity of a power system is sized to meet the expected peak demand.

2.3 DR for improving system flexibility

This emerging application of DR is very important for supporting Renewable Energy (RE) integration as it provides efficient flexibility to handle variability on the power system. In situations like sudden increase in demand too, demand response resources were able to quickly and efficiently accommodate the unexpected variability [3].

CONSUMER SURVEY

A survey was conducted in various houses of a housing society. A questionnaire was used to collect the information regarding consumer understanding of their bills, knowledge about peak-load hours, tariffs for different consumption slabs and additional ToU (Time of Use) tariff for commercial and industrial loads, and smart consumption. Analysis of the survey is summarized below:

3.1 Consumer understanding of bills

The purpose was to find out how many users read their bills. Due to Electronic Clearing Services, consumers did not really see their bills until the deductions appeared on their credit card statement. Even if the bill was slightly higher than the previous months, consumers hardly tried to understand the cause. Most of them just reduced their use of air-conditioners and washing machines in the next month, expecting a reduction in their bill.

3.2 Knowledge about peak-load hours and Tariff variation

Tata Power launched a 'thermal energy storage incentive programme' for consumers to lower peak demand of electricity on its Mumbai distribution network in 2014. According to this, there is a penalty of INR 1 a unit for usage during peak hours and incentive of INR 0.75 for energy used in off-peak hours. Thus, tariffs may vary with time and it is essential for consumers to know about this so that they can plan the use of heavy loads at off-peak hours and save on their bills.

3.3 Smart consumption

Setting up alerts and reminders to help manage and track electricity usage and using smart appliances reduce their consumptions at peak-load hours comes under smart consumption.

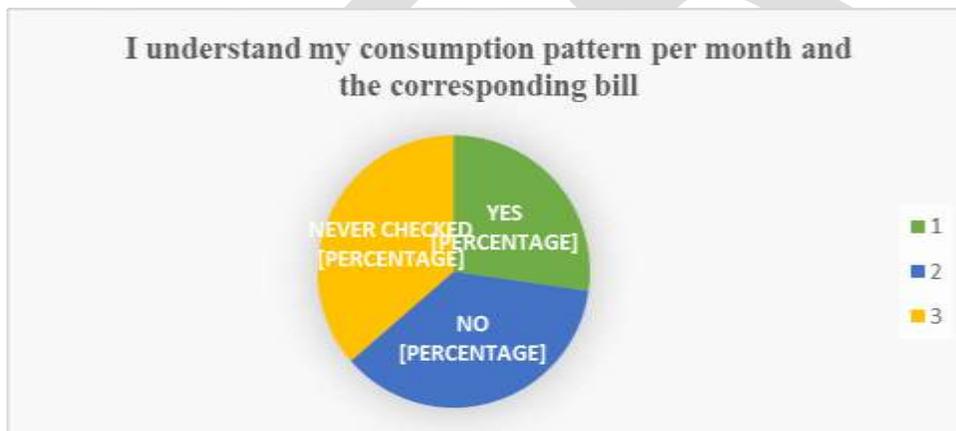


Fig1. Consumer Awareness Survey

TECHNOLOGIES THAT AID DEMAND RESPONSE

Although the success of DR programs depends to a very large extent on effective commercial arrangements (including rate structures and pricing schemes) and on an accurate evaluation of cost-effectiveness, some new technologies are physically essential for DR to function or to function better.

4.1 Advanced metering infrastructure technology

Advanced metering infrastructure (AMI) technology, commonly known as "smart metering", permits fine-grained communication of system conditions to customers and fine-grained measurement of customer responses via two-way communications between the customer and the utility. It is the technical foundation for engaging more DR, especially from smaller customers in the

future. It allows customers to receive information signals from utilities involving price, environmental impact and other aspects, and utilities to receive time-of-use data that reveals how much energy customers use at any given time.

4.2 "Behind-the-meter" technologies

AMI and home area networks also enable the use of a host of consumer-side technologies for building or home energy management, such as controllable appliances, monitoring and analysis of energy use, and price-responsive thermostats. These technologies can enable smaller commercial and residential customers to respond more actively to price or other supply-side signals. However, currently they are relatively immature and costly.

ROLE OF AMI IN DEMAND RESPONSE

Electricity consumers use a certain amount of power every day, which can be calculated as the base load. Electricity demand varies according to the different hours of the day; it is usually highest in the morning time when appliances such as washing machine, hair dryer are used, and afternoon time when air conditioners in the offices and shops are used continuously. When every customer switches on the load at the same time of the day, it is called as the peak usage time. To meet these demand requirements, we traditionally used to increase the generation of energy. Here is where demand response comes into picture, instead of increasing the generation; we can design programs to adjust energy consumption from on-peak usage time to off-peak usage time depending upon consumer's daily preferences. Thus, demand response is an economical way of reducing peak demand and avoiding energy emergencies.

To achieve the above requirements, we need some form of communication between the utility providers and consumers. Advanced Metering Infrastructure plays a significant role in demand response by engaging consumer response with the utility and enabling them to actively manage energy capacity. With the help of AMI, various demand response programs are designed for e.g. pay according to the consumption program. Using this combination of technology, customers are informed about their real-time usage and even future load curtailing signals are provided such that the customer uses this information to set high-energy use appliances to automatically reduce power demand at high pricing hours.

HARDWARE SET-UP

After identifying the need for a smart meter, the next step was to build a prototype of the same. The two-way communication between the utility and the consumers provided by the smart meters makes it possible for the consumers to understand information about tariff and the utility to obtain information regarding hourly consumption of the consumer. For AMI (smart metering) to completely serve its cause, the following features need to be incorporated:

- a. Two-way communication system
- b. End to estimated bills
- c. Monitoring and analysis of energy use
- d. Control of appliances
- e. Fault detection (outage prevention)
- f. Real-time usage tracking
- g. Remote connect and disconnect
- h. In-Home displays

➤ OUR PROTOTYPE

We detected the impulses using a digital multi-purpose optical sensor. The output of the sensor is the input to ARM Cortex-M3 microcontroller, where consumption is calculated. Along with consumption, tariff variation as per consumption slabs and plots of consumptions with respect to time were obtained. Now, this data which is calculated and the corresponding plots obtained are communicated to a display. The figure below shows the block diagram of the prototype that we are developing.

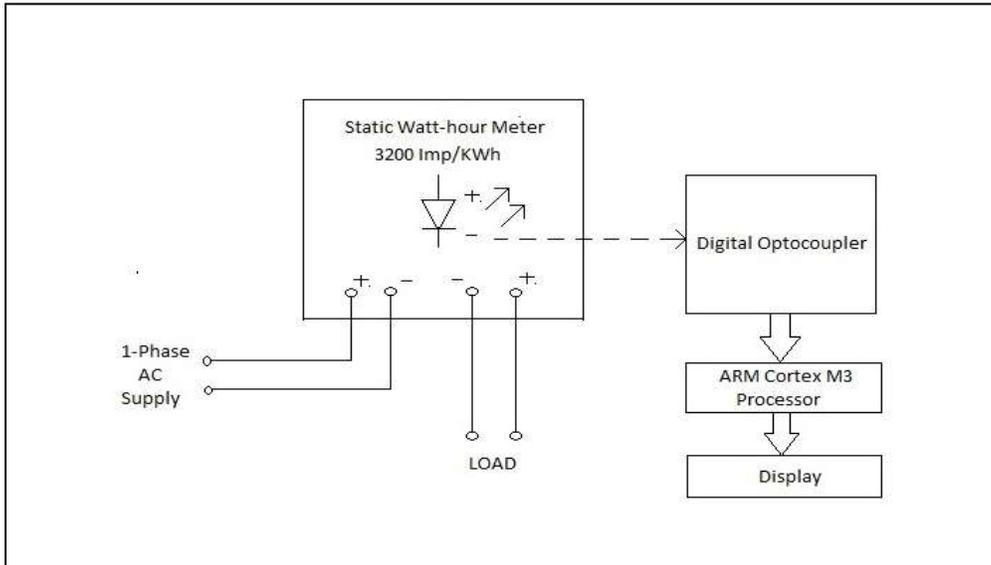


Fig 2. Block diagram of Smart Meter

We have used a 32-bit ARM Cortex-M3 processor for highly deterministic real-time applications used to develop high-performance low-cost platforms for a broad range of devices. The ARM processor is used because apart from the incorporated features, future expansion is also easily possible due to its ability to work with devices including microcontrollers, industrial control systems and wireless networking and sensors.

ALGORITHM FOR ARM PROCESSOR PROGRAMMING

1. START
2. Energy meter constant K as, $K = 3200$ Impulses/kWh
3. Count number of impulses from optocoupler output
4. Start clock at 00:00 Hours
5. Calculate energy consumption = Number of Impulses/ K
6. Reset consumption to 0 kWh at 00:00 Hours everyday
7. Store consumption/hour and consumption/day
8. Multiply with tariff according to consumption slab
9. Plot Consumption v/s Hour of the day
10. Plot tariff for all days of the month
11. Plot consumption for all days of the month
12. Communicate all calculations to display
13. END

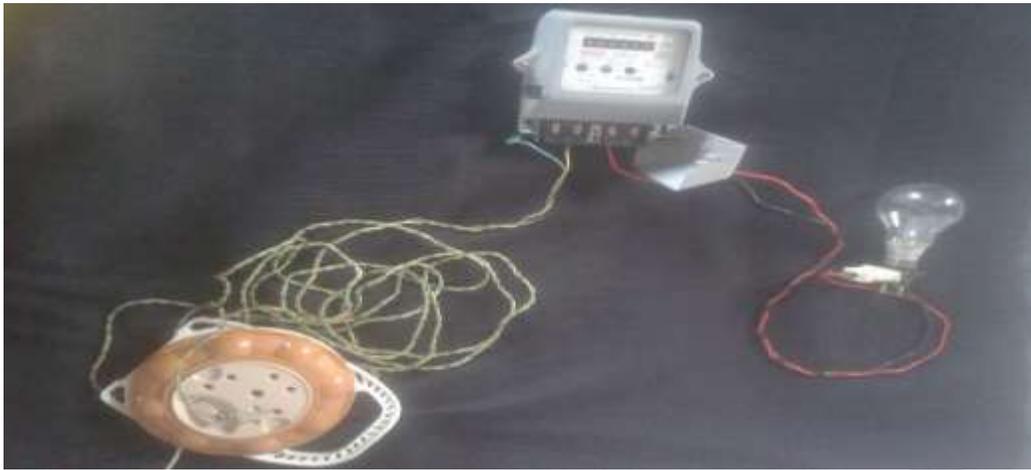


Fig3. Set-up to detect impulses of meter on test load

FLEXIBLE PRICING

One of the objectives of our paper is flexible pricing and tariff calculation. Traditionally electricity tariff rates were of two types- flat rates and tiered rates. Flat rate corresponds to paying according to the energy usage for a given period of time. Tiered rate includes paying according to the blocks of usage, for e.g. for a given period of time, the customer will pay at a certain rate for the first 100 kWh, the rate changes during the next 200 kWh and so on.

➤ FLAT RATE TARIFF

This is the flat rate tariff plan for one of the surveyed houses (Tariff applicable from 1st April 2014 to 31st March 2015) ^[5]

CONSUMPTION SLAB (KWh)	FIXED CHARGE (INR/MONTH)
0-100 units	40
101-300 units	75
301-501 units	75
Above 500 units	100

Table 1. Flat Rate tariff

The graphs below show consumption and corresponding tariff in the surveyed house.

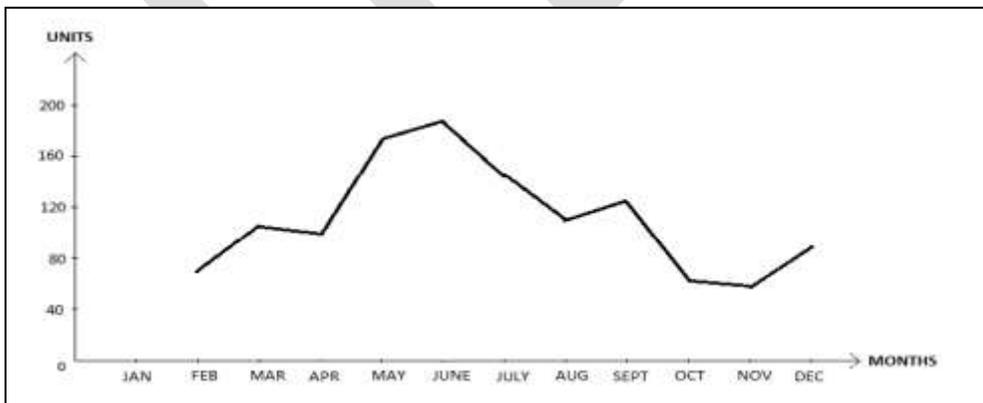


Fig 4. Graph of consumption for months of the year

On the graph of fig 4, the numbers on Y-axis represent number of units used (kWh), and X-axis represents months of the year. As it can be observed, maximum consumption is during summer months, and winter months have very light loads.

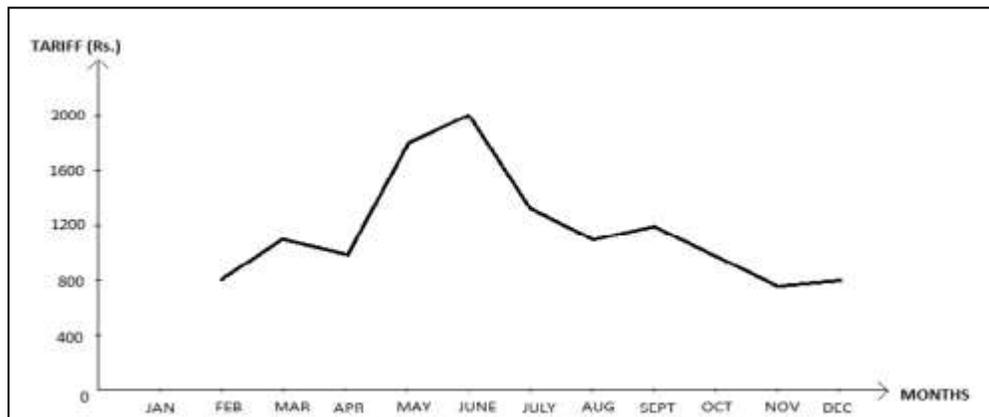


Fig 5. Graph of tariff per month

Fig 5 represents Tariff versus Months graph, Y-axis shows tariff in INR and X-axis shows months. As it was seen earlier, tariff during summer days is highest.

DYNAMIC PRICING PROGRAMS

Dynamic pricing programs use real-time or hourly electricity rates to offer residential customers a choice in how they pay for power consumption ^[2]

8.1 Real time pricing (RTP)

It analyzes the hourly consumption of energy and according to off-peak & on-peak hours, the customer will have to pay

8.2 Critical peak pricing (CPP)

During the power emergency conditions where the load demand increases substantially, the price for electricity is increased. There are two sub-types of this rate program. First one is where the rise in the price according to the load demand and its time period is predetermined (For e.g. 2.00 pm-4.00 pm in summer-time) and second type is when duration and time of rise in price is variable according to grid's preferences in the reduction of load.

8.3 Critical peak rebates (CPR)

During the power emergency conditions when the increase in load demand and its duration is predetermined, the rate of pricing is kept constant, instead, the consumer gets a certain refund for curtailing loads voluntarily.

8.4 Variable peak pricing (VPP)

In this type, the different load hours of the day are predefined. Customer will have one rate for on-peak time period and a different rate for off-peak time period, but the on-peak time period rates are varied according to the market conditions and utility.

All the above programs are referred to as dynamic pricing programs since the rate of pricing is unknown.

8.5 Time of use (TOU)

In this type, the rate schedule is predefined, i.e. on-peak periods and off-peak periods are predefined and its pricing rates are kept constant. This is one of the reasons why TOU is not included in dynamic pricing programs since we have determined its parameters in advance.

By using the above-mentioned pricing programs with the help of AMI in demand response, the tariff paid by consumers has been reduced considerably as they can choose the program that is suitable to their usage patterns. These programs allow consumers to save on their bills, understand their energy use in real-time, and reduce strain on the electric grid ^[4].

CONCLUSION

Energy is an important resource whose demand is constantly increasing. Hence, it is important to start optimizing the process of load management for sustainable development. DR is the ability of the customer to influence their consumption at peak times and, the improvement in communication systems and smart metering have supported demand response. For a smart meter to be a technological

foundation for demand response, all the features mentioned earlier are required to be incorporated. However, the development of AMI largely depends on communication between the utility and consumers, use of smart appliances in homes and cyber-security for building security systems to detect intrusion in the metering infrastructure.

In this paper, we have introduced the concept of demand response, conducted a survey to understand the consumers' attitude towards their bills, explained a prototype for a smart meter that aids demand response, and also highlighted several dynamic pricing programs that would help consumers decide a program suitable to their consumption to save on their bills.

REFERENCES:

- [1] United States Agency for International Development (USAID) in association with India Smart Grid Task Force (IGTF) - 'Smart grids: An approach to dynamic pricing in India', April 2014
- [2] <https://www.smartgrid.gov>
- [3] Marc Lipski, Principal Consultant, Black & Veatch - Demand Response- Technology for the Smart Grid, Electricity Today, May 2011
- [4] www.indiasmartgrid.org
- [5] http://www.mercindia.org.in/pdf/Tariff_booklet_REL-D_FY09_CNo_66_of_2007.pdf

A Novel high-speed transistorized 8x8 Multiplier using 4-2 Compressors

P.N.V.K. Hasini*, T. Krishna Murthy

* PG Student, VLSI Department, Sree Vidyanikethan Engineering College (Autonomous), Tirupati, A.P, India

Email : hasini.peteti123@gmail.com

Abstract— In this paper, a novel implementation of 8x8 Multiplier using 4-2 Compressors is presented; which produces quick results, especially for use in Digital Signal Processors and in Microprocessors. This multiplier uses a new partial-product reduction format which consecutively reduces the maximum output delay. The new design of multiplier requires less number of MOSFET's compared to Wallace Tree Multipliers. The 4-2 Compressor used is made from high-speed and low-power XOR-XNOR module and transmission gate based Multiplexer. The delay and power-delay product (PDP) is compared with earlier Wallace and Dadda Multipliers, implemented with 4-2 Compressors and without compressors, and is proven to have minimum delay and PDP. The Simulation results were obtained using HSPICE at 0.18 μ m standard CMOS technology.

Keywords— 4-2 Compressors, partial-product reduction, Reduction format, Tree Multipliers, XOR-XNOR module, Multiplexer, 0.18 μ m CMOS.

INTRODUCTION

With the emerging need for high speed VLSI devices, there is a continuous demand for high speed multipliers, as they are the core elements in several Computer Arithmetic circuit applications like Image Processing, Digital Signal Processors like in Filters, Convolutors; Multimedia like in Oscillators and Microprocessors like in ALU's. The performance of multipliers helps in determining the processor's speed of running and performance of several DSP algorithms. In most of the VLSI systems, multiplier directly lies in the critical path. So, for these reasons, the designers are now focusing on multipliers of high speed and low power delay product.

There are generally three phases in tree multiplier architecture, which are partial product generation phase, partial product reduction phase and finally the addition phase to obtain the final result. Among these three phases, the second phase - partial product reduction phase consumes most of the power and is responsible for overall critical path delay. Therefore in order to optimize this stage, Compressors can be used for partial product accumulation [1]. Compressors are used for addition operation and they contribute for reduced critical path delay, which is important in maintaining circuit's performance [2]. This can be accomplished with usage of 3-2 Compressors (Full-Adders) and 4-2 Compressors. These compressors are internally made of XOR-XNOR and multiplexer modules and their improved design will contribute a lot towards the overall system performance.

In present work, 4-2 Compressor made from high-speed and low-power XOR-XNOR module and transmission gate based Multiplexer was used. A new technique of partial-product reduction using 4-2 Compressors in multipliers have been proposed based on pre-determined sequence of matrix heights to give minimum number of partial-product reduction stages, with reduces delay and PDP of multiplier and has lesser transistor count.

This paper is organized as follows: In section 2, composition of 4-2 Compressor and its design is described. In section 3, tree multipliers are discussed and compared. In section 4, Wallace scheme based on compressors is presented and our reduction scheme is introduced. Experimental results and evaluation of our scheme against 4-2 compressor based Wallace schemes are presented in section 5. Finally, we conclude this work in Section 6.

COMPRESSORS

Compressors of type 3-2 and 4-2 are generally used for performing additions. In multiplier design, 4-2 Compressor is ideal for constructing regularly structured Wallace tree with less complexity. Usage of compressors will help to have fewer interconnections. Compressors of higher order can be designed by interconnecting lower order compressors, like a 4-2 compressor can be made from two full adders.

A. Composition of Compressors

Compressors are composed of XOR - XNOR gates and Multiplexers. There are several different XOR-XNOR and Multiplexer modules reported in literature. XOR-XNOR gates are also used as building blocks in Parity Checkers, Oscillators, and Comparators etc. Static CMOS based XOR-XNOR uses both pMOS and nMOS consumes many transistors and larger area [3]. Static XNOR-XOR also uses Complementary CMOS style but they both consume large power and not used at low voltages [4]. The XOR-XNOR with feedback transistors can be used at low voltages but input load is doubled, causes slow response if cascaded [5] and area increased. XOR-XNOR shown in Figure 1 uses only 8 transistors and can operate well at low supply voltages. It also provides good driving capability and has high speed performance than the prevailing three XOR-XNOR gates [1].

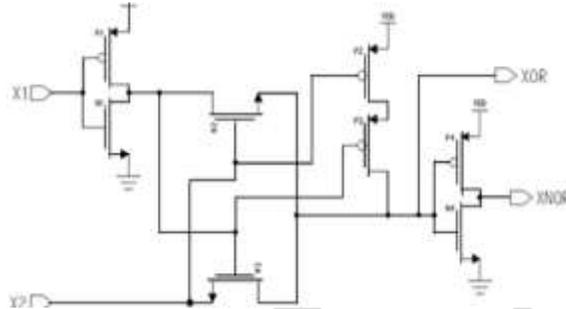


Figure 1: Circuit diagram of XOR-XNOR for good driving capability, low area

Multiplexer (MUX) module is used for Carry generation in Compressors. MUX output is based on Select lines (S). If there are 2 data inputs, it is called 2-1 MUX. Static MUX [3] and MUX with transmission gates and output buffer consume larger area and delay. So, MUX with transmission gates shown in Figure 2 can be used in Compressors for use in low power cells for faster results within low area consuming 6 transistors [6].

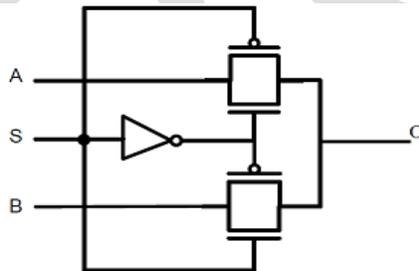


Figure 2: MUX with transmission gates

B. Design of a 4-2 Compressor

Mostly 3-2, 4-2 Compressors are generally used. A 3-2 Compressor is also called a Full Adder Cell [7] with 3 equal weighted inputs and Sum, Carry outputs. 4-2 Compressor can be built from 2 Full-Adders connected serially. It has 5 inputs called X1, X2, X3, X4 and Cin and produces 3 outputs Sum, Carry and Cout, where Carry and Cout have one bit higher weight than others. Here the Cin and Cout are independent to each other [8]. The Block diagram, logical decomposition of 4-2 compressor is shown in Figure 3,

On using the above mentioned XOR-XNOR and MUX modules, the 4-2 Compressor requires fewer transistors (only 40 transistors), and so low area and also the power consumption is minimal. The resulting output's delay is also minimized when MUX block is used at Sum output instead of XOR-XNOR as the select bit is given prior that causes transistor switching before inputs arrive [9]. The equations governing outputs are,

$$\begin{aligned} \text{Sum} &= (X1 \oplus X2) \cdot \overline{X3 \oplus X4} + \overline{(X1 \oplus X2)} \cdot (X3 \oplus X4) \cdot \overline{\text{Cin}} + \overline{(X1 \oplus X2)} \cdot \overline{X3 \oplus X4} + (X1 \oplus X2) \cdot (X3 \oplus X4) \cdot \text{Cin} \\ \text{Carry} &= (X1 \oplus X2 \oplus X3 \oplus X4) \cdot \text{Cin} + \overline{(X1 \oplus X2 \oplus X3 \oplus X4)} \cdot X4 \\ \text{Cout} &= (X1 \oplus X2) \cdot X3 + \overline{(X1 \oplus X2)} \cdot X1 \end{aligned}$$

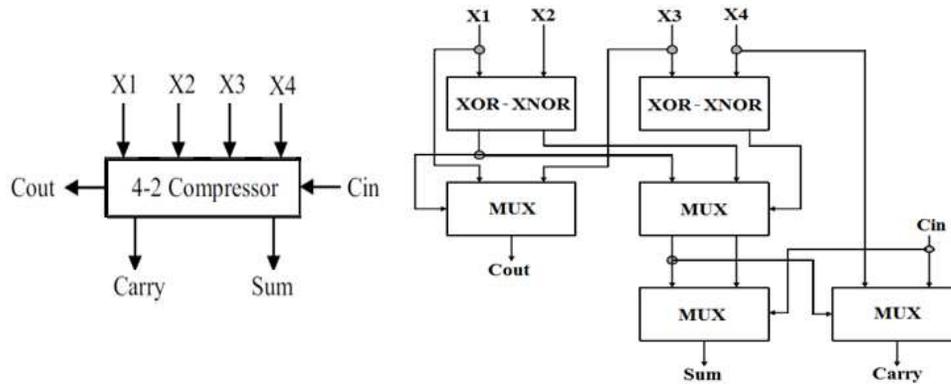


Figure 3: Block diagram, Logic Decomposition of 4-2 Compressor

The critical path delay of the above mentioned 4-2 compressor is one XOR and two MUX delays.

BASIC TREE MULTIPLIERS

The Tree (parallel) multipliers are generally highly performance efficient. In these tree multipliers, first phase of partial product generation is implemented by multiplying each multiplicand bit with the multiplier bit by AND operation. The Tree multipliers like Wallace and Dadda differ mainly in the Partial product reduction phase based on the type of reduction algorithm used. The last addition phase performs addition of the reduced bits using Carry Propagate Adder (CPA) to produce the final result.

A. Wallace Tree Multiplier

Wallace Tree multiplier accumulates partial products column-wise into three and two bits and gives them to Full-Adders and Half Adders respectively to reduce as Sum, Carry bits. Any bit that does not belong to these adders are bypassed to next stage and carry is propagated to one-bit higher order column of next stage. Wallace accumulates as many bits as possible into adders [10]. At each stage, this process is continued until the stage height is reduced to 2 rows. The Wallace tree 8x8 multiplier along with its reduction stage is shown in figure 4, with five stages. Stage 5 uses Carry Propagate Adder. A total of 47 Full-adders and 17 Half-adders are used for Wallace 8x8 multiplier.



Figure 4: 8x8 Wallace Tree Multiplier

B. Dadda Tree Multiplier

Dadda proposed an algorithm with predetermined sequence of matrix (stage) heights for $N \times N$ multipliers to have reduced number of reduction stages. It is developed by working back from two row stage. The height of each intermediate stage is limited to floor value of 1.5 times the height of the successor stage [11].
 i.e., Height of stage $i = (3/2) * \text{Height of stage } i+1$. Then sequence of stage heights are 2,3,4,6,9,13...

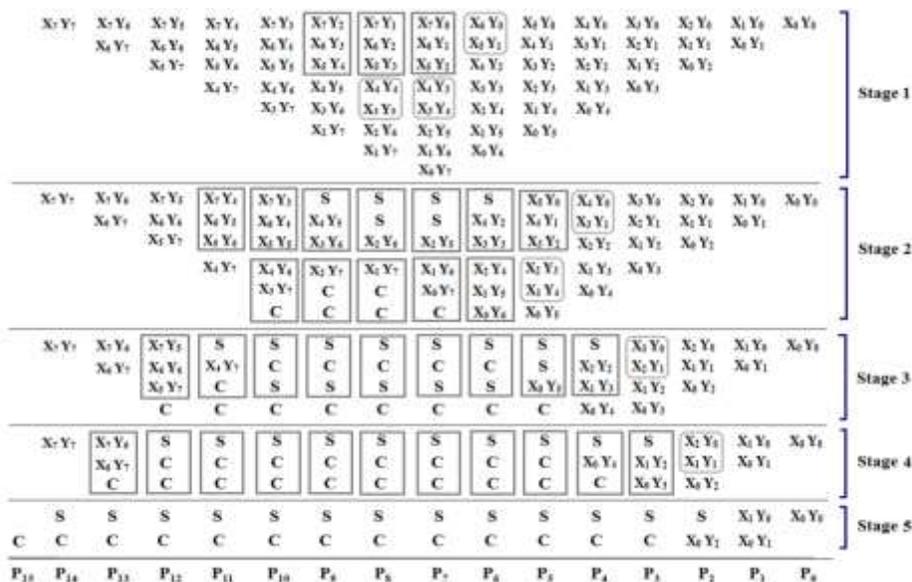


Figure 5: 8x8 Dadda Tree Multiplier

The 8x8 Dadda tree multiplier at 5 stages is shown in Figure 5. The recursive algorithm used in partial product reduction of a Dadda Multiplier (here 8x8) is as follows,

The maximum height of an 8x8 multiplier is 8 bits. The next stage height should be 6, so after reduction, the maximum column (C) size should be 6.

Step 1: C1 – C6 have column height less than or equal to 6. So, no need to change these columns.

Step 2: C7 has 7 bits. So, to reduce it into 6 bits, a half adder has to be used.

Step 3: C8 has 8 bits and a carry from C7. So, to reduce 9 bits to 6 bits, a half and full adder is required.

Step 4: C9 has 7 bits and two carry bits from C8. So, a half and full adder are needed to reduce to 6 bits.

Step 5: C10 has 6 bits and two carry bits from C9. So, to reduce these 8 bits into 6, a full adder is required.

After these steps, there will be 6 bits or less than 6 bits in every column from C11 onwards. From stage height formula, the next stage heights are to be 4, 3, 2. So, by following above reduction steps, the maximum column (C) sizes are maintained as 4, 3, 2 respectively by appropriately using full adders, half adders wherever necessary. The number of full and half adders needed in Dadda reduction are N^2-4N+3 and $N-1$ respectively for an $N \times N$ multiplier. Then the resulting 2 rows are given to adder stage. Totally, 48 Full-adders and 8 Half-adders are used for Dadda 8x8 multiplier including the reduction and addition stage.

The main difference between Wallace and Dadda multipliers is that, Wallace uses adders wherever possible but Dadda uses adders wherever necessary in order to maintain the predetermined stage height. The critical path is varied and so, delay of Dadda is less than that of Wallace as Dadda is intended to save number of adders. The delay and power delay product (PDP) comparison of Wallace and Dadda 6X6 and 8X8 multipliers are shown in table 1.

Table 1: Delay and PDP Comparison in Wallace and Dadda Multipliers

Type of Multiplier	$N \times N$	Delay (nS)	PDP ($10^{-14}J$)
Wallace	6x6	4.724	73.17
Dadda		1.907	31.83
Wallace	8x8	11.47	512
Dadda		9.242	371.8

MULTIPLIERS BUILT FROM 4-2 COMPRESSORS

Compressors when used in partial product reduction phase in multipliers will help in having lesser number of interconnections and adder cells. As 4-2 compressor has less delay compared to two full adders; in high speed multipliers, using compressors instead of conventional adders lead to fast output generation and also the number of reduction stages gets reduced. The 4-2 compressor shown in Figure 3 is better suitable in Multiplier's design as it requires lesser transistor count and it provides better performance.

A. Wallace Tree Multiplier using 4-2 Compressors

8x8 Wallace Multiplier using 4-2 compressors (rounded rectangles) is shown in Figure 6. On using compressors the number of reduction stages gets reduced to 3, instead of 5 stages when only half and full adders are used. The delay and thus PDP also gets reduced [12]. The Multiplier uses 17 no. of 4-2 Compressors, 18 full adders and 9 half adders. This Wallace tree has lesser delay compared to the one which does not use 4-2 compressors.

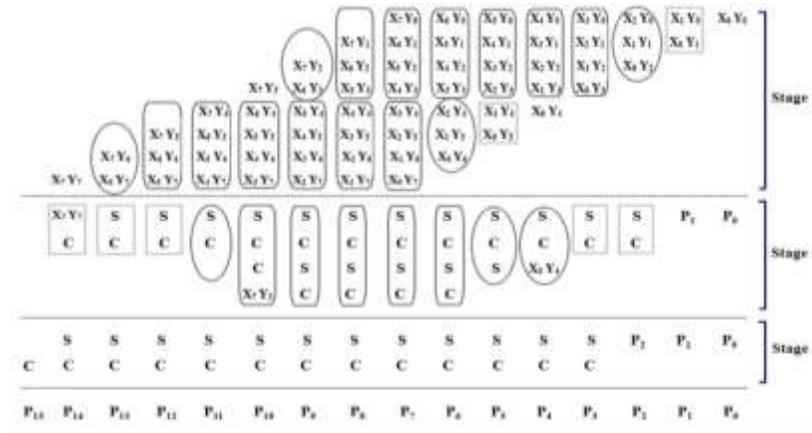


Figure 6: 8x8 Wallace Tree Multiplier using 4-2 Compressors

B. Proposed 8x8 Multiplier using 4-2 Compressors

For NxN multipliers, we introduce a partial product reduction format which is having predetermined stage heights for having high speed multiplications. After the partial product generation stage, the maximum stage height (of stage 1) is N for NxN multipliers. In our scheme,

$$\text{Height of subsequent stages} = 2^{(m-i)}, \text{ where } 2^m \text{ is nearest smaller integer to } N; i \text{ ranges from } 0 \text{ to } m-1.$$

The stage heights are Stage 2 = 2^m , Stage 3 = 2^{m-1} , Stage 4 = 2^{m-2} ... until final stage height is 2. This format is performed with usage of 4-2 compressors (in Figure 3) while maintaining stage height. The 8x8 multiplier with the proposed scheme is shown in Figure 7. The maximum height of partial products stage (Stage 1) is 8 bits. The nearest 2^m integer smaller than $8(2^3)$ is 4 i.e., $2^{(2-0)}$. So, the height of Stage 2 should be 4 bits, which is maximum column (C) height. Examine each column (C) and the reduction is as follows,

- Step 1: C1 to C4 have height less than or equal to 4 bits. So, no need to change these columns.
- Step 2: C5 has 5 bits and to reduce it to 4 bits, a half adder is required.
- Step 3: C6 has 6 bits and a carry bit from C5. A 4-2 Compressor is required to make its height 4 bits.
- Step 4: C7 has 7 bits and a carry from C6. A 4-2 Compressor and half adder are needed to reduce it to 4 bits.
- Step 5: C8 has 8 bits and 2 carry bits from C7, and so two 4-2 Compressors are required.
- Step 6: C9 has 7 bits and 2 carry bits from C8. So, two 4-2 Compressors are needed with one of its input as 0.
- Step 7: C10 has 6 bits, 2 carries and Cout from C9. A 4-2 compressor and full adder are needed to reduce it to 4 bits.
- Step 8: C11 has 5 bits and 2 carries from C10. So, one 4-2 compressor is required.
- Step 9: C12 has 4 bits and a carry, Cout from C11. So, a full adder is required, after which each column has less than or equal to 4 bits.



Figure 7: Proposed 8x8 multiplier using 4-2 Compressors

Next stage height is to be $2^{2-1} = 2$ which is last stage. The reduction steps to have maximum column height 2 are

Step 1: C1, C2 needs no changes in them, but C3 has 3 bits. So, a half adder is required to reduce to 2 bits.
 Step 2: C4 has 4 bits and carry from C3. Thus, a 4-2 compressor is needed
 Step 3: C5 to C13 has 5 bits including a carry from just preceding columns. So, a 4-2 compressor is required.
 Step 4: C14 has 2 bits and a carry, Cout from C13. So, a full adder is required to reduce it 2 bits.

Now, after this stage each column has less than or equal to 2 bits, after which the reduction phase is completed and this last stage is given to Carry Propagate Adder for producing the final multiplier result. This proposed 8x8 multiplier uses 18 no. of 4-2 Compressors, 16 full adders and 4 half adders.

This proposed reduction format using 4-2 Compressors can be applied to any NxN multiplier of N (≥ 4) to have high speed and lesser transistor count even than that of Wallace Tree multiplier using 4-2 Compressors. For example 10x10, 12x12, 16x16 multipliers, all will have the next stage heights as 8, 4, 2 bits.

EVALUATION AND EXPERIMENTAL RESULTS

With the proposed reduction format usage in multipliers, the reduction stages gets reduced and also the output delay and further power delay product (PDP) gets reduced as 4-2 Compressors have less delay and number of interconnections than multipliers with full adder cells. This present format provides even better speed performance than Wallace tree Multiplier which uses 4-2 Compressors (as in Figure 6) and also utilizes lesser number of transistors. This can be noticed from the comparison Table 2 between Wallace multiplier using 4-2 Compressors and Proposed Multiplier format. The Inputs(X, Y) and Simulation results ($P_0 - P_{15}$) of the proposed 8x8 multiplier using 4-2 Compressors is shown in Figure 8(A) and 8(B) with a supply voltage of 3.3V.

Table 2: Comparison of Proposed Multiplier Format against Wallace using 4-2 Compressors

Type of Multiplier	NxN	Number of transistors	Delay (nS)	PDP (10^{-14} J)
Wallace	6x6	852	4.030	61.48
Proposed		792	1.348	22.81
Wallace	8x8	1532	10.94	497.9
Proposed		1472	6.749	359.57



Figure 8(A) Inputs X, Y of Proposed 8x8 multiplier

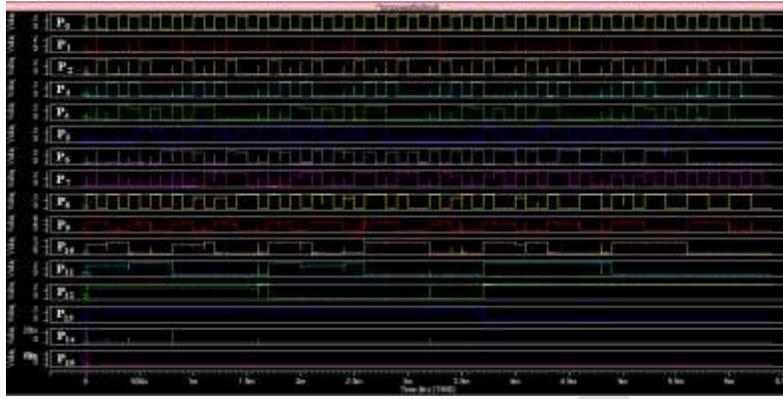


Figure 8(B) Simulation results ($P_0 - P_{15}$) of the proposed 8x8 multiplier

CONCLUSION

A novel transistorized 8x8 multiplier has been presented for high speed performance, which uses 4-2 compressors based on an XOR-XNOR gate of high speed and low power and Multiplexer made of transmission gates. This proposed multiplier uses a reduction format with predetermined stage heights for having quick results and further minimum power delay product (PDP). When the Simulation results were performed using HSPICE at 0.18 μ m CMOS technology, the 8x8 multiplier shows optimal speed performance against basic Dadda Tree multiplier and Wallace Tree Multiplier implemented with and without 4-2 Compressors with minimal transistor count and PDP. This proposed reduction format can also be applied to higher order NxN multipliers for high speed results.

REFERENCES:

- [1] Sanjeev Kumar, Manoj Kumar "4-2 Compressor design with New XOR-XNOR Module", 4th International Conference on Advanced Computing and Communication technologies, pp. 106-111, 2014.
- [2] Z. Wang, G. A. Jullien, and W. C. Miller, "A new design technique for column compression multipliers," IEEE Trans. Computers, vol.44, pp. 962-970. Aug 1995.
- [3] N. Weste, K. Eshraghian, Principles of CMOS VLSI Design: A System Perspective, 1993.
- [4] R. Zimmermann and W. Fichtner, "Low-power logic styles: CMOS versus pass-transistor logic," IEEE Journal of Solid-State Circuits, vol.32, pp.1079-1090, July 1997.
- [5] M. Zhang, J. Gu, and C. H. Chang, "A novel hybrid pass logic with static CMOS output drive full-adder cell," in Proc. IEEE Int. Symp. Circuits Syst., pp.317 -320, May 2003.
- [6] M. Shams, T. K. Darwish, and M. A. Bayoumi, "Performance analysis of low-power 1-bit CMOS full adder cells," IEEE Transactions on VLSI Systems, vol. 10, pp. 20-29, Feb. 2002.
- [7] S.F. Hsiao, M.R. Jiang, J.S. Yeh, "Design of high low power 3-2 counter and 4-2 compressor for fast multipliers", Electronic Letters, Vol. 34, No. 4, pp. 341-343, 1998
- [8] A. Weinberger, "4:2 Carry-Save Adder Module", IBM Technical Disclosure. Bulletin, Vol.23, January 1981.
- [9] S. Veeramachaneni, K. M. Krishna, L. Avinash, S. R. Puppala, and M. Srinivas, "Novel architectures for high-speed and low-power 3-2, 4-2 and 5-2 compressors," in VLSI Design. Held jointly with 6th International Conference on Embedded Systems, 20th Intern. Conference on, pp. 324-329, Jan. 2007.
- [10] http://en.wikipedia.org/wiki/Wallace_tree
- [11] http://en.wikipedia.org/wiki/Dadda_multiplier
- [12] Naveen Kr. Gahlan, Prabhat Shukla, Jasbir Kaur "Implementation of Wallace Tree Multiplier using Compressor," Int.J. Computer Technology & Applications, Vol 3 (3), pp.1194-1199, May - June 2012

A SURVEY ON HIGH SPEED CONVOLUTION AND DECONVOLUTION SYSTEM BASED ON FPGA

Miss.Priya R.Jain ¹

¹PG Student of HVPM'S College of Engineering and Technology Amravati (India)

Email: priya_20jain@rediffmail.com

Contact No- +917304790304

Prof. Dr.Ujwalla A.Bellorkar ²

²Head & Asst. Professor in Dept. of HVPM'S College of Engineering and Technology Amravati (India)

Abstract— In Digital Signal Processing, the convolution and deconvolution with a very long sequence is ubiquitous in many application areas. They consume much of time. This paper presents a direct method of computing the discrete linear convolution, circular convolution and deconvolution. The most significant aspect, is the development of a multiplier and divider architecture based on high speed algorithm. It shows that the implementation of linear convolution and circular convolution is efficient in terms of area and speed compared to their implementation using conventional multiplier & divider architectures. In this paper we study different forms of high speed convolution and deconvolution system using FPGA.

Keywords— Linear *Convolution*, Circular *Convolution*, Deconvolution, Radix-2 Booth Multiplier, Radix-4 Booth Multiplier, Vedic Mathematics, Urdhav Tiryagbhyam, Digital signal processing, ,VHDL.

INTRODUCTION

Convolution and deconvolution is the most important and fundamental concept in signal processing and analysis. However, beginners often struggle with convolution and deconvolution because the concept and computation requires a number of steps that are tedious and slow to perform. Therefore many of researchers have been trying to improve performance parameters of convolution and deconvolution system using new algorithms and hardware. Complexity and excess time consumption are always the major concern of engineers which motivates them to focus on more advance and simpler techniques. Pierre and John have implemented a fast method for computing linear convolution, circular convolution and deconvolution . This method is similar to the multiplication of two decimal numbers and this similarity makes this method easy to learn and quick to compute. Also to compute deconvolution of two finite length sequences, a novel method is used. This method is similar to computing long-hand division and polynomial division .Following diagram shows the overall process of high speed convolution and deconvolution process.

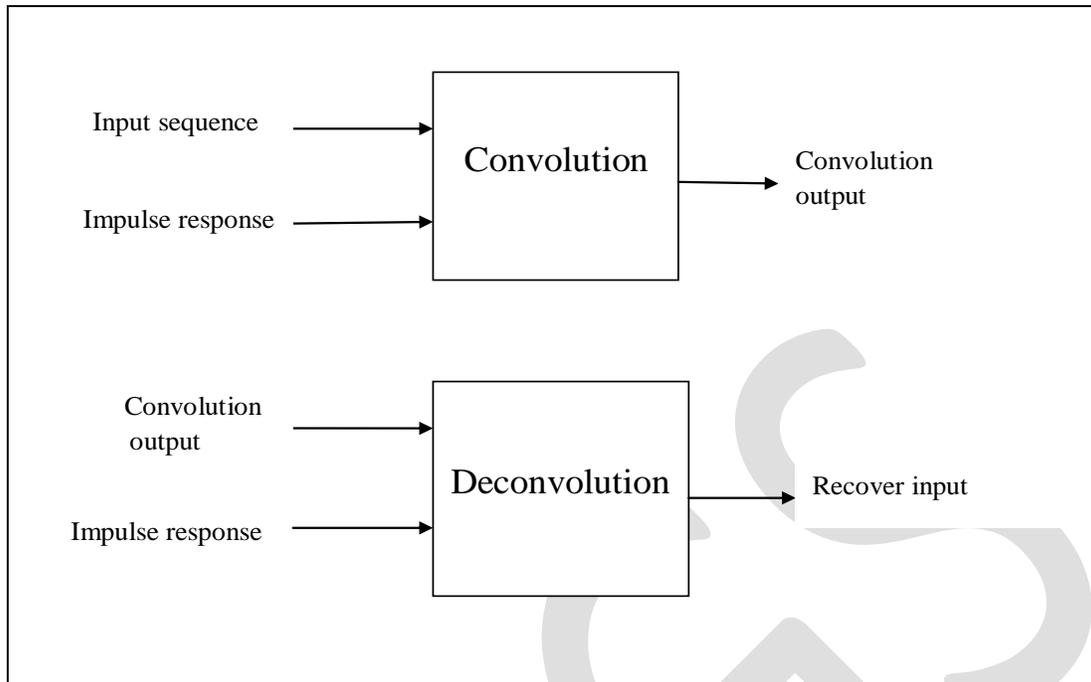


Fig . Block diagram of Convolution and Deconvolution system

With the latest advancement of VLSI technology, digital signal processing plays a pivotal role in many areas of electrical engineering. Discrete convolution is central to many applications of Digital Signal Processing and Image Processing. It is used for designing of digital filter and correlation application. However, beginners often struggle with convolution because the concept and computation requires a number of steps that are tedious and slow to perform. The most commonly taught approach is a graphical method because of the visual insight into the convolution mechanism. Graphical convolution is very systematic to compute but is also very tedious and time consuming. The principal components required for implementation of convolution calculation are adder and multiplier for partial multiplication. Therefore the partial multiplication and addition are bottleneck in deciding the overall speed of the convolution implementation technique. Complexity and excess time consumption are always the major concern of engineers which motivates them to focus on more advance and simpler techniques.

LITERATURE REVIEW :

Surabhi Jain & Sandeep Saini [1] presents a direct method of computing the discrete linear convolution, circular convolution and deconvolution. The approach is easy to learn because of the similarities to computing the multiplication of two numbers. The most significant aspect of the proposed method is the development of a multiplier and divider architecture based on Ancient Indian Vedic Mathematics sutras Urdhvatriyagbhyam and Nikhilam algorithm. The results show that the implementation of linear convolution and circular convolution using vedic mathematics is efficient in terms of area and speed compared to their implementation using conventional multiplier & divider architectures.

G.Ramanjaneya Reddy, A. Srinivasulu [2] presents an on the spot methodology of reducing convolution processing time using hardware computing and implementations of discrete linear convolution of two finite length sequences (NXN). This implementation method is realized by simplifying the convolution building blocks. The purpose of this analysis is to prove the feasibility of an FPGA that performs a convolution on an acquired image in real time. . In addition, the presented circuit uses less power consumption and delay from input to output. It additionally provides the required modularity, expandability, and regularity to form different convolutions for any variety of bits.-+.

Sukhmeet Kaur, Suman and Manpreet Singh Manna [3] describes implementation of radix-4 Modified Booth Multiplier and this implementation is compared with Radix-2 Booth Multiplier. Modified Booth's algorithm employs both addition and subtraction and also treats positive and negative operands uniformly. No special actions are required for negative numbers. The Speed and Circuit Complexity is compared, Radix-4 Booth Multiplier is giving higher speed as compared to Radix-2 Booth Multiplier and Circuit Complexity is also less as compared to it.

Madhura Tilak [4] presents a novel method of implementing linear convolution of two proposed method uses modified design approach by replacing the conventional multiplier by Vedic multiplier internally in the implementations. The proposed method is efficient in terms of computational speed, hardware resources and area significantly. The efficiency of the proposed algorithm is tested by simulations and comparisons with different design approaches. The proposed circuit is also modular, expandable and regular which provides flexibility.

Asmita Haveliya [5] describes a block convolution process which is proposed using a multiplier architecture based on vertical and crosswise algorithm of Ancient Indian Vedic Mathematics and embedding it in OLA method for reducing calculations. Found on embedding Vedic multiplication for OLA, there is a considerable improvement in their performance Overlap-Add method (OLA) and Overlap-Save method (OLS) methods are employed.

Rashmi . Lomte [6] describes a method of two finite length sequences (NXM), is implemented using direct method to reduce deconvolution processing time. The performance of the circuit has a delay of 79.595 ns from input to output using 90nm process. The outcome of research is high speed deconvolver implementation is achieved. Since 4×4 bit multiplier is need of this project, different 4×4 bit multipliers are studied and Urdhava Triyakbhyam algorithm which gives lowest delay among remaining all multipliers is used.

Honey Durga Tiwari, Ganzorig Gankhuyag, Chan Mo Kim, Yong Beom Cho [7] describes New multiplier and square architecture is proposed based on algorithm of ancient Indian Vedic Mathematics, for low power and high speed applications. It is based on generating all partial products and their sums in one step. The design implementation on ALTERA Cyclone -II FPGA shows that the proposed Vedic multiplier and square are faster than array multiplier and Booth multiplier.

ACKNOWLEDGMENT

We are very grateful to our college of HVPM College of Engineering and Technology to support and other faculty and associates of ENTIC department who are directly & indirectly helped me for these paper.

CONCLUSION

The main focus of this paper is to introduce a method for calculating the linear convolution, circular convolution and deconvolution with the help of vedic algorithms that is easy to learn and perform. An extension of the proposed linear convolution approach to circular convolution using vedic multiplier is also introduced which has less delay and area than the conventional method. This paper also introduced a straightforward approach to performing the deconvolution. The Vedic Methods enable the practitioner improve mental abilities to solve difficult problems with high speed and accuracy. Radix-4 Booth Multiplier is giving higher speed as compared to Radix-2 Booth Multiplier and Circuit Complexity is also less as compared to it.

REFERENCES:

[1] Surabhi Jain & Sandeep Saini "High Speed Convolution and Deconvolution Algorithm (Based on Ancient Indian Vedic Mathematics)" IEEE transaction on education, ECTI-Conference, May 2014.

- [2] G.Ramanjaneya Reddy, A. Srinivasulu "An Efficient Method for Implementation of Convolution" *International Archive of Applied Sciences and Technology* IAAST; Vol 4 [2] June 2013.
- [3] Sukhmeet Kaur, Suman and Manpreet Signh Manna,"Implementation of Modified Booth Algorithm (Radix 4) and its Comparison with Booth Algorithm (Radix-2)", *Advanced in Electronic & Electric Engineering* Vol 3, No.6 ,2013.
- [4] Madhura Tilak "An Area Efficient, High Speed Novel VHDL Implementation of Linear Convolution of Two Finite Length Sequences Using Vedic Mathematics", **IJITEE** Volume-2, Issue-1, December 2012.
- [5] Asmita Haveliya "FPGA Implementation of a Vedic Convolution Algorithm" *International Journal of Engineering Research and Applications (IJERA)* Vol. 2, Issue 1,Jan-Feb 2012.
- [6] Rashmi Lomte and Bhaskar P.C., "High Speed Convolution and Deconvolution using Urdhva Triyagbhyam " ,2011 IEEE Computer Society Annual Symposium on VLSI ,p.323 ,July 2011.
- [7] Honey Durga Tiwari, Ganzorig Gankhuyag, Chan Mo Kim, Yong Beom Cho "Multiplier design based on ancient Indian Vedic Mathematics"IEEE,SOC Design conference, Volume-2,NOV-2008.
- [8] Very High Speed Integrated Circuit Hardware Description Language.
URL: <http://electrosofts.com/vhdl/>.
- [9] John W. Pierre, "A Novel Method for Calculating the Convolution Sum of Two Finite Length Sequences", IEEE transaction on education,VOL.39, NO. 1, 1996.
- [10] J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles Algorithm, and Applications," 2nd Edition. NewYork Macmillan, 1992.
- [11] **Hsin-Lei Lin, Robert C. Chang, Ming-Tsai Chan (2004), Design of a Novel Radix-4 Booth Multiplier, IEEE Asia-Pacific Conference on Circuits and Systems, Vol.2, pp. 837-840.**
- [12] H. Lee, "A High-Speed Booth Multiplier", ICCS, (2002)

Design of Wideband Low Noise Amplifier with Directional Coupler for Cognitive Radio Receiver and Navigation Applications

Prof. Sharad B. Gholap¹, Mr. Sushant S. Patil²

¹*M.E. Electronics, Ph.D. Pursuing*

²*B.E. E&Tc, M.E. E&Tc Pursuing*

^{1,2}*Department of Electronics & Telecommunication Engineering, SIT, Lonavala*

¹sgholap.sit@sinhgad.edu, ²sushupatil94@gmail.com

Abstract— This paper presents a wideband low noise amplifier with low noise enhancement mode Pseudomorphic HEMT ATF-54143 transistor. The software Agilent Advanced Design System (ADS) was used for simulation of the operation of the amplifier. The performance of the amplifier were recorded and analyzed. The aim of the paper is to give low noise figure, high gain and unconditional stability. The simulation results show that the LNA using pHEMT is absolutely stable with in the band range of 1.1–1.7 GHz, which includes the band of GPS, satellite, navigation systems and cognitive radio.

Keywords— LNA, directional coupler, balanced amplifier technique, low noise amplifier, navigation application, wideband amplifier, ATF-54143, pHEMT, cognitive radio.

INTRODUCTION

Low noise amplifier is an electronic amplifier used to amplify weak signals captured by an antenna. Its location is usually close to the detection device to reduce losses in the feedline. Loss in the coaxial cable is very high in the microwave frequencies. The gain of the LNA reduces the effect of noise from subsequent stages of the receiver chain, while the noise of the LNA itself is added into the received signal. Thus, it is obligatory for an LNA to enhance the desired signal power with a precaution that minimum noise and distortion is added, so that the recovery of this signal is possible in the later stages in the system. A good LNA has following features a low NF, a large enough gain. Further criteria are operating bandwidth; gain flatness, stability and insertion losses.

At the present time, satellite navigation systems and cognitive radio systems are extensively used. So, the application of multi-band navigation receiver is becoming a trend with the development of satellite positioning technique. Wideband low noise amplifier is crucial in multi-band navigation system because the signal transmitted from antenna is distributed in different bands, and the use of wideband low noise amplifier can amplify signals within different bands by one low noise amplifier [1, 11].

GaN high electron mobility transistor (HEMT) are good choice for high power microwave electronics as it has large band gap, high saturation carrier velocity and good thermal conductivity[3]. Moreover, a low noise front end application increases interest for GaN HEMT because of low noise figure performance and high breakdown voltage characteristics.

LNA CIRCUIT DESIGN

The balanced low noise amplifier technique can guarantee the good input and output insertion loss while guaranteeing lower noise figure and better gain flatness [5–8]. There for it is a practical approach to improve the performance of low noise amplifier. As shown in the fig. 1. The balanced amplifier technique contains two low noise amplifiers and two 3 dB couplers. LNA 1 and LNA 2 are two low noise amplifiers having same structure and same performance. The 3dB coupler divides the input RF signal in to two signals having same power and 90° phase shift. Two outputs of first coupler are applied to the input of LNA 1 and LNA 2. LNA 1 and LNA 2 are amplifies this signals. When the performance and structure of LNA 1 and LNA 2 are same then the property of S11 and S22 will

be good. The two signals after the two amplifiers will be synthesized by the second coupler at the output of the module, and the reflection signal of the balanced LNA will be absorbed by R2, it can also greatly reduce S22 of the amplifier circuit [1]. The gain of the balanced amplifier is the same to low noise amplifiers gain if the 3 dB coupler is lossless [6, 7]. There are many types of 3dB couplers, some of them are lange coupler, directional coupler and branch line coupler. As lange coupler requires bonding wire and lines are very narrow, its manufacturing cost is very high. As directional coupler doesn't require bonding wire, its manufacturing cost is very less & its fabrication is simple procedure. So in this paper we used directional coupler.

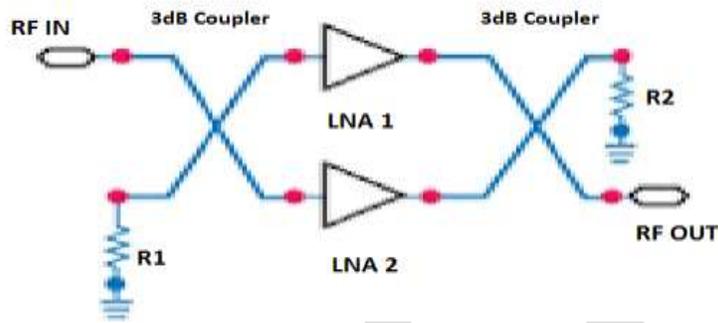


Fig. 1. Structure of balanced amplifier.

a) CHOICE OF TRANSISTOR

Choosing a transistor for an RF amplifier is very complicated. It involves choosing a transistor having an acceptable current rating with gain and noise figure capability that meets the requirements of the intended application. It is also important that the selected transistor has breakdown voltages which will not be exceeded by the dc and RF voltages that appear across the various junctions of the transistor and that permit the gain at frequency objectives to be met by the transistor. A first stage for the choice of transistor is to select the frequency range, because it may disturb other specifications [10].

Due to the design target, we choose a balanced LNA technique and Avago Technologies ATF-54143. ATF-54143 is a low noise enhancement mode PHEMT designed for use in low cost commercial applications in the 450MHz to 6GHz frequency range [9]. It has high gain, high linearity and low noise performance and so on, so that it can satisfy our requirement perfectly.

b) BIASING NETWORK DESIGN

The purpose of the bias network is to set the quiescent point that is the V_{gs} and I_{ds} for a transistor that causes it to operate in the preferred region. In a general perspective there are several types of biasing networks although in LNA applications low complexity is desired and often sufficient typical passive and active bias networks can be seen [12].

In the entire design of the LNA, a strong and stable bias network to supply an appropriate quiescent operating point is important, since the bias network will also affect the noise figure (NF), stability, gain and so on. According to the datasheet, we choose the typical quiescent operating point, $V_d = 3$ V, $I_{ds} = 60$ mA, $V_{dd} = 5$ V, $V_{gs} = 0.59$ V. The design of bias circuit as showed in Fig. 2 and it is similar to the shown in the datasheet [9].

c) STABILITY DESIGN

The design may fail if the LNA is unstable due to oscillation. There are two types of stability namely unconditional stability and conditional stability. Conditional stability in amplifier occurs when $K < 1$ and stability depends on source and load termination. It can keep the system stable for a certain range of source and load impedances [4]. To the contrary, the unconditional stability in amplifier

occurs when $K \geq 1$, ensures the network to be stable for all source and load impedances. For proper working of low noise amplifier, the designer should have an unconditional stability [4].

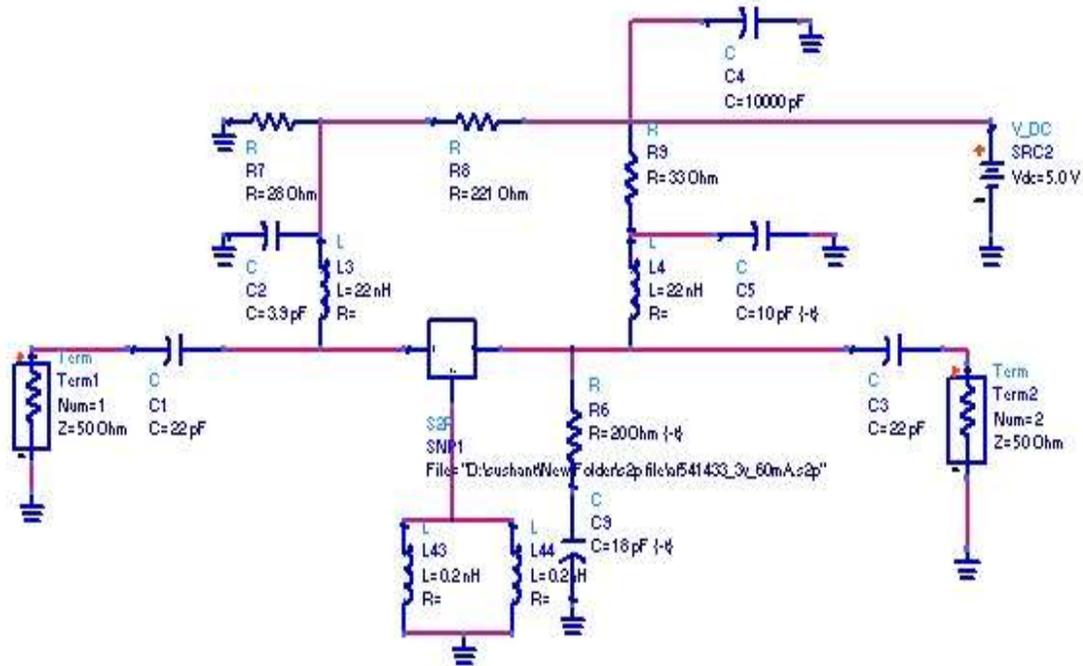


Fig. 2. Design of bias of circuit.

For this we add two small inductors in the source of ATF-54143 and also connect series combination of resistor and capacitor to drain of ATF-54143. After adding inductors we can get stability coefficient is more than 2.55 and the system is unconditionally stable.

d) MATCHING NETWORK DESIGN

In the design of low noise amplifier, the input and output matching network make the input and output impedance transform to 50ohm impedance in the condition of good noise figure and gain [1, 2]. Fig. 3 is the schematic diagram of balanced low noise amplifier; it includes bias network, stability network, input and output matching networks. For machining network two inductors and one capacitor at input and output sides are used. Stability is formed by two small inductors at source and series connection of resistor and capacitor at drain. Balanced amplifier is designed using the two 3dB directional coupler. EM simulation result of S31 and S21 of 3dB directional coupler is show in the fig. 4.

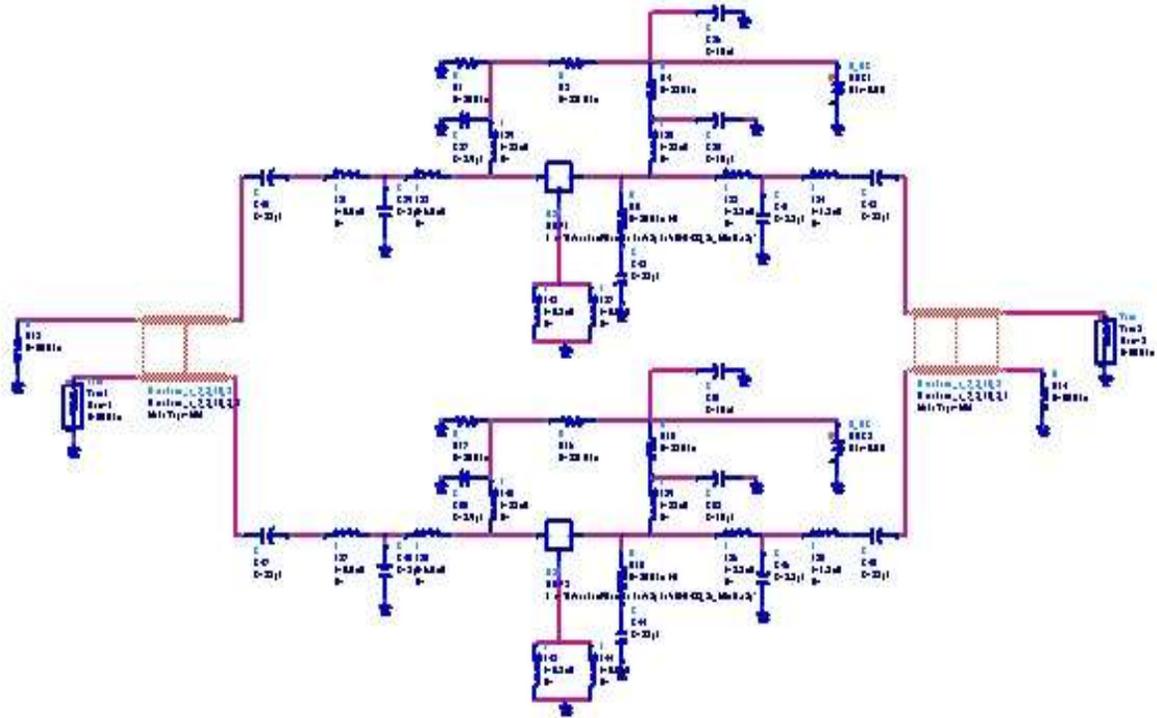


Fig. 3. Balanced LNA.

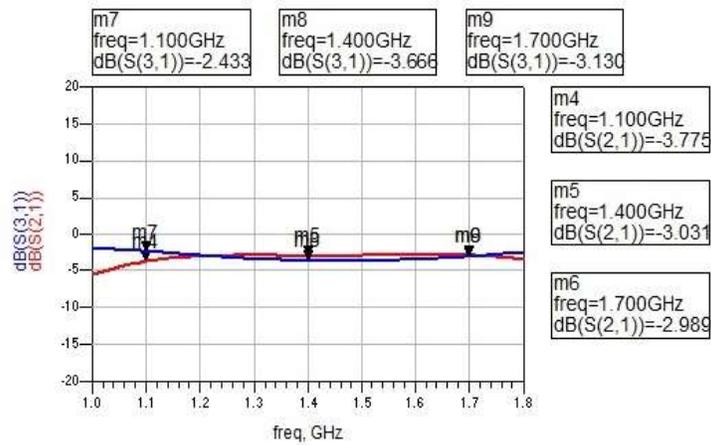


Fig. 4. S31 and S21 of directional coupler

SIMULATION RESULTS

The simulation results of the balanced low noise amplifier circuit are shown in Figs. 5–9. Fig. 5 and 6 shows that S11 and S22 of the LNA are less than -14 dB and the performance of matching network are very well. As shown in Fig. 7, the gain is more than 13.3 dB in the required frequency range of 1.1–1.7 GHz. From Figs. 8 and 9, we can see that, the max value of the noise figure is 0.76 dB, the stability factor of LNA is bigger than 2.55 and the system is unconditionally stable.

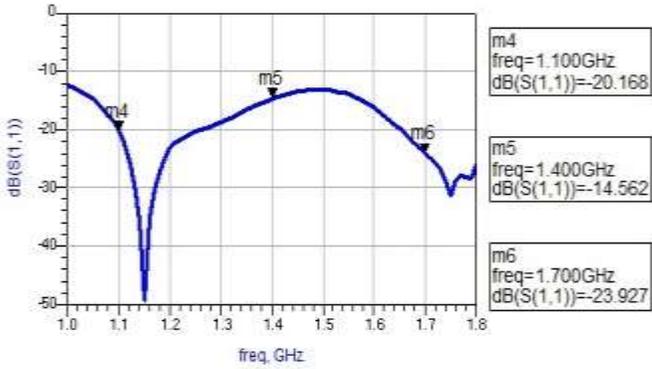


Fig. 4. Simulated s11 of LNA.

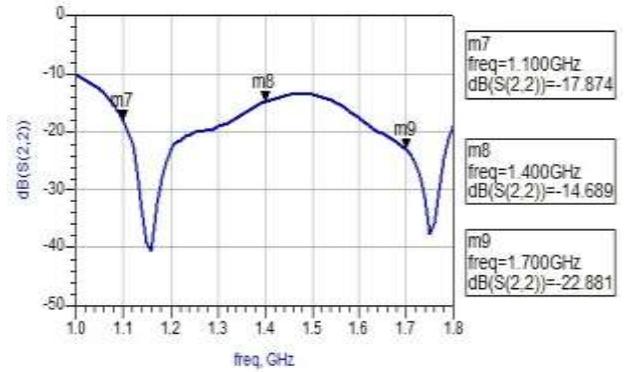


Fig. 5. Simulated S22 of LNA.

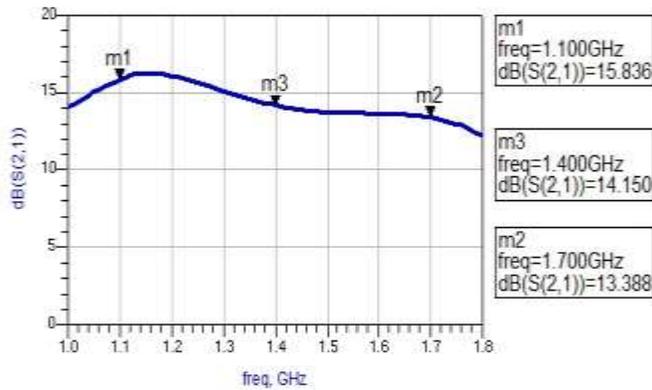


Fig. 6. Simulated gain of LNA.

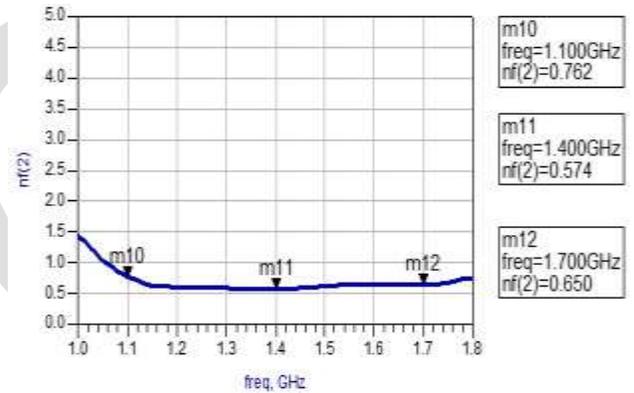


Fig. 7. Simulated noise figure of LNA.

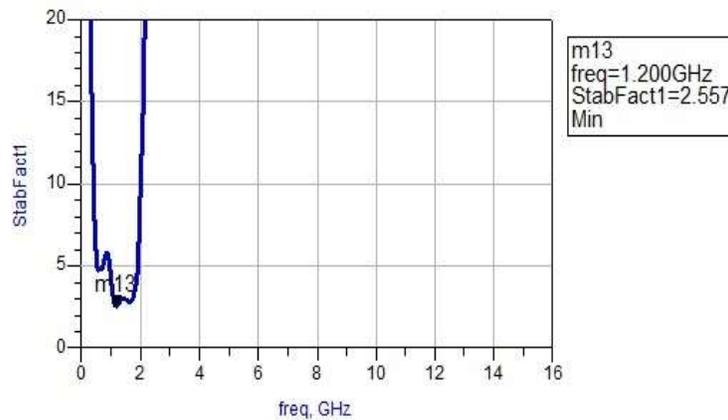


Fig. 8. Simulated stability factor of LNA.

ACKNOWLEDGMENT

The designs and simulations were done in ADS (Advanced Design System) at SM wireless solutions, Hadapsar, Pune. The authors would like to thank R. Wekhande for making the resource available.

CONCLUSION

We designed the low noise amplifier with the balanced amplifier technique in Agilent's ADS tool to get high gain, low noise figure and unconditional stability. From above simulation results it is clear that LNA is unconditional stable, noise figure is below 0.76dB, gain is above 13.3 dB and input matching (s11), output matching (s22) parameters are below -14db.

REFERENCES:

- [1] EnCheng Wang^a, ZhuoPeng Wang^b, ShaoJun Fang^c, Peng Chenc "A novel UWB low noise amplifier for multi-band navigation application" W. EnCheng et al. / Int. J. Electron. Commun. (AEÜ) 67 (2013) 144– 148.
- [2] Yanhui Lu, Qinghua Tang, Wenguang Li, Guoan Wu, Huijie Qi "Design of a 1GHz~4GHz ultra-wide band low noise amplifier" 978-1-4244-7941-2/10c ©2010 IEEE.
- [3] U. K. Mishra, P. Parikh., and Y.-F. Wu "AlGaN/GaN HEMTS- An Overview of Device Operation and Application" Proc. IEEE, vol.90, 2002, pp.1022-1031.
- [4] Dacid M. Pozar, Microwave Engineering, Third Edition, John Wiley&sons, Inc. New York, 1998, pp. 612-617.
- [5] Zongnan Z, Qinghua H. "Design of a 24–40 GHz balanced low noise amplifier using Lange couplers" J Semiconduct 2009;30(4): 0450011–4.
- [6] Kashiwa T, Komaru M, Katoh T, Yoshida N, Tanino N, Takagi T, et al. "A Q-band high gain and low noise variable gain amplifier using dual gate HEMTs" In: 17th Annu IEEE Gallium Ar-senide Integrated Circuit(GaAsIC) Symp Tech Dig. 1995.p. 210–3.
- [7] Wang JW, Fu WB. "Analysis of amplitude-frequency and phase-frequency characteristics of 3 dB bridges" J Air Force Radar Acad 2005;19(2):24–7.
- [8] Deal WR, Biedenbender PH, Liu, Uyeda J, Siddiqui M, Lai R. "Design and analysis of broadband dual-gate balanced low noise amplifiers" IEEE J Solid-State Circ2007;42(10):2107–15.
- [9] Avago, ATF54143 datasheet [Z]. www.avagotech.com.tw/docs/AV02-0488EN.
- [10] Mohamed Abdultawab Abdulla "Design procedures of bipolar Low Noise Amplifier (LNA) at Radio Frequency (RF) Using S-Parameters".
- [11] W. Farrag, A. Ragheb, N. Rashid "Design of 0.05-5 GHz LNA for Cognitive Radios Receiver" Recent Advances in Electrical and Computer Engineering ISBN: 978-1-61804-228-6.
Marcus Edwall "Low Noise Amplifier Design and Optimization" 2008:CIV – ISSN 1402-1617 – ISRN: LTU-EX—08/230—SE

SHAPE OPTIMIZATION OF FRONT AXLE BRACKET BY USING FINITE ELEMENT ANALYSIS

¹**PANKAJKUMAR.J.M.**

Department of Mechanical Engineering, Rungta College of Engineering and Technology, Raipur
Chhattisgarh, India
pankajsir@gmail.com

²**NARENDRA YADAV**

Department of Mechanical Engineering, Rungta Engineering College, Raipur, Chhattisgarh, India

³**ANKUSH TIWARI,**

Department of Mechanical Engineering, Rungta Engineering College, Raipur, Chhattisgarh, India

ABSTRACT: The objective of this paper is to analyse the proposed optimum design of tractor front axle bracket for varying load conditions. Due to brittleness of the cast component material, it is subjected to sudden failure under dynamic load condition causing potential danger. The front axle bracket is designed for high strength and stiffness. The existing design has no field failure reports and hence its parameters were taken as basis for comparison with results of the proposed designs. Based on the finite element analysis results, optimum design was carried out for the bracket for weight optimization and easy manufacturability. The proposed design was evaluated for selected worst load cases of the existing design. The finite element analysis of proposed models yielded displacement and stresses close to the existing design. The increase in displacement was not significant and the proposed design met the structural requirement. It was also observed that the proposed design has significant reduction in weight and did not involve welding, thereby significantly saving manufacturing cost. The assembly components like smaller diameters bearing, smaller knuckle size, etc were also found to be cost effective. The present work showcases the use of finite element analysis as a method for reduction of cost in terms of materials & manufacturing.

Keywords: Front Axle Bracket, Finite Element Analysis, Maximum Von Mises Stress, Weight optimization

1. INTRODUCTION

Tractor users demand low cost and light weight components for fuel efficiency and cost effectiveness. To meet the performance targets, manufacturers go for effective use of materials, easy manufacturability, weight efficient components and reduced design cycle time. Tractors work on difficult conditions than other machines and its components should have high safety of factor [1]. Front Axle of Tractor needs very good design as this part experiences the worst load condition of the whole tractor [2]. The front axle bracket requires a properly designed support with high strength and stiffness. Due to brittleness of the Nodular cast iron component material, it is subjected to sudden failure under dynamic load condition causing potential danger.

The von Mises stress also known as the maximum distortion energy criterion, is often used in determining whether an isotropic and ductile metal will yield when subjected to a complex loading condition. Von Mises stress is compared with the material's yield stress, constituting the von Mises Yield Criterion [3]. Analysis is carried out on the front axle bracket to assess the stress and displacement in the system. The shape optimization is done on the component for optimum material distribution. Solid works software [4] is used as methodology for optimum designing of front axle bracket.

2. FINITE ELEMENT ANALYSIS

Finite element analysis is a computational tool for performing engineering investigation. It uses mesh generation technique for dividing a complex problem into smaller elements and a coded finite element algorithm software program [5]. It is useful for components with complex loadings, material properties, and geometries where analytical solutions cannot be obtained [6]. The bracket optimizing is very complex due to its shape and is difficult to design through mathematical calculations [7]. ANSYS 15 [8] software is used for finite element method for static analysis is used in the present study. By analyzing the weakest link and the difference in strength between each node for the overall structure in the condition, it can provide a theoretical basis and direction for the design and optimization of geometric entities [9].

3. METHODOLOGY

The existing front axle support bracket has been taken from Mahindra tractor (Model-Arjun 265 DI) [10] /for the analysis. Existing weight is 31.28 kg and its material is nodular cast iron. The total load acting downward on the bracket is 15000 N (considering the engine weight with mountings). Structural analysis is carried out for static condition. The main objective of this study is minimization of volume with manufacturing feasibility for given strength and life with less design cycle time.

3.1 CAD Model Generation

Solid modeling of component has done with the help of Solid works software. The software is a Para solid-based solid modeler which utilizes a parametric feature-based approach to create assemblies and models. The identified parameters refer to the constraints whose values decide the geometry or shape of the model or assembly. Fig. 1 shows the CAD Model with hole position and boss feature of Front Axle Bracket.

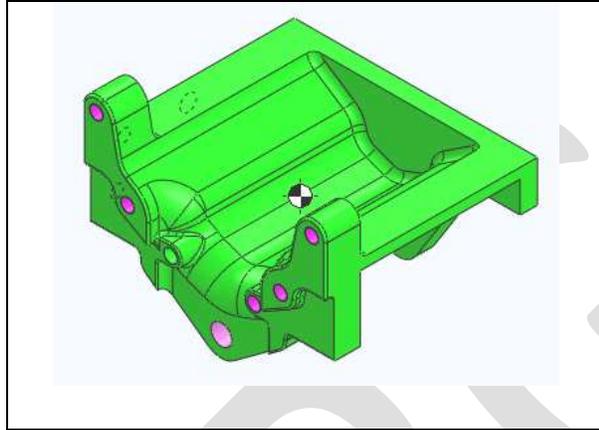


Fig. 1 CAD Model with hole position and boss feature of Front Axle Bracket

3.2 Analysis of Existing Front Axle Bracket (FAB)

The analysis of existing front axle bracket is divided into three areas; preprocessing, solution and post processing.

3.2.1 Preprocessing

The analysis front support bracket (FAB) of the tractor is done in ANSYS 15 software in the static structure analysis work bench. Static analysis is used to determine the stresses, strain, displacements, and forces in structures or components caused by loads that do not induce significant damping and inertia effects. Steady load and response conditions are assumed (vary slowly with respect to time). Table 1 shows the size of Nodes and Elements of FAB. The location of forces applied on FAB and meshing of FAB is shown in Fig. 2 and 3.

Table 1 Size of Nodes and Elements of FAB

Sr.No.	Mesh		Element type	
	Entity	Size		
1	Nodes	266840	Connectivity	Statistics
2	Elements	147493	TE10(Tetrahedron element)	47493

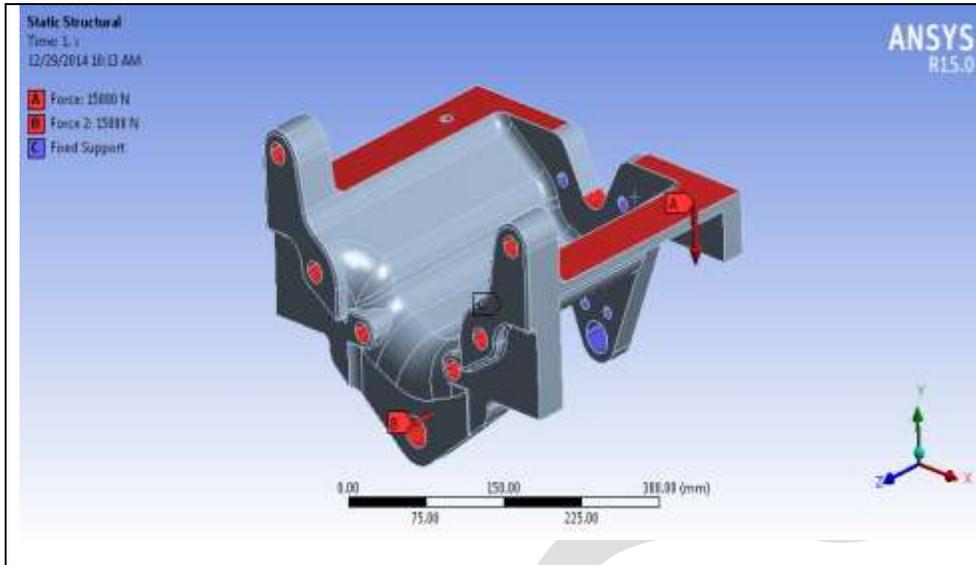


Fig. 2 Location of forces applied on FAB

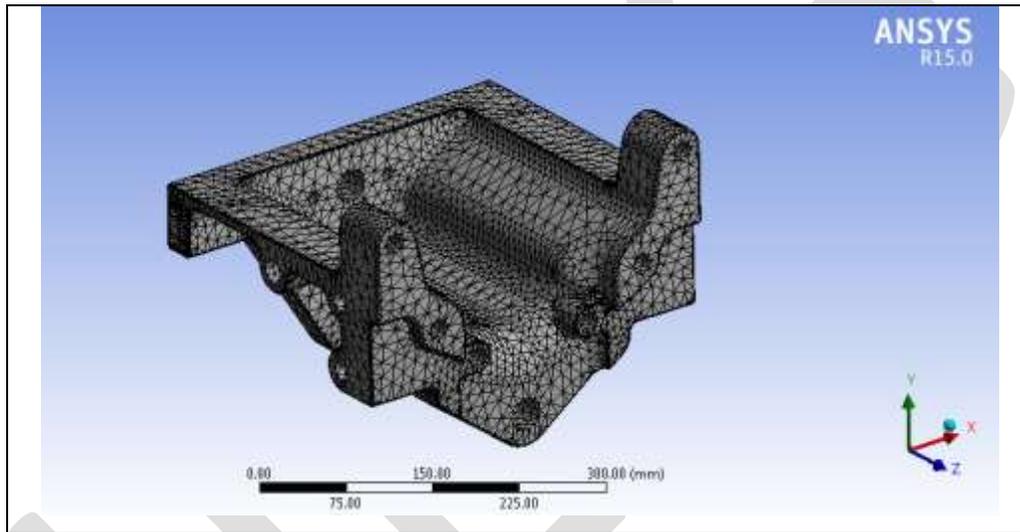


Fig. 3 Meshing of FAB

3.2.2 Solution

The results after computation are shown in Fig. 4 and 5.

3.2.3 Post processing

Reviewing the results, the values of stress and deflection obtained for front axle bracket are shown in Table 2

Table2: Results of Existing design

S.N.	PARAMETER	VALUE
1	Max Von Mises Stress	20.50 MPa
2	Max Deflection	5.2784 e-004 mm
3	Mass	31.287 Kg

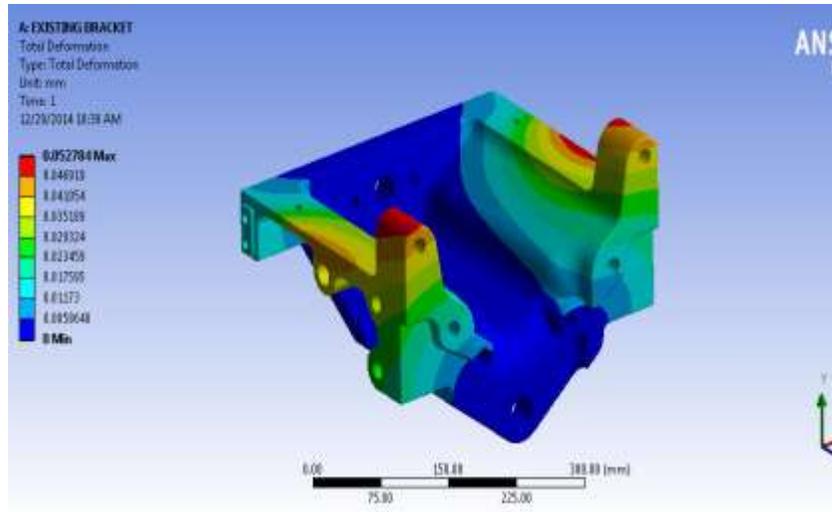


Fig.4 Stress produced in existing design

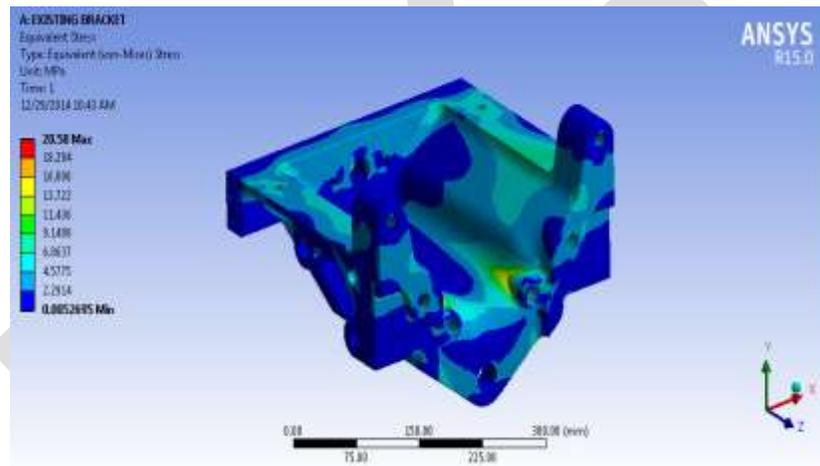


Fig. 5 Deflection generated in existing design

3.3 The uncritical area for engineering scope

Figure 6 shows the locations A, B, C for a possibility of modification. A shows the position of no load region. In this position no direct load is in contact of the tractor engine. B shows the position where the sideways tapering is to be minimized. C shows the region of the thickness of that section.

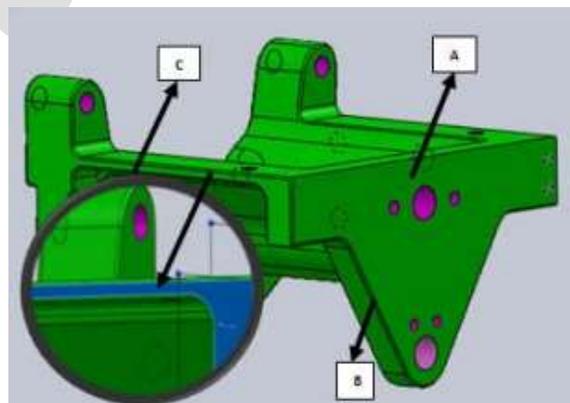


Fig. 6 The uncritical area for engineering scope

4. DESIGN OPTIMIZATION

The existing design has been discussed in CAD Model generation. The proposed designs are discussed under Optimized Design I, II and III

4.1 Optimized Design I

In this design a slight section is cut from the critical section A as shown in Fig. 7. For analysis of stress, the load applied in this design is 15000 N acting vertically downwards and same load acting at front direction over the entire span of the bracket. The front axle support is subjected to tensile load on the upper span of the bracket. The maximum stress of front axle support is monitored and it is not more than the allowable stress. The deflection generated is shown in the Fig 8.

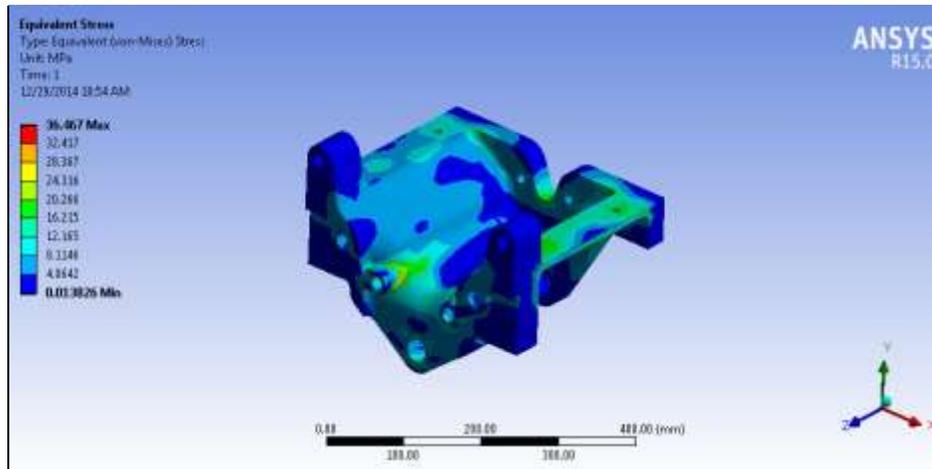


Fig.7 Stress Produced in Design I

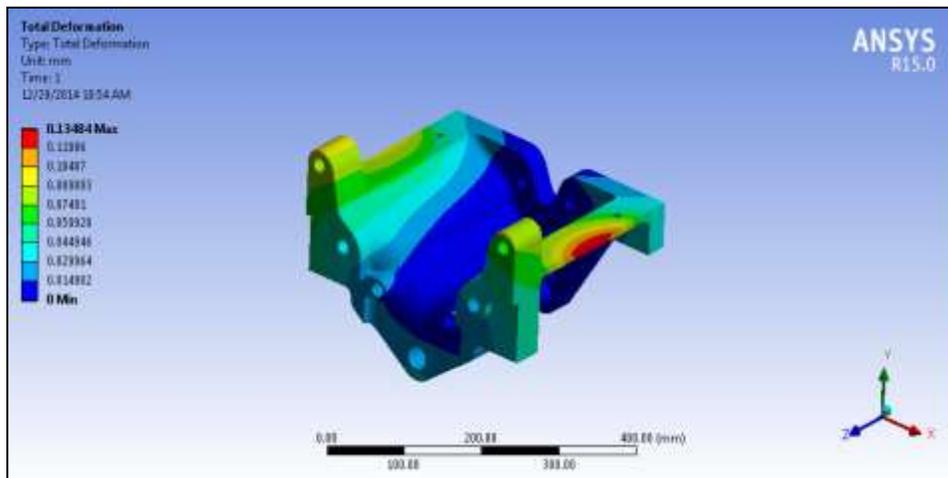


Fig. 8 Deflection generated in Design I

Table 3: Results of optimized design I

S.N.	PARAMETER	VALUE
1	Max Von Mises Stress	36.46 MPa
2	Max Deflection	11.984e-002 mm
3	Mass	30.921 Kg.

4.2 Optimized Design II

In this design, section B is considered for optimization. The arc length is reduced and the angle is tapered by which considerable amount of weight is reduced. The amount of stresses and deflection increases but it is in safe limits. The stress generated and the deflection is shown in Fig. 9 and 10.

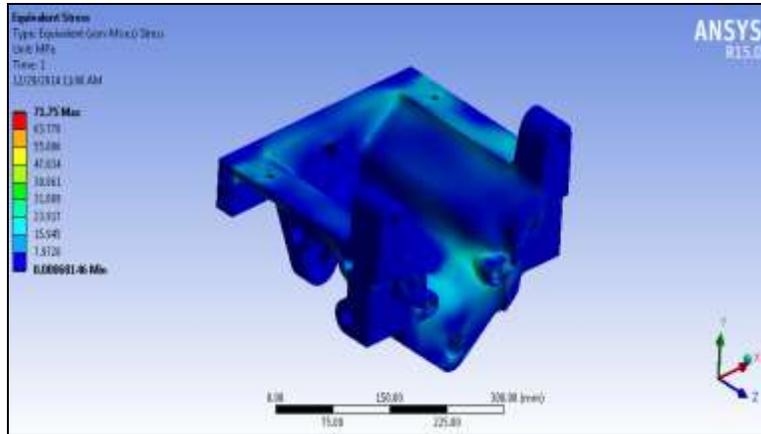


Fig. 9 Stress generated in Design II

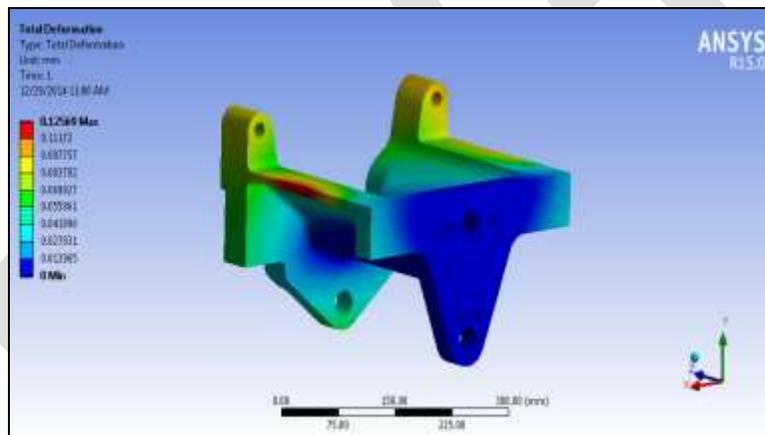


Fig. 10 Deflection generated in Design II

Table-4 Results of optimized design II

S.N.	PARAMETER	VALUE
1	Max Von Mises Stress	71.75 MPa
2	Max Deflection	12.569 e-002 mm
3	Mass	30.45 Kg.

4.3 Optimized Design III

The third and final design includes the modification of design I & II with reduction in thickness of the front and rear wall. It is reduced from 55 to 50mm and 30 mm thick wall is changed to 25mm. The stress generated is shown in Fig. 11 and the generated deflection is shown in Fig. 12.

Table-5: Results of optimized design III

S.N.	PARAMETER	VALUE
1	Max Von Mises Stress	45.89 MPa
2	Max Deflection	15.00e-002 mm

3	Mass	26.39 Kg.
---	------	-----------

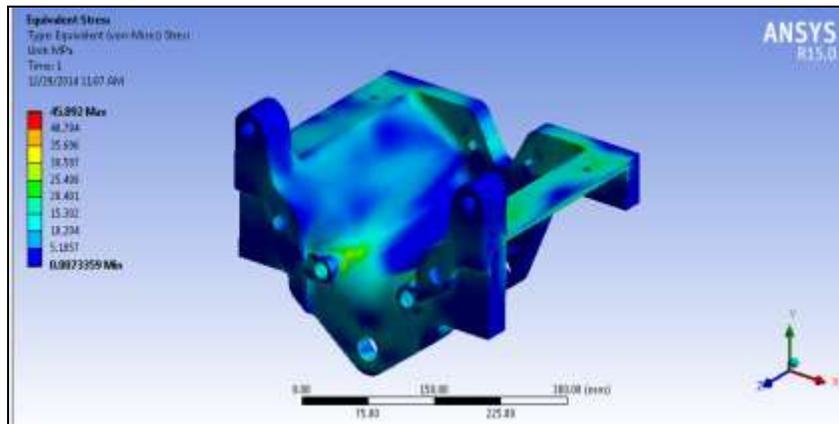


Fig. 11 Stress generated in Design III

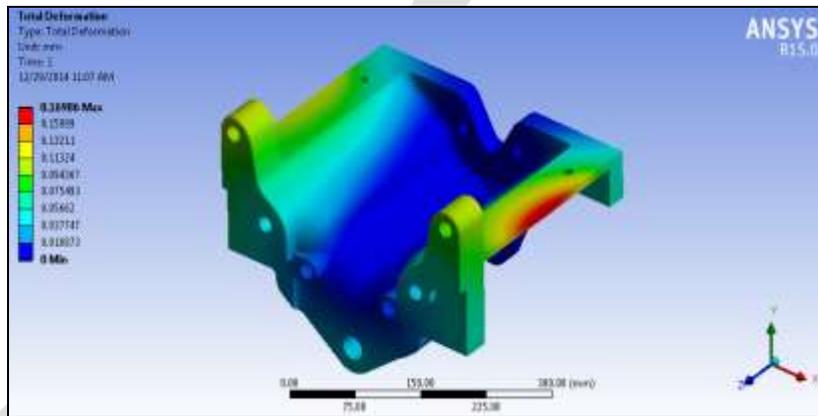


Fig. 12 Deflection generated in Design III

Table – 6: Analysis of the Results

S No.	PARAMETER	Existing Design	Design- I	Design - II	Design - III
1	Max. Von Mises Stress, MPa	20.5	36.46	71.75	45.89
2	Max Deflection, mm	5.27e-004 mm	11.9e-002 mm	12.5e-002 mm	15.0e-002 mm
3	Mass, Kg	31.287 Kg.	30.921 Kg.	30.45 Kg.	26.39 Kg.

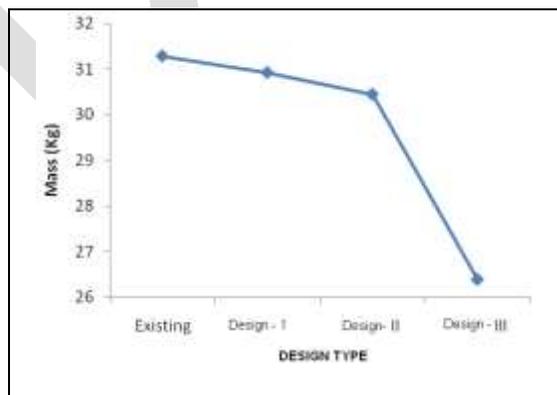


Fig. 13: variations in weight in different Designs

CONCLUSION

The three different designs have been adopted to analyze the optimum configuration for the purpose of reducing the weight of FAB without affecting the functional quality of the bracket. The results of design I, II & III are tabulated in Table-6. The variations in weight in different Designs are shown in Fig. 13. The design I results show that the amount of maximum stress was developed in area near to the right flat plate. Design I and II separately gives near about 1 and 2 percentage reduction in the weight but it shows higher amount of stress so this method is not considered from design point of view. Moving forward to design III, the reduction of material by combining design I and II is implemented along with reduction in thickness of both the walls. It gives better result with less amount of stress. Nearly 15 % weight has been reduced (weight reduced to 26.39 Kg from existing 31.287 kg). The amount of Von Mises stress is increasing from 20.5 to 45.89 MPa but it is in safe limits. The optimization analysis by design III is manufacturing feasible for given strength and life with less design cycle time.

REFERENCES:

- [1] Javad Tarighi et al, *Static and dynamic analysis of front axle housing of tractor using finite element methods*, Australian Journal of Agriculture Engineering, 2(2): 2011, pp 45-49.
- [2] <http://www.ansys.com/staticassets/ANSYS/staticassets/resourcelibrary/confpaper/2002-Int-ANSYS-Conf-106.PDF>.
- [3] <http://www.continuummechanics.org/cm/vonmisesstress.html>.
- [4] <https://www.solidworks.com>.
- [5] http://en.wikipedia.org/wiki/Finite_element_method
- [6] http://www.engr.uvic.ca/~mech410/lectures/FEA_Theory.pdf.
- [7] Shree Dewangan et al, *Shape Optimization Of Front Axle Support Of Tractor*, Int. Journal of Engineering Research and Applications, Vol. 4, Issue 4, 2014, pp.70-73
- [8] <http://www.ansys.com>
- [9] Dong Fang Hu, Wen Hui Liu, *Finite Element Analysis of the Tractor Front Axle Housing Based on ANSYS*, Applied Mechanics and Materials (Volumes 105-107), 2011, pp 168-171
- [10] <http://www.mahindractor.com>

CAR ACCIDENT PREVENTION SYSTEM

Dipak Bodare¹, Mahesh Ranmode², Prativind Ghogare³

Prof.P.S. Togrikar

prativindghogare@gmail.com Contact No: 9503090351

Abstract:- Driver in-readiness is an imperative reason for most mischance identified with the vehicles crashes. Driver exhaustion coming about because of genuine slumber is an imperative consider the expanding number of the mischances on today's streets. Tired driver cautioning framework can structure the premise of the framework to perhaps decrease the mischances identified with driver's laziness. The reason for such a framework is to perform discovery of driver weakness. By setting the cam inside the car, we can screen the substance of the driver and search for the eye-developments which show that the driver is no more in condition to driver is no more in condition to drive. In such a case, a notice sign ought to be issued. This framework depicts how to discover and track the eyes.

At the time of eyes following we separate out left and right eyes some piece of casing, at the genuine begin of laziness location process we must spare the any human eyes format as a standard. Presently we contrast caught eyes outline with our standard human eye layout. At that point if both edges are coordinated with our conditions, i.e.<1>if driver is a regular human conditions then our framework will gives a message (Diver is alert).<2> If driver is a sluggish condition i.e. we escape 3 frame out of 10,casings are consistently shut or coordinated with our shut standard format.

In this proposed system we have work on different angle of tilt face image and we observed that at least single eye can be detected and using this any one single eye system can work 80% more accurately.

Keyword: - viola and jones algorithm, Face detection, Eyes detection, left eye Detection, right eye Detection, Drowsiness alert, Buzzer.

Introduction:-

Safe driving is a significant concern of social orders everywhere throughout the world [2]. A great many individuals are murdered, or truly harmed because of drivers falling as slumber at the wheels every year. Late studies demonstrate those drivers' sleepiness represents up to 20% of genuine or deadly mishaps on motorways and dreary streets, which impede the drivers' judgment and their capacity of controlling vehicles [1]. In this manner, it is key to build up an ongoing wellbeing framework for laziness related street mischance anticipation. Numerous techniques have been produced and some of them are presently being utilized for distinguishing the driver's languor, including the estimations of physiological highlights like EEG, heart rate and heartbeat rate, head development and practices of the vehicle, for example, path deviations and guiding developments [3]. Among those distinctive innovations, visual measures, for example, eye-flickering and eyelid conclusion are considered as encouraging routes for checking readiness. Normally, after extend periods of time of driving or in truant of alarm mental state, the eyelids of driver will get to be substantial because of exhaustion.

The consideration of driver begins to lose center, and that makes dangers for mischances. These are commonplace responses of weakness, which is exceptionally perilous. Typically numerous depleted drivers are not mindful that they are in nodding off [6]. Actually, numerous such drivers can nod off whenever amid their driving.

Objective:-

- The Focus Of This Undertaking Is To: To Lay Out A Structure To Perceive Driver's Tiredness In Perspective Of Face And Eye Recognizable Proof In The Region Of Variable Lighting Conditions So That Road Incidents Can Be Stayed Far From Adequately
- To Alert The Driver On Id Of Tiredness By Using Beep Or Signal And To Ensure A Direct And Profitable Blueprint, That Can Be Completed Using Diversion And Hardware Likewise Without False

Definition of simple features for object detection:-

3 rectangular feature types:

- two-rectangle feature type (horizontal/vertical)
- three-rectangle feature type
- four-rectangle feature type

Using a 24x24 pixel base detection window, with all the possible combination of horizontal and vertical location and scale of these feature types the full set of features has 49,396 features.

The motivation behind using rectangular features, as opposed to more expressive steerable filters is due to their extreme computational efficiency.

A variant of AdaBoost for aggressive feature selection:

- User selects values for f , the maximum acceptable false positive rate per layer and d , the minimum acceptable detection rate per layer.
- User selects target overall false positive rate F_{target} .
- P = set of positive examples
- N = set of negative examples
- $F_0 = 1.0; D_0 = 1.0; i = 0$
- While $F_i > f_{target}$
- $i++$
- $n_i = 0; F_i = F_{i-1}$
- while $F_i > f \times F_{i-1}$
 - $n_i ++$
 - Use P and N to train a classifier with n_i features using AdaBoost
 - Evaluate current cascaded classifier on validation set to determine F_i and D_i
 - Decrease threshold for the i th classifier until the current cascaded classifier has
 - a detection rate of at least $d \times D_{i-1}$ (this also affects F_i)
- If $F_i > T_{target}$ then evaluate the current cascaded detector on the set of non-face images and put any false detections into the set N .

Block Diagram:-

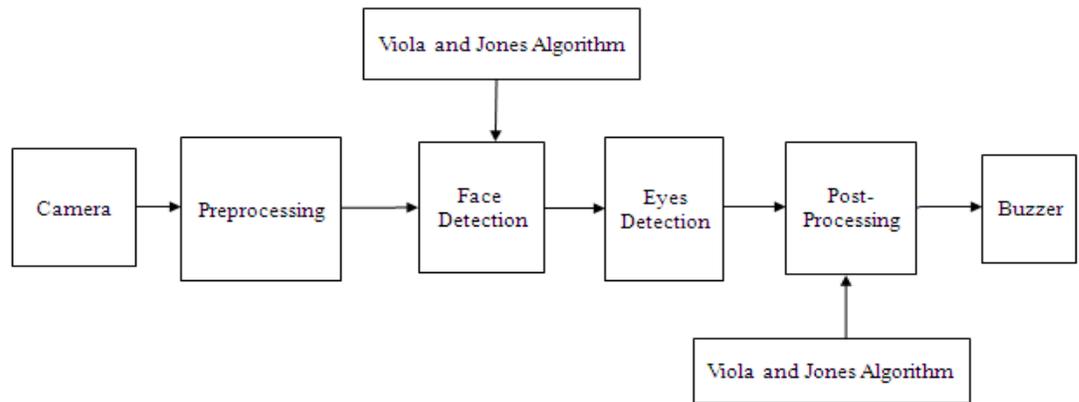


Fig: - Block Diagram of car accident prevention system.

Operation of the face detector:-

Face detection is a computer technology that determines the locations and sizes of human faces in Digital images. It detects face and ignores anything else, such as buildings, trees and bodies. Face Detection can be regarded as a more general case of face localization. In face localization, the task is to find the locations and sizes of a known number of faces (usually one) [7]. In face detection, face is processed and matched bitwise with the underlying face image in the database.

Face detection algorithm:-

- PCA (principle component analysis).
- Dynamic Template matching.
- Color skin model.
- Viola jones algorithm.
- KLT algorithm.

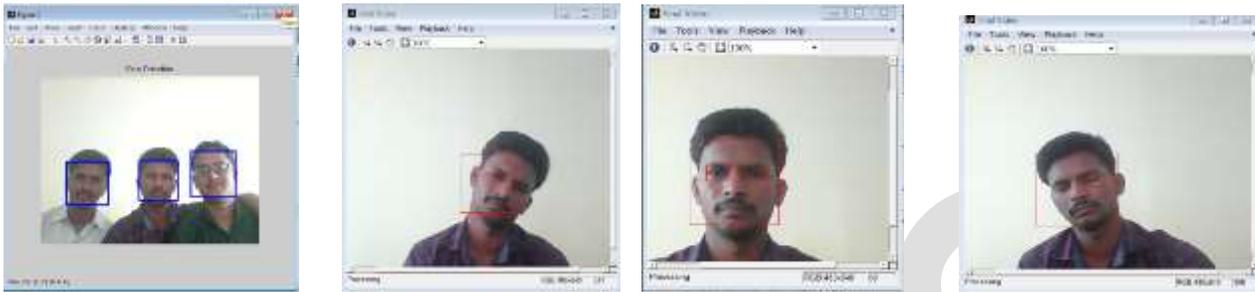


Fig:-Multiple Face Detection.

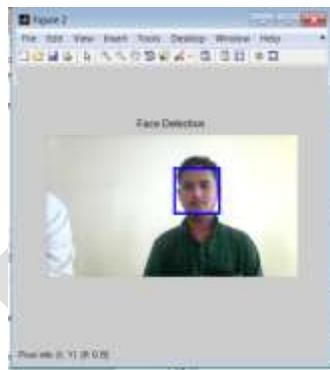


Fig:-Face Detection.

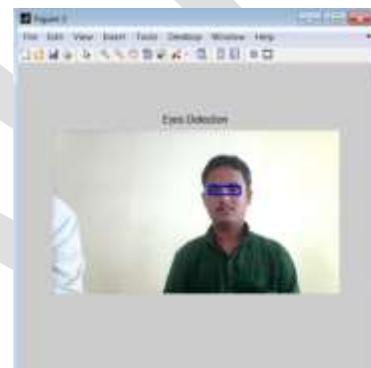


Fig: - Eyes Detection.

Viola jones algorithm:-

Paul Viola and Michael Jones presented a fast and robust method for face detection which is 15 times quicker than any technique at the time of release with 95% accuracy at around 17 fps. This work has three key contributions:

- Haar-like features
- Integral image
- AdaBoost Learning algorithm
- Cascade Classifiers.

Haar-like features:

- Each Haar-like feature consists of two or three connected “black” and “white” rectangles.
- Each feature results in a single value which is calculated by subtracting the sum of pixels under white rectangle from the sum of pixels under black rectangle.

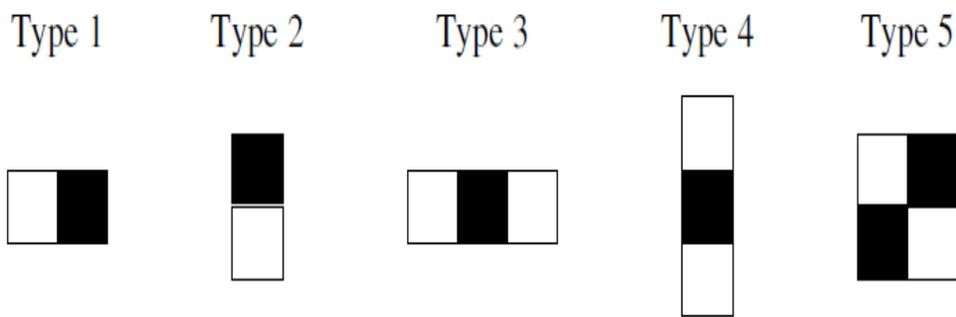


Fig:-Haar features used in viola Jones

Integral image:

- Integral image allows for the calculation of sum of all pixels inside any given rectangle using only four values at the corners of the rectangle.
- In an integral image the value at pixel (x,y) is the sum of pixels above and to the left of (x,f)

Sum of all pixels in

$$D = 1+4-(2+3)$$

$$= A+(A+B+C+D)-(A+C+A+B)$$

$$= D$$

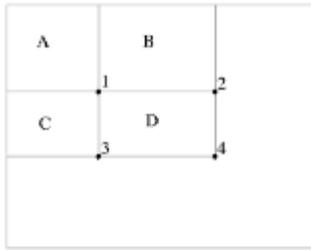


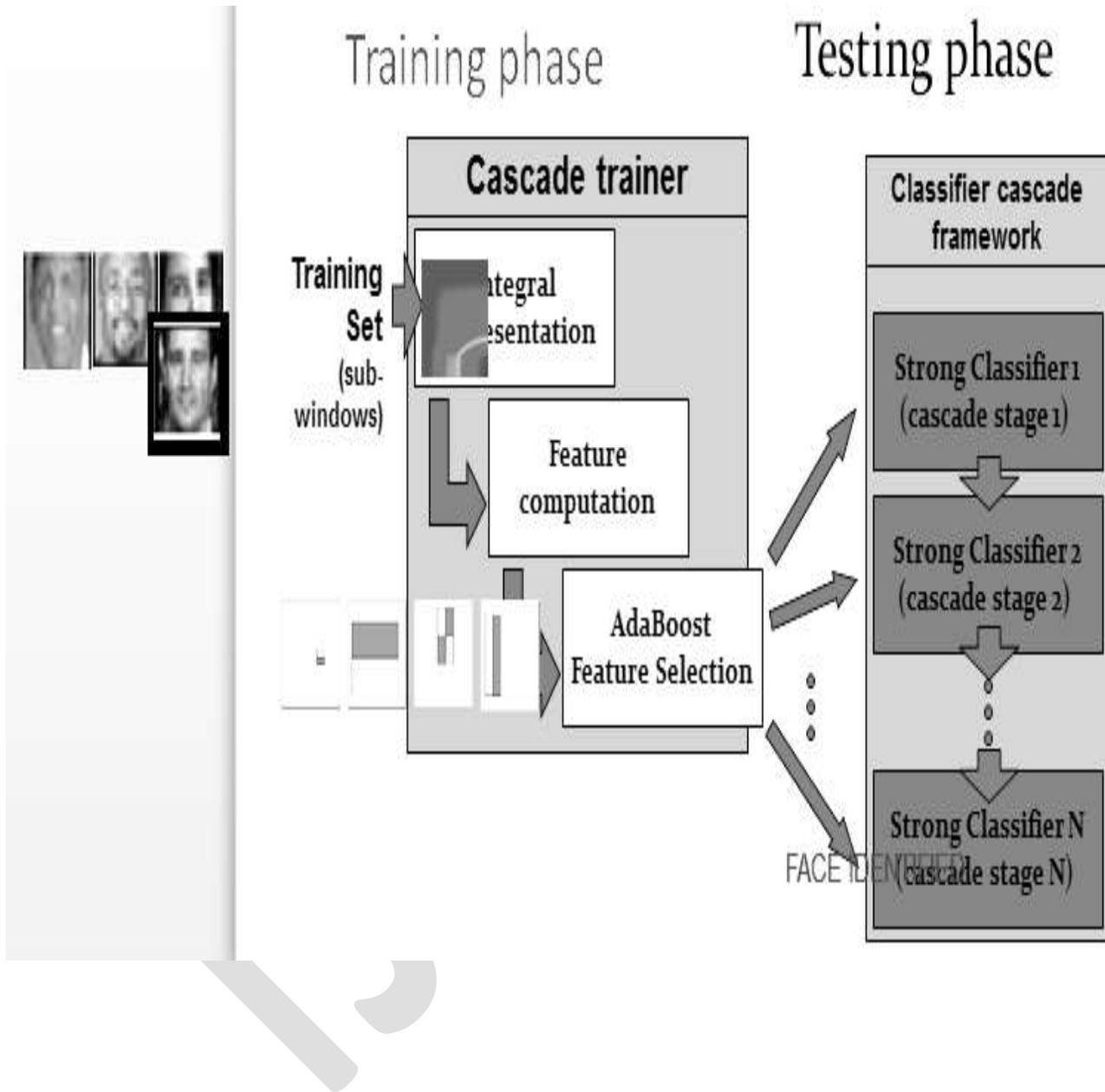
Fig: - Integral image matrix

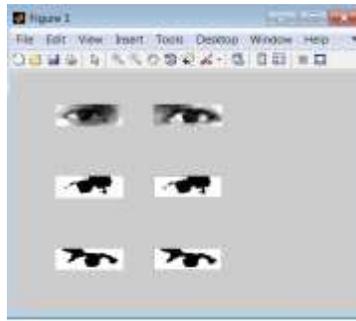
AdaBoost Learning algorithm:

- As stated previously there can be approximately 160,000 + feature values within a detector at 24x24 base resolution which needs to be calculated. But it is to be understood that only few set of features will be useful among all these features to identify a face.
- AdaBoost is a machine learning algorithm which helps in finding only the best features among all these 160,000+ features. After these features are found, a weighted combination of all these features is used in evaluating and deciding any given window has a face or not.

Cascade Classifiers:-

- For fast processing, the algorithm should concentrate on discarding non-faces quickly and spend more on time on probable face regions.
- Hence a single strong classifier formed out of linear combination of all best features is not a good to evaluate on each window because of computation cost.
- Therefore, a cascade classifier is used which is composed of stages each containing a strong classifier. So all the features are grouped into several stages where each stage has certain number of features.
- Each stage determines whether a given sub window is definitely not a face or may be a face. A given sub window is immediately discarded as not a face if it fails in any of the stage.





Left eye open



Left eye close



Half-Left eye open



Half-Left eye close



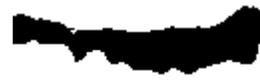
Right Eye Open



Right Eye Close



Half-Right Eye Open



Half-Right Eye Close

Fig: - Templates of eyes open and closed.



Fig:-Open Eye Strip



fig:-closed eye strip

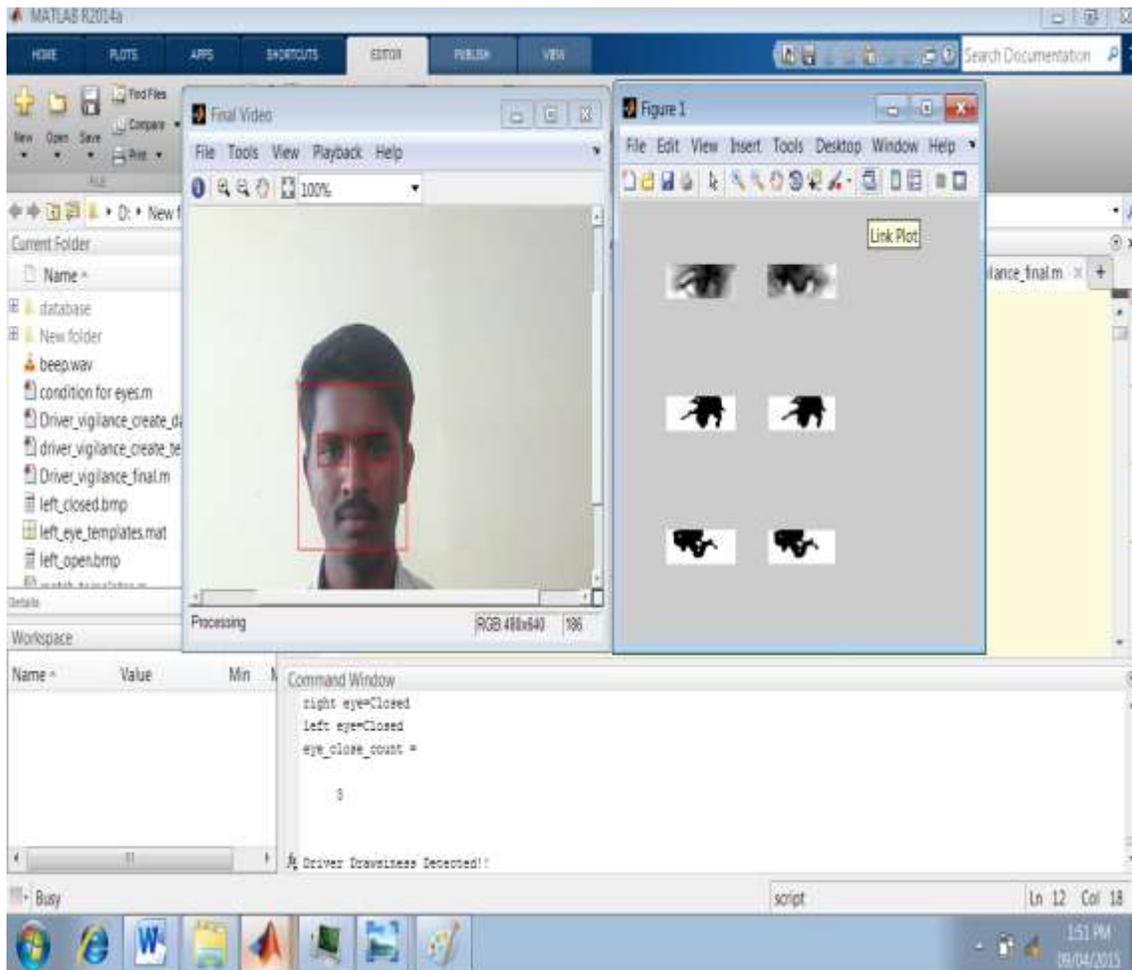


Fig:- Proposed system

Acknowledgement:-

We have incredible joy in conveying the report on the point "Car Driver Drowsiness Alert System". This paper has help me to express my appreciation towards Honorable Principal Dr. P. D. Nemade for his backing. Likewise, we might want to because of HOD Prof. A. C. Bhosale for their constant help and backing.

We might want to because of our Project-Guide Prof. P. S Togrikar for their convenient help and direction towards effective fulfillment of our paper.

Our earnest on account of all showing and non-showing staff of our specialty for their consistent collaboration stretched out to me to finish the undertaking effectively. Our gratitude to all my companions for their steady help and backing amid our venture work.

Conclusion:-

We developed a system that localizes and track the FACE and EYES movements of the driver in order to detect drowsiness. The system uses a combination of template – based matching and feature based matching in order to localize the eyes. During tracking, system will be able to decide if the eyes are open or closed and whether the driver is looking in front. When the eyes will be closed for too long, a warning signal will be given in the form of buzzer.

REFERENCES:

- [1] A. K. Jain, “*Fundamentals of Digital Image Processing*”, Prentice Hall of India, First Edition, 1989.
- [2] “*Real-Time Detection of Driver Fatigue using DIP*” “Suvarna Pathade, Vinaya Gohokar International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-1, Issue-3, August 2012
- [3] “*Road Accidents Prevention system using Driver’s Drowsiness Detection*” Garima Turan, Sheifali Gupta International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 2, Issue 11, November 2013
- [4] “*Vision-based Real-time Driver Fatigue Detection System for Efficient Vehicle Control*” D.Jayanthi, M.Bommy International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-2, Issue-1, October 2012
- [5]. K. S. Srinivasan and D. Ebenezer, “*A New Fast and Efficient Decision-Based Algorithm for Removal of High-Density Impulse Noises,*” IEEE Signal Processing Letters, Vol. 14, No. 3, March 2007.
- [6]. H. Hwang and R. A. Haddad”*Adaptive Median Filters: New Algorithms and Results*” IEEE Transactions on image processing vol 4. P.no 499-502, Apr 1995.
- [7]. Suresh Kumar, Papendra Kumar, Manoj Gupta, Ashok Kumar Nagawat, “*Performance Comparison of Median and Wiener Filter in Image De-noising*” ,International Journal of Computer Applications (0975

DESIGN AND ANALYSIS OF GLITCH FREE NAND BASED DIGITALLY CONTROLLED DELAY LINES USED TO SPREAD SPECTRUM CLOCK GENERATOR

POORNIMA M, SARANYA S

Graduate student, M.E – Applied Electronics, DSCET, ANNA UNIVERSITY, Tamilnadu, INDIA

poornimamuruganandam@gmail.com +91 9788033166

Abstract— This paper presents a glitch free NAND based digitally controlled delay lines (DCDL) by analyzing the glitching problem of existing NAND based DCDL. The proposed glitch free NAND based 32 and 64 bit DCDL overcome this limitation by opening their use in many applications. This NAND based 32 and 64 bit DCDL also maintains the same resolution and minimum delay of previously proposed NAND based DCDL. In this paper the proposed 32 and 64 bit DCDL is used to realize an All-digital spread- spectrum clock generator (SSCG). The use of proposed DCDL in this circuit allows reducing the peak- to –peak absolute output jitter of more than 40% with respect to SSCG using three state inverter based DCDLS. From a more practical point of view, nowadays, DCDLS are a key block in a number of applications, like all-digital PLL (ADPLL), all-digital DLL (ADDLL), all-digital spread-spectrum clock generators (SSCGs) and ultra-wide band (UWB) receivers.

Keywords— All-DIGITAL DELAY-LOCKED LOOP (ADDLL), ALL-DIGITAL PHASE-LOCKED LOOP (ADPLL), DELAY-LINES, DIGITALLY CONTROLLED OSCILLATOR (DCO), FLIP-FLOPS, SENSE AMPLIFIER, SPREAD-SPECTRUM CLOCK GENERATOR (SSCG).

INTRODUCTION

The Digitally Controlled Delay Line (DCDL) is a digital circuit whose delay is controlled by a digital control word. The Digitally Controlled Delay Line is designed previously using two methods. They are

- TINV based DCDL
- MUX based DCDL

A Multiplexer is a device that selects one of several analog or digital input signals and forwards the selected input into a single line. In the TINV based DCDLs the tristate inverters are used to create delay which is controlled by an input of tristate inverter. The tristate inverter will only allow the inverter to drive the bus if EN is high. In these MUX-based DCDLs, the MUX delay increases with the increase of the number of cells. This results in a tradeoff between the delay range and minimum delay t_{min} of the DCDL. The large t_{min} of MUX-based DCDLS can be reduced by using a tree-based multiplexer topology. This however results in an irregular structure which complicates layout design and consequently, also increases the nonlinearity of the DCDL. The DCDL uses again a structure of cascaded delay elements. Differently each element is constructed by using three state inverters (TINV), obtaining a resolution $t_r = 2t_{INV}$. Since the pull-up network of a TINV requires two series devices whereas a NAND gate uses a single device in the pull-up network. In next case each delay element is constructed by using an inverter and an inverting multiplexer, this topology creates two drawbacks first is due to the different delays of the inverter and the multiplexer which results in a mismatch between odd and even control-codes. Second drawback is due to the large multiplexer delay, which provides a resolution of both NAND based DCDLs and TINV based DCDLs.

The proposed system of NAND based DCDL design has certain considerations. Glitching is a common design problem in systems employing DCDLS. In the most common applications, DCDLs are employed to process clock signals; therefore a glitch free

operation is required. A necessary condition to avoid glitching is designing a DCDL which have no glitch in presence of a delay control-code switching. This is an issue at the DCDL design level.

METHODOLOGY

Analysis of NAND based DCDL and Glitching

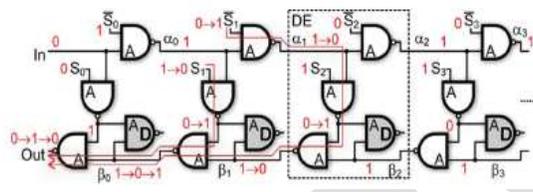


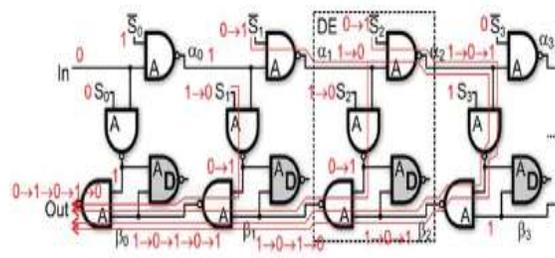
Fig2.1 Glitching when the delay control code increases by one.

The circuit is composed by a series of equal delay- elements (DE), each composed by four NAND gates. In the figure2.1 “A” denotes the fast input of each NAND gate. Gates marked with “D” are dummy cells added for load balancing. The delay of the circuit is controlled through control-bits S_i , which encode the delay control-code with a thermometric code: $S_i = 0$ for $i < c$ and $S_i = 1$ for $i \geq c$. By using this encoding, each DE in figure2.1 can be either in pass- state or in turn-state. In figure2.1 all NAND gates present the same load (two NAND gates) and, therefore in a first order approximation, present the same delay. This consideration allows writing the delay \hat{d} , from *In* to *out*, as follows:

$$\hat{d} = 2t_{\text{NAND}} + 2t_{\text{NAND}} \cdot C$$

It is interesting to observe that it holds both for low-to-high and high-to-low out commutations. In DCDL applications, to avoid DCDL output glitching, the switching of delay control-bits is synchronized with the switching of *in* input signal. Glitching is avoided if the control-bits arrival time is lower than the arrival time of the input signal of the first DE which switches from pass-state or to the turn-state. Unfortunately in the DCDL of figure2.1 this condition is not sufficient to avoid glitching .In this circuit, it is possible to have output glitches also considering only the control-bits switching, with a stable input signal. Some examples of glitching problems of this DCDL are highlighting in figure2.1.

Let us name the vector of the control-bits of the DCDL. In figure2.1 it is assumed that and that the control-code of the DCDL is switched from 1 to 2. It can be easily verified that the same glitching behavior exists when input *In* is 1, and the delay control-code is increased by 1 starting from an even value and the delay control-code is increased by



1.

Fig2.2 Glitching when the delay control code increases by two.

Figure 2.2 shows that the structure exhibits a more severe glitching problem when the delay control-code is increased by more than 1. In particular, the figure 2.2 considers the case in which control-code of the DCDL is switched from 1 to 3. The analysis of the figure 2.2, in this case, reveals that, in the worst case, four paths propagate within the DCDL structure and may create a multiple-glitch at the delay-line output.

More in general the glitching problem of NAND-based DCDL grows up because, for a control-code equal to c , all α_i and β_i signals in figure 2.2, which are stuck-at 1, while for, the logic state of signals depends on the input signals In . When the control code is increased, the logic state of the output becomes dependant on a portion of the DCDL for which and switch from 1 to a logic state dependant on In .

This switching may determine output glitches. This consideration also demonstrates that no glitching can occur when the control-code is decreased. When the control-code is increased by one, the glitching problem could be avoided by delaying S_i signals with respect to $S_i \text{ bar}$ signals. This solution, however, does not solve the glitching problem when the control-code is increased by more than one.

EXAMPLE FOR GLITCHING PROBLEM

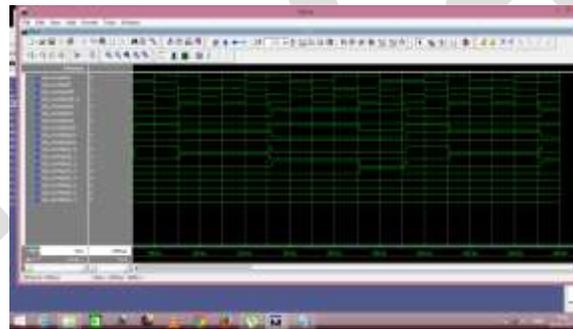


Fig 2.3 Simulation Result-Glitch present in ripple counter

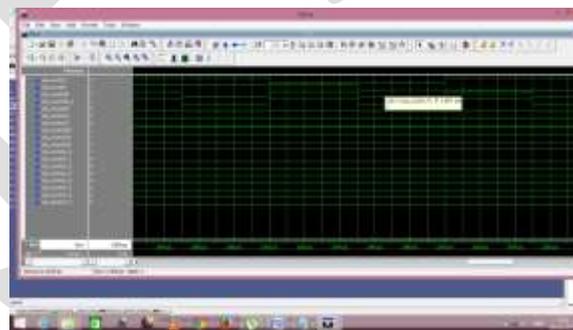


Fig 2.4 Simulation Result-Glitch free in ripple counter

PROPOSED SCHEME

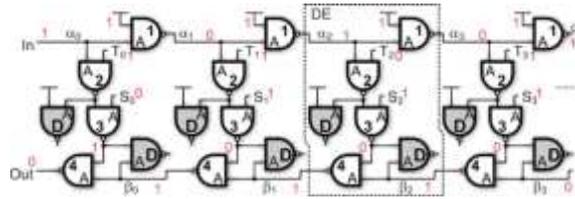


Fig3 Glitch free NAND based DCDL

The structure of proposed DCDL is shown in fig 3. In this figure3 “A” denotes the fast input of each NAND gate. Gates marked with “D” represents dummy cells added for load balancing. Two sets of control-bits, s_i and T_i , control the DCDL. The s_i bits encode the control code c by using a thermometric code: $s_i = 0$ for $i < c$ and $s_i = 1$ for $i \geq c$. The bits T_i encode again c by using a one control code: $T_{c+1}=0, T_i=1$, for $i \neq C+1$. The fig 3 shows the state of all signals in the case $In = 1, c = 1$. According to the chosen control-bits encoding, each delay element (DE) can be in one of three possible states.

The Des with $i < c$ are in pass state ($s_i = 0, T_i=1$). In this state the NAND “3” output is equal to 1 and the NAND “4” allows the signal propagation in the lower NAND gates chain. The DE with $i = c$ is in turn-state ($s_i = T_i = 1$). In this state the upper input of the DE is passed to the output of NAND “3”. The next DE ($i = c+1$) is in post turn state ($s_i = 1, T_i = 0$). In this DE the output of the NAND “4” is stuck- at 1, by allowing the propagation, in the previous DE (which is in turn state), of the output of NAND “3” through NAND “4”. All remaining DEs (for $i > c+1$) are again in turn-state ($s_i = T_i =1$). The three possible DE states of proposed DCDL and the corresponding values are summarized in Table I.

Si	Ti	DE State
0	1	Pass
1	1	Turn
1	0	Post-Turn

TABLE I LOGIC-STATES OF EACH DE IN PROPOSED DCDLS

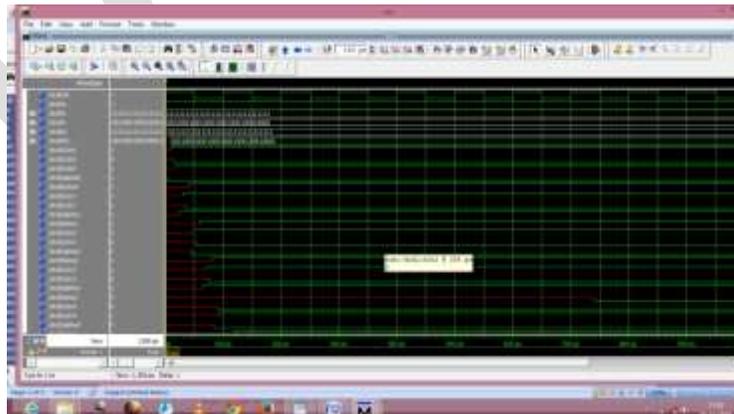


Fig3.1 Simulation Result-32 bit DCDL

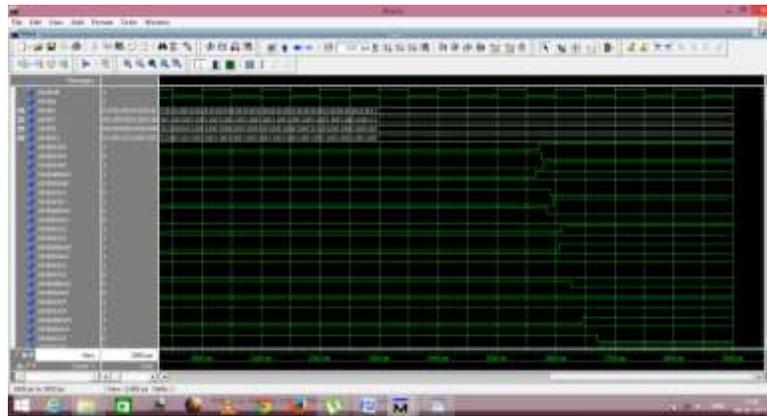


Fig3.2 Simulation Result-64 bit DCDL

SSCG APPLICATION

The SSCG proposed in fig is basically composed of a digital processor and a delay line block, including two digitally controlled delay lines (DCDLs).

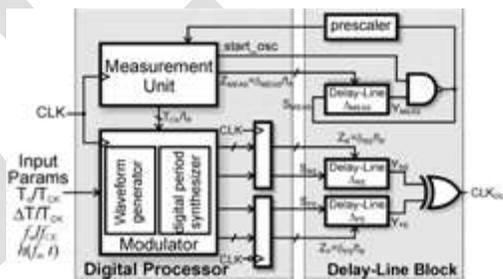


Fig4.1 Architecture of spread spectrum clock generator

A. MODULATOR

1. WAVEFORM GENERATOR

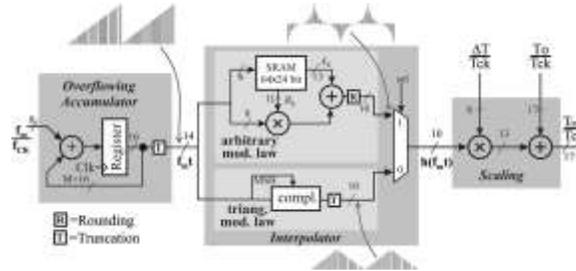


Fig4.2 Architecture of waveform generator

Waveform generator is used to compute the desired instantaneous period of the output waveform, normalized to the clock period: T_{OUT}/T_{CK} . An M-bit overflowing accumulator is used to generate a saw tooth waveform with a frequency f_m .

The modulation frequency is set with a precision of $f_{CK}/2M$ by using the control word f_m/f_{CK} . In this design $M=16$. The output of the overflowing accumulator corresponds to the argument f_{mt} of the function h , and is truncated to 14 bits to simplify the Interpolator implementation. From a practical point of view, there is no use to have a modulation Frequency much larger than the maximum Resolution Bandwidth (RBW-1 MHz) considered in EMI standards. So the number of input bits used for f_m/f_{CK} is limited to 8.

The interpolator is able to generate an arbitrary waveform $h(f_{mt})$. It is to be noted that interpolator can be largely simplified if only triangular modulation profile is required. In this case, in fact, the SRAM, the multiplier and the adder can be eliminated from the circuit and replaced by a 1's complementary.

2. DIGITAL PERIOD SYNTHESIZER:

The digital period synthesizer generates the input signals for the two delay lines ΔRE and ΔFE . It is obtained with the help of a finite state machine (FSM). The outputs of the FSM (W_F and W_R) drive the two delay lines ΔRE and ΔFE through a scaling block.

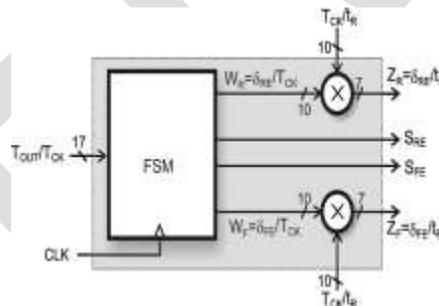


Fig4.3 Architecture of Digital Period Synthesizer



Fig 4.3 Simulation result-SSCG using DCDL

CONCLUSION

A glitch free NAND based 32 and 64 bit DCDL which avoids the glitching problem of previous circuit has been presented. The developed model also provides the timing constraints that need to be imposed on the DCDL control bits, in order to guarantee a glitch free operation. The proposed DCDL is used to realize SSCG. The use of proposed DCDL allowed to reduce the peak-to-peak absolute output jitter of more than 40% with respect to an SSCG using other DCDLS.

REFERENCE:

- [1] R. B. Staszewski and P. T. Balsara, All Digital Frequency Synthesizer in Deep Submicron CMOS. New York: Wiley, 2006.
- [2] C. C. Chung and C. Y. Lee, "An all-digital phase-locked loop for high speed clock generation," IEEE J. Solid-State Circuits, vol. 38, no. 2, pp. 347–351, Feb. 2003.
- [3] P. L. Chen, C. C. Chung, and C.Y. Lee, "A portable digitally controlled oscillator using novel varactors," IEEE Trans. Circuits Syst. II, Exp. Briefs, vol. 52, no. 5, pp. 233–237, May 2005.
- [4] P. L. Chen, C. C. Chung, J. N. Yang, and C. Y. Lee, "A clock generator with cascaded dynamic frequency counting loops for wide multiplication range applications," IEEE J. Solid-State Circuits, vol. 41, no. 6, pp. 1275–1285, Jun. 2006.

Website Reference

- 1) en.wikipedia.org
- 2) www.Mathworks.Com

Design and Analysis of Wideband Low Noise Amplifier for Multiple Wireless Applications

¹Ankita A. Pawade, ²Bhushan R. Vidhale, ³Dr. M.M. Khanapurkar

¹Research Scholar, Department of Electronics & Telecommunication Engineering,

²Research Scholar, Department of Electronics & Telecommunication Engineering,

³Professor and Head, Department of Electronics & Telecommunication Engineering,

G. H. Raisoni College of Engineering, Nagpur, Maharashtra – 440016 India.

E-mail- pawadeankita3@gmail.com

Contact No- +91-9096362065

Abstract— Effective communication requires an ideal lossless transmitter–receiver. Low Noise Amplifier being the front end of any receiver requires to be highly efficient. With the development in technology the need of multiband receiver capable of supporting multiple standard applications has emerged. This requires integrating of various band of frequency for a single device. Therefore researchers are working over developing wideband receiver with wideband Low Noise Amplifier (LNA). LNA being the chief component of radio receiver has to have highest gain with low noise figure so that the signal retrieved at later stages are lossless. LNA design is a crucial task as it requires proper management of trade-off between all it's parameters including gain, noise figure, stability, and power consumption. The CMOS LNA is designed and simulated using Advanced Design System (ADS).

Keywords— Matching, Stability, Noise figure, Gain, Trade-off, Radio receiver, Reflection Coefficient

INTRODUCTION

With the advancements in the world, technology is advancing simultaneously. Along with technology communication and especially wireless communication has observed tremendous positive changes. Over past decade wireless communication has evidenced introduction of various communication standards. But each communication standard and its respective applications and advantages is limited to the frequency band it operates at. To overcome this limitation there is a need of analog circuits which would convert radio signals to required lower frequencies, appropriate for digital processing. It's the radio receiver's front end that performs this chief function. Each communication standard has it's limitation in terms of it's band of frequency and thereby it's respective applications. But with fastly advancing technology, demand for compact devices that would support multiple applications has also been observed. For fulfilling this demand, requires multiple transceiver but this would increase the cost and complexity of device and would also require large chip size. Therefore the researchers has now targeting to develop a mobile terminal that individually support multiple communication standards and it's applications.

Low noise amplifier (LNA) that is basically the first section of any radio receiver, determines the overall efficiency of receiver. The LNA determines the performance of device in terms of it's linearity, sensitivity and power consumption. LNA practically is a electronic amplifier that amplifies the weak signals and reduce noise and other distortions present in the signal it process. The main requirement of LNA is high gain and low noise figure. The LNA design requires consideration of it's prime parameters that include; gain, power consumption, noise figure, stability and linearity. But Low noise amplifier (LNA) designing includes managing proper trade-off between it's mentioned parameters as further the noise figure of LNA solely determines the overall noise figure of the system.

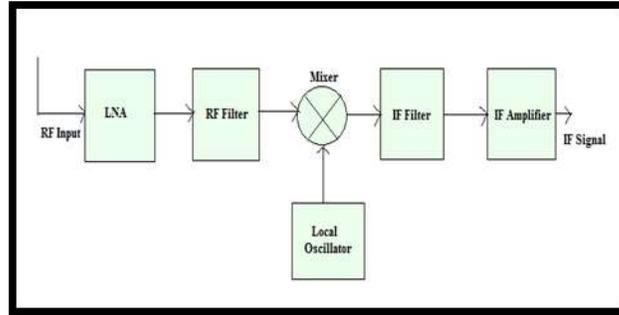


Fig 1. RF Receiver with Low Noise Amplifier

WIDEBAND CONCEPT

Low noise amplifier (LNA) is the prime component of radio receiver circuit as it plays a vital role in defining the efficiency of receiver. Wideband Low noise amplifier (LNA) is basically the one with closed-to or exactly same operating characteristics over wide passband. Wideband LNA with highest possible gain and minimum noise figure, increases the efficiency of radio receiver and reduces the noise figure of subsequent receiver stages over a complete wide range of frequency. Therefore while designing LNA for wide range of frequency it is necessary to boost the gain thereby keeping the noise effect as low as possible so that the signal can be retrieved effectively at the later stages.

LNA DESIGN PROCEDURE

LNA design being a crucial process requires a proper flow of process to be followed. Once the design technology is decided, the next part is to select a proper transistor. As transistor forms the core of LNA circuit, it is therefore necessary to select appropriate transistor with ideal characteristics. DC bias then is the 1st stage of LNA design. The DC bias should be selected such that it gives stable thermal performance, as the device should be unconditionally stable for complete range of frequency. The next step is input return loss and noise matching. Where Input return loss determines the measures of how well the system is matched well to 50Ω impedance. Last step in LNA design is output matching of the transistor. For matching and current stabilization an additional resistor is connected in either parallel or series. In the entire design process, matching plays an important role to maximize gain of the device. Even though Noise Figure, Gain, Stability, input and output match and Linearity are all important, but all these parameters are interdependent due to which it does not always work in favour of each other. This requires carefully managing trade-off between all these equally important parameters.

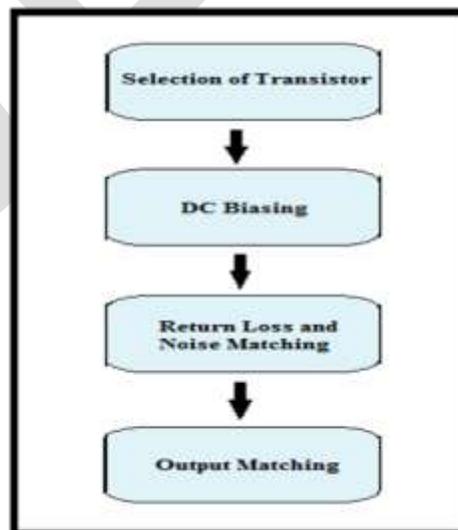


Fig 2. Design Procedure of LNA

LOW NOISE AMPLIFIER CIRCUIT

Low Noise Amplifier (LNA) is a prime component of every radio receiver circuitry. As the received signal is 1st processed through the low noise amplifier and then fed to the further stages. The performance efficiency of LNA has a huge part in defining the overall efficiency of system receiver. The LNA therefore is expected to process the signal with high gain while keeping the effect of noise and other distortions as least as possible. The design of LNA is a crucial task as it requires managing trade-off between its parameters like gain, stability, noise figure, power consumption, while all these parameters are interdependent over each other. With the voltage supply of 1.3V, the low noise amplifier schematic below is simulated over TSMC RF CMOS 0.13 μ m technology.

The Low Noise Amplifier is designed over 0.13 μ m CMOS (Complementary Metal-oxide Semiconductor) technology. The schematic shown uses lumped dc components (R, L, C) with different value at both the input and output. The signal from RF source mostly an antenna is input to the resistive feedback network. Further the active bias provides a constant bias voltage to the transistor in cascode stage for its proper continuous operation. The circuit uses common source topology as it requires lower bandwidth of operation. The cascode stage following the resistive feedback has many advantages as compared to other topologies. The Low Noise Amplifier is designed and simulated in Agilent's Advanced Design System software as it provides an easy to use integrated environment for circuit design at RF frequency.

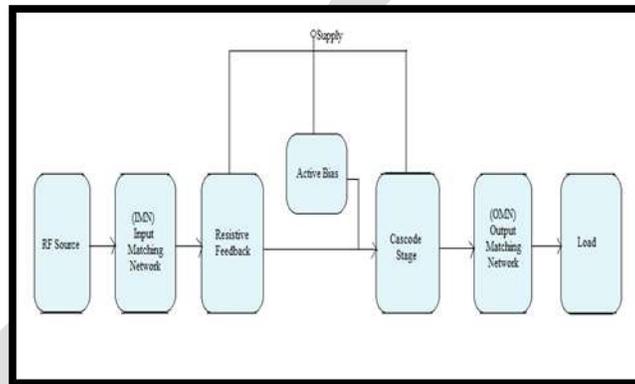


Fig 3. LNA Circuit

A. Resistive Feedback

The resistive feedback amplifier topology gives the advantage of design simplicity. Also it requires small die area and helps achieving low noise figure compared to the other amplifier topologies. Current reuse is implemented along with resistive feedback. This reduces the requirement of current and thereby helps reduce power consumption of the circuit.

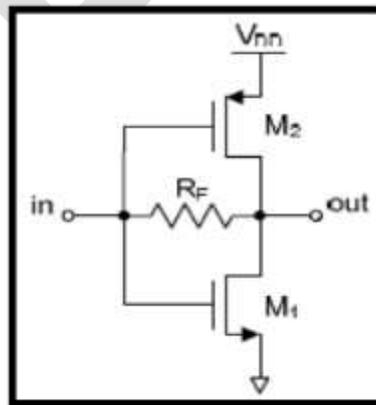


Fig 4. Resistive Feedback Stage

B. Active Bias

The Active Bias network is designed to provide a constant bias voltage to the transistor in cascode stage. The Active bias has beneficial advantage over a dc bias. Unlike dc bias active bias is least affected by environmental and processing changes therefore assures and provides a constant bias voltage to transistor despite of the change is environment it is being operated at.

C. Cascode Stage

Cascode amplifier stage is formed by the combination two vertically stacked transistor pair. The transistors may use any of the common-source or common-gate topology. Cascode stage provides high gain and also helps achieving better stability. It also has an advantage of good input-output isolation that helps reducing losses.

D. Matching Network

Matching (Impedance matching) is essential part of any RF circuit design. Matching is required to transfer maximum power from source to load without any loss in power. For maximum power transfer each device in system should be well matched to it's load. A simple matching network can also be implemented using two element LC network. But depending on the type of application there are various ways of implementing matching network.

SIMULATION RESULT

The circuit is simulated in Advanced Design System(ADS). For microwave, RF, and high-speed digital applications, Advanced Design System is a popular electronic design automation software with a powerful and easy to use interface. With 1.3V of voltage supply, S-Parameters (Scattering parameter), noise figure, harmonics and stability of the circuit for frequency range of 0.5GHz to 6GHz have been simulated.

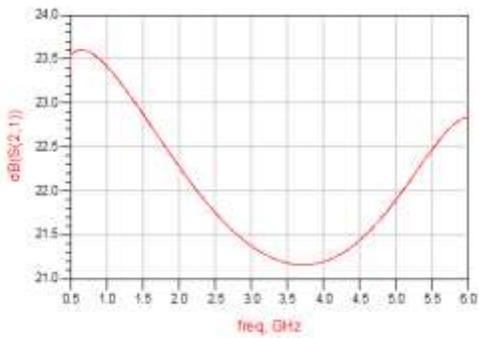


Figure 5: Gain (S_{21})

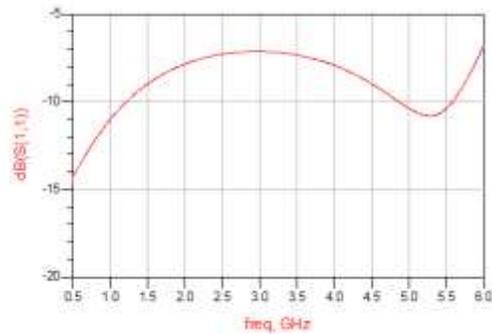


Figure 6: Input reflection coefficient (S_{11})

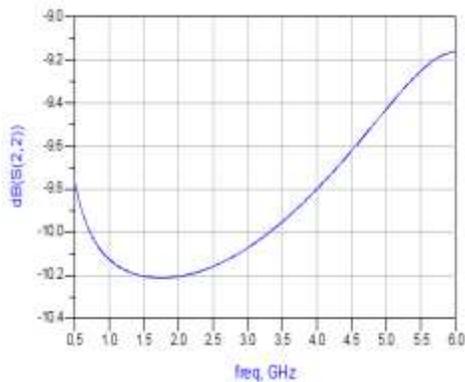


Figure 7: Output reflection coefficients (S_{22})

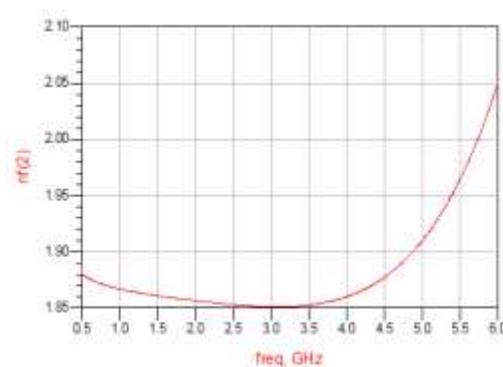


Figure 8: Noise Figure of LNA

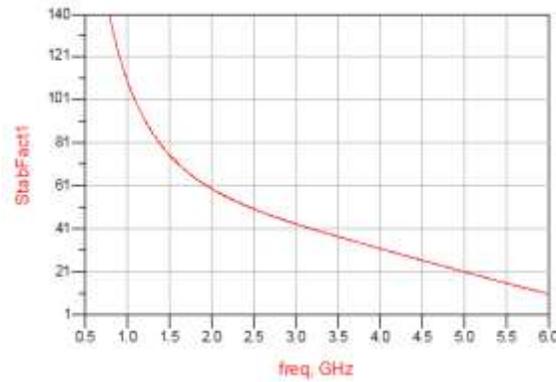


Figure 9: Stability

The circuit is stable over the complete range of frequency. S21 (forward gain) is in the range of 23.6-22.8 db over the frequency range of 0.5-6 GHz. S11(input reflection coefficient) is in the range of -14.6 - -6.8 db, S22 (output reflection coefficient) is in the range of -9.8 - -9.2 and the noise figure is in the range of 1.89 - 2.05 db over the same frequency range of 0.5-6 GHz.

TABLE 1
 COMPARISON OF SIMULATION RESULTS

Paper	Frequency (GHz)	Gain (dB)	Noise Figure (dB)	S11 (dB)	S22 (dB)
Ref 10	3.1-10.6	12.25	<3.8	<-10	<-8.2
Ref 11	0.8-2.5	15.1	1.63	<-10	<-5.0
Ref 12	1	19.5	3.81	<-5.0	NA
This Work	0.5-6	23.6-22.8	1.89 - 2.05	-14.6 - -6.8	-9.8 - 9.2

CONCLUSION

The paper presents detail procedure and design of a wideband Low Noise Amplifier (LNA). The Low Noise Amplifier Circuit is designed in 0.13 μ m CMOS Technology. The designed circuit is simulated in Agilent ADS software. The simulation results of the circuit has low noise figure with considerably high gain over the entire wideband of frequency. Also designed wideband LNA is stable for entire range. The designed Low Noise Amplifier is suitable for a wideband radio receiver circuit.

REFERENCES:

- [1] Pooyan Sakian, Erwin Janssen, Arthur H. M. van Roermund, and Reza Mahmoud, "Analysis and Design of a 60 GHz Wideband Voltage-Voltage Transformer Feedback LNA," IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, VOL.60, NO.3, MARCH 2012
- [2] Kuan-Hsiu Chien, and Hwann-Kaeo Chiou, "A 0.6-6.2 GHz Wideband LNA Using Resistive Feedback and Gate Inductive Peaking Techniques for Multiple Standards Application," Asia-Pacific Microwave Conference Proceedings , pp. 688-690, 2013
- [3] Hira Shumail, Maliha Nisar, Tooba Muzaffar, Sana Arshad and Qamar-ul-Wahab, "Fully Integrated, Highly Linear, Wideband LNA in 0.13 μ m CMOS Technology," IEEE Symposium on Wireless Technology and Applications, September 2013
- [4] Chang-Tsung F, Chien-Nan Kuo, Stewart S. Taylor, "Low-Noise Amplifier Design With Dual Reactive Feedback for Broadband Simultaneous Noise and Impedance Matching," IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, VOL.58, NO.4, APRIL 2010
- [5] Gao Zhiqiang, Liu Dawei, He Shiqing, Han Haisheng, "The Design of Dual-band CMOS Low Noise Amplifier For Wireless Applications," IEEE Cross Strait Quad Regional Radio Science and Wireless Technology Conference, pp. 675-678, July 2011
- [6] Pieńkowski D., "CMOS Low-Noise Amplifier Design for Reconfigurable Mobile Terminals", Ph.D. dissertation, Von der Fakultät IV Elektrotechnik und Informatik der Technischen Universität, Berlin, 2004
- [7] Dao V.K., Bui Q.D., and Park C.S, "A Multi-band 900MHz/1.8GHz/5.2GHz LNA for Reconfigurable Radio," IEEE Radio Frequency Integrated Circuits (RFIC) Symposium, Honolulu, June 2007
- [8] Jigisha Sureja, Shruti Oza, Jitendra Thathagar, "A 0.1-3 GHz Low Power Cascode CS LNA using 0.18 μ m CMOS Technology", 2012 1st International Conference on Emerging Technology Trends in Electronics, Communication and Networking
- [9] Vu Kien Dao, Byoung Gun Choi, Chul Soon Park, "Dual-band LNA for 2.4/5.2GHz applications," Asia-Pacific Microwave Conference (APMC), pp. 413-416, 12-15 Dec. 2006
- [10] K. Yousef , H. Jia, R. Pokharel, A. Allam, M. Ragab and H. Kanaya, "A 0.18 μ m CMOS Current Reuse Ultra-Wideband Low Noise Amplifier (UWB-LNA) with Minimized Group Delay Variations," Proceedings of the 9th European Microwave Integrated Circuits Conference 2014
- [11] Mayank B. Thacker, Manoj Awakhare, Rajesh H. Khobragade, Pravin A. Dwaramwar, "Multi-Standard Highly Linear CMOS LNA," 2014 International Conference on Electronic Systems, Signal Processing and Computing Technologies
- [12] Arunkumar Salimath, Pradeep Karamcheti, Achintya Halder, "A 1 V, sub-mW CMOS LNA for Low-power 1 GHz Wideband Wireless Applications," 2014 27th International Conference on VLSI Design and 2014 13th International Conference on Embedded Systems
- [13] Lei Liao, Stefan Kaehlert, Yifan Wang, Aytac Atac, Ye Zhang, Martin Schleyer, Ralf Wunderlich, and Stefan Heinen, "A Low Power LNA for Bluetooth Low Energy Application with Consideration of Process and Mismatch," Proceedings of APMC 2012, Kaohsiung, Taiwan, Dec. 4-7, 2012
- [14] Abdelkader Taïbi, Abdelhalim Slimane, Sid Ahmed Tedjini, Mohand Tahar Belaroussi, Djabar Maafrî, "A 0.9 V Low Power Reconfigurable CMOS Folded Cascode LNA For Multi-Standard Wireless Applications," 9th International Design and Test Symposium 2014
- [15] Aaron V. Do, Chirn Chye Boon, Manh Anh Do, Kiat Seng Yeo, Alper Cabuk, "A Subthreshold Low-Noise Amplifier Optimized for Ultra-Low-Power Applications in the ISM Band," IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, VOL.56, NO.2, FEBRUARY 2008

Optimization of Different Process Parameters of Aluminium Alloy 6351 in CNC Milling Using Taguchi Method

A.Venkata Vishnu¹, K. B. G. Tilak¹, G.Guruvaiah Naidu¹, Dr.G.Janardhana Raju²

¹Asst.Professor, Department of Mechanical Engineering, NNRESGI, Hyderabad, Telangana, India.

² Professor, Department of Mechanical Engineering, NNRESGI, Hyderabad, Telangana, India

Email:venkat666vishnu@gmail.com,+91-9985652237

ABSTRACT— The present paper outlines an experimental study to optimize the effects of cutting parameters on Surface Roughness of Aluminium Alloy 6351 by employing Taguchi techniques. This paper deals with optimization of the selected milling parameters, i.e. Cutting Speed, Feed rate, Depth of cut and Coolant flow. Taguchi orthogonal array is designed with three levels of milling parameters and different experiments are done using L_9 (3^4) orthogonal array, containing four columns which represents four factors, and nine rows which represents nine experiments to be conducted and value of each parameter was obtained. The nine experiments are performed and surface roughness is calculated. The Signal to Noise Ratio (S/N) ratio of predicted value and verification test values are valid when compared with the optimum values. It is found that S/N ratio value of verification test is within the limits of the predicted value and the objective of the work is full filled.

Keywords— Taguchi Techniques, Milling Process, Surface Roughness, Cutting Speed, Feed rate, Depth of cut, Coolant Flow, Signal to Noise Ratio (S/N), Aluminium Alloy 6351.

1. INTRODUCTION

Milling is the process of removing extra material from the work piece with a rotating multi-point cutting tool, called milling cutter. The machine tool employed for milling is called milling machine. Milling machines are basically classified as vertical or horizontal. These machines are also classified as knee-type, ram-type, manufacturing or bed type, and planer-type. Most milling machines have self-contained electric drive motors, coolant systems, variable spindle speeds, and power-operated and table feeds. The three primary factors in any basic milling operation are speed, feed and depth of cut. Other factors such as kind of material and type of tool materials have a large influence, of course, but these three are the ones the operator can change by adjusting the controls, right at the machine.

CNC (Computer Numerical Control) is the general term used for a system which controls the functions of a machine tool using coded instructions processed by a computer. The application of CNC to a manual machine allows its operation to become fully automated. Combining this with the use of a part program enhances the ability of the machine to perform repeat tasks with high degrees of accuracy. Preparatory functions, called G codes, are used to determine the geometry of tool movements and operating state of the machine controller; functions such as linear cutting movements, drilling operations and specifying the units of measurement. They are normally programmed at the start of a block. Miscellaneous functions, called M codes, are used by the CNC to command on/off signals to the machine functions. The functions allocated to lower M code numbers are constant in most CNC controls, although the higher M code number functions can vary from one make of controller to the next.

Surface roughness is an important measure of product quality since it greatly influences the performance of mechanical parts as well as production cost. Surface roughness has received serious attention for many years and it is a key process to assess the quality of a particular product. Surface roughness has an impact on the mechanical properties like fatigue behavior, corrosion resistance, creep life, etc. It also affects other functional attributes of parts like friction, wear, light reflection, heat transmission, lubrication, electrical conductivity, etc.

The objective of the present work is to find out the set of optimum conditions for the selected control factors in order to reduce surface roughness using Taguchi's Robust Design Methodology in Milling of 6351 Aluminium Alloy. The experiments are conducted using L_9 (3^4) orthogonal array.

2. LITERATURE SURVEY

Literature review bridges the gap between two stages of a project execution i.e. problem definition and evolution of design configuration (Solution). Extensive literature review is carried out to explore the elements of the present project requirement [1-11]. A thorough study of literature [1-3] suggests that the machining of Aluminium Alloy 6351 is very difficult compared to other Al alloy materials. Aluminium Alloy 6351 plates have been used as a work piece material for the present experiments because Aluminium Alloy 6351 is a high quality alloy commonly found to be used in Aero Space Industry, Automobile industry etc. Very few works have

been carried out in the optimization of process parameters in milling process of Aluminium 6351 Alloy with different controlled parameters such as cutting speed, feed rate and depth of cut etc.

3. EXPERIMENTAL SETUP AND DESIGN

The detailed experimental setup is being discussed below, the experimental setup and the parameters are maintained under such conditions so that the machining undergoes smoothly. The work material selected is 6351 Aluminium Alloy.

3.1 Specification of Vertical CNC Milling Machine

The milling operations are carried out on a CNC milling machine make MTAB is shown in Figure No.1. The machining tests are conducted under the different conditions of Cutting speed, Feed rate, Depth of cut and coolant flow. The experiments are conducted at Nalla Narasimha Reddy Educational Society's Group of Institutions, Narapally, Ghatkesar and the machine tool used is MTAB make CNC vertical milling machine. The specifications of CNC machine are shown in Table No. 1.

Table No.1: Specification of MTAB Make CNC Machine

Clamping surface	420X180mm
Repeatability	+0.005mm
Positional accuracy	0.010mm
Coolant tank capacity	40 liters
Power rating	415v
Spindle motor speed	4000rpm
X,Y and Z axis drive	6000rpm
Electrical motor	14p 3phase
Pump	4lpm
Pressure	70 bar
Drawing no	Mech.MFB-1024



Figure No.1: CNC Milling Machine

3.2 Workpiece Material



The workpiece material used is Aluminium Alloy belongs to wrought Aluminium of 90mmX90mmX12mm in the form of plates. The Aluminium association (Aluminium Alloy) defined a number of Aluminium Alloy standards with a numbering scheme for easy reference and are mentioned them in the form of grades. In the present experiment the material used is Aluminium Alloy-6351-T6, which is an Aluminium alloy of wrought Aluminium. The machined work pieces are shown in Figure No. 2.

Aluminium alloy-6351- is an Alloy consisting of 97.8% aluminium (Al), 1.0% silicon (Si), 0.6% manganese (Mn) & 0.6% magnesium (Mg). Aluminium Alloy-6351 is commonly found to be used in aero space industry, automobile industry etc. Figure No.2: Aluminium alloy-6351 work pieces used for machining

3.3 Cutting Tool

The cutting tool used is uncoated carbide inserts with a tool diameter of 16mm and four teeth shown in Figure No. 3. It consists of very high hardness and good toughness and it is principally intended for roughing of super alloys and Aluminium Alloys. The specification of tool holder used for machining is BT30-ER16, side lock adapter system.



Figure No. 3: Uncoated Carbide Insert

3.4 Surface Roughness Tester

Surface roughness measurement is measured using a portable stylus type Profilometer. The profilometer is portable self controlled instrument for the measurement of surface texture (R_a). The parameter evaluations are microprocessor based. The measurement results are displayed on an LCD screen and can be output to an optional printer or another computer for further evaluation. The instrument is powered by non-rechargeable alkaline battery (9V). It is equipped with a diamond stylus having a tip radius five micro meters.

For measurement of surface roughness, a stylus type surface roughness profilometer has been used during the experiment. The profilometer has been set to a cut off length of 0.8mm, filter 2CR, traverse speed 1mm/sec and 4mm traverse length. Roughness measurements, in the traverse direction, on the work pieces have been repeated 4times and average of 4 measurements of surface roughness parameter values has been recorded. The measured profile has been digitized. Surface roughness measurement with the help of stylus is shown in the Figure No. 4.



Figure No. 4: Profilometer Measuring Surface Roughness

3.5 Design of Experiments

In this work, Taguchi robust design methodology is used to obtain the optimum conditions for surface roughness in milling of Aluminium alloy-6351. The experiments are conducted using $L_9 (3^4)$ orthogonal array.

3.6.1 Selection of control factors and levels

A total of four process parameters with three levels are chosen as the control factors such that the levels are sufficiently far apart so that they cover wide range. The process parameter and their ranges are finalized using literature, books and machine operator's experience. The four control factors selected are spindle speed (A), feed rate (B), depth of cut(C) and coolant flow (D). Aluminium alloy-6351 workpieces are used in experimentation. The machining is performed individually depending upon the lubricant conditions. The control levels and their alternative levels are listed in Table No. 2.

Table No. 2: Control Factors and Levels

Factors /Levels	Speed (A) (rpm)	Feed (B) (mm/min)	Depth Of Cut (C) (mm)	Coolant Flow (D) (lt/min)
1	1194	600	0.5	0
2	2487	1100	1.0	2.5
3	3084	1540	1.5	4.8

3.6.2 Selection of orthogonal array

Selection of particular orthogonal array from the standard O.A depends on the number of factors, levels of each factor and the total degrees of freedom.

- i) Number of control factors = 4
- ii) Number of levels for each control factors = 3
- iii) Total degrees of freedom of factors = $4 \times (3-1) = 8$
- iv) Number of experiments to be conducted = 9

Based on these values and the required minimum number of experiments to be conducted 9, the nearest Orthogonal Array fulfilling this condition is $L_9 (3^4)$. The standard $L_9 (3^4)$ Orthogonal Array is shown in Table No. 3. The Factor assignment for $L_9 (3^4)$ has been done which is tabulated in Table No.4.

Table No. 3: Standard $L_9 (3^4)$ O.A.

Experiment Number	Column			
	1	2	3	4
1	1	1	1	1
2	1	2	2	2
3	1	3	3	3
4	2	1	2	3
5	2	2	3	1
6	2	3	1	2
7	3	1	3	2
8	3	2	1	3
9	3	3	2	1

Table No. 4: Experimental Design

Experiment Number	Column			
	Speed (A) (rpm)	Feed (B) (mm/min)	Depth of Cut (C) (mm)	Coolant Flow (D)
1	1194	600	0.5	0
2	1194	1100	1.0	2.5
3	1194	1540	1.5	4.8
4	2487	600	1.0	4.8
5	2487	1100	1.5	0
6	2487	1540	0.5	2.5
7	3084	600	1.5	2.5
8	3084	1100	0.5	4.8
9	3084	1540	1.0	0

3.6.3. Plan of experiments

The scope and objective of the present work have already been mentioned in the forgoing cases. Accordingly, the present study has been done through the following plan of experiment:

1. Checking and preparing the CNC milling ready for performing the machining operation.
2. Cutting Aluminium Alloy-6351Steel alloy plates by power saw and performing initial end milling operation in CNC milling to get desired dimension of the work pieces.
3. Selection of appropriate tool depending upon the cutting parameters i.e. speed, feed, depth of cut and material.
4. Cutting parameters speed, feed, and depth of cut are selected going through the study of different literature and also in the view of machine standard specifications.
5. Performing face milling operation on Aluminium Alloy specimens in various milling environments involving lubricant conditions and various combinations of process control parameters like: speed, feed, depth of cut. The coolant flow is done depending upon the experiment design
6. Measuring surface roughness and surface profile with the help of a portable stylus-type profilometer for the machined work piece.

4. RESULTS AND DISCUSSION

Aluminium Alloy-6351, alloy pieces of 90mmX90mmX12mm are prepared for conducting the experiment. Using different levels of the process parameters the specimens have been machined accordingly, depending upon Cutting speed, feed rate, depth of cut and coolant flow conditions. Then surface roughness is measured precisely with the help of a portable stylus-type profilometer. The results of the experiments have been shown in Table No. 5.

Table No. 5: Experimental data related to surface roughness (Ra)

Exp No.	Surface Roughness(Ra)			S/N Ratio
	Trail1	Trail2	Mean	
1	5.99	6.23	6.112	-15.7274
2	4.34	4.76	4.5545	-13.1891
3	1.044	0.87	0.957	0.366382
4	3.352	3.385	3.3685	-10.5572
5	4.456	4.474	4.465	-13.0066
6	1.42	1.45	1.435	-3.13846
7	3.567	3.777	3.672	-11.3002
8	2.435	2.449	2.4425	-7.75677
9	3.7	3.9	3.8	-11.5972

The ANOVA calculation is performed for the results obtained i.e. Surface roughness values from Table No.5. The calculations are done manually and compared with the Minitab Statistical Software version 16 and it is verified. The model was checked at 95% confidence level for the adequacy. From the ANOVA it is observed that all the factors selected (Cutting speed, Feed rate, Depth of cut and Coolant flow conditions) are significant shown in Table No.6. Optimization of surface roughness is carried out using Taguchi method (S/N Ratio). Confirmatory tests have also been conducted to validate optimal results.

Table No. 6: Basic Analysis Of Variance

FACTOR	S.S	D.O.F (D _f)	M.S.S (M _{SS})	F-RATIO (DATA)	F-RATIO (TABLE)	RESULT
SPEED	1.96274	2	0.98137	44.74948	4.26	Significant
FEED	17.55753	2	8.778765	400.3028	4.26	Significant
DEPTH OF CUT	2.37412	2	1.18706	54.12874	4.26	Significant
COOLANT FLOW	19.66284	2	9.831421	448.3028	4.26	Significant
ERROR	0.175443	9				
S _t	41.557234					
MEAN	210.802	1				
ST	252.5347	18				

Table No. 7: Analysis Of Variance

FACTOR	S.S	D.O.F (D _f)	M.S.S (M _{SS})	F-RATIO (DATA)	SS ¹	ρ %
SPEED	1.96274	2	0.98137	44.74948	1.91888	4.61%
FEED	17.55753	2	8.778765	400.3028	17.51367	42.14%
DEPTH OF CUT	2.37412	2	1.18706	54.12874	2.33026	5.60%
COOLANT FLOW	19.66284	2	9.831421	448.3028	19.61898	47.20%
ERROR	0.175443	9				0.45%
S _t	41.557234					
MEAN	210.802	1				
ST	252.5347	18				100%

4.1 Effect of Cutting Parameters on Surface Roughness

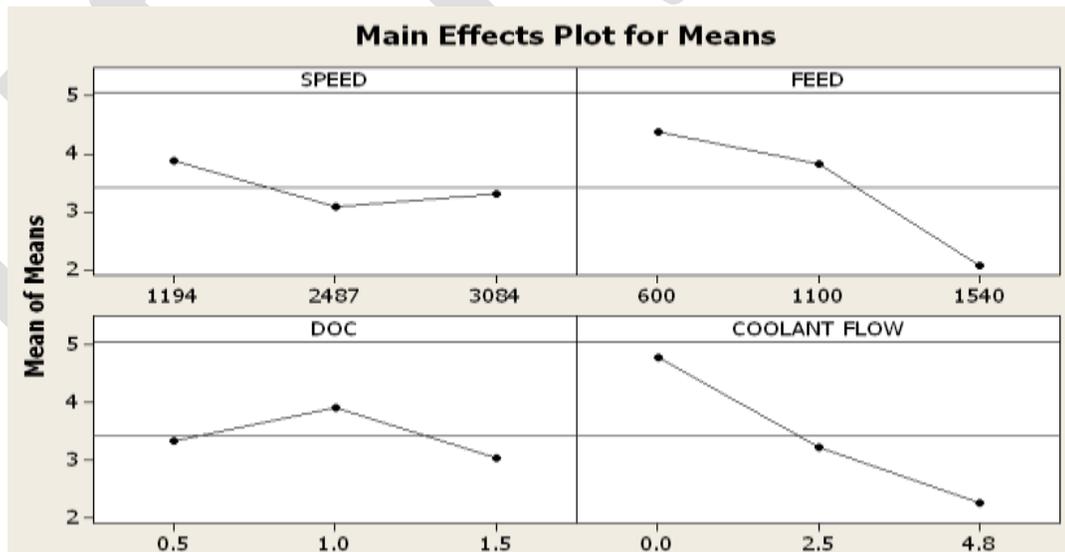


Figure No. 5: Surface roughness v/s All the Process Parameters (Cutting speed, Feed, Depth of cut and Coolant flow)

Figure No. 5 shows the effect of Cutting speed, Feed, Depth of cut and Coolant flow on surface roughness.

It is observed that, the surface roughness is high at low speed and certainly decreasing from low cutting speed to moderate speed conditions, but again from moderate to high cutting speeds, the surface roughness slightly increases. It is observed that, the surface roughness is high at low Feed Rate conditions and decreases from low feeds to moderate Feed rate conditions, and again from moderate to high feed rate, the surface roughness decreases. It is observed that, the surface roughness is low at small depth of cut and

certainly increasing from small depth of cut to moderate depth of cut conditions, but again from moderate to high depth of cut, the surface roughness decreases.

It is observed that, the surface roughness is low at high coolant flow conditions and increases from high coolant flow to moderate coolant flow conditions, and again from moderate to low coolant flow i.e. Dry condition, the surface roughness increases. This can be explained by the reason that, surface roughness increases due to temperature, stress and wear at tool tip increases.

4.2 Optimization of Cutting Parameters

Taguchi's robust design methodology has been successfully implemented to identify the optimum settings for control parameters in order to reduce the surface roughness of the selected work piece material for their improved performance, after analysis of data from the robust design experiments the optimum setting are found and is tabulated in Table No. 6. These optimum settings combination is validated by conducting confirmation test and the conformation test results are shown in Table No. 7. It is concluded that the results shown in Table No. 8 are within the acceptable limits of the predicted value and can be implemented in the real time application.

Table No. 6: Optimum Parameters for Surface Roughness

Factors	Optimum values
Cutting Speed(rpm)	2487
Feed Rate(mm/min)	1540
Depth of Cut(mm)	1.5
Coolant Flow(lt/min)	4.8

Table No. 7: Conformation Test Results

Surface Roughness(Ra) Values			S/N Ratio
1	2	Average	
0.89	0.76	0.825	1.670

Table No. 8: Comparison of S/N Ratios

η predicted	0.9738
η conformation	1.670

5. CONCLUSION

The objective of the present work is to find out the set of optimum values in order to reduce surface roughness, using Taguchi's robust design methodology considering the control factors for the aluminum alloy 6351 work piece material.

Based on the results of the present experimental investigations the following conclusions can be drawn:

- Analysis of Variance suggests that Coolant flow is the most significant factor for the surface roughness followed by Feed rate. Whereas, Depth of Cut and Cutting Speed appears to have very little effect over roughness value. An increment of Feed rate and Coolant Flow will result in better surface quality in terms of roughness.
- In the present experimentation the optimum speed obtained using Taguchi technique is 2487rpm. Similarly the results obtained for feed and depth of cut are 1540mm/min and 1.5mm respectively. Hence it can be concluded that the parameters obtained are valid and within the range of Aluminium Alloy machining standards.
- The corresponding Optimum coolant flow is 4.8 lts/min.
- The S/N ratio of predicted value and verification test values are valid when compared with the optimum values. It is found that S/N ratio value of verification test is within the limits of the predicted value and the objective of the work is full filled.

REFERENCES:

- [1] Abhang L B and Hameedullah M, "Modeling and Analysis for Surface roughness in Machining Aluminium Alloy using Response Surface Methodology", International Journal of Applied Research in Mechanical Engineering (2011), Vol.1, Issue 1, pp.33-38.
- [2] M.V. Niranjan Reddy, M. Nikhil Reddy, K. Vijay Kumar, Parthasarathy Garre, "Experimental Investigation Of Tensile Strength On Al 6351 To The Aerospace Structural Applications" International Journal of Mechanical Engineering and Technology (IJMET), ISSN 0976 – 6340(Print), ISSN 0976 – 6359(Online), Volume 5, Issue 2, February (2014), pp. 110-114.
- [3] G. Gopala Krishna1, P. Ram Reddy, M. Manzoor Hussain, "Hardness And Tensile Behavior Of Friction Stir Welded Aluminum AA6351 Alloy" Journal of Mechanical Engineering, Vol. ME 44, No. 1, June 2014 Transaction of the Mechanical Engineering Division, The Institution of Engineers, Bangladesh.

- [4] Kamal, Anish and M.P.Garg, "Experimental investigation of Material removal rate in CNC milling using Taguchi method" International Journal of Engineering Research and Applications (IJERA) Vol. 2, Issue 2, Mar-Apr 2012, pp.1581-1590.
- [5] Ballal, Inamdar and Patil P.V. "Application Of Taguchi Method For Design Of Experiments In Turning Gray Cast Iron " International Journal of Engineering Research and Applications (IJERA) Vol. 2, Issue 3, May-Jun 2012, pp.1391-1397.
- [6] B. Lee, K.Y., Kang, M.C., Jeong, Y.H., Lee, D.W. and Kim, J.S. "Simulation of surface roughness and profile in high-speed end milling", Journal of Materials Processing Technology (2001), Vol.1 Issue 3, pp.410-415.
- [7] G. Guruvaiah Naidu, A.Venkata Vishnu, G.Janardhana Raju "Optimization of Process Parameters for Surface Roughness in Milling of EN-31 Steel Material Using Taguchi Robust Design Methodology", International Journal of Mechanical And Production Engineering ISSN: 2320-2092 Vol. 2 Issue 9, September-2014, pp.15-21.
- [8] Puneet mangla, Nishant kr. Singh, Yashvir singh, "Study of effect of milling parameters on work piece hardness using Taguchi method". ICAM (2011), pp. 695-700.
- [9] Avinash A Thakre, "Optimization of Milling Parameters for Minimizing Surface Roughness Using Taguchi's Approach", International Journal of Emerging Technology and Advanced Engineering Vol. 3, Issue 6, June 2013, pp.226-230.
- [10] Mahendra Korat, Neeraj Agarwal, "Optimization of Different Machining Parameters of En24 Alloy Steel In CNC Turning by Use of Taguchi Method", International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 5, September- October 2012, pp.160-164.
- [11] K. Adarsh Kumar, Ch.Ratnam, Bsn Murthy, B.Satish Ben, K. Raghu Ram Mohan Reddy, "Optimization Of Surface Roughness In Face Turning Operation In Machining Of En-8" [IJESAT] International Journal Of Engineering Science & Advanced Technology ISSN: 2250-3676, Jul-Aug 2012, Volume-2, Issue-4, pp.807 – 812.
- [12] HMT "Production Technology", Tata McGraw Hill, 2004.
- [13] Phillip j. Ross "Taguchi Techniques for Quality Engineering", Tata McGraw Hill, Second Edition, 2005

The Adoptive Control on Ground Clearance of Vehicle with Variable Speed: A Review

Smayantak Hokale (1), Prof. V. R. Patil (2)

ME (Automotive Engineering) AISSMS COE Pune (1)

Assistant Professor of Mechanical department AISSMS COE Pune (2)

E-mail Id- smayantak@gmail.com contact no. 9503666141

Abstract— The handling of vehicle is depends number of parameters, centre of gravity of that vehicle is one of them. For sport car it always keeps low but for the passenger car it compromises with its ground clearance. To provide the appropriate ground clearance is need of designer to reduce the destructive damage of bottom component of vehicle. CG is important parameter to vehicle for handling and dynamic stability at high speed. In advanced vehicle there are active and semi-active suspensions to give stability to the vehicle. Here, this paper introducing various techniques used to provide ability to the vehicle for more stability and road holding capacity. On the same platform what will the effect of replacing passive suspension with adjustable damper. The review show that, there are multiple parameters changed with replacing passive suspension which give penalty in complexity, reliability, cost and weight. So there is need of developing a system which is intermediate in passive and active suspension.

Keywords— Ground clearance, Centre of gravity, Passive suspension, Active suspension, Semi-active suspension, Controlling strategies, Handling of vehicle, Road holding

INTRODUCTION

Road conditions are not similar at all place, it changes with application, environment and climate. In city at different sectors like school-hospital there are speed breakers of different dimensions. At certain condition road goes straight without any pits else we found irregularity. Most of the people buy only one 4 wheeler which they use that at all this condition. Hence it's necessary to give some standard ground clearance to the vehicle. But still there are some restrictions to drive the car on highway and in city.

It is not possible for the vehicle to run at high speed on its standard ground clearance provided considering the city obstacles. To provide the ability to the vehicle to give the good performance at high speed and low speed it is necessary to build one system which can vary the ground clearance. This can achieve by changing the suspension height with respect to speed of the vehicle.

Suspension systems plays vital role while designing the car for good stability and road holding ability [1]. It is very difficult to achieve this ability at all road condition with passive suspension system [2]. This problem can solve by active suspension system but this is not widely used because it required more external energy and additional controlling system which affected on cost of the vehicle [3]. With a view to reducing complexity and cost while improving ride, handling and performance the semi active suspension system is used.

In this paper various parameters are discussed which are related to the ground clearance and suspension system and its control. This gives the idea about the vehicle characteristics like ride control, height control, roll control, road holding etc. and its effect on car performance.

LITERATURE REVIEW

Hrishikesh V Deo & Nam P Suh[4] introduced that how the comfort and handling are interrelated with CG of the vehicle. They designed the suspension system which varies its height and stiffness according to speed. The researchers used short long arm suspension system which is widely used in front wheel suspension. To controlling the height and stiffness can be achieved by making the lower spring pivot movable along the lower control arm. For moving the pivoted point and achieve desired position electric motor is used to actuate the actuator. But there are some limitation comes across, that is about less quick response. In this paper they also described about active and semi-active suspensions limitations and how it can be overcome with adaptive control with variable height.

P.E. Uys *, P.S. Els, M. Thoresson[5] presented the suspension settings for optimal ride comfort of off-road vehicles travelling on roads with different roughness and speeds. In this they vary the suspension settings for different roads roughness and vehicle speeds and results achieved for comfort level. Simulation is performed on a Land Rover Defender 110 model in MSC.ADAMS software for speeds ranging from 10 to 50 km/hr. Tests were performed on 100m Belgian paving and also ISO 2631-1, BS 6841 and VDI 2057 at different speeds. Correlation between measured and simulated results is very good, especially with respect to vertical acceleration.

There are number of applications related to ground clearance and their consideration is designer need. To give the information about vital role of ground clearance Debojyoti Mitra[6] presented design optimization of ground clearance of domestic

cars. Stability and performance is also parameter of ground clearance. If we allow the vehicle for the low ground clearance then it helps to give less drag force simultaneously it consumes less fuel resulting less pollution. The experiment is carried out in wind tunnel with the help of notch back car model. The result shows that the positive lift force reduces with increasing height of ground clearance. Hence the optimized value of h/b ratio has to be taken in to consideration of clearance design. With the help of spoiler the lift force problem can be solve.

The active suspension system is very essential for handling and giving comfort. These days this system is used in different type of vehicles like hybrid vehicles. Morteza and Mahdi[7] presented active suspension system in parallel hybrid electric vehicles. In this they compare the conventional and hybrid vehicle with active suspension. For conventional the power is taken from the IC engine hence gives little lag in actuation while in hybrid electric vehicle it is direct, resulting less fuel consumption and less emission.

Guangqiang Wu, Guodong Fan, and Jianbo Guo[8] presented ride comfort evaluation for road vehicle based on rigid-flexible coupling multibody dynamics. Spectrum of vibrations occurs in the vehicle due to various speeds. There are different road profiles and roughness therefore occupants are subjected to accelerations in different directions, which caused discomfort. With the help of ADAMS-CAR they built rigid and rigid flexible coupling multi-body vehicle models. As speed increases the relative difference goes increases, at 80 km/hr it becomes 8%. It is better to build the variable suspension with rigid flexible coupling.

Mohammad, Mahir and Iyad[9] gives new control strategy for active suspension using modified fuzzy and PID controllers. In this they proposed controlled strategy to control the suspension system by means of electro-hydraulic actuator. The passive suspension is replaced by low frequency active suspension. The quarter car model tested under rolling effect, cornering and pitching effect at different speeds and road profiles. The reduction in body acceleration by 60% gives better road holding and car stability. There are two types of active suspensions which are commonly recognized that are low bandwidth and high bandwidth. Non-linear controllers are more capable to handle high bandwidth active suspension because they show good capability at worst road condition. Researchers gives the linear controller over active suspension of low bandwidth new PID with fuzzy switch which improve the performance of suspension.

The design of suspension is concern with three main parameter; car body acceleration for ride comfort, the tire deflection for road holding and the suspension travel. The ideal suspension system would minimize these three quantities for any road and operating condition, which is not achievable for suspension having constant spring stiffness and damping. This can be achieved by active suspension system. But this needed high external energy. Hence it is not widely used. The alternative solution is to use of semi-active suspension. It reduces car body resonance without compromising road holding. But this solution gives disturbance like jerk, rattling noise etc. Hence C. Collette, A. Preumont[10] presented paper on energy transfer in semi-active suspension that the energy transfer phenomenon may be bearable up to certain extent by filtering the control signal or providing suitable mounting.

VARIABLE GROUND CLEARANCE

There are two techniques to vary the ground clearance that are open loop and closed loop system. In closed loop system there are two type active suspension and semi-active suspension system.

Active Suspension System:

In active suspension actuator are located parallel to the spring and shock absorbers as shown in figure 1. To apply the proper control over the suspension data is taken from body and wheel motion [1] by means of sensors. The external supply is needed to actuate the actuator hence there are various techniques developed by the researchers such as sky-hook damping model, PI and PD

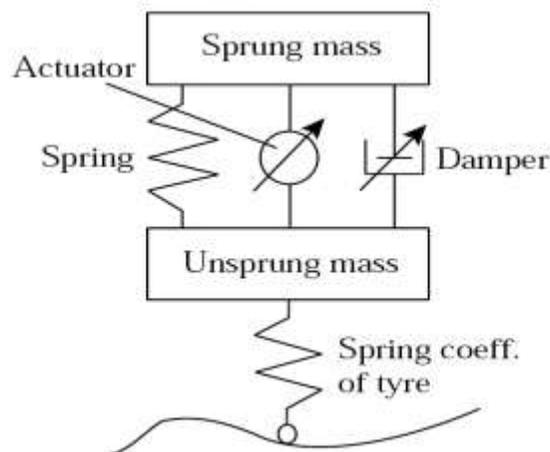


fig.1. Active suspension system[11]

fuzzy controllers, the optimum parameters of fuzzy controller by genetic algorithm [11]. Generally speaking a high- quality active suspension system can separate the vehicle chassis from the vibration arising from road surface. It further ensures the contact between the wheels and road surface for better ride comfort and safety. The active suspension classified in two modes i.e. low bandwidth (1-3 Hz) and high bandwidth (10-15 Hz) [12].

Semi-Active Suspension System:

In semi-active suspension actuator are located parallel to the spring and shock absorbers as shown in figure 2. There are several categories of semi-active suspension system;

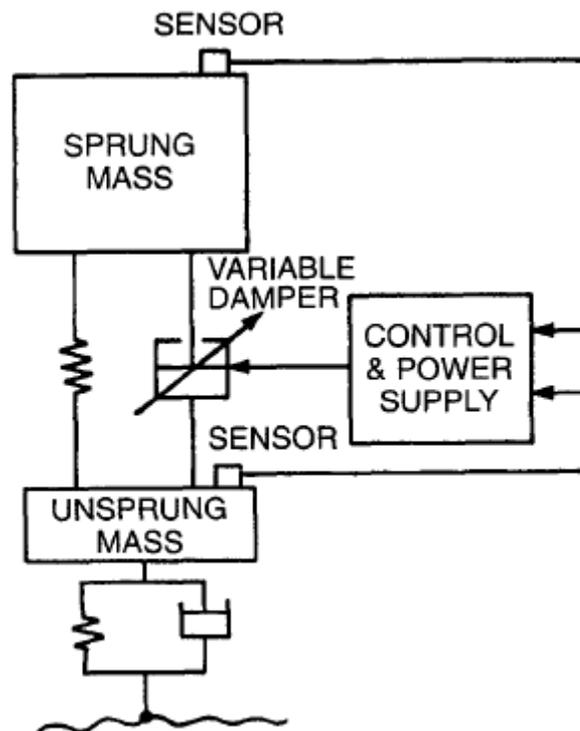


fig.2 semi-active suspension[13]

(a) Slow active- Suspension damping or spring rate can be switched between several levels of response to change in driving condition. This system is capable to control the pitch, bounce and roll motion of the vehicle.(b) Low bandwidth responds the low frequency sprung mass motion.(c) High bandwidth responds both low as well as high frequencies [12].

The regulating of the damping force can be achieved by adjusting the orifice area in the shock absorber, thus changing the resistance to fluid motion damping coefficient can change. Recently, the electrorheological and magnetorheological fluids to be developed to control the damper which is popular now a day. [13]

CONCLUSION

In automobile industry there are always research is going on to provide maximum comfort to the passenger. While considering this situation it provided low stiffness spring or damper, which compromises the handling of the vehicle. For the highway application we need more speed and stability to the vehicle. It is not possible to achieve with constant spring stiffness or damper. The above study show that there are different techniques developed to overcome this problem, but still that system is not implemented in all vehicles, because of their complexity, reliability and cost issue. Therefore it is need to develop the system which is intermediate in passive and active suspension which will provide good stability and holding capacity for the passenger car.

REFERENCES:

- [1] Seyed Ali Zahiripour, Ali Akbar Jalali "Designing an Adaptive Sliding-Mode Controller for Car Active Suspension System Using an Optimal Proportional-Integral Sliding Surface" International Conference on Future Information Technology and Management Science & Engineering Lecture Notes in Information Technology, Vol.14, 2012
- [2] Ayman A. Aly, and Farhan A. Salem "Vehicle Suspension Systems Control: A Review" International Journal of Control, Automation and Systems Vol.2 No.2, July 2013
- [3] C. Lauwerys, J. Swevers, P. Sas "Model free control design for a semi-active suspension of a passenger car" Proceedings of ISMA2004
- [4] Hrishikesh V Deo, Nam P Suh "Axiomatic Design Of Customizable Automotive Suspension" The Third International Conference on Axiomatic Design Seoul, June 21-24, 2004
- [5] P.E. Uys, P.S. Els, M. Thoresson, "Suspension Settings for Optimal Ride Comfort Of Off-Road Vehicles Travelling On Roads with Different Roughness and Speeds" Journal of Terramechanics 44 163-175, 2007

- [6] Debojyoti Mitra “Design Optimization of Ground Clearance of Domestic Cars” International Journal of Engineering Science and Technology Vol. 2 (7), 2678-2680, 2010
- [7] Morteza Montazeri-Gh, Mahdi Soleymani Morteza Montazeri-Gh & Mahdi Soleymani “Active Suspension System in Parallel Hybrid Electric Vehicles” IUST International Journal of Engineering Science, Vol. 19, No.5-1, Page 97-104, 2008
- [8] Guangqiang Wu, Guodong Fan, Jianbo Guo “Ride Comfort Evaluation for Road Vehicle Based on Rigid-Flexible Coupling Multibody Dynamics” Theoretical & Applied Mechanics Letters 3, 013004, 2013
- [9] Mohammad H. AbuShaban¹, Mahir B. Sabra, Iyad A. Abuhadrous “A New Control Strategy for Active Suspensions Using Modified Fuzzy and PID Controllers” The 4th International Engineering Conference- Towards Engineering of 21st Century, 2012
- [10] C. Collette, A. Preumont “Energy Transfer in Semi-Active Suspension”
- [11] Jyh-Chyang Renn and Tsung-Han Wu “Modeling and Control of A New 1/4t Servo-Hydraulic Vehicle Active Suspension System”, Journal of Marine Science and Technology, Vol. 15, No. 3, pp. 265-272, 2007
- [12] Thomas D. Gellispie “Fundamental of Vehicle Dynamics”, Society of Automotive Engineers, Inc.400 Commonwealth Drive Warrendale, PA 15096-0000, pp 269-271
- [13] J. Y. Wong “Theory of Ground Vehicles”, John Wiley & Sons, Inc New York, pp 474-481

A Survey on Detection and Tracking of Objects in Video Sequence

Gandham Sindhuja¹ Dr Renuka Devi S M²

¹Scholar, Department of Electronics and Communication Engineering, GNITS, Hyderabad, India

²Associate Professor, Department of Electronics and Communication Engineering, GNITS, Hyderabad, India

Sindhu.gandham14@gmail.com, 9866120013

Abstract— Object tracking is a process of segmenting a region of interest from a video scene and keeping track of its motion, position and occlusion. The tracking is performed by monitoring objects' spatial and temporal changes during a video sequence, including its presence, position, size, shape, etc. Object tracking is used in several applications such as video surveillance, robot vision, traffic monitoring, Video inpainting and Animation. Also, tracking of an object mainly involves two preceding steps object detection and object representation. Object detection is performed to check existence of objects in video and to precisely locate that object. The detected object fall into various categories such as humans, vehicles, birds, floating clouds, swaying tree and other moving objects. This paper presents a brief survey of different object detection, object representation and object tracking algorithms available in the literature including analysis and comparative study of different techniques used for various tracking stages.

Keywords— Object detection, Object representation, Object tracking, Background subtraction, Background Modelling, Point based tracking, Kernel based tracking, Silhouette based tracking.

1 INTRODUCTION

Object detection and tracking is an important task within the field of computer vision. The proliferation of high-powered computers, the availability of high quality and inexpensive video cameras, and the increasing need for automated video analysis has generated a great deal of interest in object tracking algorithms. There are three key steps in video analysis: detection of interesting moving objects, tracking of such objects from frame to frame, and analysis of object tracks to recognize their behavior [17].

Actually videos are sequences of images, each of which called a frame, displayed in fast enough frequency so that human eyes can percept the continuity of its content. It is obvious that all image processing techniques can be applied to individual frames. Besides, the contents of two consecutive frames are usually closely related [3].

An image, usually from a video sequence, is divided into two complimentary sets of pixels. The first set contains the pixels which correspond to foreground objects while the second complimentary set contains the background pixels. This result is often represented as a binary image or as a mask. It is difficult to specify an absolute standard with respect to what should be identified as foreground and what should be marked as background because this definition is somewhat application specific [4]. Generally, foreground objects are moving objects like people, boats and cars and everything else is background. Many a times shadow is represented as foreground object which gives improper output. The basic steps for tracking an object are described below:

a) Object Detection

Object Detection is a process to identify objects of interest in the video sequence and to cluster pixels of these objects. Object detection can be done by various techniques such as temporal differencing [16], frame differencing [5], Optical flow [4] and Background subtraction [6, 11].

b) Object Representation

Object representation involves various methods such as Shape-based representation[9], Motion-based representation[9], Color based representation[6] and texture based representation[14] where object can be represented as vehicles, birds, floating clouds, swaying tree and other moving objects.

c) Object Tracking

Tracking can be defined as the problem of estimating the trajectory of an object in the image plane as it moves around a scene. Point tracking, kernel tracking and silhouette tracking are the approaches to track the object.

The major issues in object tracking [17] are Loss of evidence caused by estimate of the 3D world on a 2D image, Noise in an image, Difficult object motion, Imperfect and entire object occlusions, Complex objects structures, Scene illumination changes and Real-time processing requirements.

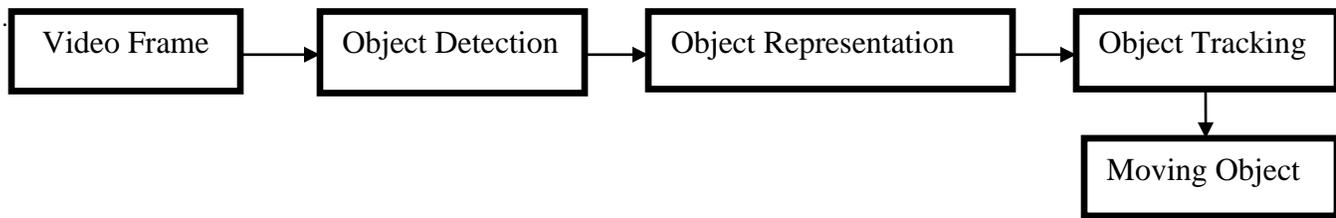


Fig 1: Basic steps in Object Tracking

In this paper, Section 2 provides brief explanation on several object detection methods. Section 3 consists of detailed study on object representation methods and Section 4 describes object tracking methods. Section 5 describes conclusion

2 OBJECT DETECTION METHODS

Every tracking method requires an object detection mechanism either in every frame or when the object first appears in the video [17]. This step in the process of object tracking is to identify objects of interest in the video sequence and to cluster pixels of these objects. Since moving objects are typically the primary source of information, most methods focus on the detection of such objects. Detailed explanation for various methods is given below.

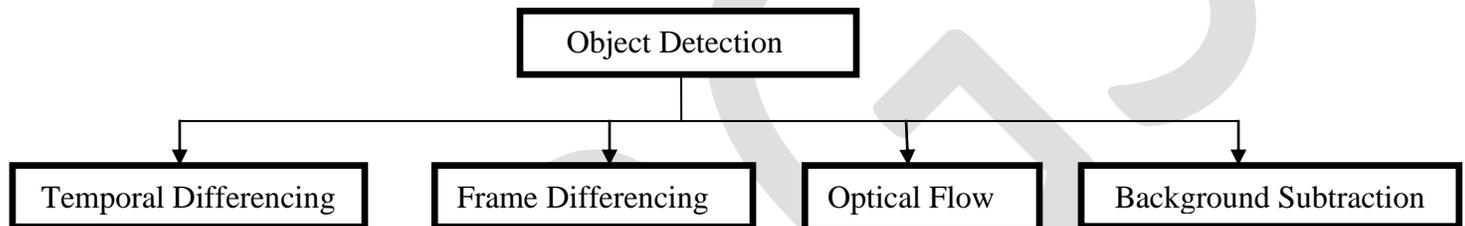


Fig 2: Methods involved in Object Detection

2.1 Temporal Differencing: Temporal differencing method uses the pixel-wise difference between two or three consecutive frames in a video imagery to extract moving regions from the background [16]. It has high adaptability with dynamic scene changes although it cannot always extract all relevant pixels of a foreground object mostly when the object moves slowly or has uniform texture [18, 19]. When a foreground object stops moving, temporal differencing method cannot detect a change between consecutive frames and results in loss of the object.

2.2 Frame Differencing: Some object detection methods make use of the temporal information computed from a sequence of frames to reduce the number of false detections. This temporal information usually in the frame differencing, highlights changing regions in consecutive frames. Given the object regions in the image, it is then the tracker's task to perform object correspondence from one frame to the next to generate the tracks. In this method, presence of moving objects is determined by calculating the difference between two consecutive images. Its calculation is simple and easy to implement. For a variety of dynamic environments, it has a strong adaptability, but it is generally difficult to obtain complete outline of moving object, as a result the detection of moving object is not accurate [5].

2.3 Optical Flow: Optical flow is the pattern of apparent motion of objects, surfaces, and edges in a visual scene caused by the relative motion between an observer and the scene. Optical flow method is to calculate the motion between two image frames which are taken at times t and $t + \delta t$ at every position [4]. These methods are called differential since they are based on local Taylor Series approximation of the image signal; that is, they use partial derivatives with respect to the spatial and temporal coordinates. This method can get the complete movement information and detect the moving object from the background better, however, a large quantity of calculation, sensitivity to noise, poor antinoise performance, make it not suitable for real-time demanding occasions [4].

2.4 Background Subtraction: Background subtraction is a technique for segmenting a foreground object from its background. The main step in background subtraction is background modelling. It is the core of background subtraction algorithm. Background Modelling must be sensitive enough to recognize moving objects [1]. Background Modelling is to yield reference model. This reference model is used in background subtraction in which each video sequence is compared against the reference model to determine possible Variation. The variations between current video frames to that of the reference frame in terms of pixels signify existence of moving objects. Currently, mean filter and median filter are widely used to realize background modelling [6]. The background subtraction method is to use the difference method of the current image and background image to detect moving objects, with simple algorithm, but very sensitive to the changes in the external environment and has poor anti- interference ability. However,

it can provide the most complete object information in the case background is known. Background subtraction has mainly two approaches [4]:

a) Recursive Techniques:

Recursive techniques do not maintain a buffer for background estimation. Instead, they recursively update a single background model based on each input frame. As a result, input frames from distant past could have an effect on the current background model. Compared with non-recursive techniques, recursive techniques require less storage, but any error in the background model can linger for a much longer period of time. This technique includes various methods such as approximate median, adaptive background, Gaussian mixture [6, 11].

b) Non-Recursive Techniques:

A non-recursive technique uses a sliding-window approach for background estimation. It stores a buffer of the previous L video frames, and estimates the background image based on the temporal variation of each pixel within the buffer. Non-recursive techniques are highly adaptive as they do not depend on the history beyond those frames stored in the buffer. On the other hand, the storage requirement can be significant if a large buffer is needed to cope with slow-moving traffic [11, 6].

The problem with background subtraction [20, 21] is to automatically update the background from the incoming video frame and it should be able to overcome the following problems: Motion in the background, Illumination changes, Memory, Shadows, Camouflage and Bootstrapping.

According to survey [5, 14, 16], Table 1 describes comparative study of detection methods using accuracy and computational time.

Methods		Computational Time	Accuracy	Feedback
Temporal Differencing		High	Moderate	✓ Less complex and adaptives to dynamic changes in video. × Sensitive to threshold value that determines changes in video frames.
Frame Differencing		Low to Moderate	High	✓ Easy to implement and perform well for static background. × Requires a background without moving objects.
Optical Flow		High	Moderate	✓ Complete Movement information of object is not produced. × Large amount of calculation is required.
Background Subtraction	Approximate Median	Low to Moderate	Moderate	✓ Does not require sub sampling of frames to create adequate background model. × A buffer with recent pixel values is required for computation.
	Gaussian of Mixture	Moderate	Moderate	✓ Huge memory is not needed. × Does not cope with multimodal Background.

TABLE 1: Comparative Study of Object Detection Methods

3 OBJECT REPRESENTATION METHODS

In a tracking scenario, an object can be defined as anything that is of interest for further analysis. Objects can be represented by their shapes and appearances [17]. The extracted moving object may be different objects such as humans, vehicles, birds, floating clouds, swaying tree and other moving objects [5]. Hence shape features are usually used to represent motion regions. As per literature survey, approaches to represent the objects are as follows:

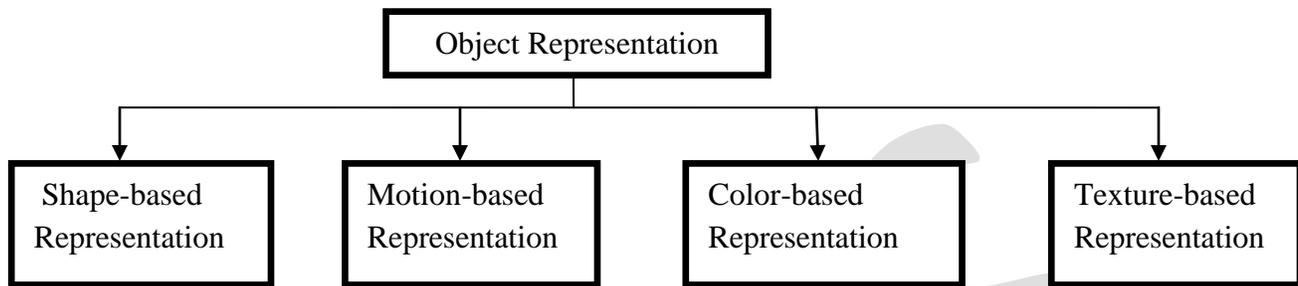


Fig 3: Methods involved in Object Representation

3.1 Shape-based Representation: Different shape information of motion regions such as representations of points, box and blob are available for representing moving objects. Input features to the network is a combination of image-based and scene-based object parameters such as image blob area, apparent aspect ratio of blob bounding box and camera zoom [9]. Representation is performed on each image blob at every frame and results are stored in histogram.

3.2 Motion-based Representation: Non-rigid articulated object motion shows a periodic property. This method has been used as a reliable approach for moving object representation. Some optical flow methods such as residual flow can be used to analyze rigidity and periodicity of moving entities. Rigid objects typically present little residual flow where as a non rigid moving object has higher average residual flow and displays a periodic component [9].

3.3 Color-based Representation: Unlike many other image features color is relatively constant under viewpoint changes and easy to be acquired. Although color is not always appropriate as the only means of detecting and tracking objects, but the algorithms that have low computational cost makes color as an important feature to use when appropriate. To detect and track vehicles or pedestrians in real-time, among other techniques, color histogram based technique [23] is used. A Gaussian Mixture Model is used to describe the color distribution within the sequence of images. Object occlusion is handled using an occlusion buffer [6].

3.4 Texture-based Representation: Texture based technique [14] counts the occurrences of gradient orientation in localized portions of an image, then computes the data on a dense grid of uniformly spaced cells and uses overlapping local contrast normalization for better accuracy.

According to literature survey [13, 14], Table 2 describes comparative study of representation methods using accuracy and computational time.

Methods	Computational time	Accuracy	Feedback
Texture-based	High	High	✓ Improved quality is provided. × Additional computation time is required.
Color-based	High	High	✓ Low computational cost × Not always appropriate because of accuracy.
Motion-based	High	Moderate	✓ Predefined pattern templates are not required. × Difficult to identify non moving human.

Shape-based	Low	Moderate	✓ Can be applied with appropriate templates. × Does not work with dynamic situations and unable to determine internal movements well.
-------------	-----	----------	--

TABLE 2: Comparative Study of Object Representation Methods

4 OBJECT TRACKING METHODS

Tracking can be defined as the problem of approximating the path of an object in the image plane as it moves in a scene. The purpose of an object tracking is to generate the route for an object by finding its position in every single frame of the video [11]. Object is tracked for object extraction, object recognition and decisions about activities. Object tracking can be classified as point based tracking, kernel based tracking and silhouette based tracking [1]. For illustration, the point trackers involve detection in every frame; while geometric area or kernel based tracking or contours-based tracking require detection only when the object first appears in the scene. Tracking methods can be divided into following categories [1]:

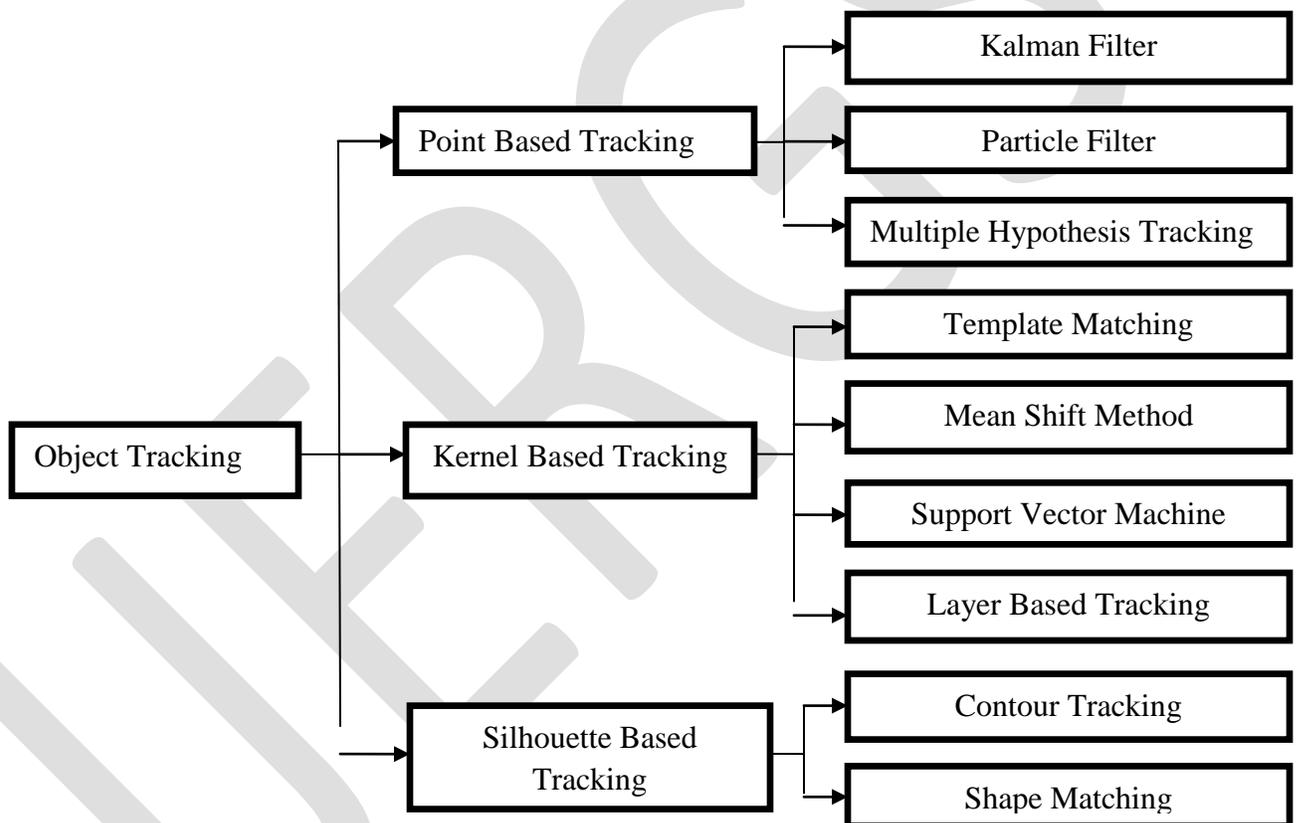


Fig 4: Methods involved in Object Tracking

4.1 Point based Tracking

In an image structure, moving objects are represented by their feature points during tracking. Point tracking is a complex problem particularly in the incidence of occlusions, false object detections. Recognition can be done relatively simple, by thresholding for the identification of these points. Point based tracking approaches [1] are described below:

1. *Kalman Filter*: They are based on Optimal Recursive Data Processing Algorithm. The Kalman Filter performs the restrictive probability density propagation. Kalman filter [10] is a set of mathematical equations that provides an efficient computational (recursive) means to estimate the state of a process in several aspects: it supports estimations of past, present, and even future states, and it can do the same even when the precise nature of the modelled system is unknown. The Kalman filter estimates a process by using a form of feedback control. The filter estimates the process state at some time and then obtains feedback in the form of noisy measurements. The equations for Kalman filters [10] fall in two groups: time update equations and measurement update equations. The time update equations are responsible for projecting forward (in time) the current state and error covariance estimates to obtain

the priori estimate for the next time step. The measurement update equations are responsible for the feedback. Kalman filters always give optimal solutions.

2. *Particle Filter*: The particle filter [1] generates all the models for one variable before moving to the next variable. Algorithm has an advantage when variables are generated dynamically and there can be unboundedly numerous variables. It also allows for new operation of resampling. One restriction of the Kalman filter is the assumption of state variables are normally distributed (Gaussian). Thus, the Kalman filter is poor approximations of state variables which are not Gaussian distribution. This restriction can be overwhelmed by using particle filtering. This algorithm usually uses contours, color features, or texture mapping. The particle filter [1] is a Bayesian sequential importance Sample technique, which recursively approaches the later distribution using a finite set of weighted trials. It also consists of fundamentally two phases: prediction and update as same as Kalman Filtering. It is applied in developing area such as computer vision communal and applied to tracking problematic.

3. *Multiple Hypothesis Tracking (MHT)*: In MHT algorithm [1], several frames have been observed for better tracking outcomes MHT is an iterative algorithm. Iteration begins with a set of existing track hypotheses. Each hypothesis is a crew of disconnect tracks. For each hypothesis, a prediction of object's position in the succeeding frame is made. The predictions are then compared by calculating a distance measure. MHT is capable of tracking multiple object, handles occlusions and Calculating of Optimal solutions.

4.2 Kernel Based Tracking

Kernel tracking [12] is usually performed by the moving object, which is represented by a embryonic object region, from one frame to the next. The object motion is usually in the form of parametric motion such as translation, conformal, affine, etc. These algorithms diverge in terms of the representation used, the number of objects tracked, and the method used for approximating the object motion. In real-time, illustration of object using geometric shape is common. But one of the restrictions is that parts of the objects may be left outside of the defined shape while portions of the background may exist inside. This can be detected in rigid and non-rigid objects .They are number of tracking techniques based on representation of object, object features ,appearance and shape of the object. Kernel based approaches are described below:

1. *Template Matching*: Template matching [12, 2] is a brute force method of examining the Region of Interest in the video. In template matching, a reference image is verified with the frame that is separated from the video. Tracking can be done for single object in the video and overlapping of object is done partially. Template Matching is a technique for processing digital images to find small parts of an image that matches, or equivalent model with an image (template) in each frame. The matching procedure contains the image template for all possible positions in the source image and calculates a numerical index that specifies how well the model fits the picture at that position. This method is capable of dealing with tracking single image and partially occluded object.

2. *Mean Shift Method*: Mean-shift tracking tries to find the area of a video frame that is locally most similar to a previously initialized model. The image region to be tracked is represented by a histogram. A gradient ascent procedure is used to move the tracker to the location that maximizes a similarity score between the model and the current image region. In object tracking algorithms target representation is mainly rectangular or elliptical region. To characterize the target color histogram is chosen. Target model is generally represented by its probability density function (pdf). Target model is regularized by spatial masking with an asymmetric kernel.

3. *Support Vector Machine (SVM)*: SVM is a broad classification method which is termed by a set of positive and negative sample values. For SVM, the positive samples contain tracked image object, and the negative samples consist of all remaining things that are not tracked. It can handle single image, partial occlusion of object but necessity of physical initialization and training is must [8].

4. *Layering based tracking*: This is another method of kernel based tracking where multiple objects can be tracked. Each layer consists of shape representation (ellipse), motion (such as translation and rotation,) and layer appearance (based on intensity). Layering is achieved by first compensating the background motion such that the object's motion can be estimated from the rewarded image by means of 2D parametric motion. Every pixel's probability is calculated based on the object's foregoing motion and shape features [8]. It can be capable of tracking multiple images and full occlusion of object.

4.3 Silhouette Based Tracking

Some object will have complex shape such as hand, fingers, shoulders that cannot be well defined by simple geometric shapes. Silhouette based methods afford an accurate shape description for the objects. The aim of a silhouette-based object tracking [12] is to find the object region in every frame by means of an object model generated by the previous frames. This method is capable of dealing with variety of object shapes, Occlusion and object split and merges. Silhouette based tracking approaches are described below:

1. *Contour Tracking*: Contour tracking methods [12], iteratively progress a primary contour in the previous frame to its new position in the current frame. This contour progress requires that certain amount of the object in the current frame overlay with the object region in the previous frame. Contour Tracking can be performed using two different approaches. The first approach uses state space

models to model the contour shape and motion. The second approach directly evolves the contour by minimizing the contour energy using direct minimization techniques such as gradient descent. The most significant advantage of silhouettes tracking is their flexibility to handle a large variety of object shapes.

2. *Shape Matching*: These approaches examine the object model in the existing frame. Shape matching performance is similar to the template based tracking in kernel approach. Another approach to Shape matching [1] is to find matching silhouettes detected in two successive frames. Silhouette matching, can be considered similar to point matching. Detection based on Silhouette is carried out by background subtraction. Models object in the form of density functions, silhouette boundary, object edges capable of dealing with single object and Occlusion handling will be performed in with Hough transform techniques.

According to the literature, performance metrics are implemented on the datasets available at cmp.felk.cvut.cz/~vojirtom/dataset/, www.iai.uni-bonn.de/~kleind/tracking, clickdamage.com/.../cv_datasets.php. Qualitative comparison of object tracking methods for different challenging situations is presented in the Table 3.

Tracking Methods	Type of Tracking	Tracking Algorithm	Number of objects tracked	Occlusion Handling	Performance metrics	Feedback
Kalman Filter[17,25]	Point tracking	Kalman Filtering Algorithm	Single	No	Efficiency in terms of total time elapsed for processing certain Frames.	<ul style="list-style-type: none"> ✓ Used to track points in noisy images × State space variables are normally Gaussian distributed
Particle Filter[17]	Point tracking	Particle Filtering Algorithm	Multiple	Yes	Minimum variance estimate & average processing time/frame	<ul style="list-style-type: none"> ✓ Robust tracking when Image content is evaluated at hypothesis object positions × Limited to linear system and require the noise to be Gaussian.
Multiple Hypothesis Tracking[17]	Point tracking	MHT Algorithm	Multiple	Yes	Distance measure	<ul style="list-style-type: none"> ✓ Able to deal with entries of new object and exit existing object × Computationally exponential in both time and memory
Template Matching [2,24,27]	Kernel tracking	Exhaustive search template matching Algorithm	Single	Partial	Correlation measure & Intensity difference measure	<ul style="list-style-type: none"> ✓ Simple to implement × Sensitive to noise and time interval of movements
Mean Shift Method[23]	Kernel tracking	Histogram based Method	Single	Partial	Mean error & standard deviation error	<ul style="list-style-type: none"> ✓ Runs very fast, suitable for models having dominant colors × Spatial information is lost and performance is not good when target and background are similar

Support Vector Machine[22]	Kernel tracking	SVM classifier & optic flow based tracker are integrated to perform support vector tracking	Single	Partial	Error surface & average Image plane motion	<ul style="list-style-type: none"> ✓ Performs real time tracking over long periods of time × It is not designed to handle momentary disappearance & reappearance.
Layer Based Tracking[26]	Kernel tracking	Background stabilization combined with layer representation	Multiple	Full	Multiple object tracking accuracy & avg. Miss detection /frame	<ul style="list-style-type: none"> ✓ Applicable for video matting and layer extraction × limited to binary labelling
Contour Tracking[17]	Silhouette tracking	Gradient descent Algorithm	Multiple	Full	Region statics is calculated using grid points	<ul style="list-style-type: none"> ✓ Object shape is implicitly modelled × limited to sensitivity of contour model
Shape Matching[17]	Silhouette tracking	Hough Transform	Single	Partial	Temporal Spatial Velocity in 4D(x,y,u,v) image /frame is calculated	<ul style="list-style-type: none"> ✓ Less sensitive to appearance variations × It requires training

TABLE 3: Comparative Study of Object Tracking Methods

5 CONCLUSION

In this survey paper all the major aspects of object detection, object representation and object tracking have been addressed. Various methods in these aspects have been explained in brief and a number of merits and demerits were highlighted in each and every technique. Different object detection methods are temporal differencing, frame differencing, optical flow and background subtraction. It can be summarized as background subtraction is a simplest method providing complete information about object compared to other methods. Among the different methods of object representation, most of the researchers prefer texture based and color based object representation. Object tracking can be performed using various methods based on point, kernel, and silhouette. Advance study may be carried out to find efficient algorithm to reduce computational cost and to decrease the time required for tracking the object for variety of videos containing diversified characteristics.

REFERENCES:

- [1] J.Joshan Athanesious, P.Suresh, "Systematic Survey on Object Tracking Methods in Video", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) October 2012, 242-247.
- [2] Saravanakumar, S.; Vadivel, A.; Saneem Ahmed, C.G., "Multiple human object tracking using background subtraction and shadow removal techniques," Signal and Image Processing (ICSIP), 2010 International Conference on , vol., no., pp.79,84, 15-17 Dec. 2010
- [3] Abhishek Kumar Chauhan, Prashant Krishan, "Moving Object Tracking Using Gaussian Mixture Model And Optical Flow", International Journal of Advanced Research in Computer Science and Software Engineering, April 2013
- [4] Sen-Ching S. Cheung and Chandrika Kamath, "Robust techniques for background subtraction in urban traffic video".
- [5] Rupali S.Rakibe, Bharati D.Patil, "Background Subtraction Algorithm Based Human Motion Detection", International Journal of Scientific and Research Publications, May 2013
- [6] M.Sankari, C. Meena, "Estimation of Dynamic Background and Object Detection in Noisy Visual Surveillance", International Journal of Advanced Computer Science and Applications, 2011, 77-83
- [7] K.Srinivasan, K.Porkumaran, G.Sainarayanan, "Improved Background Subtraction Techniques For Security In Video Applications"

- [8] Rahul Mishra, Mahesh K. Chouhan, Dr. Dhiraj Nitnawre, "Multiple Object Tracking by Kernel Based Centroid Method for Improve Localization", International Journal of Advanced Research in Computer Science and Software Engineering, July-2012, pp 137-140.
- [9] Hitesh A Patel, Darshak G Thakore, "Moving Object Tracking Using Kalman Filter", International Journal of Computer Science and Mobile Computing, April 2013, pg.326 – 332.
- [10] Greg Welch, Gary Bishop, "An introduction to the Kalman Filter", In University of North Carolina at Chapel Hill, Department of Computer Science. Tech. Rep. 95-041, July-2006.
- [11] Ruolin Zhang, Jian Ding, "Object Tracking and Detecting Based on Adaptive Background Subtraction", International Workshop on formation and Electronics Engineering, 2012, 1351-1355.
- [12] Mr. Joshan Athanesious J; Mr. Suresh P, "Implementation and Comparison of Kernel and Silhouette Based Object Tracking", International Journal of Advanced Research in Computer Engineering & Technology, March 2013, pp 1298-1303.
- [13] J. Shotton, "Contour and texture for visual recognition of object categories," Doctoral of Philosophy, Queen's College, University of Cambridge, Cambridge, 2007.
- [14] Jae-Yeong Lee; Wonpil Yu, "Visual tracking by partition-based histogram backprojection and maximum support criteria," Robotics and Biomimetics (ROBIO), 2011 IEEE International Conference on, vol., no., pp.2860,2865, 7-11 Dec. 2011
- [15] Rupesh Kumar Rout "A Survey on Object Detection and Tracking Algorithms" Department of Computer Science and Engineering National Institute of Technology Rourkela – 769 008, India.
- [16] Kinjal A Joshi, Darshak G. Thakore "A Survey on Moving Object Detection and Tracking in Video Surveillance System "International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-3, July 2012
- [17] Alper Yilmaz, Omar Javed, and Mubarak Shah. "Object tracking: A survey. *Acm Computing Surveys*" (CSUR), 38(4):13, 2006.
- [18] N. Paragios, and R. Deriche. "Geodesic active contours and level sets for the detection and tracking of moving objects." *IEEE Trans. Pattern Analysis Machine Intelligence*. 22, 3, 266–280, 2000.
- [19] S. Zhu and A. Yuille. "Region competition: unifying snakes, region growing, and bayes/mdl for multiband image segmentation." *IEEE Trans. Pattern Analysis Machine Intelligence* 18, 9, 884–900, 1996.
- [20] Changick Kim and Jenq-Neng Hwang. "Fast and automatic video object segmentation and tracking for content-based applications." *Circuits and Systems for Video Technology, IEEE Transactions on*, 12(2):122–129, 2002.
- [21] Zhan Chaohui, Duan Xiaohui, Xu Shuoyu, Song Zheng, and Luo Min. "An improved moving object detection algorithm based on frame difference and edge detection." In *Image and Graphics, 2007. ICIG 2007. Fourth International Conference on*, pages 519–523. IEEE, 2007.
- [22] Shai Avidan. "Support Vector Tracking." *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 26, No. 8, August 2004.
- [23] Dorin Comaniciu, Visvanathan, Ramesh, Peter Meer. "Kernel-Based Object Tracking." *IEEE Conference on Computer Vision and Pattern Recognition*, 2000.
- [24] J. K. Aggarwal and Q. Cai. "Human Motion Analysis: A Review." *Computer Vision and Image Understanding* Vol. 73, No. 3, March, pp. 428–440, 1999.
- [25] Banerjee Salil P., Pallipuram Krish "Multi Person Tracking using Kalman Filter" December 10, 2008.
- [26] Jiangjian Xiao, Changjiang Yang, Feng Han, and Hui Cheng "Vehicle and Person Tracking in UAV Videos"
- [27] G.S Cox "Template matching and measures of match in image processing", July 10, 1995

Load Flow Study of A UPFC Embedded System

¹V. Indira Priyadarsini , ²Dr A.V.R.S. Sarma

¹ Dept. of EEE, JN Govt. Polytechnic, Hyderabad, T.S. India

vip_riya@yahoo.co.in, +919948985544

² Retd Professor, Dept. of EEE , OU College of Engineering ,Hyderabad, T.S India

Abstract— The Unified Power Flow Controller (UPFC) in its general form can provide simultaneous, real time control of all basic power system parameters (transmission, voltage, impedance and phase angle) or any combinations there-of determining transmitted power in AC transmissions. This paper addresses the steady-state modeling of UPFC, within the context of Load Flow study of a power system. This model is incorporated into an existing Newton – Raphson Load Flow algorithm. This proposed algorithm exhibits quadratic or near quadratic convergence characteristics, regardless of the size of the network and the number of FACTS devices.

Keywords— Unified Power Flow Controller, Flexible AC Transmission Systems (FACTS), Control Strategy, Interflow Power Flow Controller (IPFC), De-regulation, Newton-Raphson method, Jacobian , Power Flow Control, AC Power transmission, IPP

1. INTRODUCTION

Optimizing the use of power transfer capability of a transmission network is always a concern in the power supply industry. Expansion in power transmission networks has taken place not only due to the increase in generation and loads but also due to the extensive interconnection among different power utilities. Interconnection between various systems is done mainly to reduce generation reserves. However power flow congestion occurs in strategic routes because of inflexibility of their power control capability [1]. Upgrading existing transmission lines or enhancing their power controllability is common practical means of achieving a better utilization of their ultimate design limit. In modern power systems, much attention has been given to explore both capital and technical concepts on how to utilize existing transmission system better.

Line compensation in the past has primarily been for reactive power management. Switched or fixed shunt capacitors and reactors as well of series capacitors are typically applied. Synchronous condensers have also been used and continue to be used where dynamic voltage control is needed. In the 70's, the Static Var Compensator (SVC) began to be applied. The first of these was the EPRI – Minnesota Power & Light and Westinghouse project commissioned in 1978[6]. Prior to this, SVC system had been applied for Voltage control primarily at locations with heavy industrial loads but not for transmission system stabilization. The amount of compensation is easily determined for steady state operation. However, in heavily compensated systems, the voltage profiles are much flatter and therefore there is almost no warning prior to reaching the point of voltage collapse. Thus voltage stability has to be continuously monitored to ensure is kept at an operating point which remains stable after a disturbance.

Advances have been made in high power semi-conductor devices, control technologies which have been instrumental in the broad application of HVDC transmission and power inertia schemes having significant impact on AC transmission.

The concept of Flexible AC Transmission System (FACTS) devices has gradually evolved as a new dimension in network analysis. The concept of FACTS was first proposed by Dr. Nori Hingorani, in 1988 when he was working in Electric Power Research Institute (EPRI), CA, and USA [1]. It involves application of high power electronic controllers in AC transmission networks, which enable fast and reliable control of power flows and voltages. FACTS don't indicate a particular controller but a host of controllers, whom the system planner can choose, based on cost benefit analysis. This new dimension is the proper adjustment in parameters including transmission line impedance, bus voltage magnitudes and phase angles. By doing so, it is possible to regulate power flow and voltage in the network at will and it is also possible to render the dispatch of electricity more controllable, reliable and flexible[2]. The ability to regulate the power flows in certain paths in a network is of particular importance, especially in a de-regulated electricity market.

The FACTS devices enable the routing of power in the steady state in any desired manner independent of the impedance of the various paths. This has assumed considerable significance with the emergence of IPP (Independent Power Producers), who are willing to invest in power, provided they are assured of wheeling of the power generated by them, to the areas where power is in demand. The fast progress in power electronics has made power wheeling a technically feasible happening.

Some of the first generation FACTS devices which used conventional Thyristors can be listed as

- 1) SVC (Static Var Compensator)
- 2) TCSC (Thyristor Controlled Series Compensator)

Presently a new generation FACTS devices are developed. These controllers are based on self-commutated voltage source based converters (VSC) using GTO Thyristor technology. These controllers are:

- 1) STATCOM (Static Var Generator)
- 2) SSSC (Static Synchronous Series Compensator)
- 3) SPS (Static Phase Shifter)
- 4) UPFC (Unified Power Flow Controller)
- 5) IPFC (Interline Power Flow Controller)

The objectives that are to be met by FACTS devices can be listed as below:

- 1) Power flow can be regulated in prescribed transmission routes
- 2) Loading of lines nearer their thermal limits
- 3) Prevention of cascading outages by contributing to emergency control
- 4) Damping of oscillation which can threaten security or limit the useable line capacity.

FACTS is the underpinning concept upon which are based promising means to avoid effectively power flow bottle necks and ways to extend the loadability of existing power transmission network. The Unified Power Flow Controller (UPFC) is a promising FACTS device for load flow control.

Power systems embedded with FACTS devices have become an integral part of power system. Hence it is essential to perform some basic studies like load flow study, stability study, fault analysis etc. to investigate the impact of FACTS devices on power systems.

2. UNIFIED POWER FLOW CONTROLLER

The Unified Power Flow Controller (UPFC) facilitates the real time control and dynamic compensation of AC transmission systems. It provides the necessary functional flexibility required for solving the problems faced by the utility industry. The UPFC could be considered as comprehensive real and reactive power flows in the line. UPFC concept provides a powerful tool for the cost effective utilization of individual transmission lines by facilitating the independent control of both the real and reactive power flow and thus the maximization of real power transfer at minimum losses in the line.

The UPFC consists of two switching converters, which in implementation considered are Voltage - Source inverters using Gate Turn off (GTO) Thyristor valves as shown in Fig.1. These inverters labeled, Inverter 1 and Inverter 2 are operated from a common DC link provided by a DC storage capacitor. This arrangement works as an ideal AC to AC power converter in which real power can freely flow in either directions between AC terminals of the two inverters and each inverter can independently generate (or absorb) reactive power at its own AC O/P terminal

Inverter 2 provides the main function of the UPFC by injecting as AC voltage V_{pq} with controllable magnitude and phase angle at the power frequency, in series with line via an insertion transformer. The basic function of Inverter 1 is to supply or absorb real power demand by Inverter 2 at the common DC link. This DC link is converted back to AC and coupled to transmission line via shunt connected transformer.

2.1 Operational features of UPFC

Operation of UPFC combines the functions of series compensator, shunt compensator and phase shifter, UPFC can fulfill all these functions there by meet multiple control objectives by adding the injected Voltage V_{pq} , with appropriate amplitude and phase angle to the terminal voltage. Using phasor representation, basic UPFC power flow control functions are shown in Fig. 2

- a) **Voltage regulation:** This function is similar to that of regulation obtained with transformer tap changes having infinitely small steps. Here $V_{pq} = \Delta V$ is injected in phase or anti phase with V_o . That is, in fact the shunt compensation is realized.
- b) **Series Capacitive Compensation:** Here $V_{pq} = V_c$ is injected in quadrature with the line current I
- c) **Phase Angle regulation:** $V_{pq} = V_\sigma$ is injected with an angular relationship with respect to V_o that achieves the desired σ phase shift (advance or retard) without any changes in magnitude.
- d) **Multi-functional Power Flow Control:** Here $V_{pq} = \Delta V + V_c + V_\sigma$. In this mode UPFC combines the functional features of voltage regulation, series compensation, shunt compensation and also phase angle regulation.

The powerful, hitherto unattainable, capabilities of the UPFC summarized above in terms of conventional transmission control concepts can be integrated into a generalized power flow controller that is able to maintain prescribed and independently controllable, real power P and reactive power Q in the line.

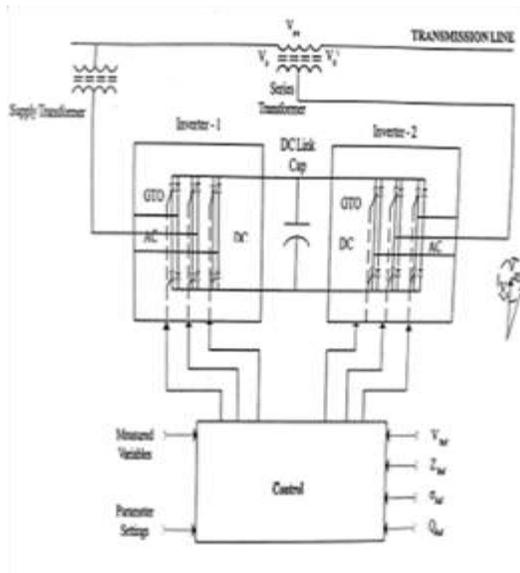


Fig. 1. Basic circuit arrangement of UPFC

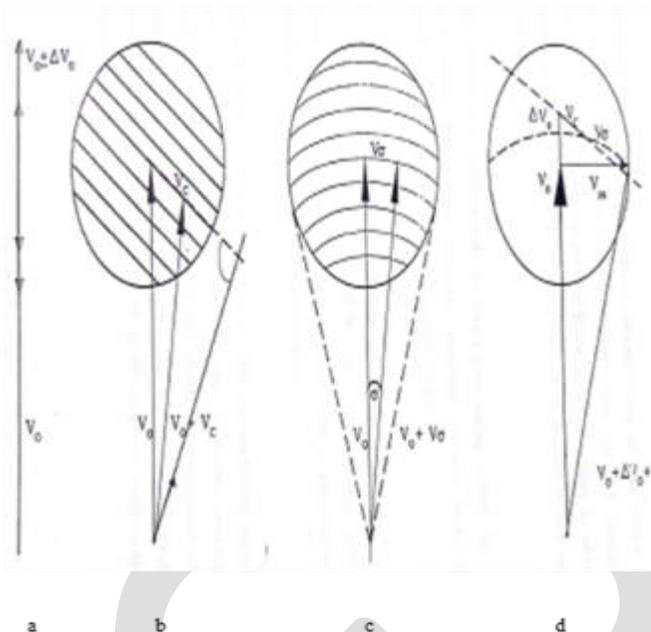


Fig. 2. Basic UPFC Control functions: a) Voltage regulation b) series compensation c) angle regulation d) multi-function power flow control

2.2 Generalized power flow controller

In this context it is appropriate to show that using UPFC in a line, we can transmit more power and hitherto increase steady state stability limit. Consider a two machine model as shown in Fig.3 [1]. This figure shows the sending end generator with voltage V_s , the receiving end generator with voltage phasor V_r , the transmission line impedance X (assumed inductive) in two sections ($X/2$) and a generalized power flow controller operated at the middle of the line [2]

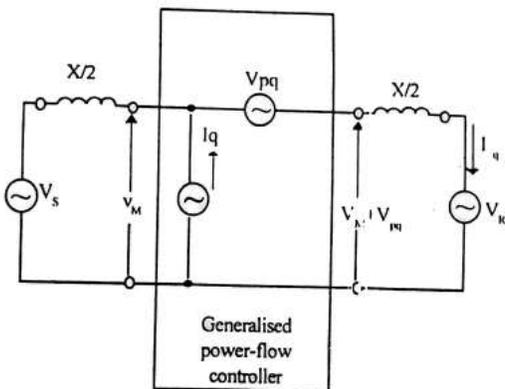


Fig. 3. Simple Two-machine power system with a generalized Power-Flow controller

The power flow controller consists of two controllable elements, a voltage source (V_{pq}) inserted in series with the line and a current source (I_q) connected in shunt with the line at the midpoint. Both the magnitude and the angle of Voltage (V_{pq}) and freely variable whereas only the magnitude of current (I_q) is variable. Its phase angle is fixed at 90 degrees with respect to midpoint voltage.

The four classical cases of power transmission

1. Without line compensation (P1)
2. With series capacitive compensation (P2)
3. With shunt compensation (P3)
4. With Phase angle control (P4)

Can be obtained by appropriately specifying V_{pq} and I_q in the generalized power flow controller.

In the above four classical cases of power transmission can be expressed by well-known formula by assuming suitable values according to the case mentioned for steady state operation of the system.

$$P = \frac{(V_r * V_s)}{X} \sin \delta$$

These classical four cases can be well explained for a two machine power system in the fig.4

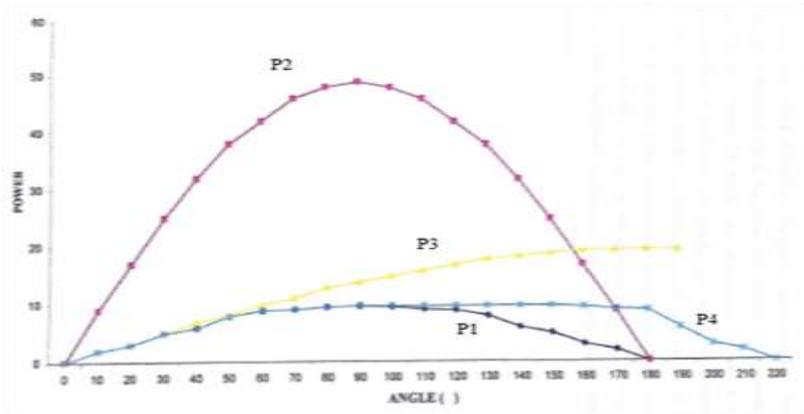


Fig.4. Power Transmission Characteristics for Two machine power system

3. STEADY STATE MODELING OF UPFC

Performance analysis and control synthesis of UPFC required its steady state and dynamic models. In this paper a steady state model of UPFC is presented [3]. The main assumptions in deriving the model is assuming the power system to be

- 1) Symmetrical
- 2) Operates under 3-phase balanced conditions

This steady state model is based on two ideal voltage source converters. One is in Series with the Line and one is in Shunt with the Line[15]. It is well suited for incorporation into an existing N-R load flow algorithm. In common with all other controllable plant component models available in the algorithm, UPFC state variables are incorporated inside Jacobian matrix and mismatch equations, leading to very robust iterative solution.

This UPFC model has been tested extensively in a wide range of power networks of varying size and degree of operational complexity [4]. A schematic representation of UPFC is shown in Fig. 5. The output voltage of series converter is added to AC terminal voltage V_o via the series connected coupling transformer. The injected voltage V_{cr} acts as an AC series voltage source changing the effective sending end voltage as seen from node m.

The product of transmission line current I_m and series voltage source V_{cr} determines the active and reactive power exchanged between the series converter and the AC system.

Then real power demanded by the series converter is supplied from AC power system by the shunt converter via the common DC link. The shunt converter is able to generate or absorb controllable reactive power in both operating modes (i.e. rectifier and inverter). The independently controlled shunt reactive compensation can be used to maintain the shunt converter terminal AC voltage magnitude at a specified value.

3.1 Mathematical Model of UPFC

The UPFC equivalent circuit shown in Fig.6 below is used to derive the steady state mathematical model.

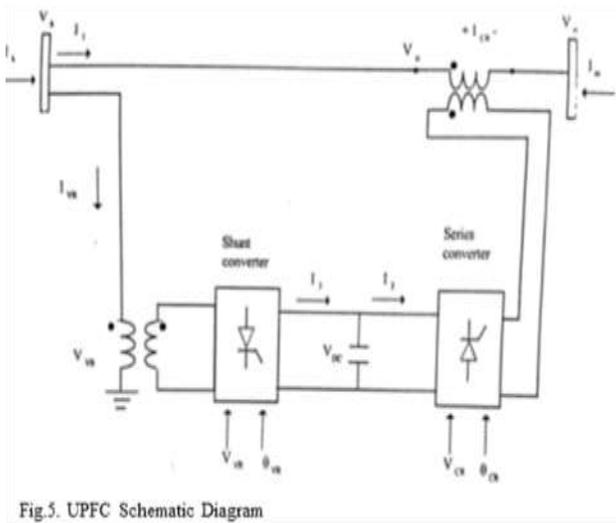


Fig.5. UPFC Schematic Diagram

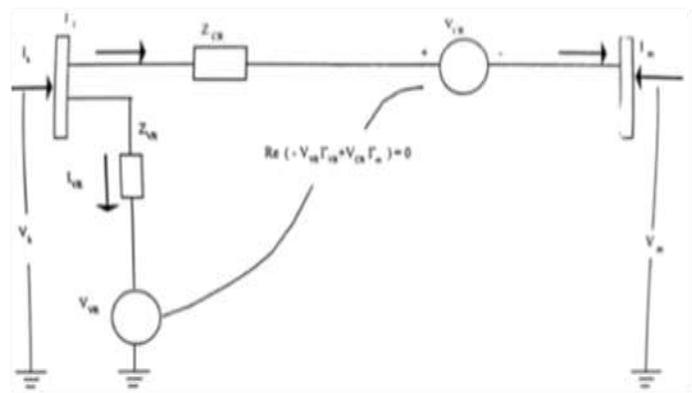


Fig. 6. UPFC Equivalent Circuit

The equivalent circuit consists of two ideal voltage sources representing the fundamental Fourier series component of the switched voltage wave forms at the AC converter terminals. The ideal voltage sources are

$$V_{vr} = V_{vr} (\cos\theta_{vr} + j \sin\theta_{vr})$$

$$V_{cr} = V_{cr} (\cos\theta_{cr} + j \sin\theta_{cr})$$

Where V_{vr} and θ_{vr} are the controllable magnitude $V_{vrmin} \leq V_{vr} \leq V_{vrmax}$ and angle ($0 \leq \theta_{vr} = 360^\circ$) of the voltage source representing shunt converter. The magnitude V_{cr} and angle θ_{cr} of the voltage source of the series converter are controlled between the limits $V_{crmin} \leq V_{cr} \leq V_{crmax}$ and angle ($0 \leq \theta_{cr} = 360^\circ$) respectively. The real and reactive powers injected nodes k, m and also at series and shunt converters.

The real and reactive powers injected at nodes k,m and also at series converter and shunt converter.

At node k:

$$S_k = V_k * I_k$$

$$P_k = (V_k * V_{cr} * b_1 * \sin(\theta_k - \theta_{cr})) + (V_k * V_m * b_1 * \sin(\theta_k - \theta_m)) + (V_k * V_{vr} * b_2 * \sin(\theta_k - \theta_{vr}))$$

$$Q_k = (V_k^2 * b_1) + (V_k^2 * b_2) - (V_k * V_{cr} * b_1 * \cos(\theta_k - \theta_{cr})) - (V_k * V_m * b_1 * \cos(\theta_k - \theta_m)) - (V_k * V_{vr} * b_2 * \cos(\theta_k - \theta_{vr}))$$

Where

$$b_1 = |Z_{cr}^{-1}| \text{ and } \theta_{cr} = \angle Z_{cr}^{-1}$$

$$b_2 = |Z_{vr}^{-1}| \text{ and } \theta_{vr} = \angle Z_{vr}^{-1}$$

At node m :

$$S_m = V_m * I_m$$

$$P_m = -(V_m * V_{cr} * b_1 * \sin(\theta_m - \theta_{cr})) + (V_m * V_k * b_1 * \sin(\theta_m - \theta_k))$$

$$Q_m = (V_m^2 * b_1) + (V_m^2 * b_2) - (V_m * V_k * b_1 * \cos(\theta_m - \theta_k)) + (V_m * V_{cr} * b_1 * \cos(\theta_m - \theta_{cr}))$$

At Series Converter :

$$S_{cr} = V_{cr} * I_m$$

$$P_{cr} = - (V_{cr} * V_m * b_1 * \sin(\theta_{cr} - \theta_m)) + (V_{cr} * V_k * b_1 * \sin(\theta_{cr} - \theta_k))$$

$$Q_{cr} = (V_{cr}^2 * b_1) + (V_{cr} * V_m * b_1 * \cos(\theta_{cr} - \theta_m)) - (V_{cr} * V_k * b_1 * \cos(\theta_{cr} - \theta_k))$$

At Shunt Converter :

$$S_{vr} = V_{vr} * I_{vr}$$

$$P_{vr} = - (V_{vr} * V_k * b_2 * \sin(\theta_{vr} - \theta_k))$$

$$Q_{vr} = (V_{vr}^2 * b_2) + (V_{vr} * V_k * b_2 * \cos(\theta_{vr} - \theta_k))$$

Assuming a free loss converter operation, UPFC neither absorbs nor injects active power with respect to the AC system. The DC link Voltage, V_{dc} remains constant. The active power associated with the series converter becomes the DC power $V_{dc} * I_2$. The Shunt converter must supply an equivalent amount of DC power to maintain V_{dc} constant. Hence, the active power supplied to the Shunt converter P_{vr} , must satisfy the active power demanded by the series converter P_{cr}

$$\text{i.e. } P_{vr} + P_{cr} = 0$$

$$P_{bb} = P_{vr} + P_{cr} = 0$$

4. LOAD FLOW ANALYSIS

Load flow studies are one of the most important aspects of power system planning and operation. The load flow gives us the sinusoidal steady state of the entire system - voltages, real and reactive power generated and absorbed and line losses. Since the load is a static quantity and it is the power that flows through transmission lines, the purists prefer to call this **Power Flow studies** rather than load flow studies.

Through the load flow studies we can obtain the voltage magnitudes and angles at each bus in the steady state. This is rather important as the magnitudes of the bus voltages are required to be held within a specified limit [13]. Once the bus voltage magnitudes and their angles are computed using the load flow, the real and reactive power flow through each line can be computed. Also based on the difference between power flow in the sending and receiving ends, the losses in a particular line can also be computed. Furthermore, from the line flow we can also determine the over and under load conditions.

The steady state power and reactive power supplied by a bus in a power network are expressed in terms of nonlinear algebraic equations. We therefore would require iterative methods for solving these equations.

4.1 Load Flow Analysis with Newton-Raphson Method

The load flow study is dealt with here is applied here with respect to balanced condition[9][10]. It mainly requires

- 1) Formulation of the network equation
- 2) Suitable mathematical technique for the solution of the network

Newton-Raphson method is an iterative method adopted using Y-bus in polar coordinates. The approach to Newton-Raphson load flow is similar to that of solving a system of nonlinear equations using the **Newton-Raphson method**: At each iteration we have to form a Jacobian matrix and solve for the corrections from an equation of the type given in (4.27)[13].

Load flow analysis involves the following steps:

- **Load Flow Algorithm**
- **Formation of the Jacobian Matrix**
- **Solution of Newton-Raphson Load Flow**

Let us assume that an n -bus power system contains a total n_p number of P-Q buses while the number of P-V (generator) buses be n_g such that $n = n_p + n_g + 1$. Bus-1 is assumed to be the slack bus. We shall further use the mismatch equations of ΔP_i and ΔQ_i given in (4.9) and (4.10) respectively [13].

4.2 Load Flow Equations with UPFC embedded branch

DEVELOPMENT OF LOAD FLOW EQUATION FOR A BRANCH BETWEEN NODE K, M IN WHICH UPFC IS EMBEDDED IS BASED ON THE EQUIVALENT REPRESENTATION OF THE UPFC. THESE LOAD FLOW EQUATIONS ARE THE REAL AND REACTIVE POWERS INJECTED AT NODES K, M AND ALSO AT SERIES CONVERTER AND SHUNT CONVERTER AS PRESENTED ABOVE.

4.2.1. UPFC JACOBIAN EQUATIONS

AS THE VARIOUS NETWORK CONTROLS INTERACT WITH EACH OTHER, THE RELIABILITY OF CONVERGENCE BECOMES THE MAIN CONCERN IN THE MODELING OF CONTROLLABLE DEVICES. THE STATE VARIABLES CORRESPONDING TO THE UPFC ARE COMBINED WITH THE NETWORK NODAL VOLTAGE MAGNITUDES AND ANGLES IN A SINGLE FRAME OF REFERENCE FOR A UNIFIED SOLUTION THROUGH A NEWTON-RAPHSON METHOD. THE UPFC STATE VARIABLES ARE ADJUSTED AUTOMATICALLY SO AS TO SATISFY SPECIFIED POWER FLOWS AND VOLTAGE MAGNITUDES.

THE UPFC LINEARIZED POWER EQUATIONS ARE COMBINED WITH LINEARIZED SYSTEM OF EQUATIONS CORRESPONDING TO THE REST OF THE NETWORK.

$$[F(X)] = [J] [X] \text{ WHERE } [F(X)] = [\Delta P_k \Delta P_m \Delta Q_k \Delta Q_m \Delta P_{cr} \Delta Q_{cr} \Delta P_{bb}]^T$$

P_{bb} IS THE POWER MISMATCH AND SUBSCRIPT T INDICATES TRANSPOSITION. X IS THE SOLUTION VECTOR AND $[J]$ IS THE JACOBIAN MATRIX. FOR THE CASE WHEN THE UPFC CONTROLS VOLTAGE MAGNITUDE AT THE AC SHUNT CONVERTER TERMINAL (NODE K) ACTIVE POWER FLOWING FROM NODE K TO M AND REACTIVE POWER INJECTED AT NODE M AND ASSUMING NODE M IS PQ – TYPE THE SOLUTION VECTOR AND JACOBIAN MATRIX ARE

$$[X] = [\Delta \theta_k \Delta \theta_m \Delta V_{vr} \Delta V_m \Delta \theta_{cr} \Delta V_{cr} \Delta \theta_{vr}]^T$$

and $[J] =$

$$\begin{pmatrix} \partial P_k / \partial \theta_k & \partial P_k / \partial \theta_m & \partial P_k / \partial V_{vr} & \partial P_k / \partial V_m & \partial P_k / \partial \theta_{cr} & \partial P_k / \partial V_{cr} & \partial P_k / \partial \theta_{vr} \\ \partial P_m / \partial \theta_k & \partial P_m / \partial \theta_m & \partial P_m / \partial V_{vr} & \partial P_m / \partial V_m & \partial P_m / \partial \theta_{cr} & \partial P_m / \partial V_{cr} & \partial P_m / \partial \theta_{vr} \\ \partial Q_k / \partial \theta_k & \partial Q_k / \partial \theta_m & \partial Q_k / \partial V_{vr} & \partial Q_k / \partial V_m & \partial Q_k / \partial \theta_{cr} & \partial Q_k / \partial V_{cr} & \partial Q_k / \partial \theta_{vr} \\ \partial Q_m / \partial \theta_k & \partial Q_m / \partial \theta_m & \partial Q_m / \partial V_{vr} & \partial Q_m / \partial V_m & \partial Q_m / \partial \theta_{cr} & \partial Q_m / \partial V_{cr} & \partial Q_m / \partial \theta_{vr} \\ \partial P_{cr} / \partial \theta_k & \partial P_{cr} / \partial \theta_m & \partial P_{cr} / \partial V_{vr} & \partial P_{cr} / \partial V_m & \partial P_{cr} / \partial \theta_{cr} & \partial P_{cr} / \partial V_{cr} & \partial P_{cr} / \partial \theta_{vr} \\ \partial Q_{cr} / \partial \theta_k & \partial Q_{cr} / \partial \theta_m & \partial Q_{cr} / \partial V_{vr} & \partial Q_{cr} / \partial V_m & \partial Q_{cr} / \partial \theta_{cr} & \partial Q_{cr} / \partial V_{cr} & \partial Q_{cr} / \partial \theta_{vr} \\ \partial P_{bb} / \partial \theta_k & \partial P_{bb} / \partial \theta_m & \partial P_{bb} / \partial V_{vr} & \partial P_{bb} / \partial V_m & \partial P_{bb} / \partial \theta_{cr} & \partial P_{bb} / \partial V_{cr} & \partial P_{bb} / \partial \theta_{vr} \end{pmatrix}$$

4.3 INITIAL CONDITIONS OF UPFC VOLTAGE SOURCES

THE SOLUTION BY NEWTON – RAPHSON METHOD REQUIRE GOOD STARTING CONDITIONS FOR THE UPFC, A SET OF EQUATIONS WHICH GIVE GOOD INITIAL ESTIMATES ARE OBTAINED BY ASSUMING LOSS-LESS UPFC AND COUPLING TRANSFORMERS AND NULL VOLTAGE ANGLES IN POWER EQUATIONS AT NODES K, M.

1. SERIES SOURCE INITIAL CONDITIONS

$$\theta_{cr} = \text{TAN}^{-1}((P_{mr})/C1)$$

$$V_{cr} = ((X_{cr} / V_m^o) * \square (P_{mr}^2 / CI^2))$$

Where $CI = Q_{mr}$ if $V_m^o = V_k^o$ otherwise $CI = (Q_{mr} - (V_m^o / X_{cr})) * (V_m^o - V_k^o)$

2. SHUNT SOURCE INITIAL CONDITIONS:

AN EQUATION FOR INITIALIZING THE SHUNT VOLTAGE ANGLE SOURCE CAN BE OBTAINED BY SUBSTITUTING THE REAL POWER EQUATIONS OF SERIES AND SHUNT CONVERTER INTO POWER MIS-MATCH EQUATION AND PERFORMING SIMPLE OPERATIONS:

$$\theta_{VR} = -\text{SIN}^{-1}((V_K^0 - V_M^0) * V_{CR}^0 * X_{VR} * \text{SIN}(\theta_{CR}^0) / V_{VR}^0 * V_K^0 * X_{CR})$$

WHERE X_{VR} IS THE INDUCTIVE REACTANCE OF THE SHUNT SOURCE .

WHEN THE SHUNT CONVERTER IS ACTING AS A VOLTAGE REGULATOR, THE VOLTAGE MAGNITUDE OF IT IS INITIALIZED AT ITS TARGET VALUE AND THE UPDATED AT EACH ITERATIONS AND IF IT IS NOT ACTING AS VOLTAGE REGULATOR ITS VOLTAGE MAGNITUDE IS KEPT AT FIXED VALUE WITHIN THE PRESCRIBED LIMITS FOR THE

$$(V_{VRMIN} \leq V_{VR} \leq V_{VRMAX})$$

HERE A PURELY INDUCTIVE BRANCH IS ASSUMED WITH SERIES AND SHUNT SOURCE IMPEDANCE VALUES OF $X_{CR} = X_{VR} = 0.1$ (P.U)

A LOAD FLOW STUDY HAS BEEN CARRIED OUT BY DEVELOPING SOFTWARE IN “C” LANGUAGE FOR A UPFC EMBEDDED POWER SYSTEM NETWORK BASED ON CONVENTIONAL NEWTON-RAPHSON ALGORITHM. IN THIS PAPER, IT IS APPLIED TO A SINGLE BRANCH OF A POWER SYSTEM EMBEDDED WITH UPFC.

5. RESULTS

THE SOFTWARE DEVELOPED IN “C” LANGUAGE IS APPLIED TO CONVENTIONAL NEWTON-RAPHSON ALGORITHM TO CALCULATE LOAD FLOW FOR A UPFC INCORPORATED BRANCH OF 5 BUS SYSTEM WHOSE DETAILS ARE IN TABLE 1, 2 AND 3. UPFC IS EMBEDDED BETWEEN THE NODES 3 AND 4 BY CREATING ANOTHER NODE LABELED AS 6 (M). THE SOLUTION IS CONVERGED IN TWO ITERATIONS AND GIVEN BELOW IN TABLE 4 AND TABLE 5.

Data for 5-bus

Table 1. Impedance and line charging for the sample 5-bus system

Bus Code p-q	Impedance (Zpq)	Line Charging Ypq/2
1-2	0.02+j0.06	0.0+j0.030
1-3	0.08+j0.24	0.0+j0.025
2-3	0.06+j0.18	0.0+j0.020
2-4	0.06+j0.18	0.0+j0.020
2-5	0.04+j0.12	0.0+j0.015
3-6	0.00+j0.10	0.0+j0.010
4-5	0.08+j0.24	0.0+j0.025
6-4	0.01+j0.03	0.0+j0.01

Table 2. Scheduled generation and loads and assumed bus voltages for the sample 5-bus system

Bus Code	Assumed Bus voltage (pu)	Generation		Load	
		MW	MVAR	MW	MVAR
1	1.06+j0.0	0	0	0	0
2	1.0+j0.0	40	30	20	10
3	1.0+j0.0	0	0	45	15
4	1.0+j0.0	0	0	40	5
5	1.0+j0.0	0	0	60	10
6	1.0+j0.0	0	0	0	0

Y-bus for the system
Table 3. Admittance to ground for sample system

Bus Code P	Admittance to ground Yp
1	0.0+j0.0550
2	0.0+j0.8500
3	0.0+j0.1450
4	0.0+j0.0550
5	0.0+j0.0400
6	0.0+j0.0100

Table 4. The final converged values of f(x) matrix

ΔP_k	0.001503
ΔP_m	-0.001988
ΔQ_k	-0.009564
ΔQ_m	0.009522
ΔP_{cr}	0.000485
ΔQ_{cr}	-0.000006
ΔP_{bb}	0.000485

Table 5. The final converged values of [X] matrix

Bus Code	Voltage (pu)	Angle (rad)	Angle (degree)
K	1	0.0045	0.257
M	0.995	0.0148	0.8484
Series Converter	0.0501	-1.6058	-92.05
Shunt Converter	1.0194	0.0045	0.257

system

5.1 Case Studies

The developed software in “C” language for load flow analysis of system embedded with UPFC is used to perform case studies on a 5-bus system. The conventional Newton-Raphson algorithm for the load flow study is carried out. Power Flow solution converged in 5 iterations to tolerance of 0.01 starting from flat voltage profiles[11]. In this paper the functional capability of UPFC as shunt compensator is investigated[14]. A load flow program is used to incorporate the specified voltage at a specified bus in a given power system.

5.1.1 Case -1

With the load demand at bus 3 as 45MW and at bus 4 as 40 MW, the load flow program is conducted. The specified voltage magnitude at bus 3 is kept at 1.0 (pu). Thus the functional capability of UPFC as shunt compensator is tested. The results of the load flow solution at the end of 5th iteration with tolerance level at 0.01 are shown in Table 6 to Table 9

Table No 6. The final converged values of change in real and reactive powers at each bus

ΔP_2	-0.0046200
ΔQ_2	-0.0000059
ΔP_3	0.0045060
ΔP_4	0.00000168
ΔQ_4	-0.00000317
ΔP_5	0.00000065
ΔQ_5	-0.00000046
ΔP_6	-0.00011300
ΔQ_6	-0.00000575
ΔP_{cr}	-0.00000727
ΔQ_{cr}	-0.00000309
ΔP_{bb}	-0.00000727
ΔQ_k	-0.00000856

Table No 7. The converged values of voltage and phase angle magnitudes at all buses

Bus Code	Voltage (pu)	Angle (rad)	Angle (degree)
1 (SLACK)	1.06	0	0
2	1.033	-0.0446	-2.5566
3	1.000	-0.0866	-4.9643
4	0.986	-0.0785	-4.5000
5	0.9953	-0.1014	-5.8120
6	0.9812	-0.0691	-3.9610

Table 8. The end values of voltage and angles of series and shunt converters are in

Voltage (pu)	Angle (rad)	Angle (deg)
V_{cr}	-0.8208	-47.05
V_{sr}	-0.0866	-4.96

Table 9. Nodal complex voltages of modified network

Bus Code	Complex Voltages V(pu) θ (deg)		Complex Voltages V(pu) θ (deg)	
	V(pu)	θ (deg)	V(pu)	θ (deg)
1	1.060	0.000	1.060	0.000
2	1.000	-1.770	1.032	-2.562
3	1.000	-6.020	1.000	-4.970
4	0.992	-3.19	0.986	-4.505
5	0.972	-5.77	0.995	-5.818
6	0.997	-2.51	0.981	-3.966

In the above case the real and reactive power references are taken as per original network values at nodes 3 and 4. The shunt compensator capability of the UPFC is studied and the results obtained are in close agreement to the reference [4].

5.1.2 Case 2

UPFC’s capability to meet the specified load demands is tested here. The load flow program is again conducted by increasing the load demands at bus 3 from its initial value to 65MW and the load at bus 4 from its original value to 50MW. Convergence is obtained at

the end of 5th iteration within tolerance of 0.01. These changes are done apart from maintaining the bus voltage at node 3 as in case 1 at 1.0 (pu). The results are shown in Tables 10, 11 and 12

Table 10. Load demands

ΔP_2	-0.00049800
ΔQ_2	-0.00002320
ΔP_3	0.00848800
ΔP_4	-0.00000685
ΔQ_4	-0.00000879
ΔP_5	0.00000214
ΔQ_5	-0.00000306
ΔP_6	-0.00041300
ΔQ_6	0.000017600
ΔP_{cr}	-0.00002980
ΔQ_{cr}	0.000011500
ΔP_{sh}	-0.00002980
ΔQ_{sh}	-0.00000365

Table 11. The converged values of voltage and phase angle magnitudes at all nodes

Bus Code	Voltage (pu)	Angle (rad)	Angle (degree)
1	1.06	0	0
2	1.0315	-0.0559	-3.204
3	1.000	-0.1148	-6.580
4	0.9833	-0.1024	-5.870
5	0.9932	-0.1169	-6.701
6	0.9793	-0.0931	-5.331

Table 12. The end values of voltage and angles of series converter and shunt converter

Voltage (pu)	Angle (rad)	Angle (deg)
$V_{sc} = -0.0621$	-0.9069	-51.987
$V_{sc} = 0.9952$	-0.1148	-6.580

ACKNOWLEDGMENT

I am deeply thankful to all of our professors in the Osmania University. I sincerely thank all of them without whose co-operation; it would not have been possible to complete this work.

I also take immense happiness in thanking my parents, husband and especially my loving daughter.

Last, but not least, I thank THE GOD for giving an opportunity of life on this wonderful planet to see many technological happenings.

CONCLUSION

In this paper load flow study is performed on 5 bus system. A software is developed in “C” language for load flow analysis of a power system embedded with UPFC. This program is based on conventional polar co-ordinates Newton-Raphson Algorithm. UPFC provides simultaneous or individual control of basic system parameters like transmission voltage, impedance and phase angle, there by controlling transmitted power. In this paper the functional capability of UPFC to maintain specified voltage magnitude at a node where UPFC is connected is obtained. The shunt compensator capability is obtained in the first case and ability of UPFC to meet the specified node demands is obtained in the second case. The results obtained in both the cases are in close agreement to the values in [4].

All the capabilities of UPFC will hasten the broad application of UPFC concepts and achievement of its ultimate goal that is **“The higher utilization of existing Power Systems”**

REFERENCES:

- [1] Dr. L Gyuugyi, FIEE “Unified Power Flow Control concept of AC transmission system” – IEEE proceedings – vol 139 No 4 July 1992
- [2] Dr. L Gyugyi, T R Rietman, A Edris: “The Unified Power Flow Controller – A new approach to power transmission control” IEEE – Transactions on Power delivery Vol 10, No 2 April 1995
- [3] A. NabaviNaik, M R Irvani : “Steady state and Dynamic modules of UPFC for power system studies” -Transactions on Power System vol 11, No 4 Nov 1996
- [4] C R Fuerte Esquivel, E Acha: “UPFC – A critical comparison of Newton- Raphson UPFC algorithm in power flow studies” IEEE proceedings – Generation, Transmission, Distribution – Vol 144, No 5 Sep 1997
- [5] K R Padiyar & A M Kulkarni : “Flexible AC Transmission System a status review” Sadhana Vol 22 part 6, Dec 1997
- [6] Prof M .V. Hariharan : Seminar on “ New perceptions in Power system control and power quality in the context of FACTS devices” 10th April 2000
- [7] E Acha,C R Fuerte Esquivel : “Incorporation of UPFC model jn an optimal power flow using Newton method” – IEEE proceedings, General Transmission and Distribution Vol 145, No 3 May 1998
- [8] C R Fuerte Esquivel and E Acha “Newton Raphson algorithm for a reliable solution of large power networks with embedded FACTS devices”

IEEE proceedings general, transmission, distribution Vol 143, No 5 Sep 1996

- [9] Computer based methods in power system analysis – Glenn W .Stagg & Ahmed H.El-Abiad
- [10] Electrical Power Systems – C.L Wadhwa
- [11] Zhengyu Huang “ Application of UPFC in interconnected power system –Modelling, Interface, control Strategy and case Study”
IEEE transactions on Power Systems ,Vol 15,No2 May 2000
- [12] W L Fang and H W Ngan “Control setting of UPFC through a robust load flow calculation” IEE proceedings on Generation ,
Transmission and Distribution Vol 146, No 4, July 1999
- [13] <http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/power-system/ui/TOC.html>
- [14] Irinjila Kranti Kiran, A Jaya Laxmi “Shunt verses Series Compensation in the improvement of Power system performance”
International Journal of Applied Engineering Research Vol-2, No-1, 2011 ISSN-0976-4259
- [15] S.Kamel, F.Jurado,J.A Pecas Lopes “comparison of various UPFC models for Power flow control”Electric Power systems
Research Vol.121:243-251 April 201

Recognition of License Plate Numbers Using Image Processing Technique and Genetic Algorithm

Dr. L.M. Varalakshmi

Dept. of Electronics and Communication Engineering,
Sri Manakula Vinayagar Engineering College,
Madagadipet, Puducherry - 605107

Radha Ramalingam

Dept. of Electronics and Communication Engineering,
Sri Manakula Vinayagar Engineering College,
Madagadipet, Puducherry - 605107

Email: radha.vipsha@gmail.com

Phone: 9791195057

Abstract— Dynamic image processing techniques coupled with Genetic Algorithm are used for recognizing the license plate numbers from an image containing it. Recognition of license plate in a picture which are prone to illumination problems is done using this process. The proposed system finds multi style number plates in an image by using Multistyle License Plate Number Using genetic algorithm and Dynamic Image Processing techniques. The license plates detection stage is the most is the most critical step in the automatic license plate identification system. Many research have been done to overcome all the challenges faced in this area, but no general method is best suitable for detection of license plates models from different countries or places. This is because each country have different plate style and design. All existing techniques or algorithms available can be classified based on the features used for the detection. Different existing algorithms that have been researched are Color-based techniques that uses specific fixed color coding used by different countries. Another widely used technique is External-shape based detection which detects plates based on its shape ratio as prescribed by different countries.

Keywords— Image processing; genetic algorithm; license plate, CCAT, binarization, detection of license plate, GRM

INTRODUCTION

The term digital image refers to processing of a two dimensional picture by a digital computer. In a broader context, it implies digital processing of any two dimensional data. A digital image is an array of real or complex numbers represented by a finite number of bits. An image given in the form of a transparency, slide, photograph or an X-ray is first digitized and stored as a matrix of binary digits in computer memory. This digitized image can then be processed and/or displayed on a high-resolution television monitor. For display, the image is stored in a rapid-access buffer memory, which refreshes the monitor at a rate of 25 frames per second to produce a visually continuous display.

LITERATURE SURVEY

In earlier researches the idea of using edge geometrical features is used in detecting these license plates. The edge part is obtained using the Difference of Gaussian operation followed by Sobel vertical edge mask. Before doing that, the gamma correction is applied to increase chances of detecting the edges. After this the morphological operations are applied to get the plate region candidates. Using these regions, together with the edge image identified previously, we calculate geometrical features of these regions and use rule-based classifier to identify the actual plate region [1]. In this paper we present a proposal to solve the problem of license plate recognition using a three layer fuzzy neural network. In the first stage the plate is detected inside the digital image using rectangular perimeter detection and the finding of a pattern by pattern matching, after that, the characters are extracted from the plate by means of horizontal and vertical projections [2]. An algorithm for detecting license plates that can detect multiple license plates having different sizes in very much unfamiliar and complex backgrounds. Detecting the License plates is an important processing step in recognizing the license plates which has many applications in transportation systems. Vertical edges and edge density are utilized to find candidate regions [3]. The crossover operator, Sequential Constructive crossover (SCX) technique, for genetic algorithm are the techniques that generates

solution of very high quality to the Traveling Salesman Problem (TSP). The constructive crossover uses a pair of parents to create an offspring using better edges based on their values that may be present in the parents' structure maintaining the sequence of nodes in the parent chromosomes. The efficiency of the Sequential constructive crossover is compared with some existing crossover operators; like, generalized N-point crossover (GNX) and edge recombination crossover (ERX) for some benchmark TSPLIB instances [4]. In ITS, car license plate detection is a basic task. A Maximally Stable External Region (MSER) license plate detection method is proposed in the paper constrained by some prior knowledge of license plate. Initially the input image is processed and converted to grayscale using gray scaling and gray stretching, etc., and then, the candidate MSER license plate regions are chosen according to the pixel sum, length-width ratio of the license plate character region, after that, similar single-character regions are removed and the upper and lower borders of the license plate are determined, using horizontal projection of candidate license plate character region and the grey level jump constraints, finally, the right and left borders of license plate are determined by vertical projection [5].

EXISTING SYSTEM

Usually the car plates appear in different types of character styles, either single or double row, different sizes, spacing and character counts. Due to such kind of variations even localizing or detecting these plates a difficult problem. The problem of localization will be much harder during night time due to poor lighting conditions. In this paper, edge geometrical feature is being used for detecting the license plates. The edge part is got using Difference of Gaussian operation followed by Sobel vertical edge mask. Before that, gamma correction is applied to the image to increase the chances of detection of edges. After this we apply morphological operations to get the plate region candidates. Using these regions, along with the edge image, we calculate geometrical features of these regions and use rule-based classifier to identify the true plate region exactly.

Disadvantages of Existing System

- There are Color-based systems developed that detect specific plates having fixed colors or color coding.
- The drawback of this existing method is, it is sensitive to any model identification text or any other texts or objects that are present above or below the license plates that can disturb the texture histogram.
- The main drawback of these existing segmentation techniques was their huge computational demand and also they are sensitive to the presence of other texts such as model identification texts and bumper stickers.

PROPOSED SYSTEM

Use of a new genetic algorithm (GA) approach is introduced to detect the locations of license plate (LP) symbols. An adaptive threshold method is being used to overcome the errors happening due to changes of illumination conditions while converting the image into binary. To detect the candidate object inside the unknown image an image processing technique, connected component analysis technique (CCAT) is used. To simplify the system adaptability when applied in different countries, a scale-invariant geometric relationship matrix is introduced to model the layout of symbols in any LP. Along with that, two new crossover operators, based on sorting, are being used, which improve the convergence speed of the system very much. Most of the problems faced by CCAT techniques such as broken bodies, are minimized by modifying the Genetic Algorithm used to perform partial match until reaching an acceptable fitness value. The proposed system is implemented using MATLAB and different samples of license plate image are experimented with to verify the accuracy of the proposed system.

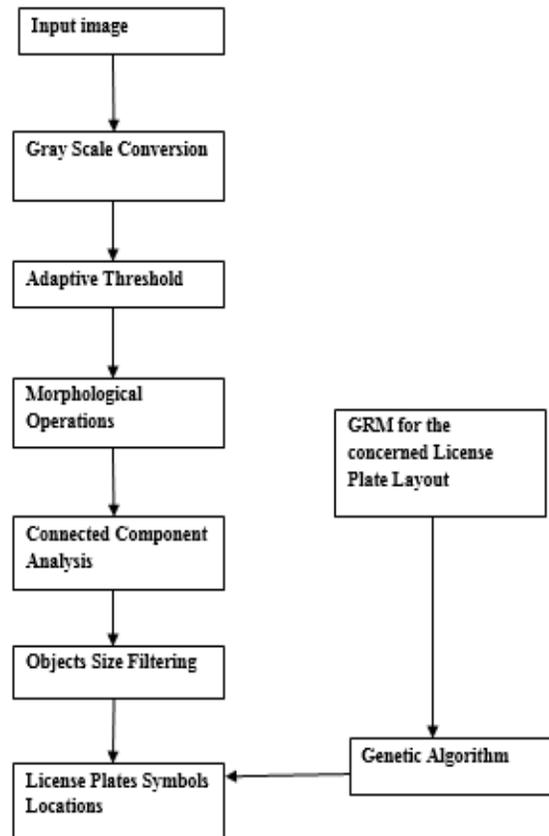
The most critical step in the process is the detection/identification stage of the license plate. Lot of research has been done to overcome the problems faced in this area, but there is no successful general method which could be used for detecting the license plates of different countries or places because each country or region use different plate style or design. All the developed existing techniques can be classified according to the selected features upon which the detection algorithm was based. For plates having fixed colors or color coding, color-based systems have been built to detect specific plates. External-shape based techniques are being used to detect the plate based on its rectangular shape. With advancement in artificial intelligence and computer science, intelligent systems such as intelligent transportation systems play more and more important role in modern society. Among these systems license plate recognition is used in many applications including automatic toll payment, identification of stolen vehicles, border control, and traffic law enforcement. A license plate recognition system generally consists of three processing steps: license plate detection, character segmentation, and character recognition. There are many factors to be taken into account when developing license plate detection

method. License plate standards vary from country to country. Images can be captured in different illumination conditions and may contain other objects such as buildings, people, trees, fences etc. Also the number of vehicles and the distance between the vehicle and the camera can vary. This makes license plate detection to be the most important and challenging step. For many years, moving object detection and location is a focus in the field of image processing, and its key technology is feature extraction and description. The most frequently used features are texture, geometrical configuration and gray feature. However, these features are often subject to different environment such as view point and distance. The MSER feature is affine-invariant to scale transformation, rotation transformation and transformation of the view-point, so it has great advantages over the common features in robustness, repetition rate, discrimination.

The proposed fitness is taken as the inverse of the objective distance calculated between the prototype chromosome and the existing chromosome.

In genetic algorithm, a population of candidate solutions to an optimization problem is evolved toward better solutions. In Every candidate solution some properties can be altered and mutated; traditionally, solutions are represented using binary strings i.e., 0s and 1s. But we can also represent the solutions using other encodings.

The evolution in genetic algorithm normally starts from a population of randomly generated candidates. This happens in an iterative process. The population of candidates in each iteration is called as generation. In each generation, every candidate's fitness will be evaluated; the fitness is normally the value of the objective function in the optimization problem being solved. The most fit individuals are selected from the current population, and each the genome of the individual is modified (mutated and recombined randomly) to form a new generation. The newer generation of candidates will be used in the next iterations. The iteration will come to an end when either a satisfactory fitness level has been reached or maximum number of generations has been produced for the population.



A genetic algorithm requires the following:

1. A fitness function to evaluate the solution domain.
2. A genetic representation of the solution domain,

A candidate solution is usually represented using as an array of bits. Arrays other types and structures can also be used in the same way. The most important property that makes these genetic representations most convenient is that their parts are aligned easily because of their fixed size, which makes simple crossover operations easier. Even variable length representations can be used but in this case the cross over implementation will be more complex. In genetic programming, Tree-like representations are explored and in evolutionary programming graph-form representations are explored; a combination of both linear chromosomes and trees is explored in gene expression programming. Once the genetic representation and the fitness function are defined, a Genetic Algorithm proceeds to initialize a population of solutions and iterate it thru repeated application of mutation, inversion, crossover and selection operations.

Usually a simple form of GA will represent each chromosome as binary string. Usually numeric parameters are represented using integer values. It is also possible to represent them using floating point representation. The floating point representation is natural to evolutionary programming and evolution strategies. Based on theoretical and experimental results (see below). The basic GA algorithm performs mutation and crossover at the bit level. Other kinds of algorithms treat the chromosome as any imaginable data structures like a list of numbers which are indexes into an instruction table, nodes in a linked list, hashes, objects, or any other imaginable data structure. Crossover and mutation are performed so as to respect data element boundaries. For most data types, variation operators can be designed. Different chromosomal data types might work better or become worse for different specific problem.

Gray coding is often employed when bit-string representations of integers are used. By using grey coding small changes in the integer can be readily affected through mutations or crossovers. This method helps to prevent premature convergence at so called Hamming walls, where too many simultaneous mutations must occur in order to change the chromosome to a better solution.

Using arrays of real-valued numbers instead of bit strings are also used to represent chromosomes. Results from the theory of schemata suggest that in general the smaller the alphabet, the better will be the performance, but good results were also obtained from using real valued chromosomes. This was described as the set of real values in a finite population of chromosomes as forming a virtual alphabet with a much lower cardinality than would be expected from a floating point representation.

Binarization

Converting the input license plate image into a binary image is one of the most important and sensitive stages in localizing the license plates. The main challenges faced during the conversion is caused due to temporal and spatial variations encountered in the plate itself and the environment around it which causes several illumination problems. Due to these issues, binarization of the image using a fixed global threshold method is not suitable to overcome these problems. In this system a local adaptive method has been used to determine the threshold at each pixel dynamically based on the average amount gray levels in the neighborhood pixels.

The AT technique is just an extension of Bradley and Roth's and Wellner's methods. The idea used in Wellner's algorithm is a pixel is compared with an average of neighboring pixels. Specifically, an approximate moving average of the last S pixels seen is calculated while traversing the image. If the value of the current pixel is T percent lower than the average, then it is set to black; otherwise, it is set to white. This technique best suited because comparing a pixel to the neighboring average pixels will keep hard contrast lines and ignore soft gradient changes. The advantage of this method is that only a single pass through the image is required. Wellner uses one eighth of the image width for the value of S and 0.15 for the value of T to yield the best results for a variety of images. The value of T might be a little bit modified from the proposed value by Wellner depending on the used images; whereas it should be in the range $0.1 < T < 0.2$ in our method.

Noise Objects Elimination

Dilation and erosion are the Morphological operations used in this method. These are vital processes that are required in most pattern recognition systems to eliminate noise and retain only objects that are expected to represent the targeted patterns. In License Plate detection, closing operation i.e., dilation followed by erosion is performed to fill holes with noise inside candidate objects and to connect broken characters/symbols.

Image morphology is a way of analyzing images based on shapes. In this study, we assume that the blood vessels are a tubule-like structure running along the length of the face. The operators used in this experiment are opening and top-hat segmentation, which are explained next. The opening operation is done to preserve foreground areas that have a similar shape to the structuring element or that can completely contain the structuring element, while eliminating all other regions of foreground pixels. The top-hat segmentation has two versions; but for our process, we use one of the version known as white top-hat segmentation as this process enhances the bright objects in the image. This operation can be defined as the difference between the input image and its opening. The selection of the top-hat segmentation is based on the fact that we desire to segment the regions associated with those of higher intensity, which demark the facial thermal signature. The task in this step is to enhance the maxima in the image. The top-hat segmented image is thus given by the basic idea in binary morphology is to look at an image with a simple, pre-defined shape, drawing conclusions on how this shape misses or fits the shapes in the image. This is called the structuring element, and is itself a binary image (i.e., a subset of the space or grid).

Encoding and Recognizing

For a complex object such as license plate, encoding is accomplished based on the objects contained within it. Since after plate detection the next step is to recognize the license plate number, the number of main symbols identifying the plate numbers should be minimum.

The simplest algorithm represents every chromosome in binary i.e., bit string. Typically, numeric parameters are represented using integers, even though it can be represented using floating points. The floating point representation is natural to evolution strategies and evolutionary programming. The real-valued genetic algorithms is really a contradictory because it does not really represent the building block theory that was proposed by John Henry Holland. This theory also has some support based on theoretical and experimental results (see below). The basic algorithm performs crossover and mutation at the bit level. The other variants treat the chromosome as a list of numbers which indexes into anything such as nodes in a linked list, instruction table, hashes, objects, or any other imaginable data structure. Crossover and mutation are done to respect data element boundaries. For most data types, specific variation operators can be designed. For different problem domains, each chromosomal data types seem to work better or worse.

When bit-string representations of integers are being used, usually gray coding is being used. Due to this, small changes in the integer can be readily affected through mutations or crossovers. This prevents premature convergence at so called Hamming walls, in which too many simultaneous mutations must occur to change the chromosome to a better solution.

Other approaches involve using list or array of real-valued numbers instead of using binary or bit strings to represent chromosomes. Results from the theory of schemata suggest that usually when the alphabets are smaller the performance gets better. Initially it was surprising to researchers that good results were obtained from using real-valued chromosomes. This was explained as the set of real values in a finite population of chromosomes as forming a virtual alphabet with a much lower cardinality than would be expected from a floating point representation.

1. **Position relationship:** This will be represented using the relative distances between the bounding boxes of the two objects in both X and Y directions.
2. **Size relationship:** This will be represented as the relative differences in their bounding boxes' widths and heights. In the above relationships, relativity is achieved by dividing on the height or width of the first object depending on which is more stable for practical reasons. Although it is logical to divide differences in heights using height and differences in widths using width to compensate for scale changes in the general case.

Fitness Functions

The proposed fitness is taken as the inverse of the calculated objective distance between the current chromosome and the prototype chromosome. Before looking up on how the objective distance is calculated, first we can contemplate how the geometric relationships between the objects inside a compound object are represented, followed by a discussion of parameter adaption in the case of various LP detection layouts. The Genetic algorithm stops if one of the following conditions is met.

- 1) The best chromosome's objective distance (OD) is less than 5.
- 2) If the average objective distance (AOD) is not improved for 6 successive generations. Then chromosomes having minimum objective distance can be accepted if it is less than 8. This maximum limit will affect the allowable angle range for the detected license numbers. For most License plates, the alphabets and digits have same heights while some symbols might have different widths than others. Hence, standardized relationships between any two objects can be based on the height of the first object.

In this system, the Stochastic Universal Sampling (SUS) method has been used for the selection of offspring in the new generation. In this method (SUS) each individual or people is assigned to a continuous segment of a line equal in size to its fitness as in roulette-wheel selection. Then, a number of equally spaced pointers are placed over the line depending on the percentage of individuals to be selected. In our system, individuals of ninety percent of the population size are selected that will be exposed to mutation and crossover operators.

Mutation is necessary in this method because successive removal of members that not less fit in genetic iterations might alter or remove some characteristics of the genetic material forever. This can be avoided using mutation. By using mutation in the chromosomes, genetic algorithm ensures that new parts of the search space are attained to maintain the mating pool variety. We have employed two types of mutation operators viz., substitution operator and swap operator as follows:

There are many methods to implement the crossover operator like, single point crossover, two/double point crossover, n-point crossover, three parent crossover, uniform crossover and, alternating crossover, etc. These operators are not suitable for our method since the generated children will not be valid due to repeated genes that may be produced. Even if we prevent repetition, the resultant children's fitness will be improved slowly because of the randomness of these mechanisms. Another solution to this problem is to design a crossover operator that insures of the generated offspring are enhanced. Since, in case of license plate detection problem, genetic algorithm is used to search for a sequence of objects having almost the same 'y' position and placed in an order according to their respective 'x' positions, then the problem can be gradually solved by dividing the recombined objects of the chromosomes' according to their 'y' positions into 2 groups and then sorting each group (constituting a chromosome) according to the 'x' positions.

Extraction

To replace only a portion of the population between generations. The most common strategy is to replace the less fit individuals in the previous generation probabilistically. In elitist strategy the best fit individuals of the previous generation are added to the current population. Feature extraction is a type of reduction of dimensionality that efficiently represents parts of an image as a compact feature vector. This approach is useful when image sizes are huge and a reduced feature representation is required.

Feature detection, extraction, and matching are joined to solve common problems with computer vision such as object recognition and detection, content-based image retrieval, face detection and recognition, and texture classification.

The building blocks of many computer algorithms are the local features and descriptors. Their applications include image registration, object detection, classification, tracking, and motion estimation. Using local features makes these algorithms to better handle rotation, scale changes, and occlusion.

CONCLUSION

Hence in this paper we prove that with effective combination of the dynamic image processing and the genetic algorithm we have identified the multi-style number plates in an image by optimization. The procedure is useful in finding multiple number plates in the given image also. Various images are tested and the system finds the localized number plate with effectiveness.

REFERENCES:

1. Y. Qiu, M. Sun, and W. Zhou, "License plate extraction based on vertical edge detection and mathematical morphology," in Proc. Int. Conf. Comput. Intell. Softw. Eng., Dec. 2009, pp. 1–5.
 - A. Ahmadyfard and V. Abolghasemi, "Detecting license plate using texture and color information," in Proc. Int. Symp. Telecommun., 2008, pp. 804–808.
2. Li, R. Yuan, Z. Yang, and X. Huang, "A yellow license plate location method based on RGB model of color image and texture of plate," in Proc. 2nd Workshop Digit. Media Its Appl. Museum Heritages, 2007, pp. 42–46.
3. X. Shi, W. Zhao, Y. Shen, and O. Gervasi, "Automatic license plate recognition system based on color image processing," in Lecture Notes on Computer Science, Berlin, Germany: Springer-Verlag, 2005, vol. 3483, pp. 1159–1168.
4. M. Deriche, "GCC license plates detection and recognition using morphological filtering and neural networks," Int J. Comp. Sci. Info Security, vol. 8, no. 8, pp. 263–269, Dec. 2010.
5. O. Villegas, D. Balderrama, H. Domínguez, and V. Sánchez, "License plate recognition using a novel fuzzy multilayer neural network," Int. J. Comput., vol. 3, no. 1, pp. 31–40, 2009.
6. S. H. M. Kasaei, S. M. M. Kasaei, and S. A. Monadjemi, "A novel morphological method for detection and recognition of vehicle license plate," Amer. J. Appl. Sci., vol. 6, no. 12, pp. 2066–2070, 2009.
 - A. Theja, S. Jain, A. Aggarwal, and V. Kandavli, "License plate extraction using adaptive threshold and line grouping," in Proc. ICSPS, Jul. 2010, vol. 1, pp. 211–214.
7. P. Tarabek, "Fast license plate detection based on edge density and integral edge image," in Proc. Int. Conf. Appl. Mach. Intell. Inform, 2012, pp. 37–40.
8. Abolghasemi and A. Ahmadyfard, "A fast algorithm for license plate detection," in Proc. Int. Conf. Visual Inform. Syst., 2007, vol. 4781, pp. 468–477.
9. S. Roomi, M. Anitha, and R. Bhargavi, "Accurate license plate localization," in Proc. Int. Conf. Comput. Commun. Electr. Technol., 2011, pp. 92–99.
10. W. Wang, Q. Jiang, X. Zhou, and W. Wan, "Car license plate detection based on MSER," in Proc. Int. Conf. Consumer Electron. Commun. Netw., 2011, pp. 3973–3976.
11. W. Lim and Y. H. Tay, "Detection of license plate characters in natural scene with MSER and SIFT unigram classifier," in Proc. IEEE Conf. Sustainable Utilization Develop. Eng. Technol., 2010, pp. 95–98.
12. Anoual, S. Fkihi, A. Jilbab, and D. Aboutajdine, "Vehicle license plate detection in images," in Proc. Int. Conf. Multimedia Comput. Syst., 2011, pp. 1–5.
13. X. Zhang and S. Zhang, "A robust license plate detection algorithm based on multi-features," in Proc. Int. Conf. Comput. Autom. Eng., 2010, vol. 5, pp. 598–602.
14. Zheng, Y. Zhao, and J. Wang, "An efficient method of license plate location," Pattern Recogn. Lett., vol. 26, no. 15, pp. 2431–2438, 2005.
15. Xu, S. Li, and M. Yu, "Car license plate extraction using color and edge information," Mach. Learning Cybern., vol. 6, pp. 3904–3907, Aug. 2004.
16. S. Z. Wang and H. M. Lee, "Detection and recognition of license plate characters with different appearances," in Proc. Conf. Intell. Transp. Syst., 2003, vol. 2, pp. 979–984.
17. L. Carrera, M. Mora, J. Gonzalez, and F. Aravena, "License plate detection using neural networks," in Proc. IWANN, 2009, vol. 2, pp. 1248–1255.
18. M. I. Chacon and A. Zimmerman, "License plate location based on a dynamic PCNN scheme," in Proc. Int. Joint Conf. Neural Netw., 2003, vol. 2, pp. 1195–1200.

19. S.-L. Chang, L.-S. Chen, Y.-C. Chung, and S.-W. Chen, "Automatic license plate recognition," *IEEE Trans. Intell. Transp. Syst.*, vol. 5, no. 1, pp. 42–53, Mar. 2004.
20. S. K. Kim, D. W. Kim, and H. J. Kim, "A recognition of vehicle license plate using a genetic algorithm based segmentation," in *Proc. Int. Conf. Image Process.*, 1996, vol. 1, pp. 661–664.
21. Xiong, S. Du, D. Gao, and Q. Shen, "Locating car license plate under various illumination conditions using genetic algorithm," in *Proc. ICSP*, 2004, vol. 3, pp. 2502–2505.
22. Z. Ji-yin, Z. Rui-rui, L. Min, and L. Yinin, "License plate recognition based on genetic algorithm," in *Proc. Int. Conf. Comput. Sci. Software Eng.*, Dec. 2008, vol. 1, pp. 965–968.
23. P. de Ara'ujo, R. D. Maia, M. F. S. V. D'Angelo, and G. N. R. D'Angelo, "Automatic plate detection using genetic algorithm," in *Proc. 6th WSEAS Int. Conf. Signal Speech Image Process.*, Sep. 2006, pp. 43–48.
24. I. Kim, K. Jung, J. H. Kim, S.-W. Lee, and A. Verri, "Color texturebased object detection: An application to license plate localization," in *Lecture Notes on Computer Science*, Berlin, Germany: Springer-Verlag, 2008, vol. 2388, pp. 293–309.
25. J. Cano and J. C. Perez-Cortes, "Vehicle license plate segmentation in natural images," in *Lecture Notes on Comput. Sci.*, Berlin, Germany: Springer-Verlag, 2003, vol. 2652, pp. 142–149.
26. Sezgin and B. Sankur, "Survey over image thresholding techniques and quantitative performance evaluation," *J. Electron. Imaging*, vol. 13, pp. 146–165, Jan. 2004.
27. Otsu, "A threshold selection method from gray level histograms," *IEEE Trans. Syst., Man, Cybern.*, vol. 9, no. 1, pp. 62–66, Jan. 1979.
28. S. E. Umbaugh, *Computer Vision and Image Processing*. Englewood Cliffs, NJ, USA: Prentice-Hall, 1998, pp. 133–138.
29. J. E. Baker, "Reducing bias and inefficiency in the selection algorithm," in *Proc. Int. Conf. Genet. Algorithms Their Appl.*, 1987, pp. 14–21.
30. Z. H. Ahmed, "Genetic algorithm for the traveling salesman problem using sequential constructive crossover," *Int. J. Biometrics Bioinformatics*, vol. 3, no. 6, pp. 96–105, 2010.
31. W. Lenders and C. Baier, "Genetic algorithms for variable ordering problem of binary decision diagrams," in *Lecture Notes in Comput. Sci.*, New York, NY, USA: Springer-Verlag, 2005, vol. 3469, pp. 1–20

Cluster Wireless Sensor Networks for Safe and Efficient Transmission

P.Susmitha Vani, Praky Jain, Jyothi B

Student, Dr. Ambedkar Institute of Technology, susmita.vani@gmail.com, 9740877064

Abstract— Wireless Sensor Networks is one of the most rapidly growing and emerging concept in the scientific domain. It is growing because of its low cost and wide applications. WSN is one of communication tools used in many areas such as in civilians and militaries. WSN is a wireless network consisting of a web of sensor nodes whose basic feature is to sense, compute, communicate and power. Storage, bandwidth, communication capability, limited energy is its main resource constraints. Secure data transmission is an important issue for WSNs. Clustering is a way of enhancing the system performance of WSNs. In this paper, by using the concept of IBS and IBOOS scheme, we study SET protocols for CWSNs, called SET-IBS and SET-IBOOS. SET-IBS depends on the Diffie-Hellman problem. SET-IBOOS relies on discrete logarithm problem and the overhead computation for protocol security is reduced, which is crucial for WSNs. Our survey is based on various aspects of wireless sensor networks, discussing various types of WSNs and their applications, different distributed clustering algorithms used in WSNs and the reliability of routing protocols.

Keywords— WSN, Cluster-based WSNs, SET protocols, IBS/IBOOS schemes, Sensor nodes, Routing protocols, Diffie-Hellman problem, Discrete logarithm problem.

INTRODUCTION

A Wireless sensor network (WSN) is a network system comprised of spatially distributed devices using wireless sensor nodes which are used to monitor physical or environmental conditions, such as temperature, motion and sound. The individual nodes sense their environments, process the information data locally, and send data to one or more collection points in a WSN [1].

Efficient data transmission is one of the most important issues for WSNs. WSNs are deployed in rough, disregarded, and physical environments for certain applications. Sensor networks advantages are reliability, robustness, accuracy, and fault tolerance. Data dissemination and Data gathering are important WSN operations [2]. Secure and efficient data transmission (SET) is necessary and demanded in many such practical WSNs.

The basic step of working of WSN: Sensing-> Computation->Communication->Data aggregation at sink node->various applications.

Limited power sources and cost effectiveness of sensors to recharge the batteries which are usually irreplaceable so, their lifetime will depend on sensor batteries. The life time of wireless sensor network can be prolonged by using effective energy balancing methods.

ASPECTS OF WSN

Characteristics of WSN:

The main characteristics of WSN are:

- It uses Data centric approach
- Efficient power management
- Uses broadcast communication approach to gather information
- Withstanding harsh environments
- Cheap sensor nodes and easy to use

- Use of various protocols for efficient energy consumption.
- Heterogeneity and mobility of nodes i.e. nodes are not fixed.
- Cross layer design to improve transmission performance.

WSN Architecture

WSN architecture includes both a hardware platform and operating system designed. TinyOS [3] is a component based operating system designed to run in resource constraint wireless device.

The major components of WSN are:-

- Sensor Field: The area in which sensor nodes are deployed.
- Sensor Nodes: Sensor nodes are the sensors which are responsible for gather information and routing this information back to a sink.
- Sink: It is also a sensor node which receives, processes and stores data from other sensor nodes. It is responsible for message reduction need to be sent and also reduce the energy requirements.
- Task Manager (Base Station): a centralized point of control within the network used to extract information from the network and passes control information back to the network.

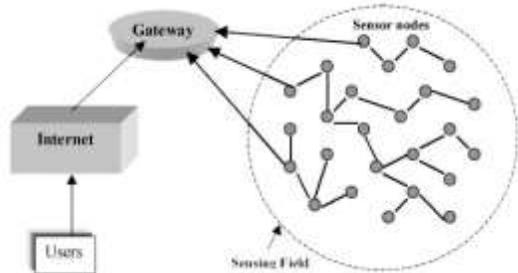


Fig1: Components of WSN

A Sensor is a tiny monitoring device which is based on micro sensor technologies which are capable of processing, sensing and communicating with other nodes. Signal processing capability is low with low computation power and bandwidth.

Components of wireless sensor node:

- Sensor Unit
- Processing Unit
- Radio Transceiver
- Battery
- Analog to Digital Convertor
- Location Finder
- Mobilizer

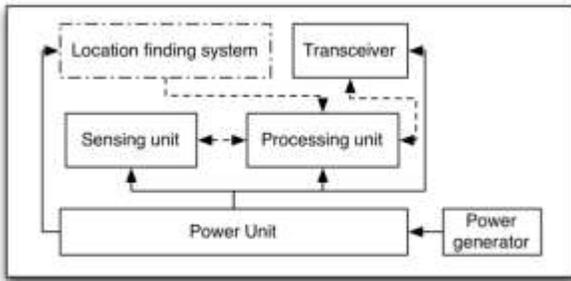


Fig2: Components of sensor node

TYPES OF WSN AND ITS APPLICATION

On the basis of interfaces sensor networks are classified in which nodes are deployed:

Underwater Wireless sensor network:

In this sensor network sensor nodes are employed under water. Through acoustic waves sensor nodes communicate with each other. This type is expensive, sparsely used, typically communicating directly to a base-station over long ranges rather than with each other [4]. This has limited bandwidth, long propagation delay and signal fading problem.

Applications: -

- Seismic monitoring
- Equipment Monitoring and Control

Underground Wireless sensor network:

This network is basically established under the ground and used to monitor the underground situations which are carried out through electromagnetic waves. Its disadvantages include signal losses and high attenuation and expensive.

Applications:

- Earthquake and landslide monitoring
- Intruder detection
- Environment monitoring
- Assisted navigation
- Infrastructure maintenance
- Sports field maintenance

Earthbound Wireless sensor network:

It is terrestrial WSNs where of nodes are arranged in ad hoc approach. Placements of nodes can be of optimal, grid, 2D, 3D types.

Applications:

- Military applications
- Environmental Monitoring
- Security
- Node tracking system
- Medical applications
- Industrial application
- Monitoring of human physiological data
- Forecasting

Mobile Wireless Sensor Network:

In this type of network sensor nodes are deployed to gather the information. These nodes can reposition and organize themselves in network. Localization, coverage, energy, maintenance, data processing etc are main features of mobile WSNs.

Applications:

- Heart rate, blood pressure health monitoring [5].
- Sensors attached to animals to track their migration patterns, feeding habits [6].
- Attaching sensors to aerial vehicles (UAVs) for surveillance and mapping [7].

Multi-media Wireless sensor networks:

These networks consist of a number of low cost sensors equipped with cameras and microphones which are used to monitor and track events in the form of multimedia. Its features include high bandwidth with low energy, QoS, filtering, processing data and its compression techniques.

Applications:

- Traffic monitoring
- Pollution control
- Smart healthcare
- Disaster/Emergency response
- Smart Environmental sensing

Wireless Nano sensor network:

Wireless communications is done based on integrated machines at the nano scale. For accelerating the deployment process of nano technology the design for the wireless nano sensor networks is fundamental.

CLUSTERING ALGORITHMS

Grouping of sensor nodes into clusters is called clustering. Every cluster has a leader, referred to as cluster-head (CH). The sensor nodes in the cluster or pre-assigned by the network designer elect CH [9]. A CH is a sensor or a node that is generally richer in resources. Membership of the cluster may be fixed or variable.

Advantages:

- Supports network scalability and localization of the route setup in the cluster [10].
- Conserves communication bandwidth [11].
- Stabilizes the network topology at the level of sensors and cuts on topology maintenance overhead [12].
- Implementation of optimized management strategies to prolong the battery life [13].

A CH can schedule activities in the cluster so that the nodes can switch to the low-power sleep mode most of the time and reduce the rate of energy consumption. CH aggregates the data collected by the sensors in its cluster [14].

Distributed clustering algorithms for WSNs

Distributed clustering is the mechanism in which, there is no fixed central CH and the CH keeps on changing from node to node based on some pre-assigned parameters.

A. Low Energy Adaptive Clustering Hierarchy (LEACH):

LEACH [15] is a clustering mechanism that distributes energy consumption all along its network which is divided into clusters. CHs are purely distributed and randomly elected. CHs collect the information from the nodes under its cluster. LEACH protocol involves four main steps for each round: Advertisement phase, cluster set-up phase, schedule creation and data transmission. Distinct CDMA codes are used to deal with Multi-cluster interference problem.

B. Hybrid Energy-Efficient Distributed Clustering (HEED):

HEED [16] is a distributed algorithm which selects the CH based on both residual energy and communication cost and supports heterogeneous sensor nodes. The random selection of CH and uneven distribution among the CH nodes will have its effect on the data gathering. Three phases in HEED protocol: Initialization, repetition and finalization phase.

C. Energy Efficient Hierarchical Clustering (EEHC):

EEHC [17] is a distributed, randomized clustering algorithm for WSNs. Information about the individual clusters is collected by CH and sends the report to the base-station. Their technique has two stages: Initial and extended. The initial stage is single-level clustering. Each sensor node declares itself as a volunteer CH. The second stage, is multi-level clustering and generally builds h levels of cluster hierarchy. To form an additional tier the clustering process is recursively repeated. The algorithm ensures h-hop connection between the base-station and cluster head.

D. Linked Cluster Algorithm (LCA):

The Linked Cluster Algorithm (LCA) is a distributed clustering algorithm that avoids communication collisions among nodes and uses TDMA frames for inter-node communication, with each node has a frame having a slot in the network for communication. It focuses on single-hop clustering and guarantees that no node will be more than one hop away from leader.

E. CLUBS:

This algorithm uses the advantage of local communication to efficiently aggregate the nodes into clusters [18]. Every node must belong to some cluster of same diameter in the network. It should have local routing, which means that every node within the cluster should be able to communicate with each other using only nodes within that same cluster. The CLUBS algorithm forms overlapping clusters. The main advantage of CLUBS is that CH conflict is probabilistically lower.

F. Fast Local Clustering Service (FLOC):

FLOC [19] is a distributed clustering technique that produces non-overlapping equal-sized clusters. FLOC achieves locality. FLOC exhibits a double-band nature of wireless radio-model for communication. A node can communicate reliably with the nodes that are in the inner band (i-band) range and unreliably with the nodes in its outer-band (o-band) range.

G. Algorithm for Cluster Establishment (ACE):

ACE [20] is a highly uniform cluster formation, self-organizing, efficient coverage, lesser overlapping and emergent cluster forming algorithm for WSNs, which is scale-independent. No knowledge of geographic location is required. The main idea of ACE is to assess the potential of a cluster node as a CH before becoming a CH and steps down if it is not the best CH at the moment. The two logical steps in ACE algorithm is "spawning" of new clusters and "migration" of existing clusters. ACE exhibits perfect scalability. ACE is fast, robust against packet loss and node failure thereby efficient in terms of communication.

H. DWEHC:

Distributed Weight-Based Energy-Efficient Hierarchical Clustering [21] is a well distributed clustering algorithm, which generates well balanced clusters. Each node first locates its neighbours, and then calculates its weight which is based on its residual energy and distance to its neighbors. The largest weight node in a neighborhood may become a CH. Neighboring nodes will join the clustered hierarchy as member nodes. There is significant improvement in both intra-cluster and inter-cluster energy consumption .

ROUTING PROTOCOLS

The process of determining a path between the source node and the destination node upon request of data transmission is called routing. Packets are relayed by nodes with the help of routing. For any given packet destination the routing tables contain lists of node options.

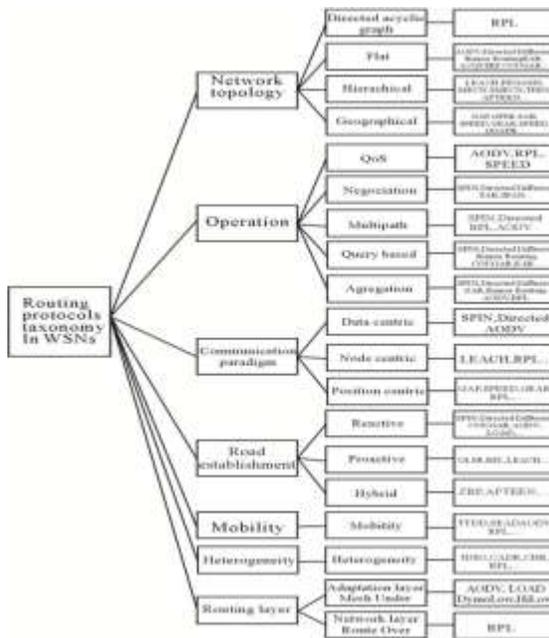


Fig3: Different Routing Protocols

WSN Routing Protocols can be classified into five ways:

- Establishment of the routing paths
- network structure
- protocol operation
- initiator of communications
- Selection of next-hop on the route of the forwarded message by a protocol

Path establishment Based Routing Protocols:

Routing paths can be established in one of three ways:

- Proactive: computes all the routes before they are really needed and then store these routes in a routing table in each node.
- Reactive: compute all the routes before they are really needed and then store these routes in a routing table in each node. They do not maintain the global information of all the nodes in a network.
- Hybrid: uses a combination of both proactive and reactive routing strategies which is applied to large networks.

Network Based Routing Protocols:

According to the structure of network and their functionalities protocols are divided into 3 categories:

- Flat-Based Routing: The number of sensor nodes is very large and uses data-centric routing approach in which Base station sends query to a group of particular nodes in a region and waits for response.

Examples of Flat-based routing protocols are:

- ✓ Energy Aware Routing (EAR)
- ✓ Directed Diffusion (DD)
- ✓ Sequential Assignment Routing (SAR)
- ✓ Minimum Cost Forwarding Algorithm (MCFA)
- ✓ Sensor Protocols for Information via Negotiation (SPIN)
- ✓ Active Query forwarding In sensor network (ACQUIRE)

• Hierarchical-Based Routing:

Also called as cluster based routing, it is used for network scalability and efficient communication. Hierarchical-based routing is energy efficient method in which high energy nodes are randomly selected for processing and sending data while low energy nodes are used for sensing and send information to the cluster heads.

Examples of hierarchical-based routing protocols are:

- ✓ Hierarchical Power-Active Routing (HPAR)
- ✓ Threshold sensitive energy efficient sensor network protocol (TEEN)
- ✓ Power efficient gathering in sensor information systems.
- ✓ Minimum energy communication network (MECN)

• Location-Based Routing:

Sensor nodes are scattered which are located using GPS.

Examples of location-based routing networks are:

- ✓ Sequential assignment routing (SAR)
- ✓ Ad-hoc positioning system (APS)
- ✓ Geographic adaptive fidelity (GAP)
- ✓ Greedy other adaptive face routing (GOAFR)
- ✓ Geographic and energy aware routing (GEAR)
- ✓ Geographic distance routing (GEDIR).

Operation Based Routing Protocols:

Optimal performance is achieved and the resources of the network are conserved. These routing protocols are classified according to their operations:

• Multipath Routing Protocols:

Multiple path selection for a message is done to reach destination thereby decreasing delay and increasing network performance.

Multipath routing protocols are:

- ✓ Multi path and Multi SPEED (MMSPEED)
- ✓ Sensor Protocols for Information via Negotiation (SPIN)

• Query Based Routing Protocols:

Queries are sent and received for data using high level languages. The destination node sends query of interest from a node through network and node with this interest matches the query and send back to the node which initiated the query.

Query based routing protocols are:

- ✓ Sensor Protocols for Information via Negotiation (SPIN)
- ✓ Directed Diffusion (DD)
- ✓ COUGAR.

• Negotiation Based Routing Protocols:

High level data descriptors are used to eliminate redundant data transmission through negotiation. Intelligent decisions are made either for communication or other actions based on facts such that how much resources are available. Negotiation based routing protocols are:

- ✓ Sensor Protocols for Information via Negotiation (SPAN)
 - ✓ Sequential assignment routing (SAR)
 - ✓ Directed Diffusion (DD)
- QoS Based Routing Protocols:
Network needs to have a balance approach for the QoS of applications. To achieve QoS, the cost function for the desired QoS also needs to be considered.

Examples of QoS routing are:

- ✓ Sequential assignment routing (SAR)
- ✓ SPEED
- ✓ Multi path and Multi SPEED (MMSPEED)

Initiator of Communication Based Routing Protocol:

Communication between a network components is done, where they usually in sleep mode temporary. The source node initiates the routing with other part to send or/and receive the control or data packets for service.

- Source Initiator Routing Protocol
- Destination Initiator Routing Protocol

Next-Hop Selection Based Routing Protocols:

- Content-based routing protocols:
Based on the query content the next-hop on the route is determined. The base requests only for data regardless of its origin and does not query.
- Probabilistic routing protocols:
Sensor nodes are homogeneous and randomly deployed. They select the next-hop neighbour for the message to be forwarded.

Energy Aware Routing Protocol:

- Location-based routing protocols:

The next-hop towards the destination is selected based on the known position of the neighbors and the destination. Communication overhead caused by flooding can be avoided.

- ✓ GEAR (Geographical and Energy Aware Routing).

- Hierarchical-based routing protocols:

Message for a each node (also called aggregator) that is in a higher hierarchy level than the sender is forwarded. The incoming data is aggregated in each node by which communication overload is reduced and energy is conserved. Network lifetime and scalability is increased. The set of nodes which forward to the same aggregator(CH) is called cluster.

- ✓ LEACH (Low Energy Adaptive Clustering Hierarchy) protocol.

- Broadcast-based routing protocols:

Each node in the network decides individually whether to forward a message or not. If a node decides to forward, it simply re-broadcasts the message. If it declines to forward, the message will be dropped.

- ✓ MCFA (Minimal Cost Forwarding Algorithm).

SET-IBS and SET-IBOOS Protocols:

Two Safe and Efficient for CWSNs, called SET-IBS and SET-IBOOS is used. The idea of both protocols is to check the validity of the encrypted sensed data. Digital signatures and key management are applied to message packets for verification and security. The Base Station distributes secret keys and pairing parameters and loaded in all the sensor nodes which deals with the key escrow problem described in ID-based cryptosystems. Safe communication in relies on the ID based cryptography is used in SET-IBS for secure communication. User public keys are their ID information. To reduce the computational overhead for security the IBOOS scheme is used, in which security relies on the hardness of the discrete logarithmic problem. Both protocols solve the orphan node problem using the concept of symmetric key management. It requires less energy for computation and storage. The CH sensor nodes execute the offline signature. Node to node communication is more suitable using SET_IBOOS in CWSNs.

CONCLUSION

In this paper, we first reviewed the aspects of wireless sensor networks, its characteristic and architecture. We also discussed various types of WSNs and their applications. We then presented different types of clustering mechanisms stating their advantages and disadvantages. We classified the routing protocols into many categories and stated two secure and efficient data transmission protocols for CWSNs i.e. SET-IBS, and SET-IBOOS. These can provide us solutions for many monitoring problems. We can conclude that to make the Wireless sensor network energy efficient is one of the great areas for future work.

REFERENCES:

- [1] T. Hara, V.I. Zadorozhny, and E. Buchmann, *Wireless Sensor Network Technologies for the Information Explosion Era*, Studies in Computational Intelligence, vol. 278. Springer-Verlag, 2010.
- [2] Y. Wang, G. Attebury, and B. Ramamurthy, "A Survey of Security Issues in Wireless Sensor Networks," *IEEE Comm. Surveys & Tutorials*, vol. 8, no. 2, pp. 2-23, Second Quarter 2006.
- [3] I.F. Akyildiz, W. Su*, Y. Sankarasubramaniam, E. Cayirci. *Wireless sensor networks: a survey*. *Computer Networks* 38 (2002) 393-422.
- [4] John Heidemann, Yuan Li, Affan Syed, Jack Wills, Wei Ye. *Underwater Sensor Networking: Research Challenges and Potential Applications*. USC/ISI Technical Report ISI-TR-2005-603.
- [5] H. Yan, H. Huo, Y. Xu and M. Gidlund. 2010. *Wireless Sensor Network Based E-Health System – Implementation and Experimental Results*. *IEEE Transactions on Consumer Electronics*, vol. 56, no. 4, pp. 2288-2295.

- [6] S. Ehsan et al. 2012. Design and Analysis of Delay-Tolerant Sensor Networks for Monitoring and Tracking FreeRoaming Animals. IEEE Transactions on Wireless Communications, vol. 11, no. 3, pp. 1220-1227.
- [7] B. White et al. 2008. Contaminant Cloud Boundary Monitoring Using Network of UAV Sensors. IEEE Sensors Journal, vol. 8, no. 10, pp. 1681-1692.
- [8] G. Piro, L.A. Grieco, G. Boggia, and P. Camarda. Simulating Wireless Nano Sensor Networks in the NS-3 platform.
- [9] B. Baranidharan, B. Shanthi, A survey on energy efficient protocols for wireless sensor networks, International Journal of Computer Applications, 11(10) (2010) 0975-8887.
- [10] W. Heinzelman, A.P. Chandrakasan, H. Balakrishnan, Application specific protocol architecture for wireless microsensor networks, IEEE Transactions on Wireless Networking (2002).
- [11] O. Younis, S. Fahmy, HEED: A hybrid energy-efficient distributed clustering approach for Ad Hoc sensor networks, IEEE Transactions on mobile computing 3(4) (2004) 366-379.
- [12] S. Bandyopadhyay, E. Coyle, An energy efficient hierarchical clustering algorithm for wireless sensor networks, in: Proceedings of the 22nd Annual Joint Conference of the IEEE Computer and Communications Societies (INFOCOM 2003), San Francisco, California, April 2003.
- [13] K. Akkaya, M. Younis, A survey on routing protocols for wireless sensor networks, Elsevier Journal of Ad Hoc Networks 3(3) (2005) 325-349.
- [14] M. Younis, M. Youssef, K. Arisha, Energy-aware management in cluster-based sensor networks, Computer Networks 43(5) (2003) 649-668.
- [15] Y.T. Hou, Y. Shi, H.D. Sherali, On energy provisioning and relay node placement for wireless sensor networks, IEEE Transactions on Wireless Communications 4(5) (2005) 2579-2590.
- [16] K. Dasgupta, K. Kalpakis, P. Namjoshi, An efficient clustering-based heuristic for data gathering and aggregation in sensor networks, in: Proceedings of the IEEE Wireless Communications and Networking Conference (WCNC 2003), New Orleans, LA, March 2003
- [17] S.D. Murugananthan, D.C.F. Ma, R.I. Bhasin, A.O. Fapojuwo, A centralized energy-efficient routing protocol for wireless sensor networks, IEEE Transactions on Communication Magazine 43(3) (2005) S8-13.
- [18] A.A. Abbasi, M. Younis, A survey on clustering algorithms for wireless sensor networks, Elsevier Journal of Computer Communications 30(2007) 2826-2841.
- [19] H. Chan, A. Perrig, ACE: An emergent algorithm for highly uniform cluster formation, in: Proceedings of the 1st European Workshop on Sensor Networks (EWSN), Berlin, Germany, January 2004.
- [20,21]. Ding, J. Holliday, A. Celik, Distributed energy efficient hierarchical clustering for wireless sensor networks, in: Proceedings of the IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS'05), Marina Del Rey, CA, June 2005

Dynamic Resource Reservation and Congestion Control in Real Time Communication System

Sauvik Bal¹, Professor Kaushik Banerjee²

¹Dept. of Computer Science & Engineering, Institute of Engineering & Management, India, sauvikbal@gmail.com

²Dept. of Computer Science & Engineering, Institute of Engineering & Management, India, kaushik.saltlake@gmail.com

Abstract— In real time communication, resource management is very much important to control the congestion of the network. Here we are going to propose an algorithm to allocate resource dynamically at the streaming time. Also we are trying to control the bit rate of data packets to overcome the congestion and maintain the QoS of the video at the receiver end. Also we have to maintain the scalability of the network and minimal number of packet loss and low delay. When continuously data streaming is going on, the network may jammed. At that moment we have to control the data transmission speed so that we can prevent the data packet loss. Here we are going to use variable bit rate (VBR) [2] concept to control the data transmission speed over the network. We also try to reduce the resources wastage at streaming time.

Keywords— VBR, ingress node, egress node, QoS, congestion, data packets, threshold bandwidth

INTRODUCTION

To prevent the resource wastage at the network, we are going to use dynamic resource reservation at the network. User sends request to server to access the data content. Data packets are divided and distributed over the network. Depending upon the threshold bandwidth, data packets chose the available routers and create path. There is an init () message, which initiate the transmission. Another is feedback () message by which we can know about the traffic of the network. If some network domain is congested, we send a feedback () message to the previous domain to control the data transmission speed. Resources are reserve for a flow according to the threshold bandwidth.

RESOURCE RESERVATION

In real time communication system we can reserve resources in two ways. We can reserve some certain amount of resources previously that is statically or we can reserve resources dynamically at run time. Here we are discussing about the dynamic resource reservation technique to maintain the QoS of the network.

Dynamic reservation is based on online network traffic prediction [5]. This is called predictive dynamic bandwidth allocation. Predictive dynamic bandwidth allocation is two types, like direct and indirect. There are some problem in direct predictive bandwidth allocation method, like signal, time prediction problem.

In our proposed algorithm we dynamically reserve resources based on the feedback () and init () message. We uses DiffServ domain to implement our method. In DiffServ [1] domain there is two boundary routers and some core routers in between them.

CONTROL BY CHANGING BIT RATE

In real time communication system bit rate can be constant or variable. In constant bit rate method the data transmission speed is same all over the network and in all times.

Here we are trying to control the data speed with variable bit rate. VBR can be prerecorded or can be real time. In prerecorded VBR the data transmission speed is fixed. In case of real time VBR, the data packet transmission depends on the congestion happens on the network traffic. Video transmission is one of the examples of real time VBR. We are implementing this concept on DiffServ domain. In DiffServ domain we control the aggregate of flow. In each DiffServ domain there is two boundary router (ingress and egress), one is ingress and another is egress and some core routers. The bit rate is calculated and controlled at boundary router. Core router is only forwarded the data packets.

PROPOSED ALGORITHM

Let, the total data is N

No. of router present K
Threshold bandwidth BW_T
Bit Rate R

Initialize N

Data are divided into $n_1, n_2, n_3, \dots, n_x$ packets.

Send init () message

For $i < 1$ to K

// Check the available ingress router (from 1 to K^{th} router) which has threshold bandwidth value.

{

If $\sum_{i=1}^x N_i > BW_T$

// If the total packet size is greater than BW_T , then

{

$\sum_{i=1}^a N_i, \sum_{i=a+1}^b N_i, \dots, \sum_{i=b+1}^z N_i$ (where a, b, ..., z are the ingress routers)

// the data packets are divided and grouped as per the 'Data distributor' policy

}

//Chose the next path where sufficient bandwidth is available and reserve the required resource

insert (N_i)

if (Domain is congested)

{

feedback ()

//feedback to the previous domain to reduce the bit rate

$R=R-1$

// reduce bit rate of the previous domain

forward (N_i)

//data packets are forwarded to the core routers of a domain

}

else

forward (N_i)

}

feedback ()

{

..

}

//feedback message send to server

Description:

User sends request to the server to access the data. The data are divided into different packets and waited in a queue. Then these are come to the 'data distributor' where all packets are marked and assign precedence. Now data distributor sends init () message to the connected router (ingress node). Depending upon the precedence, data packet makes group. Here we store the information about aggregate of flow. It will be checked by init () message in which domain, ingress router has available bandwidth. Mainly check the router's threshold bandwidth. If the data packets volume is greater than the available bandwidth, the data packets are make group and distributed in different path. Now data packets are able to transmit. At that time required resources are allocated for that flow. That means for a particular flow how much resource is required that much is only reserved. Remaining are stored for another use.

When data packets are forwarded, a feedback () message is generated and send it to the previous domain. If a domain is congested then the feedback () message goes to the previous domain to reduce the bit rate. When the data bit rate is reduced at the previous domain, the congestion of the present domain would also reduce. At that time previous domain may be congested due to bit rate reduction. So we have to make this process in synchronized way.

Actually by using the feedback () message we change the data transmission bit rate to reduce the congestion and maintain the QoS.

PICTORIAL REPRESENTATION

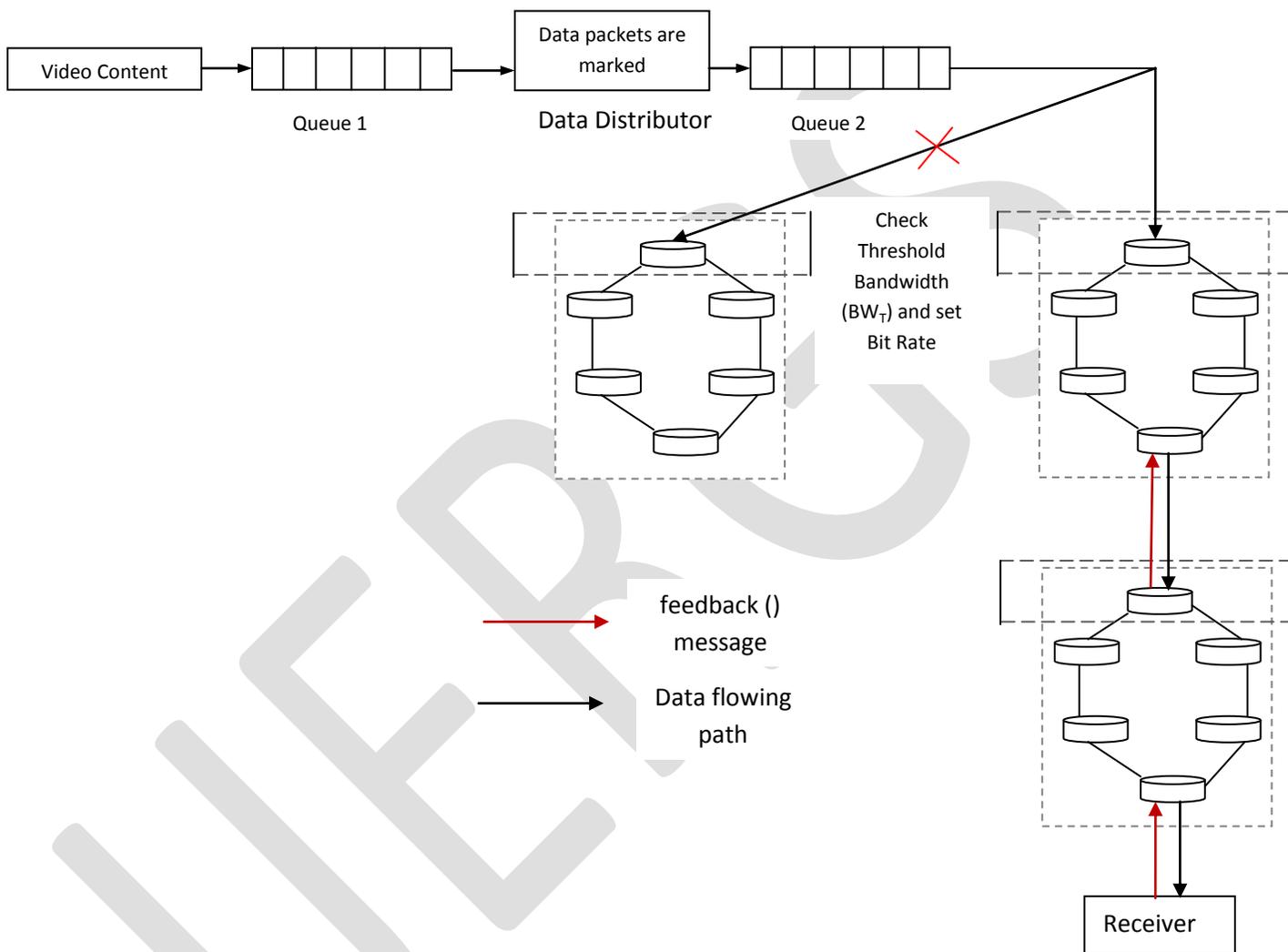


Fig. 1: Pictorial form of our method

1. Video contents are stored in the main server location. When user send the request to access the video file, then that are divided into small data packets and stored in a queue (In our diagram 'Queue 1') [3] and come to ISP (Internet service provider).
2. After that data packets are come to the 'Data distributor' part. Here the data packets are marked and assign precedence.
3. This marked and precedent data packets are then waited in a new queue, named 'Queue 2'.
4. Data packets are come to the available domain. In each domain the ingress node has assigned a particular threshold bandwidth. If the node has available bandwidth, then data packets can pass through that domain. Otherwise the packets are restricted to transmit.
5. The data packets makes new group according to the bandwidth availability and again check the threshold bandwidth of other domains.
6. If there is available bandwidth, then data packets are ready to transmission.

7. At that time required amount of resources are reserve for the particular flow. Remaining resources are stored for another flow.
8. At egress node of each domain we can manage the data transmission control speed as well as the congestion of the network by using variable bit rate (VBR).
9. If any congestion happens in any router, the threshold value of that domain increased.
10. A feedback () message is send to the previous domain to reduce the data passing speed.
11. Data bit rate will be normalized when congestion is under control.
12. So if any congestion happens, by using VBR, data transmission speed is restricted and congestion can be controlled.

ACKNOWLEDGMENT

We would like to thank all the personalities those who always support and encourage us to do the research work. We would also like to thank all our mates, colleagues, faculties for their precious help.

CONCLUSION

By using our algorithm we reserve resources at run time. That means we can reserve that much of resources which is required for a particular data flow. Also to avoid the congestion of the network we uses variable bit rate. If congestion happens in present domain, by using VBR we restrict the data bit speed in the previous domain. So in present domain congestion can be avoided but there may be problem occurs in previous domain due to the sudden reduction of data speed. So we have to control the bit rate in such a synchronized way that congestion can be controlled. We have to control the bit rate depending upon the network behavior. We can prevent the data bit loss by using this algorithm also we can maintain the quality of the content.

REFERENCES:

- [1] Sauvik Bal, Professor Kaushik Banerjee, "Routing based on Receiver Feedback with Resource Reservation in Real Time Communication", International Journal of Innovative Research in Advanced Engineering (IJIRAE); Volume 1 Issue 10 (November 2014).
- [2] Yao Liang, "Real-Time VBR Video Traffic Prediction for Dynamic Bandwidth Allocation", IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART C: APPLICATIONS AND REVIEWS, VOL. 34, NO. 1, FEBRUARY 2004.
- [3] Min Wu, Robert A. Joyce, Hau-San Wong, Ling Guan, Sun-Yuan Kung, "Dynamic Resource Allocation via Video Content and Short-Term Traffic Statistics", IEEE TRANSACTIONS ON MULTIMEDIA, VOL. 3, NO. 2, JUNE 2001.
- [4] Dan Jurca, Pascal Frossard, "Video Packet Selection and Scheduling for Multipath Streaming", IEEE TRANSACTIONS ON MULTIMEDIA, VOL. 9, NO. 3, APRIL 2007.
- [5] Abdel-Karim Al-Tamimi, Raj Jain, Chakchai So-In, "Dynamic Resource Allocation Based on Online Traffic Prediction for Video Streams", Internet Multimedia Services Architecture and Application (IMSAA), 2010 IEEE 4th International Conference, 15-17 Dec. 2010.
- [6] Min Wu, Joyce, R.A. , Hau-San Wong Zing Guan , Sun-Yuan Kung, "Dynamic resource allocation via video content and short-term traffic statistics", Multimedia, IEEE Transactions on (Volume:3 , Issue: 2), Jun 2001.
- [7] Heyman, D., Lakshman, T.V.; Tabatabai, A.; Heeke, H., "Modeling teleconference traffic from VBR video coders", Communications, 1994. ICC '94, SUPERCOMM/ICC '94, Conference Record, 'Serving Humanity Through Communications.' IEEE International Conference, 1-5 May 1994

A SURVEY ON DESIGN OF EFFICIENT NONVOLATILE SRAM CELL FOR INSTANT ON-OFF OPERATION

Miss. Nikita V. Keche¹

Student of HVPM'S College of Engineering and Technology Amravati (India)

Email-nikita4keche@gmail.com

Contact Number--919503455384

Mr. Ashish E. Bhande²

Asst. Professor in Dept. of HVPM'S College of Engineering and Technology (India)

Abstract— In today's technological world of nanoscale CMOS IC, energy is consumed more and is getting serious problem. To minimize this energy consumption, low voltage circuits are needed. Static random access memory (SRAM) is a key element in wide variety of applications and so considering the need of SRAM cell, NVSRAM have been proposed. NVSRAM provide fast power on-off speeds and information doesn't loss even if the power supply is turned off. This paper provide new approach towards designing and modeling of NVSRAM cell using volatile SRAM core. The nonvolatile characteristic and the nanoscale geometry of NVSRAM increases the packing density with CMOS processing technology provides new approaches towards power management, without loss of stored information, Hence has potential for major saving in power dissipation. Also NVSRAM cell has scope for speed improvement as the technology matures.

Keywords— Memory, Volatile memory, Nonvolatile memory, Random access memory(RAM), Static random access memory(SRAM), Non volatile static random access memory(NVSRAM), CMOS IC.

INTRODUCTION

The research for new model that will attain processing speed in terms of exa flop and then into zeta flop order is a major challenge for both system architects and circuit designers. Also there is need for realizations of new components and related circuits that are compatible with CMOS processing technology as CMOS scaling begins to slow down. This need for the realization of new circuits has arise because of the evolutionary growth of networks. In recent technology NVSRAM cell is in more focus and is creating more possibilities towards realization of innovative circuits. In this project we propose and modelled the architecture of NVSRAM cell for instant on-off operation using 45nm VLSI/CMOS technology. A typical SRAM cell consist of 6 transistors. SRAM cell is used with non volatile memory and can be fabricated as an extension to CMOS processing technology and addressing the current research towards reduction of power utilization.

Conventional SRAM cell

To appreciate some of the benefits of the proposed architecture we provide brief overview of conventional SRAM cell. The 6T SRAM cell has 2 back to back connection of inverters using N1,P1,N2, P2 and has 2 access transistors. The inverters are used to store either single bit '0' or '1'. Also 'WL' is used to turn on the access transistors and BL/BL are bit lines through which bits are apply. SRAM cell has three different states it can be in standby where the circuit is idle, reading when data has been requested and writing when updating the contents [4]. However one of the known problem for conventional 6T SRAM cell for ultra low power applications is its static noise margin. SNM is an important factor in consideration of write and read operation. Sunil jadvav has shown that SNM is reduced by using adiabatic technique [3]. However inclusion of nonvolatile memory in the architecture ensures that data is retained even if the power supply is removed and enabling new possibility in the system design by including all of the important issue of power management.

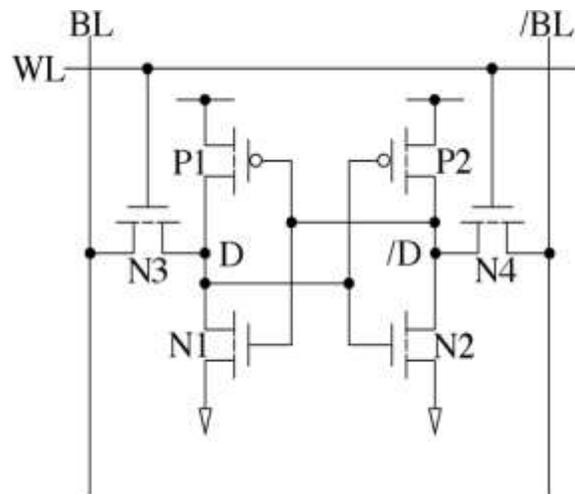


Fig.1. Conventional 6T SRAM cell

LITERATURE REVIEW AND RELATED WORK

From the review of the related work and available literature it is observed that many researcher have designed NVSRAM cell by applying their own techniques. NVSRAM is one of the advanced NVRAM technology which is fast replacing the battery backed SRAMs which need battery free solutions. The proposed NVSRAM cell is to be designed using CMOS/VLSI technology. Wei wei has researched on design of 7T1R SRAM cell for instant on operation. This proposed cell provides better nonvolatile performance such as power down, restore and store operation[1]. Pankaj kumar pal has researched on dual k spacers technology to enhance SRAM performance in terms of robustness , access time and leakage power [2]. Sunil jadav designed ultra low power 6T SRAM using adiabatic technique and by this technique average power dissipation and static noise margin is also reduced [3]. K. Dhanumjaya designed conventional 6T dynamic 8T SRAM cell and achieved improved read stability, read current and leakage current[4]. Keejong kim design a low power SRAM using Bit-line charge recycling method and achieved reduced power dissipation in write cycle[5]. Yi-Bo Liao has researched on design of gate-all-around silicon MOSFETs for 6T SRAMs area efficiency. This research is on area efficiency means architecture is designed in minimum cell area[6]. Mi Chang Chang has researched on transistor and circuit design optimization for low power CMOS. As the power is leaked during read-write cycle hence for power management this research has been taken [8]. After reviewing all of these researched paper and considering the demand of today's fast communication world, research has been taken to design low power efficient NVSRAM cell using 45nm CMOS/VLSI technology.

PROPOSED WORK

NVSRAM is more advanced NVRAM technology. It has some advantages over conventional 6T SRAM. In conventional SRAM power get lost if the power supply get disabled however in NVSRAM power doesn't lost even if the power supply get disabled. Thus we proposed the architecture of NVSRAM cell by adding non volatile memory to conventional SRAM and trying to make the architecture more efficient. In these subsections, variations of NVSRAM cells as well as brief architecture description is mentioned .The objective in this project are to design and verify the conventional SRAM cell, to design the NVSRAM cell by utilizing volatile SRAM core, to design the SRAM cell for 'instant on' operation, to design the CMOS layout of NVSRAM cell using microwind tool based on 45nm CMOS technology and to analyze the NVSRAM cell for area, power and propagation delay. The NVSRAM cell forms a feedback structure. Due to this feedback structure a low input value on the first inverter will generate high value on second inverter which amplifies and stores the low value on the second inverter. Similarly a high input value on the first inverter will generate a low input value on the second inverter , which feeds back the low input value onto the first inverter. Therefore the 2 inverters will store their current logical value, whatever value that is. Also the stored value doesn't lost even if the power supply get turned off because of

the nonvolatile element used in the structure. Hence the structure efficient nonvolatile SRAM cell is proposed. The general model for non volatile memory with 6T SRAM cell as core is as follows.

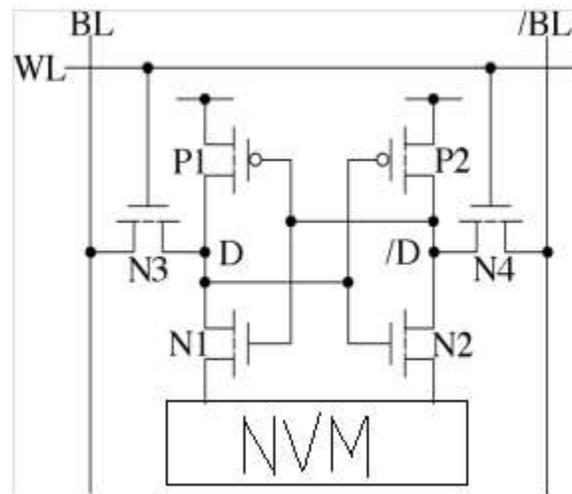


Fig.2.General model for NVSRAM Cell

The proposed NVSRAM cell can be in one of the 3 states as follows. It can be either in

Standby: If the word line is not inserted, the access transistors disconnect the cell from the bit lines. The two cross coupled inverters will continue to reinforce each other as long as they are connected to the supply [4].

Reading: Assume that the content of the memory is a 1, stored at D. The read operation is done by using the sense amplifiers that pull the data and produce the output. The row and column decoders are used to select the appropriate cell or cells from which the data is to be read and are given to the sense amplifiers through transmission gate [4].

Writing: The start of a write cycle begins by applying the value to be written to the bit lines. If we wish to write a 0, we would apply a 0 to the bit lines, i.e. setting BL bar to 1 and BL to 0. A 1 is written by inverting the values of the bit lines. WL is then inserted and the value that is to be stored is latched in. The reason this works is that the bit line input-drivers are designed to be much stronger than the relatively weak transistors in the cell itself, so that they can easily override the previous state of the cross-coupled inverters [4]. By reducing the number of components i.e. cmos transistor while designing should be less. Also software tool used in this project for the implementation of efficient non volatile SRAM cell is “microwind”. Thus we proposed efficient NVSRAM cell and will try to make it more efficient

ACKNOWLEDGMENT

We are very grateful to our college of HVPM college of engineering and technology to support and other faculty and associates of ENTIC department who directly and indirectly helped me for this paper.

CONCLUSION

NVSRAM are applicable in area such as Medical equipment, in commercial vehicles, in case of external power failure also applications in environments where field service is not possible/costly . A complete functional analysis is given to explain how the proposed cell operates with respect to timing, variation and stability. Considering the advancement of future technology and advantage of 45nm technology the future project has been decided to do with selection of higher order of nm technology. Thus considering all of the details about the demand of today’s fast communication world, the research has been taken to design efficient non volatile SRAM cell for instant on-off operation using 45nm CMOS/VLSI technology.

REFERENCES:

- [1] Wei Wei, Student Member, Kazuteru Namba, Member, Jie Han, Member and “Fabrizio Lombardi”, “Design of a Non-Volatile 7T1R SRAM Cell for Instant-on Operation”, 2014.
- [2] Pankaj Kumar Pal, Student Member, IEEE, Brajesh Kumar Kaushik, Senior Member, IEEE, and Sudeb Dasgupta, Member, IEEE “Design Metrics Improvement for SRAMs Using Symmetric Dual-k Spacer (SymD-k) FinFETs”. Vol. 61, No. 4, APRIL 2014.
- [3] Mr. Sunil Jadav, Mr. Vikrant, Dr. Munish vashisath “Design and performance analysis of ultralow power 6t sram using adiabatic technique”. Vol.3, No.3, June 2012.
- [4] K.Dhanumjaya, M.Sudha, Dr.MN.GiriPrasad, Dr.K.Padmaraju “Cell stability analysis of conventional 6t dynamic 8t sram cell in 45nm Technology”. Vol.3, No.2, April 2012.
- [5] Keejong Kim, Hamid Mahmoodi, Member, IEEE, and Kaushik Roy, Fellow, IEEE “A Low-Power SRAM Using Bit-Line Charge-Recycling.” Vol. 43, No. 2, February 2008.
- [6] Yi-Bo Liao, Student Member, IEEE, Meng-Hsueh Chiang, Senior Member, IEEE, Nattapol Damrongplisit, Student Member, IEEE, Wei-Chou Hsu, Member, IEEE, and Tsu-Jae King Liu, Fellow, IEEE “Design of Gate-All-Around Silicon MOSFETs for 6-T SRAM Area Efficiency and Yield”. Vol.61, No.7 July 2014.
- [7] Zafrullah Kamar and Kundan Nepal Dept. of Electrical Engineering, Bucknell University, Lewisburg, PA. “Noise Margin-Optimized Ternary CMOS SRAM Delay and Sizing Characteristics”.
- [8] Mi-Chang Chang, Member, IEEE, Chih-Sheng Chang, Chih-Ping Chao, Ken-Ichi Goto, Member, IEEE, Meikei Jeong, Senior Member, IEEE, Lee-Chung Lu, and Carlos H. Diaz, Fellow, IEEE “Transistor and Circuit Design Optimization for Low-Power CMOS” VOL. 55, NO. 1, JANUARY 2008

Protecting Documents Using Visual Cryptography

Ali J. Abboud

University of Diyala _College of Engineering, ali.j.abboud@uodiyala.edu.iq

Abstract— Digital documents are produced in enormous amounts everywhere in the digital world. The confidentiality, authenticity and integrity of these documents increased dramatically recently in the insecure networked environments. In this paper, we design new methods based on the visual cryptography and steganography to protect multiple digitized documents from threats created by unauthorized people. Visual cryptography is a visual secret sharing scheme used widely and proved to be secure enough in different areas. The experimental results demonstrate the efficacy of these methods to protect sufficiently multiple digital documents.

Keywords: visual cryptography, secret sharing, multiple documents protection, LSB, confidentiality, integrity and authentication.

I. INTRODUCTION

In the internet era, all our daily life actions have been managed electronically using huge number of computers connected by internet network. These electronic actions include selling and buying different things, online managing of bank accounts, online booking of air flight tickets, registering in the universities and schools and online applying for visa [1]. All these activities need to produce and manage documents digitally, an example on these documents, including university transcripts, letters and business contracts [2]. Producing digital documents electronically is more convenient and simpler than paper documents and also dealing with paperless documents is far better because of the ease of editing, searching and storing of them [1]. In addition, making these documents available digitally in the computer networks permit them to be transmitted and processed electronically [2]. However, releasing documents in the networks exposes them to different types of attacks and threats, hence; protecting digital documents is very important matter in the networked society [3].

Recently, several approaches have been proposed to protect documents. Fischer and Herfet [2] proposed a technique to protect documents integrity using visual CAPTCHAs and compared it with different kinds of authentication mechanisms such as digital signatures and hash functions. Same authors in [2] developed another method to provide document authentication using human-recognizable watermarks instead of digital signatures and message authentication codes that need complex computations [3]. Fischer and Herfet continued to improve their proposed methods explained earlier by adding text transformations to make document authentication more robust. The rest of paper is organized as follows: in section **II** visual cryptography concepts are explained, section **III** is devoted to explain our proposed methods thoroughly and finally section **IV** is dedicated for conclusions and future work.

II. VISUAL CRYPTOGRAPHY

Visual cryptography is a methodology proposed by Naor and Shamir in 1994 to share secret information among several participants in the shape of transparencies [4]. The secret information may be handwritten notes, images or text that can be uncovered without any complex cryptographic computations [4]. In the (k, n) visual cryptographic scheme, the secret information is shared among n participants and the secret is recovered if k or more shares (or transparencies) stacked together. Otherwise, if $k-1$ or fewer of shares are available only then we cannot reveal secret information. In the following, we describe the main schemes of visual cryptography as follows:

A. Black and White Visual Cryptography Scheme [2, 4, 5]

In black and white visual cryptography scheme, every pixel in the secret image is partitioned into 2x2 block in the two shares based on the rules in the **Fig. 1**. If white pixel exist in the secret image, then the dealer choose randomly one of shares in the first row and distribute them on shared transparencies; otherwise if the color of secret image is black, then the dealer choose randomly one of the shares in the second row and distribute them on the shares. Furthermore, the results of stacking sub-pixels in the shared transparencies: black and black is black, black and white is black, white and white is white. Finally, when the dealer stack two transparencies together, stacking black blocks give full black color and stacking white blocks gives half black and half white.

Secret image	Share1	Share2	Stacked image
□			
■			

Figure (1): Black and white visual cryptography scheme [5].

B. Gray-level Visual Cryptography Scheme [5, 6, 7]

Gray-level visual cryptography scheme is a developed version of black and white counterpart. In this scheme, halftoning technology is used to convert gray image into black and white image to be later encoded by dealer. Halftoning is a widely employed in the printers and scanners to convert continuous tone image to halftone image. The algorithm of gray-level visual cryptography scheme [5]:

1. Transform the gray-level image into a black-and-white halftone image.
2. For each black or white pixel in the halftone image, decompose it into a 2x2 block of the two transparencies according to the rules in the **Fig. 1**. If the pixel is white, randomly select one combination from the former two rows in **Fig.1** as the content of blocks in shares 1 and 2. If the pixel is black, randomly select one combination from the latter two rows as the contents of the blocks in the two transparencies.
3. Repeat step 2 until every pixel in the halftone image is decomposed, hence resulting in two transparencies of visual cryptography to share the secret image.

C. Color Visual Cryptography Scheme [5]

Y.-C. Hou [4] developed three methods for color visual cryptography. All these methods use CMY (C= Cyan, M= Magenta, Y= Yellow) color model to decompose and halftoning color images as shown in the **Fig. 2**.

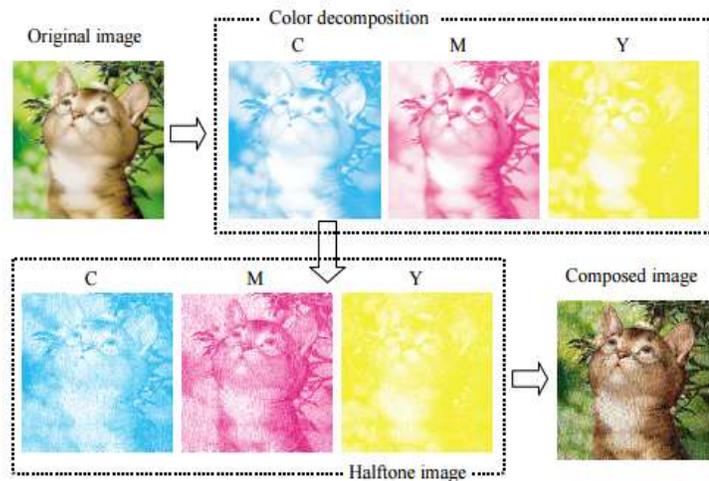


Figure (2): color image decomposition and halftoning [5].

Method 3 of Hou [5] is adopted in our paper as shown in the **Fig. (3)**. Its algorithm is described below:

1. Transform the color image into three halftone images: C, M, and Y.
2. For each pixel P_{ij} of the composed image, do the following:
 - (a) According to the traditional method of black-and-white visual cryptography, expand C_{ij} , M_{ij} and Y_{ij} into six 2×2 blocks, $C1_{ij}$; $C2_{ij}$; $M1_{ij}$; $M2_{ij}$ and $Y1_{ij}$, $Y2_{ij}$.
 - (b) Combine the blocks $C1_{ij}$, $M1_{ij}$ and $Y1_{ij}$ and fill the combined block corresponding to P_{ij} in Share 1.
 - (c) Combine the blocks $C2_{ij}$, $M2_{ij}$ and $Y2_{ij}$ and fill the combined block corresponding to P_{ij} in Share 2.
3. Repeat Step 2 until every pixel of the composed image is decomposed, hence obtaining two visual cryptography transparencies to share the secret image.
4. After stacking the two sharing images, the secret image can be decrypted by human eyes.

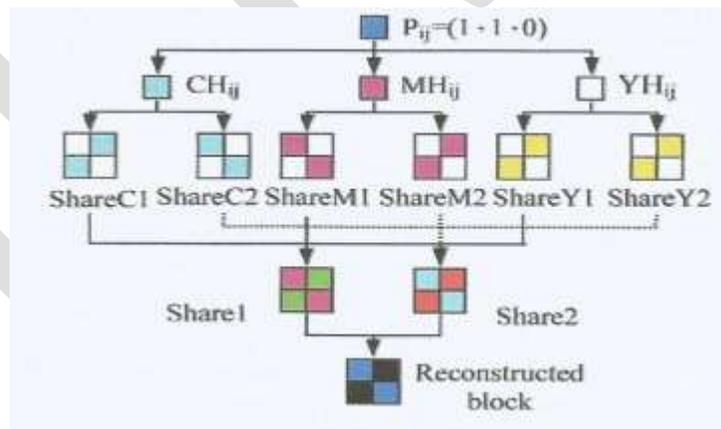


Figure (3): Color visual cryptography scheme_ Method 3 [5].

III. MULTIPLE DOCUMENTS PROTECTION METHODS

The proposed schemes to digital document authentication [1, 2, 3] are focused only on the integrity of them with no consideration to the number of documents or their size. In our proposed methods, we show how to protect several digital documents by using visual cryptography and the least significant bit (LSB) steganography method. LSB is data hiding methodology used to protect secret data

from unauthorized access by embedding bits of secret data (such as digital document image) inside the least significant bits of preselected cover image [6]. The proposed methods are:

A. Method 1

Multiple Documents Secret Sharing

1. Select the color cover image (**C**) to be used to contain all color document images. It should be large enough to have them.
2. Specify the number of document images (**NoD**) to be hid in **C**. Also, the number of bits of each pixel in the **C** to be used to embed the bits of document images **NoD**.
3. Determine the percentage of used pixels of **C** by **NoD image** pixels, if their percentage greater than (100%) then we should reduce the **NoD**, otherwise continue in the method.
4. Use method3 of Hou [4] explained previously to do color visual cryptography on the cover image **C** to obtain two shares (**share1** and **share2**).
5. Use **LSB** steganography method to hide the pixel bits of **NoD images** inside pixel bits of **share1** or **share2** or distribute **NoD** document images between two shares.
6. Distribute **share1** and **share2** to two participants or combine two shares to obtain expanded cover image **C1**.

Multiple Documents Secret Recovery

1. If we have two shares of **C** then the pixel bits of all embedded documents can be recovered exactly from where they are embedded in either **share1** or **share2**.
2. If we have **C1**, then we can separate it into two shares **share1** and **share2** and do what we did in step 1 to recover secret documents.

B. Method 2

Multiple Documents Secret Sharing

1. Select the color cover image (**C**) to be used to contain all color document images. It should be large enough to have them.
2. Specify the number of document images (**NoD**) to be hid in **C**. Also, the number of bits of each pixel in the **C** to be used to embed the bits of **NoD image** pixels.
3. Determine the percentage of used pixels of **C** by **NoD images** pixels, if the percentage greater than (100%) then we should reduce the **NoD**, otherwise continue in the method.
4. Use method3 of Hou [4] explained previously to do color visual cryptography to the cover image **C** and **all** document images to obtain two shares (**share1** and **share2**) for each one of them.
5. Use **LSB** steganography method to hide the pixel bits for the **share1 of NoD** document images inside pixel bits of **share1 of C** and similarly hide the pixel bits for the **share2 of NoD** inside pixel bits of **share2 of C**. In addition, we can embed shares of document images inside any share of **C**.
6. Distribute **share1** and **share2** to two participants or combine two shares to obtain expanded cover image **C1**.

Multiple Documents Secret Recovery

1. If we have two shares of **C** then the pixel bits of all embedded documents can be recovered exactly from where they are embedded in either **share1** or **share2**.
2. Reform share1 and share2 of all document images.
3. Decrypt document images by combining share1 and share2 of each document image.
4. If we have **C1**, then we can separate it into two shares **share1** and **share2** and do what we did in steps (1, 2, and 3) to recover secret documents.

The results of applying method 1 and method2 to set of three document images are shown in the **Fig. (4)** and **Fig. (5)** respectively.



(a)



(b)



(c)



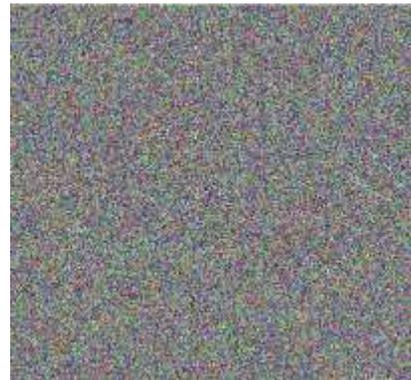
(d)



(e)



(f)



(g)



(h)



(i)



(j)



(k)

Figure (4)_method1: (a) Document1 before hiding (b) Document 2 before hiding (c) Document 3 before hiding
 (d) Cover image before visual cryptography (e) Share1 of cover image after hiding document images
 (f) Share1 of cover image after visual cryptography (g) Share2 of cover image after visual cryptography
 (h) Cover image after overlapping two shares (i) Document1 after extraction
 (j) Document2 after extraction (k) Document3 after extraction

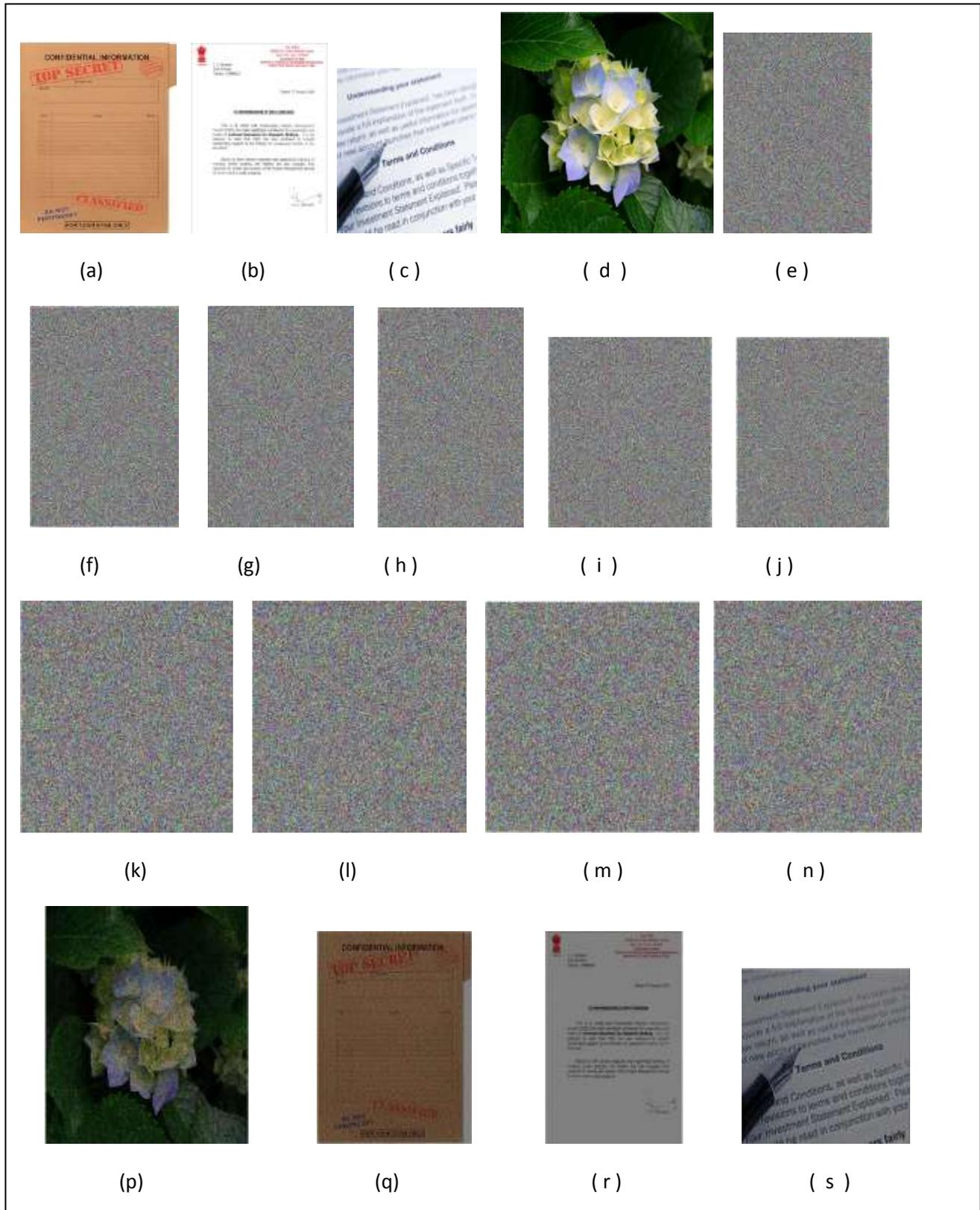


Figure (5)_method2: (a) Document1 before hiding (b) Document 2 before hiding (c) Document 3 before hiding
 (d) Cover image before visual cryptography (e) Share1 of document 1 (f) Share2 of document 1
 (g) Share1 of document 2 (h) Share2 of document 2 (i) Share1 of document 3 (j) Share2 of document 3
 (k) Share1 of cover image before hiding (l) Share2 of cover image before hiding (m) Share1 of cover image after hiding
 (n) Share2 of cover image after hiding (p) Cover image after visual cryptography (q) Document 1 after hiding
 (r) Document 2 after hiding (s) Document 3 after hiding

- (n) Share2 of cover image after hiding (p) Cover image after overlapping shares
(q) Document1 after extraction (r) Document2 after extraction (s) Document3 after extraction

IV. CONCLUSIONS AND FUTURE WORK

In this paper, we developed new methods to protect multiple digital documents simultaneously. The first method provides acceptable security with good document image quality. However, the second method provides strong security with some degradation in the document image quality after extraction. As future work, we can make the following suggestions:

1. Use other steganography techniques.
2. Use biometrics [8, 9, 10, 11, 12], watermarks and other cryptography algorithms.
3. Developing comprehensive security methods that include integrity, authentication and confidentiality [13, 14, 15].
4. Developing authentication techniques for documents in cloud computing infrastructures [16].

To sum up, this paper represents initial study to design more efficient and robust information security mechanisms in the insecure networked environments.

REFERENCES:

- [1] Fischer, Igor, and Thorsten Herfet. "Watermarks and text transformations in visual document authentication", *Journal of Computers* 2.5, 44-53, 2007.
- [2] I. Fischer and T. Herfet, "Visual CAPTCHAs for document authentication," in *Proceedings of the IEEE International Workshop on Multimedia Signal Processing (MMSP)*. IEEE, pp. 471–474, October 2006.
- [3] I. Fischer and T. Herfet, "Visual document authentication using human-recognizable watermarks," in *Proceedings of ETRICS 2006*, LNCS 3995. Springer-Verlag, pp. 509–521, June 2006.
- [4] M. Naor, A. Shamir, Visual cryptography, *Proc. Eurocrypt '94*, LNCS 950, 1–12, 1994.
- [5] J.C. Hou, Visual cryptography for color images, *Pattern Recognition*, 36 (7), 1619–1629, 2003.
- [6] Juneja, M., Sandhu, P. S. "Improved LSB based Steganography Techniques for Color Images in Spatial Domain", *IJ Network Security*, 16(4), 366-376, 2014.
- [7] Blundo, C., De Santis, A., Naor, M., "Visual cryptography for gray level images", *Information Processing Letters*, 75, 255–259, 2000.
- [8] A.J. Abboud, H. Sellahewa and S.A. Jassim, "Image quality approach for adaptive face recognition", in *Proc. Mobile Multimedia / Image Processing, Security and Applications*, SPIE, vol.7351, pp. 1-10, 2009.
- [9] S. A. Jassim, H. Al-Assam, A. J. Abboud, and H. Sellahewa. *Analysis of Relative Entropy, Accuracy, and Quality of Face Biometric*. *Pattern Recognition for IT security Workshop*, 2010.
- [10] Hisham Al-Assam, Ali Abboud, Harin Sellahewa, and Sabah Jassim. "Exploiting relative entropy and quality analysis in cumulative partial biometric fusion." In *Transactions on Data Hiding and Multimedia Security VIII*, pp. 1-18. Springer Berlin Heidelberg, 2012.
- [11] A.J. Abboud and Sabah A. Jassim. "Biometric templates selection and update using quality measures." In *SPIE Defense, Security, and Sensing*, pp. 840609-840609. International Society for Optics and Photonics, 2012.
- [12] A. J. Abboud and Sabah A. Jassim. "Image quality guided approach for adaptive modelling of biometric intra-class variations." In *SPIE Defense, Security, and Sensing*, pp. 77080L-77080L. International Society for Optics and Photonics, 2010.
- [13] Al-Assam, H., Ali Abboud, and Sabah Jassim. "Hidden assumption of face recognition evaluation under different quality conditions." In *Information Society (i-Society)*, 2011 International Conference on, pp. 27-32. IEEE, 2011.
- [14] Al-Assam, Hisham, Ali Abboud, and Sabah Jassim. "Exploiting Samples Quality in Evaluating and Improving Performance of Biometric Systems", *International Journal of Digital Society (IJDS)*, Volume 2, Issue 2, June 2011.
- [15] A.J. Abboud and Sabah A. Jassim. "Incremental fusion of partial biometric information." In *SPIE Defense, Security, and Sensing*, pp. 84060K-84060K. International Society for Optics and Photonics, 2012.
- [16] Ali J Abboud and Omar S Saleh, "Sustainable IT: A Realisation Survey among Academic Institutions of Iraq", *International Journal of Enhanced Research in Science Technology & Engineering*, Vol. 3 Issue 2, pp. (25-31), 2014

PROPOSED DESIGN OF GENERALIZED EQUALIZATION MODEL FOR VIDEO ENHANCEMENT TECHNIQUE

PANDI M, INDIRAKUMAR M

Graduate student, M.E – Applied Electronics, DSCET, ANNA UNIVERSITY, Tamilnadu, INDIA.

Assistant Prof, Dept of ECE, DSCET, ANNA UNIVERSITY, Tamilnadu, INDIA.

mgppandi@gmail.com +91 97904 26221

Abstract— Digital image processing forms core research area with in computer science disciplines. Rapid growth of image processing technologies has been used digital images more and more prominent in our daily life. Brightness preservation is a technique of improving the image brightness so that the limitations contained in these images is used for various applications in a better way. The contrast enhancement techniques capable to clean up the unwanted noises and enhance the image's brightness and contrast. In this project aimed to recover the original form of the image and video taken without presence of proper lighting effect. The previous techniques used are histogram equalization, gamma correction for contrast and brightness enhancement in image, here the improved version to overcome the noise and contrast enhancement by the FFT, Bi-log transformation and NTSC are used for both image and video quality improvement.

Keywords— FFT, BI-LOG TRANSFORM, NTSC AND WHITE BALANCING, CONTRAST ENHANCEENT, BRIGHTNESS PRESERVASION.

INTRODUCTION

With the fast advance of technologies and the prevalence of imaging devices, billions of digital images are being created every day. Due to undesirable light source, unfavorable weather or failure of the imaging device itself, the contrast and tone of the captured image may not always be satisfactory. Therefore, image enhancement is often required for both the aesthetic and pragmatic purposes. In fact, image enhancement algorithms have already been widely applied in imaging devices for tone mapping. For example, in a typical digital camera, the CCD or CMOS array receives the photons passing through lens and then the charge levels are transformed to the original image. Today, contrast enhancement process plays an important role in enhancing medical images' quality. Several previous studies proved that contrast enhancement techniques capable to clean up the unwanted noises and enhance the images' brightness and contrast. The resulting enhanced medical images provided clearer images for better and easier disease screening process by doctor.

METHODOLOGY

Existing scheme

Despite of the abundant literature on image enhancement, including representatives on literature survey, two challenging problems for image enhancement are still not solved. First how to achieve contrast enhancement while preserving a good tone. Second how to theoretically relate different types of enhancement algorithms to each other.



Fig 1 : Photo in a bus



Fig 3 : Scene from a film



Fig 4 : Image



Fig 5 : Scene of a drawing

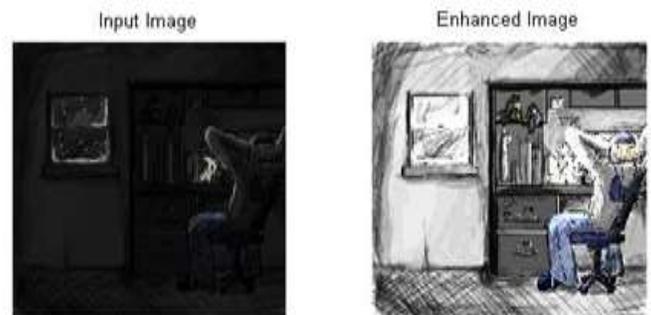


Fig 2 : Scene from a film

From the above shown examples of 1,2,3& 4, the existing system of image enhancement using the basic histogram and gamma correction results with presence of noise. So in order to overcome the drawback of image it is important to remove the irregularity of the image.

When we go for the video enhancing the method has to be changed and design a better one.

PROPOSED SCHEME

Image Quality and Preserving Colorspace for Human Visual System

The bilog transform smoothly modifies the gradient of the transformation so that in the region near zero it remains finite. A single constant C is provided to tune this behavior, so as to adjust the meaning of "region near zero". The default value of this constant is $1/\ln(10)$; this gives a unity transfer function at zero but other values can be applied as wished, to focus into the region near zero or not. The modified logarithmic transformation called Bilog transform can be both one-sided and symmetric, and thus can transform negative data to scaled negative data. It can be applied to both the X and Y data, when it becomes a bi-symmetric log transform. Applying log transformation to an image will expand its low valued pixels to a higher level and has little effect on higher valued pixels so in other words it enhances image in such a way that it highlights minor details of an image

Uses

1. Used to expand the values of dark pixels in an image while compressing the higher values
2. It compresses the dynamic range of images with large variations in pixel values

Proposed Design

Propose a generalized equalization model for image & video enhancement; Based on our analysis on the relationships between image histogram and contrast enhancement/ white balancing, we first establish a generalized equalization model integrating contrast enhancement and white balancing into a unified framework of convex programming of image histogram.

The enhanced system flow is shown below.

The processes carried out here are

- 1) RGP Panel Splitting
- 2) White Balancing
- 3) FFT & IFT
- 4) Bi-log Transform
- 5) RGP restoration and
- 6) NTSC

White Balancing

White balance (WB) is the process of removing unrealistic color casts, so that objects which appear white in person are rendered white in your photo. Proper camera white balance has to take into account the "color temperature" of a light source, which refers to the relative warmth or coolness of white light. Our eyes are very good at judging what is white under different light sources, but digital cameras often have great difficulty with auto white balance (AWB), and can create unsightly blue, orange, or even green color casts.

Understanding digital white balance can help you avoid these color casts, thereby improving your photos under a wider range of lighting conditions.

FFT

The Fourier transform is a representation of an image as a sum of complex exponentials of varying magnitudes, frequencies, and phases. The Fourier transform plays a critical role in a broad range of image processing applications, including enhancement, analysis, restoration, and compression.

The Fourier transform can also be used to perform correlation, which is closely related to convolution. Correlation can be used to locate features within an image; in this context correlation is often called template matching.

The Fourier Transform is an important image processing tool, which is used to decompose an image into its sine and cosine components. The output of the transformation represents the image in Fourier or frequency domain. In the Fourier domain image each point represents a particular frequency contained in spatial domain image.

The FT is used in a wide range of application, such as image analysis, image filtering, image reconstruction and image compression. The FT is used if we want to access the geometric characteristics of a spatial domain image. It is easy to examine or process certain frequency of the image in Fourier domain. In most implementations Fourier image is shifted in such a way that the DC-value $F(0,0)$ is displayed in centre of the image. The further away from the center an image point is the higher is its corresponding frequency.

Bilog Transformation

Still there may be some presence of negative frequency components (zero frequency components). Bilog transformation is made use of here to perform action on low frequency information. The region near zeros are to be highlighted for the enhancement and brightness preservation. Hence, after the application of this transform, the region around zeros are enhanced. This is followed by grouping of pixels, where clustering is done to increase the high resolution pixels. At this stage, the image pixels are converted back to RGB color model and pixels highlighted to a certain level

Property

- The bilog transform smoothly modifies the gradient of the transformation so that in the region near zero it remains finite. A single constant C is provided to tune this behavior, so as to adjust the meaning of "region near zero".
- The default value of this constant is $1/\ln(10)$; this gives a unity transfer function at zero but other values can be applied as wished, to focus into the region near zero or not.
- The modified logarithmic transformation called Bilog transform can be both one-sided and symmetric, and thus can transform negative data to scaled negative data.
- It can be applied to both the X and Y data, when it becomes a bi-symmetric log transform. Applying log transformation to an image will expand its low valued pixels to a higher level and has little effect on higher valued pixels so in other words it enhances image in such a way that it highlights minor details of an image.

NTSC

At the end process the NTSC technique is operated on the pre-processed input image and video to ensure the colouring effect on both. The NTSC is specially for the video signal by means of using the YIQ model.

Some of the operated image and their results are shown bellow.



Fig 6 : Birds in Forest



Fig 7 : Image of decoration



Fig 8 : Scenery Image

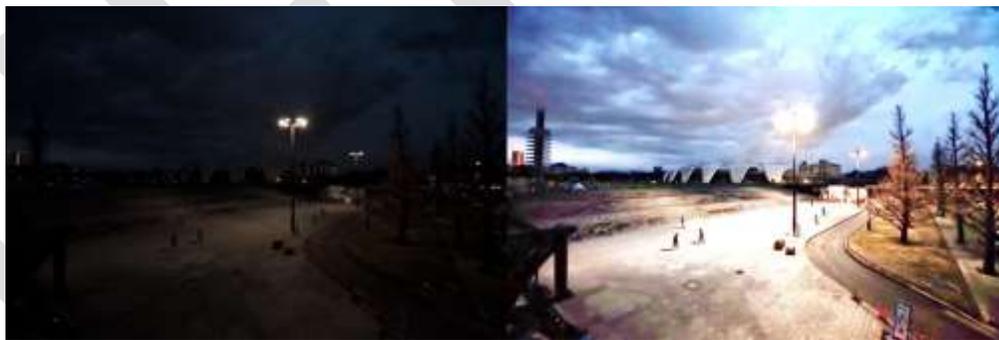


Fig 9 : Road way

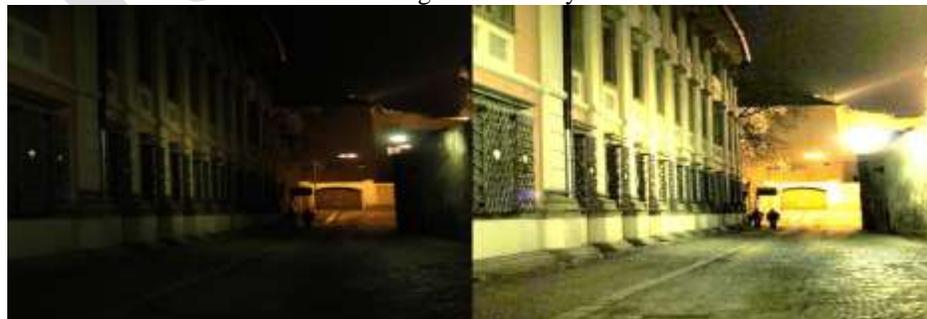


Fig 10: Dark Street



Fig 11: Bridge View

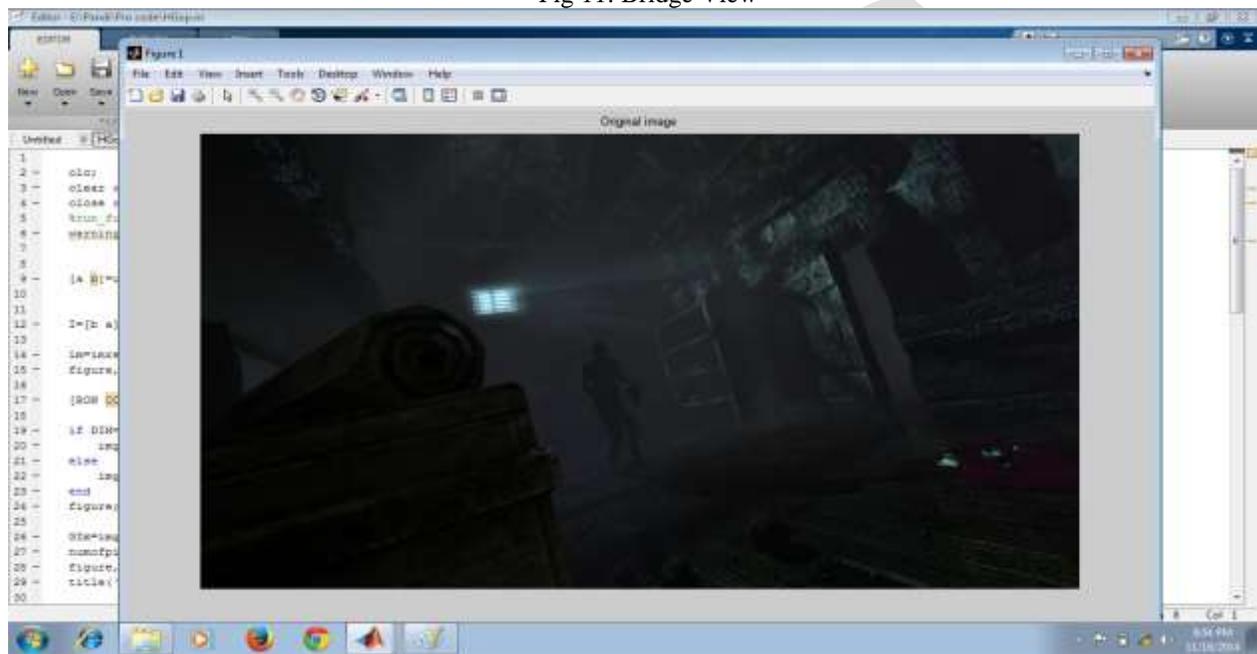


Fig 12 : Input Gray Scale Image

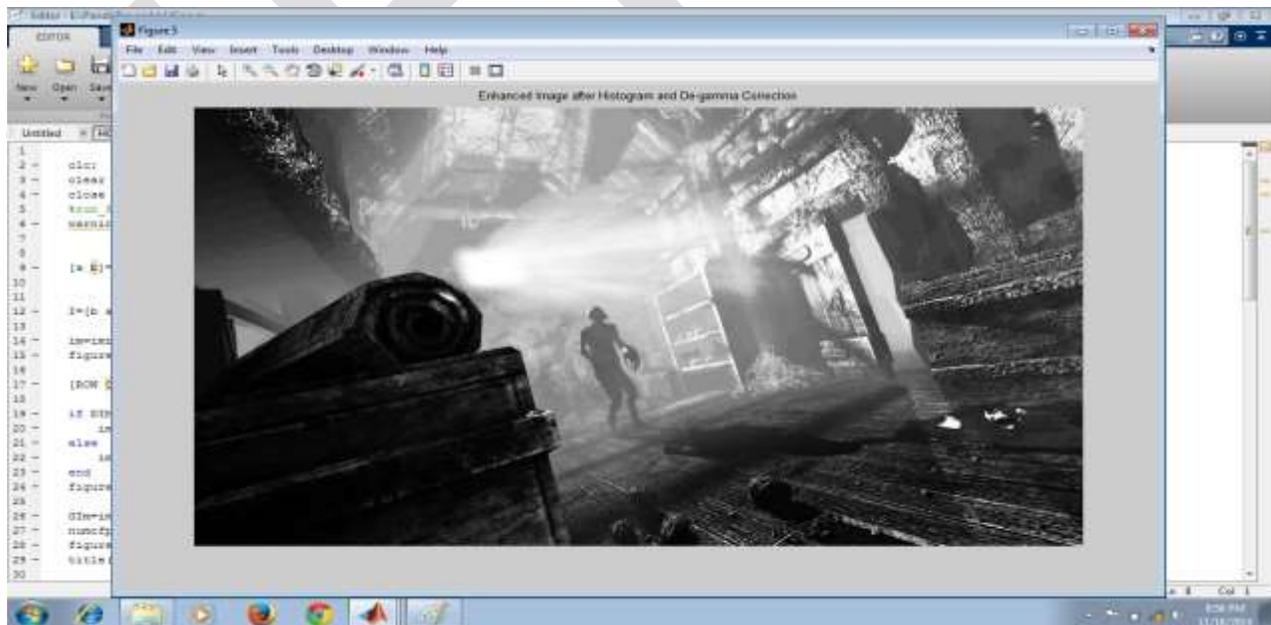


Fig 13 : Output Gray Scale Image

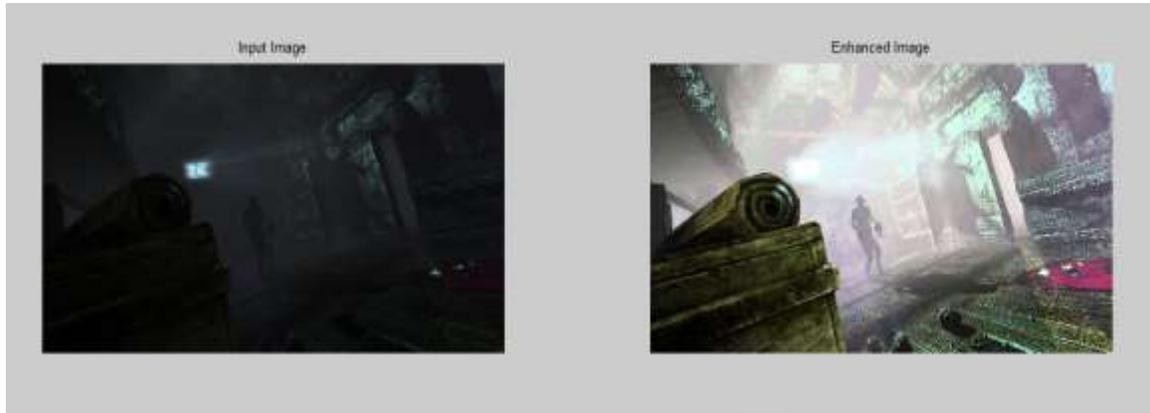


Fig 14 : Input and Output of Color Image



Fig 15 : Image in a dark time



Fig 16 : Dark Room

CONCLUSION

This Project is aimed to quality of an image / video which is taken without the presence of proper lighting source by means of using FFT and bilog transform. Here with I obtained the output of the image which are better than the existing, using the above mentioned technique as shown as bellow.

In the upcoming enhancement the performance of the image and the video frame quality are improved by using the technique of white balancing and the Bi-log transformation. This technique improves the performance by reducing the noise content present in the output shown.

FUTURE WORK

In the future, besides global image enhancement, we expect to unify more local video enhancement methods into the model through local image feature analysis. Further to improve the performance by means of live capturing of the video and generating the direct output.

REFERENCE:

- [1] Z.Chen,B.Abidi,D.Page,andM.Abidi,“Gray-level grouping(glg): An automatic method for optimized image contrast enhancement—Part i: The basic method,” IEEE Trans. Image Process., vol. 15, no. 8, pp. 2303–2314, 2006.
- [2] F.Drago, K. Myszkowski, T. Annen, and N. Chiba, “Adaptive logarithmic mapping for displaying high contrast scenes,” in Proc. Com- puter Graphics Forum, 2003, vol. 22, no. 3.
- [3] G.Finlayson and S. Hordley, “A theory of selection for gamut mapping colour constancy,” in Proc. IEEE Int.Conf.Computer Vision and Pattern Recognition, 1998, pp. 60–65.
- [4] G.Finlayson, S. Hordley, and P. Hubel, “Colour by correlation: A simple, unifying approach to colour constancy,” in Proc. IEEE Int. Conf.ComputerVision, 1999, vol. 2, pp. 835–842.
- [5] R.C.GonzalezandR.E.Woods, Digital Image Processing. Beijing, China: Publishing House of Electronics Industry, 2002.
- [6] S.-C.Pie, Y.-C Zang and C.-H.Cheng “Virtual restoration of Ancient Chinese paintings using color contrast enhancement and lacuna texture synthesis,” IEEE Trans. Image Process., vol. 13, no. 3, pp. 416–429, 2004.

Website Reference

- 1) en.wikipedia.org
- 2) www.Mathworks.Com

Review And Comparative Study of Face Recognition Using Different Neural Networking algorithm

Ms Ashwini B. Akkawar¹, Prof. Mayur S. Burange²

¹M.E (2ndSem) Department of Computer Science and Engineering, P.R.Pote College of Engineering & Technology ,Amravati ,India.

Email ID:ashu.b.akkawar28@gmail.com

²Asst. Prof in M.E (Department of Computer Science and Engineering) P.R.Pote College of Engineering & Technology, Amravati, India.

Email ID: mayurmsb123@gmail.com

ABSTRACT- Face recognition systems have gained a great deal of popularity due to the wide range of applications that they have proved to be useful. From a commercial standpoint, face recognition is practical in security systems for law enforcement situations at places like airports and international borders where the need arises for identification of individuals [1]. In this paper we have discussed about the three different techniques of face recognition such as Face Recognition Using Principal Component Analysis With Back Propagation Neural Network, face recognition using gabot filter, Face Recognition Using Wavelet Transform And Artificial Neural Network. The Merits and drawbacks of each technique and their comparative study and decide whether which technique is more useful in future.

Keywords: Principal Component Analysis, Back Propagation Neural Network, Wavelet Transform, Artificial Neural Network, Face Recognition, Gabor Filter, Extraction etc.

I. INTRODUCTION

Human beings can distinguish a particular face from many depending on a number of factors. One of the main objective of computer vision is to create such a face recognition system that can emulate and eventually surpass this capability of humans. In recent years we can see that researches in face recognition techniques have gained significant momentum [2]. Due to reasons of security issue since the 9/11 terrorist attacks, a sophisticated security system become more important in our daily life, especially for person identification. Nowadays, there are various ways to identify a person, which could be classified into two categories, such as biometric and non-biometric methods[1].

Biometric-based techniques have emerged as the most promising option for recognizing individuals in recent years since ,instead of authenticating people and granting them access to physical and virtual domains based on passwords, PINs, smart cards, plastic cards, tokens, keys and so forth, these methods examine an individual's physiological and/or behavioral characteristics in order to determine and/or ascertain his identity. Passwords and PINs are hard to remember and can be stolen or guessed; cards, tokens, keys and the like can be misplaced, forgotten or duplicated; magnetic cards can become corrupted and unreadable. However, an individual's biological traits cannot be misplaced, forgotten, stolen or forged[1].

II. FACE RECOGNITION TECHNIQUES

In this paper we have discussed about the three different techniques of face recognition

1. Face Recognition Using Principal Component Analysis With Back Propagation Neural Network.
2. Face recognition using gabor filter.
3. Face Recognition Using Wavelet Transform And Artificial Neural Network.

A. Face Recognition Using Principal Component Analysis with Back Propagation Neural Network.

PCA is a common statistical technique for finding the patterns in high dimensional data's Feature extraction, also called Dimensionality Reduction, is done by PCA for a three main purposes like

- i) To reduce dimension of the data to more tractable limits
- ii) To capture salient class-specific features of the data,
- iii) To eliminate redundancy[3].

The (BPNN) Back-Propagation is the best known and widely used learning algorithm in training multilayer perceptrons (MLP). The MLP refer to the network consisting of a set of sensory units (source nodes) that constitute the input layer, one or more hidden layers of computation nodes, and an output layer of computation nodes.

The input signal propagates through the network in a forward direction, from left to right and on a layer-by-layer basis. Back propagation is a multi-layer feed forward, supervised learning network based on gradient descent learning rule. Here recognition is performed by both PCA and Back propagation Neural Networks .BPNN mathematically models the behavior of the feature vectors by appropriate descriptions and then exploits the statistical behavior of the feature vectors to define decision regions corresponding to different classes. Any new pattern can be classified depending on which decision region it would be falling in. All these processes are implemented for Face Recognition, based on the basic block diagram as shown in fig 1 [3].

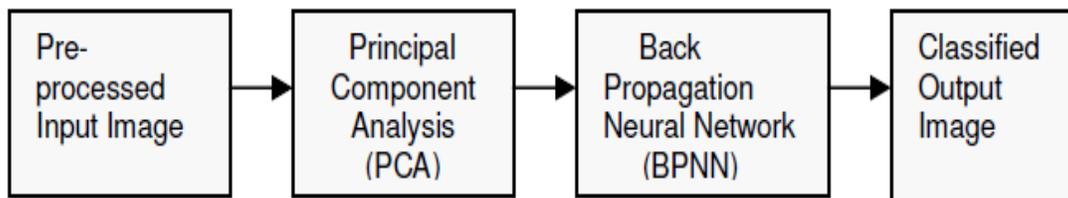


Fig. 1 Basic Block Diagram

B. Face recognition using gabor filter

Face recognition using Gabor filter are more preferred and largely studied because this method uses Gabor wavelet transform for both finding feature points and extracting feature vectors. Such as Lin-Lin proposes a classification based face detection method using Gabor filter features. Considering the desirable characteristics of spatial locality and orientation relativities of the Gabor filter using four Gabor filter for extracting facial features from local image[4].

➤ GABOR TRANSFORM

If Gaussian window is used in STFT, it is also named Gabor Transform, which is widely used due to its less leakage in time-frequency domain The major advantage of SHFT is that it could provide us the time-frequency location of the signal, which we are interested in, and some of their applications in Pattern recognition. Gabor filters are examples of Wavelets having two bases for

images, Pixels are localized in space & Fourier are localized in frequency, so such filters can be used for measuring frequency locally. The Gabor transform can be explained as

$$G(t, \omega) = \int_{-\infty}^{\infty} e^{-\frac{(t-\tau)^2}{2}} e^{-j\omega\tau} x(\tau) d\tau$$

The Gabor transform is like the short time Fourier transforms. We can see that the Gabor transform kernel is the Fourier transform kernel plus a Gaussian function. Therefore we can make a lot of transforms like the Gabor transform. Since the Gaussian signal is more concentrated than the rectangular function in the frequency domain, the frequency resolution of the Gabor transform is much better than short time Fourier transform, Gabor transform, or name.

➤ PRINCIPAL GABOR FILTER

In this work we propose novel orthogonal filters constructed as a linear combination of the original Gabor filters. These filters are capable of achieving similar recognition rates than the original ones, but using a far more compact face representation. Since the novel filters are derived from correlation matrices of the original filters by means of principal component analysis, we call them principal Gabor filters. Since exhibiting desirable properties through Traditional Gabor Filter, such as orientation selectivity or spatial locality, Gabor filters have also some shortcomings which crucially affect the characteristics and size of the Gabor representation of a given face pattern. To overcome this problem we are employing orthogonal normal linear combinations of the original Gabor filters rather than the filters themselves for deriving the Gabor face representation. The filters, named principal Gabor filters for the fact that they are computed by means of principal component analysis by short time Fourier transform (STFT)[4].

C. Face Recognition Using Wavelet Transform And Artificial Neural Network

The face recognition system is structured into three sections namely

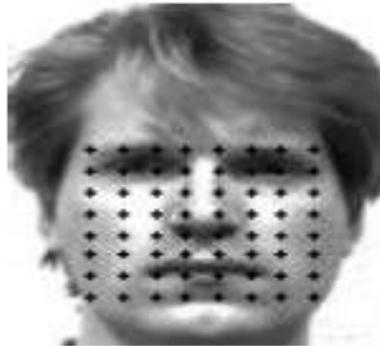
- The Image Acquisition and Analysis Section
- The Feature Extraction Section
- The Neural Network Classifier [5]

➤ ACQUISITION AND FEATURE EXTRACTION USING WAVELET TRANSFORM

The facial photograph of the subject is captured. The image is converted into the PGM format. The image is enhanced if required. This constitutes the reprocessing step. The image enhancement is carried out using Digital Image Enhancement techniques. The image is fed to the program by specifying the image filename at the command line. In order to create the wavelet, we identify feature points on the face. We choose the corners of the eyes and corner of the lips as shown below. These points are selected by mouse clicks.



Once these four points have been identified the program execution is resumed by right-clicking on the image. The program calculates the dimensions of the inner region of the face depending upon the ratios of the distances between the above placed points. The wavelet is then placed on the inner region of the face. A selection of 8 X 8 points gives the ideal trade off between image representation and computational speed. The wavelet points are as shown below[5].



➤ THE NEURAL NETWORK CLASSIFIER

1) Training of Neural Networks

Neural networks have been trained to perform complex functions in various fields of application including pattern recognition, identification, classification, speech, vision and control systems. One ANN is used for each person in the database in which face descriptors are used as inputs to train the networks. During training of the ANN's, the faces descriptors that belong to same person are used as positive examples for the person's network (such that network gives 1 as output), and negative examples for the others network. (such that network gives 0 as output). Following figure shows schematic diagram for the networks training.

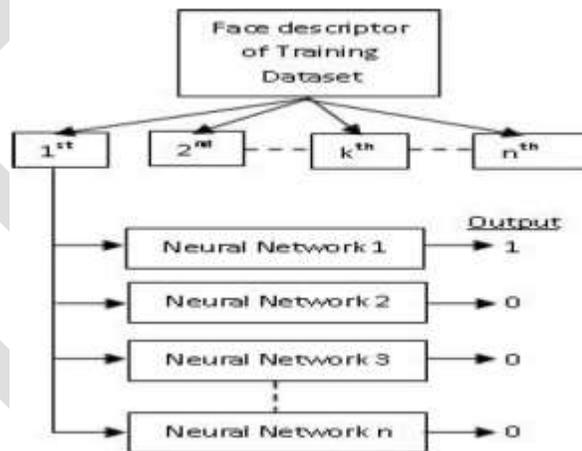


Figure 1: Training of neural

2) Simulation of ANN for Recognition

New test image is taken for recognition. These new descriptors are given as an input to every network; further these networks are simulated. Compare the simulated results and if the maximum output exceeds the predefined threshold level, then it is confirmed that this new face belongs to the recognized person with the maximum output[5].

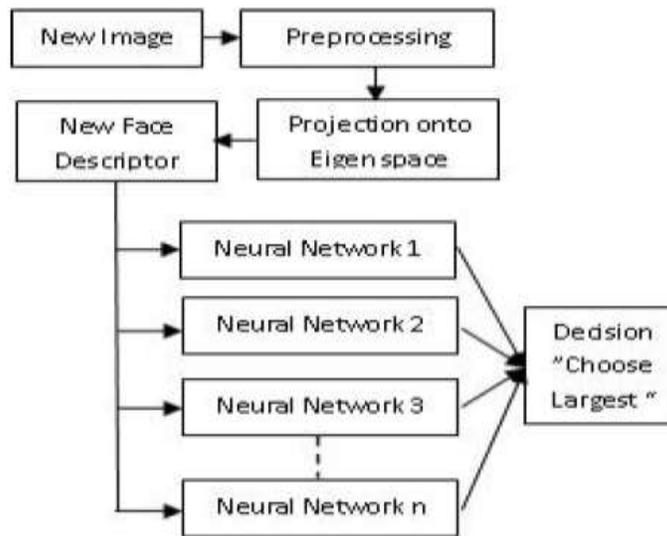


Figure 2 : Testing of neural network

III. SUBJECTS AND METHODS

- Different face recognition techniques and their advantages paired with weaknesses are given below in tabular form

Name Of Techniques	Strengths	Weaknesses
1. Face Recognition Using Principal Component Analysis With Back Propagation Neural Network.	1. Recognition is simple and efficient compared to other matching approaches. 2. Data compression is achieved by the low dimensional subspace representation. 3. Raw intensity data are used directly for learning and recognition without any significant low-level or mid-level processing. 4. No knowledge of geometry and reflectance of faces is required[1].	1. The method is very sensitive to scale, therefore, a low-level preprocessing is still necessary for scale normalization. 2. The Eigen face representation is, in a least squared sense, faithful to the original images, its recognition rate decreases for recognition under varying pose and illumination. 3. These experiments were made only with frontal views. The problem can be far more difficult when there exists extreme change in pose as well as in expression and disguise[1].
2.Face recognition using gabor filter.	1. The effectiveness of the system has been justified over a face database with face images captured in different illumination and orientation conditions of face. 2. This method can successfully reduce noise that result due to sharp	1. The Gabor filters are not orthogonal one to another and are, hence, correlated is probably the most important. 2. This makes the information contained in the Gabor face representation redundant and also affects the size of the representation[4].

	<p>transition in grey values.</p> <p>3. One of the most successful face recognition methods is based on graph matching of coefficients which are obtained from Gabor filter responses[4].</p>	
<p>3. Face Recognition Using Wavelet Transform And Artificial Neural Network</p>	<p>1. This method indicates that the high speed recognition over PCA based method which is widely used for feature extraction.</p> <p>2. Artificial Neural Network acts as a reliable classifier</p> <p>3. The combination of Wavelet and ANN exhibits the most favorable performance, it has the lowest overall training time, the lowest redundant data, and the highest recognition rates [5].</p>	<p>1. The direct use of wavelet coefficients may not extract the most discriminative features.</p> <p>2. There is much redundant or irrelevant information contained in wavelet coefficients.</p> <p>3. It can not recover new meaning underlying features which has more discriminative power[6].</p>

IV.CONCLUSION

In this paper we have compared three different techniques for face recognition along with their strengths and weaknesses. The study shows that face recognition using PCA with BPNN provides a high accuracy rate .PCA combined with BPNN works better than the individual PCA. This method has an acceptance ratio of more than 90% and the execution time of only a few seconds while Gabor filters for face recognition is to construct a filter bank with filters of different scales and orientations. Finally, the combination of Wavelet and ANN exhibits the most favorable performance, it has the lowest overall training time, the lowest redundant data, and the highest recognition rates when compared to similar so-far-introduced methods .Hence it is concluded that face recognition using wavelet transform and artificial neural network is the best one for recognizing face and it is also possible to obtained high face recognition rate equal to 98% by using this technique.

REFERENCES:

- [1] Deepali H. Shah¹, Dr. J. S. Shah² and Dr. Tejas V. Shah³,” The Exploration of Face Recognition Techniques”. International Journal of Application or Innovation in Engg. And Management(IJAIEM) Web Site: www.ijaiem.org Email: editor@ijaiem.org, editorijaiem@gmail.com Volume 3, Issue 2, February 2014 ISSN 2319 – 4847
- [2] Meftah, Ur Rahman ,” A comparative study on face recognition techniques and neural network”.
- [3] P.Latha, Dr.L.Ganesan & Dr.S.Annadurai,” Face Recognition using Neural Networks”, Signal Processing: An International Journal (SPIJ) Volume (3) : Issue (5) 153
- [4] Mohammad Javed ,” Face Recognition using Principle Gabor Filter” , International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 2, February 2014 ISSN: 2277 128X.
- [5] Mrs.Priti D.Neulkar, Mr.Srikanth Herekar,” Human Face Recognition Using Wavelet Transform And Artificial Neural Network”, International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 International Conference on Industrial Automation and Computing (ICIAC- 12-13th April 2014)
- [6] Dao-Qing Dai and Hong yan , ”wavelets and face recognition.” Sun yat-sen university and city university of Hong Kong,China

A Review on Super Conducting Fault Current Limiter (SFCL) in Power System

¹Nagarathna M C ²Prof. H. Vijay Murthy ³Shashikumar R

^{1,3} P.G Scholar, Department of Electrical and Electronics Engineering, S.D.M College of Engineering and Technology, Dharwad
² Professor, Department of Electrical and Electronics Engineering, S.D.M College of Engineering and Technology, Dharwad

ABSTRACT- Increase in power generation capacity of electrical power systems has led to increase in the fault current level which can exceed the maximum designed short-circuit ratings of the switchgear. Many conventional protective devices installed for protection of excessive fault current in electric power systems, especially at the power stations are the circuit breakers, tripped by over-current protection relay. They have the response time delay that allows initial of two or three fault current cycles to pass through before getting activated. Superconducting Fault Current Limiter (SFCL) is innovative electric equipment which has the capability to reduce fault current level within the first cycle of fault current. The application of the fault current limiter (FCL) would not only decrease the stress on network devices, but also can offer a connection to improve the reliability of the power system. This paper reviews the application of superconducting fault current limiter in power system.

Keywords- Fault, Distribution Substation, Protection, Sfcl

INTRODUCTION

The recent increase in power demand has been pressuring industries to continuously extend or expand power sources and transmission and transformer systems [1]. On the other hand, the equivalent impedance of power systems is decreasing. Accordingly, the fault current magnitude in power systems is increasing. Because of such developments, and the rising need to counter this trend, current-limiting technology has been getting much attention as it can efficiently limit the short-circuit faults and improve power system reliability. The introduction of new generating facilities by independent power producers and increasing load demand can result in fault current over duty on existing transmission system protective equipment. Conventional solutions to fault current over duty such as major substation upgrades, splitting existing substations buses or multiple circuit breakers upgrades could be very expensive and require undesirable extended outages and result in lower power system reliability. Due to the difficulty in power network reinforcement and the interconnection of more distributed generations, fault current level has become a serious problem in transmission and distribution system operations. The utilization of fault current limiters (FCLs) in power system provides an effective way to suppress fault currents.

Large-scale power systems are required to meet the increasing demand for electricity. For such systems, the fault current that occurs for short-circuit faults is higher and existing breakers may not be suitable for current interruption. In addition, the large voltage generated by electromagnetic induction can lead to communication failures. To address these issues, power system reorganization and circuit breaker upgrades can be considered. Fault condition may result in an electric power transmission system from events such as lightning striking a power line, or downed trees or utility poles shorting the power lines to ground. The fault creates a surge of current through the electric power system that can cause serious damage to grid equipment. Switchgears, such as circuit breakers, are deployed within transmission substations to protect substation equipment.

When power delivery networks are upgraded or new generation is added, fault levels can increase beyond the capabilities of the existing equipment, with circuit breakers in an "over-duty" condition. This problem necessitates upgrades such as the modification of substations or replacement of multiple circuit breakers. Increased fault currents due to load growth and industry structural changes have become a significant factor in system planning and operation. Equipment and personnel safety, power quality, and overall system reliability are all at stake if techniques and tools are not found to mitigate the higher levels of fault current in today's grid.

CONVENTIONAL SOLUTION

The existing conventional solutions to transmission-level fault current over-duty resolve the problem with varying degrees of effectiveness. Some are costly and/or have negative impact on system reliability and integrity. Some of these solutions are [2]:

1. Construction of new substations - Fault current over-duty coupled along with other factors may result in a utility selecting this solution, which will correct immediate problems, as well as providing for future growth. However, this is the most expensive of all the conventional solutions.
2. Bus splitting - This entails separation of sources that could possibly feed a fault by the opening of normally closed bus ties, or the splitting of existing busses. This effectively reduces the number of sources that can feed a fault, but also reduces the

number of sources that supply load current during normal "or contingency operating conditions. This may require additional changes in the Operational philosophy and control methodology.

3. Multiple circuit breaker upgrades - When a fault duty problem occurs, usually more than one breaker will be affected. Upgrade of these breakers has the disadvantage of not reducing available fault currents and their associated hazards, as well as the often prohibitive expense of replacing the switchgear within a substation.

4. Current limiting reactors and high impedance transformers- Fault current limiting reactors limit fault current due to the voltage drop across their terminals, which increase during the fault. However, current limiting reactors also have a voltage drop under normal loading conditions and present a constant source of losses. They can interact with other system components and cause instability.

5. Sequential breaker tripping - A sequential tripping scheme prevents circuit breakers from interrupting excessive fault currents. If a fault is detected, a breaker upstream to the source of fault current is tripped first. This reduces the fault current seen by the breaker within the zone of protection at the location of the fault. This breaker can then open safely. A disadvantage of the sequential tripping scheme is that it adds a delay of one breaker operation before final fault clearing. Also, opening the breaker upstream to the fault affects zones that were not originally impacted by the fault.

SUPERCONDUCTING FAULT CURRENT LIMITER

Superconducting Fault Current Limiter (SFCL) is innovative electric equipment which has the capability to reduce fault current level within the first cycle of fault current [3]. The application of the fault current limiter (FCL) would not only decrease the stress on network devices, but also can offer a connection to improve the reliability of the power system. There are various types of FCLs, which are made of different superconducting materials and have different designs. They are categorized into three broad types: the resistive type, the inductive type and bridge type SFCL. We discussed the operating characteristics of SFCL introduced into a simplified power transmission model system. It was finally revealed that SFCL could satisfactorily bring about the functions of fault current suppression and power system stability improvement. Along with the development of national economy in China, the supply capacity increases, the structure of power grid is strengthened and power supply and reliability enhances unceasingly. But with the expansion of power systems, the level of power system short-circuit capacity and fault short circuit current is increasing, and the level of local power grid short-circuit current exceeds the capacity of operating equipment, the power grid and electrical equipment safety is threatened seriously. To limit the short-circuit current and reduce the impact of short-circuit current for the device, the conventional measures to limit the level of short-circuit current mainly comes from three aspects: power structures, system operation mode and equipment. However, the cost of limiting short-circuit current through transformation of power structure is extremely expensive. Change the system operation mode, such as electromagnetic ring off, disconnect the mother switch, two separate buses run etc., can effectively reduce the level of short-circuit current, but the reliability of power grid is reduced to some extent. Installation of traditional limiting current reactors or high impedance transformers will increase network losses and reduce the system stability. Therefore, in order to protect the security of power system equipment, limiting short-circuit current in the power system become extremely pressing issue. With the progress of superconducting technology and superconducting materials research and the development of power electronics technology, superconducting fault current limiter (SFCL) will bring new thinking is for current-limiting technology of power system. In this paper, the structure and working principle of several SFCLs which perform high in the actual power grid is analysed on the base of classification of SFCLs, and the advantages and disadvantages of the SFCLs are discussed. It will be provided a reference for in-depth study.

Applications of SFCL in power system

- 1) Limit the fault current
- 2) Secure interconnector to the network
- 3) Reduces the voltage sag at distribution system

LIMIT THE FAULT CURRENT

In electrical network, there are various faults, such as lightning, short circuits, grounding etc., which occurs large fault current. If these large currents are not properly controlled for power system security, there happens unexpected condition like fire, equipment and facility damage, and even blackout. Therefore, Circuit Breakers are installed and have the duty to cut off fault current, however, it takes minimum breaking time to cut, and sometimes fail to break. Fault Current Limiter (FCL) is applied to limit very high current in high speed when faults occur. Different with normal reactor, normal impedance is very low and have designed impedance under faulted situation. Fault limiting speed is high enough that it can limit fault current within 1/4 cycle. Also, this function has to be recovered fast and automatically, too. Various FCLs are developed and some of them are applied in power system. Most typical FCL is to change over circuit from low impedance circuit to high impedance circuit. Circuit breakers and/or power electronics devices are used to control FCL circuits. Fuse or snubber circuits are used to protect high recovery voltage. These FCLs are attractive as it implements normal conductor, however, there are weak points such as slow current limiting speed and big size in distribution and transmission level as well. Superconducting fault current limiter (SFCL) has been known to provide the most promising solution of limiting the fault current in the power grid. It makes use of the characteristic of superconductor whose resistance is zero within critical

temperature (T_c) and critical current (I_c). If fault current exceeds I_c , superconductor lose superconductivity and the resistance increase dramatically (called quench) and limit circuit current.

The first installed one is developed by ABB. After that, various SFCLs are developed for distribution and transmission application to protect bus and/or feeder from high fault currents. Fig. shows recently developed and installed SFCLs for distribution level. [4]

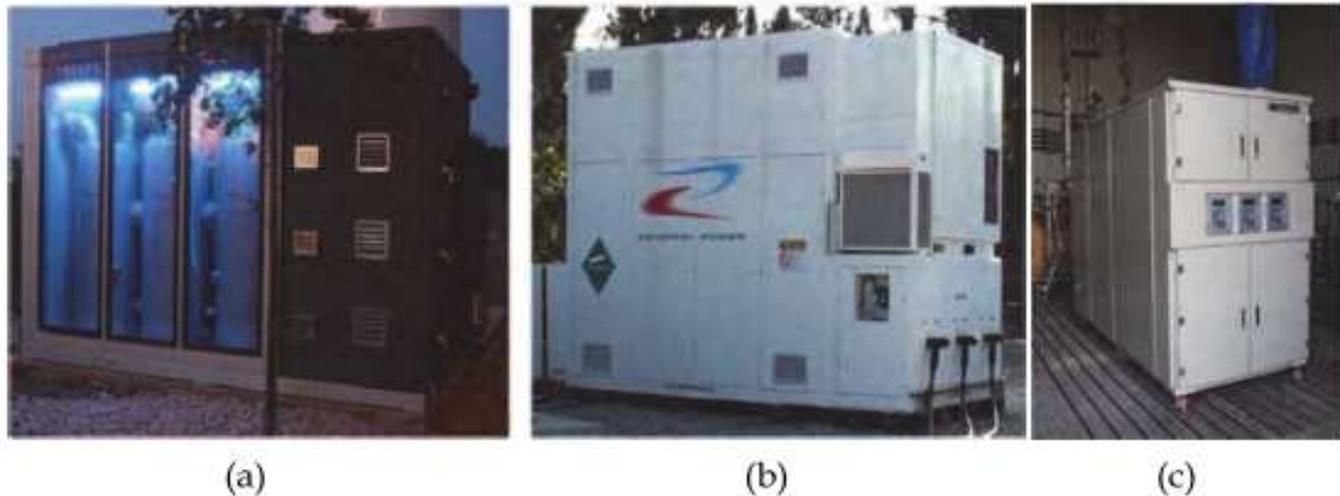


Fig. Distribution class SFCLs, (a) Boxberg, Germany (b) Shandin, USA, (c) Kochang, Korea

place	developer	Voltage (kV)	Type	status
ABB P/P, Swiss	ABB	10.5	R-type	Operated 1997(6month)
Puji S/S, China	Innopower	10.5	Saturable Core	In operation (2008~)
SCE Shandin S/S USA	Zenergy Power	15	Saturable Core	In operation (2009~)
Tokyo Gas, Japan	Toshiba	6.6		In operation (2007~)
Lancashire, U.K	Nexans SC	12	R-type	In operation (2010~)
Boxberg P/P, Germany	Nexans SC	12	R-Type	In operation (2009~)
San Dionigi S/S Italy	CESI RICERCA	9	R-Type	In operation (2011~)
Kochang, Korea	KEPRI/LS	22.9	Hybrid	In operation (2009~)
SCE, USA	AMSC/Siemens	115	R-Type	In operation (2011~)
AEP, USA	ZenergyPower	138	Saturable Core	In operation (2011~)

SFCL DEVELOPMENTS FOR TRANSMISSION LEVEL

A superconducting fault current limiter (SFCL) in series with a downstream circuit breaker could provide a viable solution to controlling fault current levels in electrical distribution networks. In order to integrate the SFCL into power grids, we need a way to conveniently predict the performance of the SFCL in a given scenario. [5] In this paper, short circuit analysis based on the electromagnetic transient program was used to investigate the operational behaviour of the SFCL installed in an electrical distribution grid. System studies show that the SFCL can not only limit the fault current to an acceptable value, but also mitigate the voltage sag. The transient recovery voltage (TRV) could be remarkably damped and improved by the presence of the SFCL after the circuit

breaker is opened to clear the fault. Being a promising application of superconductors, the SFCL is considered to be one of the innovative devices of FACTS in electric power system. In the event of a single-phase short circuit in the load feeder, a very large fault current will pass through the SFCL. After the critical current is exceeded, within the first half cycle, the critical temperature is reached and the transition to the normal conducting state quickly takes place. In case of installing the SFCL the maximum short circuit current is limited within the first cycle of the fault.

In practice the SFCL might be used in distribution systems first. However, the function of the SFCL is only to limit the fault current at a chosen value until the conventional circuit breaker could eliminate the fault. An SFCL in series with a downstream circuit breaker could provide a fast and reliable means of reducing and interrupting increasingly higher short circuit currents. Transient recovery voltage and transient overvoltage are both remarkably damped and improved by the presence of the SFCL after the circuit breaker is opened to clear the fault. This will thereby extend the breaker's life span and increase the chances of quickly achieving successful fault current interruption. The SFCL can be regarded as a very useful apparatus, shielding the distribution system from voltage decreases. The SFCL design probably requires that the limited fault current be between three and five times the steady-state current rating.

SECURE INTERCONNECTOR TO THE NETWORK

The application of the SFCL would not only decrease the stress on device but also offer an interconnection to secure the network. They can improve reliability and stability of power systems by reducing the fault current. If the bus-bars are coupled via a SFCL the short circuit power can be doubled. A further improvement can be obtained, if low impedance transformers in series with SFCLs are used. The most economical short-circuit-voltage of the transformers would be 10 %. By application of SFCLs in the transformer feeders the admissible short-circuit capability of the substation can be obtained. In this way the short-circuit power of the station is increased to nearly three times in total. By this means also voltage-disturbing customers and high loadings can be connected directly to the MV station and the connection to the higher voltage level can be avoided. Compared to the investment costs for a connection to higher voltages level, e.g. the 110 kV grid, the installation of SFCLs in the way suggested will be an economical solution, reasonable costs for the SFCL presumed. A similar situation exists regarding the connection of distributed generation and wind turbines to the MV grid. Here it becomes more and more difficult to connect such generators to the grid without a device limiting the short circuit current of the generator. In some MV stations the limits are already Reached by the contribution of the feeding 110/10 kV transformer and no more margin is left for additional short-circuit currents coming from distributed generation. Therefore nowadays these Generators have to be connected to the 110 kV Grid via an expensive generator transformer. By means of SFCL, those generators could be connected to the MV grid. By the SFCL application considerable cost savings can be achieved. The investment costs, the maintenance costs and the power losses of the SFCL bus-coupler are related to that of the transformer bay. The investment costs as well as the maintenance costs of the SFCL solution are significantly lower. The power losses of the SFCL can be neglected compared to that of the coupling transformer. Assumed. If an installation with a new transformer is considered, the cost ratio of the SFCL solution exhibits about 35% compared to that of the transformer bay. Even if 50% of the transformer investment costs are taken into account only, i.e. a transformer being in service for half of its lifetime is installed, the cost ratio is less than 50%. With the increasing demand for power, electric power systems have become greater and are interconnected. Generation units of independent Power producers (IPPs) and renewable energy have been interconnected to power systems to support the rising demands [6]. As a result, faults in power networks incur large short-circuit currents flowing in the network and in some cases may exceed the ratings of existing circuit breakers (CB) and damage system equipment. The problems of inadequate CB short-circuit ratings have become more serious than before since in many locations, the highest rating of the CB available in the market has been used. To deal with the problem, fault current limiters (FCLs) are often used in the situations where insufficient fault current interrupting capability exists. Less expensive solutions such as current limiting reactors may have unwanted side effects, Such as increasing system losses, voltage regulation problems or possibly could compromise system stability. Smart grid is a modern electricity system. It uses sensors, monitoring, communications, automation and computers to improve the edibility, security, reliability, efficiency, and safety of the electricity system. Renewable energy technologies such as photovoltaic, solar thermal electricity, and wind turbine power are environmentally beneficial sources of electric power generation. The integration of renewable energy sources into electric power distribution systems can provide additional economic benefits because of a reduction in the losses associated with transmission and distribution lines. SFCL at Integration point. This location of SFCL reduces the fault current coming from two sources. SFCL is in direct path of fault current only. When SFCL is installed at the integration point of wind farm with the grid, marked as Location 3 in Fig4.4. The wind farm fault current has been successfully reduced to 265A. SFCL gives 67% reduction of fault current from wind farm and also reduce the fault current coming from conventional power plant because SFCL located in the direct path of any fault current flowing towards Fault 1. The optimal location of SFCL is at integration point of two generating sources, for both distribution and customer grid faults. This location of SFCL in a power grid which limits all fault currents and has no negative effect on the DG source is the point of integration of the wind farm with the power grid for both distribution and customer grid faults. [5]

REDUCES VOLTAGE SAG

[7] In this paper, the effects of a superconducting fault current limiter (SFCL) installed in loop power distribution systems on voltage sags are assessed and analysed. The power distribution system will be operated to a type of loop. In this case, voltage drops (sags) are severe because of the increased fault current when a fault occurs. If SFCL is installed in the loop, power distribution system, the fault

current decreases based on the location and resistance value of the SFCL, and voltage sags are improved. Analysed according to fault. The results found that the voltage sags at loop distribution system is more severe than radial distribution system by the increased fault current. Moreover, the results of simulation represent the SFCL with bigger resistance is needed to improve the voltage sags in loop system. When SFCL is applied to a radial power distribution system. In case parallel connection Of radial systems via the SFCL which can make voltage dips less severe .Results in this paper shows that the improvement of voltage sags caused by fault current decreased by installing fault current limiter.

CONCLUSION

Now a days a superconducting fault current limiters are very attracted solution to limit the fault current. And in this paper the various application of SFCL in the power system are briefly discussed. Superconducting fault current limiters are anticipated as a solution for existing electric networks. The emerging solutions for fault current limiters are SFCL which has several merits such as low cost, high performance, coordination with conventional systems. Finally, our newly developed superconducting fault current Limiters would be promised solutions in order to solve the practical problems of conventional superconducting fault current limiters.

REFERENCES:

- 1) H. Anji, Y. Sato, D. Saruhashi, S. Yanabu, T. Akasu, and N. Takao, REALIZATION STUDY OF SUPERCONDUCTING FAULT CURRENT LIMITER, 2011 1st International Conference on Electric Power Equipment – Switching Technology.
- 2) Leonord Kolvalsy, Xing Youn, Alber Keri, Frank Beuara, "APPLICATION OF SUPERCONDUCTING FAULT CURRENT LIMITER IN ELECTRIC TRANSMISSION SYSTEM" superconductivity conference 2005 Germany.
- 3) Lin Ye, Liang Zhen Lin, and Klaus-Peter Juengst, APPLICATION STUDIES OF SUPERCONDUCTING FAULT CURRENT LIMITERS IN ELECTRIC POWER SYSTEMS, IEEE TRANSACTIONS ON APPLIED SUPERCONDUCTIVITY, vol. 12, no. 1, march 2002.
- 4) Achim HOBL Steffen ELSCHNER Joachim BOCK, Simon KRÄMER Christian JÄNKE Judith SCHRAMM , SUPERCONDUCTING FAULT CURRENT LIMITER – A NEW TOOL FOR FUTURE IN GRID. CIRED Workshop - Lisbon 29-30 May 2012 Paper 0296.
- 5) C. Neumann , SUPERCONDUCTING FAULT CURRENT LIMITER (SFCL) IN THE MEDIUM AND HIGH VOLTAGE GRID , 1-4244-0493-2/06/\$20.00 ©2006 IEEE.
- 6) S. Srilatha , Dr.K. Venkata Reddy , ANALYSIS OF POSITIONING OF SUPERCONDUCTING FAULT CURRENT LIMITER IN SMART GRID APPLICATION , © 2012 ijair. all rights reserved .
- 7) Jong-Fil Moon and Jin-Seok Kim, VOLTAGE SAG ANALYSIS IN LOOP POWER DISTRIBUTION SYSTEM WITH SFCL, 1051-8223/\$31.00 © 2013 IEEE.
- 8) B. W. Lee, J. Sim, K. B. Park, and I. S. Oh, Practical APPLICATION ISSUES OF SUPERCONDUCTING FAULT CURRENT LIMITERS FOR ELECTRIC POWER SYSTEMS, 1051-8223/\$25.00 © 2008 IEEE.
- 9) Lin Ye, M. Majoros, T. Coombs, and A. M. Campbell SYSTEM STUDIES OF THE SUPERCONDUCTING FAULT CURRENT LIMITER IN ELECTRICAL DISTRIBUTION GRIDS 1051-8223/\$25.00 © 2007 British Crown Copyright.
- 10) Linmang Wang, Pengzan Jiang, and Dada Wang, SUMMARY OF SUPERCONDUCTING FAULT CURRENT LIMITER TECHNOLOGY, © Springer-Verlag Berlin Heidelberg 2012.
- 11) F. Della Torre, A. Dolara, S. Leva, and A.P. Morando, FAULTS ANALYSIS THEORY AND SCHEMES OF FOUR-PHASE POWER SYSTEMS, 978-1-4244-2235-7/09/\$25.00 ©2009 IEEE.
- 12) Kenan Hatipoglu, Arash Jamahbozorg and Ghadir Radman, MATLAB-BASED FAULT ANALYSIS OF POWER SYSTEMS WITH GRAPHICAL USER INTERFACE AS AN EDUCATIONAL TOOL, 978-1-61284-738-2/11/\$26.00 ©2011 IEEE

Evidence Collection from Car Black Boxes using Vehicular Digital Video Recorder System

¹Priya K. Rathod, ²Dr. M.M. Khanapurkar

¹Research Scholar, Department of Electronics & Telecommunication Engineering,

²Professor and Head, Department of Electronics & Telecommunication Engineering,

G. H. Raisoni College of Engineering, Nagpur, Maharashtra – 440016 India.

E-mail- priyarathod30@gmail.com

Contact No- +91-9096820581

Abstract— A vehicular digital video recorder system acts as the flight recorder of a vehicle which is used to record the behaviour of a running vehicle. This proposed system provides information related to scenario of accident occurred and collecting information on real time basis, from obstacle detection and video camera. This information is collected by Raspberry Pi processors using module and camera which are connected to the processor which is based on Linux operating system gives all the collected data information to the monitoring system. The monitoring system display the data in real time which help the police investigation to find out the scenario of accident occurred exactly after accident which displays the scenario of accident in image format on police station server window. This information is used to analyze the behaviour of accident easily and conflicts related to car accident such as investigation process and falsification of data collected from car black box is avoided and it gives high performance advantages of evidence collection from car black box.

Keywords— Camera, Embedded system, Black Box, Raspberry Pi processor, Linux, Video streaming, Server.

INTRODUCTION

The analysis of a car accident requires physical evidence, including clear evidence from the accident site such as a witness and a trace of the vehicles. In many cases, however, there is insufficient evidence in the place of accident, and it is difficult to accurately identify the accident cause and the victims or offenders. To solve these problems, objective and trusted accident data are required. Governments, institutions, and car manufacturers have been studying the vehicle black box and many such products have been released. As a result of these efforts, recently, black boxes or Digital Video Recorders (DVRs) for vehicle are being widely used to store accident circumstances or the overall circumstances of a driving process. Current black boxes, however, simply store and provide video and sound during a specific period before and after the accident using imaging devices. Therefore, it is impossible to check whether the stored data is authentic. When the possibility for the falsification of the stored data is proposed, it is difficult to prove that the data is trust or objective evidence. The possible security threats of black box are data forgery and data modification can be done easily.

The vehicle black box is a device similar to the black box device used in flight to record driving history details which is used for police investigation process to find out the scenario of accident occurred. The vehicle black box stores the video clips information which is very helpful for investigating process carried out by police. This paper shows the proposed scheme of video streaming through Vehicular Digital Video Recorder System (VDVR) in real time which helps to collect facts of scenario of accident occurred on real time basis.

PROPOSED SCHEME OF VIDEO STREAMING

To develop and enhance the security of vehicle black box data an efficient scheme is proposed which is online video streaming of data to prevent the falsification of black box data obtained and to obtain the scenario of accident without any modification. The proposed approach is useful using a commercial black box. The proposed scheme is suitable for vehicle black box system to enhance the security of saved data. Hence a research agenda is proposed which enhances current models explaining outcomes by a conceptualization and emergent states. The principle of operation of online video streaming simulation mode is described in Fig.1

The cameras are integrated in traditional Black Boxes which continuously record video in front side and back side of the vehicle. Therefore the camera in this case helps to collect data as a evidence when accident is occurred. The system which is embedded in Black Box is Raspberry Pie which is implemented using the Linux Operating System. This operating system supports the USB connection interface with camera and other required devices which make interfacing easy.

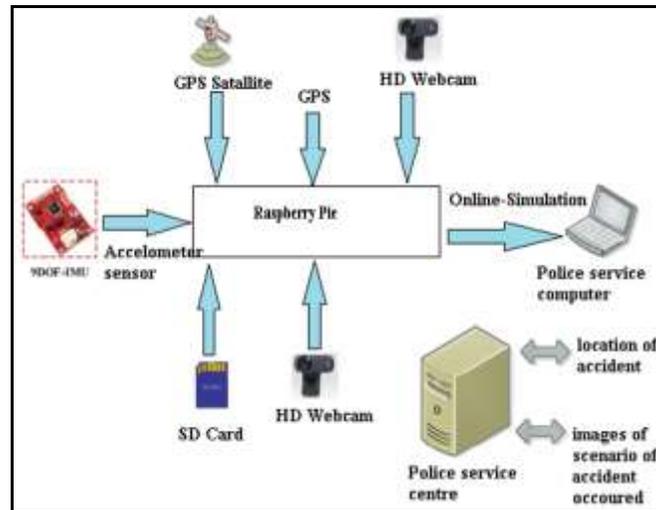


Fig.1. Online simulation of data carried out in black box

This is one of the major advantage of these operating system because of which the USB ports can be plug with many cameras. These camera helps to record the video in real-time and to capture the images of car such as of front side, back side almost around all side of car the images can be captured . In online simulation mode i.e. in real time, webcams are used for video recording process. The principle of application of this operating mode shows the whole scenario happening in inside and outside the car with the help of webcams which are being used in real-time. The collected data is in real-time i.e. in online simulation mode is used to identify the scenario of accident exactly what happened around the car environment which helps the police department to get the information related to car accident which has occurred. We get all the information of the vehicle environment in real-time, therefore these mode is very important to analysis the behaviour of vehicle and modification in data is not possible in these process. Hence the proposed method of real-time online simulation mode avoid the modification of data process and helps out as a proper method for evidence collection.

EXPERIMENTAL RESULTS OF VIDEO STREAMING

The proposed video streaming process scheme described above was implemented using commercial black box system. The implementation of the proposed scheme on Raspberry Pi is shown in Fig. 2.

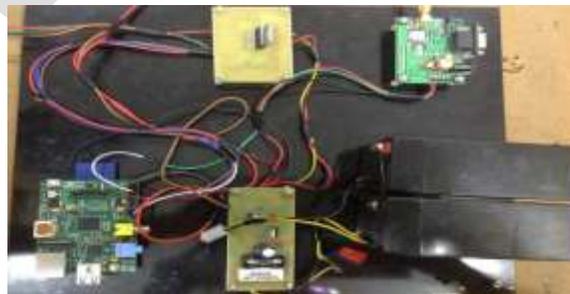


Fig.2. Implementation of device with Raspberry Pie

For the functional test, the accelerometer is moved to get a specific impact to the device which gives the information to the operating device that the accident has occurred. Immediately after the accident is detected the latitude and longitude i.e. the location of car is send on the respected police server monitoring device with the help of GPS(Global Processing System) which gives the exact location of car where it is located. Secondly, after the location is send on server window images of the scenario of accident occurred which are taken with the help of camera which are placed inside vehicle are send on respected server window as shown is Fig.3.

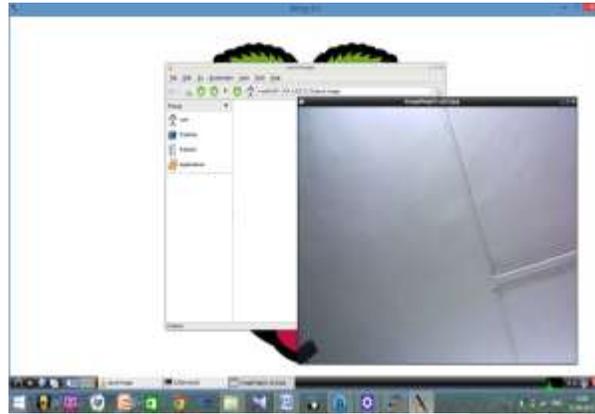


Fig.3. Image displayed on server window



Fig.4. Latitude and Longitude position displayed on server window

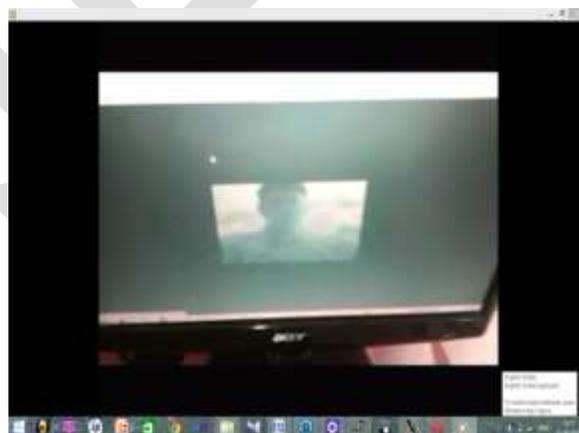


Fig.5. Video streaming displayed on server window

The images received on server window are very important fact which are obtained because it gives the information of exact scenario of accident occurred. These fact of information is very important for further investigation process. Moreover it also gives the online

simulation data i.e. it also provide the video in online mode i.e. in real time. These process of video streaming of data which we get on server window is important evidence factor for investigation process , as it gives the information of accident which has occurred in real time. In real time operation mode the fact of accident data that we get are true facts. The possibility of modification of data is avoided in these case. Whereas the evidence which are obtained helps to carry out the further investigation process very rapidly. The monitoring system successfully check and work on these process. At some part the availability of network is not available in such cases the data is stored in black box itself i.e. the data is stored in black box which could be seen at any time. Therefore, in the aspect of collection of data in real time and processing it in real time in order to get true fact of evidence, the proposed scheme can be used as an alternative method for the integrity in the black box system .

CONCLUSION

An efficient scheme of evidence collection of data from car black box and the scenario of accident occurred is being proposed in these paper. Which prevents data modification and data forgery of black box system and low-cost effective device is developed. The secure structure of memory for the black box and a proposed secure data streaming process is designed in order to avoid data modification in system and to collect data as evidence. In addition, an efficient verification scheme for secure black box system is described. In summary, the video streaming functionality strongly indicate that the proposed scheme is suitable for black box system, which urge for data integrity and data modification and falsification of data from system is avoided.

REFERENCES:

- [1] Michal Kochlan, Michal Hodon, Lukas Cechovic, Jan Kapitulik, Matus Jurecka, WSN for Traffic Monitoring using Raspberry Pi Board, 978-83-60810-58-3/\$25.00 c 2014, IEEE.
- [2] Sławomir Michalak, Raspberry Pi as a Measurement System Control Unit, 978-1-4799-7009 4/14/\$31.00 ©2014 IEEE.
- [3] Fabian Kaup, Philip Gottschling, David Hausheer, PowerPi: Measuring and Modeling the Power Consumption of the Raspberry Pi, 39th Annual IEEE Conference on Local Computer Networks, 978-1-4799-3780-6/14/\$31.00 ©2014 IEEE.
- [4] Vladimir Vujovic, Mirjana Maksimovic, Raspberry Pi as a Wireless Sensor Node: Performances and Constraints, MIPRO 2014, 26-30 May 2014, Opatija, Croatia.
- [5] M. Maurya, S. R. N. Shukla, Current Wireless Sensor Nodes (Motes): Performance metrics and Constraints, International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE), Volume 2, Issue 1, January 2013.
- [6] M. Richardson and S. Wallace, Getting started with Raspberry Pi, O'Reilly, USA, 2013.
- [7] S. Goodwin, Smart Home Automation with Linux and Raspberry Pi, 2nd Edition Apress Media, 2013.
- [8] Rajasekar.L, Soundarraj.V, "Design of Car Black Box Based on ARM", International Journal of Microsystems Technology and Its Applications (IJMTA) Vol-1, No-2 January-2013.
- [9] S. Goodwin, Smart Home Automation with Linux and Raspberry Pi, 2nd Edition Apress Media, 2013
- [10] S. H. Baek, and J-W. Jang, Implementation Automation Vehicle State Recorder System with In-Vehicle Networks, CAN-2011, CCIS 199, pp. 412-420, 2011.
- [11] L. Jiang and C. Yu, Design and Implementation of Car Black Box Based on Embedded System, Int. Conf of Electrical and Control Eng., pp. 3537-3539, 2010.
- [12] Kassem, R. Jabr, G. Salamouni, and Z. K. Maalouf, "Vehicle Black Box System," in System Conference, pp. 1-6, April 2008

Efficiency Prediction of ESP through Mathematical Modeling for PV Applications

Rameshprabhu.S¹, Dr.Deivasundari.P²,

¹ Assistant Professor -Dept of EEE – KCG College of Technology, Chennai

² Associate Professor/HOD -Dept of EEE – KCG College of Technology, Chennai

ramesprabu@gmail.com - +91-9894648499

Abstract— This project presents a generalized formulation for the computer-aided analysis of induction motor driving a submersible pump. In general Electric Submersible Pump [ESP] incorporates an induction motor and a pump, having centrifugal action. The pump is powered by the DC source especially by photovoltaic modules. In this case the insolation level of the sun is not constant at all time, it is necessary to predict the pump's performance. To do so, mathematical modeling and simulation of the electric submersible pump is proposed here. The dynamic model of the induction motor consists of an electrical sub-model to implement the three-phase to two-axis (3/2) d-q transformation of stator voltage and current calculation, a torque sub-model to calculate the developed electromagnetic torque, and a mechanical sub-model to yield the rotor speed. The submersible pump is modeled with the inputs as shaft speed, torque and head. The output variable is chosen to be discharge. With all these system modules, the electrical and mechanical condition of the pump under different operating condition is simulated with Matlab/Simulink model.

Keywords— ABC axis, Induction motor, Discharge, d-q axis, Steady state model, Submersible pump, System efficiency

INTRODUCTION

Solar submersible pumps are designed to move water by tapping on solar energy harnessed from the sun. These pumps can perform its functions well even when the sun is out. Pumps are primarily used to move water. The first designs of solar submersible pumps that came out were used to move water on a horizontal plane. Today, with the advanced solar panels and developments in the solar submersible pumps assembly, the pumps can now lift water for use in waterfalls, fountains or to move water to higher elevations than the actual source of the water.

Another feature of solar submersible pumps is that it is installed underwater. Placing the pump completely immersed in water has its advantages. It requires less cost in installation for one does not need another casing to hide the pump, like in the case when the pump is placed out in the open. Hiding the pump underwater also helps to muffle the sound of the pump. Thus the peace and tranquility of the surrounding area is maintained. The fact that the pump is underwater helps to maintain the even temperature of the pump. It helps in the cooling off process of the pump thus preventing overheating. This indirectly assists in prolonging the life of the pump assembly.

The feature that sets the solar submersible pumps apart from the rest of the pumps is that it is solar powered. These pumps are powered by harnessing the sun's rays. Using this as an energy source, the entire system depends on the solar panels that are placed high above the water. The solar panel does not necessarily have to be placed near the source of water. In fact, it is advised that it be placed in an area that is clear of shade so that it can get the most sunlight. The advancement in assembly now allows the solar panels to be mounted on a pivoting base that can move the panels to allow greater access to sunlight at all times of the day. The greatest advantage of using solar submersible pumps is that the energy resource is free. There are no additional charges for the valuable energy obtained. The basic expenses incurred in setting up a system will be to purchase a solar panel motor, pump, and pipe.

This project lays emphasis on predicting the discharge of the over-all unit under different operating conditions using a commercially available software package, MATLAB.

ELECTRIC SUBMERSIBLE PUMP

The submersible pump unit consists of a pump powered by a three-phase squirrel cage induction motor. The induction motor and submersible pump are modeled mathematically using software package Matlab/Simulink [2] as shown in Fig 1

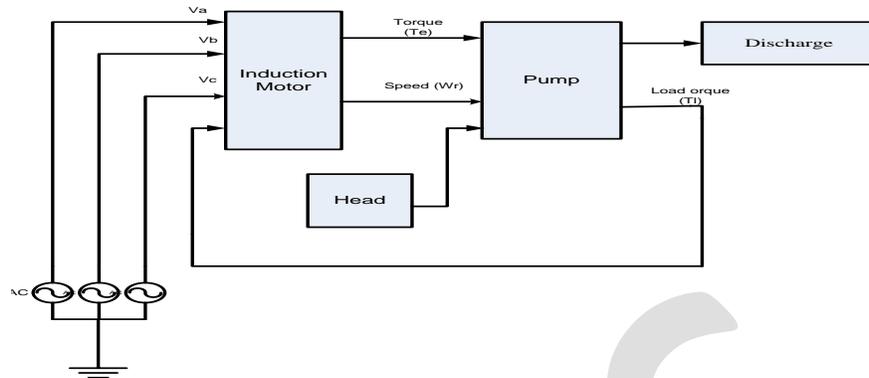


Fig.1 Block diagram of induction motor driven submersible pump

Matlab provides a powerful matrix environment for state space modeling, system design and algorithm development. Simulink is an extension to Matlab and allows graphical block modeling and simulation of the system. In the system design the entire system can be modeled using number of basic functional blocks to design and test each of them individually. The induction motor driven submersible pump consists of model of induction motor and pump.

INDUCTION MOTOR MODEL

Modeling is nothing but, the mathematical model of electrical machines, by using mathematical expressions and parameters. It is mainly done to know the performance of machine at different input and output conditions using simulation software. To find out time varying inductance and to simplify electrical and mechanical differential equations we go for reference frame

The primary function of the induction motor is to provide torque, which makes the shaft/loads to rotate at the required speed.

1. The “Torque” of an induction motor depends upon the flux in the air gap.
2. Further, flux is directly proportional to V/f , where V is supply voltage and f is the supply frequency. It can therefore be said that, the torque T is directly proportional to flux and flux is directly proportional to V/f .
3. Thus the torque producing capability of the motor at the rated/required speeds can be retained constants, by maintaining the voltage v/f frequency ratio constant.

However, the speed of the physical rotor must be less than the speed of the rotating magnetic field in the stator or else the magnetic field will not be moving relative to the rotor conductors and no currents will be induced. Fig.2 shows per phase equivalent circuit of the induction motor.

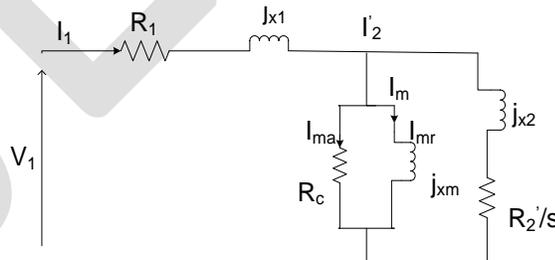


Fig.2 Per phase equivalent circuit of the induction motor

The starting step in the mathematical modeling of ac machines is to describe them as coupled stator and rotor polyphase circuits in terms of so-called phase variables, namely stator currents i_{as}, i_{bs}, i_{cs} ; rotor currents i_{ar}, i_{br}, i_{cr} for an induction machine or i_{kd}, i_{kq} for a synchronous machine; the rotor speed ω_r ; and the angular displacement θ between stator and rotor windings. The magnetic coupling is expressed in terms of an inductance matrix which is a function of position θ .

The next step is to transform the original stator and rotor abc frames of reference into a common k or d-q frame in which the new variables for voltages, currents, and fluxes can be viewed as 2-d space vectors. In this common frame the inductances become constant independent of position. The triplet $[A_s B_s C_s]$ denotes a three-phase system attached to the stator while the pair $[a_s b_s]$ corresponds

to an equivalent two-phase system (zero sequence components can be ignored in Y connected ac machines in which the neutral is normally isolated).

Among possible choices of d-q frames are the following:

- a) Stator frame where $\omega_r = 0$
- b) Rotor frame where $\omega_r = \omega_m$
- c) Synchronous frame associated with the frequency ω_s (possibly time varying) of the stator excitation.
- d) Rotor flux frame in which the d-axis lines up with the direction of the rotor flux vector.

The choice of the common d-q frame is usually dictated by the symmetry constraints imposed by the construction and excitation of the machine. With the complete symmetry encountered in a three-phase induction machine with balanced sinusoidal excitation, any one of the five frames can be used, although the synchronous frame is more convenient in as much as all signals appear as constant dc in steady state.

ABC-SYN CONVERSION BLOCK

To convert three-phase voltages to voltages in the two-phase synchronously rotating frame, [3] they are first converted to two-phase stationary frame using (1) and then from the stationary frame to the synchronously rotating frame using (2)

$$\begin{bmatrix} v_{qs}^s \\ v_{ds}^s \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -\frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} \end{bmatrix} \begin{bmatrix} v_{an} \\ v_{bn} \\ v_{cn} \end{bmatrix} \quad (1)$$

$$\begin{cases} v_{qs} = v_{qs}^s \cos\theta_e - v_{ds}^s \sin\theta_e \\ v_{ds} = v_{qs}^s \sin\theta_e - v_{ds}^s \cos\theta_e \end{cases} \quad (2)$$

Where the superscript “s” refers to stationary frame.

Equation (1) is implemented in simple matrix transformation. Equation (2), however, contains the unit vectors; therefore, a simple matrix transformation cannot be used. Instead v_{qs} and v_{ds} are calculated using basic simulink “Sum” and “Product” blocks.

Unit vector calculation block

Unit vectors $\cos\theta_e$ and $\sin\theta_e$ are used in vector rotation blocks, “abc-syn conversion block” and “syn-abc conversion block”[4]. The angle, θ_e is calculated directly by integrating the frequency of the input three-phase voltages, ω_e

$$\theta_e = \int \omega_e dt \quad (3)$$

The unit vectors are obtained simply by taking the sine and cosine of θ_e . This block is needed where the initial rotor position can be inserted. If needed an initial condition to the Simulink “Integrator” block is added. Note that the result of the integration in (3) is reset to zero each time it reaches 2π radians so that the angle always varies between 0 and 2π .

syn-abc conversion block

This block does the opposite of the abc-syn conversion block for the current variables using (4) and (5) following the same implementation techniques as before.

$$\begin{cases} i_{qs}^s = i_{qs}^s \cos\theta_e + i_{ds}^s \sin\theta_e \\ i_{ds}^s = -i_{qs}^s \sin\theta_e + i_{ds}^s \cos\theta_e \end{cases} \quad (4)$$

$$\begin{bmatrix} i_a \\ i_b \\ i_c \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ -\frac{1}{2} & -\frac{\sqrt{3}}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix} \begin{bmatrix} i_{qs}^s \\ i_{ds}^s \end{bmatrix} \quad (5)$$

INDUCTION MACHINE d-q MODEL BLOCK

One of the most popular induction motor models derived from this equivalent circuit is Krause's model. When the reference frame is rotating at synchronous speed, both the stator and rotor are rotating at different speeds relative to it. However, with the reference frame rotating at the same speed as the stator and rotor space field MMF waves, the stator and rotor d,q variables are constant quantities, whereas the actual variables are at 50 Hz and slip frequencies respectively.

For any arbitrary value of θ , the transformation of stator ABC phase variables $F [ABC]$ to d,q stator variables $F [odq]$ is carried out through Park's transform.

The Flux linkage is a property of a coil of conducting wire and the magnetic field through which it passes. It is determined by the number of turns in the coil and the flux of the magnetic field. The definition of the flux linkage is the total flux passing through a surface (i.e. normal to that surface) formed by a closed conducting loop. The modeling equations in flux linkage form are as follows,

$$\frac{dF_{qs}}{dt} = \omega_b \left[v_{qs} - \frac{\omega_e}{\omega_b} F_{ds} + \frac{R_s}{x_{ls}} (F_{mq} + F_{qs}) \right] \quad (6)$$

$$\frac{dF_{ds}}{dt} = \omega_b \left[v_{ds} + \frac{\omega_e}{\omega_b} F_{qs} + \frac{R_s}{x_{ls}} (F_{md} + F_{ds}) \right] \quad (7)$$

$$\frac{dF_{qr}}{dt} = \omega_b \left[v_{qr} - \frac{(\omega_e - \omega_r)}{\omega_b} F_{dr} + \frac{R_r}{x_{lr}} (F_{mq} - F_{qr}) \right] \quad (8)$$

$$\frac{dF_{dr}}{dt} = \omega_b \left[v_{dr} + \frac{(\omega_e - \omega_r)}{\omega_b} F_{qr} + \frac{R_r}{x_{lr}} (F_{md} - F_{dr}) \right] \quad (9)$$

The magnetizing flux linkage along d-q axis is represented as,

$$F_{mq} = x_{ml}^* \left[\frac{F_{qs}}{x_{ls}} + \frac{F_{qr}}{x_{lr}} \right] \quad (10)$$

$$F_{md} = x_{ml}^* \left[\frac{F_{ds}}{x_{ls}} + \frac{F_{dr}}{x_{lr}} \right] \quad (11)$$

The stator and rotor current is mainly depend on the stator and rotor leakage reactance and flux linkages, which is mathematically represented as,

$$i_{qs} = \frac{1}{x_{ls}} (F_{qs} - F_{mq}) \quad (12)$$

$$i_{ds} = \frac{1}{x_{ls}} (F_{ds} - F_{md}) \quad (13)$$

$$i_{qr} = \frac{1}{x_{lr}} (F_{qr} - F_{mq}) \quad (14)$$

$$i_{dr} = \frac{1}{x_{lr}} (F_{dr} - F_{md}) \quad (15)$$

The electromagnetic (inner) torque of the machine is computed by

$$T_e = \frac{3}{2} \left(\frac{p}{2} \right) \frac{1}{\omega_b} (F_{ds} i_{qs} - F_{qs} i_{ds}) \quad (16)$$

In the presented investigation neither friction nor ventilation losses nor stray load losses are taken into account. In order to obtain the dynamic characteristics, it is necessary to relate torque and speed [4]

$$T_e - T_l = J \left(\frac{2}{P} \right) \frac{d\omega_r}{dt} \quad (17)$$

Where T_l is the load torque and J is the total inertia.

For a squirrel cage induction machine as in the case of this paper, v_{qr} and v_{dr} in (14) and (15) are set to zero. An induction machine model can be represented with four differential equations as seen above. To solve these equations, they have to be rearranged in the state-space form. It can be achieved by inserting (10) and (11) in (6-9) and collecting the similar terms together. So that each state derivative is a function of only other state variables and model inputs. Then, the modeling equations (6-9 and 16) of a squirrel cage induction motor in state-space become,

$$\frac{dF_{qs}}{dt} = \omega_b \left[v_{qs} \frac{\omega_e}{\omega_b} F_{ds} + \frac{R_s}{x_{ls}} \left(\frac{x_{ml}^*}{x_{lr}} F_{qr} + \left(\frac{x_{ml}^*}{x_{ls}} - 1 \right) F_{qs} \right) \right] \quad (18)$$

$$\frac{dF_{ds}}{dt} = \omega_b \left[v_{ds} + \frac{\omega_e}{\omega_b} F_{qs} + \frac{R_s}{x_{ls}} \left(\frac{x_{ml}^*}{x_{lr}} F_{dr} + \left(\frac{x_{ml}^*}{x_{ls}} - 1 \right) F_{ds} \right) \right] \quad (19)$$

$$\frac{dF_{qr}}{dt} = \omega_b \left[\frac{(\omega_e - \omega_r)}{\omega_b} F_{dr} + \frac{R_r}{x_{lr}} \left(\frac{x_{ml}^*}{x_{ls}} F_{qs} + \left(\frac{x_{ml}^*}{x_{ls}} - 1 \right) F_{qr} \right) \right] \quad (20)$$

$$\frac{dF_{dr}}{dt} = \omega_b \left[\frac{(\omega_e - \omega_r)}{\omega_b} F_{qr} + \frac{R_r}{x_{lr}} \left(\frac{x_{ml}^*}{x_{ls}} F_{ds} + \left(\frac{x_{ml}^*}{x_{lr}} - 1 \right) F_{dr} \right) \right] \quad (21)$$

$$x_{ml}^* = \frac{1}{\left(\frac{1}{x_m} + \frac{1}{x_{ls}} + \frac{1}{x_{lr}} \right)} \quad (22)$$

$$\frac{d\omega_r}{dt} = \left(\frac{p}{2J}\right)(T_e - T_1) \quad (23)$$

PUMP MODEL :

The ESP is a multistage centrifugal pump. The performance or characteristic curve of the pump provides information on the relationship between total head and flow rate. There are three important points on this curve.

1. The shut-off head, this is the maximum head that the pump can achieve and occurs at zero flow. The pump will be noisy and vibrate excessively at this point. The pump will consume the least amount of power at this point.
2. The best efficiency point B.E.P. this is the point at which the pump is the most efficient and operates with the least vibration and noise. This is often the point for which pumps are rated and which is indicated on the nameplate. The pump will consume the power corresponding to its B.E.P. rating at this point.
3. The maximum flow point, the pump may not operate past this point. The pump will be noisy and vibrate excessively at this point. The pump will consume the maximum amount of power at this point

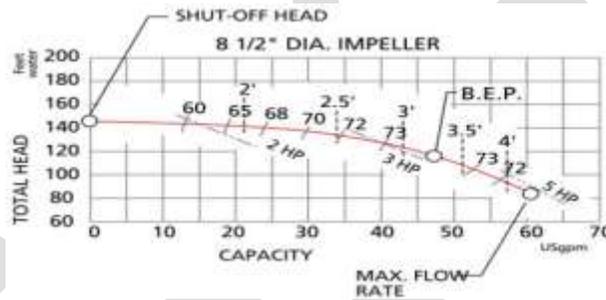


Fig.3 Pump characteristic curve

This curve is only valid for water, if the fluid has a different density than water you cannot use this curve. However you can use the total head vs. flow rate curve since this is independent of density.

MODELING EQUATIONS

The horsepower required at the pump shaft to pump a specified flow rate against a specified total dynamic head is the brake horse power and is given by [1]

$$BHP = \frac{100 \cdot Q \cdot H}{3960 \cdot \eta} \quad (24)$$

The power added to water as it moves through a pump is the water horse power.

$$WHP = \frac{Q \cdot h}{3960} \quad (25)$$

The efficiency of the pump is given by,

$$\eta = \frac{WHP}{BHP} \quad (26)$$

The pump discharge (Q) which mainly depends on the area and velocity of flow is given by [12],

$$Q=A*V_{f1} \quad (27)$$

$$A=\pi*d*b \quad (28)$$

$$V_{f1}=u*\tan\theta \quad (29)$$

$$u=\frac{\pi*d*\omega_r}{60} \quad (30)$$

$$w=\rho*g*Q*H \quad (31)$$

Where,

- Q - Flow rate or discharge
- H - Total head
- η - Pump efficiency
- V_f – velocity of flow
- g – Acceleration due to gravity
- A – Area of flow
- d – Diameter of the impeller
- b – Width of the impeller
- w – Weight of the water
- u – Tangential flow of water
- θ – Vane angle at the inlet or outlet

SIMULINK IMPLEMENTATION :

The inputs of a squirrel cage induction machine are the three-phase voltages, their fundamental frequency, and the load torque. The outputs, on the other hand, are the three- phase currents, the electrical torque, and the rotor speed. The induction machine model implemented is shown in Fig.5.2.

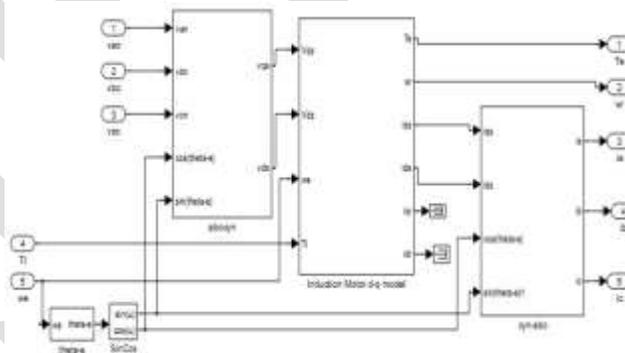


Fig.4 Simulink model of three phase induction motor

The d-q model requires that all the three-phase variables have to be transformed to the two-phase synchronously rotating frame. Consequently, the induction machine model will have blocks transforming the three-phase voltages to the d-q frame and the d-q currents back to three-phase. The rotor speed and torque sub model of IM is shown in Fig.5.3

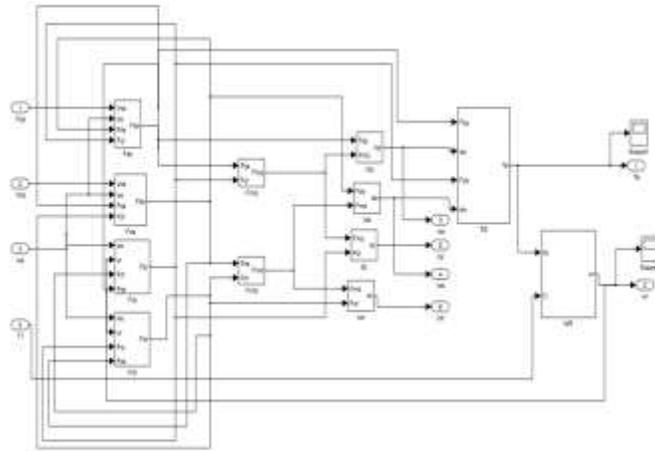


Fig.5 Induction motor d-q model

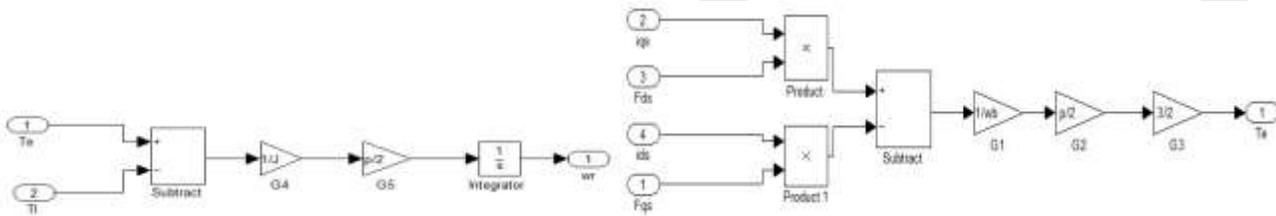


Fig.6 Rotor speed and torque sub model

The main inputs for the pump are electromagnetic torque, rotor speed and head. The discharge is mainly depends on impeller design and vane angle. The brake horse power and water horse power are used to calculate the efficiency of the pump. The torque applied to the pump is inversely related to the efficiency

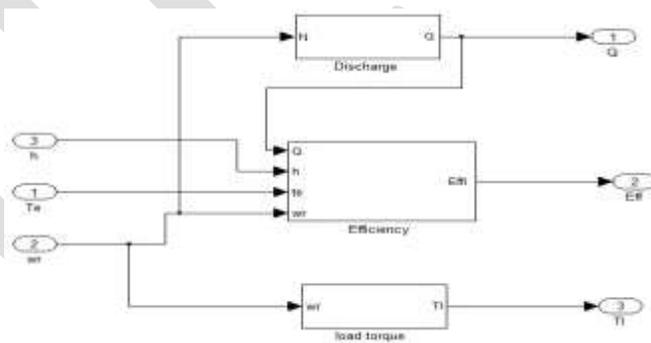


Fig.7 Simulink model of pump

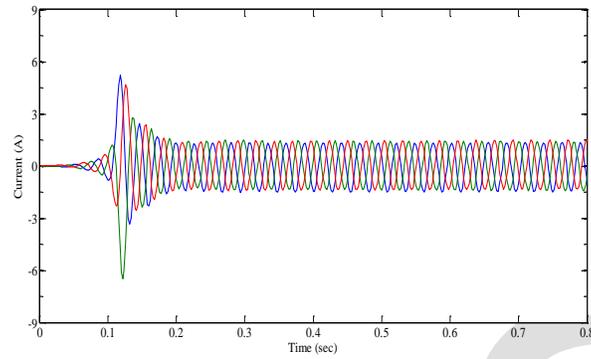


Fig.11 Output current waveform of three phase induction motor

The electromechanical torque developed depends on the stator and rotor flux linkages and the base angular frequency. Here the base frequency set at Indian standard of 50 hz. The machine accelerates at first and comes to steady state at 0.2 seconds with a small slip because of the inertia load. Fig clearly depicts it

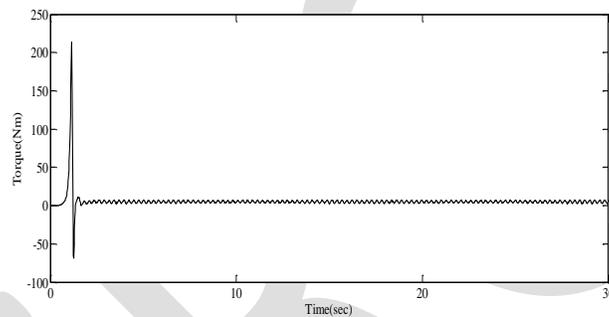


Fig.12 Output torque waveform of three phase induction motor

Table shows the variation of the efficiency under different heads, with almost constant discharge at rated voltage

Head (m)	Discharge (m ³ /Sec)	Efficiency (η)	Speed (rpm)
5	0.00589	12.9	1450
15	0.00568	31.56	1410
25	0.00525	46.07	1380
35	0.00476	56.81	1350
45	0.00425	63.39	1330
55	0.00366	66.69	1310
65	0.00314	66.34	1295
75	0.00275	65.17	1268
80	0.00204	59.53	1240

CONCLUSION

The steady state model of submersible pump driven by induction motor is presented using MATLAB/SIMULINK. The variation of pump efficiency with head and magnetizing inductance with air gap voltage has been effectively included in the MATLAB model of pump-motor unit. The sun's insolation produces variation in input voltage to the pump. The discharge is almost constant for voltage variation between 380v to 440v for a given head, but its efficiency changes considerably. The simulink model of the submersible pump shows the variation of the efficiency under various heads. With this mathematical modeling, the efficiency and discharge under various input voltage level and head is predicted early.

REFERENCES:

- [1] Venkoba Rao Vivek, Kumudini Devi and Chinnagounder Chellamuthu , "Modeling and Simulation of Energy – Efficient Controllers for Pumps Within Process Industry" in *proceeding on International Review of Modeling and Simulation*, Vol26, No.1,2006
- [2] Venkoba Rao Vivek, Kumudini Devi and Chinnagounder Chellamuthu, "Performance of Induction Motor driven Submersible Pump using Matlab/Simulink" *IEEE Transactions on Energy Conversion*, 2002
- [3] Burak Ozpineci, Leon M. Tolbert "Simulink Implementation of Induction Machine model – A Modular approach" *IEE proceeding on Electrical Power Applications- 2003*
- [4] Olav Vaag Thorsen, Magnus Dalva "Combined Electrical and Mechanical model of Electric Submersible Pumps" *IEEE Transaction On Industrial Applications*, VOL.37, No.2, March/ April 2001
- [5] W.Phang, P.Brogan R.Yacamini "Reduction of Over Voltages on ESP systems" in *Proceeding on 8th International Conference on Harmonics and Quality of Power*, 1998
- [6] C.V Nayar, E Vasu and S.J.Philips "Optimised Solar Water Pumping System Based on an Induction Motor Driven Centrifugal Pump" *IEEE Transaction TENCON '93/Beijing*
- [7] S,N.Singh, Snehlata Mishra, Vandana Neha Tigga "Design and Development of Utility Interface Adaptive Solar Power Conversion For water Pumping System in Indian Villages" in *Proceeding on IJRRAS – March 2010*
- [8] Lyon Van der Merwe, Gawie J. Van der Merwe "Universal Converter For DC PV Water Pumping Systems" *IEE proceeding on Electrical Power Applications- 1998*
- [9] Antonio c.S.de Lima, Richard M.Stephen, Jaime Mourente " Analysis of Long Distance Drive for an Induction Motor" in *Proceeding of the IEEE International Symposium Industrial electronics – 1996*
- [10] W.Phang, P.Brogan, R.Yacamini "Simulation of Variable Speed Drives for remote Downhole Pumps Applications" in *Proceeding on IEE Conference No. 456 – 1998*
- [11] M.A. Choudhury, M.Azizur Rahman "Starting Performances of Delta-Modulated Inverter – Fed Submersible Induction Motors" *IEEE Transactions on Industry Applications*, VOL.,28,No.28,May/June 1992
- [12] Olav Vaag Thorsen, Magnus Dalva "Modeling and Simulation of Electric Submersible pumps" in *Proceeding on International Conference on Electrical Machine & Drives IEMD'99*.
- [13] S. N. Singh, Pooja Singh, Swati, Swati Kumari,"Rural Home Energy Management by Fuzzy Control Model for Autonomous Solar (PV) - Diesel Power System in India", *IJAEST* (2011), Vol 4, Issue 1, pp 015-021.
- [14] B. Lindgrin, "A 110W inverter for photovoltaic application", *Published in International Journal of Renewable Energy Engineering*, April 2002

Key Aggregate Cryptosystem with Identity Based Encryption for Data Sharing in Cloud Storage

Ms. Farog Fatema Khan¹, Ms. Kshitija Mohod², Prof. V.B. Gadicha³

¹ B.E. (C.S.E, Final Year), P.R. Patil College of Engineering and Technology, Amravati, India
Email: faroghfatema77@gmail.com, Contact No.: 8928241808

² B.E. (C.S.E, Final Year), P.R. Patil College of Engineering and Technology, Amravati, India

³ H.O.D. (C.S.E), P.R. Patil College of Engineering and Technology, Amravati, India
Email: v_gadicha@rediffmail.com, Contact No.: 9423622833

Abstract—

Using Cloud Storage, users can remotely store and can share their data and enjoy the on-demand high quality applications and services from a shared pool of configurable computing resources, without the burden of local data storage and maintenance. Data sharing is one of the important functionality in cloud storage. We show how to securely, efficiently, and flexibly share data with others in cloud storage. We describe new public-key cryptosystems which produce constant-size ciphertexts where one can aggregate any set of secret keys and make them as compact as a single key, but encompassing the power of all the keys being aggregated. In other words, the secret key holder can release a constant-size aggregate key for flexible choices of ciphertext set in cloud storage, but the other encrypted files outside the set remain confidential. This compact aggregate key can be conveniently sent to others or be stored in a smart card with very limited secure storage.

Keywords: Cloud Storage, Data Sharing, Key-Aggregate Encryption, Public Key Cryptosystem, Cloud Computing, Public-Key Encryption, Confidentiality.

I. INTRODUCTION

Cloud computing is a model for convenient and on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management efforts. Main goal of the cloud computing is to provide scalable and inexpensive on-demand computing infrastructures with good quality of service levels. Many developers of cloud-based applications struggle to include security. In other cases, developers simply cannot provide real security with currently affordable technological capabilities. The architecture of the Cloud Computing involves multiple cloud components interacting with each other about the various data they are holding on too, thus helping the user to get to the required data on a faster rate.

Cloud systems can be used to enable data sharing capabilities and this can provide an abundant of benefits to the user. There is currently a push for IT organizations to increase their data sharing efforts. The benefits organizations can gain from data sharing is higher productivity. With multiple users from different organizations contributing to data in the Cloud, the time and cost will be much less compared to having to manually exchange data and hence creating a clutter of redundant and possibly out-of-date documents.

Data sharing is an important functionality in cloud storage. The challenging problem is how to effectively share encrypted data. Users should be able to delegate the access rights of the sharing data to others so that they can access these data from the server directly. However, finding an efficient and secure way to share partial data in cloud storage is not trivial. Below we will take Dropbox as an example for illustration [1].

Assume that Alice puts all her private photos on Dropbox, and she does not want to expose her photos to everyone. Due to various data leakage possibilities, so she encrypts all the photos using her own keys before uploading. One day, Alice's friend, Bob, asks her to share the photos taken over all these years which Bob appeared in. Alice can then use the share function of Dropbox, but the problem now is how to delegate the decryption rights for these photos to Bob [1].

We solve this problem by introducing a special type of public-key encryption which we call key-aggregate cryptosystem. In, key-aggregate cryptosystem users encrypt a message not only under a public-key, but also under an identifier of ciphertext called class. That means the ciphertexts are further categorized into different classes. The key owner holds a master-secret called master-secret key, which can be used to extract secret keys for different classes. More importantly, the extracted key have can be an aggregate key which is as compact as a secret key for a single class, but aggregates the power of many such keys, i.e., the decryption power for any subset of ciphertext classes [1].

With solution, Alice can simply send Bob a single aggregate key via a secure e-mail. Bob can download the encrypted photos from Alice's Dropbox space and then use this aggregate key to decrypt these encrypted photos. The scenario is depicted in Figure 1. The sizes of ciphertext, public-key, and master-secret key and aggregate key in our key-aggregate cryptosystem schemes are all of constant size [1].

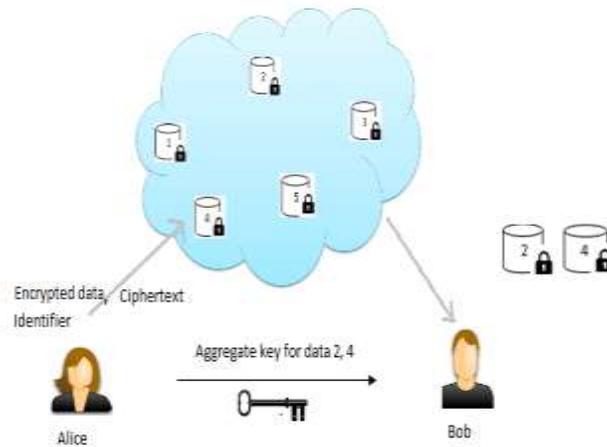


Fig: 1. Alice shares files with identifiers 2, 4 with Bob by sending a single aggregate key.

II. RELATED WORK:

This section gives a brief introduction into the related work done on this subject.

A. CRYPTOGRAPHIC KEYS FOR A PREDEFINED HIERARCHY

We start by discussing the most relevant study in the literature of cryptography/security. Cryptographic key assignment schemes (e.g., [2], [3], [4], [5]) aim to minimize the expense in storing and managing secret keys for general cryptographic use. Utilizing a tree structure, a key for a given branch can be used to derive the keys of its descendant nodes (but not the other way round). Just granting the parent key implicitly grants all the keys of its descendant nodes. Sandhu [6] proposed a method to generate a tree hierarchy of symmetrickeys by using repeated evaluations of pseudorandom function/block-cipher on a fixed secret. The concept can be generalized from a tree to a graph. More advanced cryptographic key assignment schemes support access policy that can be modeled by an acyclic graph or a cyclic graph [7], [8], [9].

Most of these schemes produce keys for symmetric-key cryptosystems, even though the key derivations may require modular arithmetic as used in public-key cryptosystems, which are generally more expensive than “symmetric-key operations” such as pseudorandom function. We take the tree structure as an example. Alice can first classify the ciphertext classes according to their subjects like Figure 2(a). Each node in the tree represents a secret key, while the leaf node represents the keys for individual ciphertext classes. Filled circles represent the keys for the classes to be delegated and circles circumvented by dotted lines represent the keys to be granted.

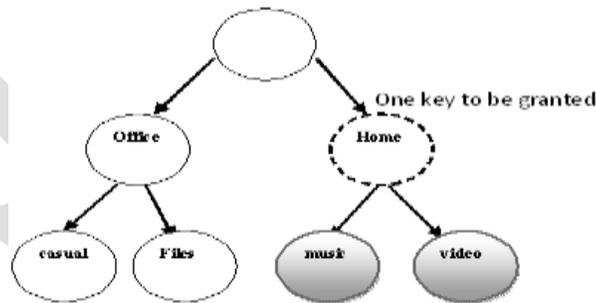


Fig: 2(a). Compact key is not always possible for a fixed hierarchy

Note that every key of the non-leaf node can derive the keys of its descendant nodes. In Figure 2(a), if Alice wants to share all the files in the “home” category, she only needs to grant the key for the node “home”, which automatically grants the delegatee the keys of all the descendant nodes (“video”, “music”). This is the ideal case, where most classes to be shared belong to the same branch and thus a parent key of them is sufficient. However, it is still difficult for general cases.

As shown in Figure 2(b), if Alice shares her demo music at work (“office”! “Casual” and “office”! “files”) with a colleague who also has the rights to see some of her personal data, what she can do is to give more keys, which leads to an increase in the total key size. For this delegatee in our example, the number of granted secret keys becomes the same as the number of classes.

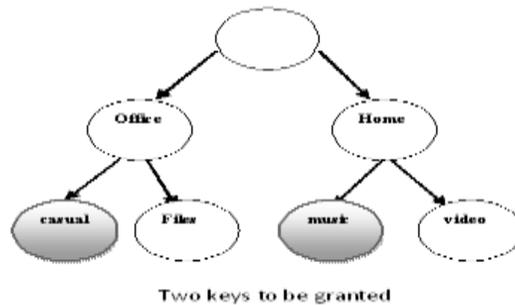


Fig: 2(b). Compact key is not always possible for a fixed hierarchy

In general, hierarchical approaches can solve the problem partially if one intends to share all files under a certain branch in the hierarchy. On average, the number of keys increases with the number of branches. It is unlikely to come up with a hierarchy that can save the number of total keys to be granted for all individuals (which can access a different set of leaf-nodes) simultaneously.

B. COMPACT KEY IN IDENTITY-BASED ENCRYPTION

Identity-based encryption (IBE) (e.g., [10], [11], [12]) is a type of public-key encryption in which the public-key of a user can be set as an identity-string of the user (e.g., an email address). There is a trusted party called private key generator (PKG) in IBE which holds a master-secret key and issues a secret key to each user with respect to the user identity. The encryptor can take the public parameter and a user identity to encrypt a message. The recipient can decrypt this ciphertext by his secret key. Guo et al. [13], [14] tried to build IBE with key aggregation. One of their schemes [13] assumes random oracles but another [14] does not.

In their schemes, key aggregation is constrained in the sense that all keys to be aggregated must come from different “identity divisions”. While there are an exponential number of identities and thus secret keys, only a polynomial number of them can be aggregated. Most importantly, their key-aggregation [13], [14] comes at the expense of $O(n)$ sizes for both ciphertexts and the public parameter, where n is the number of secret keys which can be aggregated into a constant size one. This greatly increases the costs of storing and transmitting ciphertexts, which is impractical in many situations such as shared cloud storage. As we mentioned, our schemes feature constant ciphertext size, and their security holds in the standard model. In fuzzy IBE [11], one single compact secret key can decrypt ciphertexts encrypted under many identities which are close in a certain metric space, but not for an arbitrary set of identities and therefore it does not match with our idea of key aggregation.

III. KEY-AGGREGATE ENCRYPTION

Here we are describing how to use key-aggregate cryptosystem in a scenario of its application in cloud storage. A key-aggregate encryption scheme consists of five polynomial-time algorithms as follows. The data owner establishes the public system parameter via *Setup* and generates a public/master-secret key pair via *KeyGen*. Messages can be encrypted via *Encrypt* by anyone who also decides what ciphertext class is associated with the plaintext message to be encrypted. The data owner can use the master-secret to generate an aggregate decryption key for a set of ciphertext classes via *Extract*. The generated keys can be passed to delegateses securely (via secure e-mails or secure devices) finally; any user with an aggregate key can decrypt any ciphertext provided that the ciphertext’s class is contained in the aggregate key via *Decrypt*.

- *Setup* ($1^\lambda, n$): The data owner establishes system parameter via *Setup*. On input a security level parameter 1^λ and the number of ciphertext classes n , it outputs the public system parameter *param*.
- *KeyGen*: It is executed by the data owner to randomly generate a public/master-secret key pair (pk, msk).
- *Encrypt* (pk, i, m): It is executed by anyone who wants to encrypt data. On input a public-key pk , an index i denoting the ciphertext class, and a message m , it outputs a ciphertext C .
- *Extract* (msk, S): It is executed by the data owner for delegating the decrypting power for a certain set of ciphertext classes to a delegatee. On input the mastersecret key msk and a set S of indices corresponding to different classes, it outputs the aggregate key for set S denoted by K_s .
- *Decrypt* (K_s, S, i, C): It is executed by a delegatee who received an aggregate key K_s generated by *Extract*. On input K_s , the set S , an index i denoting the ciphertext class the ciphertext C belongs to, and C , it outputs the decrypted result m if $i \in S$.

A canonical application of key-aggregate cryptosystem is data sharing. The key aggregation property is especially useful when we expect the delegation to be efficient and flexible. The schemes enable a content provider to share her data in a confidential and selective way, with a fixed and small ciphertext expansion, by distributing to each authorized user a single and small aggregate key. Here we describe the main idea of data sharing in cloud storage using key-aggregate cryptosystem, illustrated in Figure 3.

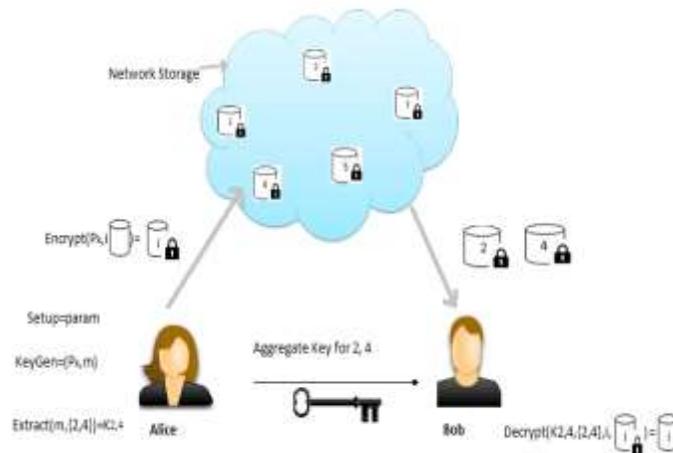


Fig. 3. Using key-aggregate cryptosystem for data sharing in cloud storage

Suppose Alice wants to share her data m_1, m_2, \dots, m_i on the server. She first performs $Setup(I^\lambda, n)$ to get $param$ and execute $KeyGen$ to get the public/master-secret key pair (pk, msk) . The system parameter $param$ and public-key pk can be made public and master-secret key msk should be kept secret by Alice. Anyone (including Alice herself) can then encrypt each m_i by $C_i = Encrypt(pk, i, m)$. The encrypted data are uploaded to the server. With $param$ and pk , people who cooperate with Alice can update Alice's data on the server. Once Alice is willing to share a set S of her data with a friend Bob, she can compute the aggregate key K_s for Bob by performing $Extract(msk, S)$. Since K_s is just a constant size key, it is easy to be sent to Bob via a secure e-mail. After obtaining the aggregate key, Bob can download the data he is authorized to access. That is, for each $i \in S$, Bob downloads C_i (and some needed values in $param$) from the server. With the aggregate key K_s , Bob can decrypt each C_i by $Decrypt(K_s, S, I, C_i)$ for each $i \in S$.

IV. CONCLUSION AND FUTURE WORK

How to protect users' data privacy is a central question of cloud storage. With more mathematical tools, cryptographic schemes are getting more versatile and often involve multiple keys for a single application. In this article, we consider how to "compress" secret keys in public-key cryptosystems which support delegation of secret keys for different ciphertext classes in cloud storage. No matter which one among the power set of classes, the delegatee can always get an aggregate key of constant size. Our approach is more flexible than hierarchical key assignment which can only save spaces if all key-holders share a similar set of privileges.

A limitation in the work is the predefined bound of the number of maximum ciphertext classes. In cloud storage, the number of ciphertexts usually grows rapidly. So we have to reserve enough ciphertext classes for the future extension. Otherwise, we need to expand the public-key.

Although the parameter can be downloaded with ciphertexts, it would be better if its size is independent of the maximum number of ciphertext classes. On the other hand, when one carries the delegated keys around in a mobile device without using special trusted hardware, the key is prompt to leakage, designing a leakage-resilient cryptosystem [12], [21] yet allows efficient and flexible key delegation is also an interesting direction.

REFERENCES:

- [1] Cheng-Kang Chu, Chow, S.S.M, Wen-Guey Tzeng, Jianying Zhou, and Robert H. Deng, "Key-Aggregate Cryptosystem for Scalable Data Sharing in Cloud Storage", IEEE Transactions on Parallel and Distributed Systems. Volume: 25, Issue: 2. Year: 2014.
- [2] S. G. Akl and P. D. Taylor, "Cryptographic Solution to a Problem of Access Control in a Hierarchy," ACM Transactions on Computer Systems (TOCS), vol. 1, no. 3, pp. 239–248, 1983.
- [3] G. C. Chick and S. E. Tavares, "Flexible Access Control with Master Keys," in Proceedings of Advances in Cryptology – CRYPTO '89, ser. LNCS, vol. 435. Springer, 1989, pp. 316–322.
- [4] W.-G. Tzeng, "A Time-Bound Cryptographic Key Assignment Scheme for Access Control in a Hierarchy," IEEE Transactions on Knowledge and Data Engineering (TKDE), vol. 14, no. 1, pp. 182–188, 2002.

- [5] G. Ateniese, A. D. Santis, A. L. Ferrara, and B. Masucci, "Provably-Secure Time-Bound Hierarchical Key Assignment Schemes," *J. Cryptology*, vol. 25, no. 2, pp. 243–270, 2012.
- [6] R. S. Sandhu, "Cryptographic Implementation of a Tree Hierarchy for Access Control," *Information Processing Letters*, vol. 27, no. 2, pp. 95–98, 1988.
- [7] Y. Sun and K. J. R. Liu, "Scalable Hierarchical Access Control in Secure Group Communications," in *Proceedings of the 23th IEEE International Conference on Computer Communications (INFOCOM '04)* IEEE, 2004.
- [8] Q. Zhang and Y. Wang, "A Centralized Key Management Scheme for Hierarchical Access Control," in *Proceedings of IEEE Global Telecommunications Conference (GLOBECOM '04)*. IEEE, 2004, pp. 2067–2071.
- [9] M. J. Atallah, M. Blanton, N. Fazio, and K. B. Frikken, "Dynamic and Efficient Key Management for Access Hierarchies," *ACM Transactions on Information and System Security (TISSEC)*, vol. 12, no. 3, 2009.
- [10] D. Boneh and M. K. Franklin, "Identity-Based Encryption from the Weil Pairing," in *Proceedings of Advances in Cryptology – CRYPTO '01*, ser. LNCS, vol. 2139. Springer, 2001, pp. 213–229.
- [11] A. Sahai and B. Waters, "Fuzzy Identity-Based Encryption," in *Proceedings of Advances in Cryptology - EUROCRYPT '05*, ser. LNCS, vol. 3494. Springer, 2005, pp. 457–473.
- [12] S. S. M. Chow, Y. Dodis, Y. Rouselakis, and B. Waters, "Practical Leakage-Resilient Identity-Based Encryption from Simple Assumptions," in *ACM Conference on Computer and Communications Security*, 2010, pp. 152–161.
- [13] F. Guo, Y. Mu, and Z. Chen, "Identity-Based Encryption: How to Decrypt Multiple Ciphertexts Using a Single Decryption Key," in *Proceedings of Pairing-Based Cryptography (Pairing '07)*, ser. LNCS, vol. 4575. Springer, 2007, pp. 392–406.
- [14] F. Guo, Y. Mu, Z. Chen, and L. Xu, "Multi-Identity Single-Key Decryption without Random Oracles," in *Proceedings of Information Security and Cryptology (Inscrypt '07)*, ser. LNCS, vol. 4990. Springer, 2007, pp. 384–398.
- [15] T. H. Yuen, S. S. M. Chow, Y. Zhang, and S. M. Yiu, "Identity Based Encryption Resilient to Continual Auxiliary Leakage," in *Proceedings of Advances in Cryptology - EUROCRYPT '12*, ser. LNCS, vol. 7237, 2012, pp. 117–134

Efficient High Capacity Quantum Cryptography Based Key Distribution in WI-FI Network

Ajish S , Assistant Professor

Department of Computer Science and Engineering
College of Engineering, Perumon, Kollam, India, ajishs2014@gmail.com

Abstract— There are a large variety of kinds of mobile wireless networks, Wi-Fi, based on the IEEE 802.11 standard, is a wireless local area network, mainly used in offices and campus at universities or in meeting rooms. For such limited coverage area, IEEE 802.11 standard may be observed as building oriented environment, which potentially offers a chance to let quantum key distribution (QKD) play a role in the security of wireless communications. In fact, secured data transmission is one of the prime aspects of wireless networks as they are much more vulnerable to security attacks. We can explore the possibility of using Quantum Key Distribution (QKD) for authentication and data encryption for IEEE 802.11 standard. Quantum key distribution is based on the laws of quantum physics which ensure that nobody can measure a state of an arbitrary polarized photon carrying information without introducing disturbances which will be detected by the legitimate user. In the new protocol (BB84) the existing 4-way handshake of IEEE 802.11 has been replaced with the QKD based 4-phase handshake. In the BB84 protocol each photons carry only one bits. So to improve the efficiency in Efficient High Capacity Quantum Cryptography based Key Distribution in WI-FI Network each photons carry two bits. The channels used in the QKD are quantum channel and classical channel. The polarized photons are transmitted through the quantum channel and the classical channel deals with recovering identical secrete keys at both ends. The classical channel comprises of four stages, namely Sifting, Error Estimation, Reconciliation and Privacy Amplification. The Quantum Bit Error Rate (QBER) is the measurement of the error probability in the key distributed via the quantum channel. This value allows the users to estimate the maximum amount of information that an eavesdropper could have on the key.

Keywords— IEEE 802.11; Quantum Key Distribution; 4-phase Handshake Protocol; BB84 Protocol; Quantum Channel; Classical Channel.

I. INTRODUCTION

While wireless networks and their applications are becoming popular every day, associated security issues have become a great concern. It could be seen that the key used for data encryption plays a major role to the security of the wireless communication. The amended version IEEE 802.11i of 802.11[1] standard has been using the process known as 4- way handshake to exchange the key between the two parties. It was shown that 4-way hand shake is subject to security issues. The main key obtain through 4-way handshake is the Pair-wise Transient Key (PTK). PTK is used to build the key hierarchy containing few other keys that are needed for other encryptions of 802.11. Thus it is essential to have the PTK distributed safely.

It is well known that from the laws of physics, a key distributed via Quantum Key Distribution (QKD) offers unconditional security between two communication parties. Instead of using 4-way handshake, QKD has been used to distribute the secrete key (PTK) in Wi-Fi network. Since the key obtained via QKD [1] provide unconditional security, 802.11 key hierarchies will inherit the same level of protection enabling secure communications. The QKD comprises of two channels: Quantum Channel and Classical Channel. Quantum channel is used to transmit series of polarized photons representing the key bits that are to be sent to the receiver. Quantum transmission normally associated with errors that are introduced as a result of atmospheric conditions, dark counts of photon apparatus etc, and most importantly eavesdropping. The foundation of quantum cryptography lies in the Heisenberg uncertainty principle, which states that certain pairs of physical properties are related in such a way that measuring one property prevents the observer from simultaneously knowing the value of the other. Thus any intervention of an eavesdropper can easily be recognized by the alterations introduced to the measurements of polarized photons. The Quantum Bit Error Rate (QBER) [2] is the measurement of the error probability in the key distributed via the quantum channel. The QBER can be defined as the ratio of an error rate to the key rate and contains information on the existence of an eavesdropper and how much such eavesdropper knows. This value allows the users to estimate the maximum amount of information that an eavesdropper could have on the key. It serves as an input to the key distillation protocol that transforms raw keys into the secret key.

The classical channel, being the 802.11 wireless network, is used to recover the final key after removing the errors introduced during transmission. In order to make all the system works well, the classical channel comprises of four stages, namely Sifting, Error Estimation, Reconciliation and Privacy Amplification. During the sifting phase Supplicant (STA) and Access Point (AP) communicates to keep the bits that recorded against the correct bases that used to polarize the bits. In the error estimation phase they estimate possible error level by comparing a sample of bits obtained from their key. In the reconciliation phase, STA and AP remove all the errors present in their keys. Finally, in privacy amplification, they apply a chosen hash function to eliminate possible information that may have leaked to a third party. The modifications are mainly focus on the Counter-Mode/CBCMAC Protocol (CCMP) data confidentiality protocol. The existed 4-way handshake has been replaced by the QKD based 4-phase handshake.

Modifications are proposed in two places of the existing 802.11 protocol: firstly, during the association process to negotiate QKD specific parameters to be used, secondly, the 4-way handshake protocol. These changes only require few field level modifications thus the existing frame structure remains intact.

II. 4-WAY HANDSHAKE

The 4-way handshake is started by the Authenticator by sending a value ANonce (Authenticator Nonce) to the Supplicant. Upon receiving the value ANonce, the Supplicant generates the value SNonce (Supplicant Nonce) and has all materials to build the key hierarchy. To build the Pair-wise key hierarchy, the Supplicant uses a Pseudo Random Function (PRF) to derive the PTK of 384 bits (for CCMP) or 512 bits (for TKIP) from the PMK, the MAC(Medium Access Control) address of the Authenticator (AMAC), the MAC address of the Supplicant (S-MAC), the ANonce, and the SNonce. The PTK is then split into a KEK of 128 bits, a KCK of 128 bits, and a TK of 128 bits (for CCMP) or 256 bits (for TKIP). However, this key hierarchy is not used until the Authenticator is authenticated and ready to use these keys.

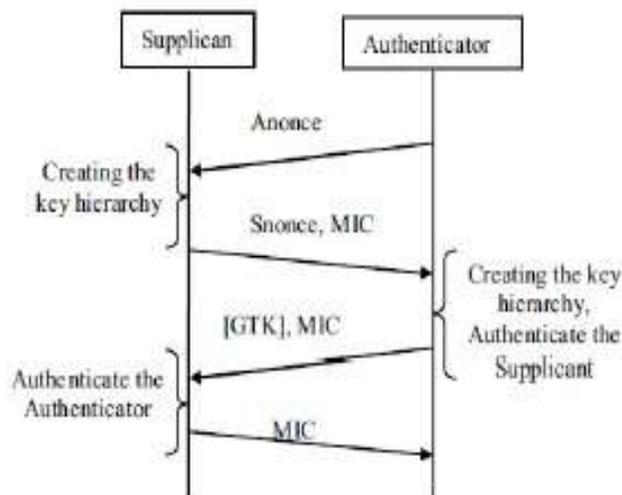


Figure 1. 4-way Handshake.

In the second message of the 4-way handshake, the Supplicant sends to the Authenticator the value Snonce and a MIC calculated based on the content of the message and the KCK which has just derived. The algorithm used to calculate the MIC is HMAC-MD5 or HMAC-SHA1-128 [4] depending on the cipher suite chosen for the system. Upon receiving this message, the Authenticator has all materials to build the same key hierarchy. Then it uses the KCK to check the MIC. If the MIC is correct, that means that the Supplicant obtains the PMK, and thus the Supplicant is authenticated.

In the third message of the 4-way handshake, the Authenticator tells the Supplicant that it has finished the derivation of the key hierarchy. It also sends a MIC calculated based on the content of the message and the KCK which has just derived. Upon receiving this message, the Supplicant checks the MIC in order to verify that the Authenticator obtains the PMK, and thus authenticates the Authenticator. Then, the key hierarchy can be used without the doubt about the authenticity of the access point. The third message of the 4-way handshake can be used by the access point as a means to distribute the GTK to the mobile terminal. In this case, the GTK is sent encrypted using the KEK in the key hierarchy just derived.

The last message of the 4-way handshake is for the purpose of synchronization. The Supplicant tells the Authenticator that the 4-way handshake is now successfully completed and both can turn on the encryption of user data. This message also includes a MIC to assure the Authenticator that this message is sent by the Supplicant and that it is not modified. After the 4-way handshake, the Temporal Key (TK) is used by the encryption algorithm to provide confidentiality and the integrity of user data.

III. MODIFIED BB84 PROTOCOL

BB84 was introduced by Bennet and Brassard [3] in 1984, thus it was named BB84. BB84 is a nondeterministic protocol, which means that it is useful only for the distribution of a random sequence. BB84 is a four state protocol. Other protocols can be a two-state protocol (e.g. the B92), a three-state protocol or a six-state protocol. The BB84 and B92 protocols are nowadays widely used. These protocols are securely proven and largely experimented.

The BB84 protocol is used for the integration of quantum cryptography in 802.11 networks. The operating mode of BB84 protocol consists on two main steps : Quantum transmission as presented in Figure 2, and public discussion.

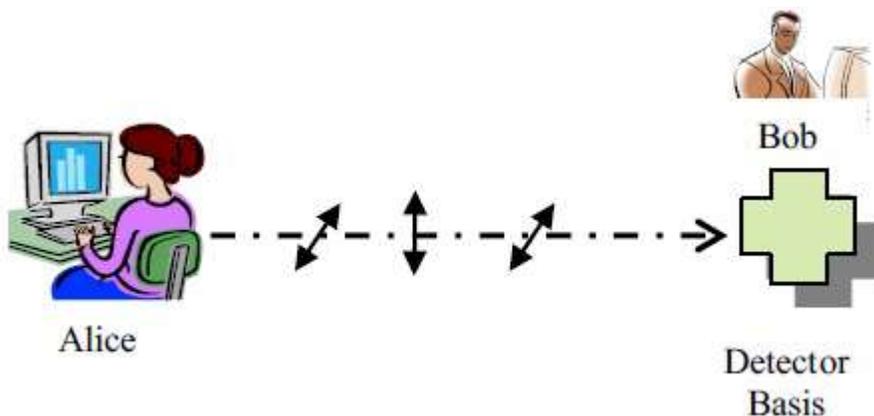


Figure 2. Photon Exchange.

Polarization Direction	Bit Representation
0	00
$\pi/4$	01
$\pi/2$	10
$3\pi/4$	11

Table I
 Polarization Direction of Photons and Corresponding Bit Representation

In the phase of quantum transmission, the information is encoded in non-orthogonal quantum states. This could be a single photon with a polarization direction of 0, $\pi/4$, $\pi/2$ or $3\pi/4$. The sender and the receiver must agree first on the meaning of the photon polarizations for instance 0 for a binary 00, $\pi/4$ for binary 01, $\pi/2$ for 10 and $3\pi/4$ for a binary 11. The polarization direction of photons and the corresponding bit representation is shown in Table I.

The sender (Alice) generates a random bit string and a random sequence of polarization bases then sends the receiver (Bob) photon by photon. Each photon represents two bit of the generated bit string polarized by the random basis for this bit position. When receiving photons, Bob selects the polarization filters (rectilinear or diagonal) to measure the polarization of the received photon.

In the phase of public discussion, after finishing the quantum transmission Bob reports the bases that he picked for each received photon. Alice checks Bob bases and says which ones were correct as described in Figure 3.

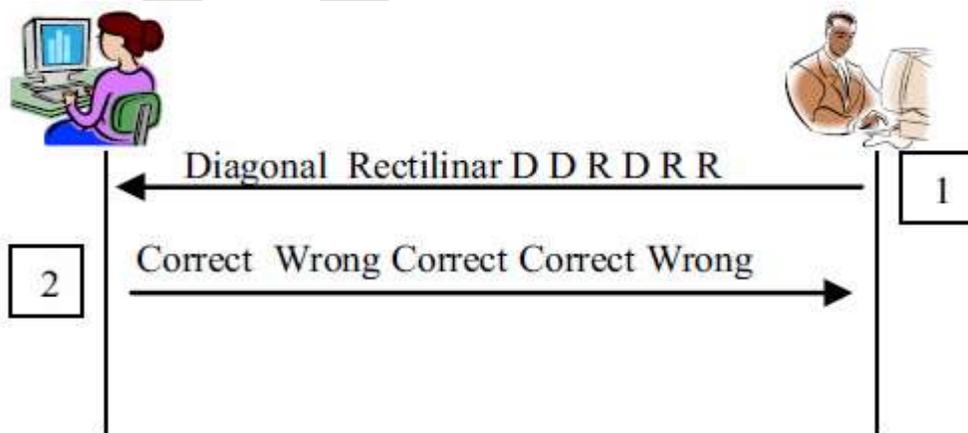


Figure 3. Validation of Bob Bases.

Bob and Alice take the bits resulting from these correct bases, these bits are only known by Alice and Bob. At this moment Alice and Bob share a secret bit string. This exchange is unconditionally secure providing that there is no eavesdrop or active attack and that the quantum channel is perfect. However, as an attack is always possible and the quantum channel is usually imperfect, an additional step is used to estimate the error rate. In this step, Bob chooses a random sequence of testing bits and sends it back to Alice. Alice checks whether these bits are in conformity with those sent by Alice originally. If there is an attack on the quantum channel the error rate will be about 25% or higher. In this case, Alice and Bob detect the eavesdropper. Otherwise, i.e. the error rate is less than 25%, the two parties discard the revealed bits and take the resulting stream as the secret key. The secrecy of this final stream is unconditional.

Other steps could be applied to enhance the secrecy and generalize the unconditional security of key exchange. These steps are done mainly by error correction and privacy amplification.

IV. PROPOSED 4-PHASE HANDSHAKE PROTOCOL

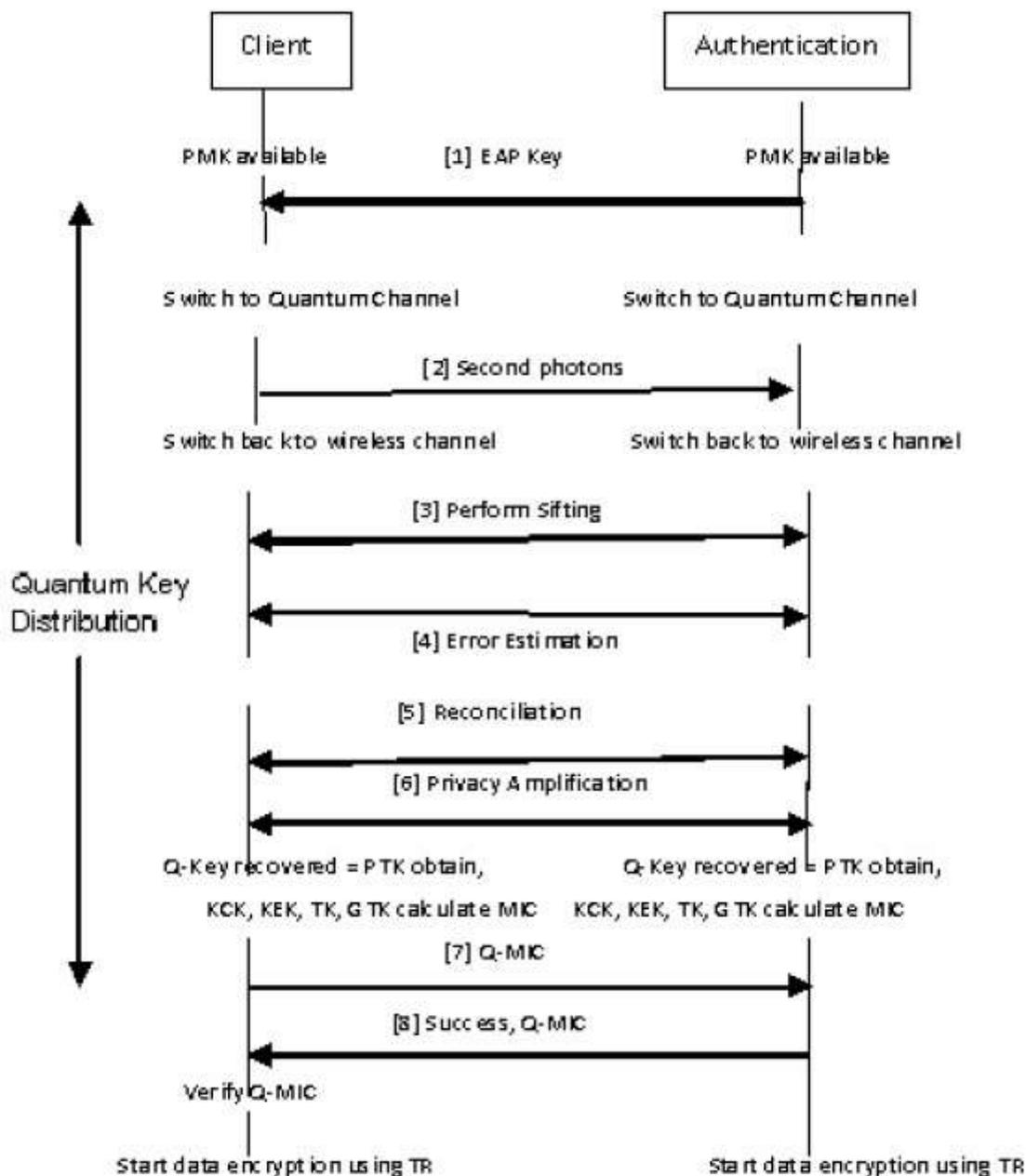


Figure 4. The Proposed 4-Phase Handshake Protocol.

In the proposed protocol, the existing 4-way handshake of IEEE 802.11i has been replaced with the QKD based 4-phase handshake as shown in Figure 4. The last message of IEEE 802.1X authentication is the delivery of EAP key as in flow (1). Both parties are in possession of Pair-wise Master Key (PMK) at the end of this message. At this point the proposed QKD based Wi-Fi protocol begins. The communication switches to quantum channel and the photon transmission takes place (flow (2)) from the STA towards the AP. Once the quantum transmission finishes, the communication channel switches back to the wireless channel. Afterwards the final key recovery process begins by executing the 4 phases as shown in flows (3) to (6).

In the first phase (sifting) AP announces the bases it used to interpret the bits received from STA. With this information, they only keep the bits that are recorded against the matching bases. In the next phase, error estimation as shown in flow (3), the STA sends a random sample of its key to AP. AP then compares these bits with its copy of the key can calculate the error level. In the next phase (flow (5)), they extract the final secured key by implementing a reconciliation protocol such as Cascade, Winnow, parity check etc. At the end of this phase both parties hold identical keys, but may not completely secure. In the last phase, privacy amplification (flow (6)), they apply a selected hash function to extract the final key which has been proven to be unconditionally secure. We take this key as the PTK. Knowing the PTK, rest of the 802.11i key hierarchy consisting of KCK (Key Confirmation key), KEK (Key Encryption key), TK (Temporal Key) and GTK (Group Temporal Key) can be retrieved. The TK is used to encrypt data for the subsequent data communication.

A. Sifting

The authenticator starts the public discussion step by announcing the N bases that it used to receive the N photons. The first message of the public discussion is sent to the supplicant over the radio link and appended with a MIC calculated based on the content of the message and the KCK just established. This MIC assures the integrity and the authenticity of the message.

Upon receiving the bases announcement of the authenticator, the supplicant compares the bases used for the sent photon and those used for the received photons. Assuming that there are M ($M < N$) photons which are sent and received with the same basis. In the second message of the public discussion, the supplicant tells the authenticator the M bases which were correct.

B. Error Estimation

The supplicant and the authenticator keep only the M bits corresponding to the M correct bases. These bits can be the shared secret information if there is no eavesdrop and the quantum channel is perfect without noise. However, eavesdrop is always possible and the quantum channel is usually noisy. The supplicant and the authenticator will detect the probably happened eavesdrop based on an error rate estimation. For this task, the authenticator randomly selects P testing bits ($P < M$) among the remaining M bits. P can be one third of M following the BB84 protocol. In the third message of the public discussion, the authenticator reveals the values of the P testing bits to the supplicant.

In theory the photons sent and received with the same basis should yield the same information value. The authenticator and the supplicant should have the same values for the P testing bits. In practice, the photon's polarization can be changed during the transmission over the quantum channel by the presence of eavesdropping or the noise of the quantum channel, leading to the disagreement on the values of the testing bits. A bit 1 encoded by a photon which is sent and received with the same basis can be decoded into a bit 0. Upon receiving of the values of the P testing bits, the supplicant compares them with the values of their original values. In the fourth message of the public discussion, the supplicant confirms the values of the P testing bits with the authenticator. The error rate is calculated as follows.

$$Er = \frac{\text{Number of disagree testing bits}}{P}$$

If the error rate Er is smaller than a threshold E_{max} , we can conclude that there was no eavesdrop and the error bits are caused by the imperfection of the quantum channel. Otherwise, the quantum transmission was eavesdropped and the photon measurement of the eavesdropper caused an unusual high error rate to quantum transmission. The value of E_{max} depends on the quantum transmission quality of specific QKD systems. If the quantum transmission is concluded "no eavesdropping" after the estimation of the error rate Er , the P testing bits are removed from the M bits. The remaining $M-P$ bits are used as the sifted keys K_r shared between the supplicant and the authenticator, finishing the BB84 procedure. If eavesdropping is detected, the transmitted photon cannot be used. The Quantum handshake is terminated without establishing necessary keys.

C. Reconciliation

The procedure described for Alice and Bob to reconcile their bits takes place over a public channel. Since Eve presumably listens to all public transmissions, Alice and Bob must reveal as little information as possible while still ensuring that they end up with identical keys. They can do this by agreeing upon a random permutation of the bits in their strings (to randomize the locations of errors) and then splitting the resulting string into blocks of size b. The constant b is chosen so that each block is unlikely to contain more than one error. In the BBSS implementation,

was chosen by experiment rather than theory. Alice and Bob then compare the parity of each block. If they find a pair of blocks with mismatched parities, they continually bisect the block into smaller and smaller blocks, comparing parities each time, until the error is found. To ensure that Eve learns nothing from this process, Alice and Bob discard the last bit of each block whose parity they disclose.

After completing this process once, there will still be mismatches in those blocks which happened to contain an even number of errors. So Alice and Bob repeat the process several more times with increasing block sizes until they believe the total number of errors to be low. At this point, the above strategy becomes inefficient because Alice and Bob must discard a bit for each block they compare, and the probability of finding an error in each block is low. So Alice and Bob switch to a new strategy, which they again perform multiple times. Each time, they choose a random subset of the bit positions in their complete strings, and compare parities. The probability of disagreement if the subset strings are not identical is exactly 1/2. If a disagreement occurs, a bisective search for the error is performed, this time using random subsets rather than blocks. The last bit of each subset is discarded. Eventually, all the errors will have been removed, and Alice and Bob will go through enough parity checks without discovering any errors that they may assume their strings are identical.

D. Privacy Amplification

After Reconciliation Alice and Bob possess identical strings, but those strings are not completely private. Eve may have gained some information about them either by beam splitting or through intercept/resend. Although this second strategy may cause some errors in Bob's string, if Eve uses it on only a small number of bits, the induced errors will be lost among the errors caused by noise in the detectors and other physical problems. During the reconciliation phase, Eve did not gain any information, since the last bit of each parity check set was discarded. However, some of her original information about specific bits may have been converted to information about parity bits. For instance, if she knew the value of a bit x in string y , and Alice and Bob revealed the parity of y and discarded x , Eve would then know the parity of the remaining bits of y . If we say that Eve knows a parity bit about a string if she knows the parity of a non-empty subset of that string, then if Eve started out knowing at most k physical bits of the key, she will know at most k parity bits of the key after reconciliation.

In any case, Alice and Bob share an n -bit string S , and we will suppose that Eve knows at most k deterministic (i.e. parity or physical) bits of S . Alice and Bob wish to compute an r -bit key K , where $r < n$, such that Eve's expected information about K is below some specified bound. To do so, they will choose a compression function $g: \{0,1\}^n \rightarrow \{0,1\}^r$ and compute $K = g(S)$.

Definition: A class G of functions $A \rightarrow B$ is universal if for any distinct x_1 and x_2 in A , the probability that $g(x_1) = g(x_2)$ is at most $1/|B|$ when g is chosen at random from G according to the uniform distribution.

An universal class is the set of permutations of A onto itself, since for any g in the set, the probability that $g(x_1) = g(x_2)$ is zero, which is less than $1/|A|$. If Eve knows k deterministic bits of S , and Alice and Bob choose their compression function g at random from a universal class of hash functions $\{0,1\}^n \rightarrow \{0,1\}^r$ where $r = n - k - s$ for some safety parameter $0 < s < n - k$, then Eve's expected information about $K = g(S)$ is less than or equal to $2^{-s/\ln 2}$ bits. One such hash function to generate K is for Alice and Bob to compute an additional r random subset parities of S , this time keeping the results secret. The r results of the parities will be the final r -bit key.

Given this result, one might ask how Alice and Bob are to determine the value of k , i.e. how much information has been leaked to Eve. As a conservative estimate, they can simply assume that all transmission errors were caused by eavesdropping (although most likely some came from detection errors). Eavesdropping errors could come from either intercept/resend or beam splitting. Alice and Bob can use the beam intensity m and the bit error rate to calculate the expected fraction of S that Eve has learned. If they are conservative in their assumptions and add several standard deviations to their results, they will have a safe upper bound on the number of bits leaked to Eve.

The above discussion assumes that Eve knows only deterministic bits, so another issue is whether it might be more useful to her to obtain probabilistic information about S instead. In other words, rather than measuring photons in the same bases as Alice and Bob, she could pick a basis halfway in between them. This will give her a result that matches Alice's with probability approximately 85%, regardless of which basis Alice uses. She will not gain any information when Bob reveals his measurement choices, so with this strategy all of her information is probabilistic rather than deterministic. Conceivably, this probabilistic information could be more resistant to privacy amplification than deterministic information. However, it turns out that this is not the case, so if Eve wishes to optimize her expected information on the final key, she should use the same bases as Alice and Bob, obtaining only deterministic bits.

V. EVALUATION OF RESULTS

In the evaluation process SAGR04 is used as the QKD protocol and parity based bisect method as the reconciliation protocol. These test data has been chosen to cover different error rates, enabling to simulate worst case scenarios as well.

The length of PTK for CCMP is 384 bits. Hence the aim is to obtain 384 bit long final key after removing any errors introduced during the quantum transmission. The main contributor to the errors in the quantum transmission is the eavesdroppers. In addition, environmental conditions and poor quality photon apparatus too could contribute to the errors. By using the modified BB84 protocol the time for Quantum Key Distribution in WIFI network can be reduced to half of that used by BB84 protocol.

The four phases of 4-phase handshake is analyzed against different input data. These data consists of key lengths vary between 400 to 800 bits with error rates of 10%, 20%, 30% and 40%.

A. Analysis of Sifting Phase

During the sifting phase, AP and STA agreed on the bits that are recorded against matching bases. This phase consists of two EAPOL communication flows: AP informing STA the bases used, STA then informs the correct bases back to AP. During this simulation, different key lengths with various error rates have been used as the input to sifting model to calculate the time taken to complete the sifting phase.

The analysis shows that irrespective of the key length, the time taken pattern for sifting is very much identical across different error rates. In the worst possible case the longest key length of the key is 800 classical bits. This means there are 800 bases used to be transmitted. By using the Modified BB84 protocol only 400 photons are need to be transmitted for a key length of 800 bits, so the time taken for Shifting Phase can be reduced to 1/4(AP informing STA the bases used, STA then informs the correct bases back to AP). This number can be easily fitted into one EAPOL frame via the key data field of new information element.

B. Analysis of Error Estimation

The main task of error estimation process is to estimate the errors of the mapped key string after quantum transmission. This estimation is done by selecting a random sample of bits from their keys to find out how many of them are in error. This calculated error rate is then compared against the QBER of the quantum transmission. The QKD project work carried out in parallel with this work has achieved QBER levels between 4% - 8.1% in free space.

Like in sifting phase, error estimation comprises of two EAPOL communication flows: one to inform the sample of bits used for comparison, the other to inform the result. Yet again same set of test data has been used to analyze the performance of the error estimation phase. The below table shows the statistics recorded against these input values.

Key Lengths (bits)	Time taken to complete Error Estimation with various error rates (ms)			
	10%	20%	30%	40%
400	0.63	0.72	0.80	0.97
500	0.68	0.79	0.90	1.01
600	0.73	0.82	0.98	1.10
700	0.81	0.90	1.01	1.19
800	0.97	1.03	1.11	1.27

The analysis shows that the overall performances of error estimation are similar for different key lengths and error levels. As expected, when the size of the key and the error rate increases, the time taken to complete the error estimation also increases.

C. Analysis of Reconciliation

Reconciliation is the most critical phase of 4-phase handshake protocol where STA and AP remove all the errors present in their respective keys to recover the final identical key. The parity based bisect method chosen in this work consumes more messages flows than other reconciliation protocols. The main reason to choose bisect method is to observe the behavior of 4-phase handshake protocol in worst possible circumstances. The time taken to complete reconciliation process depends on several key factors:

1. Length of the main key.
2. Length of the initial block size of the partition.
3. Number of cycles the parity check will run for.

Fig.5 shows time to complete the reconciliation has been calculated at various error levels for a fixed key length of 500 bits. Block size refers to the size of the partition that the main key is divided to perform parity checks. This block size gets reduced if any block is found to have parity mismatch. In such cases, respective blocks are bisected and parity check continues.

It could be seen that smaller the bisect block size, quicker the completion of reconciliation process. With initial block sizes of 4, 8 and 16 m reconciliation completes within 5 ms time frame which is quite acceptable considering the amount of work involved in removing the errors. Main reason to this result is that when the initial block size is smaller, the errors can locate more quickly. Further, if a parity

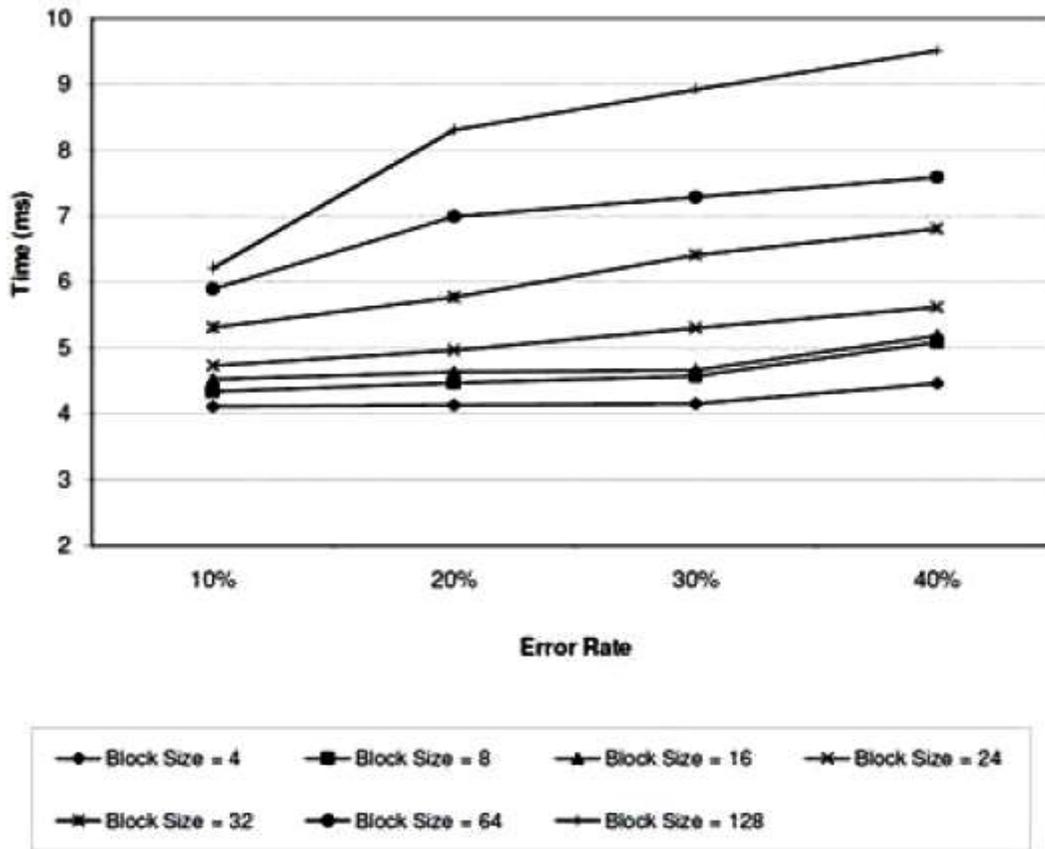


Figure 5. Time Taken to Complete Reconciliation

mismatch is found, then the respective block gets bisected and eventually another round of parity verification is added to the overall communication. With a smaller initial block size, number of sub-blocks required is considerably low. Hence the reconciliation can be completed more quickly. The main reason to this observation is the number of cycles that needed to process the full key length is considerably large. Larger block length will subsequently bisect into more and more sub-blocks hence parity check requires more time to complete.

Other notable observation is when the error level is high (error level of 40%), it takes significant amount of time for reconciliation irrespective of the block size. This is because the entire key is required to process right up to the smallest sub-block level, hence consuming more time for completion.

D. Analysis of Privacy Amplification

During privacy amplification, the key gets further reduced by applying a selected universal hash function to eliminate whatever information that may have leaked to an eavesdropper. The amount of information an eavesdropper might know is based on the sifted bit error rate determined during reconciliation and is entirely applied to potential eavesdropping, rather than distributing that error rate between eavesdropping and system losses.

It can be seen that the performance behavior of privacy amplification remains similar across different key lengths. When the error rate is low, it is evident that privacy amplification gets completed much quicker as the amount of processing on the key is low. In addition to error rate and length of the key, security parameter and the hash function being used also have an impact on the performance. Most of the time consumption during this phase depends on the type of universal hash function being used. The hash function requires some mathematical calculations to compute how the bits are removed to eliminate the information that may have leaked to eavesdroppers.

E. Analysis of the 4-Phase Handshake Protocol

The first, second and fourth phases, namely, sifting, error estimation and privacy amplification respectively, do not consume heavy resources as they the amount of activities involved are limited to few bit comparisons and restructuring the key etc. In contrast, the bisect algorithm using parity check involves some considerable amount of processing during the reconciliation phase. During the simulation, lots of different scenarios with several input data have been used. The variations of chosen reconciliation protocol are: the length of the key, initial block size of the partition and error rate. However the first, second and fourth phases do not

have any such variations that would impact the overall process. Different key lengths with error rates 10%, 20% for initial block size 8 and have been used for these analyses.

It could be seen that the 4-phase handshake protocol gets completed well below 9 ms. This is because the key get partitioned only during the reconciliation phase. The length of the key has most of the impact on the reconciliation as longer the key, more partitions are required, hence more parity comparisons needed. However for other phases, key length does not impact in such a magnitude. During those phases, most time consuming operations being the key reconstruction at the end of each of the phase.

VI. CONCLUSION

The 4-way handshake protocol of the existing IEEE 802.11 has been replaced with the QKD based 4-phase handshake protocol. QKD is the most advanced application of Quantum Information Science. It reached already the world of commercial implementation. The main advantage of this proposed protocol is its ability to offer unconditional security to the users and each photons carry two bits. However, the key exchanged in the existing protocol needs to be refreshed at regular intervals or upon requested by STA to maintain security of data encryption. The AP can refresh the PTK either periodically or upon the request from the STA by running another 4-Way Handshake with the same PMK. But in the proposed QKD based Wi-Fi protocol, such key refresh cycles are not needed as the key exchanged provide unconditional security. Hence with this new protocol significant amount of processing time could be saved. Overall, this can compensate to the extra cycles of flows taken during the reconciliation process.

REFERENCES:

- [1] Thi Mai Trang Nguyen and Mohamed Ali Sfaxi and Solange Ghernaoui-Helie "802.11i Encryption Key Distribution Using Quantum Cryptography", 3rd ed. Journal of Networks 2006.
- [2] Xu Huang and Shirantha Wijesekera, and Dharmendra Sharma "Novel Protocol and Its Implementation QKD in Wi-Fi Networks", 3rd ed. Eighth IEEE/ACIS International Conference on Computer and Information Science.
- [3] C H Bennett and G Brassard "Quantum cryptography: Publickey distribution and coin tossing", 3rd ed. Proceedings of IEEE International Conference on Computers, Systems and Signal Processing, Bangalore, India, December 1994.
- [4] S Wijesekera "Quantum cryptography based key distribution in Wi-Fi Networks-protocol modification in IEEE 802.11" in 5th international conference on software and data technology, Athens, July 2010.
- [5] Brub D "Optimal eavesdropping in quantum cryptography with six states" Phys. Rev. Lett. 81, 3018-3021 (1998).
- [6] Bechmann-Pasquinucci and H Peres A "Quantum cryptography with 3-state systems" Phys. Rev. Lett. 85, 3313- 3316 (2000).
- [7] Bourennane M and Karlsson A and Bjork G "Quantum key distribution using multilevel encoding" Phys. Rev. A 64, 012306 (2001).
- [8] N J Bourennane and M Karlsson and A Gisin "Security of quantum key distribution using d-Level systems". Phys. Rev. Lett. 88, 127902 (2002).
- [9] Groblacher S and Jennewein T and Vaziri A and Weihs and G Zeilinger, "Experimental quantum cryptography with qutrits". New J. Phys. 8, 1-8 (2006).
- [10] Allen L and Beijersbergen M and W Spreeuw " Orbital angular momentum of light and the transformation of Laguerre Gaussian laser modes" . Phys. Rev. A 45, 8185-8189 (1992).
- [11] Bennett, C. H., Wiesner, S. J "Communication via one and two-particle operators on Einstein-Podolsky-Rosen states", Phys. Rev. Lett. 69, 2881-2884 (1992).
- [12] Hanggi E and Renner R and Wolf S " Quantum cryptography based solely on Bell's theorem". Available at arxiv:quant ph/0911.4171 (2009)

Simulation of Tunnel Magneto Resistance

AbhishekThakur, Raminder Preet Pal Singh

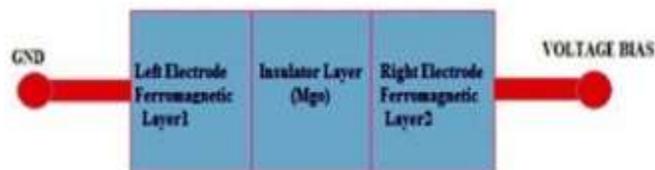
Arni University, abhishek.thakur77@gmail.com (9418373225)

Abstract— In the past two decades electronics has been reaching to its limit of miniaturization and a time will come when further miniaturization will not be possible. Spintronics is the key for opening this deadlock. The science of manipulating the spin of electron with or without the charge to get the desired result is known as Spintronics. Magnetic Tunnel junction is a vital element in Spintronics consists of two ferromagnetic electrodes separated by an insulator layer. Scarcely few works, however, have been carried out thus far in modelling and simulation of Magnetic tunnel junction. Acknowledging the fact that the simulation of tri-layer magnetic tunnel junction will provide a valuable insight for further integration of Spintronics in practical devices, a study of magnetic tunnel junction is presented. In this paper we present result of first principle simulation of TMR of Co/MgO/Co magnetic tunnel junction and various constraints affecting it using Atomix toolkit and NEMO5 Program package. The method in program package is based on carrying out density functional theory (DFT) within the Keldysh Non-equilibrium Green's function

Keywords— Spintronics, Tunnel Magneto resistance, Magnetic Tunnel junction, Co/MgO/Co, Non Equilibrium Green function(NEGF), DFT, LSDA

1. INTRODUCTION

The persistent efforts in device miniaturization by mankind in past few decades lead us to nanometre era of electronic devices where the quantum phenomena of spin and charge took prominent role in device physics. In recent years Magnetic Tunnel Junction is the centre of attraction for various researchers due to interesting physics behind it and its application in area like magnetic sensors and data storage technology. Magnetic Tunnel junction consist of an insulator layer (Mgo, Beo) sandwiched between two thin Ferromagnetic electrode (Fe, Ni or Co) in such a way that the magnetization of two ferromagnetic electrode can be switched between parallel and antiparallel state under the influence of external magnetic field.



Figur1: Magnetic tunnel junction

The following effect was discovered by M. Julliere in year 1975 by taking Fe/Ge-O/Co-junction in consideration at 4.2 K [1]. For practical device applications it is of utmost importance to make sure that insulating layer is very thin so depending upon the relative orientation of magnetization of the two ferromagnetic layers, electrons from one ferromagnetic layer can tunnel through to reach the other metal layer when a bias voltage is applied across the MTJ. This phenomenon is called spin dependent tunnelling (SDT). However TMR decrease precipitously for barrier thickness below 2 nm [2]

In earlier stages of its development magnetic Tunnel junction is usually based on Amorphous Al_2O_3 [2,3] but with the theoretical prediction of WH Butler in year 2001 the course

Changes to that of MgO as it shows large Tunnelling Magneto resistance in a Fe/MgO/Fe Magnetic Tunnel Junction [4,5]. Extensive studies have started over MgO based Magnetic tunnel junction up to now however

Complete understanding of tunnelling is still not attained due to complexity of metal/insulator surface. The major aspect of Magnetic tunnel junction that makes it such a promising candidate for future Spintronic devices like magnetic sensors is Tunnel magneto resistance. Magnetic Tunnel junction is made in such a way that the magnetization of two ferromagnetic electrodes can be switched

between parallel and antiparallel state under the influence of external magnetic field. This switching property caused an abrupt change in electrical conductance of Magnetic tunnel junction [6]. The Tunnel magneto resistance ratio defined the sensitivity of device more the ratio more sensitive the device is. In practical way Tunnel magneto resistance ratio can be defined in terms of conductance and Tunnelling current.

Equation 1(a) and (b)

$$\delta = \frac{G_P - G_{AP}}{G_{AP}}, \delta = \frac{I_{PS} - I_{APS}}{I_{APS}} e$$

Here G_P is conductance in parallel state, G_{AP} is conductance in antiparallel state and similar term goes to tunnelling current. With the theoretical predictions and several experiments TMR ratio is increased to several hundred percent in recent time [7,8].

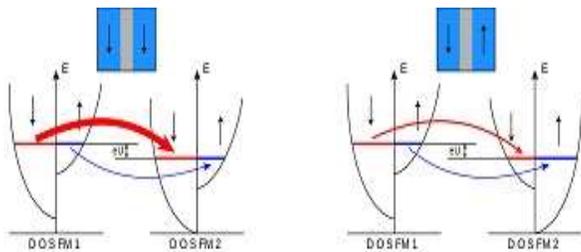


Figure2:Tunnel Magneto Resistance in parallel and antiparallel

The simulation and modelling using first principal calculations help us in discovering various new materials for Magnetic tunnel junction application's [9, 10]. Here in this paper we have studied about Mgo based magnetic Tunnel Junction with Fe as pinned and free layer.

SIMULATION SET UP

In this paper we have built Co/Mgo/Co magnetic tunnel junction on Nemo5 and then simulated it for I-V curve and Transmission spectrum in both parallel and antiparallel configurations. The left electrode has no voltage where as we applied a bias voltage on right electrode. In magnetic tunnel junction the I-V curves are result of spin polarized electron transportation. The exchange correlation used is LSDA. The insulator layer we have taken into consideration is up to 7 layers. Here we have used NEMO5 as calculator and cross checked the result with ATK11.08. The mesh cut off and temperature are 90 Hartree and 373 Kelvin. Here work is done on spin-density functional theory and non-equilibrium Green's functions to estimate the structure and low-bias current/voltage characteristics of magnetic tunnel junctions (MTJs) consisting of five to seven MgO barriers sandwiched between Co electrode in both the parallel and anti-parallel magnetization configurations. The tunnelling magneto resistance in the above two described magnetic tunnel junction with increasing bias voltage ranging from (0 to .4v). The decrease in tunnel magneto resistance with bias voltage is in accordance with the experimental values. Here we only work on deducing the effects of voltage bias on Tunnel Magneto Resistance there are other aspects also which also affect the Tunnel magneto resistance and that are thickness of Barrier layers and temperature which I will include in our next work. .

Simulation Results

Figure 3(a) (b) I/V curve in parallel and anti - parallel configuration from the following figures we can depict that Tunnel current in parallel state and antiparallel are almost independent of bias voltage.

**I/V Curve Parallel configuration of Co/MgO/Co
Magnetic Tunnel Junction**

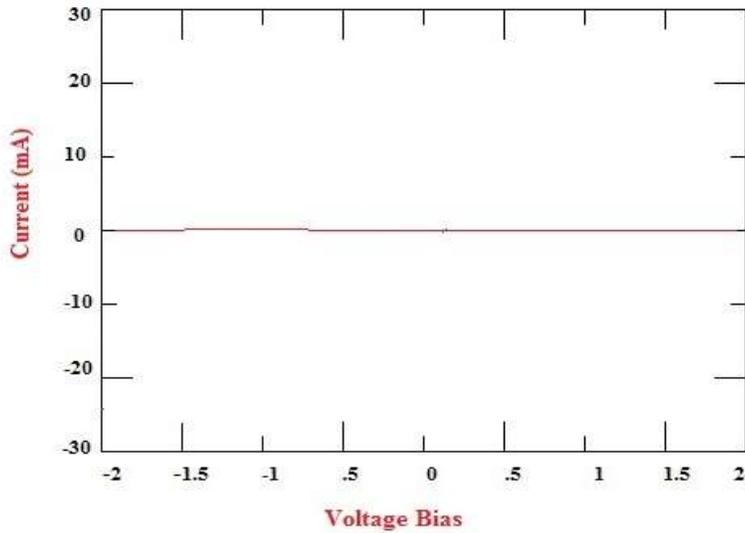


Figure 3(a)

I/V curve Antiparallel Configuration

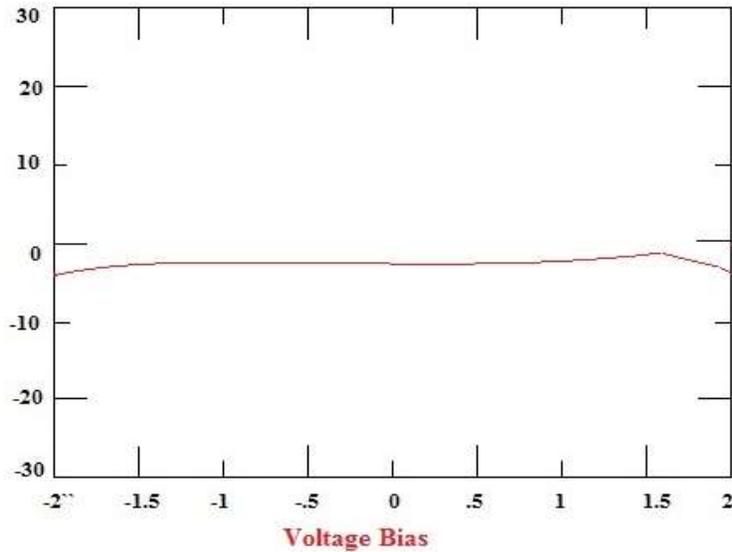


Figure 3 (b)

From the I/V curve we have obtained the value of TMR of the Co/MgO/Co magnetic tunnel junction. From figure 3 and 4 we got the value of Tunnel Magneto Resistance at various bias voltages and what effect does bias voltage cause on the Tunnel magneto resistance of Co/MgO/Co magnetic tunnel junction various bias voltage and a graph has been plotted from the graph it has been seen that the Magnetic Tunnel Junction here exhibit a TMR (ratio) of about 87%-94% when voltage is varied between -1 to 1 volt. Which is quite near to that of 100% hence

copper is also one of the promising materials to be used in Magnetic tunnel junction. This is shown below in Diagram:

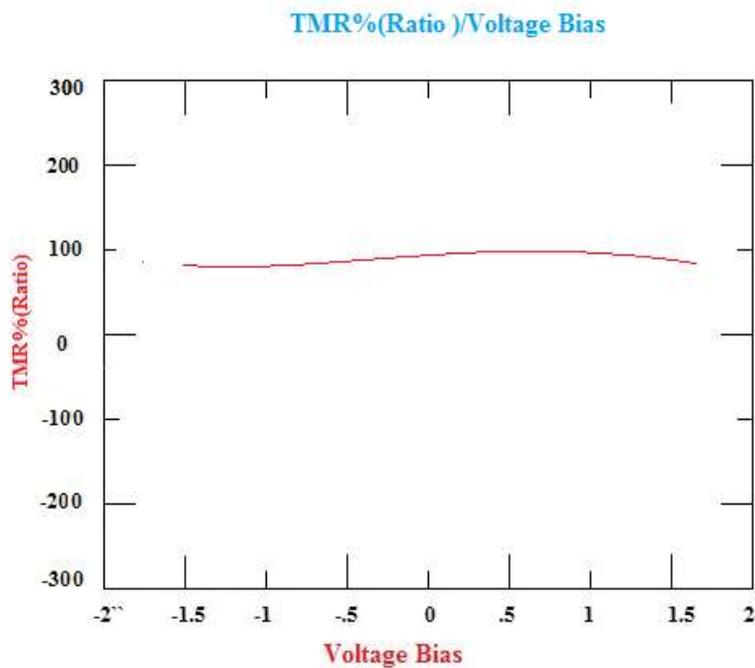


Figure 4

The electrical aspects arising from external conditions applied like bias voltage and its effects on internal condition (e.g. Tunneling Magneto Resistance) are shown precisely in the figure below. The simulation results are not exact in line with that of experimented values reported the variation in results are due to various impurities and resonant channels that are present there at the fabrication process

Conclusion

Although several modeling approaches has been used till today to study electrical properties of Magnetic tunnel junction but none can accurately predict the electrical properties of Magnetic Tunnel Junction. In this paper we have used SGGA band structure calculation for Co/Mgo/Co

Magnetic Tunnel Junction to obtain I/V curve for parallel and anti-parallel states .From the I/V curve we have calculated The Tunnel Magneto resistance at various bias voltages(-1.5 - 1.5). The parallel and anti-parallel states are also simulated against varying insulator thickness from 4 to7 layers.A gradual increase is seen in resistance when varied through four to seven layers. In this we have used NEFG-DFT formalism to examine the case of Co/Mgo/Co magnetic tunnel junction and it is seen that tunnelling properties of magnetic tunnel junction is strongly influenced by voltage bias and insulator thickness of the layer.

Future work

The above described work can further improved by adding various conditions like thermal and stress distribution effect on the simulated magnetic tunnel junction also the study of noise sources of MT J and the defects in the barrier can be studied for further development of Magnetic tunnel junction..

REFERENCES:

- [1]M. Julliere, "Tunneling between ferromagnetic films," Phys. Lett. A, vol. 54, no. 3, pp. 225–226, Sep. 1975
- [2]W. H. Butler, X. G. Zhang, T. C Schulthess and J. M MacLaren, Phys. Rev. B. 63, 054416 (2001).
- [3]W. Thomson, "On the Electro-Dynamic Qualities of Metals: Effects of Magnetization on the Electric Conductivity of Nickel and of Iron", Proceedings of the Royal Society of London, 8, pp. 546–550 (1856–1857).
- [4]N. F. Mott, "The electrical conductivity of transition metals," Proc.Roy.Soc.A153,699 (1936).
- [5]M. Julliere, "Tunneling between ferromagnetic films," Phys. Lett. A, vol. 54, no. 3, pp. 225–226, Sep. 1975
- [6]S. Maekawa and U. Gafvert, "Electron-tunneling between ferromagnetic films," IEEE Trans.Magn., vol.MAG-18, no. 2, pp. 707–708, Mar. 1982.
- [7]K. Deb, S. Agrawal, A. Pratab, T. Meyarivan, "A Fast Elitist Non-dominated Sorting Genetic Algorithms for Multiobjective Optimization: NSGA II," KanGAL report 200001, Indian Institute of Technology, Kanpur, India, 2000. (technical report style)
- [8]M. N. Baibich, J. M. Broto, A. Fert et al., Giant magnetoresistance of (001) Fe/(001) Cr magnetic superlattices, Phys. Rev.Lett. 61, 2472–2475 (1988).
- [9] W. H. Butler, X. G. Zhang, T. C Schulthess and J. M MacLaren, Phys. Rev. B. 63, 054416 (2001).
- [10] First Principles modeling of electron transport KStokbro(J.phy.:Condens. Matter(2008) 064216(7pp)
- [11]First principles modeling of TMR Fe/MgO/Fe trilayers arXiv:cond-mat/0605017
- [12]Simulation of Tunneling Magneto resistance of Fe/Mgo/Fe Magnetic Tunnel Junction by K Shiiki
http://iopscience.iop.org/1742-6596/303/1/012101/pdf/1742-6596_303_1_012101.pdf

Design Improvement for Enhancing the Performance of drag Conveyor Chain and its Cost Reduction

Vishal Wankhade¹, Prof. Suman Sharma²

¹Student of Master of Engineering in Production Engineering and Engineering Design from Truba College of Engineering and Technology, Indore

² Prof. and Head of Mechanical Engineering Department in Truba College of Engineering and Technology, Indore

¹wankhade_vishal@yahoo.co.in, mevishal.acropolis@gmail.com, +91-8878844446

Abstract— Drag conveyors are the most efficient medium of material handling for conveying higher volume from one place to another. In horizontal condition drag chain conveyors can handle material up to 45-50% of cross sectional area of the trough. In between the drive and non drive ends of drag conveyor an endless chain, having wide links carrying projection or wings are drags a bed of bulk material from feeding end to discharge end. Drag conveyor chains are work under the very extreme conditions such as high tensile load, friction and some time hazardous operating environment (e.g. presence of humidity, chemicals). Due to versatile application various failures are occurred in the drag conveyor chain and causes loss of productivity and corrective maintenance in the system. In this paper we emphasis on appropriate design changes by which can reduce cost of drag conveyor chain and enhance the performance.

Keywords— Drag conveyors, material handling, trough, productivity, appropriate design changes, corrective maintenance.

INTRODUCTION

A chain is a reliable machine component, which transmit power by means of tensile forces and is used primarily for power transmission and material handling systems. In the drag conveyors for conveying bed of material from one place to another place a large pitch chain are used. Large pitch conveyor chains are critical component of conveyors in paper mill, sugar mill, fertilizer industry, pharmaceutical industry, cement industry, coal mine, heat treatment plant and food processing industry. In the drag conveyors a roller chain is wound around at least two sprockets, with the sprocket teeth engaging rollers or bushings between the links of the chain. Rotation of a driving sprocket causes power transmission through the chain and consequent rotation of at least one driven sprocket. This process is applied various forces on the chain and cause failure of components of chain assembly. In this research we are emphasis on failure of drag conveyor chain and trying to modify the design of pin and fasteners for enhancing performance and to meet the cost reduction by reducing the material and operations.

Today it is widely acknowledged that companies need to reduce the environmental impact of their activities. In the early days of industrial environmental consciousness focus was set on so-called “end-of-pipe” solutions, i.e. solutions aimed at reducing the amount of harmful emissions and substances from manufacturing facilities. Recently, focus has changed towards the environmental performance of the products and consequently product development has become of great importance, because a product’s environmental performance is mainly determined during the product development process. Eco-design concept in product development is depends upon some key factors and they are: management, customer relationships, supplier relationships, development process, competence and motivation. [1]

Most of the time chain is under tension which causes failure of chain assembly which is the major problem for industrial sector. Causes of this failure are improper design. It is important to study the influence of these parameters. All these parameters can be considered simultaneously and chain link design optimally. Optimization is the process of obtaining the best result under given circumstances in design of system.[2]

Failure of chain link and stress analysis is widely done by Finite Element Method (FEA & FEM) and design optimization tool. The chain links are considered different loading condition, different behavior of failure and design parameter. FEA apply in mechanical element and link, we find in which the parameter are effect to its failure.[3]

COMPONENTS OF DRAG CONVEYOR CHAIN AND THEIR FUNCTION

The list of components of drag conveyor chain and their function and selection criteria is mentioned in the table -1

Table – 1: Components of Drag Conveyor and Their Function and Selection Criteria

PART	FUNCTION	CRITERIA
Plate	Bears the tension placed on the chain	Must have great static tensile strength Must hold up to the dynamic forces of load and shock Must meet environmental resistance requirements
Bush	Bears to shearing and bending stresses transmitted by the plate. Bears to shock and impact load as it strikes the sprocket teeth during the chain engagement with the sprocket	must have great tensile strength against shearing resistant to wear have strength against shock, fatigue, and compression
Pin	Bears to shearing and bending forces transmitted by the plate	needs high tensile and shear strength resistance to bending sufficient endurance against shock and wear
Nut Cotter pin Spring Clip T-Pin, Circlip	Prevent the outer plate from falling off the pin at the point of connection	May wear out during high speed operation, therefore, for this application, these parts require heat treatment
T – Flat Flight	Convey or Drag the material	Must have abrasion resistance from material to be convey Ability to wear sliding friction Tensile and shear strength
Gusset	Provide the Strength to welding joint of flight and protect bending of flights	Must have abrasion resistance from material to be convey Tensile and shear strength

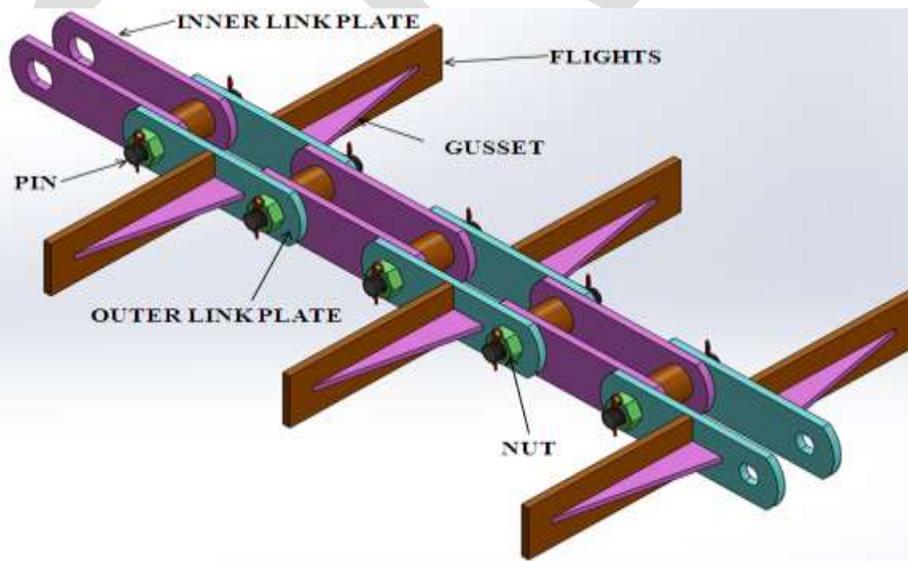


Figure 1: Components of drag conveyor chain and their function

DESIGN OF DRAG CONVEYOR CHAIN

A typical roller chain consists of alternate outer links and inner links. The outer links, which are sometimes known as "pin links," consist of spaced link plates each having a pair of openings or apertures. Pins are tightly fitted in the oblong openings of the outer links. The inner links, which are sometimes known as "bushing links," consist of spaced link plates each having a pair of oblong

openings or apertures. Bush is tightly fitted in the apertures. The bush freely rotates about the pins, so that the inner links are pivotally connected to the outer links or able to articulate with respect to the outer links. Pin of drag conveyor chain are assembled in chain with the help of temporary fastening arrangement.

When this endless chain are moves in between drive and non drive ends of drag conveyor than through flight or projection a bed of bulk material are drags from feeding end to discharge end. This dragging action of material is applies forces on the flights of chain later on this forces are transmitted to the outer chain link and cause deformation of outer chain link. The deformation of outer link is apply forces on fasteners and tries to remove the fastener and break the temporary joint. Direction of forces applied on chain is shown in the figure 2.

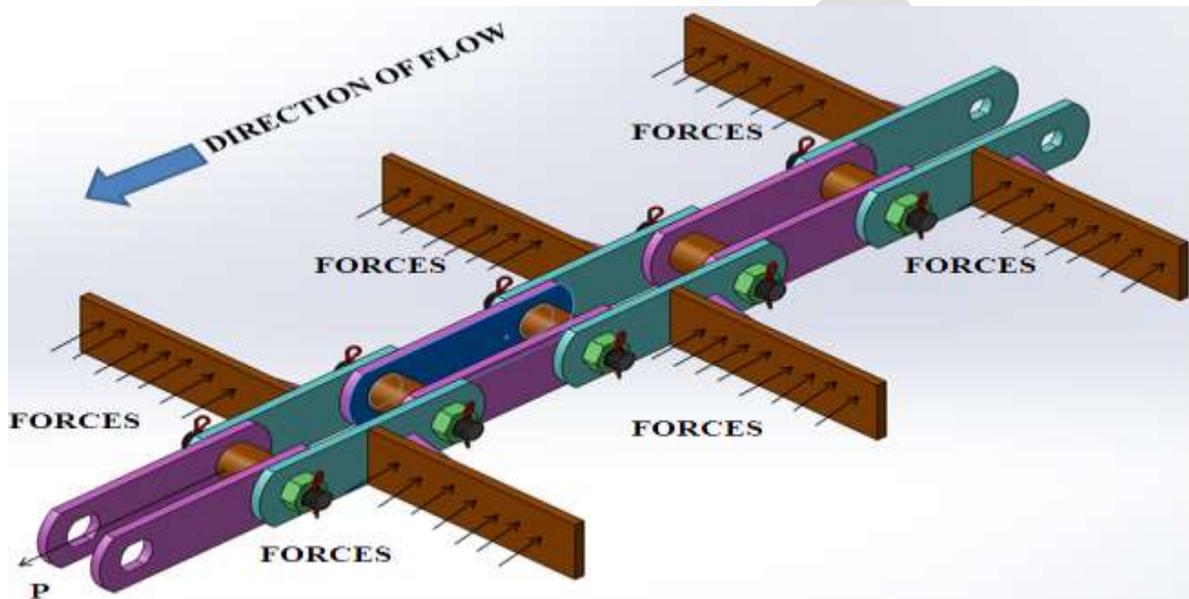


Figure 2: Direction of forces applied by material on drag conveyor chain

EXISTING DESIGN OF DRAG CONVEYOR CHAIN

In the existing design of drag conveyors chain nut is used as a fastener and they are fitted on the two threaded ends of pin. For preventing removal of nut due to rotation, vibration and sudden shocks a split dowel pin is pivoted in the holes at the ends of pin. This type of chain is failed due to following reasons.

Forces applied due to the dragging of material

Another reason of chain failure is miss alignment. If a chain is not properly aligned than at the time of contact of sprocket and chain that time sprocket is applies impact on the two inner link plates later on this impact will transfer in form of force to the outer link plate and cause removal of nuts.

In the figure 3 assembly and disassembly of existing design of chain is shown. This type of chain assembly mainly consist six parts and they are inner link, outer link, bush, pin, nut and split dowel pin.

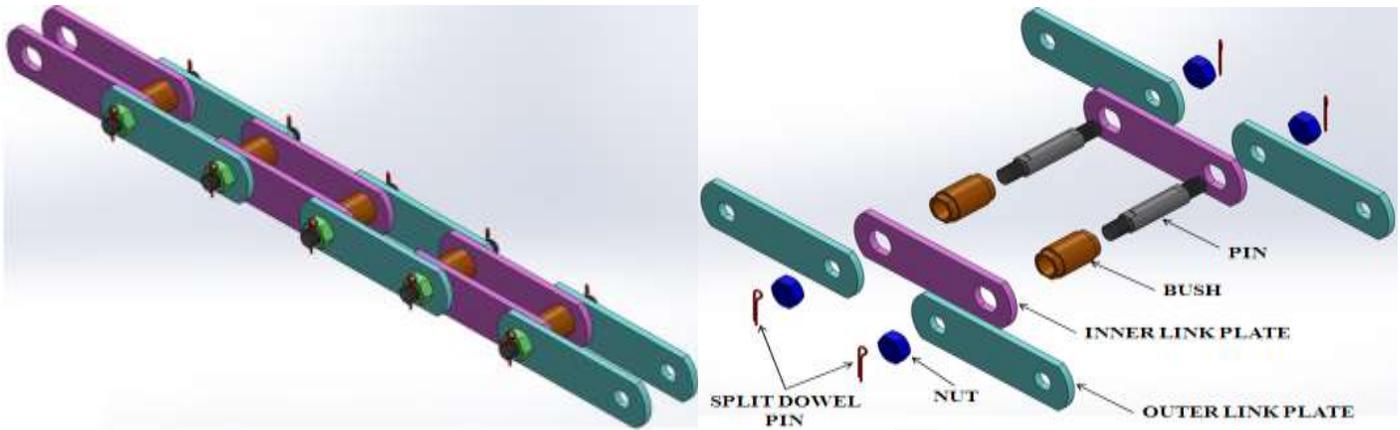


Figure 3: Assembly and Disassembly of Drag Conveyor Chain Existing Design.

PROPOSED DESIGN OF DRAG CONVEYOR CHAIN

In the proposed design of drag conveyors chain we are trying to simplify the design of chain at here we are replace the tedious and costly external threading operation at the pin ends with the simple turning operation through it we can save the material and tries to reduce the weight of chain.

Second change in the proposed design is we are replace the nut and split dowel pin with a single circlip and tries to make the more strength to the joint against the deformation and stresses.

In the figure 4 the assembly and disassembly of proposed chain design is shown. This type of chain assembly mainly consist five parts and they are inner link, outer link, bush, pin and circlip.

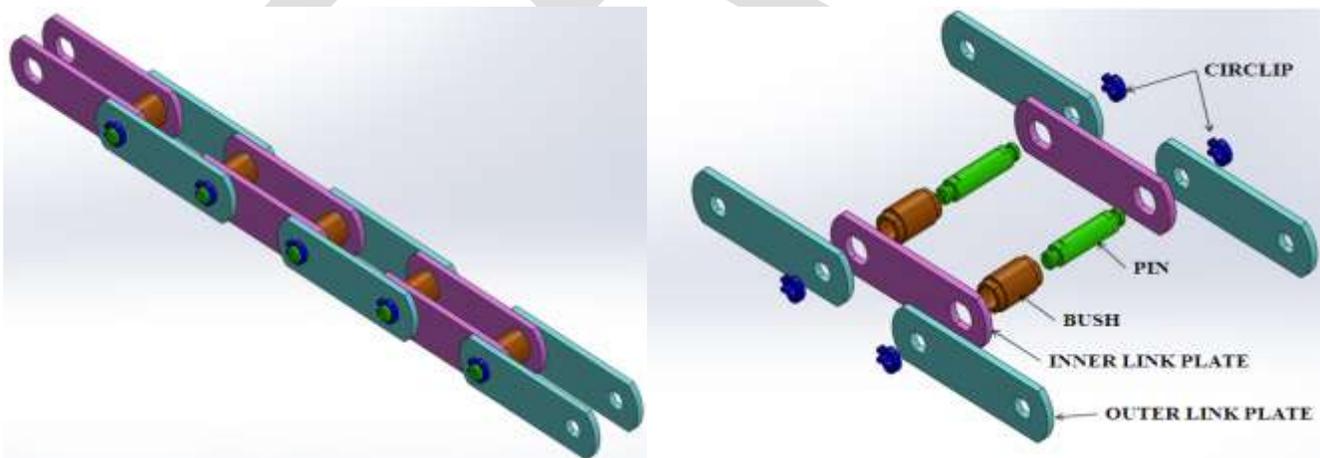


Figure 4: New design of drag conveyor chain

COMPARISONS BETWEEN EXISTING DESIGN AND PROPOSED DESIGN OF DRAG CONVEYOR CHAIN.

We are comparing the existing design of chain with the proposed design at various phenomenons like weight of chain and FEA analysis of chain for finding element stress and displacement in both designs. Linear static FEA analysis of chain is being done by using HyperMesh software with OptiStruct solver. The results of comparison of chain are tabulated in table 2 and table 3.

Weight of chain

Table – 2: Comparison between weights of chain

PART	EXISTING DESIGN	PROPOSED DESIGN
	Weight in grams	
OUTER LINK PLATE	259.4	259.4
INNER LINK PLATE	242.9	242.9
BUSH	83.3	83.3
PIN	111.4	94.0
CIRCLIP	Not used in this design	7.97
NUT	21.03	Not used in this design
SPLIT DOWEL PIN	0.9	Not used in this design
PER METER WEIGHT OF CHAIN	7921.4	7574.4

Load wearing capacity of chain

CAD models of the chain are prepared in the Solidworks and then FEA analyses is being performed in Hypermesh using Optistruct solver. The results of analysis are viewed in the Hyperview.

Input Parameters	
Young's Modulus	2.05e + 005 2 N/mm ²
Poisson's Ratio	0.3
Material Density	79 e -09 t/mm ³
Force Applied	+ ve X Direction

We have applied force of 5kN in +ve X direction on pin and fastener assembly and get the result of element stress which are shown in figure 4. At same force displacement is shown in figure 5

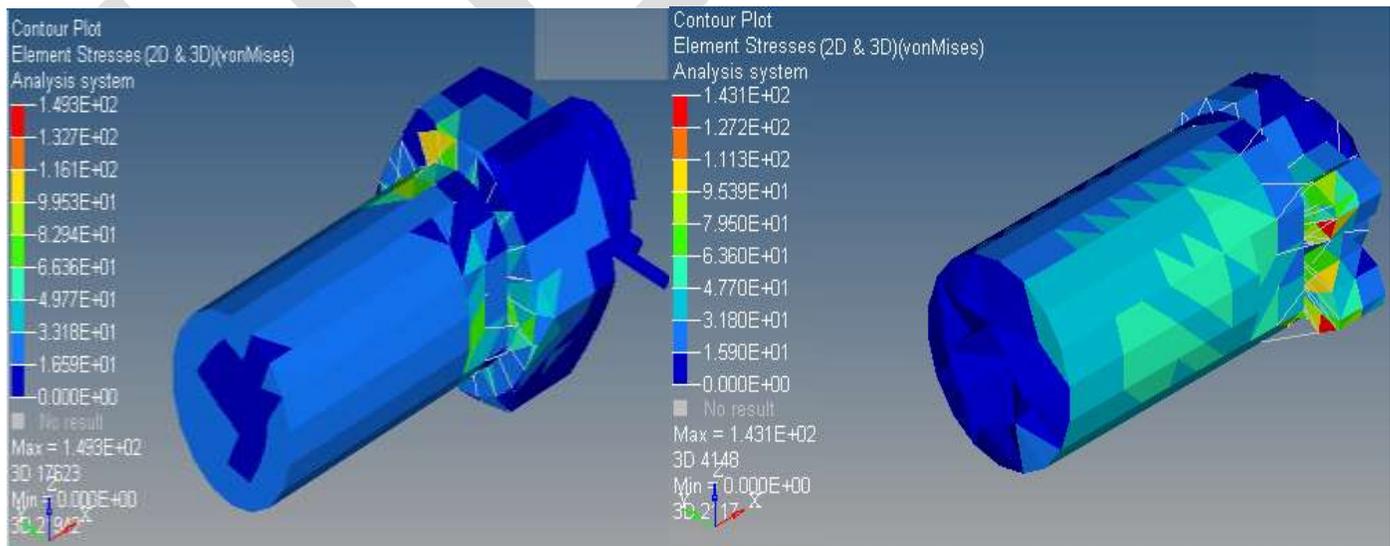


Figure 4: Element stress in pin and fastener assembly

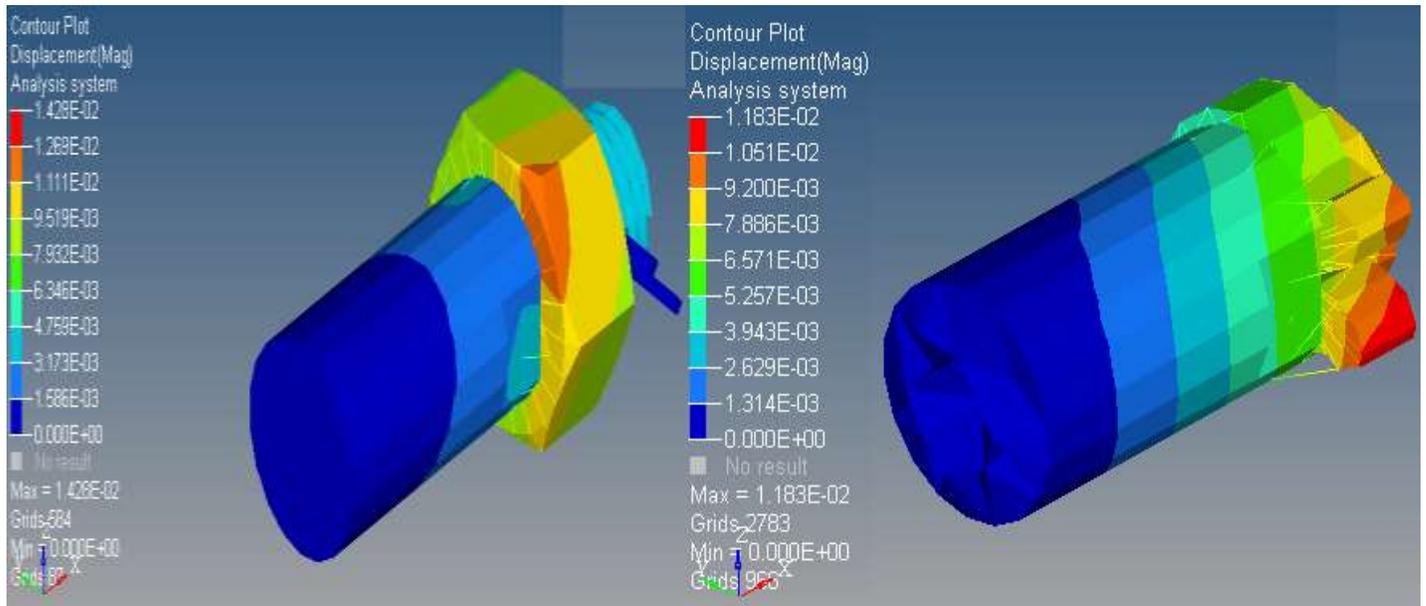


Figure 5: Displacement in pin and fastener assembly

Similarly we have applied forces of 10kN, 15kN and 20kN and get the result which is tabulated in table 3.

Table – 3: Comparison between stress and displacement at different forces

Forces Applied (in kN)	EXISTING DESIGN		PROPOSED DESIGN	
	Stress (in MPa)	Displacement (in mm.)	Stress (in MPa)	Displacement (in mm.)
5	149.3	0.0142	143.1	0.0118
10	298.6	0.0285	286.2	0.0236
15	447.9	0.0428	429.3	0.0354
20	597.2	0.0571	572.4	0.0473

Figure 6 is showing a graph made by values using the values in table 3.

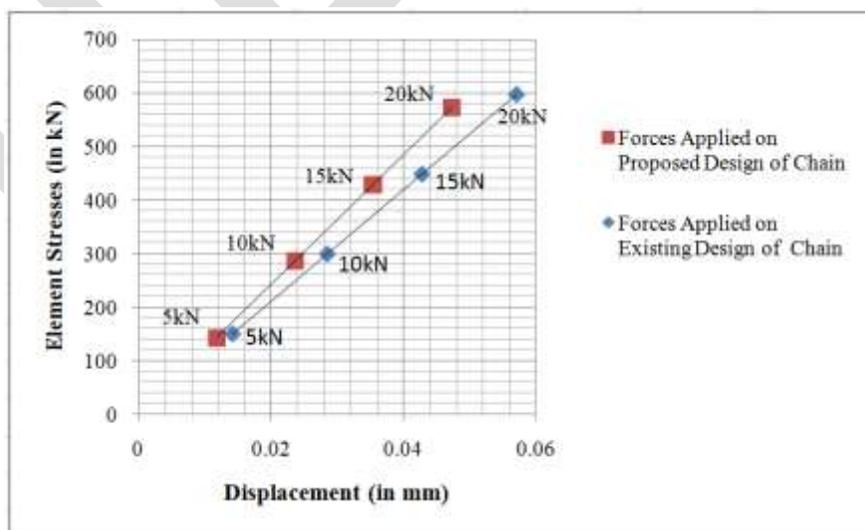


Figure 6: Graph between stress and displacement for existing design of chain and proposed design of chain at different forces

RESULTS

If we are comparing existing design with proposed design of chain then we found following benefits.

- Material saving up to 4.5% in per meter length of chain for same tensile strength by changing design of pin.
- Replace tedious external threading operation at the end of pins with simple turning operation and saves cost of operation and time.
- Eliminating drilling operation for split dowel pin.
- Replacing two fasteners split dowel pin and nut with a single fastener circlip.
- Reducing average element stresses by 4.15 by applying forces from 5kN to 20kN.
- Reducing average displacement by 17.1% by applying forces from 5kN to 20kN.

CONCLUSION

The proposed design of chain is performed better when forces are applied. By the proposed design of chain we can achieve goal of productivity by saving material and operations. The new design also help us in the standardization by replacing two fasteners nut and split dowel pin by single circlip. So we can say we can enhance performance of chain by implementation suggested in the proposed design.

REFERENCES:

- [1] Glenn Johansson “Success Factors for Integration of Ecodesign in Product Development” A Review of State-of-the-art, International Graduate School of Management and Industrial Engineering, Department of Mechanical Engineering, Linköping University, S-581 83 Linköping, Sweden
- [2] Jagtap M. D. “Study of Roller Conveyor Chain Strip under Tensile Loading” International Journal of Modern Engineering Research (IJMER), Vol. 4, May. 2014, pp. 61-66
- [3] Tushar D. Bhoite “Fea Based Study of Effect of Radial Variation of Outer Link in A Typical Roller Chain Link Assembly”, International Journal of Mechanical and Industrial Engineering (IJMIE), Vol-4, 2012, pp. 65-70.
- [4] M. D. Jagtap “Use of Strain Gages to Analyze the Behavior of Roller Conveyor Chain Strip” International Conference on Computer Science and Mechanical Engineering, August 2014.
- [5] Patil R.A “Application of Fine Piercing Process for Roller Chain Link Plate to Increase Breaking Load of Roller Chain”, International Journal of Advanced Engineering Research and Studies, 2014, pp. 106-110.
- [6] Piotr Sokolski “Evaluation of resistance to catastrophic failures of large-size caterpillar chain links of open-pit mining machinery” Maintenance and Reliability, Vol.16,2014, pp. 80-84.
- [7] Thoguluva Raghavan Vijayaram “ Materials Handling Technology and Significance of Expert System to Select Appropriate Handling Equipments in Engineering Industries : A Review”, Journal of Scientific & industrial Research, Volume 65, August 2006, pp. 619-624.
- [8] D. Van Steenkiste “Abrasive Wear of Link Chains” Ghent University, Laboratory Soete, Belgium, Sustainable Construction and Design, 2011, pp. 388-396.
- [9] H. Zheng “A refined numerical simulation on dynamic behavior of roller chain drives” Shock and Vibration IOS Press and the authors Volume 11, 2004, pp. 573–584.
- [10] Sine Leergaard Pedersen “Simulation and Analysis of Roller Chain Drive Systems”, Ph.D. Thesis Department of Mechanical Engineering Technical University of Denmark, August 2004, pp. 1- 188.

[11] DHHS (NIOSH) "Ergonomic Guidelines for Manual Material Handling", Publication No. 2007-131, 2007, pp. 1-68.

[12]V.V.Sople, "Material Handling Equipment: Exploiting Productivity Potential in Supply Chain", SEARCH Article published in 'SEARCH', ITM Business School, Navi Mumbai, Volume 10, October 2007, pp. 1-7.

[13] Nur Ismalina Binti Haris, "Failure Analysis of Conveyor Chain Links : A Case Study at Top Glove Sdn. Bhd." A Project Report for Master of Mechanical Engineering, Universiti Tun Hussein Onn Malaysia, July 2013, pp. 1-55.

[14]Zhan Zhang "Finite element analysis and a model-free control of tension and speed for a flexible conveyor system", Mechanical Engineering Master's Theses, Department of Mechanical and Industrial Engineering, Northeastern University, Boston, Massachusetts, pp. 1-103



Low-Audible Speech Detection using Perceptual and Entropy Features

Karthika Senan J P and Asha A S

Department of Electronics and Communication, TKM Institute of Technology, Karuvelil, Kollam, Kerala, India.

karthika.senan@gmail.com, 91-9447712231

Abstract— Low-audible speech detection is important since it conveys significant amount of speaker information and understanding. The performance of Automatic Speaker Recognition (ASR) and speaker identification systems drops considerably when low-audible speech is provided as input. In order to improve the performance of such systems, low-audible speech detection is essential. The production, acoustic and perceptual properties of such speech is different from normal speech and due to this reason, the methods for detection also differs. In the work, low-audible speech detection process involves feature extraction, feature set combination and a detection algorithm. To obtain the speech components perceived by humans, Perceptual Linear Prediction (PLP), RASTA-PLP (Relative Spectral Perceptual Linear Prediction) and Spectral Information Entropy (SIE) features are extracted. These features are combined and a detection algorithm is performed using Gaussian Mixture Model (GMM) classifier. Mobile phone users can convey their credit card information in an open space using low-audible speech in order to access secure services like phone banking, hotel or car reservation etc. Low-audible speech detection can be used in medical field by speech therapists for evaluating voice disorders in aphonic patients. Forensic scientists are able to recognize speaker identities from low-audible speech which is relevant in the area of national security and defense.

Keywords— Low-audible speech, feature extraction, detection algorithm, Perceptual linear prediction, Relative spectral perceptual linear prediction, spectral information entropy, Gaussian mixture model.

INTRODUCTION

Low audible speech or whispering is the mode of speech defined as speaking softly with little or no vocal fold vibration. Thus the passing air does not generate any fundamental frequency, but just a little turbulent noise. Due to the high noise like content and lack of harmonic structure, the modeling of low-audible speech is challenging compared to other modes of speech production. Moreover, it do not reach very far and can be masked easily by environmental noise. Current speech processing systems works well in situations where normally phonated speech is provided as input. When low-audible speech in noisy environment is provided as input to Automatic Speech Recognition (ASR) or Automatic Speaker Verification (ASV) systems, their performance is reduced considerably. There also occurs mismatches between the training and testing phases of such systems. In order to improve the system performance, detection and recognition of low-audible speech is essential.

Low-audible speech differs from normal speech in its physiological production, acoustic and perceptual properties. In normal speech, air from the lungs causes vocal folds of the larynx to vibrate, exciting the resonances of vocal tract. In low-audible speech, the glottis is opened and turbulent flow created by exhaled air passing through this glottal constriction provides a source of sound. Thus the low-audible speech differs from normal speech in its physiological production. Low-audible speech is characterized by the absence of periodic excitation, changes in energy and duration characteristics, shift of lower formant locations, and changes in the spectral slope. The intensity of low-audible speech is significantly lower than that of neutral speech. Due to the absence of vocal fold vibration, fundamental frequency and harmonic components are absent which makes it aperiodic. The location of lower frequency formants in low-audible speech are shifted to higher frequencies as compared to neutral speech counterparts. The spectral tilt is much flatter compared to normal speech. Due to these characteristics, the methods for processing and detection of low-audible speech is quite different from normal speech.

Various methods like calculating the spectral energy ratio, spectral tilt [2], spectral flatness measure [10], linear prediction [14] etc. are useful for low-audible speech detection in silent environment. The spectral energy ratio method uses the shift of spectral energies to higher frequencies to detect whispered speech. The spectral flatness measure is calculated because in whispered speech, the spectral slope becomes flat due to loss in low-frequency content. When noise is present, these methods will not provide adequate results. Therefore other detection methods using features extracted from time waveform or spectral analysis of speech signal like entropy-based features [5],[6],[7], linear prediction residual [8], linear prediction analysis using minimum variance distortionless

modeling of speech [9],[10], Mel Frequency Cepstral Coefficients (MFCC) [14] are explored. But these existing methods are not efficient in presence of background noise. The proposed method include features which perform well in presence of background noise. The features which are perceived by humans are extracted and the classifier is trained accordingly. It was found that these features also separate speech from noise, reverberation etc. The Gaussian Mixture Model (GMM) Classifier used in the method give better performance compared to other classifiers and is quite helpful in speaker verification tasks.

The use of multimedia portable devices like smart phones and tablets enables users to communicate in any environment. Many applications allow them to interact with these devices through voice. They can carry out tasks such as unlocking the phone or accessing secure services using voice as an interacting medium. With the help of such devices, they can also make confidential and private conversations even in public places. In such situations, they whisper over the phone to reduce the amount of information being spilled out. In such scenarios, the detection of low-audible speech is essential thereby the users can convey their social security numbers, pin numbers or credit card numbers without being overheard. The application of low-audible speech detection also occurs in spoken document retrieval to preserve historical data. It is useful in the field of medicine where speech scientists use low-audible speech to determine perceptual constants and medical doctors evaluate it for safe recovery of larynx surgery patients.

ACOUSTIC DIFFERENCES OF LOW-AUDIBLE SPEECH FROM NEUTRAL SPEECH

In normally phonated speech, air from the lungs causes the vocal folds of the larynx to vibrate, exiting the resonances of the vocal tract. In low-audible speech, vocal folds do not vibrate and the glottal aperture remains open. The turbulent flow created by the exhaled air passing through the glottal constriction provides a source of sound. This sound source is distributed through the lower portion of the vocal tract and the resulting speech is noise excited. The major differences between whispered and neutral speech [3],[4] are the following:

1. The spectrogram of low-audible speech indicate that it does not have a definite formant structure due to lack of vibrating vocal folds. The formants that are present are shifted to higher frequencies as compared to their neutral speech counterparts.
2. Due to the turbulence created at the vocal folds, there is a shift in spectral powers to the higher frequencies in low-audible speech.
3. The spectral slope of low-audible speech is flatter than that of neutral speech and the duration of it is longer than that of normal speech.
4. Low-audible speech has much lower energy than that of normal speech.

METHODOLOGY

The methodology for low-audible speech detection comprises of feature extraction process, feature set combination and a detection algorithm. The feature extraction process includes the extraction of three features namely: PLP (Perceptual Linear Prediction), RASTA-PLP (ReLative SpecTrAl Perceptual Linear Prediction) features and entropy based features. The feature set combination process involves combining discriminative capabilities from different sets of features. The detection algorithm is performed using a Gaussian Mixture Model (GMM) based classifier.

The basic block diagram for the methodology adopted in the work is as shown in figure. Figure 1 shows all the major processes involved in the low-audible speech detection.

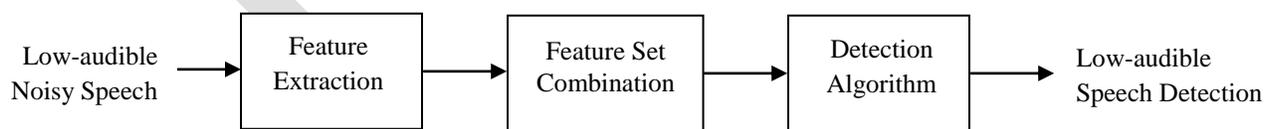


Figure 1: Block Diagram for Methodology

The processing steps and proposed method used in low-audible speech detection are as follows:

Feature Extraction

Feature extraction is the computation of a sequence of feature vectors which provides a compact representation of the given speech signal. This is intended to produce a perceptually meaningful representation of the speech signal. The purpose of feature extraction is to transform the audio data into a space where the observations from the same class will be grouped together and observations of different classes will be separated. Thus the main goal of feature extraction process is to compute a sequence of feature vectors providing a compact representation of the input signal. Prior to feature extraction process, pre-processing steps like framing and windowing are performed in the input speech signals.

Step 1:- Framing

Speech signals are slowly timed varying signals. If speech signals are examined over a sufficiently short period of time (5-100 ms), its characteristics are fairly stationary. In order to analyze speech signals, they are divided into frames. In this step, speech signals are blocked into small frames of N samples, with next frames separated by M samples ($M < N$) with this the adjacent frames are overlapped by $(N-M)$ samples. That is, each frame shares the first part with the previous frame and the last part with the next frame. Studies show that the standard value taken for the samples, $N=256$ and for overlapping is $M=100$ with the reason of dividing the given speech signal into small frames having sufficient samples to get enough information. If the frame size is smaller than the described size, then the number of samples in the frames will not be enough to get the reliable information and with large size frames it will cause frequent change in the information inside the frame. This process of breaking down the signal into frames will continue until the whole speech signal is broken down into small frames.

Step 2:- Windowing

Windowing is performed to minimize the disruptions at the starting and at the end of the frame. Since the edges add harmonics, it is necessary to tone down the edges using a window. If the window is defined as $W_n(m)$, $0 \leq m \leq N_m - 1$, and N_m stands for the quantity of samples within every frame. The output after windowing the signal will be represented as:

$$Y(m) = X(m) W_n(m), \quad 0 \leq m \leq N_m - 1 \quad (1)$$

$Y(m)$ represents the output signal after multiplying the input signal represented as $X(m)$ and Hamming window represented by $W_n(m)$. Hamming window is applied for carrying out windowing which usually represented as:

$$W_n(m) = 0.54 - 0.46 \cos\left(\frac{2\pi m}{N_m - 1}\right), \quad 0 \leq m \leq N_m - 1 \quad (2)$$

Hamming window provides spectral analysis with a flatter pass band and significantly less stop band ripple. This property with the fact that it normalize the signal, so that the energy of the signal will be unchanged through the operation, play an important role for obtaining smoothly varying parametric estimates.

Step 3:- Perceptual Linear Prediction (PLP) Feature Extraction

Perceptual Linear Prediction (PLP) model was developed by Hynek Hermansky [11]. PLP models the human speech based on the concept of psychophysics of hearing. The technique uses three concepts from the psychophysics of hearing to derive an estimate of the auditory spectrum:

1. The critical-band spectrum resolution
2. The equal-loudness curve
3. The intensity loudness power law

The auditory spectrum is then approximated by an autoregressive all-pole model. PLP analysis is more consistent with human hearing in comparison with conventional linear prediction (LP) analysis. The major disadvantage of LP all-pole model is that autoregressive all-pole model approximates power spectrum equally well at all frequencies of analysis band. This is highly inconsistent with human hearing as the spectral resolution of hearing decreases with frequency. The spectral details of power spectrum

are discarded by LP analysis. Therefore a class of spectral transform LP techniques that modify the power spectrum of speech before its approximation by the autoregressive model is introduced.

The steps involved in Perceptual Linear Prediction (PLP) are as follows:

1. The framed and windowed speech signal is subjected to Discrete Fourier Transform (DFT) which transforms it into frequency domain.
2. Computation of Critical Band Spectrum :- The power spectrum obtained (denoted by $P(\omega)$) is warped along its frequency axis ω into the bark frequency Ω by

$$\Omega(\omega) = 6 \ln \left\{ \frac{\omega}{1200\pi} + \left[\left(\frac{\omega}{1200\pi} \right)^2 + 1 \right]^{0.5} \right\} \quad (3)$$

where ω is the angular frequency in rad/s. The resulting warped spectrum is convoluted with the power spectrum of the simulated critical –band masking curve, $\psi(\Omega)$. The critical band curve is given by:

$$\Psi(\Omega) = \begin{cases} 0 & \text{for } \Omega < -1.3 \\ 10^{2.5(\Omega+0.5)} & \text{for } -1.3 \leq \Omega \leq -0.5 \\ 1 & \text{for } -0.5 < \Omega < 0.5 \\ 10^{-1.0(\Omega-0.5)} & \text{for } 0.5 \leq \Omega \leq 2.5 \\ 0 & \text{for } \Omega > 2.5 \end{cases} \quad (4)$$

The Bark filter bank used in the analysis allocates more filters to the lower frequencies where hearing is more sensitive. Also the shape of auditory filters is approximately constant on the Bark scale.

3. The discrete convolution of critical band curve with power spectrum gives samples of the critical-band spectrum.

$$\theta(\Omega_i) = \sum_{\Omega=-1.3}^{\Omega=2.5} P(\Omega - \Omega_i) \Psi(\Omega_i) \quad (5)$$

The convolution of relatively broad critical band masking curves $\psi(\Omega)$ reduces the spectral resolution of $\theta(\Omega)$ in comparison with the power spectrum $P(\omega)$. $\theta(\Omega)$ is sampled in approximately 1-Bark intervals.

4. The sampled critical band power spectrum is pre-emphasized by simulated equal-loudness curve. The function is an approximation to the nonequal sensitivity of human hearing at different frequencies.
5. The operation before all-pole modelling is the cubic root compression. This operation is an approximation to the power law of hearing and stimulates the nonlinear relation between the intensity of sound and its perceived loudness.
6. In the final operation of PLP analysis, an all-pole model is estimated using the auto-correlation method. The Inverse Discrete Fourier Transform (IDFT) is applied to yield the dual of autocorrelation function. The IDFT is used since only a few autocorrelation values are needed. The autocorrelation values are used to solve the Yule-Walker equations for the autoregressive coefficients. The autoregressive coefficients are transformed into cepstral coefficients.

Step 4:- Relative Spectral Perceptual Linear Prediction (RASTA-PLP) Feature Extraction

In RASTA-PLP (RelAtive SpecTrAl Perceptual Linear Prediction) feature extraction, each frequency channel is band-pass filtered by a filter with sharp spectral zero at the zero frequency [12]. Since any slowly varying component in each frequency channel is suppressed by this operation, the new spectral estimate is less sensitive to slow-variations in the short-term spectrum. Thus RASTA-PLP features suppresses the spectral components that change more slowly or quickly than the typical range of change of speech.

The initial steps of RASTA-PLP are same as that of the conventional Perceptual Linear Prediction (PLP) speech analysis. RASTA-PLP feature extraction follows step 1 to step 3. The remaining steps are as follows.

1. After computing the critical band spectrum, its logarithm is taken.
2. The temporal derivative of the log critical-band spectrum is estimated.
3. Re-integrate the log critical band temporal derivative using a first order IIR system.

The remaining steps are as explained in the PLP feature extraction (i.e. steps 4 to 6). The block diagram for RASTA-PLP feature extraction is as shown in Figure 2.

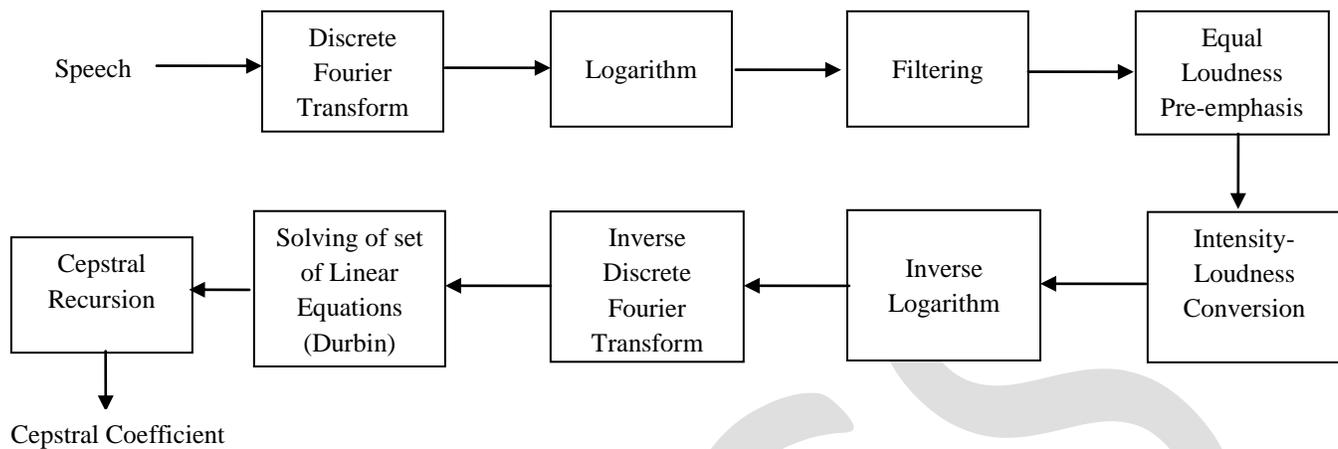


Figure 2. RASTA-PLP Feature Extraction

Step 5:- Spectral Information Entropy Feature Extraction

Entropy based features are considered because short term spectrum is more organized during speech segments than during noise. The spectral peaks of the spectrum are more robust to noise and due to this reason, a voiced region of speech would induce low entropy. The entropy in time-frequency domain known as Spectral Information Entropy (SIE) is found as a useful feature for low-audible speech detection.

The Spectral Information Entropy (SIE) for the input speech frame is measured in the following manner.

1. Let $X(k)$ be the power spectrum of the input speech frame $x(n)$, where k varies from k_1 to k_m , a specified frequency band; then that portion of the frequency content in the k_{th} band versus the entire frequency response is written as:

$$p(k) = \frac{|X(k)|^2}{\sum_{j=k_1}^{k_M} |X(j)|^2}, \quad k = k_1 \text{ to } k_M \quad (6)$$

2. Since $p(k) = \sum_{k=k_1}^{k_M} p(k) = 1$, $p(k)$ can be viewed as an estimated probability that describes the energy distribution within this frequency band ($k=k_1, \dots, k_M$) can be calculated as

$$H = \sum_{k_1}^{k_M} p(k) \log p(k) \quad (7)$$

The SIE represents the distribution of energy over the frequency domain rather than the total amount of energy over the entire frequency domain. Even though the original waveform is amplified, the spectral information energy which means that it is not influenced by the amplitude of the original speech signal.

Step 6:- Feature Set Combination

The idea for feature set combination is to use the discriminative capabilities from different sets of features that have been computed on the same basis from the speech recordings. That is, for a given frame, the feature vector X is computed (nx_1), i.e n features. From the same frame the feature vector Y , (mx_1), i.e m features, then the combination will be the feature vector $Z=[X;Y]$ of dimension $(m+n) \times 1$. This is done for all frames.

Step 6:- Detection Algorithm

Gaussian Mixture Model (GMM) based classifier is used for the detection of low-audible speech. Gaussian Mixture Model (GMM) is a distribution which consists of finite number of Gaussian distributions in the linear way. Gaussian distribution is commonly used because it provides a mathematically straight forward analysis and also it is well qualified to approximate many types of noise in physical systems. GMM is used for unsupervised learning because it can identify the data patterns and cluster those sharing similar data behaviours together. Expectation Maximization (EM) algorithm is a method to estimate the parameters under Maximum a Priori (MAP) or Maximum Likelihood (ML) since hidden variables are involved.

The Expectation Maximization (EM) algorithm computes probabilities for each possible completion of the missing data, using the current parameters. These probabilities are used to create a weighted training set consisting of all possible completions of the data. The EM algorithm alternates between the steps of guessing a probability distribution over completions of missing data given the current model (known as the E-step) and then re-estimating the model parameters using these completions (known as the M-step). The name 'E-step' comes from the fact that one does not usually need to form the probability distribution over completions explicitly, but rather need only compute 'expected' sufficient statistics over these completions. Similarly, the name 'M-step' comes from the fact that model re-estimation can be thought of as 'maximization' of the expected log-likelihood of the data.

A general form of the EM algorithm can be formulated as follows:

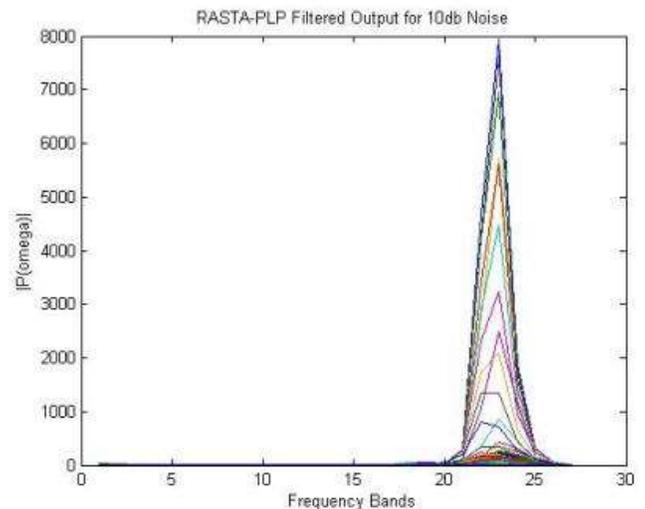
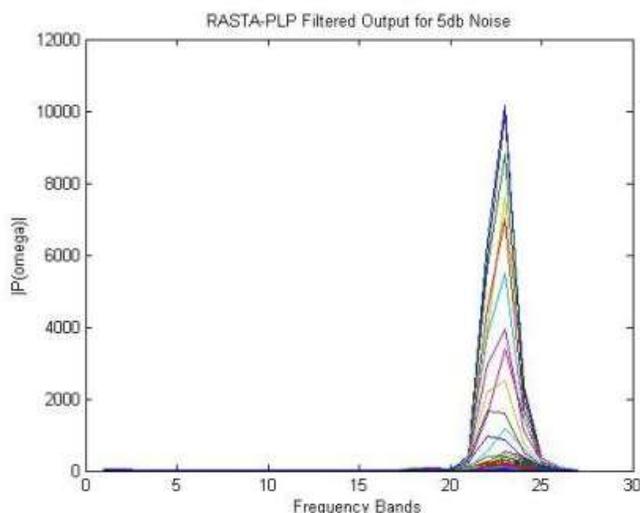
The notation X and Y is the unobserved data and the observed data corresponding to X respectively. θ is the parameters needed to calculate the likelihood $f(Y)$. The goal is to calculate the maximum likelihood θ_{ML} that maximizes $L(\theta) = \log f(Y|\theta)$. Usually the $\log(f(X, Y|\theta))$ has well defined form and thus easy to compute the maximum but it asks the unobserved data X ; then what the EM algorithm does is to figure out a sequence of θ' and θ'' such that $L(\theta') > L(\theta'')$. The calculation steps are the following:

1. Estimation Step: Calculate the expectation of unobserved data $E_{f(X|Y,\theta')} [\log f(X, Y|\theta'')]$.
2. Maximization Step: Find θ'' such that $\theta'' = \operatorname{argmax} (E_{f(X|Y,\theta')} [\log f(X, Y|\theta'')])$.

If it hold that: $E_{f(X|Y,\theta')} [\log f(X, Y|\theta'')] > E_{f(X|Y,\theta')} [\log f(X, Y|\theta')]$ then it is also valid $L(\theta') > L(\theta'')$ to achieve the goal of Maximum Likelihood.

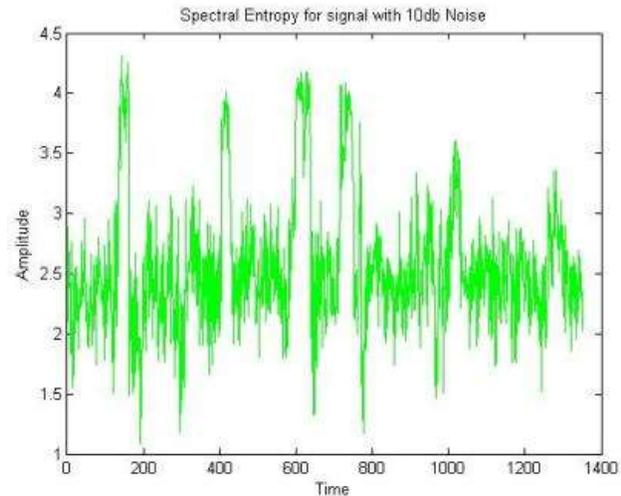
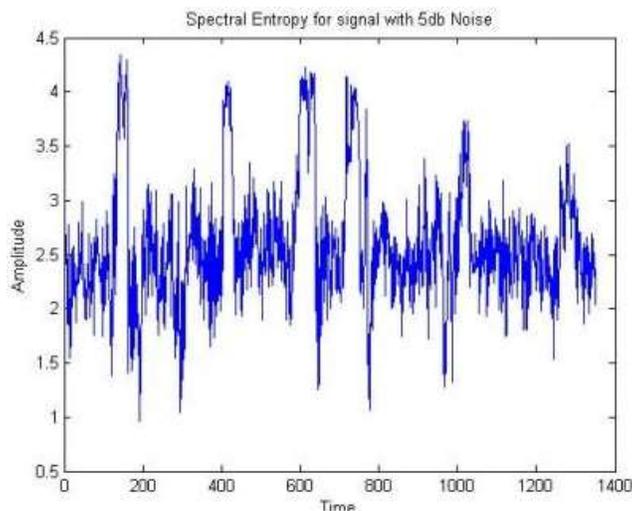
EXPERIMENTAL RESULTS & ANALYSIS

The input speech signal of 3ms duration is obtained from CHAINS Speech Database. The speech signals were created by adding babble noise of different signal strengths. Thus a noisy speech environment was created and changes in the amplitude of input speech was observed. The RASTA-PLP filtering was carried out as the primary feature extraction process are shown in figure. From the filtered output, it is seen that the magnitude of the signal with 10 db noise is less than that of the signal with 5db noise. The components are found in the frequency band ranging from 20-25 Hz. The frequency range of low-audible speech are particularly low frequencies and the audible range of frequencies are filtered.



The spectral entropy for both the speech segments was plotted. Figure

shows the spectral information entropy for speech signal with 5db noise and 10 db noise.



CONCLUSION

The RASTA-PLP feature extraction process extracted the speech components perceived by humans. More amount of low-audible speech information was obtained by this feature extraction. The output of RASTA-PLP feature extraction process is components in the low-frequency range since low-audible speech components are present in the low frequency range. The spectral entropy feature was also extracted since it is useful for separating speech from background noise. The low-audible speech can be used for speaker verification. Speaker verification is the process of accepting or rejecting the identity claim of a speaker. The speaker verification process comprises of training and recognition phases. The training of the classifier can be made by feature extraction and the same classifier can be used for training. The gender of the speaker can also be identified from the detected speech.

REFERENCES:

- [1] Milton Sarria-Paja, Tiago H. Falk, "Whispered Speech Detection in Noise using Auditory-Inspired Modulation Spectrum Features", IEEE Signal Processing Letters, pp. 783-786, vol.20, No.8, Aug. 2013.
- [2] C. Zhang, J. H. L. Hansen, "Analysis and Classification of Speech Mode: Whispered through Shouted", Proc. Interspeech '07-ICSLP, Antwerp, Belgium, pp. 2289-2292, 2007.
- [3] T. Itoh, K. Takeda, F. Itakura, "Acoustic Analysis and Recognition of Whispered Speech", IEEE Int. Conf. on Acoustic, Speech and Signal Processing, pp. 389-392, vol.1, 2002.
- [4] Nicholas Obin, "Cries and Whispers: Classification of Vocal Effort in Expressive Speech", Interspeech, Portland, United States, Sep. 2012.
- [5] C. Zhang, J.H.L Hansen, "Effective Segmentation based on Vocal Effort Change Point Detection", Proc. of ITRW, Aalborg, Denmark, June 2008.
- [6] C. Zhang, J.H.L Hansen, "Whisper-Island Detection based on Unsupervised Segmentation with Entropy-based Speech Feature Processing ", IEEE Trans. on Audio, Speech & Lang. Processing, pp. 883-894, vol. 19, No.4, May 2011.
- [7] C. Zhang, J.H.L Hansen, "An Entropy based Feature for Whisper-Island Detection within Audio Streams", Proc. Interspeech '08, Brisbane, Australia, 2008.
- [8] C. Zhang, J.H.L Hansen, "Advancements in Whisper-Island Detection using the Linear Prediction Residual", International Conf. on Acoustics, Speech and Language Processing (ICASSP), pp. 5170-5173, 2010.
- [9] A. Mathur, S. Reddy, and R. Hegde, "Significance of Parametric Spectral Ratio Methods in Detection and Recognition of Whispered Speech," EURASIP Journal on Advanced Signal Processing, no.157, 2012.
- [10] A. Mathur, S. Reddy, and R. Hegde, "Significance of the LP-MVDR Spectral Ratio Method in Whisper Detection," IEEE National Conf. on Communications (NCC), pp. 1-5, 2011.

- [11] H. Hermansky, "Perceptual Linear Predictive (PLP) Analysis of Speech", Journal of Acoustic Society of America, vol.4,pp. 1738-1750, April 1990.
- [12] Hynek Hermansky, Nelson Morgan, Aruna Bayya, Phil Kohn,"RASTA-PLP Speech Analysis", Speech Communication, vol. 45, pp. 139–152, 2005.
- [13] C. B. Do, S. Batzoglou, "What is Expectation Maximization Algorithm?", Nature Biotechnology, vol.26, no.8, August 2008.
- [14] T. F Quatieri,"Discrete-Time Speech Signal Processing", Pearson Education Inc., 2002.
- [15] B. Gold,N. Morgan,"Speech and Audio Signal Processing: Processing and Perception of Speech and Music", Wiley, India, 2006.
- [16] Matthias Wolfel, John McDonough, "Distant Speech Recognition", John Wiley & Sons Ltd, 2009

IJERGS

Advancing the Efficacy of the College Office Management System of the Bulacan State University through the Implementation of a Network-Based Application

Keno C. Piad

Computer Technology Department, Bulacan State University, Philippines, keno.piad@bulsu.edu.ph

Abstract— The major concern of the research study is the development of a network-based Office Management System for the different colleges of the Bulacan State University that will automate all the transactions done inside the dean's office of each colleges. The beneficiaries of the system includes the deans, college secretaries, student assistants, computer technicians and faculty members of the different colleges. In order to develop a quality system, Iterative Waterfall Model was used. The system was developed using VB.Net and SQL Server as the development tools in developing the system. The Office Management System has the following important features: portability, low maintenance, user-friendliness, scalability, security. The Office Management System was evaluated based on the five acceptability issues with their corresponding computed mean performance which includes reliability, efficiency, accuracy, user friendliness and security of the system. The overall weighted mean is 4.71 with verbal interpretation of "Excellent" shows that the developed system is highly acceptable for implementation.

Keywords—Office management, network-based system, office automation, iterative waterfall model, development model, prototype, input-process-output

INTRODUCTION

It is very evident that the role of Information Technology has a huge impact in every facets of the different industry, as well in the educational institution. Before the birth of pertinent technology, business transactions and operations were done using manual operations such as ledgers and organize files through filling cabinets. This boils down that every task becomes more complicated and the duration of time to complete a task takes longer [1].

Conversely, as computers becomes popular in business institutions, the dispensation of work got more alleviated [2]. These technologies are used in almost all sectors such as financial management and analysis, inventory and transportation control, database management, software development, security control and many other vital fields. The end result of modern computing is increased productivity and quality. Thus modern computing generates in proliferation of quality and productivity.

Through the application and integration of technology performing everyday routine in a usual business environment becomes less burdensome [3]. Management system is describe as an interaction between humans and machines that, together set common objectives, strategies and tactics which is essential to run the totality of an organization [4].

Administering and consolidating the supporting day-to-day activities of the front office commonly describe the definition of office management. This activities is often performed by an office manager [5]. The office manager possible task includes supervision of office workers, responding with customer service, dealing with accounting task, examining sales, hiring process, approval and decision making.

Background of the Study

Bulacan State University (BulSU) is a state-funded institution of higher learning established in 1904 and converted into a university in 1993 by virtue of Republic Act 7665 [6]. The University in mandated to provide higher professional/technical and special instruction for special purpose and to promote research and extension services, advanced studies and extension services. Through the progressive leadership of the university, it is continuously growing in terms of number of colleges and faculty members skilled in the diversified fields of education. With this increasing number of members its community, office management in each colleges becomes burdensome particularly in the part of the office of the dean where most of the college transactions transpire.

The system does not cover the computation of salary and generation of daily time record (DTR). Any process out of the scope would be the limitation of this study. The system was evaluated by selected deans, faculty members and college secretary of the university

METHODOLOGY

The study is an applied research wherein a prototype of the system was developed, tested and evaluated using the Iterative Waterfall Model [7, 8, 9]. The development was based on the assumption that the member colleges are equipped with the necessary hardware for network-based application.

Project Design and Development

In this study, the researcher used diagram that recapitulated the steps on developing the system as presented in Figure 1 as a conceptual model. A system can be modelled using the basic IPO model. The IPO model describes how a process can transform and input to give a desired output [10].

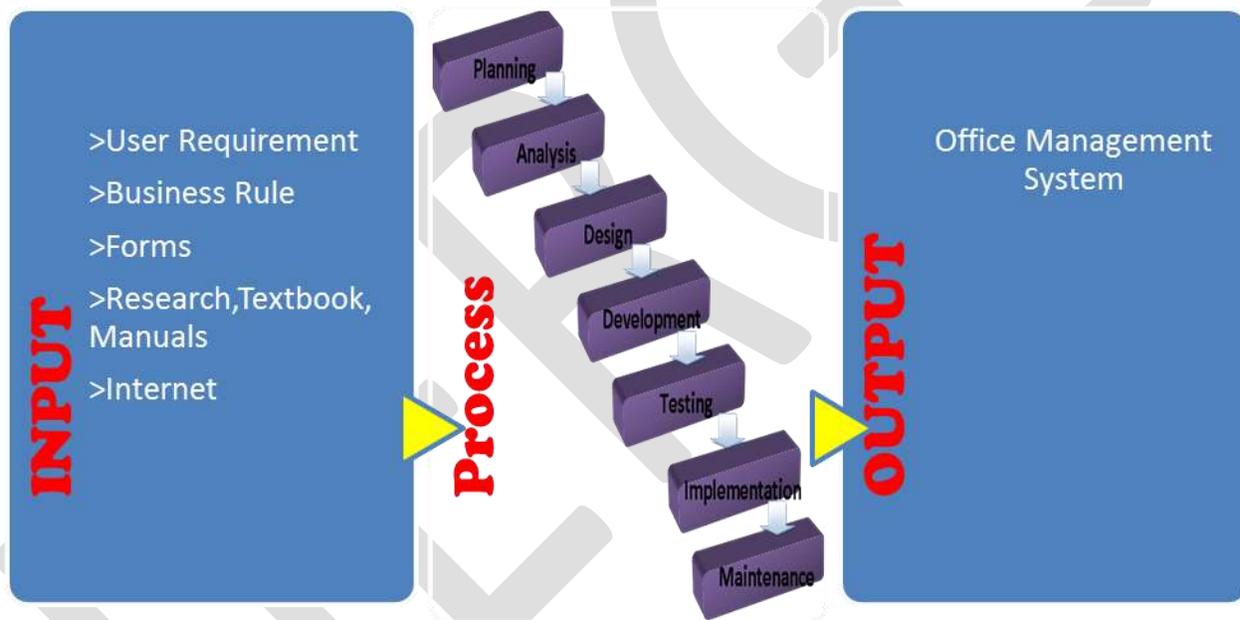


Figure 2. Conceptual model of the college office management system

The first part of the diagram is the input which refers to all raw materials required in the development and producing output. Basically the most common input includes the user requirement, research done by the researchers, forms for the data required to validate and the business rules that will define the system process.

The second part is the processing side which involves different stages. The first stage includes planning and analysis which discusses the analysis of the input and converting into technical aspect resulting of programming and development. During this activity the researcher discovers ambiguities and inconsistencies in the transaction management particularly in the different offices of each colleges. The result of the analysis is a system model annotated with attributes, operations, and associations. The design phase of the study will follow after the analysis, and this includes precisely describing object and subsystem interfaces. Interface of the system is properly layout as what has been planned during the analysis stage. Development stage includes the programming side such as the development of the front-end application and back-end application of the OMS [11, 12]. For better quality, the output testing is being applied under the processing. In this stage, the differences between the system and its model are found by executing the system with the sample input data [13]. During the implementation stage the developed OMS becomes operational. This includes user training and

software installation. The maintenance part will accommodate all necessary enhancement to the system as well as correction of any error encountered.

Upon completing all the stages in the process, the final output will be fully functional office management system for each colleges.

Testing and Evaluation Procedures

After the system was created, it was tested for functionality and acceptability. It was installed in selected colleges, where different office transactions were made for a span of one semester. The system was tested for its reliability, efficiency, accuracy, user friendliness and security by technical people while selected deans, faculty members and college secretary evaluated the acceptability of the system. The researcher devised an evaluation instrument based on the Software Quality Model following a five-point Likert scale [14].

Results and Discussions

The office management system is created with the following interfaces. Figure 3 shows the System Log-in which provides gateway to access the system.



Figure 3. The System Login

It requires username and password to access the system. A specific validation is added to make the system secured as follows:

- (a) The user only has given three chances to enter the user credentials properly. Once the user reached the limit the account will be locked.
- (b) The user can only login in one terminal only. The system can checked if the user is currently online to the other terminal.
- (c) The application identifies the role of the user to the system.

Once the user has log-in the system, it will display the Main Menu where you can navigate all the functionality of the system as shown on Figure 4. The College Office Management System Menu.



Figure 4. The Office Management System Main Menu

Each menu and toolbar provides you a quick access in every modules in the system. The user can click the menu or tools in order to navigate within the system.

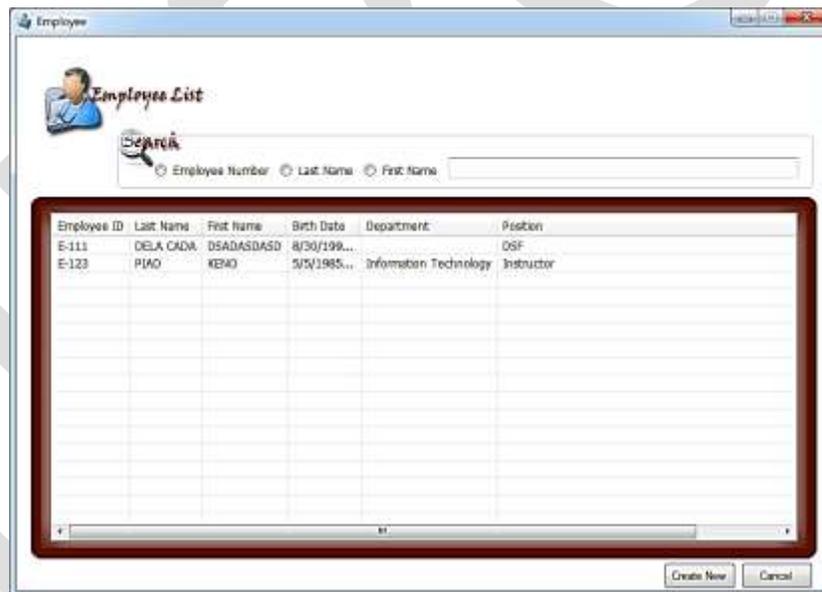


Figure 5. The Employee List

One of the major data needs to add is the list of employee or the faculty member. These faculty is also given an access to the system. In Figure 5, the Employee List displays the list of employee added on the application. It also allow the user to search the record by employee number, last name or first name. To create new employee record, just click the Create New button. Cancel button is used to close the employee list form.

The screenshot shows a software window titled "Create Employee Records". Inside, there is a section titled "Add Employee" with a small icon of a person. Below this, there are several input fields: "Employee Number:", "Last Name:", "First Name:", "Middle Name:", "Address:", "Birth Date:" (with a calendar icon showing "Tuesday, August 30, 2"), "Age:", "Gender:" (with radio buttons for "Male" and "Female"), "Email Address:", "Department:" (a dropdown menu), "Position:", and "Status:" (a dropdown menu). There are "Save" and "Cancel" buttons at the bottom right, and a "Browse" button next to the "Address:" field.

Figure 6. Create New Employee Record

Figure 6 is the Create New Employee Record windows that allows the user to create new employee profile. All the fields presented on the forms are required to be filled up. It will be needed in creation of account for a faculty ito access the system.

One of the main features of the system is to create their monthly status report for computer laboratories. Figure 7 illustrates the list of Monthly Status Report for a particular room custodian and technician.

The screenshot shows a software window titled "Computer Status Report". Inside, there is a section titled "Monthly Status Report" with a small icon of a computer monitor. Below this, there is a sub-section titled "Room Details" with a small icon of a room. Below "Room Details", there are four input fields: "Room No.:", "Custodian:", "Technician:", and "No. Of Units:". There are "Create New" and "Cancel" buttons at the bottom right.

Figure 7. Computer Status Report

A technician can create status report by clicking Create New button. Figure 7 displays the creation of new status report. It shows the list of computer and selection of the status of computer. The user just simply selects the status of computer whether OK, Repaired, Not OK. The User also provides recommendation for those computers with status of not OK.

Computer Number	Status	Recommendation
PC-01	OK	
PC-02	Repaired	Fixed Power Supply
PC-03	Not OK	Mouse and Keyboard
PC-04	Repaired	Reformat
PC-05	OK	
PC-06	Not OK	OS Corrupted
PC-07	Not OK	OS Corrupted
PC-08	OK	
PC-09	OK	
PC-10	OK	

Figure 12. Create New Technical Reports

Each computer in the laboratory is saved on the system. Figure 12. Computer Details Inventory, display the list and detail of every computer assigned on a particular room. It allows the user to add new computer and save the record through clicking Save button.

The system testing was done for a duration of one semester (5 months) to ensure a very satisfactory outcome on its functionality and acceptability. In the selected colleges where initial evaluation was done, they rated the system “Excellent.” The system had an overall rate of “Excellent” on its functionality and “Very Acceptable” on its acceptability.

ACKNOWLEDGMENT

This research study would not have been possible without the guidance and the help of several individuals who in one way or another contributed and extended their valuable assistance in the preparation and completion of this study. The author would like to extend his gratitude to his family, colleges, and to his beloved university who continuously served as a source of inspiration and encouragement in the achievement of this study.

CONCLUSION

Based on the results of the tests and evaluation, it can be concluded that:

1. The Bulacan State University community can greatly benefit by using the developed Office Management System that is specifically configured by network specification for the monitoring of all office transactions of the different colleges.
2. The Office Management System was designed and created with the following features: portability, low maintenance, user-friendliness, scalability, security.
3. The system was tested to be “Excellent” and “Very Acceptable.”

REFERENCES:

- [1] Rampur, Stephen (2010). "Computers in Business", available at <http://www.buzzle.com/articles/computers-in-business.html>
- [2] Mwesigye Herbert (2006). "The Impact of Computer Utilization in Business Organizations" , available at <http://mwesigyeb.blogspot.com/2006/09/impact-of-computer-utilization-in.html>
- [3] Genviere, Christoff (2009). "The Impact of Computers on Society Today", available at <http://www.answers.com/topic/office-management>
- [4] Computer Desktop Encyclopedia , © 1981-2015 The Computer Language Company Inc. , available at <http://www.yourdictionary.com/management-system>
- [5] Clint Johnson, updated by David E Salame (2011). "OFFICE MANAGEMENT", available at <http://www.referenceforbusiness.com/encyclopedia/Mor-Off/Office-Management.html>
- [6] CICT Annual (2010). "The Firefox Semaphore"
- [7] Craig Larman and Victor Basili (2003). "Iterative and Incremental Development: A Brief History", Published by IEEE Computer Society
- [8] Larman, Craig (2004). "Agile and Iterative Development: A Mangers Guide", ISBN 0-13-111155-8
- [9] Deepak Dahiya and Pooja Jain (2010). "Enterprise Systems Development: Impact of Various Software Development Methodologies ", International Journal of Advancements in Computing Technology Volume 2, Number 4, October 2010
- [10] Nabil Mohammed, Ali Munassar1 and A. Govardhan (2010). "A Comparison Between Five Models Of Software Engineering", IJCSI International Journal of Computer Science, Vol. 7, Issue 5, September 2010 ISSN (Online): 1694-0814
- [11] Itzik Ben-Gan (2009). "Inside Microsoft SQL Server 2008: T-SQL Querying"
- [12] Diane Zak (2004). "Programming with Microsoft Visual Basic.Net", Thomas Asian Edition
- [13] Glenford J. Myers, Corey Sandler, Tom Badgett – 3rd ed. (2012), "Software Testing", Published by John Wiley & Sons, Inc., Hoboken, New Jersey
- [14] Chua, B.B. & Dyson, L.E. (2004). Applying the ISO9126 model to the evaluation of an e-learning system. In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds), Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference (pp. 184-190). Perth, 5-8 December. <http://www.ascilite.org.au/conferences/perth04/procs/chua.html>

Cooperative Provable Data possession for integrity verification in multicloud

Ms.Ashwini Mandale, Prof.Shriniwas Gadage

ME CE student -G.H. Raison College of Engg and Management, Pune, (ashwini.mandale@gmail.com), 8407975547

Abstract— To ensure the integrity of data in storage outsourcing Provable data possession (PDP) is a technique. In this paper, there is the construction of an efficient PDP scheme for distributed cloud storage to support the scalability of service and data migration, where the existence of multiple cloud service providers to cooperatively store and maintain the client's data. This paper presents a cooperative PDP (CPDP) scheme based on homomorphic verifiable response and hash index hierarchy.

In this paper proof of the security of CPDP scheme based on multi-prover zero-knowledge proof system, which can satisfy completeness, knowledge soundness, and zero-knowledge properties, is given.

Keywords— CPDP, Interactive Protocol, Multiple Cloud, POR, Provable Data Possession, Storage Security, Zero-knowledge.

INTRODUCTION

By providing a comparably low-cost, scalable, position-independent platform for clients' data, cloud storage service has become a faster profit growth point. The cloud computing environment is constructed based on open architectures and interfaces, so has the capability to incorporate multiple internal / external cloud services together to provide high interoperability. We call such a distributed cloud environment as a *multi/hybrid Cloud*.

There are various tools and technologies for multicloud, such as Platform VM Orchestrator, VMware vSphere, and Ovirt. These technologies and tools help cloud providers construct a distributed cloud storage platform (DCSP) for managing clients data. If such an important platform is vulnerable to security attacks, it would bring irretrievable losses to the clients. So, it is indispensable for cloud service providers (CSPs) to provide security techniques for managing their storage services.

Provable data possession (PDP) [2] or known as proofs of retrievability (POR) [3] is such a probabilistic proof technique for a storage provider to prove the integrity and ownership of clients' data without downloading data. The Scalable PDP [4], Dynamic PDP [5] are not suitable for a multi-cloud environment.

To provide a low-cost, scalable, location independent platform for managing clients' data, current cloud storage systems adopt several new distributed file systems, Apache HDFS, GFS, Amazon S3 File System, CloudStore etc. These file systems share some similar features: a single metadata server provides centralized management by a global namespace; files are split into blocks or chunks and stored on block servers; and the systems are comprised of interconnected clusters of block servers. Those features enable cloud service providers to store and process large amounts of data. It is crucial to offer an efficient verification on the integrity and availability of stored data for detecting faults and automatic recovery. Moreover, this verification is necessary to provide reliability by automatically maintaining multiple copies of data and automatically redeploying processing logic in the event of failures.

Although existing schemes can make a false or true decision for data possession without downloading data at untrusted stores, and are not suitable for a distributed cloud storage environment as they were not originally constructed on interactive proof system. They use an authenticated skip list to check the integrity of file blocks adjacently in space. They did not provide any algorithms for constructing distributed Merkle trees that are necessary for efficient verification in a multi-cloud environment. When a client asks for a file block, the server needs to send the file block along with a proof for the intactness of the block. This process incurs significant communication overhead in a multi-cloud environment, since the server in one cloud typically needs to generate such a proof with the help of other cloud storage services, where the adjacent blocks are stored.

The schemes PDP [2], CPOR-I [5], and CPOR-II [6] are constructed on homomorphic verification tags by which the server can generate tags for multiple file blocks in terms of a single response value. However, that doesn't mean the responses from multiple clouds can be also combined into a single value on the client side. For lack of homomorphic responses, clients must invoke the PDP protocol repeatedly to check the integrity of file blocks stored in multiple clouds servers. Also, clients need to know the exact position of each file block in a multi-cloud environment. In addition, the verification process in such a case will lead to high communication overheads and computation costs at client sides as well. Therefore, it is of utmost necessary to design a cooperative PDP model to reduce the storage and network overheads and enhance the transparency of verification activities in cluster-based cloud storage

systems. Moreover, such a cooperative PDP scheme should provide features for timely detecting abnormality and renewing multiple copies of data.

Existing PDP schemes have various security properties such as public verifiability, dynamics, scalability and privacy preservation. There are some potential attacks:

- 1) Data Leakage Attack: Here an adversary can easily obtain the stored data through verification process after running or wiretapping sufficient verification communications.
- 2) Tag Forgery Attack: a dishonest CSP can deceive the clients. These attacks may cause potential risks for privacy leakage and ownership cheating and can more easily compromise the security of a distributed cloud system than a single cloud system.

LITERATURE SURVEY

To check the availability and integrity of outsourced data in cloud storages two basic approaches called Provable Data Possession (PDP) [2] and Proofs of Irretrievability (POR) [3].

PDP: Ateniese et al. [2] first proposed the PDP model for ensuring possession of files on untrusted storages and provided an RSA-based scheme. They also proposed a publicly verifiable version, which allows anyone to challenge the server for data possession. This property greatly extended application areas of PDP protocol due to the separation of data owners and the users. But these schemes are insecure against replay attacks in dynamic scenarios because of the dependencies on the index of blocks. And they do not fit for multi-cloud storage due to the loss of homomorphism property in the verification process.

Scalable PDP/dynamic PDP: In order to support dynamic data operations a lightweight PDP scheme based on cryptographic hash function and Symmetric key encryption is proposed. But the servers can deceive the owners by using previous metadata or responses Due to the lack of randomness in the challenges. The numbers of updates and challenges are limited and fixed in advance and users cannot perform block insertions anywhere.

DPDP-I and DPDP-II: There are two Dynamic PDP schemes with a hash function tree to realize $O(\log n)$ communication and computational costs for a n -block file. The basic scheme, called DPDP-I, retains the drawback of Scalable PDP, and in the 'blockless' scheme, called DPDP-II, the data blocks $\{m_{ij}\}_{j \in [1,t]}$ can be leaked by the response of a challenge, $M = \sum_{j=1}^t a_j m_{ij}$, where a_j is a random challenge value.

All above schemes are not effective for a multi-cloud environment because the verification path of the challenge block cannot be stored completely in a cloud.

POR scheme: It relies largely on preprocessing steps that the client conducts before sending a file to a CSP. Unfortunately, these operations prevent any efficient extension for updating data.

Compact POR: It is an improved version of POR protocol. It uses homomorphic property to aggregate a proof into $O(1)$ authenticator value and $O(t)$ computation cost for t challenge blocks, but their solution is also static and could not prevent the leakage of data blocks in the verification process.

A dynamic scheme with $O(\log n)$ cost: By integrating the Compact POR scheme and Merkle Hash Tree (MHT) into the DPDP.

A distributed cryptographic system: It allows a set of servers to solve the PDP problem. This system is based on an integrity-protected error correcting code (IP-ECC), which improves the security and efficiency of existing tools. However, a file must be transformed into l distinct segments with the same length, which are distributed across l servers. Hence, this system is more suitable for RAID rather than cloud storage.

PROPOSED WORK

For addressing the problem of provable data possession in distributed cloud environments from the following aspects: high security, transparent verification, and high performance.

To achieve this verification framework for multi-cloud storage along with two fundamental techniques: hash index hierarchy (HIH) and homomorphic verifiable response (HVR) is proposed.

Then possibility of constructing a cooperative PDP (CPDP) scheme without compromising data privacy based on modern cryptographic techniques, such as interactive proof system (IPS) is proposed. Then an effective construction of CPDP scheme using above-mentioned structure is introduced. Then security analysis of our CPDP scheme from the IPS model is given. As this construction is a multi-prover zero-knowledge proof system (MP-ZKPS) [11], which has completeness, knowledge soundness, and zero-knowledge properties which ensure that CPDP scheme can implement the security against data leakage attack and tag forgery attack.

A. Verification framework for multi-cloud storage:

The majority of existing PDP schemes are incapable to satisfy the inherent requirements from multiple clouds in terms of communication and computation costs. To address this consider a multi-cloud storage service as shown in Fig 1.

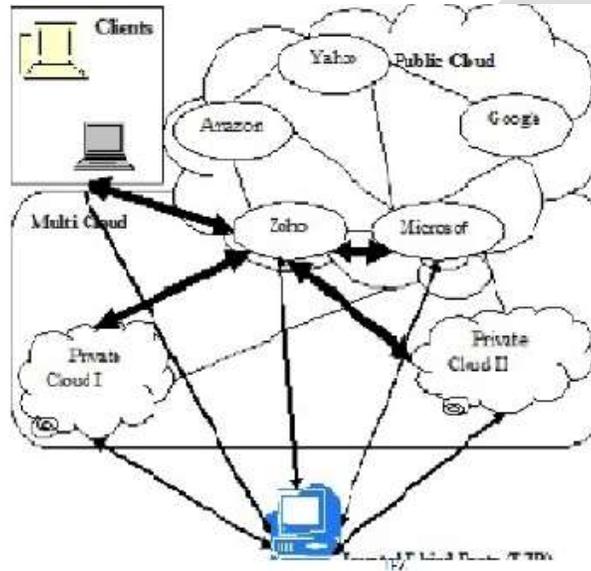


Fig 1: Architecture for data integrity in multicloud environment

A data storage service involves three different entities: Clients who have a large amount of data to be stored in multiple clouds and have the permissions to access and manipulate stored data. Cloud Service Providers (CSPs) who work together to provide data storage services and have enough storages and computation resources. Trusted Third Party (TTP) who is trusted to store verification parameters and offer public query services for these parameters.

This architecture consist the existence of multiple CSPs to cooperatively store and maintain the clients' data alongwith CPDP to verify the integrity and availability of their stored data in all CSPs.

The verification procedure:

I.A client (data owner) uses the secret key to pre-process a file which consists of a collection of n blocks, generates a set of public verification information that is stored in TTP, transmits the file and some verification tags to CSPs, and may delete its local copy.

II.By using a verification protocol, the clients can issue a challenge for one CSP to check the integrity and availability of outsourced data with respect to public information stored in TTP.

B.Definition of Co-operative PDP:

A cooperative provable data possession scheme S' is a collection of two algorithms and an interactive proof system, $S' = (K, T, P)$.

KeyGen (1k): It takes a security parameter k as input, and returns a secret key sk or a public-secret key pair (pk, sk) .

TagGen(sk, F,P): It takes as inputs a secret key sk , a file F , and a set of cloud storage providers $P = \{Pk\}$, and returns the triples (ζ, ψ, σ) , where ζ is the secret of tags, $\psi = (u, H)$ is a set of verification parameters u and an index hierarchy H for F , $\sigma = \{\sigma(k)\} Pk \in P$ denotes a set of all tags, $\sigma(k)$ is the tags of the fraction $F(k)$ of F in Pk .

Proof(P, V): It is a protocol of proof of data possession between the CSPs ($P = \{Pk\}$) and a verifier (V), that is, $(\Sigma Pk \in Pk(F(k), \sigma(k)), V) (pk, \psi)$, where each Pk takes as input a file $F(k)$ and a set of tags $\sigma(k)$, and a public key pk and a set of public parameters ψ is the common input between P and V. At the end of the protocol run, V returns a bit $\{0|1\}$ denoting false and true where, $\Sigma Pk \in P$ denotes the collaborative computing in $Pk \in P$.

C. Hash Index Hierarchy for CPDP:

This work addresses the construction of an efficient PDP scheme for distributed cloud storage to support data migration and scalability of service, where the existence of multiple cloud service providers to cooperatively store and maintain the clients' data is considered. It presents a *cooperative*-PDP (CPDP) scheme based on homomorphic verifiable response and hash index hierarchy. Multi-prover zero-knowledge proof system is used to prove the security of this scheme, which can satisfy knowledge soundness, completeness and zero-knowledge properties.

a. Hash index hierarchy: Architecture used in cooperative PDP scheme to support distributed cloud storage as shown in Fig 2.

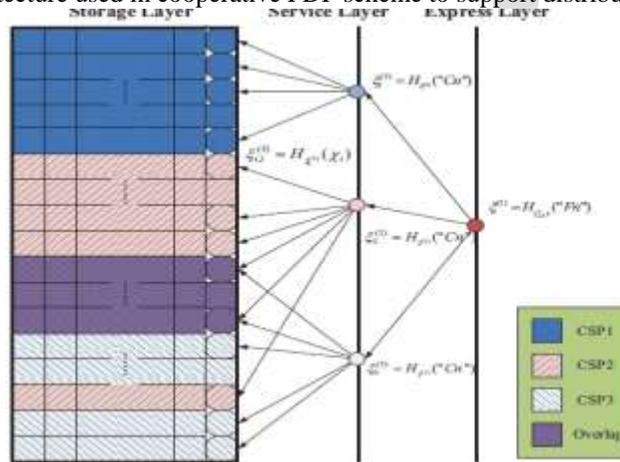


Fig 2: Index-hash hierarchy of CPDP model.

This hierarchical structure \mathcal{H} consists of three layers to represent relationships among all blocks for stored resources.

- a) **Express Layer:** offers an abstract representation of the stored resources.
- b) **Service Layer:** offers and manages cloud storage services.
- c) **Storage Layer:** realizes data storage on many physical devices.

This hierarchy used to organize data blocks from multiple CSP services into a large size file by shading their differences among these cloud storage systems. The resource in Express Layer are split and stored into three CSPs in Service Layer. After that each CSP fragments and stores the assigned data into the storage servers in Storage Layer. It follows the logical order of the data blocks to organize the Storage Layer.

b. Homomorphic Verifiable Response:

A response is called homomorphic verifiable response in a PDP protocol, if given two responses θ_i and θ_j for two challenges Q_i and Q_j from two CSPs, there exists an efficient algorithm to combine them into a response θ corresponding to the sum of the challenges $Q_i \cup Q_j$. It is the key technique of CPDP as it reduces the communication bandwidth as well as conceals the location of outsourced data in the distributed cloud storage environment.

c. Security Analysis:

Multi-prover zero-knowledge proof system is directly used for security, which satisfies following properties:

1) *Collision resistant for index-hash hierarchy*: The index hash hierarchy in CPDP scheme is collision resistant, even if the client generates files with the same file name and cloud name collision doesn't occur there.

2) *Completeness property of verification*: In this scheme, the Completeness property implies public verifiability property. Due to this property allows client as well as anyone other than client (data owner) can challenge the cloud server for data integrity and data ownership without the need for any secret information.

3) *Zero-knowledge property of verification*: This paper makes use of the zero-knowledge property to preserve the privacy of data blocks and signature tags. Initially, randomness is adopted into the CSPs' responses in order to resist the data leakage attacks.

4) *Knowledge soundness of verification*: The soundness means that it is infeasible to fool the verifier to accept false statements. Often, the soundness can also be considered as a stricter notion of unforge ability for file tags to avoid cheating the ownership. This denotes that the CSPs, even if collusion is tried, cannot be tampered with the data or forge the data tags if the soundness property holds. Thus CPDP scheme can resist the tag forgery attacks to avoid cheating the CSPs' ownership.

ACKNOWLEDGMENT

I would like to thanks to Prof. Shrinivas Gadage, Adj. faculty Computer Engg-G.H.Raisoni College of Engg and Management, Pune for his help, Encouragement and intellectual influence, which made this paper possible. His invaluable guidance in the successful completion of this paper work.

CONCLUSION

In this paper the construction of an efficient PDP scheme for distributed cloud storage is described. Based on homomorphic verifiable response and hash index hierarchy, this paper showed that CPDP scheme provided all security properties required by zero-knowledge interactive proof system, so that it can resist various attacks even if it is deployed as a public audit service in clouds.

REFERENCES:

- [1] B. Sotomayor, R. S. Montero, I. M. Llorente, and I. T. Foster, "Virtual infrastructure management in private and hybrid clouds," IEEE Internet Computing, vol. 13, no. 5, pp. 14–22, 2009.
- [2] G. Ateniese, R. C. Burns, R. Curtmola, J. Herring, L. Kissner, Z. N. J. Peterson, and D. X. Song, "Provable data possession at untrusted stores," in ACM Conference on Computer and Communications Security, P. Ning, S. D. C. di Vimercati, and P. F. Syverson, Eds. ACM, 2007, pp. 598–609.
- [3] A. Juels and B. S. K. Jr., "Pors: proofs of retrievability for large files," in ACM Conference on Computer and Communications Security, P. Ning, S. D. C. di Vimercati, and P. F. Syverson, Eds. ACM, 2007, pp. 584–597.
- [4] G. Ateniese, R. D. Pietro, L. V. Mancini, and G. Tsudik, "Scalable and efficient provable data possession," in Proceedings of the 4th international conference on Security and privacy in communication networks, SecureComm, 2008, pp. 1–10.
- [5] C. C. Erway, A. K. Upc, C. Papamanthou, and R. Tamassia, "Dynamic provable data possession," in ACM Conference on Computer and Communications Security, E. Al-Shaer, S. Jha, and A. D. Keromytis, Eds. ACM, 2009, pp. 213–222.
- [6] H. Shacham and B. Waters, "Compact proofs of retrievability," in ASIACRYPT, ser. Lecture Notes in Computer Science. Pieprzyk, Ed., vol. 5350. Springer, 2008, pp. 90–107.
- [7] Q. Wang, C. Wang, J. Li, K. Ren, and W. Lou, "Enabling public verifiability and data dynamics for storage security in cloud computing," in ESORICS, ser. Lecture Notes in Computer Science, M. Backes and P. Ning, Eds., vol. 5789. Springer, 2009, pp. 355–370.
- [8] Y. Zhu, H. Wang, Z. Hu, G.-J. Ahn, H. Hu, and S. S. Yau, "Dynamic audit services for integrity verification of outsourced storages in clouds," in SAC, W. C. Chu, W. E. Wong, M. J. Palakal and C.-C. Hung, Eds. ACM, 2011, pp. 1550–1557.
- [9] K. D. Bowers, A. Juels, and A. Oprea, "Hail: a high-availability and integrity layer for cloud storage," in ACM Conference on Computer and Communications Security, E. Al-Shaer, S. Jha, and A. D. Keromytis, Eds. ACM, 2009, pp. 187–198.

- [10] Y. Dodis, S. P. Vadhan, and D. Wichs, "Proofs of retrievability via hardness amplification," in TCC, ser. Lecture Notes in Computer Science, O. Reingold, Ed., vol. 5444. Springer, 2009, pp. 109–127.
- [11] L. Fortnow, J. Rompel, and M. Sipser, "On the power of multiprover interactive protocols," in Theoretical Computer Science, 1988, pp. 156–161.
- [12] Y. Zhu, H. Hu, G.-J. Ahn, Y. Han, and S. Chen, "Collaborative integrity verification in hybrid clouds," in IEEE Conference on the 7th International Conference on Collaborative Computing: Networking Applications and Worksharing, CollaborateCom, Orlando, Florida, USA, October 15-18, 2011, pp. 197–206.
- [13] M. Armbrust, A. Fox, R. Griffith, A. D. Joseph, R. H. Katz, A. Konwinski, G. Lee, D. A. Patterson, A. Rabkin, I. Stoica, and M. Zaharia, "Above the clouds: A Berkeley view of cloud computing," EECS Department, University of California, Berkeley, Tech. Rep., Feb 2009.
- [14] D. Boneh and M. Franklin, "Identity-based encryption from the weil pairing," in Advances in Cryptology (CRYPTO'2001), vol. 2139 of LNCS, 2001, pp. 213–229.
- [15] O. Goldreich, Foundations of Cryptography: Basic Tools. Cambridge University Press, 2001.
- [16] P. S. L. M. Barreto, S. D. Galbraith, C. O'Eigeartaigh, and M. Scott, "Efficient pairing computation on supersingular abelian varieties," Des. Codes Cryptography, vol. 42, no. 3, pp. 239–271, 2007.
- [17] J.-L. Beuchat, N. Brisebarre, J. Detrey, and E. Okamoto, "Arithmetic operators for pairing-based cryptography," in CHES, ser. Lecture Notes in Computer Science, P. Paillier and I. Verbauwhede, Eds., vol. 4727. Springer, 2007, pp. 239–255.
- [18] H. Hu, L. Hu, and D. Feng, "On a class of pseudorandom sequences from elliptic curves over finite fields," IEEE Transactions on Information Theory, vol. 53, no. 7, pp. 2598–2605, 2007.
- [19] A. Bialecki, M. Cafarella, D. Cutting, and O. O'Malley, "Hadoop: A framework for running applications on large clusters built of commodity hardware," Tech. Rep., 2005. [Online]. Available: <http://lucene.apache.org/hadoop/>
- [20] E. Al-Shaer, S. Jha, and A. D. Keromytis, Eds., Proceedings of the 2009 ACM Conference on Computer and Communications Security, CCS 2009, Chicago, Illinois, USA, November 9-13, 2009. ACM, 2009

IMPACT OF TRANSPORT OVER SOME SELECTED SOCIO-ECONOMIC INDICATORS: SIGNIFICANT RESULTS FOR ODISHA

M. Mishra* and C. Das**

* Research Scholar, P. G. Department of Mathematics, Vani Vihar, Utkal University, Bhubaneswar, 751004, Odisha.

E-mail: manoranjanmishra.1966@gmail.com

** Retired Professor of Mathematics, N.I.T., Rourkela.

Corresponding Address:

Manoranjan Mishra, C/O- A.C. Swain

Plot- A/141, Saheed Nagar, Bhubaneswar, 751007, Odisha.

Abstract: The author's goal in present article is to focus scientifically the impact of transport over some selected socio-economic indicators in Odisha context like agriculture & animal husbandry, forestry, fisheries, mining & quarrying, manufacturing units, electricity, gas & water supply, construction, hotel & restaurant trade, storage, communication, banking & insurance, real estate, public administration, other services, total GSDP and consumer price index by taking mathematical models like linear, quadratic, cubic, logarithmic, inverse, compound, power, growth and exponential into account by taking GSDP figures at current prices of above socio-economic indicators during the period 2003 to 2013 A.D. for forecasting purpose.

Key words:

GSDP, Socio-economic indicators, Transport, mean, standard deviation, correlation, mathematical models, STP.

INTRODUCTION:

The platform of management science and operation research can be a useful background for top level decision-making. The main culprit is our growing awareness that in today's complex and rapidly changing world, there are just so many more consideration that should be weighed in making major decision. The context of top-level decision is of course a product of the strategic planning, programming and budgeting system.

The basic need of transport planning is to design the entire transportation structure into sophisticated economic zone by restructuring the infrastructural facilities into productive force. The central orientation is to inculcate all scientific and modernized roadways and railways for the benefit of society in the form of development of various socio-economic indicators [1]. Strategic Transport Planning (STP) increases competition, efficiency, transparency, accessibility and adequate availability of transport services in Odisha by escalating substantial revenue and economic growth.

STP is the basis of Odisha and has got international flavor. It gears to balance towards infrastructural development in roads, railways in integrated style for the development of human responses and it ends the societal distress, destitute, despair and dependency by acting as a tonic to re-structure the system, reorient the objective and reform the logistic connectivity's in Odisha.

MAIN FOCUS:

In this paper, it has been judged human welfare in the global era as captured by a set of socio-economic indicators. Impact of transport over some socio economic indicators are projected through various mathematical models. Emphasis is given on desirable and feasible STP on the face of complex challenges in 21st century.

The prime focus here is to disclose the impact of transport over some selected socio-economic indicators like agriculture & animal husbandry, forestry, fisheries, mining & quarrying etc. [1] by taking mathematical models like linear, quadratic, cubic etc. [2,3] into account by taking GSDP figures at current prices of above socio-economic indicators during the period 2003-2013 A.D. for forecasting purpose.

Results and Interpretation:

The relationship as well as impact of transport over the selected socio-economic parameters have been presented in the following. [5, 7]

Table-1: Mean and Standard Deviation of transportation and allied aspects with some social parameters during the period from 2003-04 to 2012-13

Social Parameters	Mean	Std. Deviation
Transportation (Rs. In Lakh)	1141511.20	598623.78
Road Length (In Kms.)	2440.26	1341.80
Amount spent in Road (Rs. In Crore)	917.47	673.57
No. of Vehicles (In 000)	2314.81	688.09
Agriculture & Animal Husbandry (Rs. In Lakh)	2513458.40	961149.29
Forestry (Rs. In Lakh)	341347.00	83787.00
Fisheries (Rs. In Lakh)	172483.60	63959.46
Mining & Quarrying (Rs. In Lakh)	1399819.40	759168.63
Manufacturing units (Rs. In Lakh)	1879955.50	897408.71
Electricity, Gas & Water Supply (Rs. In Lakh)	377646.50	97613.81
Construction (Rs. In Lakh)	1368434.00	529561.15
Hotel, Restaurant & Trade (Rs. In Lakh)	1760100.20	898683.65
Storage (Rs. In Lakh)	15302.00	8551.02
Communication (Rs. In Lakh)	149768.10	61709.34
Banking & Insurance (Rs. In Lakh)	490424.70	260188.39
Real Estate (Rs. In Lakh)	856150.50	378146.79

Public Administration (Rs. In Lakh)	620812.90	296440.90
Other Services (Rs. In Lakh)	1441740.40	693536.10
Total GSDP (Rs. In Lakh)	14405854.40	6427863.16
Population (In Lakh)	403.47	16.19
Consumer Price Index	400.38	83.57

Sources: Collected and compiled from Economic Survey (2012-13),

Table-1 above presents the mean and standard deviation (SD) of transport and allied aspects and some social parameters of Odisha state during the period 2003-04 to 2012-13. The figures for transportation, length of roads constructed, amount spent in road construction and number of vehicles are in lakh, kms, crore and thousand respectively whereas the same for social parameters are in lakh. On application of reliability analysis to the considered data, the Cronbach's Alpha [9] has been calculated as 0.748 which signifies the adoptability of the data for further analysis [8].

Table-2: Correlation between transportation and allied aspects with some social parameters

Social Parameters	Total Transport	Road Length	Amount spent in Roads	No. of vehicles
Agriculture & Animal Husbandry	0.696	0.872*	0.897*	0.903*
Forestry	0.689	0.883*	0.840*	0.952*
Fisheries	0.735*	0.851*	0.822*	0.913*
Mining & Quarrying	0.735*	0.877*	0.861*	0.908*
Manufacturing units	0.745*	0.808*	0.822*	0.902*
Electricity, Gas & Water Supply	0.718*	0.380	0.294	0.545
Construction	0.778*	0.849*	0.856*	0.916*
Hotel & Restaurant Trade	0.790*	0.861*	0.845*	0.919*
Storage	0.764*	0.831*	0.812*	0.915*
Communication	0.761*	0.859*	0.836*	0.914*

Banking & Insurance	0.747*	0.838*	0.804*	0.901*
Real Estate	0.752*	0.851*	0.824*	0.921*
Public Administration	0.726*	0.851*	0.845*	0.915*
Other Services	0.734*	0.890*	0.879*	0.910*
Total GSDP	0.758*	0.869*	0.863*	0.922*
Population	0.779*	0.877*	0.878*	0.919*
Consumer Price	0.549	0.917*	0.925*	0.916*

N.B.: - GSDP – Gross State Domestic Product, * - Significant at 5% level ($P < 0.05$)

Table-2 presents the correlation coefficients between the transportation and allied aspects with some social parameters, The correlation coefficients more than 0.71 are significant and have been marked with “*” [10]. Accordingly, agriculture and animal husbandry is weakly correlated with transportation but significantly correlated with road length, amount spent in road construction and number of vehicles. Similar trend is observed in case of forestry and consumer price. But the contrasting trend is observed in case of electricity, gas and water supply. But in other social parameters like fisheries, mining and quarrying, manufacturing units, construction, hotel and restaurant trade, storage, communication, banking and insurance, real estate, public administration, other services, total GSDP and population are significantly correlated with transportation as well as allied aspects. Although it establishes acceptable linear relationship between selected social parameters with transportation and its allied aspects, still it is of further inquisitiveness to look for the best suited mathematical relationship. Since all the correlation coefficients are positive, it indicates one increases when the other increases. Here, transport has been taken as the independent variable (X) and social parameters have been taken as dependent (Y). Now the data have been put to the following mathematical models for the cited purpose [11, 12].

Linear $Y = C + a_1 * X$ (1)

Quadratic $Y = C + a_1 * X + a_2 * X^2$ (2)

Cubic $Y = C + a_1 * X + a_2 * X^2 + a_3 * X^3$ (3)

Logarithmic $Y = C + a_1 * \ln(X)$ (4)

Inverse $Y = C + \frac{a_1}{X}$ (5)

Compound $Y = C * a_1^X$ (6)

Power $Y = C * X^{a_1}$ (7)

Growth $Y = e^{C+a_1*X}$ (8)

Exponential $Y = C * e^{a_1*X}$ (9)

N.B:- X = Transport and Y = Social Parameter,

C = Constant, a₁, a₂, a₃ = Coefficients

Table 3: Mathematical relationship between transportation (X) and some social parameters (Y) during the period 2003-04 to 2012-13.

Social Parameters	Mathematical Models	R ²
Agriculture & Animal Husbandry	$Y = 2920.380 * X^{0.485}$	0.574
Forestry	$Y = 287292.219 - 0.200 * X$ $+ 3.772 * 10^{-7} * X^2 - 1.261 * 10^{-13} * X^3$	0.552
Fisheries	$Y = 111563.120 - 0.107 * X$ $+ 2.568 * 10^{-7} * X^2 - 8.924 * 10^{-14} * X^3$	0.625
Mining & Quarrying	$Y = 10.620 * X^{0.843}$	0.678
Manufacturing units	$Y = 45.254 * X^{0.762}$	0.698
Electricity, Gas & Water Supply	$Y = 68589.791 + 0.718 * X$ $- 5.689 * 10^{-7} * X^2 - 1.578 * 10^{-13} * X^3$	0.547
Construction	$Y = 376.690 * X^{0.589}$	0.732
Hotel & Restaurant Trade	$Y = 32.466 * X^{0.781}$	0.751
Storage	$Y = 0.314 * X^{0.772}$	0.691
Communication	$Y = 87.971 * X^{0.534}$	0.656

Banking & Insurance	$Y = 47.481 * X^{0.661}$	0.621
Real Estate	$Y = 355.138 * X^{0.558}$	0.631
Public Administration	$Y = 220.947 * X^{0.568}$	0.568
Other Services	$Y = 207.769 * X^{0.633}$	0.620
Total GSDP	$Y = 2105.397 * X^{0.633}$	0.681
Consumer Price	$Y = 3811.563 - 0.009 * X$ $+ 1.176 * 10^{-8} * X^2 - 3.836 * 10^{-15} * X^3$	0.996

R²- Coefficient of Determination, The highest value of R² has been considered only.

Table 3 presents all the R²-values are more than 0.5 and it indicates more than 50% of the data in consideration is explained by the cited mathematical models arising out of different regression equations cited above [Eq.(1)... Eq. (9)]. Thereby the obtained mathematical relationship between transport and some social parameters are acceptable [4, 6]. This indicates acceptable impact of transport over the cited social parameters in the forms of mathematical relationship mentioned in Table 3. The variation in transport will give variation in the cited social parameters in the forms of mathematical equations mentioned against each. This conforms to the trend of relationship existing between two in every case. Taking the available figures on transport and social parameters from 2003-13 into the account, the future may be forecasted by referring the mathematical equations in Table 3.

Conclusion:

It is concluded from above that transport has significant impact on social parameters like Agriculture & Animal Husbandry, Forestry, Fisheries, Mining & Quarrying, Manufacturing units, Electricity, Gas & Water Supply, Construction, Hotel & Restaurant Trade, Storage, Communication, Banking & Insurance, Real Estate, Public Administration, Other Services, Total GSDP, Population, Consumer Price during the period 2003-13. As it is envisaged, the development in transport system has considerable effect on the social parameters for their development. Hence, the augmentation of transport system has caused the development in social sector.

REFERENCES:

1. Economic Survey 2012-2013, Directorate of Economics and Statistics planning & co-ordination dept., Govt of Odisha.
2. Panik Michael J, (2014) Growth Curve Modeling : Theory and applications, John wile & sons, Inc.
3. Birkes, D., & Dodge, Y. (1993). Alternative methods of regression. New York: John Wiley (Wiley-Interscience).
4. Bates Douglas M and Watts Donald G, 2007, non linear Regression Analysis and its Applications, John wile & sons, Inc.
5. Field, A. (2005). Discovering statistics using SPSS (2nd Edition). London: Sage.
6. Fox, J. (1997). *Applied Regression Analysis, Linear Models and Related Methods*. Sage.
7. Cox D.R and Donnelly Christl A, 2011, Principles of Applied Statistics, Cambridge University Press.

8. Hogg Robert V, Mc Kean Joseph and Craig Allen T, 2013, Introduction to Mathematical Statistics, 7/E, Pierson Education Inc.
9. Miler Irwin and Miller Marylees, 2014, John E. Freund's Mathematical Statistics With Applications, 8/E, Pierson Education Inc.
10. [Lindley, D.V.](#) (1987). "Regression and correlation analysis," [New Palgrave: A Dictionary of Economics](#), v. 4, pp. 120–23.
11. Cook, R. D. (1999). Applied Regression: Including Computing and Graphics. New York: John Wiley.
12. Draper, N. R., & Smith, H. (1998). Applied regression analysis. 3rd Ed. New York: Wiley

IJERGS

Promoting Digital Empowerment through Implementation of Barangay Management System

Rosemarie M. Bautista

Bulacan State University, Philippines, rosemarie.m.bautista@gmail.com

Abstract—Politically speaking, the Philippines is composed of local government units (LGUs) classified as province, city, municipality and barangay where each is allowed to manage its own resources. The smallest administrative unit of the country, the barangay, serves as the foundation from which the country's success emanates. The more than forty two thousand barangays all over the country are the primary implementers of the different vision, projects and undertakings of the government for the community. Thus, empowerment of individual barangay may eventually lead to a stronger, more resilient and more prosperous society. The advent of modern technology opens wider opportunities for barangays to serve its constituents better through computerization of the documents it provides such as barangay clearance, certificate of indulgency, letter of recommendation, annual report and others. Motivated by the vision of empowering this self-governing political system digitally, the researcher aimed to determine the advantages of ICT and develop an office management system that will hasten the transactions performed and documents provided by the barangays. The developed system was designed to be accessed only by the authorized users to ensure the integrity of all transactions. The study determined the significant features, and the most appropriate method of system development used in the development of an effective and reliable barangay management system. The output of the study was evaluated based on the ISO 926 Software Quality Assurance Model by employees of selected barangays and was assessed with high level of acceptability.

Keywords—barangay office management system, local government unit, e-government, computerized system, Information Technology system, barangay system, digital society

INTRODUCTION

The Philippine archipelago is composed of three major islands: Luzon, Visayas and Mindanao. Politically speaking, the country is composed of local government units (LGUs) classified as province, city, municipality and barangay. The barangay is the smallest political unit of the government where the initial planning and implementation of the different vision, projects and undertakings in the community happens [1].

As the Philippine government intensifies its programs to strengthen the economy and decreases if not totally eradicate corruption, improving government transactions and promoting more transparent services prove vital. With this in consideration as well as the advancement in ICT, the government started investing in local government units' computerization. The establishment of the National Computer Center (NCC) on June 1971 marks the birth of early computerization in LGUs [2]. Its role became essential in ICT training and system conceptualization for public sector [3]. Eventually, the government gear towards attainment of higher aspiration and started to embark on electronic governance program.

The Philippine constitution allows LGU to manage its own resources to become more self-reliant and attain its fullest development [4]. To perform effectively, each barangay maintains database (most of the time using manual file-based system) holding different information about the barangay such as the barangay population, cases filed, apartments and houses constructed and even businesses running in the community. Since majority of the transactions operate manually several barriers such as difficulty in planning, tracking and monitoring of government transactions as well as the generation of up-to-date documents hinder barangay's success in the delivery of better public services.

In the advent of modern technology, grass root planning and transactions may be hastened and delivery of public services may be improved. Thus, the study of "Promoting Digital Empowerment through Implementation of Barangay Office Management System" was formulated with the following objectives:

1. To determine role of Information and Communications Technology (ICT) in country's empowerment and development.
2. To design a system that can be used to improve transactions of barangays with the following features:

- 2.1. user-friendly environment;
- 2.2. system security;
- 2.3. file manageability;
- 2.4. and report generation.
3. To evaluate the level of acceptability of the system in terms of :
 - 3.1. usability;
 - 3.2. security;
 - 3.3. accuracy;
 - 3.4. and user-friendliness.

Significance of the Study

The design and development of a barangay management system could help enhance the management of barangays' different transactions. With the system, the generation of effective, up-to-date documents and reports as well as the ease of administration of different barangay's projects, programs and activities will be possible.

The result of the study will be useful for the following:

General Public. Through the system, government operations will be transparent and government officials will have well-defined accountability. The documents needed by the public such as barangay clearance, certificate of indulgency, certificate of residency, occupancy permit, business permit could easily be provided by barangay personnel.

LGU Management. The developed system will be of help in the proper and reliable safe keeping of barangay's records. The system could also provide better control to barangay's transactions that could lead to a more effective use of the government resources.

Barangay Officials and Staff. The system will be an aid in a faster and more accurate processing of voluminous barangay transactions. Therefore, could save staff time in attending to different transactions. It will also ensure up-to-date delivery of different reports that could be used by barangay officials in creating sound decisions.

Future Researchers. The study will also benefit the future researchers who will have the same line of interest as this material could be used in conducting further study.

Literature Review, Theoretical Review and Conceptual Explanation

Technology such as computer and internet can be used to complete a task within an organization with greater ease, accuracy and consistency but with relatively cheaper cost [5]. The dominance of computer in our society drives the many changes in this world. Its existence is manifested in almost any place in the globe: in offices, government agencies, home, and schools [6].

It is evident that in the Philippine society, information technology has become and will continue to be an essential part of every Filipino's life. The government probably realized the importance of ICT in nation-building, bringing good governance, fighting corruption and providing better services to the public. This drives the government to develop strategies to prepare its citizens to live and survive in a digital world and to maximize the benefits brought about by the use of Information and Communication Technology (ICT) to further improve governance, economy and one's way of life [7]. Local government then, created development plans across sectors in the community to maximize public assets.

Since 1991 when the Local Government Code was implemented, several attempts were done to generate information at the local level. Barangay based information limited to population data were launched in some barangays by the National Information Statistics Office [8].

In 1997 the dawn of electronic governance in the Philippines took place. The RPWEB requiring the internet connectivity of all government agencies and local government units was also established [9].

The Republic Act 8792 otherwise known as the Electronic Commerce Act of 2000 that promotes the use electronic mode in all government dealings and transactions was passed in June 2000 [10]. In line with this, NCC undertook the e-LGU project in 2002 [11].

In June 2004, through the Executive Order No. 269 the Commission on Information and Communication Technologies (CICT) was created to be the agency that will be in charge of primary planning, coordinating and implementing IT programs and projects for the government, including the e-LGU program.

Conceptual Framework

The study came up with a prototype of the system which was analyzed and tested to determine its feasibility. This serves as basis of analysis, design and development of the proposed system.

The conceptual framework describes the overall structure, flow and procedure of the development of the barangay management system. The model consists of frames, each representing a stage and its requirements needed towards the achievement of goals.

The input frame shows all required by the system and its development. This includes relevant inputs and the various knowledge requirements needed by the researcher to perform the endeavor in the next frame. This frame also considers the system requirements and other sources of information.

The process frame shows the activities needed to perform to transform the inputs to desired output. This includes: requirements' analysis and system design conceptualization; system development; and system testing and evaluation.

The last frame shows the expected short term and long term outputs of the study as well as its impact. The immediate output of the study is the development a barangay management system which may lead to a long-term output – the enhancement of local government units' transaction management. This may eventually lead in a more resilient Philippine economy by having a government that is more transparent and citizen-centered.

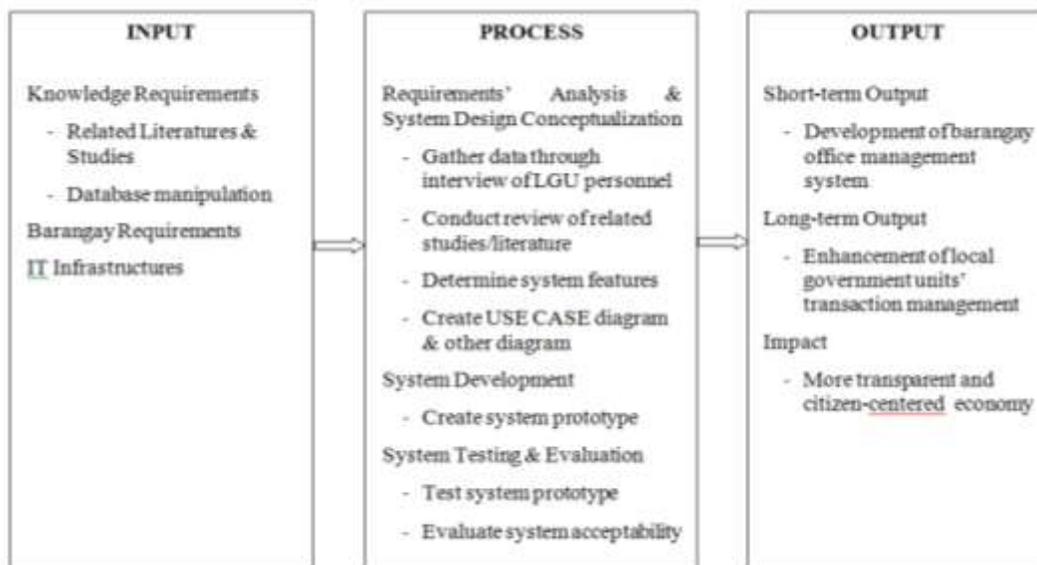


Figure 1. Conceptual paradigm: input, process and output.

Figure 1 shows the system development process used which was presented using the three dimensions of the conceptual paradigm: input, process and output.

Methodology

The researcher use the Unified Modeling Language (UML) particularly USE CASE in identifying, building and communicating the components and design of the developed system.

The functionality of the Barangay Management System was shown in Figure 2. The primary actors of the systems are the barangay captain, barangay secretary, barangay treasurer and the residents of the barangay. The barangay captain will act as the system administrator who will be in charge of maintaining the system and will be given full authority and responsibility over the information stored in the system. He will also be allowed to add and provide access level to all users of the system. The secretary, on the other hand, will be in charge of managing information on census, cases filed, house constructed and business established in the barangay. The secretary also prints the different barangay certificates and clearances. The treasurer will be responsible for managing all financial-related modules of the system. It manages the purchase request and order and creates different reports such as requisition, liquidation and accomplishment reports. Clearances, certificates and reports can be requested by residents of the barangay.

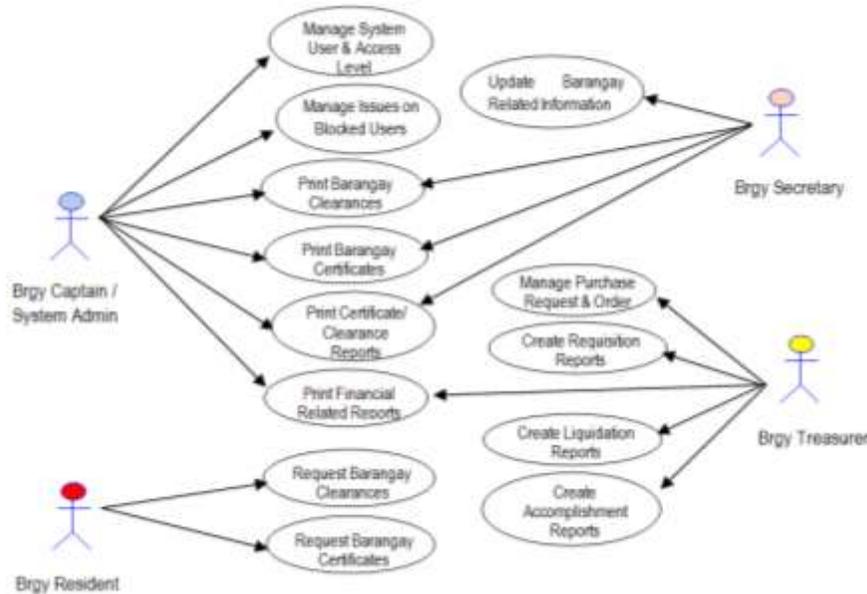


Figure 2. USE CASE diagram for the system.

RESULTS AND DISCUSSIONS

The term Information and Communication Technology or ICT is a broad term which generally referred to technologies used in accepting, saving, modifying and communicating information in various forms. If ICT is properly utilized, its maximum benefits to country's growth and development will be realized [12].

ICT may have three major effects that influence societal development. First, it simply substitutes the old technology with new one. Next is it leads to the improvement of the different processes enabled by the new technology. And, it can be used in the generation of new technology-related processes or development of different applications such as e-government which leads to societal change [13].

E-government applications were initially used to accelerate transaction processing for citizens. Over the past years, technology and information tools hold the promise of putting the community to the economic mainstream that can drive neighborhood change and progress [14].

ICT can be used in performing different transactions with greater ease, therefore, with ICT one can save time. Similarly, the little the amount of time spent in performing one's task will be equivalent to the bigger monetary savings of the organization. Another advantage brought about by ICT use is the improved security. In saving files in computer, for example, security codes can be applied to protect important information from being access by unauthorized users. Thus, file can be properly safeguarded and its integrity will be increased [15].

In developing a system that will be used in performing transactions, specifically in this case, of the barangay a well-structured database is required to handle the different files of the institution. A well-constructed database allows the proper addition, modification, deletion and retrieval of barangay information. With this, the quality of information saved can be ensured. Thus, the reports that will be generated by the system can be used in creating sound decisions of the decision making body.

In analyzing and developing the barangay system a systematic approach called System Development Life Cycle (SDLC) was used. SDLC phases include system planning, analysis, design, programming, testing and evaluation of the system. To communicate the functionality of the system, USE CASE diagram was used.

In order to create a Barangay Management System, a combination of interface software and database software was used. Java SE Programming Language is used in creating the front-end of the system supported by MySQL as repository of the different data and information pertinent in barangay management.

The researcher identified the most relevant features of the system as:

User-friendly Environment. The developed system was intended to be used by non-IT personnel such as the barangay captain, secretary and treasurer. To easily be understood by the users, the graphical user interface was designed to be simple and self-explanatory. The screen layouts were customized. Likewise, the forms and its components include buttons and menus that are easy-to-recognize. Aside from that, data entry has intuitive user interface and flowing navigation. Most importantly, the reports are well filtered.

System Security. The system was protected from unauthorized users. This can be done by allowing each system user to set user name and password which will be approved by the administrator. This should be used in gaining access to the system. In line with this, every user will have different level of access to the system which is dependent on the tasks assigned to the user. Moreover, to ensure data/information ownership, the system generates license key for every barangay that will be using the system.

File manageability. The system, having well-designed database, allows easy manipulation (adding, updating, deleting and searching) of barangay information. The integrity of data is maintained through implementation of entity integrity and referential integrity constraint in the database tables.

Report Generation. The system generates different certificates, clearances and reports of the barangay. Among the clearances and certificates that the system is capable of generating are: barangay clearance; business permit; indigence certificate; residency certificate; certificate of recommendation; occupancy permit; excavation permit; and building permit. Likewise, the following reports can be generated: purchase request and order report; inspection report; disbursement and requisition report; liquidation report; and accomplishment report.



Figure 3.a. Log in Menu

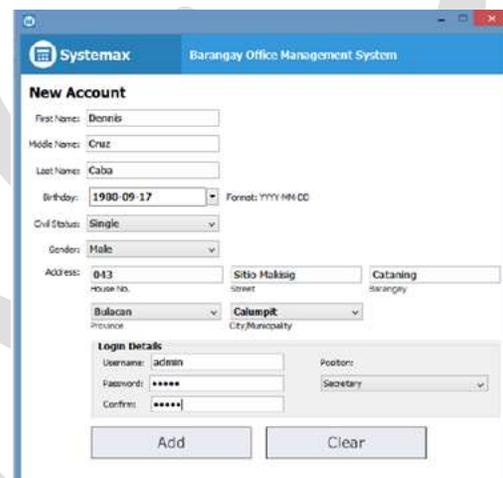


Figure 3.b. System User Management



Figure 4. Main Menu



Figure 5. Manage - Resident Information

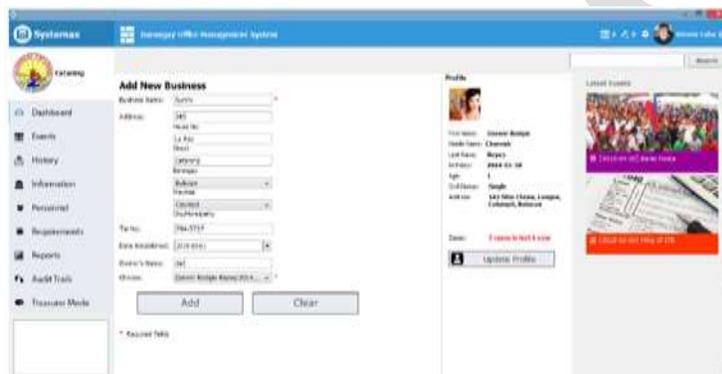


Figure 6. Manage – Business

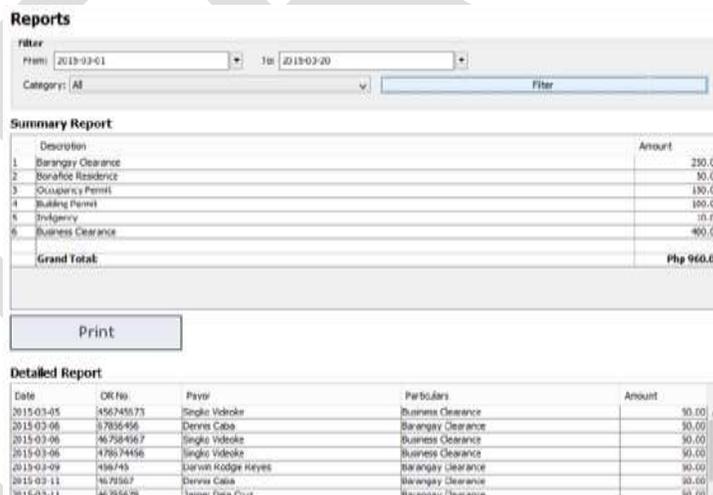


Figure 7. Barangay Reports

Figures 4 to 7 displays some of the significant features showing the major functionalities of the Barangay Management System.

The functionalities of the system were tested by the respondents from IT experts and barangay staff. To determine the respondent's perception on the developed system, data gathered from the evaluation were examined and summarized. Responses were interpreted using the mean value and the quantitative average of responses of the criterion in the evaluation sheet was determined. The acceptability of the system based on the evaluators' responses was quantified following the five points Likert Scale. The system was perceived to be acceptable in terms of usability, security, accuracy and user-friendliness. The over-all weighted mean is 4.23 which is interpreted as "Very Good".

ACKNOWLEDGMENT

The author wishes to express her deepest gratitude to the Bulacan State University for supporting this endeavor and to Dennis Caba and Jasper dela Cruz for helping the author in the development of the system.

CONCLUSION

ICT can be used in performing government transactions reliably and with greater ease. Among the advantages of ICT use are upgraded security, improved data integrity, better data consistency and enhanced decision making. The use of ICT also saves time and money.

The system was perceived to be useful in increasing the efficiency and effectiveness of managing and performing barangay transactions. With technological breakthrough and advancement in ICT, the existing manual process would still be improved. Hence, the developed system would provide better alternative to the existing current process. The significant features of the system which are relevant to the functionality of the system include: the user-friendly environment; high system security; better manageability of files; and accurate and quick report generation.

The over-all interpretation for the acceptability of the developed software in terms of usability, security, accuracy and user-friendliness was very good. The result signifies that the developed system passed the level of acceptability.

REFERENCES:

- [1]. Reyes, E. (2013, October 28). *Barangay History 101. From pre-Hispanic, to colonial to modern, the barangay chief's "the man"*. Retrieved December 2014 from [www. InterAkasyon.com](http://www.InterAkasyon.com)
- [2]. Siar, S. (2005). E-governance in Philippine Local Government: Content Analysis of City Websites and Study of a Best Practice Case. *Philippine Journal of Development* 2005.32(2).
- [3]. National Information Technology Council (2009). Government Information Systems Plan. Manila, Philippines. Retrieved December 2014 from <http://www.ncc.gov.ph/files/gisp.pdf>
- [4]. Pimentel Jr., A. (1991, October 10). Local Government Code of 1991 Republic Act 7160. Retrieved December 2014 from http://www.lawphil.net/statutes/repacts/ra1991/ra_7160_1991.html.
- [5]. Jessup, L. (2006). *Information Systems Today*. Upper Saddle River, New Jersey: Pearson Prentice Hall.
- [6]. Hopper, J.A., Prescott, M.B., & McFadden, F.R. (2002). *Modern Database Management 6th Ed*. Upper Saddle River, New Jersey: Pearson Education Asia Pte. Ltd.
- [7]. Commission on Information and Communications Technology (2011). *The Philippine Digital Strategy Transformation 2.0: Digitally Empowered Nation*. Manila, Philippines: Uy, I. J.
- [8]. Celeste, R (2004). *Proceedings from 9th National Convention on Statistics (NCS)*. EDSA Shangri-La Hotel, Manila: Philippines
- [9]. Ramos, f. (1997, November 7). Directing All Government Agencies and Instrumentalities Including Local Government Units to Undertake Electronic Interconnection through the Internet to be Known as RPWEB. Administrative Order No. 332. Retrieved December 2014 from www.ncc.gov.ph/files/Ao332.pdf
- [10]. Padilla, J. (2005). The Electronic Commerce Act (R.A. 8792) An Overview of IT (Information Technology) Impact on the Philippine Legal System. Retrieved February 2015 from http://ustlawreview.com/pdf/vol.L/Articles/The_Electronic_Commerce_Act_RA_8792.pdf
- [11]. Alampay, E. Incorporating participation in the Philippines' e-LGU Project. Retrieved December 2014 from <http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan034698.pdf>
- [12]. Zimbabwe Academic and Research Network. *The Role of Information and Communication Technology ICT in Enhancing Local Economic Development and Poverty Reduction*. Causeway, Harare, Zimbabwe: Kundishora, S.M.
- [13] Harindranath, G. (2007). *Proceedings from 9th International Conference on Social Implications of Computers in Developing Countries*. São Paulo: Brazil
- [14]. Sabety, P. (2006). *Proceedings from 2006 Council on Foundations Annual Conference*. Pittsburgh, Pennsylvania: USA
- [15]. Hopper, J.A., Prescott, M.B., & McFadden, F.R. (2002). *Modern Database Management 6th Ed*. Upper Saddle River, New Jersey: Pearson Education Asia Pte. Ltd

A REVIEW ON CLUSTER-BASED TRAFFIC INFORMATION GENERALIZATION IN VEHICULAR AD-HOC NETWORKS

Sandeep Kumar, Kantveer bhagat.

Student, Department of Computer Engineering, Global institute of Management and Emerging Technology Amritsar PTU University,
Er.sandeep22@yahoo.com, 9646003534

Abstract—Getting the traffic information to avoid collision, Accidents of vehicles and for congestion free traffic networks we can use the vehicular Ad-hoc network(VANET'S).VANETS will be provide dense free traffic to vehicular for traveling safely and comfortably by data dissemination to the vehicular ad-hoc networks. In VANETS all the vehicles act very intelligently like a machine. But for dense free traffic we have to need to 3steps.1st have to collect the information of traffic for the Cluster of the vehicles. We can choose the new clustering algorithm for collecting information. Then for forwarding the information to the various clusters of vehicles used the chaining technique .finally we got the generalization method to extend the total traffic volume from collected data. After that we got the data simulation technique for the design tool to predicate the performance of the system. Simulation technique help to evaluate the performance, accuracy, Stability to the proposed approach and provide superior performance as compare to other mobility base techniques.

Keywords — Estimation of traffic in Vehicular by Ad-hoc networks.

INTRODUCTION

Traffic problem in the today date is most crucial problem. Lot of accidents occur due to traffic problem in today date will be happens. Much kind of impact and problems by traffic will be such as.

1. Its harmfully impact on the economy due to a lot of vehicular stuck in traffic and the gallon of fuel will be wasted.
- 2Health, environment also impact due to the more of vehicular stuck in traffic by pollution.
- 3A lot of accidental case will occur due to the traffic problem in today date.
- 4Time wasted, death causes, and its effect the economy of the world.
- 5 Higher Chances of collisions due to tight spacing and constant stopping- and- going.

Above problems may be overcome by following steps.

STEP1:-1ST OF all Traffic information system (TIS) is used. Its purpose is to capture evaluate and dissemination the information regarding traffic related

STEP2:-For information passing in between vehicle to vehicle (V2V) and vehicle to infrastructure (V2I) Cooperative Traffic information system (CTISs) will be used.

STEP3:-CTISs will be providing the long range bandwidth. In which user are able to Dissemination data to the 0 to 300 meters approximately range.

STEP4:-In VANETs there are some components which will complete it. (OBU)On Board unit which will install in vehicles to help him to communicate each other Wireless. Road Side Unit (RSU) which make an access or hotspot by internet in vehicles to sending

information from one end to other. Authentication server (AU) An authentication server can reside in Computer an Ethernet switch or a network access server.

STEP5:-The two system GPS (GLOBAL POSITIONING SYSTEM) which providing location and up to date information of data with Accuracy. DGPS (DIFFERENTIAL GLOBAL POSITIONING SYSTEM) which is enhancement to the Global Positioning system for improve the quality of finding location.

In this work, we will discuss about the traffic problem in the today life and the various impact of that on human Being life. The upper step will be help to cure that the traffic problem by providing VANETS System Which turns every vehicle as mobile nodes and send him traffic information to provide congestion free and reliable traffic.

REMAINING CONTENTS

ACKNOWLEDGMENT

THIS PROJECT WILL CONSUMED HUGE AMOUNT OF WORK ,DEDICATION IT WILL NOT COMPLETED WITH MY GUIDE SUPPORT OF ALL MY SINCERE THANKS[KANTVEER BHAGAT] I WILL LIKE TO MY SINCERE THANKS TOWARD HIM WHO DEVOTED THEIR TIME AND GIVE KNOWLEDGE TO ME.

CONCLUSION

Traffic problem in today date is most crucial problem. Causes various impacts like Economy, Pollution, and Human lifestyle and occur accident. In upper paper the purpose is that how to control that's various problems by sending traffic information data dissemination to all the vehicular. For that purpose various techniques like GPS ,DGPS,TIS,TMC,CTIS,CLUSTERING ALGORITHM , ,CLUSTERING CHAINING TECHNIQUES,SIMULATION TECHNIQUE will be used all of that technique have to purpose that the communication the various clusters of vehicles through wireless by make him mobiles nodes and send data dissemination of traffic For estimation total traffic density purpose of reliability, scalability and congestion free traffics, noisy free environments and saving economy of country.

REFERENCES:

- [1] HAMID Reza Arkian,RezaEbrahmi Atani,AtefePourhalli,SamanKamali," Cluster –based traffic information generalization in vehicular Ad-hoc Networks ",Elsevier 2014.
- [2] Rasmeet SBalia ,Neeraj kumara,Joel J.P.CRodrigues," Clustering in vehicular ad hoc Networks :Taxonomy ,challenges and Solutions ",Elsevier 2014.
- [3] OmarChakron,SoumayaCherkaoui," Overhead-free congestion control and data dissemination for 802.11p VANETs "Elsevier 2014.
- [4]MS..Kakkasegria,S.S.Manvi," Regression based critical information aggregation and dissemination in VANETs :A Cognitive agent Approach "Elsevier 2014.
- [5]MoumenaChaqfeh,AbderrahmaneLakas. Imadjawhar," A survey on Data Dissemination in vehicular Ad-hoc Networks" Elsevier 2014.
- [6] J.Liu, Z.Yang and I.Stojemenovic," Receiver Consensus: On time Warning Delivery for Vehicular Ad-hoc Networks," IEEE Trans .Emergent Topics in Computing, VOL 1 JUNE 2013
- [7]Yousef-Awwad Daraghmi and chih-Wei Yi, National Chaio Tung University Ivan Stojmenovic University of Ottawa, Canada and King Abdulah university ,Saudi Arabia," Forwarding Methods in Data Dissemination and Routing Protocol for Vehicular Ad Hoc networks "IEEE 2013
- [8]Ming-Ching Chung and jeng –Farn Lee," TEAM: Trust –Extended Authentication Mechanism for Vehicular AD-hoc networks", IEEE 2013.
- [9]M.Chitral and S.Siva Sathya2, Department of computer Science, Pondicherry University Pondicherry," Efficient Broadcasting Mechanism in Vehicular Ad-hoc Networks", ,Ijmnc 2013.

[10] Annum or Research Scholar, Department. Of Computer Science Applications Kurukshetra University Kurukshetra Haryana, India “Study of Different type of data dissemination Strategy in VANET”, IJESIT2012.

[11] Fei Ye Student Member, IEEE, Sumit Roy, Fellow, IEEE, Haobing Wang. Student Member, IEEE, “Efficient Data Dissemination in Vehicular Ad Hoc Networks”, IEEE 2012

[12] A. Mostafa, A.M Vengi, T. Oliveria, T.D.C Little, and DP AGRAWAL, “QOSHVCP: HYBRID Vehicular Communication protocol QOS Priorazation for safety Applications”, ISRN COMMN. Networks”, VOL 2012 P 2012

IJERGS

Design OF Advanced Encryption Standard Algorithm Using Xilinx Project Navigator, ISE 13.1

Shubhangi V. Funde¹, Dr.D.V.Padole²

¹PG Scholar ,Dept. of electronics Engineering ,G.H.Raisoni College of engineering, Nagpur (M.S),India.
sshubhangis90@gmail.com

²Professor,Dept. of Electronics Engineering, G.H.Raisoni College of Engineering, Nagpur(M.S.),India

Abstract- Security is the weighty part in wireless communication system, where more randomization in secret keys increases the security as well as complexity of the cryptography algorithms. The AES is used to protect data in cryptography. It is a symmetric block cipher in which encryption and decryption is takes place. For the performance AES algorithm is discussion from its starting publication. The propose method is to design AES algorithm by using Xilinx ISE 13.1. The simulated result shows the different parameters such as power and time of AES algorithm.

Keywords: Substitution, Encryption, Decryption, Plain text, cipher text, VHDL.

1. Introduction

The hardware implementation of the AES algorithm is created for external data storage unit in application. Rijndael is a symmetric block cipher which can process data blocks of 128 bits (4 words), AES is divided into three types , namely AES - 128, AES - 192, and AES-256, In this algorithm 128, 192 and 256 is a key length for the above three types and 10,12 and 14 rounds respectively are takes place. In cryptography, the AES is also known as Rijndael which is a block cipher decide as an encryption standard. It is capable to protect sensitive information. This algorithm is a symmetric block cipher, which encrypt and decrypt information. Encryption converts data in to cipher-text. Decryption of the cipher-text converts into its original form that is plaintext. AES generally allows a 128 bit data length that can be divided into four basic operation blocks. These blocks are Substitute Bytes, Shift rows, Mix columns, Add round key. The algorithm starts with the Add round key stage for both encryption and decryption algorithm.

2. AES Algorithm

AES algorithm encryption and decryption process is shown in Fig.1, in which Inversed its encryption process will be able to decrypt the cipher text.

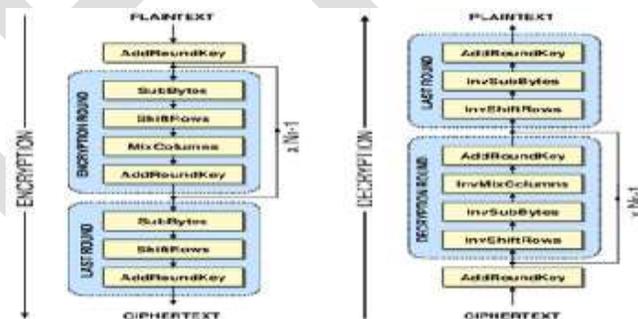


Fig 1. AES algorithm

1. Sub Bytes: During the forward process substitution takes place this substitution depends on bytes. 16x16 lookup table used in the sub bytes.
2. Shift Rows: Shift rows are a cipher result. It contains four rows; the first line of State remains the same, the second, third and fourth shifted by one, two and three respectively.
3. Mix Columns: In the Mix Columns transformation, every column work independently and a new value represents by every byte. In this transformation Matrix multiplication is take place.
4. Add-Round Key: Here add-round key is added in the previous output. XOR operation is used to combine the state byte with the expanded key.

3. The Encryption Key and Its Expansion

The key is arranged in the form of a matrix of 4×4 bytes. Here length of key is 128-bit is used, first word is saved in column. These words are arranged in 44 words. They are represented as W_0, W_1, \dots, W_{43} .

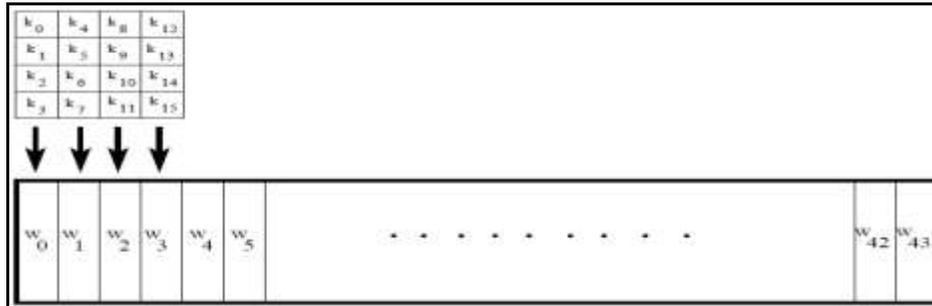


Fig.2 Expanded key schedule

4. Proposed System

For the power consumption the hardware implementation is takes place because it is better than software implementation. The hardware / software partitioning is the process in which application divided between software which is executed on a microprocessor and hardware implemented on an FPGA. The Xilinx Platform Studio (XPS) is used for design the hardware portion of embedded processor system.

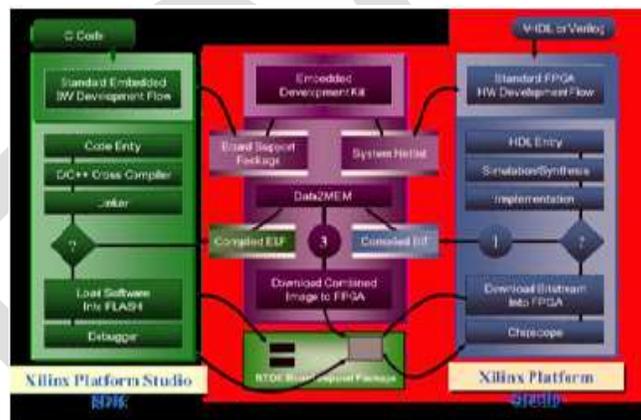


Fig.3 Design Flow of EDK

EDK consist the hardware and software system which are the important part of the embedded processor system.

Xilinx Platform Studio (XPS): It is used for designing the hardware portion of embedded system. This h/w then implemented on the FPGA with the help of microblez.

Software Development Kit (SDK): It is used to design the software portion of the embedded system which is then implemented on the FPGA.

5. AES with Hardware for Encryption and Decryption (VHDL)

In figure 4, 128 bit length key is used in the plain text. With the help of 2:1 MUX, encryption of AES is controlled.

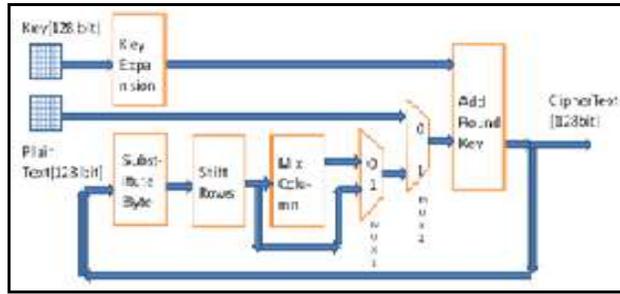


Fig.4- AES with hardware for encryption

With the help of two 2:1 MUX Flow of Decryption is controlled. These muxes is used to decide the path of execution. Because of the flexibility VHDL is used as the hardware description language.

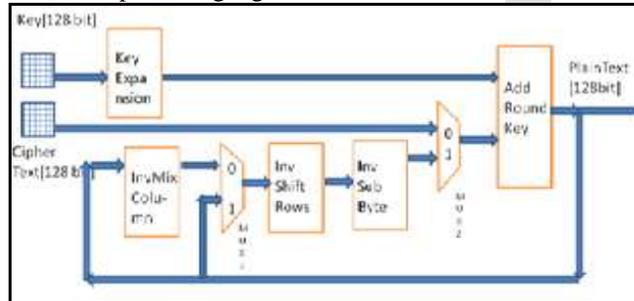


Fig.5 AES with hardware for decryption

The software used for this work is Xilinx ISE 13.1 suite. This software is used for writing, debugging and optimizing efforts, and also for fitting, simulating and checking the performance results using the simulation tools.

6. Simulation Result

Fig 5 shows the simulated result of encryption and decryption on ISE13.1.

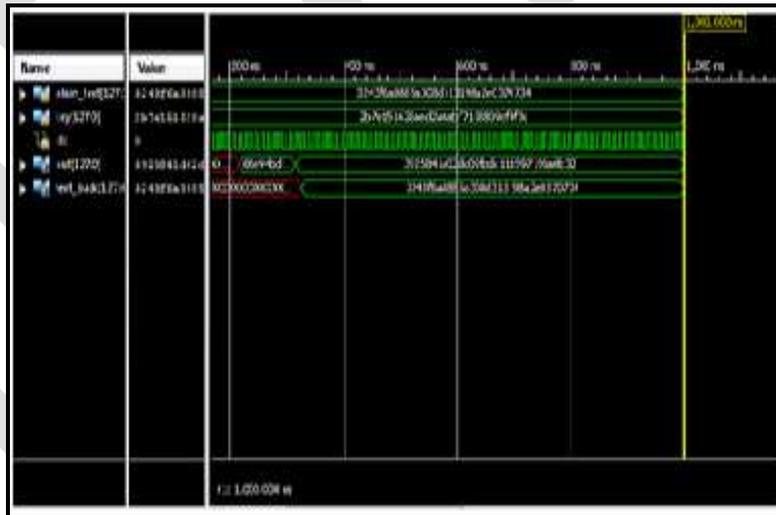


Fig.6 Simulation Result

Simulation Test Vectors For Encryption and Decryption process:

PlainText: 128'h3243f6a8_885a308d_313198a2_e03704;
 Key: 128'h2b7e1516_28aed2a6_abf71588_09cf4f3c;
 Cipher Text: 3925841d02dc09fdbc118597196a0b32
 Text back: 128'h3243f6a8_885a308d_313198a2_e03704;

7. Power Analysis and Time Analysis

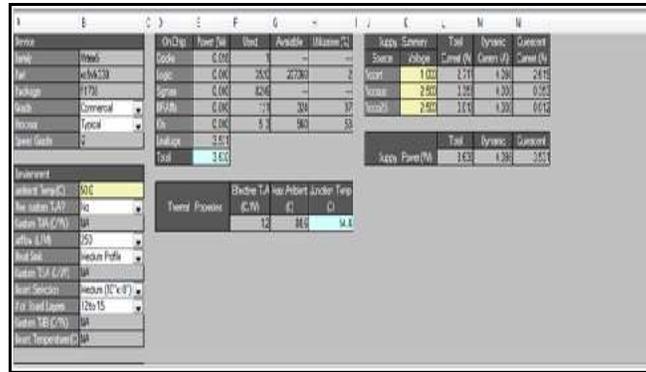


Fig.6 analysed power

X-Power Analyzer is graphical tool. With the help of this tool analyse the power used for the synthesis of AES on Xilinx ISE 13.1. Here total power used for synthesis is 3.630W.

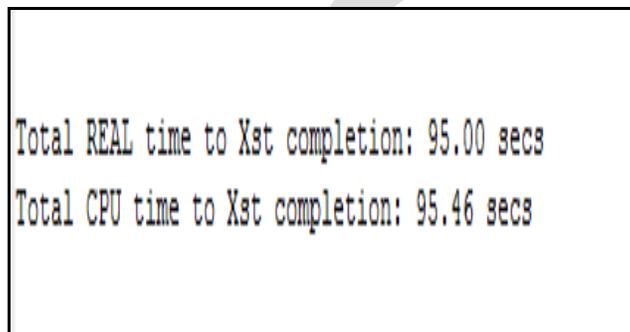


Fig.7Time analysis

For the synthesis of AES in real time it takes total 95.00 secs and for CPU it takes 95.46 sec.

8. Conclusion and Future Work

This paper introduces a design scheme to implement an AES IP Core based on key lengths. Future work will be Design software and Hw/Sw code-sign and implement on Spartan6. For the Software implementation, C language is used and for the hardware development VHDL is preferred. This co-design is implemented using Xilinx platform studio and evaluates the parameters of AES algorithm for the performance evaluation.

REFERENCES:

1. Yang , Jun Ding ,“FPGA-Based Design And Implementation Of Reduced AES Algorithm”, 978-0-7695-3972-0/10 \$26.00 © 2010 IEEE
2. AES Overview. Intel® Advanced Encryption Standard (AES) New Instructions Set323641-001 Revision 3.0 May 2010
3. Vilas V Deotare, Dinesh V Padole, Ashok S. Wakode, ” Performance Evaluation of AES using Hardware and Software Codesign”, ISSN: 2321-8169 Volume: 2, June 2014
4. Santhosh Kumar. D, K.Navatha, Dr.Syed mushtak Ahmed, ” Implementation of AES Algorithm on Micro Blaze Processor in FPGA”, International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 10, October 2013
5. Meghana A. Hasamnis, ” Design and Implementation of Rijindael’s Encryption Algorithm with Hardware / Software Co-design Using NIOS II Processor”, 978-1-4577-2119-9/12/\$26.00 © 2011 IEEE
6. Hoang Trang, Nguyen Van Loi, ” An efficient FPGA implementation of the Advanced Encryption Standard algorithm”, 978-1-4673-0309-5/12/\$31.00 ©2012 IEEE
7. Ciprian Leonard Pițu, Ciprian Leonard Pițu, Radu Câmpeanu. ” Differential Power Analysis: Simulated versus Experimental Attacks”, 978-1-4799-1555-2/13/\$31.00 ©2013 IEEE
8. M.Sambasiva Reddy, Mr. Y. Amar Babu, ” Evaluation Of Microblaze and Implementation Of AES Algorithm using Spartan-3E”, international journal of advanced research in electrical, electronics and instrumentation engineering vol. 2, issue 7, July 2013
9. MicroBlaze overview.
http://www.xilinx.com/support/documentation/sw_manuals/xilinx14_2/mb_ref_guide.pdf
10. Medhat H. A. Awadalla, Kareem Ezz El-Deen, Kareem Ezz El-Deen, “Real-Time Software Profiler for Embedded Systems” Department of Computer Science, Faculty of Computers and Information / Organization Name, University of Fayoum, Egypt

Machining of Plastics: A Review

Mr. Tushar U. Jagtap, Dr. Hemant A. Mandave

Department of Mechanical Engineering, Karmaveer Bhaurao Patil College of Engineering & Polytechnic, Satara,

tujagtap@gmail.com

Abstract—Plastic materials have good mechanical properties. Price and weight of plastic products are less as compared to metallic products. Therefore plastic is replacing to metals in various applications. Most of the plastic products are primarily produced by moulding process. For large scale production moulding process is preferred, whereas small scale production and requirement of surface quality, machining is preferred. Turning, drilling and milling these are the machining operations mostly carried out in plastic machining. Study carried out in the field of plastic machining is discussed in this paper.

Keywords—Plastic machining, machining on polymers, plastic composite, plastic materials, processing on polymers, machining methods

INTRODUCTION

Polymers are organic materials having excellent formability and mouldability. The term plastic is synonymously used for polymers. Depending upon the nature of the intermolecular bonding, plastics can be classified as thermoplastics and thermosets. Generally plastic products are manufactured by moulding processes like injection moulding, blow moulding, compression moulding, transfer moulding, etc.

Plastic injection moulding is the process primarily used for manufacturing of large quantities of plastic products and suffers through the problems of warpage, poor weld lines, sink marks and poor surface finish. So, post processing or recycling is required in these cases. In majority of the cases, post processing is limited to removing burr, runners, flash etc. However, wherever dimensional accuracy and surface finish requirements can not be fulfilled by moulded components, they are required to be finished by machining. Also quantity requirement of products does not justify investment in tooling, particularly moulds, plastic components become economical, if produced by machining. Dimensional accuracy and superior surface smoothness are desirable characteristics of plastic products in the applications of precision machinery, electronics and optics. To acquire these characteristics, plastic products need to undergo machining process. Higher form and shape accuracies may be achieved by the precision machining processes like turning, drilling, milling, etc. Machining also enables a high flexibility in the production of asymmetric plastic products.

During turning process, measure of the technological quality such as surface roughness is influenced by cutting parameters. These cutting parameters are like cutting speed, feed rate, depth of cut, etc. For drilling process, thrust force and surface roughness of hole are considered as process and quality measure respectively. While performing milling operation, surface roughness and machining force can be affected by spindle speed, feed rate and helix angle.

This paper discusses plastic machining, particularly, machining processes like turning, drilling, and milling.

LITERATURE REVIEW

Polymers (plastics) are organic materials having long chain carbon molecules. Polymer molecule is formed by number of monomers. As per intermolecular bonding, plastics can be classified as thermoplastics and thermosets. Thermoplastics can be recycled by melting, hence it is widely used. Polyethylene (PE), polystyrene, polypropylene (PP), polyvinylchloride (PVC), nylon (polyamide), teflon are some examples of thermoplastic materials. Thermosets, before moulding, are in partially polymerized state. Cross linking of molecular chain takes place in polymerization process. After polymerization, if thermosets are heated, it does not melt. Epoxies (EP), Phenolic (PF), Polyurethane (PUR), unsaturated polyester are examples of thermosets [1-4].

Generally, plastics and plastic composite materials are used in production of plastic components. Plastics like nylon, teflon, polypropylene have good mechanical properties. These plastic materials have increasing applications for specialty purposes where their toughness, rigidity, abrasion resistance and heat resistance are important. [2-4, 10-11]. Therefore it is widely used in the applications like gears, cams, bearings, bushes, valve seats, etc. [2-4]. On the other hand, plastic materials have few limitations over metals. Such as melting point of plastics is comparatively low, therefore applications of plastics in high working temperature is not favourable. Thermal expansion of plastics is ten times as that of metals, hence it is one of the constraint need to be consider in application. Plastic deformation occurs in plastic materials under heavy stresses [1-4]. Some important properties of material are compared between plastics and metals in table 1. [4].

Table 1
Comparison of important properties

S.N.	Property	Metals	Plastics
1	Density, g/cm ³	2 to 22 (average 8)	1 to 2
2	Melting points	Low to high	Low
3	Hardness	Medium	Low
4	Machinability	Good	Good
5	Tensile strength, MPa	Up to 2500	Up to 140
6	Compressive strength, MPa	Up to 2500	Up to 350
7	Young's modulus, GPa	15 to 400	0.001 to 10
8	Thermal expansion	Medium to high	Very high
9	Thermal conductivity	Medium to high	Very low
10	Electrical characteristics	Conductors	Insulators
11	Chemical resistance	Low to medium	Good
12	Stiffness	High	Low
13	Malleability	High	High

Plastic composites are mixture (blend) of two or more plastic materials having different characteristics. Composites are generally made by reinforcing fibers in original plastics. Reinforcement of fibers in plastic is done for better mechanical properties of material [1-4]. These composites (like glass fiber reinforced plastic, carbon fiber reinforced plastic) are preferred in the field of automotive parts, modern underwater projectiles, parts of aircraft, etc. [4, 11, 15-18]. Important properties and applications of plastic materials are summarized in table 2 [1-3].

Table 2
Different parameters of some plastic materials

S.N.	Material	Abbreviation	% Elongation at break	Applications
1	Acrylonitrile butadiene styrene	ABS	8	Housing appliances, Safety helmets, interior of automotive
2	Acetal	POM	40	Gears, bearings, plumbing parts, automotive parts, electronic equipment
3	Nylon (Polyamide)	PA	60	Bearings, gears, appliance housings, cams, bushes, valve seats
4	Polycarbonate	PC	100	Electronic connectors, appliance housings, pen bodies, geometry instruments, lenses
5	Low density polyethylene	LDPE	400	Squeezable bottles, packaging films
6	High density polyethylene	HDPE	150	Storage and transport containers, packaging films
7	Polymethyl methacrylate	PMMA	2	Optical fibers, lenses, appliance panels, windshields, automotive tail lights
8	Polypropylene	PP	150	Disposable syringes, automotive interior trims, utensils
9	Polystyrene	PS	1.5	toys, food packaging, coffee cups, hangers
10	Polyvinyl chloride	PVC	80	Cable insulation, pipelines, floor coverings, shoe soles
11	Epoxy	EP	3	Encapsulation of electronic components, adhesives
12	Phenolic	PF	0.8	Utensil handles, terminal boards, oven trims, electrical switch housings

Plastic products can be manufactured by moulding processes like injection moulding, blow moulding, compression moulding, transfer moulding, etc. Out of which, injection moulding contributes 70-80 % of production of plastic components [2-3]. Products

manufactured by injection moulding suffers through problems like warpage, poor weld lines, sink marks and poor surface finish. Which affects closer tolerances and accurate dimensions. Therefore, post processing or recycling is required in these cases [2-6].

Requirement of small quantities plastic products are not preferably produced by moulding process. As cost of making mould, process setting time and wastage of material through runners, testing experimentation material wastage do not justify cost of product. Therefore, production of small quantities of products are primarily done by machining process [9]. Turning and drilling operations are mainly carried out in machining of plastics. Special tools (like carbide or diamond tools) are preferred to prevent localized melting, smearing, or cleaving in coarse fragments. It helps in machining of plastics and reinforced plastics at higher rates with acceptable surface finish [4]. During machining, quality surface characteristics are being affected by process parameters like cutting speed, feed rate, depth of cut, etc.[3-4, 7-19]. Whereas, along with surface characteristics, high dimensional accuracy is important in the field of precision machinery, electronics and optics. Where precision machining is preferred [7-8, 11]. Study carried out by researchers on machining of plastics is discussed here:

Kobayashi [7] studied ultraprecision machining on polymethyl methacrylate (PMMA). It is found that the surface roughness decreases as the feeding rate decreases. Optical grade surface roughness can be obtained for PMMA by machining method. Author advocates machining of plastics for achieving high dimensional accuracy and good surface finish. Whereas, while studying turning on PMMA, Jagtap [8] observed that spindle speed is most significant parameter. When the spindle speed is less then surface flatness is better. Diamond tool is used by the researchers in turning on PMMA. Keresztes [9] studied machinability of polymers such as PA 6 (Mg), PA 6 (Na), POM C (Polyoximethylene), HD 1000 (UHMWPE). It is found that PA 6 (Mg) is toughest material in the view of cutting force and the cutting resistance. Cutting force decreases substantially by increasing feed rate and depth of cut. With increase in feed rate and depth of cut, amount of decrease in cutting force for remaining polymers are stated in descending order: PA 6 (Na), POM C, HD 1000. Salles [10] studied effects of machining on surface quality of Ultra High Molecular Weight Polyethylene (UHMWPE). It is found that as higher the feed rate then higher the surface roughness. Cutting speed doesn't affect much on surface roughness. Pawade [11] studied effects of machining on surface flatness of Nylon and Polypropylene (PP) during precision turning. For lower values of surface flatness, surface quality is considered as better. It is found that, for both polymers, feed rate is an effective parameter in precision turning for both polymers. With increase in feed, cutting speed and depth of cut, there is increase in surface flatness. Larger degree insert clearance angle gives better surface quality than the smaller degree insert clearance angle. Lazarevic [12] found out, during turning on polyamide 6 (PA 6), that as feed rate is less then surface roughness is less. Also at lower level of depth of cut and tool nose radius, surface roughness is less. Whereas the influence of cutting speed is negligible. It is suggested that cutting speed can be set at the highest level to obtain higher material removal rate. Silva [13] studied machinability of polyamide 66 (PA66) with and without glass fiber reinforcing during precision turning. It is found that surface roughness of the reinforced polyamide is insensitive with respect to changes in the feed rate and for the polyamide, surface roughness increases with feed rate. Mehdi [14] found out that, during turning, content of nano calcium carbonate in polyamide 6 decreases the cutting forces, but it doesn't have any effect on surface roughness. As feed rate increases both cutting force and surface roughness increase. Cutting force is maximum for lower cutting speed. Kini [15] studied finish turning of ± 300 filament wound glass fiber reinforced polymers (GFRP) pipes using carbide insert. Surface roughness is inversely proportional to feed rate and cutting speed. For lower tool nose radius, the depth of cut and feed rate, the material removal rate is small. Gupta [16] observed, while turning on GFRP, that factors which have great influence on surface roughness and material removal rate are depth of cut followed by feed rate. Whereas Kumar [17] observed machining on unidirectional GFRP is different from the metals. Plastic deformation, bending rupture and shearing are observed during the machining of these composites. The machinability of composites depends on the flexibility, orientation and toughness of the fibers used in the composite materials. Cutting speed is inversely proportional to surface roughness. Surface roughness increases with increase in feed rate and depth of cut. Hussain [18] studied machinability of glass fiber reinforced polymer (GFRP) materials during turning. It is found that surface roughness increases with increase in feed rate, whereas it decreases with increase in cutting speed and orientation angle. Depth of cut has very little effect on surface roughness. Cutting forces are highly influenced by feed, followed by cutting speed and fiber orientation angle.

While drilling on plastics, surface quality affects by process parameters such as drilling speed, feed rate and drill diameter, etc. Quadrini [19] studied drilling on glass fiber reinforced polyamide. It is found that the dependence of the thrust on the drilling process parameters is significantly affected by the chip formation mechanism. If chip is discontinuous, thrust increases with drilling speed and decreases with feed rate. Krishnaraj [20] studied high speed drilling of carbon fiber reinforced plastic (CFRP) by using carbide tool. It is observed that thrust force increases with increase in feed rate. Whereas thrust force decreases with increase in spindle speed. Circularity decreases with an increase in spindle speed, while it remains almost constant for increase in feeds. Hole size is influenced by feed rate. Ramirez [21] monitored tool wear and surface quality during drilling of CFRP by using cemented carbide tool. It is observed that abrasion is main wear mechanism during drilling of CFRP, wear has a direct impact on the final surface topography of the hole. There is poor surface roughness of the hole due to localization of uncut fibers. Li [22] studied surface quality while drilling

on CFRP composites by using diamond coated carbide tools. Surface roughness is lowered with increase in feed rate. Tool wear is occurred and it affects on hole surface quality. Surface defects in the form of grooves or cavities are generally observed at higher degree plies irrespective of cutting parameters and tool condition.

Machining parameters considered during milling of plastics are : spindle speed, feed rate, helix angle and fiber orientation angle. Jenarathanan [23] observed in his study that end mills with small helix angles develop the greatest machining force, lowest surface roughness and delamination factor. Surface roughness, machining force and delamination factor increases with increase in fiber orientation angle and feed rate, and decreases with increase in cutting speed. It is suggested that lower fiber orientation angle, lower helix angle, moderate spindle speed and lower feed rate are the ideal machining conditions for machining of GFRP composite. Generally, optical polymer components are widely used for bioengineering applications. Grabchenko [24] studied precision cutting (milling) of optical polymer by using diamond tool. Diamond tool can be used in high speed cutting. High speed helps to keep temperature of surface layer under control. High temperature leads to thermal destruction of polymer. It is found that surface roughness is minimum at very high cutting speed. Lower feed rate gives less shear sections, which increases life of optical product.

Now days, unconventional machining methods like laser cutting are being used in machining of plastics. Tamrin [25] tells laser cutting has the advantages over conventional machining process in terms of reduced heat affected zone, improved cut quality, speed of cutting process. Due to non-contact type cutting process, it does not produce any unwanted mechanical stresses. Laser cutting enables precision cutting of very thin materials also. While studying on PMMA, polycarbonate (PC) and polypropylene (PP). It is found that the laser power has dominant effect on heat affected zone (HAZ) as compared to the cutting speed and air pressure. Also low laser power and high cutting speed are required during laser cutting of thermoplastics.

DISCUSSION

Plastic materials have good mechanical properties. Plastic materials have less price and weight. Therefore plastic is replacing metals in many applications. Mostly plastics processing can be done by moulding process. Moulding processes are like injection moulding, blow moulding, compression moulding, transfer moulding, etc. For manufacturing of large quantity plastic products, moulding is preferred. For requirement of small quantities plastic products, moulding process is not preferred, because, cost of making mould, process setting time and wastage of material do not justify cost of product. Hence machining of plastics can be adopted in this case. Machining methods primarily used are like turning, drilling and milling. In the production of plastic products like gears, cams, bearings, bushes, valve seats, these machining methods can be used. Whereas in the production of precision machinery, electronics and optics, their is need of high dimensional accuracy and good surface finish. Where precision machining is preferred. Today, use of non-conventional machining processes like laser cutting are also used for precision cutting.

During turning operation, cutting speed, feed rate and depth of cut show maximum influence on quality measure such as surface roughness. Machinability differs for different types of plastics. For example, feed rate, for PA66, increases surface roughness, whereas it is indifferent to reinforced PA66. Cutting speed affects surface roughness of PMMA, but it is insensitive to PA 6. This different nature of plastics proposes need of investigation on machining on each plastic material separately. During turning on PMMA, diamond tool is used by the researchers, it is observed that when the spindle speed is less then surface flatness is better. During turning on UHMWPE, feed rate is directly proportional to surface roughness. Cutting speed doesn't affect much on surface roughness. Generally, during turning on GFRP, cutting speed is inversely proportional to surface roughness, whereas directly proportional to feed rate. But in case of turning on pipes of composite GFRP, feed rate is inversely proportional surface roughness. During drilling on plastics, surface quality affects by process parameters such as drilling speed, feed rate and drill diameter, etc. During drilling of glass fiber reinforced polyamide, chip formation mechanism affects part quality. If chip is discontinuous, thrust decreases with feed rate and increases with drilling speed. Whereas in case of CFRP, thrust force decreases with increase in spindle speed and increases with increase in feed rate. These results shows that along with drilling parameters, chip formation has the same importance in drilling operation.

During milling on plastics, mainly following machining parameters are considered: spindle speed, feed rate, helix angle and fiber orientation angle. It is observed that small helix angles develop the greatest machining force and lowest surface roughness. During unconventional machining, methods like laser cutting are being used in machining of plastics. It has advantages in operation like reduced heat affected zone, improved cut quality, speed of cutting process. Also it does not produce any unwanted mechanical stresses.

Requirements of dimensional accuracy, good surface finish and flexibility in shape of products are challenge for moulding processes. Moulding processes have few limitations in overcoming these types of challenges. Production of small quantities of plastic components by moulding process does not justify cost of component. Therefore, plastic machining is needed to overcome these types of challenges.

CONCLUSION

Mechanical properties (like toughness, rigidity, abrasion resistance and heat resistance) of some polymers are like metals. So these types of polymers can replace metals. Also price and weight of plastic products are less as compared to metallic products. For achieving high dimensional accuracy and desired surface roughness of plastic components, plastic machining is preferred. Generally,

plastic machining has processes like turning, drilling, milling and unconventional methods like laser cutting, etc. Study of machining on plastics shows, machining nature of all plastics is not same. Hence effects of machining parameters need to be studied for different plastic material separately.

In the field of machining, many investigations are carried out on various metallic materials and metal alloys. Literature on machining of metals and alloys are widely available. Very few investigations are carried out on plastic machining. Hence, literature in this area is comparatively less. Therefore, plastic machining needs to study very widely.

REFERENCES:

- [1] Brydson, "Plastics materials", Butterworth scientific, London, 5th edition, 1989.
- [2] Crawford, "Plastic engineering", Butterworth Heinemann, 3rd edition, 1998.
- [3] Patton, "Plastics technology: Theory, Design, Manufacture", Reston publishing company, Mumbai, 1986.
- [4] ASM international Handbook, "Material selection and design", Volume 20, 1997.
- [5] Mathivanan, Nouby, Vidhya, "Minimization of sink mark defects in injection moulding process –Taguchi approach", "International Journal of Engineering, Science and Technology (2010), Vol. 2, No. 2, pp. 13-22.
- [6] Cheng, Feng, Tan, Wei, "Optimization of injection mould based on fuzzy mouldability evaluation", Journal of materials processing technology (2008), No. 208, pp. 222-228.
- [7] Kobayashi, Hirakawa, "Ultraprecision Machining of Plastics. Part 1. Polymethyl Methacrylate", Polymer-Plastic technology and engineering (1984), Vol. 22, No. 1, pp. 15-25.
- [8] Jagtap, Pawade, "Experimental Investigation on the Influence of Cutting Parameters on Surface Quality obtained in SPDT of PMMA", International Journal of Advanced Design and Manufacturing Technology (2014), Vol. 7, No. 2, pp. 53-58.
- [9] Keresztes, Kalacska, Zsidai, Dobrocsi, "Machinability of engineering polymers", Sustainable Construction and Design (2011), pp. 106-114.
- [10] Salles, Goncalves, "Effects of machining parameters on surface quality of the ultra high molecular weight polyethylene (UHMWPE)", Conamet/SAM-SIMPOSIO Materia (2002).
- [11] Pawade, Jagtap, Balasubramaniam, "Some Investigations on Surface characteristics in Precision Turning of Nylon and Polypropylene", International Journal of electronics, Communication & Soft Computing Science & Engineering (2012), pp. 236-240.
- [12] Lazarevic, Madic, Jankovic, "Surface roughness minimization of polyamide PA-6 turning by Taguchi method", Journal of Production engineering (2012), Vol.15, No.1, pp. 29-32.
- [13] Silva, Davim, Festas, Abrao, "Machinability study on precision turning of PA66 polyamide with and without glass fiber reinforcing", Materials and Design (2009), Vol. 30, pp. 228–234.
- [14] Mehdi, Zinati, Razfar, "Experimental and Modeling Study of the Turning Process of PA 6/Nano Calcium Carbonate Composite", Journal of Composites (2013), Article No. 970954.
- [15] Kini, Chincholkar, "Effect of machining parameters on surface roughness and material removal rate in finish turning of ± 300 glass fiber reinforced polymer pipes", Materials and Design (2009), Vol. 31, pp. 3590-3598.
- [16] Gupta, Kumar, "Multi-objective optimization of cutting parameters in turning using grey relational analysis", International Journal of Industrial Engineering Computations (2013), Vol. 4, pp. 547–558.
- [17] Kumar, Meenu, Satsangi, "Experimental investigation and optimization in turning of UD-GFRP composite material by regression analysis using PCD tool", International Journal of Advanced Engineering Technology (2012), Vol. 3, No. 3, pp. 32-38.
- [18] Hussain, Pandurangadu, Kumar, "Machinability of glass fiber reinforced plastic (GFRP) composite materials", International Journal of Engineering, Science and Technology (2011), Vol. 3, No. 4, pp. 103-118.
- [19] Quadrini, Squeo, Tagliaferri, "Machining of glass fiber reinforced polyamide", Express Polymer Letters (2007), Vol. 1, No. 12, pp. 810-816.
- [20] Krishnaraj, Prabukarthi, Ramanathan, Elanghovan, Kumar, Zitoun, Davim, "Optimization of machining parameters at high speed drilling of carbon fiber reinforced plastic (CFRP) laminates", Composites: Part B (2012), Vol. 43, pp. 1791-1799.
- [21] Ramirez ,Poulachon, Rossi, Saoubi, "Tool wear monitoring and hole surface quality during CFRP drilling", Procedia CIRP Conference on Surface Integrity (2014), Vol. 13, pp. 163-168.
- [22] Li, Soo, Aspinwall, Pearson, Leahy, "Influence of lay-up configuration and feed rate on surface integrity when drilling carbon fibre reinforced plastic (CFRP) composites", Procedia CIRP Conference on Surface Integrity (2014), Vol. 13, pp. 339-404.
- [23] Jenarathanan, Jeyapaul, "Optimisation of machining parameters on milling of GFRP composites by desirability function analysis using Taguchi method", International Journal of Engineering, Science and Technology (2013), Vol. 5, No. 4, pp. 23-36.
- [24] Grabchenko, Verezub, Lavrynenko, Horvath, Mamalis, "Precision cutting of optical polymer components for bioengineering applications", Journal of Materials Processing Technology (2000), Vol. 97, pp. 126-131.
- [25] Tamrin, Nukman, Choudhury, Shirley, "Multiple-objective optimization in precision laser cutting of different thermoplastics", Optics and Lasers in Engineering (2015), Vol. 67, pp. 57-65.

Implementation of Multilevel Inverter with Svpwm Scheme for PV Grid

Mr.N.Dasu, Ms. G.Shirisha, Mr. K.S.Mann, Dr. M.Narendra Kumar

GNIT,Hyderabad

ABSTRACT- This paper presents the implementation of space vector pulse width modulation (SVPWM) scheme for a multi level inverter to generate 3- ϕ wave form from the PV cell and connect it to the grid. Multiphase multilevel inverters are controlled by this method to provide multiphase variable voltage and variable frequency supply. PV cells are the DC voltage sources and they give the variable DC voltage at their terminals. By using space vector pulse width modulation method we control the inverters thereby we generate 3- ϕ wave form with required voltage magnitude and frequency in order to connect it to the grid. This technology very useful to the power producers in small amount in their plants (solar, fuel cell, vehicle to grid system) .we are getting the controlled pulses by the use of algorithm to give multilevel inverters .

KEY WORDS: Multilevel inverters, SVPWM, PV cells,

I.) INTRODUCTION

Recent development in the area of multiphase variable speed drives, initiated predominantly by potential applications in electric ship propulsion, more-electric aircraft, electric and hybrid-electric vehicles, and other high power industries, have led to a equivalent development of pulse width modulation (PWM) schemes for multiphase inverters used in these drives. The most generally used techniques for implementing the pulse width modulation (PWM) strategy for multilevel inverters are sine-triangle PWM (SPWM) and space vector PWM (SVPWM). Each method has its own advantages and disadvantages and is suitable for different occasions. SPWM is simple and easy to implement. This method can be divided into carrier disposition PWM and phase shift carrier PWM

The SVPWM is considered a better technique of PWM implementation as it has some advantage over SPWM in terms of good utilization of dc-bus voltage, reduced switching frequency and small current ripple. SVPWM presents the advantage of its extreme simplicity and its easy and direct hardware implementation in a digital signal processor (DSP). SVPWM can be efficiently executed in a few microseconds, achieving similar results compared with other PWM methods. The topology of a cascade multilevel inverter is shown in Fig. 1. In general, the SVPWM implementation involves the sector identification, determining the duration of each switching space vector voltage, determining the switching space vector and optimum switching sequence selection for the inverter voltage vectors. .

Multilevel converter technology is based on the synthesis of a voltage waveform from several DC voltage levels. As the number of levels increases, the synthesized output voltage gets more steps and produces a waveform which approaches the reference more accurately. The major advantages of using multilevel inverters are: high voltage capability with voltage limited devices; low harmonic distortion; reduced switching losses; increased efficiency

II.) The SVPWM modulator of a single-stage inverter

The PWM waveform for the left bridge arm is obtained by comparing and the triangular carrier with amplitude of 1. Through uni-polar double frequency theory, the PWM waveform for the right bridge arm is obtained by comparing with the 180° phase shift and the triangular carrier.

In Phase A, the reference modulation waveform of the left and right bridge arms, the switching signals of the upper tube in the left and right bridge arms, and the output waveform of the H-bridge are shown in Figure -1. In the figure, the carrier frequency is $f_c=1/T_s=500$ Hz, and the reference modulation waveform frequency is $f=50$ Hz. The modulation method in Figure 4 is DPWM min. The generalized SVPWM modulator is shown

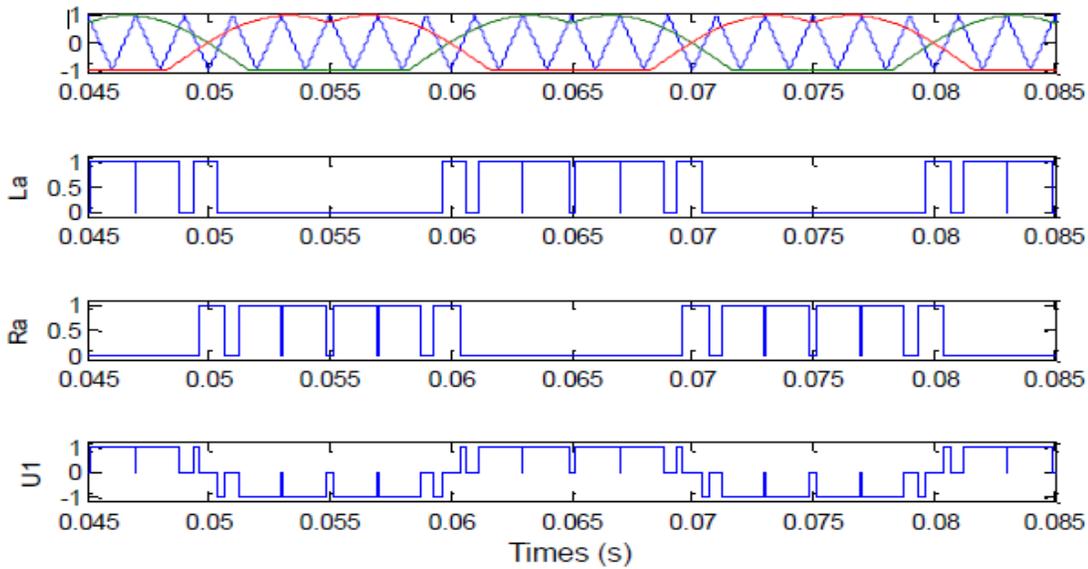


Figure 1. Phase A modulation and switching signals of DPWM min

III.) PWM of a multilevel inverter

The carrier phase shift technique, the carriers of adjacent single-stage inverters deviated by $T_s/2N$, where N is the series of cascaded inverters, and T_s is the carrier cycle. The PWM waveforms of all single-stage inverters are obtained by comparing the carriers and the reference modulation waveforms. The output voltage of each single-stage inverter and the total output voltage of Phase A are shown in bellow, where $N=3$, $U_{DC} = 750$ V, $f_c=500$ Hz, and $f=50$ Hz.

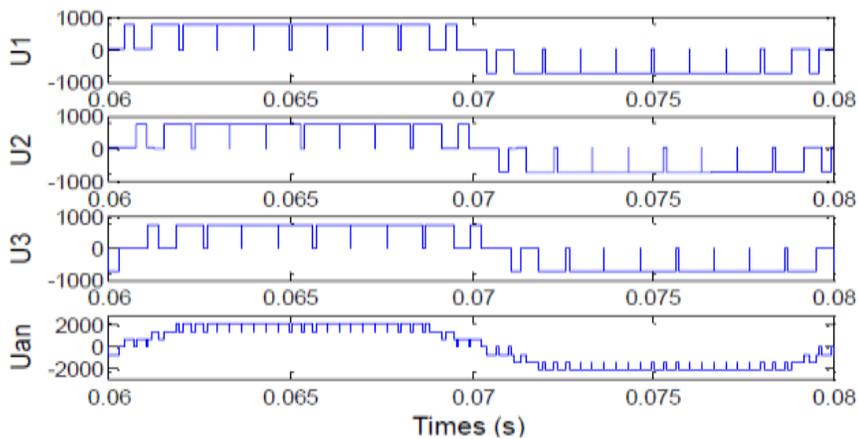


Figure -2 Output waveform for PWM Inverter

IV.) IMPLEMENTATION OF SVPWM TECHNIQUE FOR PV GRID:

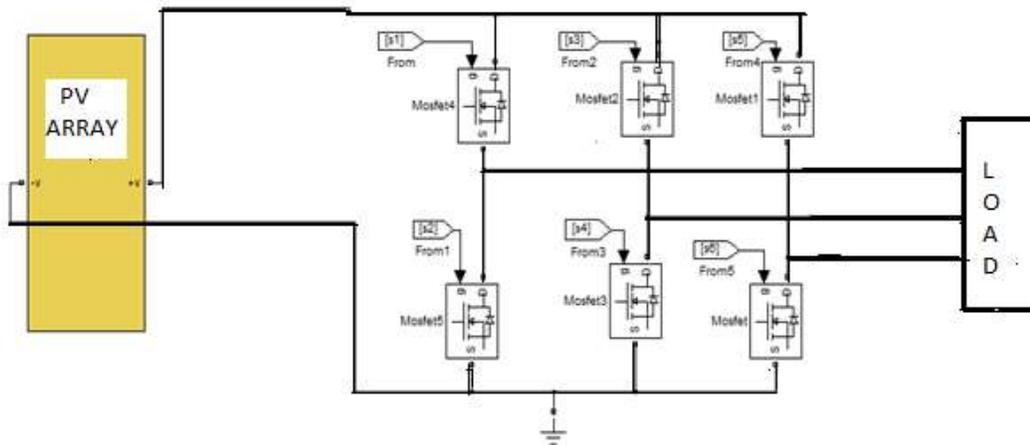


Figure 3 Simulation of PV Grid with SVPWM inverter

we use 6 bidirectional switches, here we connect the A, B, here we will connect C such that the load three phase load when it is represented; let us take this is ABC such that i_A plus i_B plus i_C is equal to 0 that means for a three phase system.

ABC phases or the poles, A can have two positions, either to the top or to the bottom. So, this will represent as if top switch is on, top on, we will mark as one; for the bottom switch is on, we will mark as 0. So, for each pole, there are two states possible either 1 or 0. So, there are three poles. So, you will have 2^3 sets, 8.

Generation of three phase wave is only possible Using these combinations of, alternatively using these 8 states, we have to generate the PWM wave from such that the average variation in the phase will be sinusoidal. now this is our A, B, C. So, let us take the conditions 000, 001, 010, 011, then 100, 101, 110, 111. these two(111,000) are zero states that means all the top switches are on, all the ABC phases will be shorted to the positively and all lower switches are on will be shorted negatively.

(1) let us start with 100. 100 means this A phase will be connected to top switch. B and C will be connected to the bottom switch that means bottom device is on; this is 100.

(2) Now, let us take, next is let us take, 110. So, 110 will be A B C; this is A, this is B, C. So, 110 means both A and B is connected to the top.

(3)Now, let us take three, the three, let us take 010. so A will be connected to 0, bottom. B will be connected to the top, C pole will be connected to the bottom; so this is 010.

(4)let us take the **fourth state**, fourth state we will take as 011. So here, the inverter poles are connected, so from this pole states 011 it clear clearly indicates where we have to connect the inverter poles that is ABC poles. A will be connected to zero that is bottom side, B will be connected to the positive, so top switch is on in the B leg; this is 011, this is our fourth state.

(5) let us take our **fifth state**; fifth is 001. Here, it will be like this; A phase will be connected to 0, B phase also connected to 0, C phase connected to A B C. A phase is connected to 0; by connecting means bottom switch is turned on, B is also connected here, C is connected to top; these are fifth

(6) Let us take our **sixth one**; sixth one is 101. This ABC, see A phase is all A is connected to the top rail and B is connected to the bottom rail that means the bottom switch is on and C is again connected to bottom top here. This is 101, sixth.

the next are the zero states that is 7 and 8. 7 and 8 let us take that is 111, seven is 111 that means all the legs or the pole ABC are shorted to the positive top rail that means ABC

Now, one more is there; that is 000 that will term as the number 8. So here, ABC, here all the three poles ABC is connected to the bottom rails that is bottom switch is on. This is also called a zero state.

we can only have one out of this 8. So, how do you use these states such that the average variation in phase is sinusoidal or the voltage space vector will tip of the voltage space vector, the average voltage space vector will trace a circle

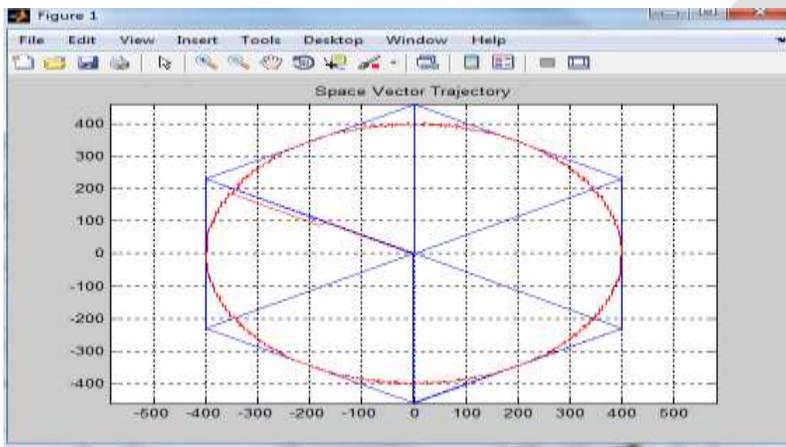


Figure - 4 voltage space vector rotation diagram

The figure-4 shown the voltage space vector rotation diagram, which is implement for PV grid. The inverter control Signals are shown in Figure-5. The figure-6 is shown the 3-phase Multilevel inverter output from the PV grid and Figure-7 is a Space vector voltage for two phase control.

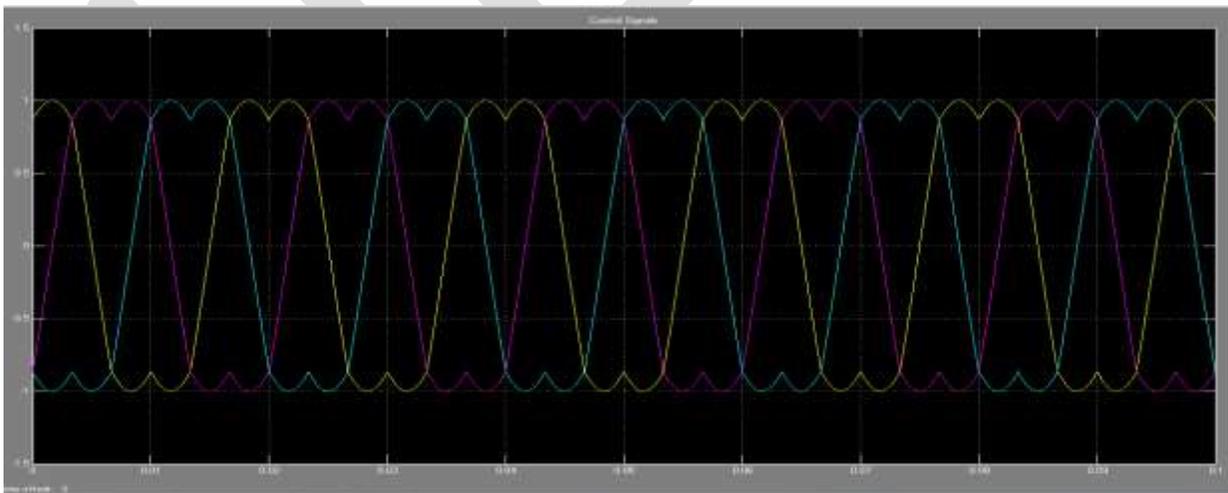


Figure-5 Inverter control signals.

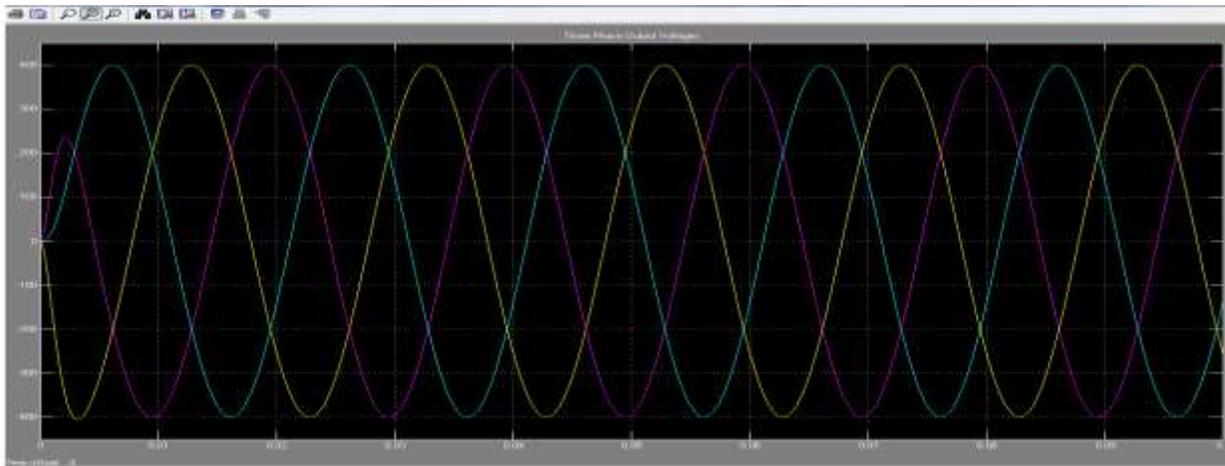


Figure-6 output waveform of the inverter

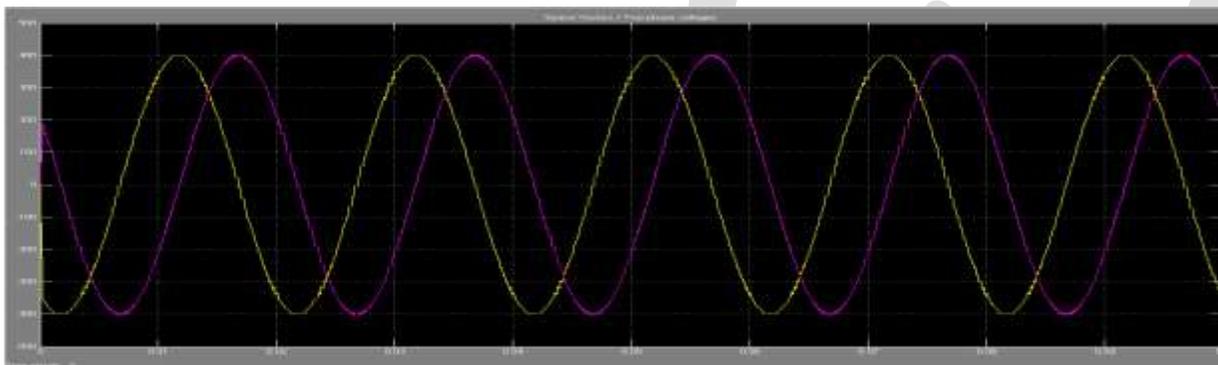


Figure-7 Space Vector two phase voltage

V.) CONCLUSION

This paper proposes a SVPWM based scheme to perform over modulation for a multilevel inverter, and its implementation. The position of the vector is identified using an integer parameter, called a triangle number. The switching sequences are mapped with respect to the triangle number. The on-times calculation is based on on-time calculation for two-level SVPWM. The on-time calculation equations do not change with the triangle. A simple method of calculating on-times in the over modulation range is used, hence, a solution to complex equations and lookup tables are not required. This leads to ease of implementation. There are no significant changes in computation with the increase in level. The proposed implementation is general in nature and can be applied to a variety of modulation schemes. The implementation is shown for a five-level and seven-level cascaded inverter. The experimental results are provided. The proposed method can be easily implemented using a commercially available motion control DSP or micro-controller, which normally supports only two-level modulation.

REFERENCES:

- [1] Xiaodong Yang, Chonglin Wang, Liping Shi and Zhenglong Xia “Generalized Space Vector Pulse Width Modulation Technique for Cascaded Multilevel Inverters”, International Journal of Control and Automation Vol.7, No.1 (2014),
- [2] Nikola Celanovic, “Space Vector Modulation and Control of Multilevel Converters”, Doctoral dissertation of Virginia Polytechnic Institute and State University, (2000).

[3]C.Govindaraju and K. Baskaran, “Performance Improvement of Multiphase Multilevel Inverter Using Hybrid Carrier Based Space Vector Modulation”, International Journal on Electrical Engineering and Informatics – Vol.2, No.2, (2010).

[4] Amit Kumar Gupta And Ashwin M. Khambadkone, “A General Space Vector Pwm Algorithm For Multilevel Inverters, Including Operation In Overmodulation Range” IEEE Transactions On Power Electronics, Vol. 22, No. 2,(2007)

[5] R.Karthikeyan and Dr.S.Chenthur Pandian,” An Efficient Multilevel Inverter System for Reducing THD with Space Vector Modulation”, International Journal of Computer Applications (0975 – 8887) Volume 23– No.2, (2011).

[6] Oscar Lopez Sanchez, “Space Vector Pulse Width Modulation For Multilevel Multiphase Voltage Source Converters” Doctoral Dissertation Of Vigo University, Department Of Electronics Technology, (2009)

IJERGS

Video Surveillance and Content Sharing Using Cloud

Vinay Bhawsar, Swapnil Awekar, Pravin Bagul

Dept. of Computer Engineering

P.E.S. Modern College Of Engg., Pune University, Pune 05.

Abstract - Connect devices with Peer to Peer technology in which the connecting devices may be two PC's/ two Mobiles/ one peer PC and another peer Mobile or vice versa. Connectivity by using CLOUD, we can connect two discrete systems in a network and do a peer to peer networking. Connectivity can only be established after installing the client application on their device and then they may control other system by authenticating the device or see/browse a file which is there on remote device, store images and text taken in the mobile to home PC. Also we can control extended devices which are plugged in remote system. This paper also presents architecture to improve surveillance application security using authenticated device allowing application dynamic composition and increasing the flexibility of the system. Video Surveillance systems have increase their needs of dynamism in order to allow the different users (operators and administrators) to monitor the system/ Webcam the system status and to access live video from different localizations.

Keywords - Android; Cloud; Surveillance; Peer to Peer; Remote Control; Video Streaming;

Introduction -

In today's competitive world, people want everything to happen at their door steps. The information which is stored in the cloud system can be viewed through the device by the registered users anywhere in the world. This makes the users to know their information from wherever they are located and the pictures in the mobile can also be transferred to the system if there is no enough space in the mobile. Also video monitoring from anywhere via authenticated user can be done with Web Camera. Different surveillance methodologies such as notification system and face detection on PC based system are used to ensure security. In this system, it is possible for a person to monitor the security of his or her desired location when they are outside. Now-a-days anybody can communicate with anyone at any time around the globe with the help of mobile phone technology. By keeping the technological facility of mobile phone in mind, a mobile phone based controlling and sharing system has been described in this paper. This paper will give a solution for the security of corporate houses as well as corporate personnel.

Now-a-days anybody can communicate with anyone at any time around the globe with the help of mobile phone technology. By keeping the technological facility of mobile phone in mind, a mobile phone based controlling and sharing system has been described in this paper. This paper will give a solution for the security of corporate houses as well as corporate personnel. Mobile has become a basic need for everyone. A conceptual architecture of Java as a Server Platform, which enables multiple users to use Android Applications on cloud server via network. Since server is stored in cloud which may be affordable to connect many users. Utilization of memory space is more when application is kept in cloud. Therefore, the cost and wastage of memory may be a deterrent factor for many users [4]. So memory management techniques have been added to system which will control the memory usage issues and recycle the memory to improve efficiency. Android/ Desktop Client Application Setup is kept in cloud for users convenience, which deals with accessing another device and share files within these system from anywhere in the world through the mobile device without a centralized server.

In mobile app, we will specify the filename and the system will search the directories for the specified filename, from which the contents can be viewed through the mobile or browse all the contents directly. For this process, Smartphone application should be installed on the mobile and server application has to be developed system and saved on the cloud. The main requirement of the system is that it must be switched ON with internet connection enabled and if mobile is used then it should have GPRS/ Wi-Fi connection. Similar features are provided on Desktop application also. Only PC to Mobile Controlling is not possible but Content can be shared from PC to Mobile. So this paper implements secure sharing between two devices which makes the traverse reliable and efficient for users. This paper also makes a user to know the contents of the file stored in the system from anywhere in the world through any

authorized device. Sometimes there may not be enough memory space in the mobile to save the pictures taken, at this point of time, the person can transfer the pictures to the remote system without a centralized server and carry on taking pictures.

REMAINING CONTENTS -

- In the Day-Night mode, the brightness of the camera will change according to the intensity of surrounding ambiance.
- The feature of Wake-Up LAN can be added as the future scope.
- Panoramic Image system has to implemented in near future.
- Automation System Facility is to be implemented as the unauthorized person if entered in authorized room then the siren will be alarmed and the doors will be automatically get locked.
- GPRS system will be technically advance by using Video Surveillance System.

ACKNOWLEDGMENT -

It is a matter of a privilege for us to submit this Preliminary Project Report on "Video Surveillance System and Content Sharing using Android and Cloud" as a part of the curriculum of University of Pune. With our deep sense of gratitude we thank our internal project guide Prof. Mrs. A. A. Junnarkar, for her constant encouragement and able guidance, without which this report would not have been a success. This report provides us with an opportunity to put into knowledge of the advanced technology. We are highly indebted to Prof. Mrs. S. A. Itkar, the H.O.D of Computer Dept. (Modern College of Engineering, Pune) for her valuable support.

We take this opportunity to express our deep sense of gratitude towards those, who have helped us in various ways. All the members of project worked really hard for developing various sections of report like glossary, appendices, test plan, literature survey, UML diagrams and formatting of report. Last but not the least, we thank our parents who have shown tremendous support and inspired us with their blessings. We would like to express our gratitude with a word of thanks to all of those who have directly or indirectly helped us with this report.

CONCLUSION -

- Using peer to peer technology, frames are retrieved from the system through the mobile and are transferred from the mobile to the system.
- Video monitoring is possible.
- In addition, alert messages can also be implemented in future, where the authenticator gets an alert message whenever a person enters into the frame.
- In future, the videos can be transferred from the mobile to the system, two way communication is possible as well as face to face conversation, viewing the images in the system through the mobile and controlling the games in the system through mobile.

REFERENCES:

1. S.Ahmed, A.Khan, I.Babar, "Monitoring Detection and Security Maintenance using WMS Webcam Mobile Surveillance", IEEE Conference on Emerging Technologies(ICEF), Page(s) 58-61, Year 2007.
2. Peizhao Hu, N. Symons, J. Indulska, M. Portmann, "Share your View: Wireless Multi-Hop Video Streaming using Android Phones", IEEE International Conference on Pervasive Computing and Communications Workshops(PERCOM Workshops), Page(s) 782-787, Year 2009.
3. Eun-Sung Kim, Yu-Seok Lee, Wang-Cheol Song, "Content Sharing Application in Mobile PC Browser Based on JXTA", IEEE Transaction on Mobile Technology", Page(s) 993-996, Year 2011.
4. Roger Pressman, "Software Engineering", 2011.
5. D. Shiny Irene, "Video Surveillance System and Content Sharing Between PC and Mobile using Android", International Journal of Computational Linguistics and Natural Language Processing Vol 1 Issue 5 December 2012.
6. Schildt, "Java complete Reference 8th Edition", McGraw Hills, 2012

General network with four nodes and four activities with triangular fuzzy number as activity times

R. R. Tamhankar

Maharshi Parshuram Engineering College,

Velaneshwr .416004, Maharashtra, India

Email: rtamhankar@gmail.com

M. S. Bapat

Willington College,

Sangli. 416415, Maharashtra, India

Email: msbapt@gmail.com

Abstract— In many projects we have to use human judgment for determining the duration of the activities which may vary from person to person. Hence there is vagueness about the time duration for activities in network planning. Fuzzy sets can handle such vague or imprecise concepts and has application to such network. The vague activity times can be represented by triangular fuzzy numbers. In this paper a general network with fuzzy activity times is considered and conditions for critical path are obtained also we compute total float time of each activity. Several numerical examples are discussed.

Keywords- PERT, CPM, Triangular fuzzy numbers, Fuzzy activity times.

INTRODUCTION

Fuzzy numbers were first introduced by Zadeh in 1965. There after theory of fuzzy numbers was further studied and developed by Dubois and Prade, R.Yager, Mizomoto, J. Buckley and many others. Fuzzy numbers plays an important role in many applications.

The fuzzy numbers are used to represent uncertain and incomplete information in decision making, linguistic controllers, expert systems etc. But the main hurdle in the development of applications is the computational complexity. Particularly arithmetic operations on fuzzy numbers are not an easy task. Hence more attention is needed to simplify arithmetic computation with fuzzy numbers. By restricting fuzzy numbers to triangular fuzzy numbers addition and subtraction becomes simpler but still the operation of multiplication, division and max-min remains a complex processes. Therefore, some approximate methods are needed to simplify these operations.

In this paper we have obtained one such triangular approximation for multiplication which satisfies some criteria for approximation.

PRELIMINARIES

A. Definitions

A fuzzy subset A of a set X is a function $A: X \rightarrow I$, where $I = [0, 1]$. $A(x)$, is called membership of x in A . The set $\{x \in X \mid A(x) \geq \alpha\}$ is called α -level cut or in short α -cut of A and is denoted by A_α . The strict α -level cut of A is the set $A_{\alpha+} = \{x \in X \mid A(x) > \alpha\}$. Support of A is the set $A_{0+} = \{x \in X \mid A(x) > 0\}$.

If $A(x) = 1$ for some $x \in X$ then A is called normal fuzzy set. If each α -cut of A is convex then the fuzzy set A is called convex fuzzy set. Core of fuzzy set A is a set $A_1 = \{x \in X \mid A(x) = 1\}$. we assume $X = \mathbb{R}$. A fuzzy number A is a fuzzy subset of the set of real numbers \mathbb{R} with membership function $A: \mathbb{R} \rightarrow [0, 1]$ such that A is normal, convex, upper semi-continuous with bounded support. If left hand curve and right hand curve are straight lines then the fuzzy number A is called trapezoidal fuzzy number. If the core is singleton set then the trapezoidal fuzzy number is called triangular fuzzy number.

If A is a triangular fuzzy number then it can be represented by $A = (a_1, a_2, a_3)$. The membership function of this fuzzy number is given by,

$$A(x) = \begin{cases} \frac{x-a_1}{a_2-a_1} & \text{when } a_1 < x \leq a_2 \\ \frac{a_3-x}{a_3-a_2} & \text{when } a_2 \leq x < a_3 \\ 0 & \text{otherwise} \end{cases}$$

In this paper we use different type of representation for triangular fuzzy numbers called as ε - δ fuzzy number. The membership function of ε - δ fuzzy number is of the form,

$$r(x) = \begin{cases} \frac{x-(r-\varepsilon)}{\varepsilon} & \text{when } r-\varepsilon < x \leq r \\ \frac{(r+\varepsilon)-x}{\varepsilon} & \text{when } r < x \leq r+\varepsilon \\ 0 & \text{otherwise} \end{cases}$$

We denote the above triangular fuzzy number by $r_{\varepsilon, \delta}$ where ε and δ are left and right spreads of the fuzzy number. To obtain arithmetic computations with fuzzy numbers in simpler way we use this notation.

Note that $A = (a_1, a_2, a_3)$

is equivalent to $A = (a_2)_{a_2-a_1, a_3-a_2}$. Conversely if $A = r_{\varepsilon, \delta}$ then $A = (r-\varepsilon, r, r+\delta)$

B. Arithmetic operations on ε - δ Fuzzy Numbers

1) Addition

Addition of ε - δ fuzzy numbers $r_{\varepsilon_1, \delta_1}$ and $s_{\varepsilon_2, \delta_2}$ is $(r+s)_{\varepsilon_1+\varepsilon_2, \delta_1+\delta_2}$ -fuzzy number defined by $(r_{\varepsilon_1, \delta_1} + s_{\varepsilon_2, \delta_2}) = (r+s)_{\varepsilon_1+\varepsilon_2, \delta_1+\delta_2}$.

2) Negation

Negation of ε - δ fuzzy numbers $r_{\varepsilon, \delta}$ is $-(r_{\varepsilon, \delta}) = (-r)_{\delta, \varepsilon}$.

3) Subtraction

Subtraction of ε - δ fuzzy numbers $r_{\varepsilon_1, \delta_1}$ and $s_{\varepsilon_2, \delta_2}$ is $(r-s)_{\varepsilon_1+\delta_2, \varepsilon_2+\delta_1}$ -fuzzy number defined by $(r_{\varepsilon_1, \delta_1} - s_{\varepsilon_2, \delta_2}) = (r-s)_{\varepsilon_1+\delta_2, \varepsilon_2+\delta_1}$.

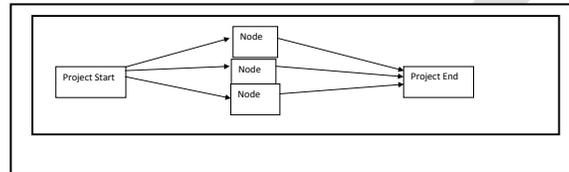
4) Maximum and minimum of fuzzy numbers

We use the max min operations introduced by Dubois-Prade [9]. If $r_{\varepsilon_1, \delta_1}$ and $s_{\varepsilon_2, \delta_2}$ are two fuzzy numbers then

$$\text{Max} (r_{\varepsilon_1, \delta_1}, S_{\varepsilon_2, \delta_2}) = r_{\varepsilon_1, \delta_1} \vee S_{\varepsilon_2, \delta_2} = (r \vee s)_{\varepsilon_1 \wedge \varepsilon_2, \delta_1 \vee \delta_2}$$

$$\text{Min} (r_{\varepsilon_1, \delta_1}, S_{\varepsilon_2, \delta_2}) = r_{\varepsilon_1, \delta_1} \wedge S_{\varepsilon_2, \delta_2} = (r \wedge s)_{\varepsilon_1 \vee \varepsilon_2, \delta_1 \wedge \delta_2}$$

A project network is a graph (Flow chart) depicting the sequence in which a project's terminal elements are to be completed by showing terminal elements and their dependencies. The terminal elements of the project are called nodes. Nodes are connected by arcs or lines. Time required to complete the activity is written on arcs. The project network is always drawn from left to right to reflect its project's chronology.



The most popular form of project network is activity on node the other is activity on arc. PERT are CPM are the main project network techniques to identify critical path of the Network. CPM provides graphical view of the project and predicts the time required to complete the project. Network in which the activity time is fuzzy is called as fuzzy project network.

NOTATIOS USED

A network $G = \langle V ; A \rangle$, being a project activity-on-arc model with n nodes and m activities, is given. V is the set of nodes (events) and A is the set of arcs (activities), $|V| = m$ and $|A| = n$. The network G is a directed, connected and acyclic graph. The set $V = \{1, 2, \dots, n\}$ is labeled in such a way that $i < j$ for each activity $(i, j) \in A$. Weights of the arcs (activity durations) $(i, j) \in A$ are to be denoted by t_{ij} . Two nodes 1 and n are distinguished as the initial and final node, respectively.

Let $i-j$ be the activity in which 'i' is called tail event (node) and 'j' is called the head event (node). Let t_{ij} be the activity duration of an activity $i-j$. The earliest starting time for an activity $i-j$ is the earliest time by which activity can commence and is denoted by $ES = \max(T_E^i + t_{ij}) ; i \neq j$. Earliest finish time is the time by which it can be finished and is denoted by EF

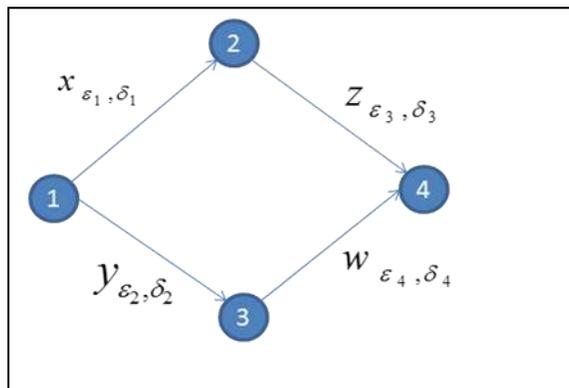
Latest starting time of an activity is the latest time by which an activity can be started without delaying the completion of the project and it is denoted by LS . Latest finish time for an activity is the time by which an activity can be finished and it is given by $LF = \text{Latest finish time} = \min(T_L^j - t_{ij})$ if $i \neq j$.

Total float (slack) at each event is given by

$$TF = LF - EF. \text{ Similarly Free float (FF) is } FF = F_F = F_T - S_j \text{ where } S_j = T_L^j - T_E^j, \text{ and}$$

$$\text{Independent Float is } IF = F_F - S_i, \text{ where } S_i = T_L^i - T_E^i.$$

GENERAL EXAMPLE



Then earliest start time for different nodes is

$$ES_1 = 0_{0,0}, ES_2 = ES_1 + t_{12} = x_{\epsilon_1, \delta_1}, ES_3 = ES_1 + t_{13} = 0_{0,0} + y_{\epsilon_2, \delta_2} = y_{\epsilon_2, \delta_2}$$

$$ES_4 = (ES_2 + t_{24}) \vee (ES_3 + t_{34}) = (x_{\epsilon_1, \delta_1} + z_{\epsilon_3, \delta_3}) \vee (y_{\epsilon_2, \delta_2} + w_{\epsilon_4, \delta_4})$$

$$(x + z)_{\epsilon_1 + \epsilon_3, \delta_1 + \delta_3} \vee (y + w)_{\epsilon_2 + \epsilon_4, \delta_2 + \delta_4}$$

$$= (x + z) \vee (y + w)_{(\epsilon_1 + \epsilon_3) \wedge (\epsilon_2 + \epsilon_4), (\delta_1 + \delta_3) \vee (\delta_2 + \delta_4)}$$

$$\text{Let } (\epsilon_1 + \epsilon_3) \wedge (\epsilon_2 + \epsilon_4) = e \quad (\delta_1 + \delta_3) \vee (\delta_2 + \delta_4) = d \quad ES_4 = (x + z) \vee (y + w)_{e,d}$$

The Latest finish time is given by $LF_4 = ES_4 = (x + z) \vee (y + w)_{e,d}$ $LF_3 = LF_4 - t_{34} = (x + z) \vee (y + w)_{e,d} - w_{\epsilon_4, \delta_4} =$

$$LF_3 = LF_4 - t_{34} = (x + z) \vee (y + w)_{e,d} - w_{\epsilon_4, \delta_4} = ((x + z) \vee (y + w) - w)_{e + \delta_4, d + \delta_4}, LF_2 = LF_4 - t_{24}$$

$$= ((x + z) \vee (y + w))_{e,d} - z_{\epsilon_3, \delta_3}$$

$$= ((x + z) \vee (y + w) - z)_{e + \delta_3, d + \delta_3}$$

$$LF_1 = (LF_2 - t_{12}) \wedge (LF_3 - t_{13})$$

$$[((x + z) \vee (y + w) - z)_{e + \delta_3, d + \delta_3} - x_{\epsilon_1, \delta_1}] \vee [((x + z) \vee (y + w) - w)_{e + \delta_4, d + \delta_4} - y_{\epsilon_2, \delta_2}]$$

$[(x + z) \vee (y + w) - z - x]_{e + \delta_3 + \delta_1, d + \delta_3 + \delta_1} \vee [(x + z) \vee (y + w) - w - y]_{e + \delta_4 + \delta_2, d + \delta_4 + \delta_2}$ If $x + z > y + w$ then 1-2-4 is critical path and if $x + z < y + w$ then 1-

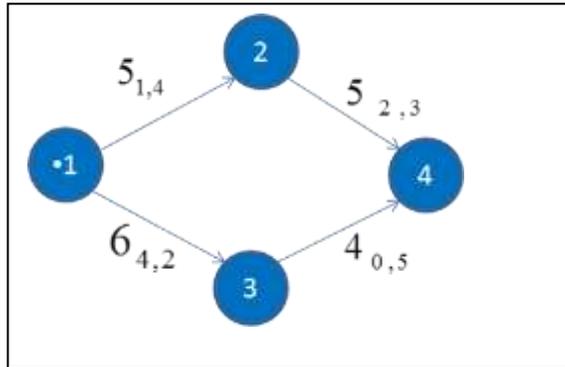
3-4 is critical path. If $x + z = y + w$ then we can determine the critical path using following procedure. We

have $LF_1 = 0_{(e + \delta_3 + \delta_1) \wedge (e + \delta_4 + \delta_2), (d + \delta_3 + \delta_1) \vee (d + \delta_4 + \delta_2)}$, Float on node (3) $TF_3 = LF_3 - ES_3$

$$= [(x+z) \vee (y+w) - w]_{e+\delta_4, d+\varepsilon_4} - y_{\varepsilon_2, \delta_2} = 0_{e+\delta_4+\delta_2, d+\varepsilon_4+\varepsilon_2}$$

Float on node (2) $TF_2 = LF_2 - ES_2 = [(x+z) \vee (y+w) - z]_{e+\delta_3, d+\varepsilon_3} - x_{\varepsilon_1, \delta_1} = 0_{e+\delta_3+\delta_1, d+\varepsilon_3+\varepsilon_1}$ Floats are given in the table 1

A. NUMERICAL EXAMPLE 1.

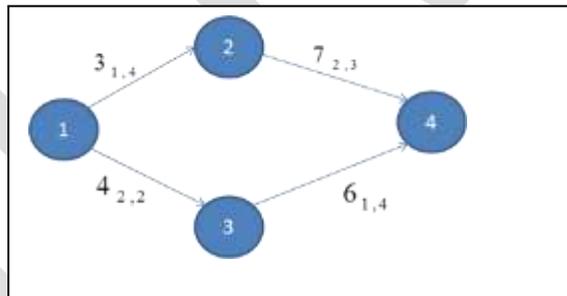


From Fig. 2 float at node (2) is, $TF_2 = LF_2 - ES_2 = 5_{6,9} - 5_{1,4} = 0_{10,10}$.

Float at node (3) is $TF_3 = LF_3 - ES_3 = 6_{8,7} - 6_{4,2} = 0_{10,11}$. The possible paths are 1-2-4 and 1-3-4,

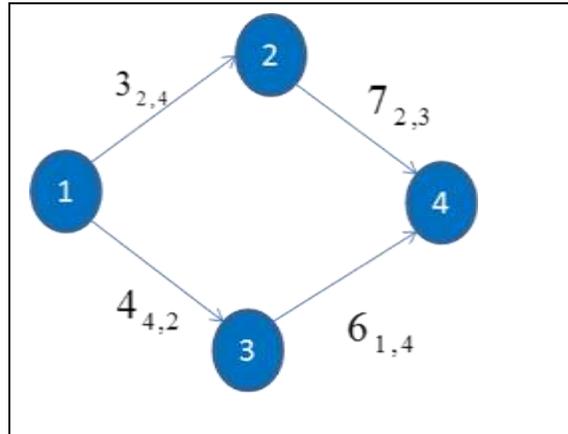
Decision nodes are (2) and (3). The floats have equal core. Therefore we compare their spreads. The left spreads are equal but right spread of (3) is greater. Hence the critical path is 1-3-4.

NUMERICAL EXAMPLE 2



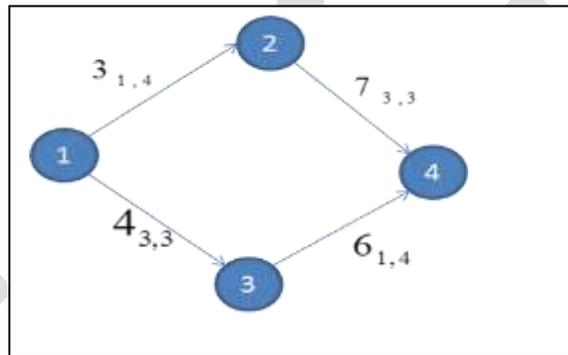
From Fig.(3) Floats at node (2) and (3) are $0_{10,10}$ and $0_{9,10}$. Here right spreads are equal therefore the node which has lesser left spread is critical. The critical path is 1-3-4.

NUMERICAL EXAMPLE 3



From fig.4 floats at nodes (2) and (3) are $0_{11,11}$ $0_{10,12}$ therefore node which has lesser left spread and greater right spread is critical. The critical path is 1-3-4.

NUMERICAL EXAMPLE 4



From fig. 5 floats at node (3) and (2) are $0_{11,11}$ Floats are equal. Therefore both the paths are critical paths and in this case there are multiple critical paths.

CONCLUSION

In this paper triangular fuzzy numbers are renamed as ε - δ fuzzy numbers are used to represent time duration of activities. A general network with four nodes and four activities is discussed. Computation of critical path is discussed with various examples.

Rules for determining nodes on the critical path are given.

NODE	Total Float	Free Float
1	$[(x+z) \vee (y+w) - x - z]_{(e+\delta_3+\delta_1), (d+\varepsilon_3+\varepsilon_1)}$	$0_{e+d+\varepsilon_1+\varepsilon_3+\delta_1+\delta_3, e+d+\varepsilon_1+\varepsilon_3+\delta_1+\delta_3}$

Table 1

2	$[(x+z) \vee (y+w) - y - w]_{(e+\delta_4+\delta_2), (d+\epsilon_4+\epsilon_2)}$	$0_{e+d+\epsilon_2+\epsilon_4+\delta_2+\delta_4, e+d+\epsilon_2+\epsilon_4+\delta_2+\delta_4}$
3	$[(x+z) \vee (y+w) - x - z]_{(e+\delta_1+\delta_3), (d+\epsilon_1+\epsilon_3)}$	$0_{2e+d+\delta_1+\delta_3, e+2d+\epsilon_1+\epsilon_3}$
4	$[(x+z) \vee (y+w) - y - w]_{(e+\delta_4+\delta_2), (d+\epsilon_4+\epsilon_2)}$	$0_{2e+d+\delta_2+\delta_4, e+2d+\epsilon_2+\epsilon_4}$

REFERENCES:

[1] D. Dubois, "The role of fuzzy sets in decision sciences: Old techniques and new directions", Fuzzy Sets and Systems(2011),doi;10.1016/j.fss.2011.06.003.

[2] N. Ravi Shankar, K. Shrinivas Rao and S. Siresha, "A new approach to evaluate characteristics involved in a fuzzy critical path", Advances in Fuzzy Mathematics vol. 6 (2011), pp. 217-226 .

[3] M. S. Bapat, S. N. Yadav, P. N. Kamble, "Triangular Approximation of Fuzzy numbers", International J. of Statistica and Mathematica, vol. 7 (3)2013,63-66.

[4] Lootsma F.A. "Stochastic and Fuzzy PERT", European Journal of Operations Research 1989,43,174-183.

[5] D. Dubois, H. Prade, Fuzzy Sets and Systems: Theory and Applications, Academic Press, Boston, 1980.

[6] M. Hanss, Applied Fuzzy Arithmetic, An Introduction with Engineering Applications, Springer-Verlag Berlin Heidelberg 2005.

[7] Prade H. "Using fuzzy set theory in a scheduling problem: a case study" Fuzzy Sets and Systems, 2 (1979) ,153-165.

[8] G. J. Klir, and T. A. Folger, Fuzzy Sets, Uncertainty, and Information, Prentice-Hall, Englewood Cliffs, NJ, 1988.

[9] D. Dubois , H.Prade, Fuzzy Sets and Systems ,Theory and Applications, Academic Press, New York;1980.

[10] H. J. Zimmerman , Kandel, Fuzzy Sets Theory and its Applications, Kluwer

[11] S. Chanas, J. Kamburowski, The use of fuzzy variables in PERT ,Fuzzy sets and systems,5(1981) 1-19

[12] C.S. Mc Cahon, E.S. Lee, Project network analysis with fuzzy activity times, Computers and Mathematics with applications,15(1988),829-838.

[13] V. Sireesha , N. Ravi Shankar , "A new approach to find total float time and critical path in a fuzzy network ", International Journal of Engineering science and technology ,2 (2010) 995-1006.

[14] L.S. Shrinath, PERT and CPM : Principles and Applications, Affiliated East-West Press Ltd.

[15] B. C. Punmia, Project planning and control with PERT and CPM, Laxmi Publications (P) Ltd

Predictive Analysis of an Efficient Rank Based Fault Tolerance Network on Chip System

Mr. Subodh Kakran¹,
Sharda University, Department of
Computer Science and Engineering-
Networking, Greater Noida, INDIA
Email: subodhkakran@gmail.com

Dr. Ravi Rastogi²
Sharda University, Department of
Computer Science and Engineering
Greater NOIDA, INDIA
Email: ravikumarrastogi@gmail.com

Abstract— Network on Chip (NoC) are the integrated communication systems on a single chip. This paper presents a study of an Efficient Rank Based algorithm to reduce the area and the power consumption of the overall Network on Chip. The main motive of the research is to reduce the computation complexity for the fault tolerance. The Conventional algorithms are based on the table based routing that consumes much more time in calculating the routing path. We developed the rank based approach which will not depend on any tabular calculations for their routing. The paper presents the various considerations faced during the designing of a cost effective and scalable Rank Based Network on Chip architecture

Keywords— FTDR, Wormhole Routing, Network-on-Chip, HARQ, Rank Based Routing

INTRODUCTION

There were not any promising techniques and methods to integrate a large number of cores on a single chip before the existence of Network on chip and nor any technique could achieve the performance in comparison to the Network-on-Chip (NoC) However, as the CMOS technology scales down to the nanometer domain, smaller feature size, lower voltages and higher frequencies increase the number of occurrence of intermittent and transient faults, besides manufacturing defects and wear out effects which lead to permanent faults are also inevitable. The inherent structure redundancy of NoC provides the potential to design a fault-tolerant routing algorithm to enhance the reliability.

Recently, buffer less routing, also called detection routing, has been widely used for reducing the hardware overhead and power consumption of NoC. In detection routing, an incoming packet is always routed to a free output port even though it is far away from the destination. Because of its non-minimal routing characteristic, detection routing can be easily modified to achieve fault-tolerance.

This paper proposes a reconfigurable fault-tolerant detection routing algorithm (FTDR) based on a kind of reinforcement learning Q-learning. It is a table-based routing algorithm, which reason figures the routing table through Q-learning and uses 2-hop fault information to make efficient routing decision to avoid faults. In order to reduce the routing table size, we also propose a hierarchical Q-learning based detection routing algorithm (FTDR-H) with area reduction up to 27% for a switch in an 8*8 mesh compared to the original FTDR.

MOTIVATION

The main motive of the research is to reduce the computation complexity for the fault tolerance. The Conventional algorithms are based on the table based routing that consumes much more time in calculating the routing path. We developed the rank based approach which will not depend on any tabular calculations for their routing.

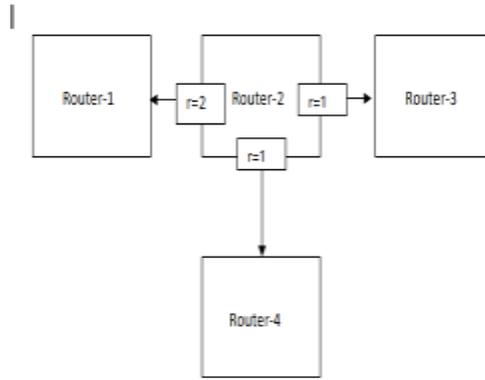


Fig.1. Rank Based Routing

The fig. given below depicts the rank based routing architecture for the network on chip system. Data will be transferred through the highest Rank port and the Rank will be decided according to neighbouring conditions.

NOC ARCHITECTURE

The fig. given below describes the routing scheme in a network on chip architecture. The NoC architecture is based on Nostrum NoC, which is a 2D mesh topology. Each process element (PE) is attached to a switch (S), as shown in Fig. 1.

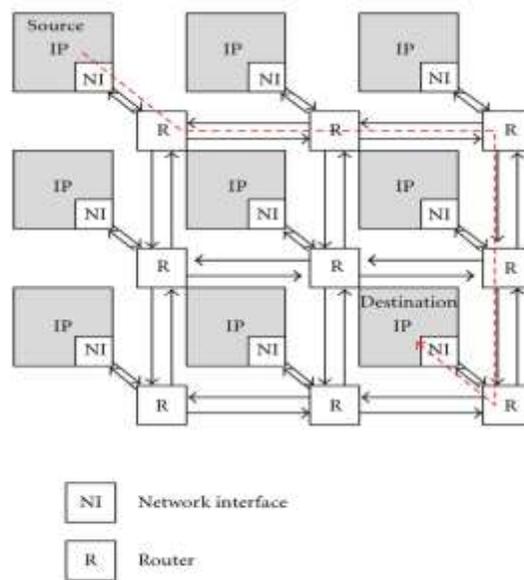


Fig. Routing in NoC

The difference from the ordinary 2D mesh is that the boundary output is connected to the input of the same switch, which can be used as a packet buffer. All incoming packets are prioritized based on its hop counts which record the number of hops the packet has been routed. The switch makes routing decision for each arriving packet from the highest priority to the lowest. If a desired output port has already been occupied by a higher priority packet, a free port with the smallest stress value, which is the traffic load of neighbour switches in last 4 cycles, will be chosen, which means the packet has to be detected.

BUFFERLESS ROUTING

Buffers in on-chip networks consume significant energy, occupy chip area, and increase design complexity. In this paper, we make a case for a new approach to designing on-chip interconnection networks that eliminates the need for buffers for routing or flow control.

We describe new algorithms for routing without using buffers in router input/output ports. We analyze the advantages and disadvantages of bufferless routing and discuss how router latency can be reduced by taking advantage of the fact that input/output buffers do not exist. Our evaluations show that routing without buffers significantly reduces the energy consumption of the on-chip cache/processor-to-cache network, while providing similar performance to that of existing buffered routing algorithms at low network utilization (i.e., on most real applications). We conclude that bufferless routing can be an attractive and energy-efficient design option for on-chip cache/processor-to-cache networks where network utilization is low.

HOW RANK WILL CHANGE AUTOMATICALLY IN RANK BASED NOC

As the address of the receiver router is sent with every data packet it knows the exact destination of departure. Also, on the hardware, all the blocks get implemented at the place and routing phase every router knows about their neighbor router. The rank based algorithm assumes its data path in no fault condition. While traveling through the different routers the data packet assign ranks to the ports of the router according the shortest path to the destination. As any fault detected in any port of the router immediately switches their path to the lower rank of the path and this process goes on.

The approach do not use any table based routing neither any complex algorithm it only uses the dynamic rank assignments at the run time. The algorithm satisfies both less area and less computation time.

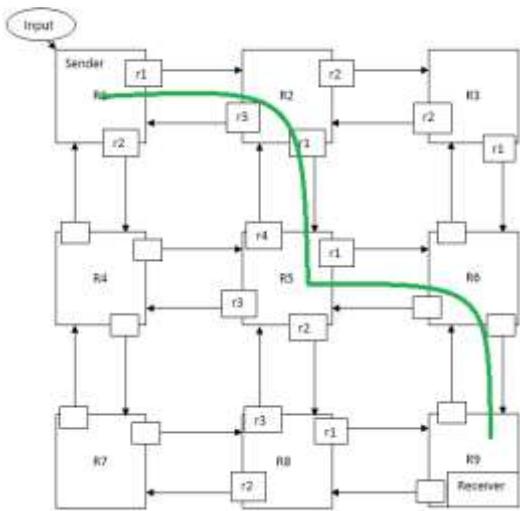


Fig. A Fault Less Rank Based NoC Architecture

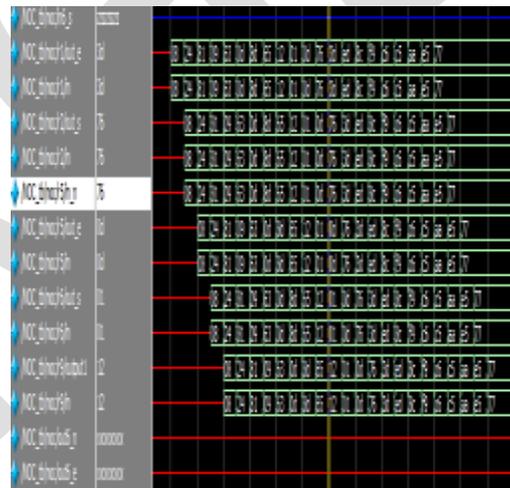


Fig. Output of a Rank Based NoC architecture

The figures above depicts the basic architecture of a rank based NoC router and its output waveforms.

Congestion Condition1- When data input on R5 from both the sides viz. SOUTH and NORTH

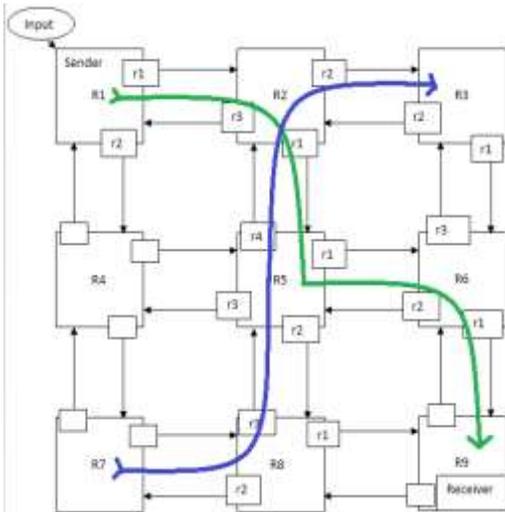


Fig. Congestion condition -1

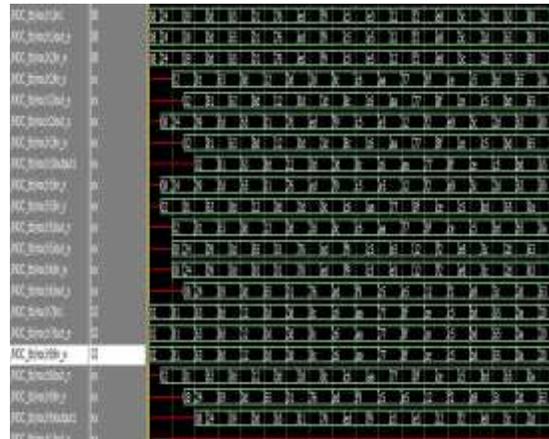


Fig. Output waveforms for Congestion condition-1

METHODOLOGY

This project implemented using HDL (Hardware Description Language), it can work live once it get fabricated to become a real chip. The algorithm is written in Verilog HDL to write the behaviour of NoC router. The rank based routing assigns the dynamic rank to each router sending the packets and when each packet is assigned with the shortest path. Thus, with the shortest path and rank assigned to each packet decreases the latency and improves the efficiency of the NoC architecture.

CONCLUSION

In this paper, we have discussed some of the issues generated in an Efficient Rank Based fault-tolerant solution for a bufferless NoC to protect it from faults and achieved low latency. The Rank based NoC is a complete new approach in the routing of a network to transmit the packets on the basis of their ranks to avoid the congestion in the network. This study will surely clear some doubts of the research associates working in Networking and will provide them an extra edge for the further research in the NoC architectures. The proposed NoC architecture will be the cost effective and more scalable when brought on hardware as it will transmit the packets according to their rank and need of the information at the receiver end.

REFERENCES:

- [1] W. J. Dally and B. Towles, "Route packets, not wires: On-chip interconnection networks," in *Proc. 38th Annu. Design Autom. Conf.*, 2001, pp. 684–689.
- [2] C. Constantinescu, "Trends and challenges in VLSI circuit reliability," *IEEE Micro*, vol. 23, no. 4, pp. 14–19, Jul.–Aug. 2003.
- [3] Y. H. Kang, T.-J. Kwon, and J. Draper, "Fault-tolerant flow control in on-chip networks," in *Proc. 4th ACM/IEEE Int. Netw.-Chip Symp.*, May 2010, pp. 79–86.
- [4] S. Murali, T. Theocharides, N. Vijaykrishnan, M. J. Irwin, L. Benini, and G. De Micheli, "Analysis of error recovery schemes for networks on chips," *IEEE Design Test Comput.*, vol. 22, no. 5, pp. 434–442, Sep.–Oct. 2005.
- [5] S. Pasricha, Y. Zou, D. Connors, and H. J. Siegel, "OE+IOE: A novel turn model based fault tolerant routing scheme for networks-on-chip," in *Proc. 8th IEEE/ACM/IFIP Int. Conf. Hardw./Softw. Codesign Syst. Synth.*, Oct. 2010, pp. 85–94.
- [6] A. Patooghy and S. G. Miremadi, "XYX: A power & performance efficient fault-tolerant routing algorithm for network on chip," in *Proc. 17th Euromicro Int. Parallel, Distrib. Netw.-Based Process. Conf.*, 2009, pp. 245–251.
- [7] Z. Lu, M. Zhong, and A. Jantsch, "Evaluation of on-chip networks using deflection routing," in *Proc. 16th ACM Great Lakes Symp. VLSI*, 2006, pp. 363–368.
- [8] M. Hayenga, N. E. Jerger, and M. Lipasti, "SCARAB: A single cycle adaptive routing and bufferless network," in *Proc. 42nd Annu. IEEE/ACM Int. Symp. Microarch.*, Dec. 2009, pp. 244–254.
- [9] C. Feng, Z. Lu, A. Jantsch, J. Li, and M. Zhang, "A reconfigurable fault tolerant deflection routing algorithm based on reinforcement learning for network-on-chip," in *Proc. 3rd Int. Workshop Netw. Chip Arch.*, 2010, pp. 11–16.
- [10] H. Zimmer and A. Jantsch, "A fault model notation and error-control scheme for switch-to-switch buses in a network-on-chip," in *Proc. 1st IEEE/ACM/IFIP Int. Conf. Hardw./Softw. Codesign Syst. Synth.*, Oct. 2003, pp. 188–193.

- [11] C. Feng, Z. Lu, A. Jantsch, J. Li, and M. Zhang, "FoN: Fault-on neighbor aware routing algorithm for networks-on-chip," in *Proc. 23rd IEEE Int. SoC Conf.*, Sep. 2010, pp. 441–446.
- [12] A. Kohler, G. Schley, and M. Radetzki, "Fault tolerant network on chip switching with graceful performance degradation," *IEEE Trans. Comput.-Aided Design Integr. Circuits Syst.*, vol. 29, no. 6, pp. 883–896, Jun. 2010

IJERGS

DNA Barcoding and Its Applications

Sukhamrit Kaur

sukhamrit91@gmail.com

Contact No.: 09872455529

Abstract— DNA barcoding is a system for fast and accurate species identification that makes ecological system more accessible by using short DNA sequence instead of whole genome and is used for eukaryotes. The short DNA sequence is generated from standard region of genome known as marker. This marker is different for various species like CO1 cytochrome c oxidase 1 for animals, matK for plants and Internal Transcribed Spacer (ITS) for fungus. DNA barcoding has many applications in various fields like preserving natural resources, protecting endangered species, controlling agriculture pests, identifying disease vectors, monitoring water quality, authentication of natural health products and identification of medicinal plants.

Keywords— CO1, DNA, DNA Barcode, IBOL, Identification, ITS, Marker.

INTRODUCTION

Biological effects of global climate lead to importance of identification of organisms to preserve species because of increasing habitat destruction. About 5 to 50 million plants and animals are living on earth, out of which less than 2 million have been identified. Extinction of animals and plants is increasing yearly means thousand of them are lost each year and most of them are not identified yet.[1] This destruction and endangerment of ecosystem has lead to an improved system for identifying species. In recent years new ecological approach called DNA barcoding has been proposed to identify species and ecology research. [2][3] DNA barcoding, a system for fast and accurate species identification which will make ecological system more accessible. [4] It first came to attention of the scientific community in 2003 when science research group of Paul Hebert at university of Guelph published a paper titled “biological identifications through DNA bar codes”. DNA barcoding is a new tool for identification of species and for taxonomic research. It is not a new concept as Carl Woese used rRNA and molecular markers like rDNA and mtDNA to discover archea i.e. prokaryotes and then for drawing evolutionary tree. But DNA barcoding uses short DNA sequence instead of whole genome and it is used for eukaryotes. The short DNA sequence is taken from standard region of genome to generate DNA barcode. DNA barcode is short DNA sequence made of four nucleotide bases A (Adenine), T (Thymine), C (Cytosine) and G (Guanine). Each base is represented by a unique color in DNA barcode as shown in figure 1. Even non experts can identify species from small, damaged or industrially processed material. [5]

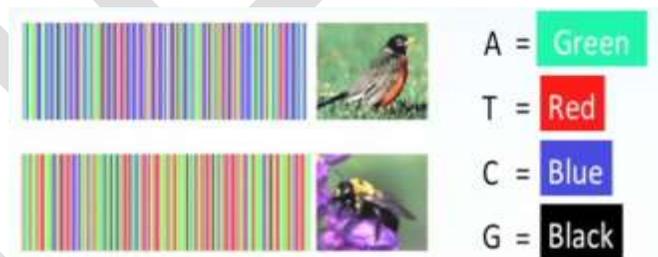


Figure 1. DNA Barcode [11]

The standard region used to generate DNA barcode is known as marker. This marker is different in different species like COI or cox1 (Cytochrome C Oxidase 1) present in mitochondrial gene in animals proposed by Paul Hebert and recognized by International Barcode of Life (IBOL) as official marker for animals, because of its small intra specific and large inter specific differences in animals. It is not suitable for other group of organisms because it is uniform in them. So, ITS (Internal Transcribed Spacer) for fungus and two genes rbcL and matK, from chloroplast genome are recognized as barcode markers for plants by IBOL. [8][9]

The sequence data generated from standardized region is used for identification of organism and to construct a phylogenetic tree. In this tree related individuals are clustered together and can provide large amount of information about specie. [7][10]

APPLICATIONS

1) Controlling Agricultural Pest

DNA barcoding can help in identifying pests in any stage of life making easier to control them saving farmers from cost of billion dollars from pest damage. The global tephritid barcoding initiative contributes to management of fruit flies by providing tools to identify and stop fruit flies at border.

2) Identifying Disease Vectors

DNA barcoding allows non ecologists to identify the vector species that can cause serious infectious diseases to animals and humans, to understand these diseases and cure them. A global mosquito barcoding initiative in building a reference barcode library that can help public health officials to control these diseases causing vector species more effectively and with very less use of insecticides.

3) Sustaining Natural Resources

Using DNA barcoding, natural resource managers can monitor illegal trade of products made of natural resources like hardwood trees. Fishbol is reference barcode library for hardwood trees to improve management and conservation of natural resources.

4) Protecting Endangered Species

Primate Population is reduced in Africa by 90% because of bush meat hunting. DNA barcoding can be used by law enforcement to bush meat in local markets which is obtained from bush meat.

5) Monitoring Water Quality

Drinking water is a process resource for living being. By studying organism living in lakes, rivers and streams, their health can be measured or determined. DNA barcoding is used to create a library of these species that can be difficult to identify. Barcoding can be used by environmental agencies to improve determination of quality and to create better policies which can ensure safe supply of drinking water.

6) Routine Authentication of Natural Health Products

Authenticity of natural health products is an important legal, economic, health and conservation issue. Natural health products are often considered as safe because of their natural origin.

7) Identifying of plant leaves even if flowers or fruit are not available

8) Identification of medical plants [13]

PROCEDURE OF DNA BARCODING

The process of DNA barcoding involves two basic steps: First step is to build a barcode library of identified species and second is matching the barcode sequence of the unknown sample with the barcode library (known as sequence alignment) for its identification. The first step requires ecologic expertise in selecting one or several individuals per species as reference samples in the barcode library. Tissue samples can be collected from live specie in field or from specimen in museum for generating. These specimens go through lab processes that are tissue sampling and DNA processing and sequencing to generate DNA barcode in form of chromatogram. Chromatogram is visual representation of DNA sequence produced by sequencer. This barcode can be stored in database for future use or can be used as query sequence to be compared with sequence already present in database. [6]

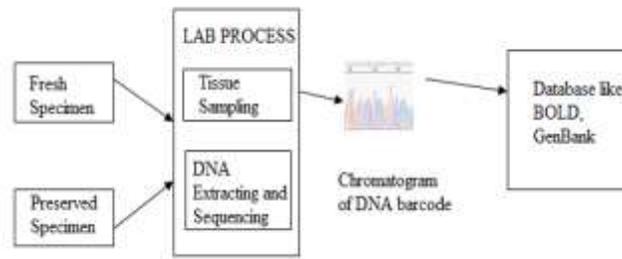


Figure 2. DNA Barcoding Procedure

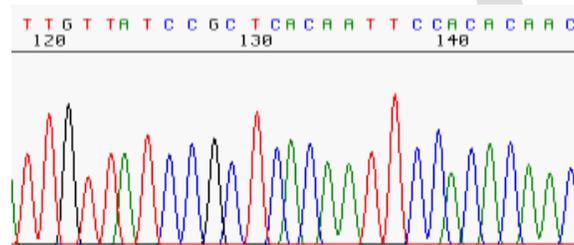


Figure 3. Chromatogram of DNA barcode generated by sequencer [12]

CONCLUSION

DNA barcoding is a system for fast and accurate species identification which will make ecological system more accessible. It has many applications in various fields like controlling agricultural pests, sustaining natural resources, protecting endangered species, monitoring water quality, preserving natural resources, protecting endangered species and identification of medicinal plants.

REFERENCES:

- [1] P.D.N. Hebert, A. Cywinska, S.L. Ball and J.R. deWaaed (2003), Biological identifications through DNA Barcodes, pp 313-321.
- [2] Z.T. Nagy, T. Backeljau, M.D. Meyer and K. Jordaens (2013), DNA barcoding: A practical tool for fundamental and applied biodiversity research, 5(24)
- [3] John Waugh (2007), DNA barcoding in animal species: progress, potential and pitfalls, 29, pp 188-197.
- [4] Paul Hebert and T.R. Gregory (2005), The promise of DNA Barcoding for taxonomy, 54(5), pp 825-859.
- [5] (2010). Identifying species with DNA barcoding. Available: www.barcodeoflife.org
- [6] W.J. Kress, D.L. Erickson, "Introduction", in DNA barcodes methods and protocols, Washington, DC, USA, 2012, pp 3-10.
- [7] Meetu Maheshwari, "Sequence alignment", in Introduction to bioinformatics, 1st ed., New Delhi, 2008, pp 164-196.
- [8] K. Sasikumar and C. Anuradha (2012). Dna barcoding as a tool for algal species identification and diversity studies, 7, pp 75-76.
- [9] C. Ebach and C. Holdrege (2005), Dna barcoding is no substitute for taxonomy, 434, pp 697.
- [10] M.C.Ebach and C.Holdrege (2005). More taxonomy, not DNA barcoding, 55(10), pp 822-823.
- [11] J. Hanken. (2003, Feb.). Trends in ecology and evolution. 18(2).
- [12] Available at: <http://seqcore.brcf.med.umich.edu/>
- [13] Available at: www.dnabarcodes.org

Modeling and Simulation of a Microgrid with Multiple Energy Resources.

Mr. Siddharth Endrakanti, Mr. K.S.Mann, Dr. M.Narendra Kumar
Gurunanak Institute of Technology- Electrical and Electronics Engineering Department,
Ibrahimpattanam- 501506.
e.sid@outlook.com

Abstract— this paper presents the modeling and simulation of a Microgrid with three power sources and along with a battery as a storage system. The renewable sources are solar photovoltaic, fuel cell and wind turbine. The objective of this paper is to describe useful model of integration of non renewable sources and how the Microgrid performs accordingly along with a comparison in between output of Microgrid and the output with power quality improved. The modeling of the full system including all the stages is performed using MATLAB and SIMULINK software package. The Microgrid, for general analysis is connected to a load and is analyzed. The Microgrid operated appropriately where the settling time is considered as $2e-6$.

Keywords: Batteries, Fuel cells, Microgrid, Photovoltaic cells, inverter, wind power, three phase measurement, load and Simulink.

I. INTRODUCTION

A Microgrid is a model of a power system that integrates the renewable energy sources along with a storage, for optimal generation and distribution of power for a confined area. When a general scenario is considered, the transmission losses are of about 30% of the energy generated, hence representing the drawback of a largely interconnected power system. The general power system in effect, of course can fulfill a large power demand but when it comes to the case of generation or transmission or distribution failures, the solution becomes a much complicated one. But, when a Microgrid power system is taken into account, there are no transmission losses besides renewable energy and ecofriendly power.

This paper outlines the simulation model of a Microgrid where the input is solar for photovoltaic cell, H_2 +Air for fuel cell and wind for windmill integrated together for an output of 3 phase AC power.

II. MICROGRID

As Microgrid is defined as an effective integration of renewable energy sources for optimal and ecofriendly power generation, the models of renewable sources are discussed. The power is integrated dynamically so as to maintain the output power constant. The harmonics are eliminated using the active filter. The circuit is as shown in figure 1.

A circuit breaker is used to trip automatically when wind provides the sufficient amount of power. It also helps in protecting the over current sensitive renewable energy sources. The load is considered as a 3 phase grounded one.

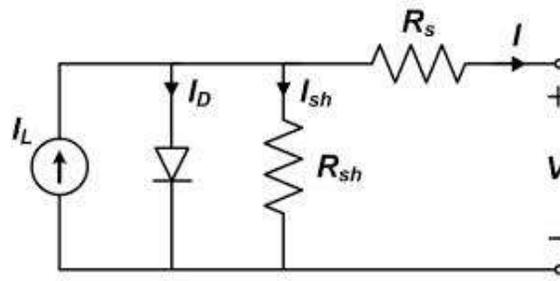


fig2: pv model

$$I = I_{ph} - I_s \cdot \left(e^{\frac{V + I \cdot R_s}{N \cdot V_t}} - 1 \right) - I_{s2} \cdot \left(e^{\frac{V + I \cdot R_s}{N2 \cdot V_t}} - 1 \right) - \frac{V + I \cdot R_s}{R_p}$$

The above shown as in figure 2 is the standard cell equation and PV cells are integrated depending on the power requirement as shown below.

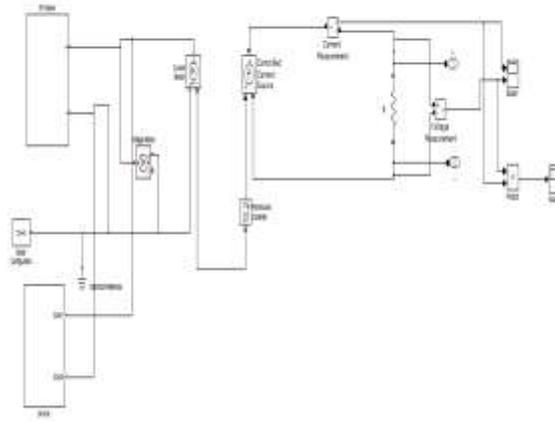


Fig 3: Pv panel

The model is designed using voltage and current sensors which are integrated with Simulink converter to obtain the required solar power output as shown in the figure 3.

The output of the simulation is as in figure 4 and 5.

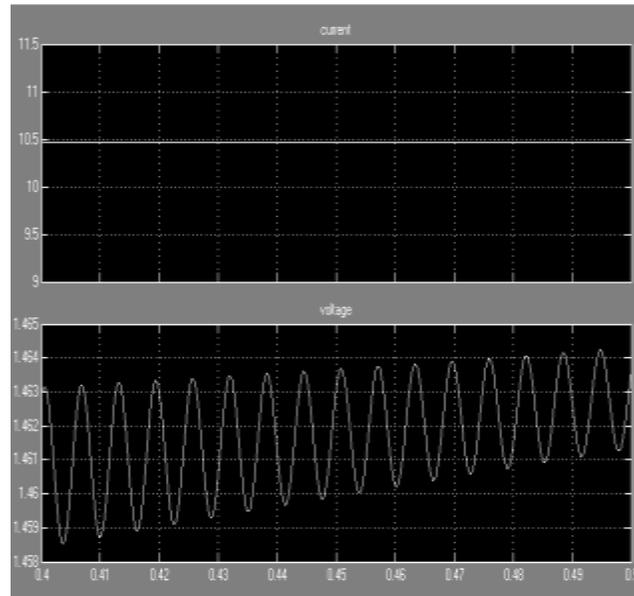


Fig4: voltage and current of pv panel model

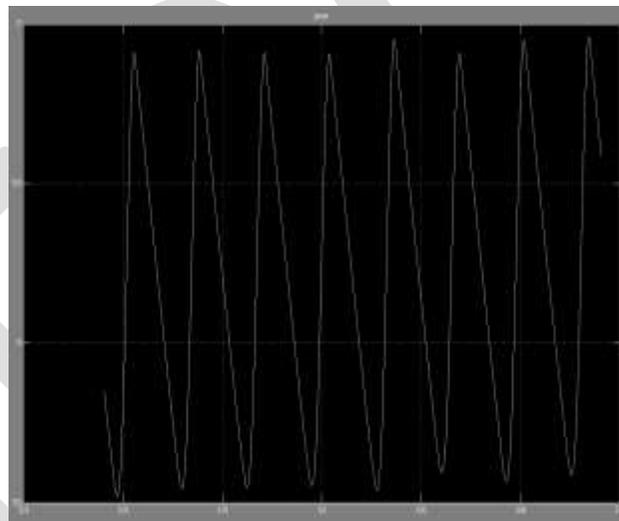


Fig5: power of pv panel

MODELING OF FUEL CELLS

Initially a fuel cell stack is considered which is provided with a flow rate selector which functions in the feedback of the desired output. The flow rate selector pumps in the required amount of air accordingly where the input is given through flow rate regulator which regulates the amount of air to be pumped on a feedback.

As the output is not in the required range, a voltage booster or DC/DC converter of 100vdc is used for the required output which is as in figure 6.

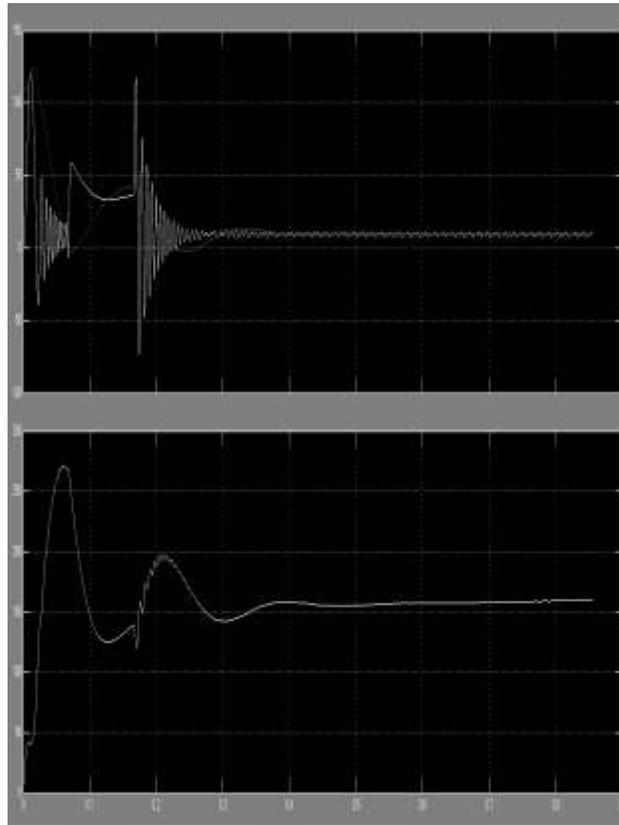


Fig10: output of PMSG wind model.

MODELING OF INVERTER

The main component of inverter is PWM IGBT, which receives a gate pulse from pi controller. The output of the three sources is integrated and is supplied to the inverter. An LC filter is used to reduce the harmonic content. For the desired voltage output, the output of inverter is fed back to gate pulses through a voltage regulator, which sets out the pulses accordingly.

The simulink model of an inverter is as shown in figure 11.

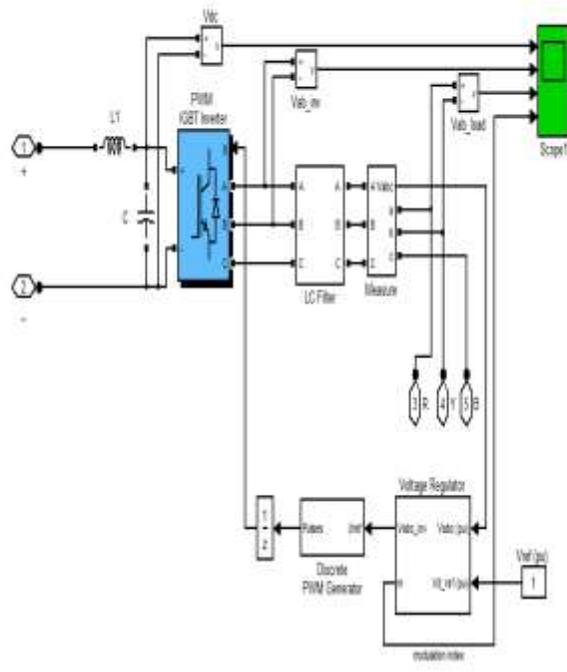


Fig 11: Inverter simulink model

The output of the inverter is as shown in the figure 12 which is three phase output.

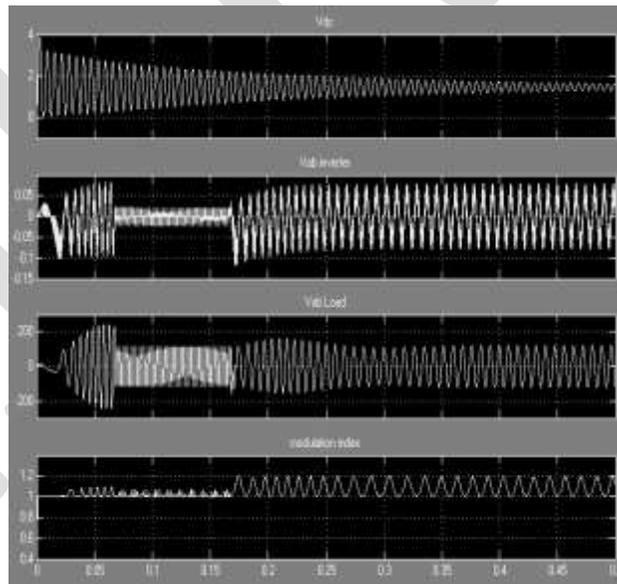


Fig12: output of inverter model

IV. FINAL SIMULATION RESULT

The output of the inverter is integrated with the output of the wind via a circuit breaker, which protects as well as trips when wind turbine provides the sufficient power. The output if the simulation result is as shown in the figure 13, 14, 15 and 16, a three phase sinusoidal output.

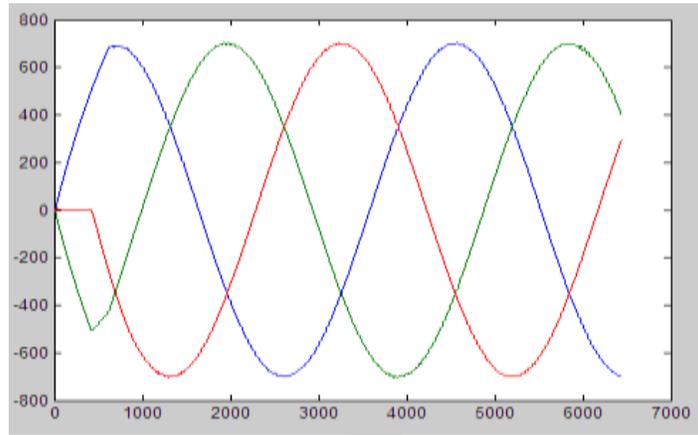


Fig13: final output voltage of microgrid model.

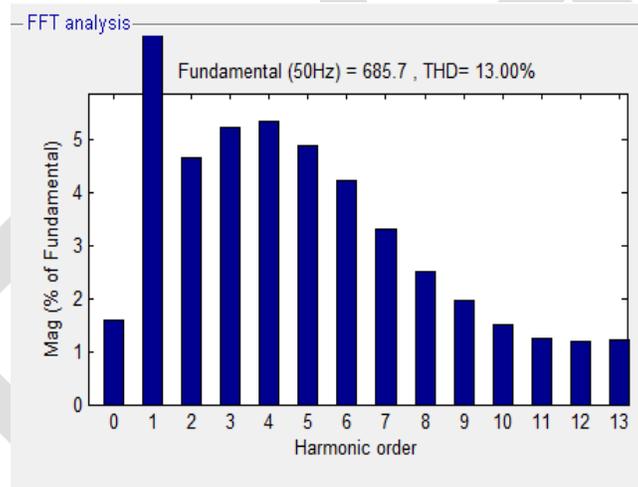


Fig14: Final FFT analysis of voltage.

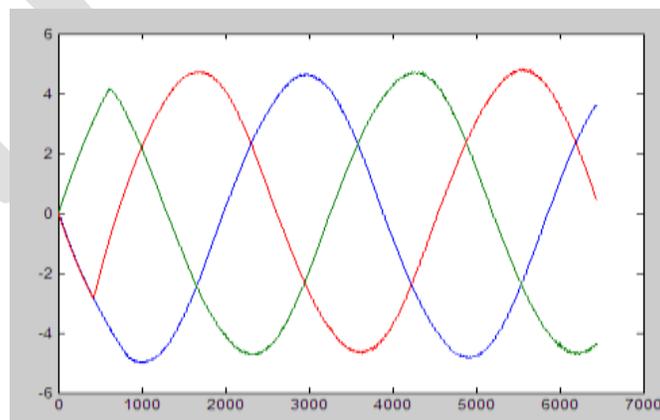


Fig15: Load current

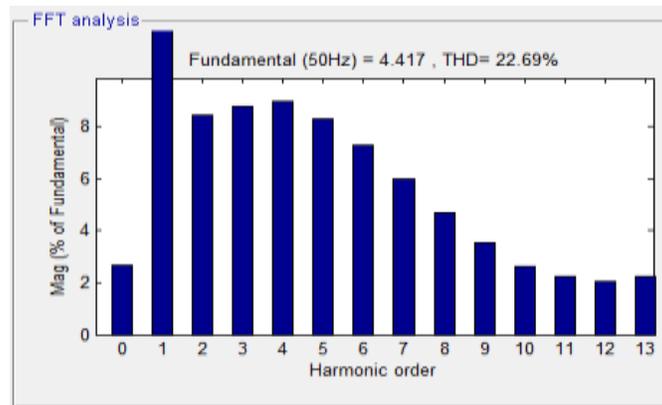


Fig16: FFT analysis of Load current

V. CONCLUSION

The paper has presented useful models of single and three phase micro sources and battery bank of a Microgrid. The simulation results are based as in matlab and simulink software environment. The energy resources parameters were obtained using the datasheet and operating curves as per the requirements that are to be used as part of the Microgrid. The final integrated output is connected to a resistive load so as to analyze the harmonic content. The load is considered as resistive but it can be connected to a grid. The inverter used for PV cells and fuel cells is efficient because of a feedback loop. This model helps to physically construct a Microgrid that can supply power for far off places where natural sources are of only available resources.

REFERENCES:

- A. Kahrobaeian and Y.A.-R.I. Mohamed, "Interactive Distributed Generation Interface for Flexible Micro-Grid Operation in Smart Distribution Systems," *IEEE Trans. on Sustainable Energy*, vol. 3, pp. 295 - 305, Apr. 2012.
- M. H. Nehrir, C. Wang, K. Strunz, H. Aki, R. Ramakumar, J. Bing, Z. Miao, and Z. Salameh, " A Review of Hybrid Renewable/Alternative Energy Systems for Electric Power Generation: Configurations, Control, and Applications," *IEEE Trans. on Sustainable Energy*, vol. 2, pp. 392 - 403, Oct. 2011.
- B. Belvedere, M. Bianchi, A. Borghetti, C. A. Nucci, M. Paolone and A. Peretto, " A Microcontroller-Based Power Management System for Standalone Microgrids With Hybrid Power Supply," *IEEE Trans. On Sustainable Energy*, vol. 3, pp. 422 - 431, Jul. 2012.
- J. Lee, B. Han and N. Choi, " DC micro-grid operational analysis with detailed simulation model for distributed generation," in *Proc. 2010 IEEE Energy Conversion Congress and Exposition*, pp. 3153 - 3160.
- M. G. Villalva, J. R. Gazoli, and E. Ruppert Filho, "Comprehensive Approach to Modeling and Simulation of Photovoltaic Arrays." *IEEE Trans.on Power Eletronics*, vol. 24, pp. 1198 – 1208, May 2009.

M. M. Casaro and D. C. Martins, "Modelo de arranjo fotovoltaico destinado a análises em eletrônica de potência via simulação," *Revista Eletrônica de Potência*, vol. 13, n. 3, pp. 141 – 146

IJERGS

PERFORMANCE OF FSO LINKS USING VARIOUS MODULATION TECHNIQUES AND CLOUD EFFECT

Prof JABEENA A , SRAJAN SAXENA

VIT UNIVERSITY VELLORE (T.N) , srajansaxena26694@gmail.com, 8056469941

ABSTRACT - Free space optical technology uses light wave travelling in free space to wirelessly transmit data for telecommunication. FSO is used in such places where physical optical wire usage is not possible or it is too costly. In this study the performance of the differentially coherent detected signal based FSO communication system is investigated considering the effect of cloud caused Inter Symbol Interference (ISI). To mitigate the effect of fading, the differential coherent detection technique is employed. BER performance is analysed in both absence and the presence of ISI. BER performance is also analysed with BPSK-SIM, DPSK, DPSK-SIM, M-ary PPM and PolSK modulation schemes. Graphs taken with the help of MATLAB/OPTISIM at different carrier wavelength is analysed.

KEYWORDS - Free Space Optical (FSO) , Inter Symbol Interference (ISI) , Differential Phase Shift Keying (DPSK), BER Performance, Optisim , Carrier Wavelength

INTRODUCTION

The recent surge in the research of free-space-optics (FSO) are due to its advantages over radio frequency (RF) communication, viz. much larger capacity, license free bandwidth, lower power consumption, more compact transceiver architecture, excellent security, low cost and better protection against interference[1] . FSO systems are widely used in inter-satellite and deep space communications. Un fettered bandwidth and very high speed of FSO makes it an apt technology for delivering broadband wireless services for certain applications like metropolitan area network (MAN), local area network (LAN), optical fiber backup , last mile access network and high definition television (HDTV) broadcasting services. However, as FSO links undergo random change in the refractive index due to the variations in air, temperature and pressure, a temporal and spatial variation in light intensity (called scintillation) similar to the fading effect on wireless communication occurs [2]. It can be shirked through spatial diversity, aperture averaging, modulation techniques and error control coding.

An important factor on the selection of modulation technique for FSO systems is the receiver sensitivity as there is always a trade -off between the receiver sensitivity and complexity. Though amplitude shift keying (ASK) is the simplest and widely reported, it does not offer immunity to the turbulence induced

Fading [3]. Differential phase shift keying (DPSK) with coherent phase -diversity system offers the best sensitivity in optical fiber systems. However, there is an additional power penalty caused by the frequency offset because of delayed and not-delayed bits not being in phase[4]. Furthermore, there is a further power penalty due to the phase noise of the semiconductor lasers sources[5]. The inter symbol interference (ISI) due to multipath propagation is considered because of cloud.

The deterministic and random factors, which are involved to decide the overall performance of FSO communication systems are scattering, absorption, propagation distance, turbulence, weather conditions, pressure, temperature variations, wind speed, laser wavelength, pointing error effects and data rate etc [6]. The obvious solution to lessen the impairments on the performance of FSO systems and also cover large distances is to employ relay assisted and/or multi hop transmission techniques primarily three major statistical models to describe the atmospheric turbulence channel, viz. the log-normal distributed channel model, K-distributed channel model and the gamma-gamma distributed channel model .

CIRCUIT DIAGRAM

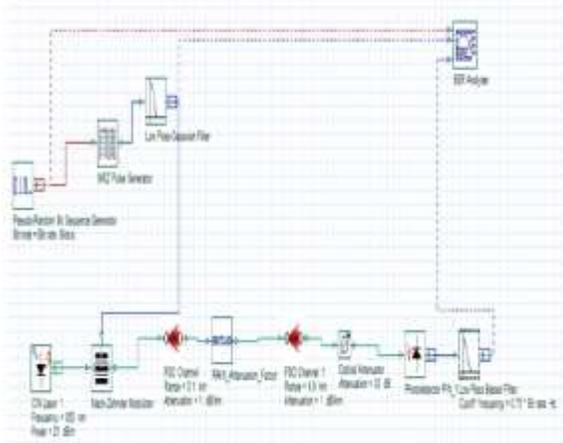


FIG 1 FSO-NRZ Stimulation with cloud effect

TRANSFER FUNCTION OF CLOUD

Clouds cause temporal widening and attenuation of optical pulse power as a part of optical communication channel. In all practical cases, part of the optical channel passes through the earth's atmosphere that contains clouds[7]. One important distortion effect imposed by the atmosphere is the signal temporal broadening. This produces inter symbol interference which limits maximum transmission bandwidth. Using transmission with a wider temporal frequency bandwidth will cause significant degradation in received signal quality because of the narrow information bandwidth permitted by clouds. Usually, in open optical communication severe bandwidth limitation occurs particularly when clouds are present. In order to improve performance, adaptive methods may be used according to atmospheric conditions. A theoretical model is presented [8]. It is followed by calculations of the electro-optical properties of the clouds. This includes solving the Mie equations of scattering and absorption coefficients and the scattering phase function for the polydispersion case. All calculations were carried out at three different wavelengths in the visible and near infrared (IR) spectral range, i.e. 0.532 μm, 0.8 μm and 1.3 μm wavelengths. These wavelengths are those under consideration for optical satellite communication. Longer wavelengths in the IR atmospheric windows exhibit very high absorption. Mid-IR wavelengths exhibit much more scattering than shorter ones because of the size distribution of cloud particulates. Mathematical models were developed for temporal impulse response at the three wavelengths listed above for the visible and near IR.

Table 1: Double Gamma function Constants: cloud thickness=250 m

Gamma function constant	Wavelengths		
	0.532μm	0.8μm	1.3μm
k ₁	12.4	5.2	2
k ₂	1.1×10 ⁷	0.83×10 ⁷	0.71×10 ⁷
k ₃	0.66	0.41	0.3
k ₄	2.4×10 ⁶	1.9×10 ⁶	1.8×10 ⁶

DIFFERENTIAL COHERENT

Differential coherent detection offers the simplest way of achieving carrier synchronization with phase-shift keying (PSK), and, thus, represents an attractive solution for systems where error in signal is caused by the channel itself. However, differentially coherent detection is based on the premise that there is no inter-symbol interference (ISI) in the received signal [9]. When a frequency selective multipath channel introduces ISI, differentially coherent detection must be combined with equalization. In fact, when carrier phase noise effects are not severe, coherent detection performs better than non-coherent detection. In non-coherent detection, a receiver computes decision variables based on a measurement of signal energy. In differentially coherent detection, a receiver computes

decision variables based on a measurement of differential phase between the symbol of interest and one or more reference symbol(s). In differential phase-shift keying (DPSK), the phase reference is provided by the previous symbol.

BIT ERROR PERFORMANCE ANALYSIS

Bit error rate of the received signal is determined after propagation through cloud. It is observed from the transfer function of cloud that high attenuation of transmitted signal occurs while it passes through cloudy environment. Therefore there is higher probability of error due to inter symbol interference which is occurred by pulse broadening in cloud. The inherent non-linear frequency response of cumulus cloud causing successive symbols to blur together. The presence of ISI in the system introduces errors in the decision device at the receiver output [10].

RESULTS

The possibility that the endwise output SNR falls less than a specified threshold is known as outage probability. Threshold is a smallest value of the SNR above which the quality of service is acceptable. The outage probability over slow fading channel is expressed as:

$$P_{out} = P(SNR(h) \leq SNR_{th})$$

where SNR this the threshold SNR value below which the signal strength of the receiver is less than acceptable limits. For a various modulation techniques BPSK-SIM, DPSK, DPSK-SIM, M-ary PPM and PoLSK, it can be estimated as follows

$$P_{out, BPSK-SIM} = P\left(h \leq \sqrt{\frac{2\sigma_n^2 SNR_{th}}{\gamma^2}}\right) = F_h\left(\sqrt{\frac{2\sigma_n^2 SNR_{th}}{\gamma^2}}\right)$$

$$P_{out, DPSK} = P\left(h \leq \frac{P_T SNR_{th}}{\eta A T}\right) = F_h\left(\frac{P_T SNR_{th}}{\eta A T}\right)$$

$$P_{out, DPSK-SIM} = P\left(h \leq \sqrt{\frac{2\sigma_n^2 SNR_{th}}{\gamma^2 A^2}}\right) = F_h\left(\sqrt{\frac{2\sigma_n^2 SNR_{th}}{\gamma^2 A^2}}\right)$$

$$P_{out, MPPM} = P\left(h \leq \frac{SNR_{th} P_R}{P_T} \left(\frac{\lambda L}{\eta A}\right)^2\right) = F_h\left(\frac{SNR_{th} P_R}{P_T} \left(\frac{\lambda L}{\eta A}\right)^2\right)$$

$$P_{out, PoLSK} = P\left(h \leq \frac{\sigma_n^2 SNR_{th}}{\gamma^2 P_{LO}}\right) = F_h\left(\frac{\sigma_n^2 SNR_{th}}{\gamma^2 P_{LO}}\right)$$

GRAPHS FOR VARIOUS MODULATIONS

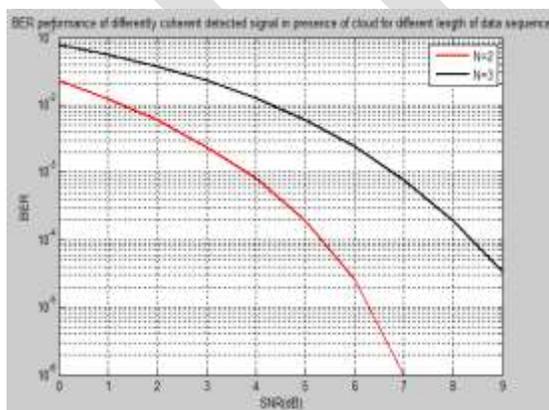


FIG 2 BER performance of differently coherent detected signal in presence of cloud for different length of data sequence (Data sequence length is 2N, where N=2, 3)

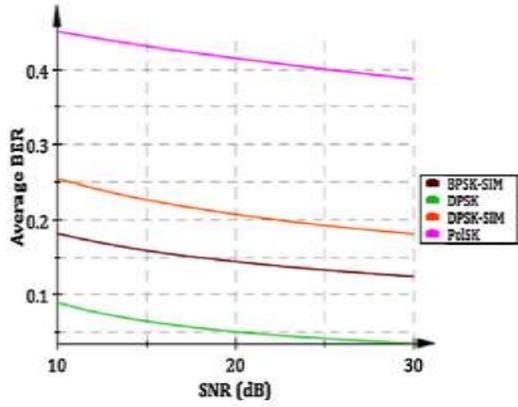


FIG 3 BER against SNR for various modulation schemes with $\alpha=4$, $\beta=1$.

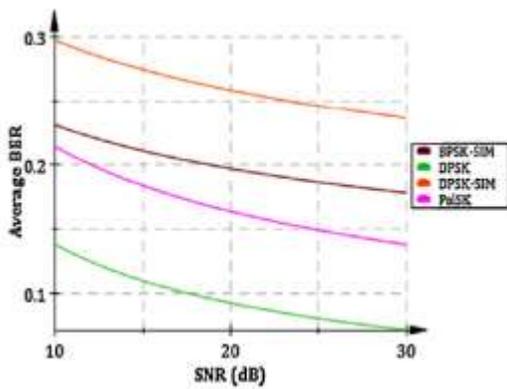


FIG 4 BER against SNR for various modulation schemes with $\alpha=1$, $\beta=1$.

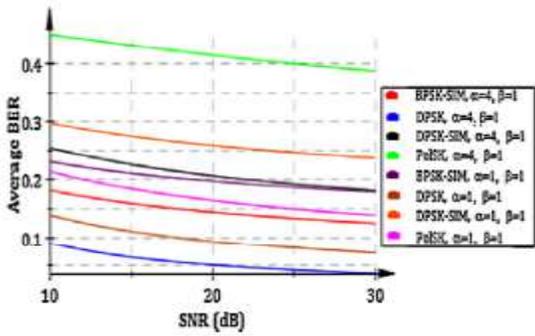


FIG 5 BER against SNR for various modulation schemes with $\alpha=4$, $\beta=1$ and $\alpha=1$, $\beta=1$

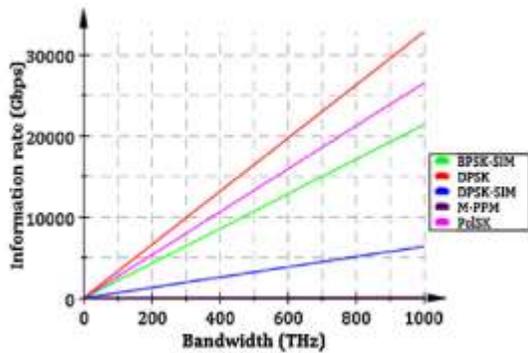


FIG 6 Information rate versus bandwidth with $\alpha = 4, \beta = 1$.

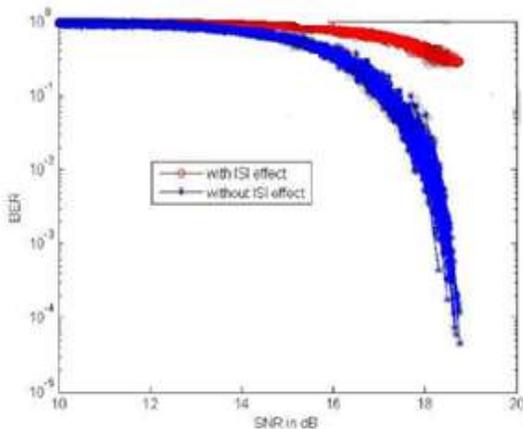


FIG 7 BER performance of received signal with and without the effect of ISI caused by cloud. Cloud thickness=250m

CONCLUSIONS

We studied different modulation formats using FSO. Novel closed-form expressions for the average BER, channel capacity and outage probability of the various modulation techniques such as, BPSK-SIM, DPSK, DPSK-SIM, M-ary PPM and PolSK were derived. The channel capacity, BER and outage performance of the FSO system using various modulation formats were analyzed and compared. It is also shown that PolSK offers the best outage probability performance and high channel capacity is achieved by the DPSK modulation formats. It is evident from analysis that there is signal power and signal quality both degrades a lot for cloud effect. As a result of pulse broadening in cloudy media ISI effect is severe in received signal so that high SNR (nearly 7.8 dB) is needed to achieve a BER at the scale of 10^{-8} . However with the increase of received data sequence length and combination of adaptive algorithm with differentially coherent detected signal better BER performance can be achieved than conventional OOK detection.

REFERENCES:

- [1] E. Bayaki, R. Schober, R.K. Mallik, Performance analysis of MIMO free-space optical systems in γ - γ fading, IEEE Trans. Commun. 57 (11) (2009) 3415–3424
- [2] I.B. Djordjevic, H.G. Batshon, LDPC-coded OFDM for heterogeneous access optical networks, IEEE Photon. J. 2 (2010) 611–619

- [3] T.T. Nguyen, L. Lampe, Coded multi pulse pulse-position modulation for free-space optical communications, IEEE Trans. Commun. 58 (2010) 1036–1041
- [4] W.O. Popoola, Z. Ghassemlooy, H. Haas, E. Leitgeb, V. Ahmadi, Error performance of terrestrial free space optical links with subcarrier time diversity, IET Commun. 6 (5)(2012) 499–506
- [5] Carlson A. B.(1986) Communications System, third edition, McGraw Hill, London, UK .Marshalek, R. G. and Koepf, G.A. (1988), “Optical technology for space communication system”Opt. Eng .,pp 27, 663
- [6] Z. Wang, W. Zhong, S. Fu, C. Lin, Performance comparison of different modulation formats over free space optical (FSO) turbulence links with space diversity reception technique, IEEE Photon. J. 1 (6) (2009) 227–285.
- [7] X. Tang, Experimental demonstration of polarization shift keying in the free space optical turbulence channel, in: In Communications in China Workshops (ICCC), 20121st IEEE International Conference on, IEEE, 2012, pp. 31–36.
- [8] Srabanty Ahmed Shaon, Sazzad Ferdous Analysis of BER Performance Differentially Coherent Detected Signal Considering Cloud Effect in FSO Link. International Journal of Scientific & Engineering Research, Volume 4, Issue 7, July-2013 ISSN 2229-5518
- [9] K.Prabu, D. Sriram Kumar , T. Srinivas Performance analysis of FSO links under strong atmospheric turbulence conditions using various modulation scheme.
- [10] Carlson A. B.(1986) Communications System, third edition, McGraw Hill, London, UK .Marshalek, R. G. and Koepf, G.A. (1988), “Optical technology for space communication system”Opt. Eng .,pp 27, 663

FINEGRAINED CHANNEL ACCESS IN WIRELESS LAN

Vani Reddy Attapuram

Department of computer science

University of Bridgeport

vattapur@my.bridgeport.edu

[4752001404](tel:4752001404)

Tarik Eltaeib

Proff : Department of computer science

University of Bridgeport

teltaeib@my.bridgeport.edu

ABSTRACT: A local area network (LAN) is a network of computer that connects computers within a finite area. Developing the physical-layer (PHY) rate of information in present remote neighborhood (WLANs), the media access control (MAC) reliably undermines information output ability. It reflects a key bit of present MAC custom, circles channel as solitary asset as soon as possible. The report says, Wireless LAN with a high information rate, the network that separate as particular sub channels for which the width is for all intents and purposes indistinguishable of the PHY information proportion and common edge extent. Different locations can later battle aimed at and use sub networks in the meantime as indicated by their advancement requests, hence developing general capacity. We present FICA, a system which simplifies accordingly to MAC utilizing two works. In any case, it proposes an interchange PHY structural building in light of orthogonal repeat division multiplexing (OFDM) that holds Orthogonality among sub channels while depending singularly with the co-ordination systems in existing Wireless LAN, TV and sensing transporter. On the other hand, FICA utilizes a zone talk about organization that practices physical-layer Application to Guide/Clear to Show (RTS/CTS) hailing then rehash space back off to gainfully arrange sub channel control. We acknowledged FICA, which includes MAC and PHY layers, utilizing a thing radio stage, and examinations shows probability of FICA course of action. In addition, our preoccupation outcomes display FICA can inform the volume of WLANs since a limited part to 600% seem contrastingly in connection to existing 802.11.

KEYWORDS: Fine grained channel access, OFDM, cross layer, MAC, PHY, MRCS/MCTS, CP.

1. INTRODUCTION

Present day innovations are consistently increasing the physical layer (PHY) information rates in remote neighborhood (WLANs). Consider the case, the most recent confirmed 802.11n standard [1] has helped information rates to higher speeds (up to 600Mbps). The limit development is accomplished principally with more extensive channel transfer speeds and progressed PHY methods like MIMO (Multiple-Input Multiple-Output). The information throughput effectiveness — the proportion of the system output and the PHY information rate — debases quickly as PHY information rate increments because of the outline of the present 802.11 MAC convention

have not with standee. Consider the case, if we are given most IP parcels which will have the maximal transmit unit (MTU) which estimates it about 1500 bytes, the effectiveness degree in the 802.11n system which are around 300Mbps which is just 20%. The information rate maintains a output of just 60Mbps. The necessary explanation behind the wastefulness is that current MAC allots whole channel to a single station as a unique asset. The allotment procedure gets to be more when the width of the channel increases or the PHY information rate rises. Regardless of the fact that whenever a sender had a little measure of information which has to be sent, despite everything it should battle for the whole channel. The dispute determination time will consequently increase to the channel time utilized for information. The increase can't without much of a stretch be diminished because of imperatives of present physical and hardware laws. Subsequently, the more the PHY information rate, they bring down the output productivity gets to be. An approach which enhances the Media Access Control proficiency used to expand the helpful channel time to the information transmissions there by sending bigger casings. For sure, 802.11n permits outline total which is sending numerous edges in only one controversy time. On the other hand PHY information rate builds, collected edge size which needs to increment too: accomplishing a productivity of 80% in a 300Mbps system would oblige edges to be as huge as 23KB [2]. A superior approach to enhance WLAN effectiveness is to adequately decrease the width of the channel and make more than one channels, where width of the channel may be similar with the PHY information rate and average edge quantity. Large number of station fight for and utilize these small channels at the same time as indicated by their movement requests, consequently amortizing MAC coordination and expanding general efficiency. This is called as strategy fine grained channel access to higher information rate Wireless LANs. In any case, to separation of wide band channel into a number of sub channels by not losing the helpful channel transmission capacity. The regular procedure is that to distribute both the edge of two contiguous sub channels as "watchman band" so the valuable transmission which legitimately dispersed to abstain from meddling with one another. The watchman group indicates critical overhead, however, particularly if the quantity of sub channels is expansive. Case in point, 802.11a uses a bandwidth of 1.875MHz [1] at both edges of each channel. On the off chance that a 40MHz channel is partitioned into four sub channels of 10MHz, the increase should sum to 75% of the aggregate transmission capacity. Watchman band width can't be effortlessly decreased because of force cover necessities and the trouble of channel plans, free of size of a sub channel. Orthogonal recurrence partition multiplexing is a reasonable PHY sheet innovation which take out the gatekeeper groups, if the size of recurrence and sub channels are deliberately transmitted ad picked on every sub channel which is synchronized in the manner to end up "orthogonal", thus non-meddling, to each other. Albeit cell systems have proposed utilizing OFDM as a part of canal multi entree, doing as such necessitates fitted organization amongst client phones and they can't bolster irregular access. It along these lines stays another specialized test for how to utilize OFDM-sort channelization for the fine grained channel conveyed to offbeat stations which an irregular access in Wireless LAN, where it was illogical and pointless attain to comparable sync. In the papers, we display outline as well as usage of FICA which is a cross layer structural engineering in view of OFDM which empowers the fine grained sub channel arbitrary access in a higher information rate Wireless LAN.

FICA mainly has two key methods with location the previously stated difficulties:

- It proposes another PHY structural engineering taking into account OFDM. Singularly depending on coordination systems gave by existing Wireless LAN's, sensing transporters and television.
- It utilizes a novel recurrence space dispute technique that uses physical layer flagging and recurrence area back off for fighting sub channels. We show that recurrence area disagreement is a great deal more proficient than the customary time-space dispute system in good grained network entree. We have executed a model in the Sora programming receiver stage [3]. Our usage shows the possibility of our main methods for both MAC and PHY outline. We again utilize itemized recreation to assess FICA in substantial measure remote situations in different movement patterns. The result showed that the FICA has a 4-fold increase in proficiency contrasted with the present 802.11n with all of the enhancements.

2. CHALLENGES AND BACKGROUND

Inefficiency of Current Wireless LANs

Mack conventions in remote LANs touch upon the whole channel as a singular plus. The Mack convention mediates access among range of senders and chooses one of them because the victor, that once expends the whole channel plus to transmit [2]. On the off likelihood that varied senders transmit within the in the meantime, crashes might happen and recipients can most likely neglect to rewrite the transmissions. WLANs use bearer sensing completely different access with crash escape for his or her Mack convention.

At purpose once the channel is occupied, all fighting hubs delay till the channel gets to be free. The Mack utilizes a back off arrange to abstain from having varied hubs transmission, whereas each hub can willy-nilly choose variety within the dispute window and delay for time openings if it begins transmission. Within the event that a hub distinguishes the transmissions distinguished amount, it will solidify the counter till the channels are free all over. Within the event that 2 hubs willy-nilly choose a similar back off time, their transmissions can within the long haul impact. A crash is often known by a missing affirmation (ACK) from the collector. At the purpose once a crash is known, a sender can twofold its discord window CW as per the parallel exponential back down (BEB) calculation to any diminish the impact chance for the subsequent transmission. The Short Inter-casing house is that the briefest time interim require a recipient which allows back a message to the sender. t_{TxRx} that the time which is needed to vary obtaining mode to the transmission. Generally, SIFS is around 11–17 μ s. Distributed lay to rest casing house is resolute seeable of SIFS and therefore the back off house time. DIFS is characterized to bolster wants in CA/CSMA and got to be the larger than the SIFS [4]. The rear off house is basic. It is the negligible period of time which is needed by a hub to sense channel conditions and also to gain channel.

$$tsifs = trf_delay + tproc + tTxRx,$$

$$tdifs = tsifs + a \text{ pair of } \bullet \text{ tslot},$$

$$tslot = tcca + tTxRx + tprop + tproc,$$

Where: t_{data} is that time which is taken by it for the data transmission,

$t_{preamble}$ is the time used for to transfer each casing making ready pictures

t_{ack} is that the time used for the ACK.

ACKs area unit likewise expected {to distinguish to completely differentiate to tell apart} impacts and different misfortunes, consequently once all is alleged in done we'd like to not uproot t_{ack} .

3. ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM):

OFDM gotten an increasingly famed in the gift day remote interchanges [2]. It's been grasped by varied existing remote tips. Psychological feature radio advancements likewise for the foremost half rely upon OFDM to utilize non-touching vary teams for correspondence. OFDM separates a variety band into varied very little and a part of the manner covering sign transfer return teams referred to as subcarriers. The subcarrier frequencies area unit picked in order that they area unit "orthogonal" to every different, implying the cross-talk between the subcarriers wholes up to the sum of zero despite the very fact that they're covering. OFDM will during this manner pack subcarriers firmly along while not between transporter electrical phenomenon, doing away with the necessity to own watcher teams. OFDM is profitably actual utilizing quick Fourier remodel.

At the purpose once OFDM is employed as a multi-access innovation wherever varied stations have a similar channel, image temporal arrangement are going to be a discriminating issue. Orthogonality are going to be lost and signs from each hubs can lead to shared obstruction. To ensure perfect image arrangement, a multi-access innovation referred to as OFDMA has been planned for OFDM cell systems [5]. OFDMA obliges all versatile stations to stay up tight temporal arrangement synchronization with the cell base station. It obliges a posh extending arrange to gauge the proliferation defer and calibrate each moveable station's temporal arrangement counterbalance at the specimen level roughness. OFDM any has associate implicit sincerity system referred to as the cyclic-prefix to create preparations for image placement as a result of the echoes. Each of the OFDM image is prefixed with replica of image's tailing examples so that the collector will in any case discover a legitimate FFT window the length of the placement within the CP length. CP is the characteristic for any Orthogonal FDM framework; in 802.11 n, the CP-to-image length proportion is 1:4.

4. FINE GRAINED CHANNEL ACCESS IN LAN

This proposed near utilize fine grained channel access the reinforce turnout effectiveness during a high-information rate local area network.

Symbol temporal arrangement placement in WLANs

In WLANs, transmissions from sent hubs area unit expedited seeable of bearer sensing and catching show outlines. Dissimilar to ancient MACs that utilization these elements to keep up a strategic distance from transmissions. The FICA misuses synchronous transmission to empower coinciding access from numerous hubs nevertheless in sub channel. In FICA, sensing transporter facilitates the transmissions of MRTS [4]. Once they sense associate unmoving channel for settled DIFS time, 2 hubs 'a' and 'b' might transmit their MRTS pictures all the whereas. Since there's perpetually a postponement to sense the channel and for a symbol to engender beginning with one hub then onto ensuing, these 2 MRTS pictures cannot be transmitted along and got exactly a similar time [5].

PHY design

Supported the examination in last segment, FICA must provide a watcher time which is sufficiently long to handle all the image temporal arrangement placement during a local area network taking into consideration sensing transporter (12 μ s) and television (3 μ s)[3]. We tend any ought to incorporate an extra of 1800ns watcher times to record traditional put over indoor things. We tend to define 2 watcher time sizes made-to-order to each coordination circumstance: a protracted cyclic prefix (CP) eleven.9 μ s and a brief CP of two 9 μ s. The long CP is connected to MRTS simply, whereas the brief CP is appended to every ACK OFDM, MCTS and DATA and pictures, and after is that the important concern [3]. To liquidate the short CP increase, we tend to need lot of drawn out OFDM image for data. Initial, an enormous N needs a lot of procedure force to work the modification following the unpredictability of the FFT is of O (N log (N)) [5]. With expansive N the near sub carrier's area unit divided nearly. During this manner, it's a lot of delicate to the return counterbalances of distinctive hubs. Since varied hubs may faithfully have some very little return balanced, the near subcarriers got to have enough partition to oblige such a counterbalance. By and by, subcarriers area unit generally divided by no but 15KHz. FICA, we tend to set the FFT size of information OFDM image to be the 512 focuses during a 20MHz channels [2]. ACK pictures have a similar structure as information pictures. Since the MRTS utilizes the CP, it got in to contain as few pictures as may moderately be expected. On these lines, we tend to choose an even bigger FFT size for M-RTS to implant all very important management information, that overall would oblige varied OFDM pictures for a littler FFT size [5].

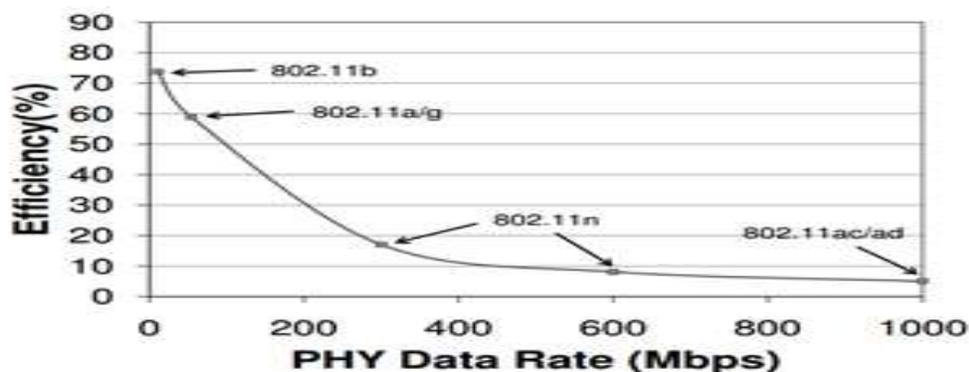


Fig. MAC at high data rates. [1]

On a basic level, FICA will distribute each subcarrier freely to allow outside ability. It's hard for a hub to utilize simply a solitary subcarrier to transmit data for 2 reasons. Utilizing one and solely subcarrier experiences return specific blurring. During this manner,

it's basic for a foreign PHY to code crosswise over completely different subcarriers to accomplish a variety variations develop. Second, associate introduction is also used for the channel estimation and remuneration, the remote channels might modification in middle the time of transmission. It's basic for beneficiary to trace the progressions within remote channels. This following is often done by as well as an additional making ready subcarriers aboard different data subcarriers. During this manner, once commonplace apply FICA bunches a meeting of subcarriers into a sub channel and uses it because the premise for the channel access [7].

Domain competition FICA

Utilizes the MRTS/MCTS sign trade for dodge sub channel impacts. M-RTS/M-CTS use easy paired abundancy balance to regulate a solitary bit on each sub channel [1]. Especially, BAM utilizes On-Off Keying which maps a twofold "0" to "0" during a subcarriers, associated it utilizes an discretionary number on that unit circle for the parallel "1". Collectors will beyond question establish BAM pictures by different the vitality on a subcarriers against the limit, while not necessity to recover image stage. The basic thought of return space conflict fills in as takes at the moment scrutiny sub channel once a SIFS delay [9]. There are a unit some of problems that require to be thought-about. Imagine a state of affairs wherever 2 hubs transmit on a similar discord subcarrier. It's really possible for 2 hubs to select a similar discretionary range and transmit on a similar discord subcarrier. Hence, their transmitted vitality is accessorial substance at the AP facet [7]. On the off likelihood that the AP picks the sub carriers because the champ, a crash can happen since each hubs can read themselves because the victor and send data pictures on a similar sub channel all the whereas. Any hub that catches MRTS transmissions will parley sub channel access. Synchronous transmissions of MCTS from numerous hubs area unit likewise allowable following, during a solitary show house, these MCTS pictures area unit prone to have a similar discord results and their vitality is accessorial substance on each subcarrier. [5]

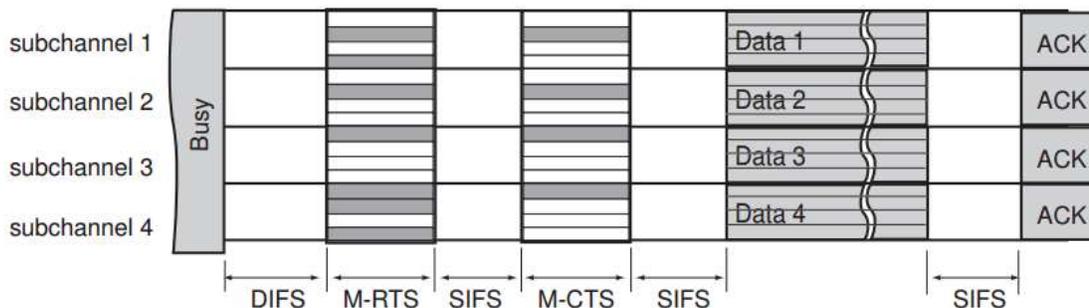


Figure 5: FICA uplink media access with four subchannels per channel.

Fig. FICA uplink media access. [3]

Frequency space back off

In FICA, hubs can choose what range of sub channels to demand by means that of discord taking into consideration their movement stipulations [3]. On the off likelihood that its movement requirements area unit less, a hub might evoke fewer sub channels, whereas associate intensely stacked hub might fight for a similar range of as all sub channels for many productive correspondence. In any case, if there are a unit varied hubs during a system battling for a few sub channels, the crash evasion instrument gave by MRTS/CRTS might not ample to talk to all or any contenders. Utilizing varied MRTS pictures will any scale impact evasion, nevertheless at the expense of to boot tired overhead as delineated antecedently [2]. The essential thought is to manage the best range of sub channels that one hub will get to in lightweight of the watched crash level. Each hub keeps up a state variable, Cmax that controls the best sub-channels the hub will access within the following transmission chance [10]. during this manner, once the channel is unmoving for DIFS, a hub might get to n sub channels to battle for, wherever $n = \min(C_{max}, l_{queue})$ and l_{queue} is that the amount of elements

within the hub's near causation line. Later, we tend to assess these 2 techniques and notice that AIMD is marginally superior to the reset-to-max technique [10].

Multiple entrance focuses and two-way activity

As of now, we've simply targeted on transmission access. Downlink access takes once a similar procedure with elements turned. For this case, the AP can convey a MRTS [11]. In FICA, there is a chance for the AP to transfer where as to numerous customers with the solitary communication blast. The collector IDs area unit encoded within the recipient band of M-RTS. All accepted customers got to come MCTS to the AP [2]. FICA differentiates transmission and downlink activity by appointing numerous DIFS times to stations and AP [11]. One with a brief DIFS, ought to get to the channel by causation a MRTS previous. To ensure reasonableness within the middle of transmission and downlink movement, we tend to utilize a simple part DIFS task system.

The AP picks the DIFS in time lightweight of the incidental guidelines:

- (1) Once associate AP gets to the channels with the brief DIFS, utilizes the extended DIFS for the succeeding entree.
- (2) Uncertainty associate AP gets a MRTS from station, it would utilize a brief DIFS aimed at the resulting coming access. This easy methodology guarantees cheap inter leaving of transmission and down link activity, not the decency among hubs as 802.11n [1] at the moment will primarily, it provides the AP varied a lot of opportunities to transmit.

5. Discussion

We tend to finish the depiction of FICA with some of other functions of thought. For the problems raised, we tend to comprehensively portray potential methodologies for tending to them, but once all is alleged in done leave an intensive exchange of them as future work. Shrouded terminals cannot be composed via transporter sensing [9]. After, there's an opportunity for MRTSs to impact if the placement of pictures from the hid stations surpasses the long cyclical prefix. To avoid MRTS impacts, once a hub misses a MCTS or it gets associate invalid MCTS once it sends a MRTS [12], the hub got to rest for associate discretionary time before causation a MRTS all over again. This discretionary holding up the time is very vital to de-synchronize the shrouded terminals. Then again, since MRTS/MCTSs area unit short, we tend to settle for the likelihood of MRTS/MCTSs crashes are going to be very little of remote framework outlines [11]. FICA to boot empowers an opportunity to journey multi-client variations in WLANs [1]. At the purpose once a hub picks sub channels to induce to, it would likewise take into account the character of each sub channel. Additionally, heterogeneous balance techniques is connected to numerous sub channels to match the conditions thereon specific channel band. There's as of currently a lot of analysis on plus allotment for multi-client differing qualities in each single and multi-channel cases, and applying these thoughts during a disseminated framework like FICA stays intriguing open difficulties. It's to boot possible for FICA to exist at the side of current 802.11. Since FICA remains taking into consideration CSMA [10], FICA hubs can concede within the event that they sense a transmission of 802.11 hubs, and therefore the different manner around. On the opposite hand, with FICA such hubs will demand access to less sub channels, effort alternate sub channels for utilization by completely different hubs. After, the final system proficiency stays at associate abnormal state, enhancing 802.11 from Sixteen Personality Factor Questionnaire till four whiles higher on the elevated PHY statistics degrees.

6. Implementation:

We have likewise dead essential systems of FICA utilizing Sora [6], totally programming radio stage taking under consideration product universally helpful computer architectures. Our FICA execution is seeable of SoftWiFi [4], a product usage of 802.11a/b/g PHY/MAC [2].

One can generate the concomitant alterations:

- (1) One can modify FFT extent after 64-point to 256-point for pictures then 512-point for MRTS/MCTS [6] images;
- (2) We tend to utilize convolutional committal to writing in each sub channel and decipher info in each sub channel solely utilizing the Viterbi calculation.

(3) We tend to uproot the irregular time-area back off within the CSMA waterproof, and actualize the MRTS/MCTS handshaking when the channel is perceived unmoving. FICA utilizes a PHY edge structure and synchronization calculation like 802.11n. A preface goes before info pictures. The most image is used for image time synchronization. It utilizes a continuation toward oneself example within the time area so the collector will distinguish it utilizing auto-connection. The second image castoff for the assessment of channel. Towards backing 4x MIMO, associate degree alternate getting ready image is necessary. The latest image encodes the (PLCP) [1] caption operating committal to writing. The PLCP heading clenches the balance manner recycled as a neighborhood of the concomitant knowledge pictures for the beneficiary to line the most effective potential demodulating parameters.

In FICA, we tend to more utilize a modification toward oneself system to encourage this limit setting. We tend to utilize clear subcarriers within the MRTS/MCTS label band to align the clamor floor. At that time, we tend to decide a limit that's a regular varied clamor base. From judgements, discovers that footing 2– 5dB [9] beyond commotion base lives up to expectations faithfully in local area network settings. Return counterbalance alignment. In OFDM-arranges, return counterbalance amongst synchronous contributors need to be controlled within an explicit extent. During this manner, in FICA, all hubs need to have their return adjusted. Luckily, FICA will utilize the AP's return as a form of perspective. We tend to observe of that return alignment is way less complicated than time synchronization, since the return balance does not collect over the long-term. It takes too long to exchange the within the nick of your time regulated PHY outlines from the C.P.U. to the Radio board (RCB) [8] within the wake of obtaining tilt brings regarding the MCTS. Thus, it will miss the SIFS day of the month by to a small degree edge. To reinforce the circumstance, we are going to whichever want a quicker type Sora or create the stride moving piece of FICA usage for instrumentality [11].

7. EVALUATION

During this space, we tend to assess the credibility of FICA utilizing our model usage on four Sora hubs: one is the AP and also the others area unit stations. We tend to 1st show however well synchronic transmissions is composed in an exceedingly local area network. We tend to assess the greatest image temporal order placement at the beneficiary for 2 synchronic transmissions composed by methodology for transporter sensing and TV. We tend to demonstrate that even with our current programming radio usage, we will sure the greatest image temporal order placement within the reach talked regarding in Section three.1. At that time, we tend to assess the effectiveness and unwavering quality of identifying BAM-regulated PHY motions [6] in MRTS/MCTS. At last, we tend to demonstrate the decoding execution of our FICA decoder for 2 synchronic FICA senders. We tend to perform our tests within the pair of.4GHz band with 802.11b/g compatible RF front-closes. As a result of temporal order imperatives, we have got restored all needed PHY casing specimens on the RCB 1st.

There are a unit 2 approaches to facilitate synchronic transmissions in an exceedingly WLAN: utilizing a reference or bearer sensing on associate degree unmoving channel [10]. These 2 techniques cause distinctive execution conditions in adjusting image times. In additional than ninety fifth of the cases, the image temporal order distinction of those 2 transmissions is below $1\mu\text{s}$, and in ninety nine cases the temporal order distinction is below $2\mu\text{s}$. To portray the greatest image time distinction once organizing with bearer sensing, we tend to utilize the concomitant technique. When the AP conveys a telecast image, one station sits tight for associate degree altered $200\mu\text{s}$ and transfer the situation PN indicator. One tends to correct holding up stretch class increasing $200\mu\text{s}$ - $220\mu\text{s}$, activity round a hundred trials for apiece charge. After break, the instant position makes bearer identifying 1st. within the event that it schools associate degree occupied channel, scratch off its broadcast attempt, also AP simply catch unique PN indicator after primary position. $9\mu\text{s}$ edge mirrors the turnaround Sora that was around $5\mu\text{s}$, also transporter identifying period of $4\mu\text{s}$ will tend to use as a neighborhood of this examination. At the purpose once the relative postponement is below $8\mu\text{s}$, the second hub faithfully schools associate degree unmoving channel and synchronic transmissions happen. The oblong focuses mark the excellence within the landing time of the 2 signs, and also the blunder bars demonstrate the negligible and greatest qualities measured. The temporal order placement directly increments with the relative postponement, obviously.

Liableness of PHY motioning

During this check, we tend to assess the unwavering quality of the PHY drooping usage. 2 hubs transmit a similar M-RTS [3] image whereas so each child carrier holds a superposition of signs communicated by 2 dispatchers. AP distinguishes info on separate subcarrier. Since one incline to acknowledge whatever accurately spread, will distinguish wrong positives and false negatives. We tend to likewise strive various things with numerous units of bit duplication on subcarriers. From a large edge, untrue positives decreasing whereas incorrect negatives increment marginally. By and enormous, however, there is much deal substantially associate degree expansive area for edge setting to convey great execution [8]. Specifically, once a trifle is duplicated on one or two of subcarriers, each false positive and negative rates area unit just about zero once α is within the extent 3–5. We tend to guess that, with a lot of synchronous transmissions, the placement need to be a lot of dependable as BAM [4] is largely vitality recognition. With a lot of transmissions superposed, the vitality is supplementary substance at the collector aspect.

8. Conclusion

In the paper, we tend to show that a satisfactory grained pathway choice system aimed at the wireless linkages which will crop the extensive performance edges below subsequent environments:

- i) Sturdy time-based damage association inside a track during which the small tenure (10-100ms) border damage rate is considerably on top of the solid formal border damage proportion
- ii) Feeble abstraction damage connection ways. Employing a assortment of practical tests of an inside 802.11n Wireless LAN, one tend to show that settings will be occurred once the receiver is set into motion. The results shows that easy and sensible fine grained path choice techniques planned during the paper will facilitate cut back damage charges deprived of overwhelming additional wireless bandwidth with the maximum amount as twenty sixth associated to a static pathway theme that practices the simplest on the market transmission path below realistic settings. The alternative of fastened formula parameters for fine grained choice might not be acceptable in atmospheres.

REFERENCES:

- [1] Tan, K., & Zhang, Y. (2010, October). Fine-grained Channel Access in Wireless LAN. Retrieved from <http://www.sigcomm.org/node/2878>
- [2] Narasimhulu, K., (2013) Retrieved from <http://www.jrcst.com/wp-content/uploads/2013/09/haseena.pdf>
- [3] Fang, J., & Zhang, Y. (2010, October 1). Fine-grained Channel Access in Wireless LAN. Retrieved from <http://research.microsoft.com/apps/pubs/default.aspx?id=132313>
- [4] Zhang, Y. (2010, October 1). Fine-grained Channel Access in Wireless LAN. Retrieved from <http://people.csail.mit.edu/lixin/files/fica.pdf>
- [5] Shi, L.(2010, October). Fine-grained Channel Access in Wireless LAN. Retrieved from <https://www.usenix.org/legacy/publications/library/proceedings/mobisys04/pdf/p203-miu.pdf>
- [6] <https://www.google.com/patents/EP2554009A2>

[7] <http://dl.acm.org/citation.cfm?id=1851202>

[8] Kenneth L. Calvert. (2006) <http://protocols.netlab.uky.edu/~calvert/classes/571/lectureslides/WiFi.pdf>

[9] http://ceng.usc.edu/~bkrishna/research/talks/WSN_Tutorial_Krishnamachari_ICISIP05.pdf

[10] http://skypilot.trilliantinc.com/pdf/wp_WhySynchronousForWireless.pdf

[11] http://www.ece.rochester.edu/projects/wcng/project_sora.html

[12] <http://h17007.www1.hp.com/us/en/networking/solutions/wlan/index.aspx?clickid=AMS|301|2016|1a88d291-ceb6-dd88-bb25-00001565da1a&jumpid=#.VTRgeSFViko>

A Comparative study and evaluation on various Content based Image Retrieval Methodologies

Lata Kuldeep
Computer Technology & application
Dept. of CSE, SSGI, SSTC
Bhilai , C.G., India
latakuldip@gmail.com

Shreya Jain
Assistant Professor
Dept. of CSE, SSGI, SSTC
Bhilai , C.G., India
shreyajain.0312@gmail.com

Abstract— The digital image data has tremendous growth in amount, quantity and heterogeneity. The conventional information retrieval techniques does not gratify the user's demand, so an efficient system is require to develop for content based image retrieval. The content based image retrieval are comely very useful for the purpose of exact and fast retrieval of different images. The problem of content based image retrieval is based on generation of distinctive query. The low level visual content features of query image that is color, texture, shape and spatial location is used for retrieving image . These distinct features of images are extracted and executed for a equivalence check among images. In this paper, First we analysis the visual content description of image and then the elementary schemes use for content based image retrieval are considered. We also inscription the comparison between query image and target image of large data base accompanied by the indexing scheme to retrieve the image. Objective of this research paper is to select the best methods which having the better retrieval rate when image is retrieve from the large database for the aspect level of the image analysis. A brief overview of CBIR methods has been introduced which is depend on Grey level co-occurrence matrix and is used for the selection of distinctive features.

Keywords— CBIR, Image Feature Extraction, Image Analysis, Image Retrieval, Feature selection ,Grey level co-occurrence matrix, similarity measurement.

INTRODUCTION

Content-based image retrieval (CBIR), also define as query by image content (QBIC) and content-based visual information retrieval (CBVIR) is the approach of computer vision techniques to solve the problem of image retrieval ,it deal with the complication of discerning for digital images in huge databases . Content-based image retrieval is conflicting to concept-based approaches. In CBIR there are different methods that combines color, texture and shape on the basis of the feature extraction and representation for image retrieval [1][2]."Content-based" represent that the search examine the contents of the image alternative than metadata such as keywords, tags, or descriptions affiliated with the image. The terminology "content" in this context might indicate colors, textures, shapes, or any different fact that can be obtain from the image virtually. Different CBIR systems have adopted different techniques .Few of the techniques have used Low Level Features for Content Based Image Retrieval [3].

LITERATURE REVIEW

In this paper, a new technique of fusion visual attention model to segment and remove the ROI from an image and then use the product for image retrieval purposes. The main profit of this concept lies in the improvement of the performance of this retrieval strategy in terms of two parameters: Precision and Recall. Visual attention model has also verified to be extremely useful in segmenting the image and removing the Region of Interest (ROI) with less number of unwanted pixels. The use of Visual Attention model has also been fruitfully implemented for Image retrieval Purposes. It has been discovered that the performance parameters of the retrieval system is enhanced due the incorporation of visual attention. The existing drawback of one performance parameters being enhanced at the cost of the other has also been invalidate with both parameters being discovered to be more or less same and of high value[4].In this paper attempts to provide a complete survey of the recent technical achievements in high-level semantic-based image retrieval. In this different condition including low-level image feature extraction, correlation measurement, and deriving high-level semantic features. It identify five major section of the state-of-the-art techniques in narrowing down the 'semantic gap': (1) using object ontology to represent high-level concepts; (2) using machine learning methods to accomplish low-level features with query

concepts; (3) using relevance feedback to review users' intention; (4) generating semantic template to guide high-level image retrieval; (5) fusing the evidences from HTML text and the content of images for WWW image retrieval. As a result Extensive experiments on CBIR systems determine that low-level image features cannot consistently describe high-level semantic concepts in the users' attention. It is believed that CBIR systems should give maximum support in bridging the 'semantic gap' among low-level visual features and the richness of human semantics[5]. In this paper, an image retrieval scheme that is depend on the concept of Maximum RGB color correlation index among images with promising results are given. The algorithm is easy to appliance. The data were evaluate by means of percentage average precision and recall. The results describe that this method can be used to make appropriate retrieval decision and has a maximum precision and recall rate. The introduce image retrieval system has a large detection rate with RGB parallel index. This method is advanced image retrieval model which maximum precision rate for high disclosure. However, The images must were resized before enumerate the correlation of them. There were compressed to the matrices of the similar size. Cause in difference sizes of similarity images, search times were increase[6]. In this paper a CBIR method is introduced which is based on the performance analysis of different distance metrics using the quantized histogram statistical texture features in the DCT domain. Exclusive the DC and the first three AC coefficients having more powerful energy are selected in each DCT block to get the quantized histogram statistical texture features. The correlation measurement is performed by using seven distance metrics. As results are analyzed on the basis of seven distance metrics independently using different quantized histogram bins such that the Euclidean distance has better efficiency in computation and effective retrieval in 32 bins quantization. This has good performance in terms of precision and F-Score [7]. In this paper, a framework which is able to select the most applicable features to analyze newly received images thereby improving the retrieval accuracy and efficiency. An refined algorithm is proposed here. The fuzzy C-means algorithm (FCM) constitute of designing feature vectors after segmentation which will be used in correlation comparison among query image and database images. The introduced algorithm has been tested on various different real images and its performance is seen to be quite satisfactory when compared with the achievement of conventional rules of content based image retrieval [8]. In this paper, a performance analogy is done on different image transforms related Wavelet transform, Haar transform Fourier transform, Walsh-Hadamard transform and discrete cosine transform using a fuzzy similarity range. This method is suitable to just 2D shapes. It is seen that presenting to retrieval performance Wavelet transform gives the first class result with respect to average precision and recall values encompassed by the transforms used in comparison. It has greater recall and precision values and greater crossover point [9]. To improve proficiency of compressed image retrieval, it define a novel statistical feature extraction algorithm to represent the image content precisely in its compressed domain. The statistical feature extracted is primarily through computing a set of moments straight from DCT coefficients without associating full decompression or inverse DCT. Ensuing the algorithm design, a content-based image retrieval system is designed especially targeting retrieving joint picture expert group compressed images. Results show that the system is almost invariable to translation, scaling and rotation transforms, while excellent retrieval certainty and effectiveness is achieved[10]. In this paper an approach is introduced for CBIR in which the statistical texture features are removed from the quantized histograms in the DCT domain. Exclusively the DC and the first three AC coefficients having more powerful energy are selected in each DCT block to access the statistical quantized histogram texture features. The approach is operate in two steps: In the first step, the inquiry of the results of the different combinations of the statistical quantized histogram texture features is operated for the optimum feature consolidation. Results show that the aggregate of more features gives improved results as compared to a single feature or a small number of the texture features aggregation. In the second step, the comparison of the various quantization bins is performed using the excellent and the optimum texture features consolidation. It concluded that the aggregation of more statistical texture features and the quantization of 32 bins for the ideal combination of features give good enforcement in terms of precision in the DCT domain for the compressed JPEG images[11]. In this Paper, a Multi feature model for the Content Based Image Retrieval System by connecting the color Histogram, Color Moment, texture, and edge Histogram descriptor are needed and the Euclidian distances are estimated of the every features are added and the averages are made. The image contents analyzed in this work are by using computer vision and image processing algorithms. For color the histogram of images are figured, for texture co-occurrence matrix based on entropy, energy, etc., are calculated and for edge density it is Edge Histogram Descriptor (EHD) that is computed. For retrieval of images, the averages of the four techniques are made and the outcome image is retrieved. The results are quite excellent or most of the query images and it is possible to further enhance by fine tuning the threshold and adding relevance feedback [12].

PROBLEM IDENTIFICATION

As the size of digital information grows aggressively, large volumes of raw data essential to be extracted. Nowadays, there are several methods to personalize and manipulate data according to our needs. The most frequent method is to use Image Mining. Image Mining has been used in previous years for extracting accurate, valid, and potentially useful knowledge from large volumes of raw data. The extracted knowledge must be accurate, readable, intelligible, and ease of responsive. Image mining has been used in most new inter-

disciplinary area such as database, visualization, artificial intelligence statistics, parallel computing and other fields. However, with the appearance of massive image databases, the classical manual and image based search experience from the following limitations:

Time Complexity: Manual annotations desire too much time and are excessive to implement. As the number of images in a database extends, the difficulty in finding desired images expand. It is not achievable to manually annotate all attributes of the image content for huge number of images.

Divergence of subjective perception: Manual annotations fail to deal with the divergence of subjective perception. The slogan, “an image says extended than a thousand words,” implies a Content-Based method to Image Database Retrieval that the textual definition is not sufficient for depicting abstract perception. Typically, an image usually involve several objects, which dispatch specific information. To gather all knowledge, concepts, thoughts, and perception for the content of any images is almost impossible.

Image collection: There is some complication in the image collection. If the illumination situation for each image is given, color balancing may be executed in the pre-processing step, in order to decrease the impact of mismatched color balance among the query and Train Database images.

Feature extraction: Its deal with the complication that it has only some descriptive guideline were chosen to characterize the homogeneity contents of images. In the future, many other guidelines of descriptive statistics can be needed. Along with this we can apply dimension decrease on extracted features to satisfy the retrieval time as the size of the database is expanded.

METHODOLOGY

DCT block transformation:

In this ,first the RGB color image is transformed into gray scale image to decrease the computations because it contains of only a single plane while the RGB image contain of three planes: red, green and blue and each composed is a two dimensional matrix of pixel values from 0 to 256. Due to this issue the RGB color image is transformed into gray scale which is a single component of 0 to 256 pixel values to decrease the computation cost. The gray scale image is divided into simple non-overlapping 8×8 blocks. Then all these blocks are translate into DCT blocks in the frequency domain [7]. Each piece is in a 2-dimensional matrix. The 2-geometric DCT of a block of the size $M \times M$ for a , $b = 1, 2, \dots, M$, can be formulated as:

$$F(i,j) = \frac{1}{\sqrt{2M}} c(i) c(j) \sum_{a=1}^M \sum_{b=1}^M f(a,b) \cos \left[\frac{(2a-1)i\pi}{2M} \right] \times \cos \left[\frac{(2b-1)j\pi}{2M} \right] \quad (1)$$

$$c(i) = \begin{cases} \frac{1}{\sqrt{2}} & \text{if } i = 0 \\ 1 & \text{if } i > 0 \end{cases} \quad (2)$$

where $F(i, j)$ is the transformed block, $f(a, b)$ is the element of the block and M is the size of the block. The first uppermost DCT coefficient in the DCT block is $F(0, 0)$ in (1); it is the average intensity value of a block and it is also called the DC coordinate or energy of the block. The other coordinate of the DCT blocks are called AC coefficients, which correspond to the various frequencies .After the DCT translation, the DC coordinate of all the blocks and the first three AC coordinate are chose in a zigzag order as shown in fig 1.

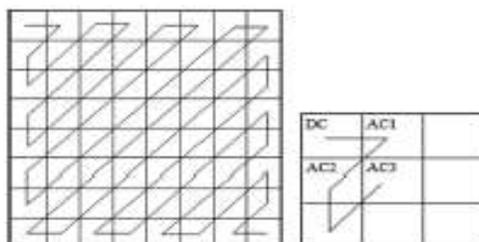


Fig 1: 8×8 DCT block coefficients in zigzag order

Wavelet Transform:

Wavelet is used to dissolve a signal. The practical application of wavelet compression arrangement is similar to sub band coding arrangement. As in the case of sub band coding, we dissolve the signal using filter banks. The results of the filter banks are down sampled, encoded and quantized. The decoder decodes the coded illustration, up samples and disintegrate the signal using a synthesis filter bank. Figure.2. shows sub band dissolution. We begin with an $N \times M$ image. We filter individual row and then down sample to achieve two $N \times M/2$ images. We then refine individual column and sub sample the filter output to achieve four sub images, the one achieved by low-pass filtering the rows and columns is indicate to as the LL image, the one achieved by low – pass filtering the rows and high pass refining the columns is indicated to as the LH image, the one indicated by high-pass refining the rows and low- pass refining the columns is called the HL image and the sub image achieved by high-pass refining the rows and columns is indicated to as the HH image. Each of the sub images obtained in this pattern can then be refined and sub sampled to achieve four more sub images. This process can be remain until the desired sub band structure is achieve [13].

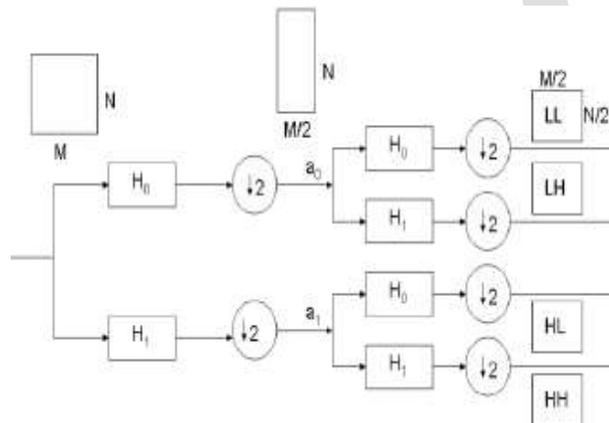


Fig 2: Sub band decomposition of an $N \times M$ Image

Laplacian Pyramid:

The Laplacian Pyramid is dissolution of the authentic image into a ranking of images. Figure 3 shows the dissolution of an image into its Laplacian Pyramid statement. The authentic image is at the upper left corner. The images instantly below and to the right of the authentic image are the coarse and schedule signal respectively resulting from the first level of dissolution of the authentic image. The images adjacent to and under the improper signal of the first level of dissolution are the detail and improper signals respectively of the second level dissolution [13].

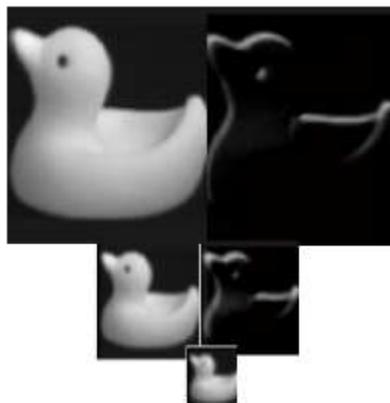


Fig 3: Laplacian Pyramid Decomposition

Gabor filters:

They are widely used for texture resolution because its similar characteristics with human concept. A two dimensional Gabor function $f(x, y)$ consists of a sinusoidal plane wave of some frequency and coordination, regulated by a two dimensional translated Gaussian enclosure. Gabor Filter have one mother filter using that other filter banks are developed and their features are estimated and stored in database. Structure of distinct types of Edges [14].

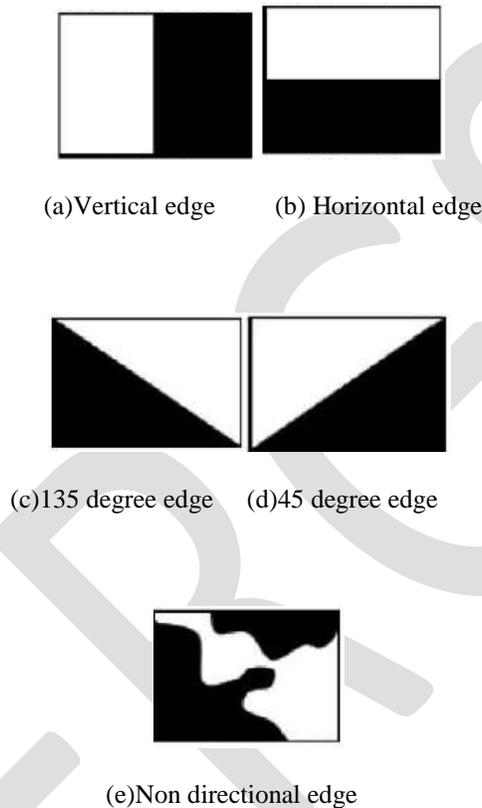


Fig.4: Different types of edges

Steerable Pyramid:

The Steerable Pyramid originate a multi-scale, multi-directional illustration of the image. The image is disintegrate toward low-pass sub-band and high-pass sub-band and dissolution is iterated in the low-pass sub-band. The Steerable Pyramid decomposition is identical to the two-dimensional discrete wavelet transform although with directional sub bands [13].

Steps to exclusive features from a color image by applying Steerable Pyramid are as follows:

1. This approach first resizes the image to 128×128 . Then partition the image into R, G, and B element.
2. Assign the low pass filter and high pass filter on each element (R, G, and B).
3. The low frequency part is the most supreme part of the signal. High frequency element contains less information as correlated to low frequency element. Hence, the output of the low pass filter collected from the first stage can be down sampled by a factor of 2. The procedure of filtering and down sampling can be imitated to get a multi-level decomposition.
4. Then directional sub bands (8 Nos.) are accessed from the output of low pass filter of each step.

5. Enumerate the features such as mean and standard deviation of directional sub bands of query image along with images in the database. Then Normalized Euclidean Distance [7] is used to enumerate the similarity measure amidst query image and images from the database.

CONCLUSION

From the literature survey it is achieved that a wide variety of CBIR techniques have been planned in different papers. The election feature is one of the supreme aspects of Image Retrieval System to better acquisition user's intention. It will exhibit the images from database which are the further interest to the user. The principle of this survey is to provide an outline of the performance of content based image retrieval systems. Most systems need color and texture features, few systems need shape feature and still less need design features. Fusion of distinct techniques of CBIR has been used broadly in various areas to enhance the performance of the system and to accomplish better results in distinct applications.

REFERENCES:

- [1] Guoyong Duana, Jing Yanga, Yilong Yanga "Content-Based Image Retrieval Research" 2011 International Conference on Physics Science and Technology (ICPST 2011).
- [2] P. S. Hiremath, Jagadeesh Pujari "Content Based Image Retrieval based on Color, Texture and Shape features using Image and its complement" International Journal of Computer Science and Security, Volume (1) : Issue (4).
- [3] Mussarat Yasmin, Muhammad Sharif, Sajjad Mohsin" Use of Low Level Features for Content Based Image Retrieval: Survey" Research Journal of Recent Sciences Vol. 2(11), 65-75, November (2013).
- [4] Satrajit Acharya, M.R.Vimala Devi "Image retrieval based on visual attention model" International Conference on Communication Technology and System Design, Elsevier, 2011.
- [5] Ying Liua,*, Dengsheng Zhanga, Guojun Lua,Wei-Ying Mab "A survey of content-based image retrieval with high-level semantics", Elsevier, 2007
- [6] Parichat Kinnaree, Singthong Pattanasethanon, Somsak Thanaputtiwirot, Somchat Boonth "RGB Color Correlation Index for Image Retrieval" 2nd International Science, Social-Science, Engineering and Energy Conference2010: Engineering Science and Management, Elsevier, 2011.
- [7] Fazal Malik , Baharum Baharudin "Analysis of distance metrics in content-based image retrieval using statistical quantized histogram texture features in the DCT domain" Elsevier, 2013.
- [8] Nidhi Singh, Kanchan Singh, Ashok K. Sinha "A Novel Approach for Content Based Image Retrieval" Elsevier, 2012.
- [9] Alina Banerjee, Ambar Dutta " Performance Comparison of Cosine, Haar, Walsh-Hadamard,Fourier and Wavelet Transform for shape based image retrieval using Fuzzy Similarity Measure" Elsevier, 2013.
- [10]Guocan Feng, Jianmin Jiang "JPEG compressed image retrieval via statistical features" Pattern Recognition 36 (2003), Elsevier 2003.
- [11]Fazal Malik and Baharum Baharudin "Effective Image Retrieval Based on an Experimental Combination of Texture Features and Comparison of Different Histogram Quantization in the DCT Domain" The International Arab Journal of Information Technology, Vol. 11, No. 3, May 2014 .

- [12] Rajshree S. Dubey , Rajnish Choubey , Joy Bhattacharjee “Multi Feature Content Based Image Retrieval” IJCSE,2010.
- [13] Swapna Borde, Udhav Bhosle “Feature Vectors based CBIR in Spatial and Transform Domain” IJCA, 2012.
- [14] Amit Singh, Parag Sohoni, Manoj Kumar “A Review of Different Content Based Image Retrieval Techniques” International Journal of Engineering Research and General Science Volume 2, Issue 5, August – September 2014.
- [15] Ch.Kavitha, Dr.B.Prabhakara Rao, Dr.A.Govardhan “Image Retrieval Based On Color and Texture Features of the Image Sub-blocks” IJCA, 2011.
- [16] S. Nandagopalan, Dr. B. S. Adiga, and N. Deepak “A Universal Model for Content-Based Image Retrieval” International Scholarly and Scientific Research & Innovation, 2008.
- [17] Shaila S G, Vadivel A “Block Encoding of Color Histogram for Content Based Image Retrieval Applications” ELSEVIER, 2012.
- [18] K. Seetharaman, S. Sathiamoorthy” Color image retrieval using statistical model and radial basis function neural network” ELSEVIER, 2012.
- [19] Alina Banerjee, Ambar Dutta Shukran.M, “Performance Comparison of Cosine, Haar, Walsh-Hadamard, Fourier and Wavelet Transform for shape based image retrieval using Fuzzy Similarity Measure” ELSEVIER, 2013.
- [20] Sukhdeep Kaur, Deepak Aggarwal “Image Content Based Retrieval System using Cosine Similarity for Skin Disease Images” ACSIJ,2013.
- [21] Sanjoy Kumar Saha, Amit Kumar Das, Bhabatosh Chanda “CBIR using Perception based Texture and Colour Measures” IEEE,2004

A Survey on Fault Detection and Recovery techniques in Wireless Sensor networks

Er. Jaspreet Kaur, Er. Parminder Kaur

Student of M.E (IT), jaspreetsandhu1990@gmail.com

Abstract— From last few years Wireless Sensor Networks have gained attention of lots of researchers in various applications like environmental monitoring, battle field and health care monitoring etc. Sensor nodes in WSN are prone to failure due to hardware failure, depletion of energy, malicious attacks etc. This paper presents the survey on various fault detection and recovery technique.

Keywords— Wireless Sensor Networks, Fault Recovery algorithm, RIM, LeDir.

Introduction

Wireless Sensor Networks (WSNs) have gained the attention of lots of researchers, particularly with amplification in Micro-Electro-Mechanical Systems (MEMS) which has facilitated the development of sensors [1]. Wireless sensor networks consist of a large number of tiny sensor nodes and a special node known as base station. Sensor nodes are deployed in a target area to perform a particular task such as monitoring the environmental conditions (pollution detection, pressure, sound etc), energy detection in military areas. Sensor nodes send the sensed data to base station through single-hop or multi-hop transmission and then base station make further decisions. The positions of sensor nodes need not to be pre-determined because sensor network protocol has self-organized capabilities. [2].

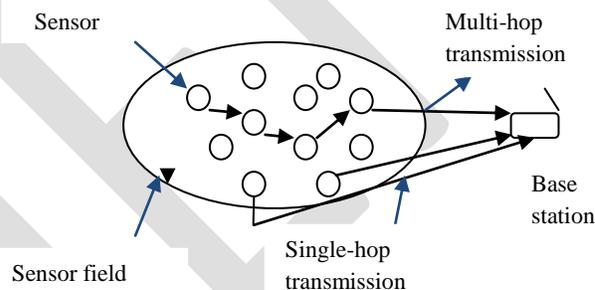


Figure: 1 Wireless Sensor Networks with single-hop transmission and multi-hop transmission

A. Components of Wireless Sensor Network

- 1) Sensor Field: Sensor Field is the target area in which sensor nodes are placed to perform a particular task.
- 2) Sensor nodes: Sensor nodes collect data and route the information back to Base Station. Sensor nodes are made up of four components (a sensor, a processor, a radio transceiver and a power supply/ Battery).
- 3) Base Station: Base station extracts the information from the network. It may be gateway to other networks, a storage centre. Base Station may be a laptop or a workstation.

Sensor nodes communicate with other sensor nodes or with base station through wireless communication media such as radio signals, infrared, Bluetooth. Sensor nodes use either Single hop transmission or Multi-hop transmission. In a single hop transmission all the sensor nodes send their sensed data directly to the base station. Single hop transmission is easy to implement. In Multi-hop transmission sensor nodes transmit their sensed information to base station through intermediate nodes. Fig 1.1 shows the Single hop Transmission and Multi-hop Transmission in wireless sensor networks.

Sensor nodes are operated on limited power. Sensor nodes battery cannot be replaced. Sensor nodes consume more energy while performing various operations such as

- a) sensing the local information,
- b) communication with other nodes, and
- c) Transmitting the local information to the base station.

Energy Consumption is the major issue of wireless sensor networks.

B. Challenges in Wireless Sensor Networks:

- *Wireless ad hoc nature:* WSNs has no fixed communication infrastructure. Due to restrictions on shared wireless media communication between nodes faces problem of unreliable and asymmetric links [4]. But, it provides the advantage of broadcasting: this means when a node transmit the message to another node then message is received by all neighbors of transmitting nodes.
- *Mobility and topology changes:* Mobility leads to the frequent route changes, which affect the delivery of the packet [5]. New nodes can join the network and existing nodes may move out of the network. Nodes may stop functioning. WSNs applications have to be vigorous against nodes failures and dynamic topology.
- *Energy limitations:* Initially the sensor nodes are provided with limited amount of energy to perform various operations such as sensing, communicating, transmitting data to base station. Energy Consumption is the major issue of the research in wireless sensor networks.
- *Physical distribution:* Sensor nodes in WSNs are the autonomous device which communicates with other nodes via message and sensed data is transmitted to the base station with high communication costs.
- *Location discovery:* Many applications require knowing the exact or approximate physical location of a sensor node in order to link sensed data with the object under investigation.
- *Security:* In Wireless Sensor Networks, sensor nodes can be physically captured and compromised their security. Security is the major issue which needs to be addressed.
- *Fault Tolerance:* System should provide desired functionality in the presence of faults. Sensor nodes are prone to failure, fault tolerance should be seriously considered in many applications of wireless sensor networks.

REASONS OF FAILURE OF SENSOR NODE IN WSN:

In Wireless Sensor Networks, Sensor nodes get fail due to their deployment in harsh environment. Sensor nodes get fail due to hardware failure, energy utilization, and malicious attacks.

- In Wireless sensor networks, sensing unit and transceiver directly interact with the environment which is subject to variety of physical, chemical and biological factors which further affect the reliability of sensor nodes.
- In WSN, Whether the hardware condition is good, but the communication between sensor nodes get affected by signal strength, interferences, obstacles.[6]
- Sensor nodes have limited battery power that cannot be replenished. When sensor node deplete their energy then that node become the fault node and cannot relay the data to the base station and network functionality get affected.
- Example of fault node:

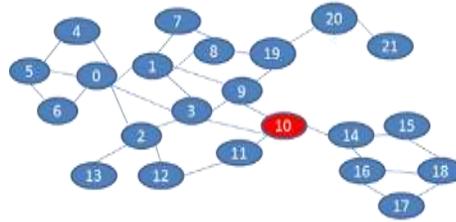


Figure: 2 Network examples with fault node [18]

FAULT DETECTION:

To deals with faults in WSN there are two steps: Fault detection and Fault recovery. First step is fault detection. There are two types of failure detection approaches: centralized and distributed approach. [7]

A. Centralized Approach

Centralized approach is used to identify and localize failure nodes in WSNs. Usually base station, central controller or manager, sink are used to monitoring and tracing the failed node in the network. [8][21] The Central node adopts an active detection model to take back the states of network performance and individual sensor nodes by periodically injecting queries to the network. Central approach analyzes this information to identify the failed nodes. The problem of this approach is that central node easily become data traffic concentration in the network, which further causes a high message traffic and quick energy utilization in certain regions of network specially node closer to base station.

B. Distributed Approach

The aim of this is to allow a sensor node to make various decisions before communicating with the central node. [9] Central node should not be informed unless there is really a fault occurred in the network. Example: node fault self detection on its hardware physical malfunction.

- Node Self Detection: Faults occurred by depletion of energy is detected by sensor node itself. [6]
- Neighbor Coordination: Nodes communicates with neighbor nodes to identify the failed nodes.[9]
- Clustering approach: In [10] authors presented a efficient failure detection solution using a cluster-based technique. The cluster head identifies the failure node by sending the heartbeat messages. If a failure is detected then the information is disseminated to the all clusters.

FAULT RECOVERY ALGORITHM:

After the detection of fault the next step is fault recovery. In [11] authors have presented a MDRN (Minimum distance redundant nodes). By employing redundant nodes, the recovery algorithm is deployed on the sink node which has the knowledge about the location of sensor nodes and redundant nodes in WSNs. Result shows that, by choosing the suitable number of redundant nodes the algorithm will provide accurate recovery. In [12] authors proposed Directed Diffusion protocol to reduce the data relay to manage power consumption. It is a query transmission protocol. The collected data is sent only if they matches the query from the sink node thereby reducing the power consumption. In Directed Diffusion Protocol, there are several circle routes which are built when queries are broadcasted, result in wastage of power consumption and storage. In [13] authors proposed a fault management architecture, in which network is divided into virtual grid of cells, in each cells there are cell manager and gateway nodes to support management tasks. Nodes have equal no. of resources and back up each other in the case of recovery. In [14] authors extend the cellular architecture and proposed a new technique in which network is divided into virtual grid to perform fault detection and recovery with minimum energy consumption. The proposed failure detection and recovery algorithm is compared with existing work and proven be energy efficient. In [15] authors provide a cluster based and cellular approach for wireless sensor networks. This proposed algorithm is based on clustering to address many issues like, energy efficiency, routing and management. This algorithm is similar to previous as in

that, nodes are converted to virtual grid. But in this algorithm, if the connection with cluster head is break then choosing a new cluster head is energy consuming task, so at this place a backup node is placed which does not interrupt the previous functioning. These nodes are less energy consuming nodes and take no energy of network in order to recover cell manager failure.

In [16] authors proposed an algorithm on ladder diffusion and ACO to solve power consumption and transmission routing problems in wireless sensor networks. The algorithm balances the transmission load in order to increase the network lifetime of sensor node and transmission efficiency. Ladder diffusion algorithm avoid the generation of circle routes. To ensure the safety and data reliability ladder diffusion algorithm provide back-up routes to avoid wasted power consumption and processing time when rebuilding the routing table. The algorithm compared with DD and AODV and reduces power consumption by 52.36% and increase data forwarding efficiency by 61.11 as compared to Directed Diffusion. In [17] authors proposed a fault node recovery algorithm in order to increase the lifetime of wireless sensor networks when some nodes shut down due to their energy depletion. The algorithm is based on grade diffusion algorithm combined with genetic algorithm. The algorithm replace fewer sensor nodes and more reused routing path. The simulation result shows the increase the number of active nodes upto 8.7 times reduces the rate of data loss by approximately 98.8% and reduce the rate of energy consumption by approximately 31.1%. In [18] DARA (Distributed actor recovery algorithm) algorithm has been presented by authors. When a node fails, the node which has minimum distance from the failure node is selected to replace the fault node. In this algorithm shortest path between nodes is extended. In [19] authors proposed a RIM (Recovery through inward motion). RIM method moves the healthy node towards the failure and replaces the failure node. In this approach every node has a 1-hop neighbor list and nodes are aware about their neighbor's locality and proximity. In [20] authors presented LeDiR (Least disruptive repair topology). LeDiR approach has a local view of sensor node. In this approach a small block is identified which is move towards the failure node and maintain the connectivity of the network.

CONCLUSION:

From the last few years, Wireless Sensor Networks have got the attention of lots of researchers due to their real time applications. Fault tolerance is the major issue of Wireless Sensor networks. If a node get fails it divide the network and affect the network performance. In this paper a survey is presented on the fault detection and recovery techniques in Wireless Sensor Networks.

REFERENCES:

1. Yick, J., Mukherjee, B., Ghosal, D., "Wireless sensor network survey" *Computer Networks* 52, Accepted in April, 2008, , pp. 2292-2330.
2. I.F. Akyildiz, W. Su., Y. Sankarasubramaniam, E. Cayirci, "A survey on sensor networks", *IEEE communications Magazine* 40 (8), Published in 2002, pp. 104-112.
3. Abassi, A., Younis, M., "A survey on clustering algorithm for wireless sensor network" *Computer Communications* 30, Published in June, 2007, pp. 2826-2841.
4. Kulkarni, R.V.; Forster, A.; Venayagamoorthy, G.K. *Computational intelligence in wireless sensor networks: A survey*. *IEEE COMMUNICATIONS SURVEYS & TUTORIALS*, Vol. 13, 2011, pp. 68-96.
5. Bharti, D., Behniwal, M., Sharma, A., K., "Performance Analysis and Mobility Management in Wireless Sensor Network", *International Journal of Advanced Research in Computer Science and Software Engineering*, Vol. 3, issue 7, Published in July, 2013.
6. Liu, H., Nayak, A., Stojmenovic, I., "Fault Tolerant Algorithms/Protocols in Wireless Sensor Networks." *Guide to Wireless Sensor Networks*. Springer London., 2009, pp. 261-291.
7. M. Yu., H. Mokhtar., "A Survey on Fault Management in Wireless Sensor Networks", ISBN, 2007.
8. A. Perrig, R. Szewczyk, V. Wen, D. Culler, J. D. Tygar. "SPINS: Security protocols for sensor networks." in *ACM MobiCom'01*. Rome, Italy: ACM Press, 2001
9. K. Farinaz., P. Miodrag., S. Alberto., "Fault Tolerance Techniques for Wireless Ad Hoc Sensor Networks." 2000.
10. Ann T. Tai, Kam S. Tso, William H. Sanders. "Cluster-Based Failure Detection Service for Large-Scale Ad Hoc Wireless Network Applications in Dependable Systems and Networks" *DSN '04*. 2004.
11. J. Sony., W. Bailing, P. Xiyar, Li Jianfeng and Zhong cheng, "A Recovery Based on Minimum Distance redundant Nodes Fault Management in WSNs," *International Journal of control and automation*, vol 6, No. 2 April 2013.
12. Intanagonwiwat, C., et al. "Directed diffusion for wireless sensor networking." *Networking, IEEE/ACM Transactions on* 11.1 (2003), pp. 2-16.

13. Asim, M., H. Mokhtar, and M. Merabti. "A Fault management architecture for wireless sensor network." *Wireless Communications and Mobile Computing Conference, 2008. IWCMC'08. International. IEEE, 2008.*
14. Asim, M., H. Mokhtar, and M. Merabti, "A cellular approach to fault detection and recovery in wireless sensor networks", *IEEE 2009 Third International Conference on Sensor Technologies and Applications.*
15. Akbari, A., and Neda B., "Cluster-based and cellular approach to fault detection and recovery in wireless sensor networks." *Advanced Computer Theory and Engineering (ICACTE), 2010 3rd International Conference on. Vol. 5. IEEE, 2010.*
16. Ho, J-H., et al. "A ladder diffusion algorithm using ant colony optimization for wireless sensor networks." *Information Sciences 192 (2012) pp.204-212.*
17. Shih, H-C., et al. "Fault node recovery algorithm for a wireless sensor network." *Sensors Journal, IEEE 13.7 (2013), pp. 2683-2689.*
18. A. Abbasi, M. Younis, and K. Akkaya, "Movement-assisted connectivity restoration in wireless sensor and actor networks," *IEEE Trans. Parallel Distrib. Syst., vol. 20, no. 9, Sep. 2009, pp. 1366–1379.*
19. M. Younis, S. Lee, S. Gupta, and K. Fisher, "A localized self-healing algorithm for networks of moveable sensor nodes," in *Proc. IEEE GLOBECOM, New Orleans, LA, Nov. 2008, , pp. 1–5.*
20. A. Abbasi, M. Younis and U. Baroudi, "Recovering from a Node Failure in Wireless Sensor-actor Networks with Minimal Topology Changes", *IEEE Transactions on Vehicular Technology, Vol. 62, No. 1, January 2013.*
21. S. Jessica, B. Dirk, D. Glenn, "Efficient Tracing of Failed Nodes in Sensor Networks." in *First ACM International Workshop on Wireless Sensor Networks and Applications.. Atlanta, GA, USA: ACM. 2002*

Production of urease enzyme from ureolytic yeast cell

Bharathi N* and Meyyappan RM

Bio-Electro Chemical Laboratory,

Dept of Chemical Engineering, Annamalai University, Annamalai nagar-608002

Tamilnadu, India

*bharibt@gmail.com

Abstract- The objective of the present study is investigated the potentiality of isolated soil yeast *C. Tropicalis*, which produce urease enzyme and their conditions were carried. Parameters for growth conditions were studied. Urease producing *C.tropicalis* was identified by urease test and CHROMagar medium. Urease enzyme Crystals were confirmed by microscopic and macroscopic view.

Introduction

Urease is a nickel dependent metalloenzyme which catalyzes the hydrolysis of urea to yield ammonia and carbamate, the latter compound spontaneously hydrolyzes to form carbonic acid and another molecule of ammonia. The best-studied urease is that from jack bean, which was identified as the first nickel metalloenzyme and urease from jack bean (*Canavalia ensiformis*) was the first enzyme to be crystallized. In 1926, James Sumner showed that urease is a protein. Urease is found in bacteria, yeast, and several higher plants. Urease is a cytosolic enzyme. Its major activity with some exceptions is associated with the soluble fractions of the cells. The best genetic data of plant ureases are available for soybean (*Glycine max*). Two urease iso-enzymes, a tissue-ubiquitous and embryo-specific encoded by two separate genes, as well as regulatory proteins encoded by unlinked genes were identified in soybean. The embryo-specific urease is an abundant seed protein in many plant species, including soybean, jack bean and *Arabidopsis*, while the other type of urease (called ubiquitous) is found in lower amounts in vegetative tissues of most plants. The enzyme urease occurs in a wide variety of tissues in humans, as well as in bacteria, yeasts, molds, plants and invertebrates. In 1926, Sumner was the first chemist who showed that urease was a protein of the globulin type with an iso-electric point of five.

Microbial urease: Microbial ureases hydrolyze urea to ammonia and carbon dioxide. There are many microbial sources for this enzyme including bacteria such as *Lactobacillus ruminis*, *Lactobacillus fermentum* and *Lactobacillus reuteri* and *Klebsiella aerogenes* and fungi such as *Rhizopus oryzae*. Filamentous fungi are the sources of about 40% of all available urease enzymes. Urease activity of an infectious microorganism can contribute to the development of urinary stones, pyelonephritis, gastric ulceration, and other diseases. In contrast to its pathogenic effects, microbial ureases are important enzymes in ruminant metabolism and in environmental transformations of certain nitrogenous compounds. Thus urease activities serve as an indicator of pathogenic potential and of drug resistance among some groups of bacteria (Banerjee and Aparna 2013).

Materials and methods

Candida tropicalis

From agricultural soil, sample was collected, using sterile water serially diluted and plated on

Sabouraud dextrose agar, *Candida tropicalis* colonies are cream colour with mycelial border. They are smooth, glabrous and yeast like in appearance.

Microscopic morphology shows spherical budding yeast like

No capsules present on Indian ink preparation.

Germ tube test shows negative, Hydrolysis of Urea shows positive, Growth on Cyclohexidine medium shows positive, Growth at 37⁰ C shows positive

On CHROM agar medium shows bluish purple color (Ainscough and Kibbler, 1998).

Urease test

The media composition for urease test are; urea (20g/l), Na₂HPO₄ (9.5g/l), KH₂PO₄ (9.1g/l), SD broth (0.1g/l) and 0.01g phenol. pH was made to 7. This test detects the ability of organism to produce urease enzyme. This enzyme converts urea to ammonia and CO₂, which convert the environment alkaline and turns pink colour referred as urease positive (Bharathi and Meyyappan, 2014).

Incubation period

Incubation was carried out for a time period ranging from 8 to 64 h with 8 h interval and the urease production was estimated

To determine the optimal pH for maximum urease, the production was tested ranging from 5 to 8 with the interval of pH 0.5. To know the optimal temperature for maximum urease, the production ranging between 20 to 40°C with the interval of 5°C. The effect of varying salt concentrations was checked between 5 to 50 ppt with the interval of 5 ppt since the strain is of marine origin.

Inoculum size Optimization of inoculum size with varying concentrations of addition 10 to 50 ml of $6-8 \times 10^7$ cells/ml is one important factor for maximizing urease production and time conception by earlier production.

Enzyme assay

In the semi-quantitative screening method, the enzyme production was evaluated by visual inspection of the phenol red color change caused by ammonia liberation in the culture tubes.

The amount of color change intensity was correlated to the enzyme production. In the quantitative urease assay, the enzyme activity in media supernatants and homogenized mycelia was measured by Weatherburn method [21] with some modifications, i.e. Na₂ HPO₄ was used instead of NaOH in alkaline hypochlorite solution and the 20 minute time for color development was elongated to 30 minutes. The reactions were done in micro tubes containing 100 µl of sample, 500 µl of 50 mM urea, and 500 µl of 100 mM potassium phosphate buffer (pH 8.0) in a total volume of 1.1 ml.

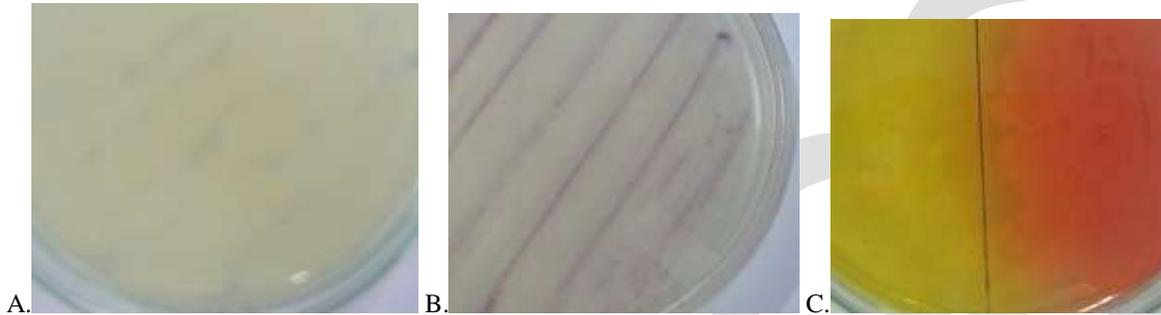
The reaction mixture was incubated in a shaking water bath at 37°C for 30 min. The reaction stopped by transferring 50 µl of reaction mixture to the tubes containing 500 µl of phenol-sodium nitroprusside solution (0.05 g sodium nitroprusside + 1 g phenol/100 ml distilled water). Five hundred micro liters of alkaline hypochlorite (3.56 g Na₂HPO₄ + 1 ml sodium hypochlorite + 100 ml distilled water) was added to the tubes, and incubated at room temperature for 30 min. Finally, the optical density of the color complex was measured at 630 nm against the blank (500 µl phenol nitroprusside sodium + 500 µl sodium hypochlorite + 50 µl distilled water) with a spectronic 20D + spectrophotometer and compared to a standard curve prepared with (NH₄)₂SO₄. Controls used for the enzyme reactions were reaction mixture without substrate and reaction mixture without incubation. One unit of urease activity was defined as the amount of enzyme liberating 1 µmol NH₃ from urea per minute, under the above assay conditions (Natarajan, 1995).

Results

The collected samples were serially diluted and plated on urea agar with pH 6.5 with phenol red pH indicator and incubated at 37°C for 48 h. After incubation, colonies showed pink colour are urease producers (that is) confirm hydrolysis of urea resulting ammonia, which forms an alkaline environment.

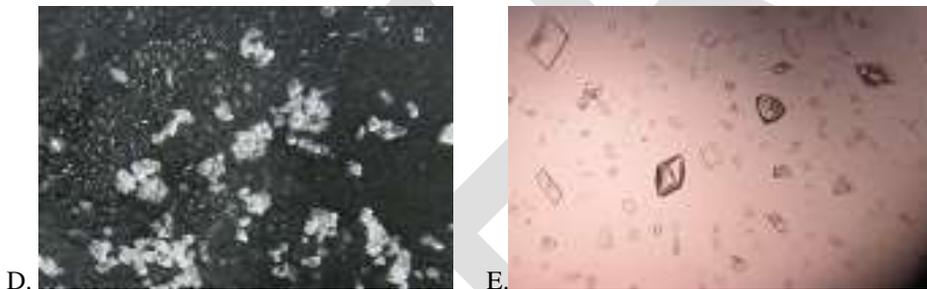
The isolated strains were identified as *Candida tropicalis*, strains were grown in urea broth and after incubation at 37°C for 48 h with pH 6.5, the broth was centrifuged and the cell free supernatant was used for phenol hypochlorite assay. Showed a maximum urease activity of 1.82U/ ml

Isolation of *Candida tropicalis* from soil

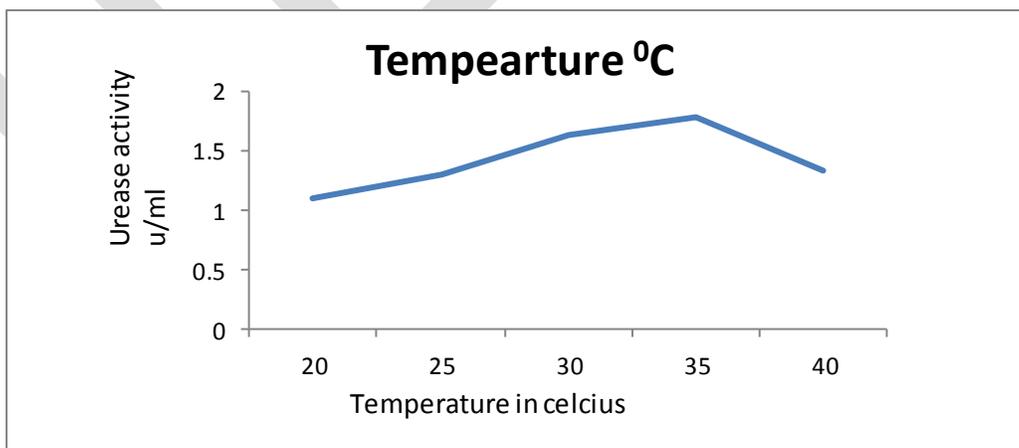
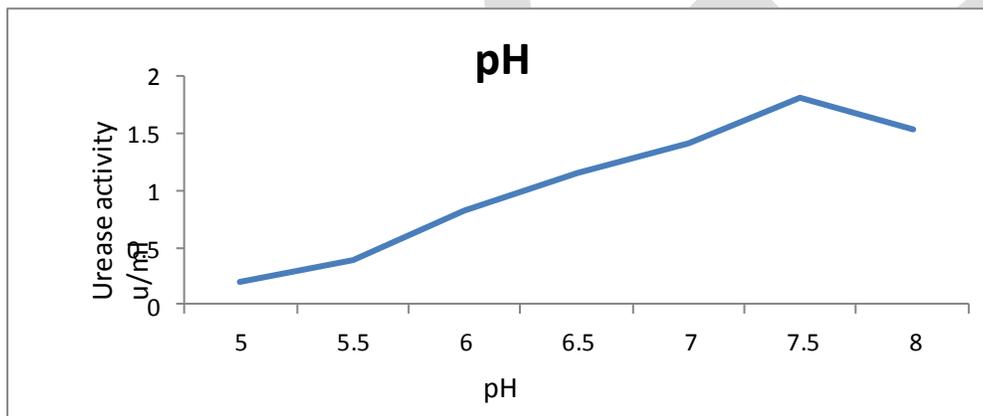
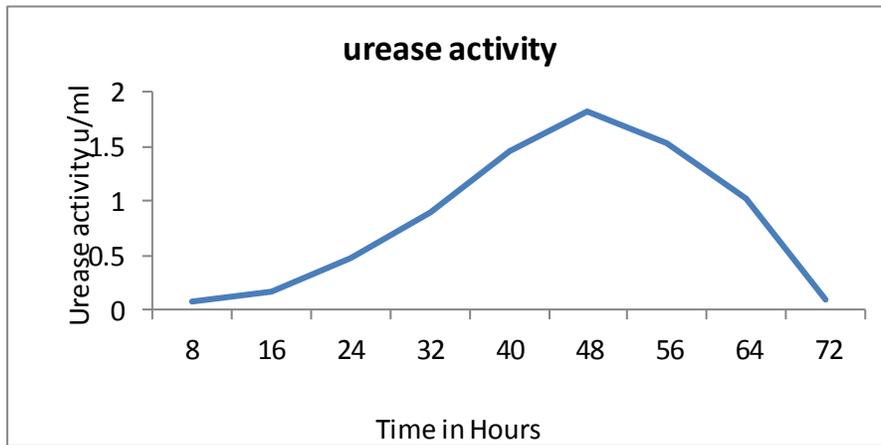


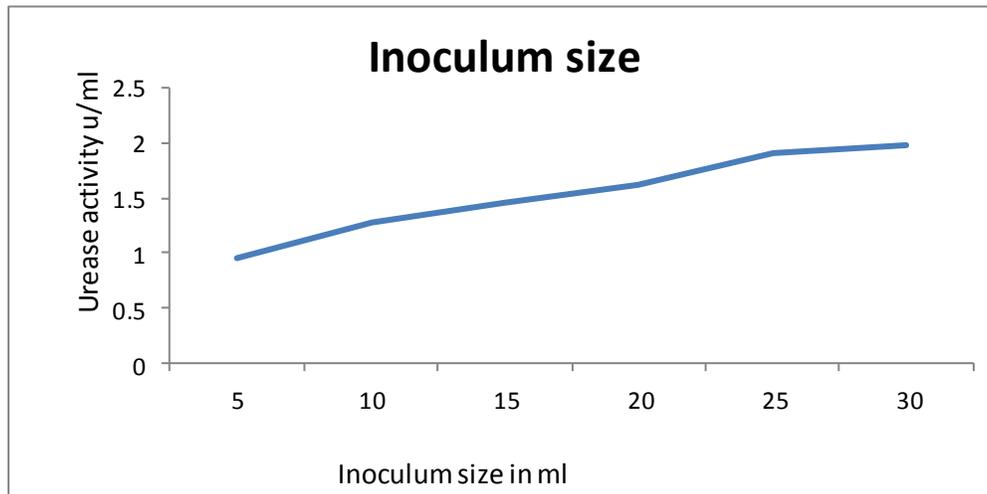
- A. Isolation of *C.tropicalis* from soil
- B. On CHROMagar medium shows bluish purple
- C. Urease positive

Crystallization of urease enzyme



- C. Macroscopic view of urease crystal
- D. Microscopic view of urease crystal





The carried above conditions favours Urease enzyme production sufficiently.

Conclusion

We conclude that the isolated soil yeast *C.tropicalis* can able to produce sufficient amount of urease enzyme for many applications. Under favourable conditions as period, pH, temperature for 48hrs, 7.5pH and 35⁰C respectively. Urease producing *Candida tropicalis* yeast cell was facultative sometimes. In agricultural field, they are capable for enzyme production and also favour soil texture and plant growth.

REFERENCES:

- [1] Banerjee Sujoy and Aggarwal Aparna Enzymology, Immobilization and Applications of Urease Enzyme *Int. Res. J. Biological Sci* Vol. 2(6), 51-56, 2013
- [2] Ainscough S and Kibbler C.C An evaluation of the cost-effectiveness of using CHROMagar for yeast identification in a routine microbiology laboratory *J.Med. Microbio.* 47 (623-628), 1998
- [3] Natarajan K.R Kinetic study of enzyme urease from *Dolichos biflorus* *J. Chem. Edu.* 72(556-557), 1995
- [4] Bharathi N and Meyyappan Rm Role of key factors on microbial calcium carbonate precipitation using isolated yeast strain *Int.Jr. of Chemtech. App.* Vol. 3, 3(11-19), 2014

Image data compression with CCSDS Algorithm in full frame and strip mode

Hardik Sanghani¹, Rina Jani²

¹Lecturer in Electronics and Communication department, Government Polytechnic Rajkot India

hardiksanghani19@gmail.com, M-9376871428

²Assistant Professor in Electronics and communication department, Government Engineering College Rajkot India

rina.ec@gmail.com

Abstract—Efficient sensor and detector at payloads creates large volume of data at high data rate. Amount of compression is essential to handle this situation. CCSDS (Consultative Committee for Space Data System) recommendation specifies image data compression standard that is based on DWT (Discrete wavelet transform) and BPE (Bit plane encoding). Objective of the paper is to analyze the performance of CCSDS image data compression algorithm for strip and frame mode. Algorithm suitable for the lossy and lossless both type of compression. The Recommendation supports two choices of DWT: an integer and a floating point DWT. The integer DWT is capable of providing lossless compression, and has lower implementation complexity. While floating point DWT provides improved compression effectiveness at low bit rates, but requires floating point calculations and cannot provide lossless compression. Algorithm supports 8,10,12,16 bit images. The compression scheme performs on a suite of test images acquired from spacecraft instruments. Simulation result shows 1st, 2nd and 3rd level DWT results. Compression ratio and different parameters are observed for this algorithm.

Keywords— Discrete Wavelet transforms, Image compression, CCSDS, Wavelets, Wavelet transform.

INTRODUCTION

With effective sensor and detector large amount of information to be collected, buffered, and transmitted. To help this situation CCSDS (consultative committee for space data segment) has developed the algorithm specific for the space application. Initially CCSDS has developed the lossless algorithm that is used for lossless compression only. Then it developed image data compression algorithm [6] that supports both loss less and lossy compression. CCSDS image data compression scheme is similar to the JPEG 2000 but it is differ in the some issues. Paper demonstrates CCSDS image data compression for the frame and strip mode . If entire image is compressed as one segment than it is frame mode while image is compressed in step by step is called strip mode. In strip mode as number of segments are more so more amount of header and footer is require than lengthen the code.

CCSDS ALGORITHM DESCRIPTION

DWT (Discrete Wavelet Transform)

Wavelets are used for CCSDS image data compression algorithm recommendation. Their irregular shape lends them to analyze signals with discontinuity's or sharp changes, while their compactly supported nature enables temporal localization of a signal's features.

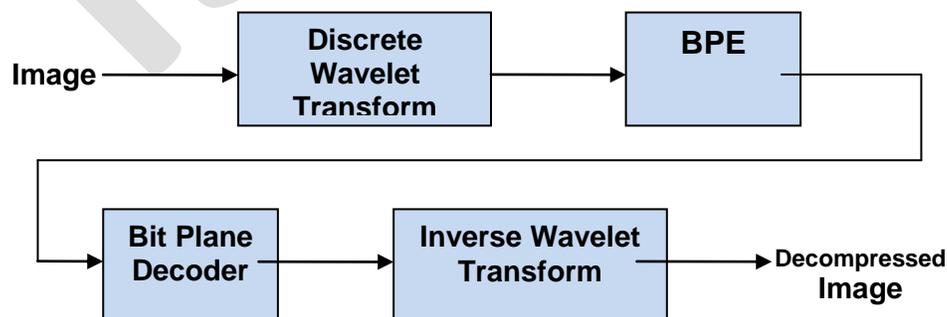


Fig-1 Algorithm

The recommended algorithm consists of two functional modules as depicted in Figure 1, a Discrete Wavelet Transform (DWT) module that performs decorrelation, and a Bit-Plane-Encoder (BPE) that encodes the decorrelated data. The wavelets Transforms can be interpreted in two ways. Vector space decomposition and Filter bank approach. The former one describes the wavelet transform as a projection of a signal onto a series of basis functions called the wavelet basis. Just like the Fourier series, where the signal is decomposed into trigonometric sine & cosine basis functions, the wavelet transform decomposes the signal into a basis called the wavelet.

FORMULATION

For preprocessing required by lossy and lossless compression, different methods and formulae are applied. For lossless compression Integer Discrete Wavelet Transform is applied whereas in Lossy compression Floating Discrete Wavelet Transform is applied. Also for this recommendation a three level transform of coefficients is done. These are explained as following. Both are done using 9/7 tap filters.

- **Integer Discrete Wavelet Transform (For Lossless Compression) Forward DWT**

In this case we do a non-linear approximation of 9/7 tap Integer DWT. Data is fed into the program in a row-wise fashion first then column-wise. A 1-dimensional wavelet transform maps a vector to a set of wavelet coefficients, one high pass set, D_j , and one low pass set C_j . This completes a one level forward Integer Discrete Wavelet Transform. This process is repeated two more times to achieve the required three-level wavelet transform of the image. The equations used to compute this transform are as follows. Here we have considered a row size of N and a row containing elements from 0 to $N-1$.

$$D_0 = x_1 - \left[\frac{9}{16} (x_0 + x_2) - \frac{1}{16} (x_2 + x_4) + \frac{1}{2} \right] \quad (1)$$

$$D_j = x_{2j+1} - \left[\frac{9}{16} (x_{2j} + x_{2j+2}) - \frac{1}{16} (x_{2j-2} + x_{2j+4}) + \frac{1}{2} \right] \quad \text{for } j = 1, 2, \dots, N-3 \quad (2)$$

$$D_{N-2} = x_{2N-3} - \left[\frac{9}{16} (x_{2N-4} + x_{2N-2}) - \frac{1}{16} (x_{2N-6} + x_{2N-2}) + \frac{1}{2} \right] \quad (3)$$

$$D_{N-1} = x_{2N-1} - \left[\frac{9}{8} (x_{2N-2}) - \frac{1}{8} (x_{2N-4}) + \frac{1}{2} \right] \quad (4)$$

$$C_0 = x_0 - \left[-\frac{D_0}{2} + \frac{1}{2} \right] \quad (5)$$

$$C_j = x_{2j} - \left[-\frac{D_{j-1} + D_j}{4} + \frac{1}{2} \right] \quad \text{for } j = 1, 2, \dots, N-1 \quad (6)$$

- **Floating discrete wavelet transform (for lossy compression) forward (analysis)**

In this case we do 9/7 tap Floating DWT. A 1-dimensional wavelet transform maps a vector to a set of wavelet coefficients, one high pass set, D_j , and one low pass set C_j . This completes a one level forward Discrete Wavelet Transform. This process is repeated two more times to achieve the required three-level wavelet transform of the image. The equations used to compute this transform are similar to those of convolution of the input signal with the filter. Hence the filter coefficients are to be specified as well. The coefficients for forward transform are known as analysis filter coefficients and are stated in table 1.

Table -1: Filter coefficient

i	Analysis Filter Coefficients	
	Lowpass Filter h_i	Highpass Filter g_i
0	0.852698679009	-0.788485616406
± 1	0.377402855613	0.418092273222
± 2	-0.110624404418	0.040689417609
± 3	-0.023849465020	-0.064538882629
± 4	0.037828455507	

And the equations used are as follows

$$C_j = \sum_{n=-4}^4 h_n x_{2j+n} \quad j=0,1, \dots, N-1 \quad (7)$$

$$D_j = \sum_{n=-3}^3 g_n x_{2j+n+1} \quad j=0,1, \dots, N-1 \quad (8)$$

In the above equations h_n is the set of low pass filter coefficients and g_n are the set of high pass coefficients.

BPE(bit plane encoder)

The BPE takes DWT coefficient data from the DWT coefficient buffer, encodes coefficient data, and places the encoded output in the compressed data stream. The wavelet coefficients are either rounded to the nearest integer (when the floating-point transform has been used), or scaled using the weighting factors (when the integer transform has been used). The Bit Plane Encoder (BPE) processes wavelet coefficients in groups of 64 coefficients referred to as blocks. A block is the basic building unit in BPE coding. A block loosely corresponds to a localized region in the original image. Information pertaining to a block of coefficients is jointly encoded by the BPE. A block consists of a single coefficient from the LL3 sub-band, referred to as the DC coefficient, and 63 AC coefficients. The AC coefficients in a block are arranged into three families, F_0 , F_1 and F_2 .

Structure of the coded segment

Segment header: Four types of segment headers are specified in the recommendation. Header 1 is mandatory and remaining parts are optional. Header mainly include the compression option.

Quantized representation of DC coefficient information: simple differential coding method can be used to exploit inter-block correlation among DC coefficients. Rice code algorithm is used for the differential coding.

Bit depths of AC coefficient blocks: the BPE encodes the sequence of BitDepthAC of the different blocks. The value of BitDepthACBlock m indicates the number of bits needed to represent the largest magnitude of AC coefficient in the m^{th} block. Figure 2 represent how the block is formatted from the DWT coefficient.

Bit planes of AC coefficients: The last step of the BPE stage is bit-plane coding of the AC coefficients. Each wavelet coefficient is represented in binary using one sign bit and R-1 bits to specify the magnitude. Here, R represents the maximum number of bits that may be needed to represent a DWT coefficient, and thus R is not a parameter that can be arbitrarily set by the user, but rather the value of R is determined by the image pixel bit depth and choice of DWT employed.

RESULTS

- **Results for full frame compression**

Number of blocks per segment can be controlled in CCSDS-IDC. There are S number of blocks in the segment. Choice of S affects the memory requirement, robustness to data errors and compression effectiveness. Image with width W and height H generates $\lceil W/8 \rceil \cdot \lceil H/8 \rceil$ DWT coefficient blocks. The blocks can be thought of as an array with width $\lceil W/8 \rceil$ and height $\lceil H/8 \rceil$. When block size $s = \lceil W/8 \rceil \cdot \lceil H/8 \rceil$ entire image is compressed as a single segment and that compression is called full-frame compression

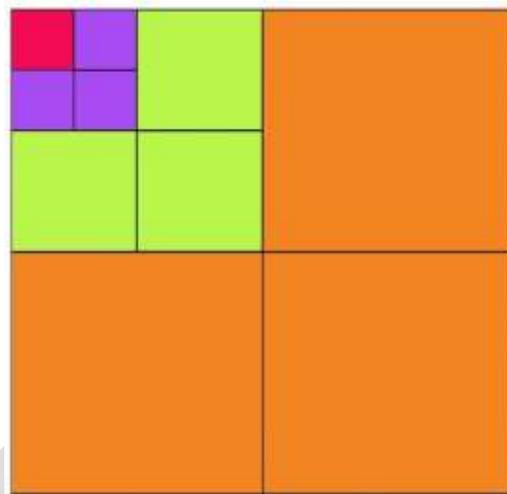


Figure: Example of Frame compression

- **Results Strip compression**

When segment size $S = \lceil W/8 \rceil$ each image is loosely corresponds to a thin horizontal strip of image. This is called strip compression. This type of compression is suitable for the push-broom type of sensors. Advantage of strip compression is that there is no need to store a complete frame of image. thus it can lead to memory efficient implementation that is convenient to push-broom sensors

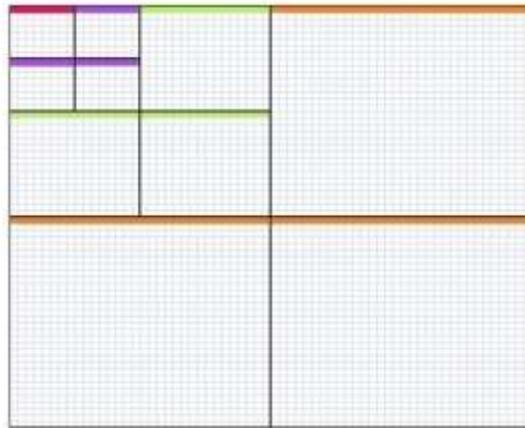


Figure: Example of Strip compression

Table 2: Result for Lossless full frame compression

Serial No	Image name	Segment size	Bit depth	CR	RMSE	PSNR	PPM
1	Moon	4096	8	1.4	0.4	57	89
2	Ocean	16384	10	3.2	1.04	66	75.5
3	Foc	4096	12	5.5	0.98	72.57	85
4	Sunspot	4096	12	2.3	0.1	92.24	99
5	Europa	4096	16	1.8	0	inf	100
6	Galaxy	4096	8	1.5	0.54	82.13	88
7	Spiral	4096	8	2.1	0.74	77.13	90
8	Mars	4096	8	1.3	0.01	94	96

Table 3: Result for Lossy full frame compression

Serial No	Image name	Segment size	Bit depth	CR	RMSE	PSNR	PPM
1	Moon	4096	8	1.58	1.01	46.54	63
2	Ocean	16384	10	3.42	1.5	56	65.40
3	Foc	4096	12	5.69	1.0	72	71.95
4	Sunspot	4096	12	2.56	1.7	43.49	61.58
5	Europa	4096	16	1.93	1.22	94.03	65.68
6	Galaxy	4096	8	1.82	1.14	45.13	67.7
7	Spiral	4096	8	2.3	0.2	54.18	86.99
8	Mars	4096	8	1.5	1.04	80	85

Table 4: Result for Lossless strip compression

Serial No	Image name	Segment size	Bit depth	CR	RMSE	PSNR	PPM
1	Moon	64	8	1.52	1.18	45	62
2	Ocean	256	10	3.32	1.58	55	64
3	Foc	128	12	5.58	1.07	68	70.1
4	Sunspot	64	12	2.54	1.76	42.15	60
5	Europa	64	16	1.67	1.2	93	64
6	Galaxy	64	8	1.6	1.09	44.13	65
7	Spiral	64	8	2.2	0.5	52.12	85
8	Mars	64	8	1.2	0.54	92	95

Table 5: Result for Lossy strip compression

Sr. No	Image name	Segment size	Bit depth	CR	RMSE	PSNR	PPM
1	Moon	64	8	1.52	1.18	45	62
2	Ocean	256	10	3.32	1.58	55	64
3	Foc	128	12	5.58	1.07	68	70.1
4	Sunspot	64	12	2.54	1.76	42.15	60
5	Europa	64	16	1.67	1.2	93	64
6	Galaxy	64	8	1.6	1.09	44.13	65
7	Spiral	64	8	2.2	0.5	52.12	85
8	Mars	64	8	1.2	0.54	92	95

CONCLUSION

Paper shows the method used for the image data compression for spacecrafts. Algorithm use the Discrete wavelet transform. It gives better results than DCT. Algorithm is suitable for the Lossless as well as lossy compression techniques. Interger and floating point arithmetic is used for the lossless and lossy compression respectively. Result table shows the result for the lossless as well as lossy compression for the frame compression and strip compression. For frame compression entire image is compressed in a single segment while in strip compression strip by strip compression is performed. There is trade off between the selection of strip based and frame based compression. Minimum value of $S=16$. If the segment size is very small, total number of segment in the image will be large and it will degrade the compression effectiveness. Because the larger number of header are there but if any one segment is lost then there is considerable loss of information. while in strip based compression if any one segment is lost there is small amount of loss. Thus selection of frame based and strip based compression depends on the memory requirements. number of headers are included with each segment.

REFERENCES:

1. Pen-shu Yeh, Phillippe Armbruster, Aaron Kiely, Bart Massschelein, Gilles Moury, Christoph Schaefer, Carole Thiebaud, "The new CCSDS image compression recommendation" Proc. Of the IEEE Aerospace Conference, pp,1-7 big Sky, MT, March 2005.
2. Pen-shu Yeh , Jack Venbrux, "High Performance Image data compression Technique for Space application. in: NASA Earth Science Technology Conference, Maryland, USA, 2003.
3. M. Carbal, R. Trautner, R. Vitulli, C.Monteone, "Efficient Data Compression for Space craft including Planetary probes", IPPW-7 S/C incl. PP – 2010.
4. Michael W. Marcellin, Michael J. Gormish, Ali Bilgin, Martin P. Boliek," An Overview of JPEG-2000", Proc. of IEEE Data Compression Conference, 2000.
5. C.Chysafis and A.Orgeta. "Line based. Reduced memory, Wavelet image compression." IEEE Transaction on image processing 9,march 2000,issue-3.
6. Consultative committee for space Data Systems, Image Data compression, nov-2005, ser, Blue Book CCSDS 122.0-B-1.
7. Consultative committee for space Data Systems, Image Data compression CCSDS120.1-G-1, 2007, Washington DC:CCSDS. USA .Green book

Effectiveness of Magnetic Abrasive Finishing Process over Buffing Process for surface finish of Brass component

R.Gill¹, Dr. Sehijpal Singh²

¹Assistant Professor, Department of Mechanical Engineering, Chandigarh Engineering College, Mohali, Punjab, India
rajgill4u@gmail.com.+919781992727

²Professor & Head, Department of Mechanical Engineering, Guru Nanak Dev Engineering College, Ludhiana, Punjab,, India

ABSTRACT- Magnetic Abrasive Finishing (MAF) Process is one of Non-Conventional Processes in which a mixture of non-ferromagnetic abrasives and ferromagnetic iron particles is used to do finishing operation with the aid of magnetic force. The trapped iron particles and abrasives is called Flexible Magnetic Abrasive Brush (FMAB), which when given relative motion against a metal surface, polishes that surface. The major studies concerning MAF have been done regarding the behaviors of the process under the effect of various parameters like working gap, mesh number of abrasives, speed of relative motion etc. but limited study on effectiveness of MAF over existing conventional Processes such as buffing. This paper has aim of development of Magnetic Abrasive Finishing Process & evaluate for surface finish of Brass material keeping in view the performance of buffing process, The results indicates that MAF has capability to get required surface finish with low speed over buffing with competitive machining time

Keywords: Magnetic abrasive finishing, Buffing, Surface Finish, Flexible Magnetic Abrasive Brush, MAF, Iron particles

1. INTRODUCTION

1.1 Conventional Finishing Process (Buffing)

These processes use multipoint cutting edges in the form of abrasives, which may or may not be bonded, to perform cutting action. Buffing is one of the most common, technically buffing uses a loose abrasive applied to the work wheel known as mops are either made from cotton or wool cloth using medium to hard pressure. Buffing may be done by hand or grinder or specialized equipment to convert rough surface into a smooth one

1.2 Non-Conventional Finishing Process (MAF)

A magnetic abrasive finishing process is defined as a process by which material is removed, in such a way that the surface finishing and deburring is performed with the presence of a magnetic field in the machining zone. The working gap between the work piece and the magnet pole is filled with magnetic Abrasive particles (MAP), composed of ferromagnetic particles and abrasive powder which is prepared by sintering process. The magnetic abrasive particles attract each other along the lines of magnetic force and form a flexible magnetic abrasive brush (FMAB) between the work piece and the magnetic pole and behaves like a multi-point cutting tool.

In external finishing of cylindrical surface, the cylindrical work piece rotates between the magnetic poles, with the MAP filled in both the gaps on either side (Fig 1.1). Whereas in internal finishing of cylindrical surface, the work piece rotates between the magnetic poles and the MAP (Fig. 1.2)

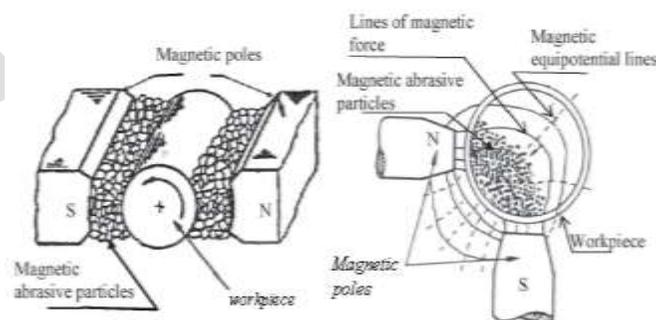


Fig-1.1 External cylindrical finishing Fig 1.2. Internal cylindrical finishing

2. LITERATURE REVIEW

The effective way of changing the force/finishing pressure and rigidity of MAFB is through the change in diameter “D” of magnetic abrasive particle. Hence, ferromagnetic particles of several times the diameter of diamond abrasive “d” are mixed to form the magnetic abrasive brush. Pressure increases with increase in flux density and decreases as the clearance gap between tool & work-piece increases. Larger the particle size, poorer the finishing at higher is the stock removal which increases linearly with finishing time [1].

The surface roughness is predicted as a function of finishing time by a model that has been derived from the removed volume of material. Thus, it is possible, from the surface-roughness model, to predict the time when existing scratches are completely removed [2]. The magnetic force acting on the magnetic abrasive, controlled by the field at the finishing area, is considered the primary influence on the abrasive behavior against the inner surface of the work-piece. [3].

With increase in working gap, the percentage improvement in surface roughness increases initially, reaches a maximum value and then it starts decreasing [4]. Removal of burrs in large surfaces with drilled holes using MAF shown that this method can be applied both for ferromagnetic and non-magnetic parts. This method can be improved as applied to new tasks of deburring [5].

The unbounded magnetic abrasive is a mechanical mixture of Sic -abrasive and ferromagnetic particles with a SAE30 lubricant. Iron grit and steel grit, three particle sizes were prepared for both and were used as ferromagnetic particles, each of them being mixed with 1.2 and 5.5 μm Sic abrasive, respectively. Results indicate that steel grit is more suitable for magnetic abrasive finishing because of its superior hardness and the polyhedron shape [6]. Important parameters influencing the surface quality generated during the MAF were identified as: (i) voltage (DC) applied to the electromagnet, (ii) working gap, (iii) rotational speed of the magnet, and (iv) abrasive size (mesh number). [7].

Efficient finishing of magnesium alloy is possible by the process. The volume removed per unit time of magnesium alloy is larger than that of other materials such as brass and stainless, that is, high-efficiency finishing could be achieved. Micro-burr of magnesium alloy could be removed easily in a short time by the use of MAF [8].

MAF process creates micro scratches having width less than 0.5 μm on the finished surface by the shearing of the peaks resulting in circular lays formed by the rotation of the FMAB. It shows that the finished surface has fine scratches which are farther distant apart resulting in smoothed surface. But these fine scratches would also disappear by using higher mesh number (finer abrasive particles) [9]. A new technique was developed to compare the performance of the magnetic abrasive powders and to find the powder that is appropriate for finishing and deburring of drilled holes placed on a plane steel surface [10]. In addition to deburring, efficiency influence to surface roughness is analyzed. To improve the surface roughness and purity, volume of powder, height of gap, inductor rotational frequency, feed velocity and the method of coolant supply are analyzed and proved that the continuous flow of coolant and the Fe powder without abrasive is effective for deburring and surface quality. [11]

3. EXPERIMENTAL SET-UP

3.1 Buffing Process Equipment

Machine setup for the experiments is considered from the Buffing section of Industry. The main equipment used in the process is buffing machine. The tool used with machine is cylindrical fine abrasive laden cloth buff wheel. The work piece (Brass) is held by operator in hands and force it against the rotating buffing wheel whose speed is 3500 r.p.m. All the inspection is done by the operator visually. The additional data of buffing machine is given in Table no 1.1

Table: 1.1-Data regarding Buffing Equipment

Type of Motor	3 phase A.C
Type of tool	Buff Wheel
Dia of wheel	12 inches

Material of wheel	Cotton cloth
Speed of wheel	3500 r.p.m

3.2 Magnetic Abrasive Finishing

Fundamental requirements of the experimental set-up are:

- A. Magnetization unit
- B. Electromagnet
- C. *Rotary Motion Unit*
- D. Magnetic Abrasives
- E. Specimen & Material

A. Magnetization Unit

Basic purpose of magnetization unit is to generate magnetic field to assist the finishing process. Main parts of magnetization unit are –

- D.C. Power supply
- Electromagnet

A variable DC supply is needed to changes the magnetic field strength. It ranges from 1 ampere to 15 amp and a very low voltage (0 to 220V) The diode is used to convert AC to DC supply with the help of bridge rectifier, which can supply a current up to 10 amp without any damage. Capacitor is used at outlet to get pure DC.

B. Electromagnet

As per literature survey, the magnetic field should vary with the help of variable D.C supply from 2KG to 12 KG between the clearance of electromagnet pole and work piece for best performance. Area of magnetic core is proximately 1200 mm² and the diameter of magnetic core is 36.65 mm and length is 24.7cm. Yoke is prepared from mild steel, which is suitably ground to adjust with platform. The detail is given in Table no 3.2 and figures no 1.3

TABLE 1.2 Dimensions of Electromagnet

Maximum Flux Density	12KG
Diameter of magnetic core	3.69cm
Cross-sectional Area of Magnetic Core	10.70cm ²
Cross section of core	1200mm ²
Material of core (pipe)	Aluminum
Thickness of core (pipe)	1.2mm
Diameter of core (pipe)	36.9mm
Length of Core (Pipe)	24.7cm
Material of Core ends	Bakelite
Coil turns (each side):	1800

Material of coil wire:	Enameled copper (17SWG)
Current Range of wire	0- 5 Ampere
Voltage range of wire	0-3 volts
Diameter of Wire	1.7mm (17 gauge)
Angel between two poles:	180 degree

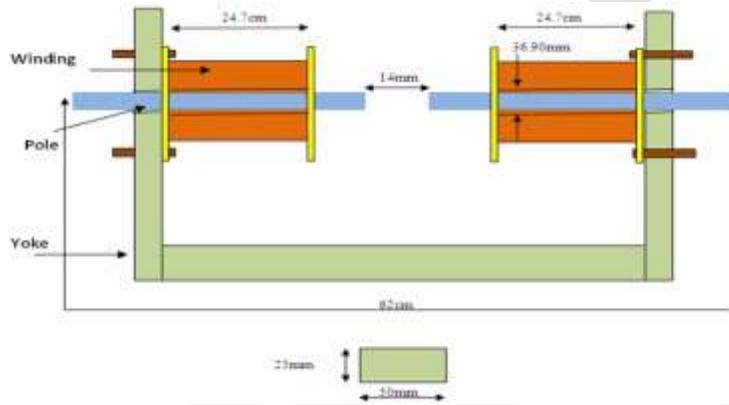


Fig 1.3- Detail Diagram of MAF Setup for external cylindrical finishing

C. Rotary Motion Unit

Variable D.C motor is used to rotate the work piece in between two poles. Motor has 3- jaws chuck to hold the job to get the relative motion between work piece and FMAB.

D. Magnetic Abrasives

In the present work sintered magnetic abrasives are used. The mixture of iron particles and Al₂O₃ is sintered and heat treated. After that the solid mass is crushed to get required size of abrasives. From the literature survey, it was found that 60-100 grit size is most suitable size of magnetic abrasive for finishing brass material. Grit Size 60 was selected for experimentation.

E. Specimen & Material

One of the tap cap of Brass being manufactured by industry has been used as the specimen for the present work. Cap has one handle that is used to move manually as shown in figure no 1.4

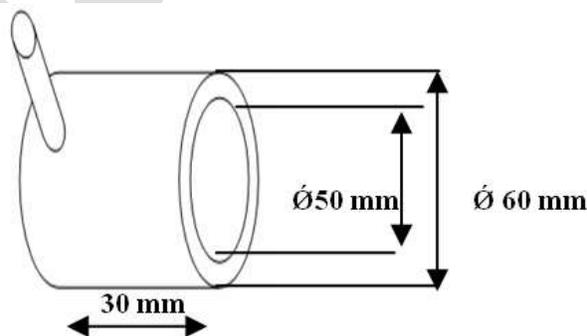


Fig 1.4 Detail of Tap cup

Brass is common for household building materials such as lock sets and door hinges, made from a combination of copper and zinc with other alloys often added for strength and/or additional corrosion resistance. (Yellow Brass has a ratio of roughly 70% Copper and 30% Zinc). The relatively low melting point of 1560 to 1725 °F makes it good for both casting and machining.

4. EXPERIMENTAL PROCEDURE

4.1. Buffing Process

In the first set of present experimental work, around 30 components were taken to observe the performance parameters and response parameters such as surface finish after fine grinding process. Ten work pieces with small variation in surface finish are selected for further buffing process. In the industry, buffing is done by operator manually so there were variations in the accuracy. Measurements about surface finish and weight were taken after buffing. Further variation in values is considered as final acceptable range. The other observations related to buffing machine setup is given table no 4.1

Table: 1.3- Additional Data for Buffing

Cost of machine	Rs 50,000/-
Cost of Tool	Rs 1200/-
Life of Tool	2 days
Speed of Tool	3500 r.p.m
Working Environment	Pollutant, unhealthy
Noise Level	High

4.2. Magnetic Abrasive Finishing Process (MAF)

The experiments were conducted according to following steps-

Twenty work pieces were taken from the industry which was ground by surface grinder to give all the work pieces almost same initial recommended surface roughness value.

1. After the grinding process, the work pieces were manually cleaned by acetone to remove the foreign particles from the work surface. Initial surface roughness values were measured. Surface finish was measured by using 'Citizen cy 510 surf analyzer' (least count up to 0.001 μm).
2. To conduct the surface finish experiments, after the grinding, the work piece was mounted on the MAF machine chuck. The work piece was made perpendicular to the electromagnet pole to maintain proper gap between them.
3. On supplying current to the electromagnet, it gets energized and the Magnetic Abrasive Particles (MAPs) fill between the electromagnet and work piece. The MAPs get aligned along the magnetic lines of forces making Flexible Magnetic abrasive Brush (FMAB). By giving rotation to the work piece, this FMAB behave like multi cutting tool and performs the actual finishing operation on cylindrical portion with length of 30 mm on job.
4. After completing the finishing operation, work piece was again cleaned and final surface roughness.

4.2.1 Selection of parameters for experimentation

The following three effective parameters has been taken for conduct of experiment on MAF

1. Current
2. Machining Time
3. Circumferential speed of work piece.

The ranges of the values of the variable parameters selected from available literature and on the basis of capabilities of experimental setup shows the range of variables and values of constant parameter respectively constant in Table 1.4 & 1.5

Table 1.4 Variable parameters and their ranges

Parameter	Range of Values
Current	2 Amp to 10 Amp
Machining Time	1 mins to 3 mins
Circumferential Speed of Work Piece	200 rpm to 1500 rpm

Table 1.5 Fixed parameters and their value

Parameter	Value
Gap	1. mm
Grit size	60#
Abrasives used in MAP	Sintered (Al ₂ O ₃ + Iron)
Work-piece	Cylindrical Brass
Percent of oil in MAP	2 %

Response Surface Methodology (RSM) was used to conduct & analyses the experimental work that can be used for either process improvement or determination of optimal conditions of various industrial processes in no of possible experimental situations to represent independent factors in quantitative form.

4.2.2 Response Characteristics

The effect of selected process parameters was studied on the following response characteristic of MAF process:

Percentage Improvement in Surface Roughness (ΔRa)

The surface roughness before and after the machining operation was measured with Mitutoyo Roughness tester and calculated with the formula given below:-

$$\Delta Ra = \frac{(\text{Initial roughness} - \text{final roughness}) \times 100}{\text{Initial roughness}}$$

5. OBSERVATIONS

5.1 Buffing

Surface Finish and metal removal were measured on ten work pieces and recorded in Table 1.6. The speed of Buffing was fixed 3500 r.p.m. The operator was asked to do buffing as per his judicious judgment. The operator took time to the prevailing practice. There was 15 % variation of buffing time for ten specimens. Max & Min time taken by the operator was 2.43 mins & 2.00 mins respectively. The max % age improvement in Ra is 86% with machining time 2.34 mins. Surface finish varies from **0.2 μ m -to- 0.6 μ m**. The decision about the rejection of the work piece is taken by visual inspection.

Table 1.6: Observations for Surface Finish (Ra)

Ex. No	Buffing Time (mins)	Surface finish before Buffing (μ m)	Surface finish After Buffing (μ m)	% Age Imp (Ra)

1	2.02	1.0	0.23	77%
2	2.00	1.5	0.32	78%
3	2.30	1.1	0.22	80%
4	2.34	1.2	0.34	86%
5	2.5	1.2	0.21	82%
6	2.1	1.5	0.63	60%
7	2.4	1.2	0.45	62.5%
8	2.32	1.5	0.5	68%
9	2.33	1.3	0.3	76%
10	2.43	1.3	0.2	84%

It is observed that the selection criteria of product in the industry after buffing depend upon the surface finish. So the range of Recommended surface finish under which the work piece get approval is **0.2 μm -to- 0.6 μm** at the speed of 3500 r.p.m.

5.2 Magnetic Abrasive Finishing

Observations for Surface Finish are obtained for standard combination of process parameters by using RSM analyzed by the Design expert v. 8 software. By putting the range values of the process parameters namely current, speed of work piece and machining time, we obtained the combinations of three parameters shown in Table no 1.7

Table 1.7: Observations for Surface Finish (Ra)

Exp No	Current (Amp)	Machining Time (min)	Speed (r.p.m)	Surface Finish Before	Surface Finish After	ΔRa
1	3.62	1.41	463.51	1.0	0.7	30%
2	8.38	1.41	463.51	1.5	0.5	66%
3	3.62	2.59	463.51	1.1	0.4	63%
4	8.38	2.59	1236.49	1.2	0.7	41%
5	3.62	1.41	1236.49	1.2	0.7	41%
6	8.38	1.41	1236.49	1.6	0.3	80%
7	3.62	2.59	1236.49	1.2	0.5	58%
8	8.38	2.59	1236.49	1.6	0.2	87%
9	2.00	2.00	850.00	1.3	1.0	23%
10	10.00	2.00	850.00	1.3	0.6	54%
11	6.00	2.00	850.00	1.5	1.0	33%
12	6.00	3.00	850.00	1.3	1.0	23%
13	6.00	2.00	1500.00	1.2	0.9	25%

14	6.00	2.00	850.00	1.6	0.7	56%
15	6.00	2.00	850.00	1.5	1.0	33%
16	6.00	2.00	850.00	1.3	0.8	38%
17	6.00	2.00	850.00	1.4	0.9	35%
18	6.00	2.00	850.00	1.2	0.8	33%
19	6.00	2.00	850.00	1.4	1.0	28%
20	6.00	2.00	850.00	1.4	0.9	35%

It is observed that the max %age improvement in Ra is 87 % with machining time 3.00 minutes at the speed of 1236 rpm. Experiment no 2,6,10 shows that the surface finish within the recommended range, obtained at the speed 463 rpm, 850 rpm and 1226 rpm with max 80 % improvement Ra with same or less time as compared to buffing process

6. RESULTS & DISCUSSIONS

6.1 Effective Analysis of Process Parameter on Response

All the three individual parameters current, speed of work piece, machining time in MAF have significant effect on the surface roughness as shown from three dimensional views shown in fig 7.1. It can be seen that as the current increases (from 3.62 amp to 8.38 amp) resulting increase in the %age improvement in surface roughness (ΔRa). In case of Machining Time, as the time increases (from 1 minutes to 3 minutes), the %age improvement in surface roughness (ΔRa) increases. Machining time and current have higher contribution to ΔRa . Due to high current, rigid brush of abrasives that is why more surface finish. Optimization of MAF setup can be done by controlling these effective process parameters for specific application

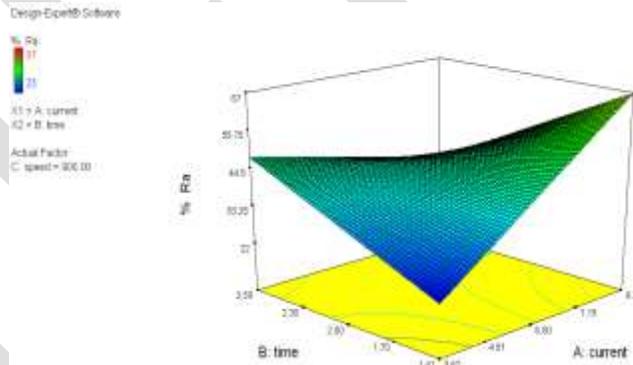


Fig: - 1.4 Comparison of required rotational speed for Buffing & MAF to get Ra ((0.2 μm -to- 0.6 μm))

7. COMPARITIVE EVALUATION FOR SURFACE FINISH

7.1 Rotational Speed

It is observed that the range of Recommended surface finish under which the work piece get approval for electroplating is 0.2 μm -to- 0.6 μm at the speed of 3500 r.p.m. Experiments on MAF were conducted to get same recommended surface finish value. As

per the experiment no 2,6,10 from the table no: 6.2, It is observed that the surface finish within recommended range can be obtained with low speed of work piece (463rpm).

85% reduction in speed is possible to get same level of finish on the component. So MAF has capability to get required surface finish with low speed over buffing for less than 2 minutes machining time as shown by Figure no 1.5

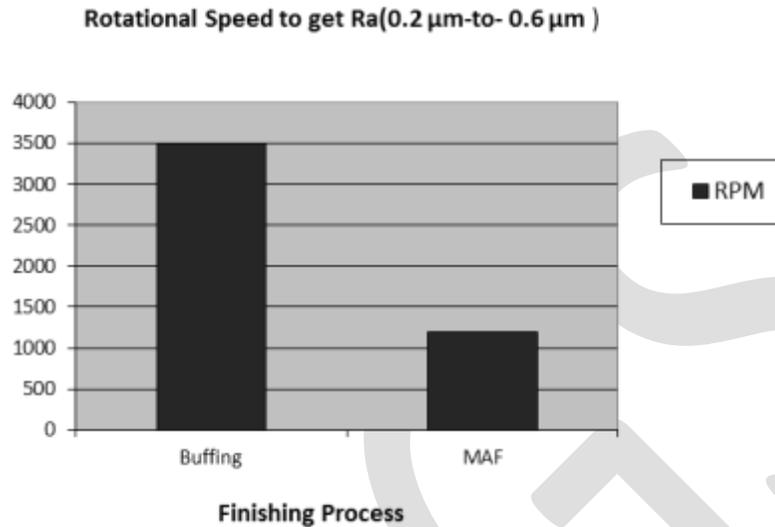


Fig: - 1.5 Comparison of required rotational speed for Buffing & MAF to get Ra ((0.2 μm-to- 0.6 μm)

7.2 Machining Time

From the table no 6.2, It can be seen that to get required surface finish, operator takes machining time from 2 min to 2.5 min at the speed of 3500 r.p.m. Experiments on MAF were conducted to get same recommended surface finish value. As per the experiment no 2,6,10 from the table no: 5.2. It is observed that the surface finish within recommended value can be obtained with almost same machining time as taken during buffing, This factor shows the production rate capability of MAF same as Buffing. as shown in figure no 1.6 From table no:-1.7, it observed that 12 experiments out of 20 experiments , produce the surface finish close to recommended value , when machining time is not consider as mandatory factor to maintain.

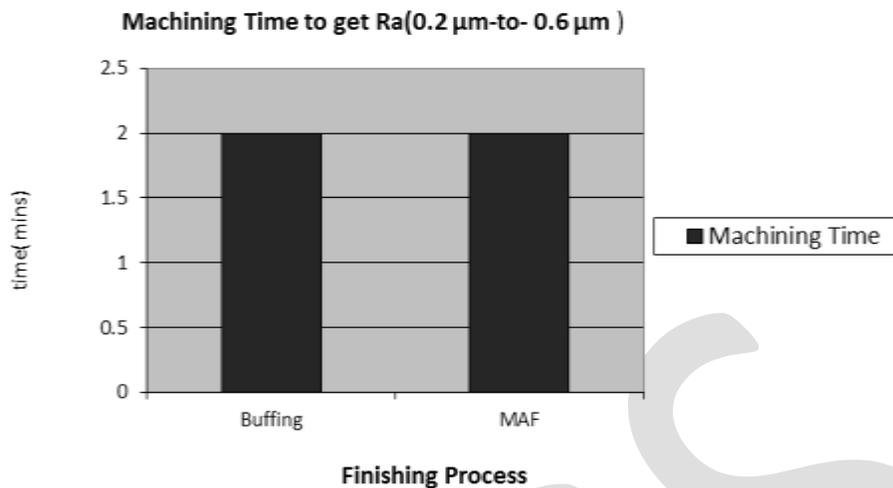


Fig: - 1.6 Comparison of Machining time for Buffing & MAF to get Ra ((0.2 μm-to- 0.6 μm)

CONCLUSIONS

Experimental results indicate that MAF is better than buffing as regards to reduction of operating speed of the motor in MAF for same required surface finish range (**0.2 μm-to- 0.6 μm**)

REFERENCES:

- [1] Jain V.K, "Advance Machining Processes" Allied Publishers Pvt. Ltd. 2002
- [2] Jeong-Du Kim , Min-Seog Choi "Simulation for the prediction of surface-accuracy in magnetic abrasive machining" Journal of Materials Processing Technology 53 (1995) pp 630- 642
- [3] Hitomi Yamaguchi*, Takeo Shinmura "Study of an internal magnetic abrasive finishing using a pole rotation system Discussion of the characteristic abrasive behavior" Journal of the International Societies for Precision Engineering and Nanotechnology 24 (2000) 237–244
- [4] Singh Dharendra K., Jain V. K. and Raghuram V. "Parametric study of magnetic abrasive finishing process" Journal of Materials Processing Technology Volume 149, Issues 1-3 , 10 June 2004, Pages 22-29
- [5] Singh Dharendra K., Jain V. K. and Raghuram V, R. Komanduri (2005) "Analysis of surface texture generated by a flexible magnetic abrasive brush" Published by Elsevier
- [6] Singh Dharendra K., Jain V.K. and Raghuram V. and Kamanduri R (2005) "Analysis of Surface Texture Generated by a Flexible Magnetic Abrasive Brush", Wear, 259, pp. 1254-1261.
- [7] Singh Dharendra K., Jain V.K. and Raghuram V.(2006) "Experimental Investigations into Forces Acting During a Magnetic Abrasive Finishing Process", Int. J Adv Manuf Technol, 30, pp. 652-662.
- [8] Shaohui Yin,Takeo Shinmura (2004) "Vertical vibration-assisted magnetic abrasive finishing and deburring for magnesium alloy" International Journal of Machine Tools & Manufacture 44 , pp 1297–1303
- [9] Yuri M.Baron ,Sung Lim Ko, Elena Repnikova, Experimental Verification of Deburring by Magnetic Abrasive Finishing Method, (2001)

- [10] Geeng-Wei Chang, Biing-Hwa Yan ,Tzong Hsu , Study on cylindrical magnetic abrasive finishing using unbonded magnetic abrasives, International Journal of Machine Tools and Manufacture Volume 42, Issue 5 , April 2002, Pages 575-583
- [11] Y. M. Baron , S. -L. Ko and J. I. Park, Characterization of the Magnetic Abrasive Finishing Method and Its Application to Deburring, Key Engineering Materials Vols. 291-292 (2005) pp. 291-296
- [12] S.L. Ko, Yu M. Baron and J.I. Park , Micro deburring for precision parts using MAF, Journal of Materials Processing Technology ,Volumes 187-188, 12 June 2007, Pages 19-25

IJERGS

An Experimental Study of Dual Mass Flywheel on Conventional Flywheel on Two stroke petrol engine.

N. N. Suryawanshi¹, Prof. D. P. Bhaskar²

¹M.E. Design, S.R.E.S Kopergaon.

nikhil23031992@gmail.com, 8275257897.

²Associate Professor in Mechanical Engineering Department, S.R.E.S Kopergaon.

Abstract-The Dual Mass Flywheel (DMF) is primarily used for dampening of oscillations in automotive power trains and to prevent gearbox rattling. We explained detailed initial model of the DMF dynamics is presented. This mainly includes the two arc springs and two masses in the DMF and their behavior. A experimental the DMF model is compared to convention flywheel. Finally the observation of the engine torque using the DMF is discussed. For this purpose the DMF is manufactured and done experiment or testing to see the results. And then results are compare with the conventional flywheel.

Keywords-Spring mass flywheel, concept, experimental study, techniques.

INTRODUCTION

There are two schools of thought concerning light flywheels. The first is that they do not contribute to power output. The second is that they do. Which thought is correct? In fact both, in a way, are correct.

If we measured the power output of an engine first with light flywheel and then again with the standard part on an engine dyno, no change in power will be seen to occur. At first it appears that the light flywheel has done nothing and was a total waste of cash. This is not the case. A dyno that shows max power at constant revs does not demonstrate what happens to an engine's power output in real life situations - like acceleration. If an engine is accelerated on a dyno (we are talking about a rate of around 2000rpm a second) it would show a power output of around 20%-25% less than at the constant rev state.

The reason for this is that when accelerating a vehicle the engine not only has to push the total mass of the car but the internal components of the engine need to be accelerated also. This tends to absorb more power as the extra power is used accelerating the internal mass of the engine components and is why a motor accelerating on a dyno will produce less power than at constant revs. Also it must be remembered that the rate of acceleration on the engine internals is much greater that the rest of the car. This would then suggest that by lightening the flywheel, less power would be required to accelerate it and therefore more power would be available to push the car along.

All engines have flywheels or weighted crankshafts that balance out compression and power strokes, maintain idle, aid starting and reduce component wear. If the flywheel is too light the motorcycle requires more effort to start, idles badly, and is prone to stalling. Weight is not the important factor here, but inertia. Inertia is stored energy, and is not directly proportional to flywheel weight. It's possible to have a light flywheel with much more inertia than a heavier flywheel. Any power the motor develops must accelerate the flywheels before leaving the sprocket shaft, and any used in bringing the flywheel up to speed is not available at the rear wheel. This will not show up on a steady-state or rear wheel dyno or simple desk-top dyno program, but is detectable in a transient dyno that accelerates the engine at a specific rate (300 or 600 RPM per second are common).

Flywheel inertia is stored when you rev the engine slightly before letting the clutch out - this small amount of extra power helps in getting the motorcycle underway with minimal effort. By "borrowing" power for a few seconds, the engine has to develop less to move from a standing start. Once the clutch is completely engaged, inertia can no longer be borrowed - the motorcycle can only use what it produces in "real time".

In any event, except for when the clutch is slipped all flywheel weight reduces acceleration.

Thus it is safe to interpret from above discussion that the flywheel inertia plays a major role in vehicle optimized performance and by suitable modifying the flywheel mass of flywheel can be reduced by still maintaining the inertia.

The arrangement of the dual mass flywheel is an suitable answer to the above problem statement where in the inertia is increased using two set of masses phased opposite to each other .

LITERATURE REVIEW

1. Ulf Schaper, Oliver Sawodny, Tobias Mahl and Uti Blessing

They explain the DMF along with its application and components. Afterwards a detailed model of the DMF dynamics is presented. This mainly includes a model for the two arc springs in the DMF and their friction behaviour. Both centrifugal effects and redirection forces act radially on the arc spring which induces friction. The numerical method is used to measure model validation.^[1]

2. Bjorn Bolund, Hans Bernhoff, Mats Leijon

This paper explains the use of flywheel. Nowadays flywheels are complex construction where energy is stored mechanically and transferred to and from the flywheel by an integrated motor or generator. The wheel has been replaced by a steel or composite rotor and magnetic bearings have been introduced. By increasing the voltage, current losses are decreased and otherwise necessary transformer steps become redundant.^[2]

3. Jordan Firth, Jonathan Black

This paper explains the vibration interaction in a multiple flywheel system. Flywheels can be used for kinetic energy storage. In this paper one unstudied problem with vibration interaction between multiple unbalanced wheel. This paper uses a linear state space dynamics model to study the impact of vibration interaction. Specifically, imbalanced induced vibration inputs in one flywheel rotor are used to cause a resonant whirling vibration in another rotor. Vibration is most severe when both rotors are spinning in the same direction.^[3]

PROBLEM STATEMENT

The engine's ignition-induced rotational speed irregularity causes torsional vibration in the vehicle's driveline. At a given speed the ignition frequency is equal to the natural frequency of the driveline so that extremely high vibrations amplitudes occur that causes transmission rattle and body boom. Also more mass increases the cost of DMF.

FINDING

In the planetary dual mass flywheel, the planetary gear and the torsional damper are incorporated into the flywheel. For this purpose, the flywheel is divided into a primary and a secondary mass, hence the name exists planetary "dual mass flywheel". Rattle and booming noise are now a thing of the past which is rectified by DMF. Again By reducing the mass and keeping the Inertia factor same we will be able to optimize the Dual mass flywheel giving the better results than that of conventional flywheel.

EXPERIMENTAL TECHNIQUES

Effect Of Increased Inertia Of Dual Mass Flywheel-

The effect of inertia augmentation can be seen by the difference in the fluctuation of energy in the Dual mass flywheel and the Conventional flywheel

Let, Maximum fluctuation of energy of Dual mass flywheel = $\Delta E_{dmf} = m R^2 \omega_{dmf}^2 C_s$

Where, m = mass of flywheel = 1.9 kg

R = Mean Radius of rim = 68 mm = 0.068

ω_{dmf} = mean angular speed of dual mass flywheel

$$= 2\pi (N_1 + N_2)/2 = 2\pi (1430 + 930)/2$$

$$\omega_{dmf} = 7414 \text{ rad/sec}$$

C_s = Coefficient of fluctuation of speed = $(N_1 - N_2) / N$

Where $N = (N_1 + N_2)/2 = 1180$

$$C_s = (1430 - 930) / 1180 = 0.423$$

$$\Delta E_{dmf} = m R^2 \omega_{dmf}^2 C_s$$

$$= 1.9 \times 0.068^2 \times 7414^2 \times 0.423 = 204.27 \text{ KJ}$$

Maximum fluctuation of energy of Conventional flywheel = $\Delta E_{cnv} = m R^2 \omega_{cnv}^2 C_s$

Where, m = mass of flywheel = 1.9 kg

R = Mean Radius of rim = 68 mm = 0.068

ω_{cnv} = mean angular speed of dual mass flywheel

$$= 2\pi (N_1 + N_2)/2 = 2\pi (1315 + 910)/2$$

$$\omega_{cnv} = 6990 \text{ rad/sec}$$

$C_s = \text{Coefficient of fluctuation of speed} = \frac{N_1 - N_2}{N}$

Where $N = \frac{(N_1 + N_2)}{2} = 1112$

$C_s = \frac{1315 - 910}{1112} = 0.364$

$\Delta E_{cnv} = m R^2 \omega_{dmf}^2 C_s$

$$= 1.9 \times 0.068^2 \times 6990^2 \times 0.364 = 156.25 \text{ KJ}$$

Effectiveness (ϵ) = $\frac{\Delta E_{dmf}}{\Delta E_{cnv}} = \frac{204.27}{156.25} = 1.30$

Thus the Dual mass flywheel is 1.3 times effective than the Conventional flywheel.

Observations:

a) Conventional mount

ENGINE SPEED = 1300 rpm

Engine Power = 205 watt

Sample calculations:

a) Output Torque = $W \times 9.81 \times \text{Radius of dyno- brake pulley}$

$$\text{Top} = 4 \times 9.81 \times 0.032 = 1.26 \text{ N-m}$$

b) Output power = $2 \pi N \text{Top} / 60$

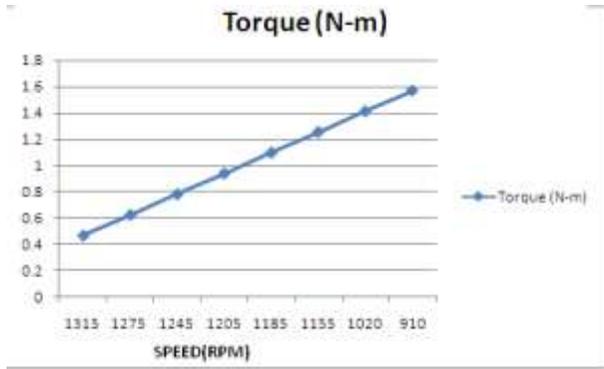
$$\text{Pop} = 2 \pi \times 1155 \times 1.26 / 60 = 152.39 \text{ watt}$$

c) Efficiency = $(\text{Output power} / \text{Input power}) \times 100 = (152.39 / 205) = 74.33$

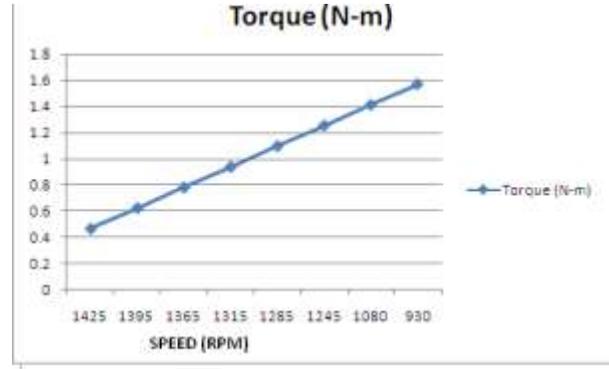
RESULT TABLE

Sr. No	Load(gm)	Speed	Torque	Power	Efficiency	Acceleration(m ² /s)
1	1500	1315	0.47088	64.85163408	31.63494345	31.5
2	2000	1275	0.62784	83.8386144	40.89688507	40
3	2500	1245	0.7848	102.3324264	49.91825678	50
4	3000	1205	0.94176	118.8535651	57.97734884	63
5	3500	1185	1.09872	136.3610405	66.51758072	80
6	4000	1155	1.25568	151.8958426	74.09553296	100
7	4500	1020	1.41264	150.9095059	73.61439313	125

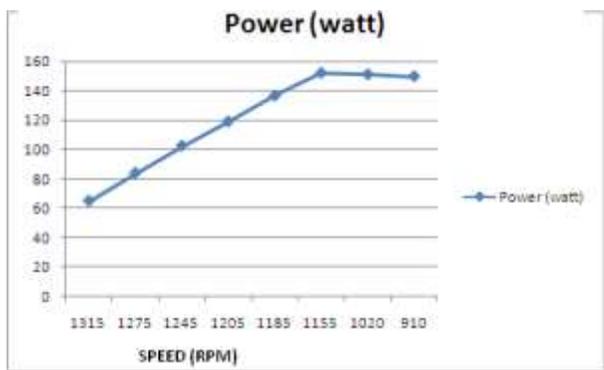
Graph of Torque Vs Speed for Conventional Flywheel



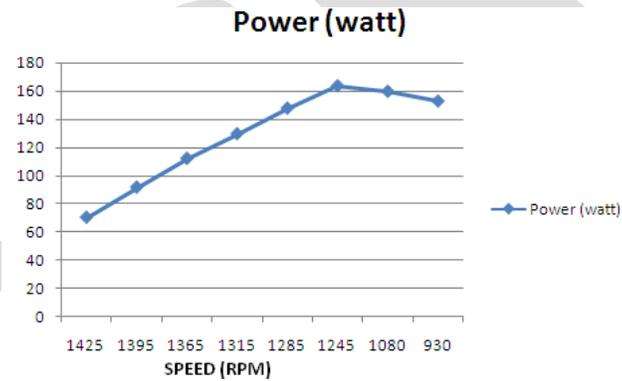
Graph of Torque Vs Speed for Dual mass Flywheel



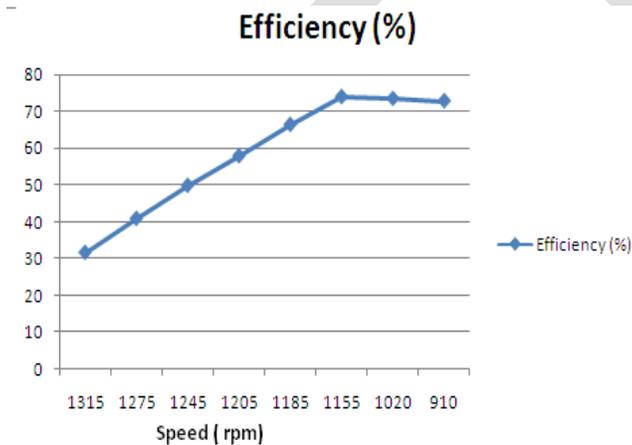
Graph of Power Vs Speed for Conventional Flywheel



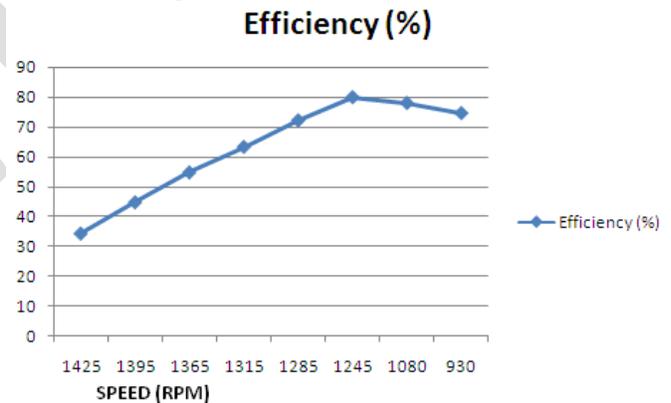
Graph of Power Vs Speed for Dual mass Flywheel



Graph of Efficiency Vs Speed for Conventional Flywheel

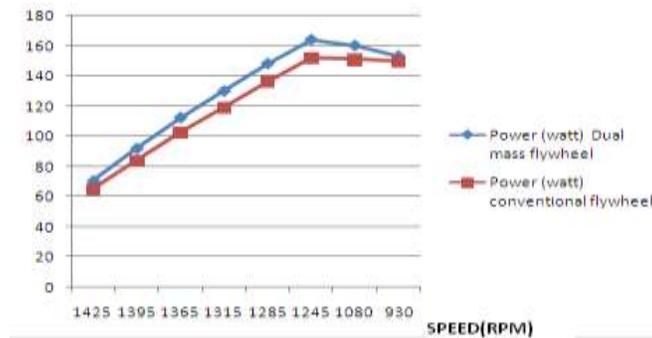


Graph of Efficiency Vs Speed for Dual Mass Flywheel



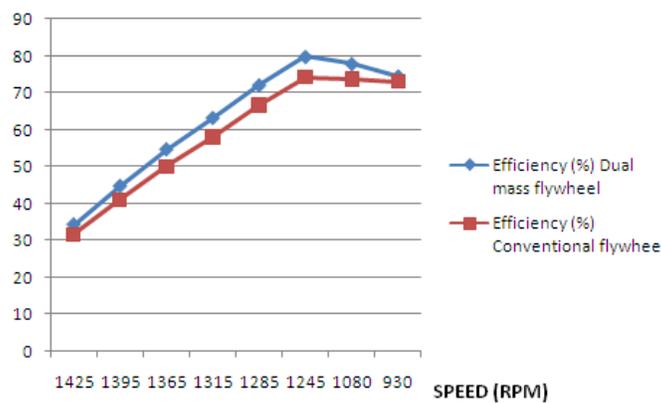
CONCLUSION

1) Comparison of Power output of Conventional and Dual mass flywheel-



i) It is observed that there is approximately 7 to 8 % increase in power output by using the Dual mass flywheel.

2) Comparison of Efficiency of Conventional and Dual mass flywheel-



ii) It is observed that the Dual mass flywheel is 5 to 6 % efficient than the conventional flywheel which will also result in increasing fuel economy of the engine.

REFERENCES:

1. Ulf Schaper, Oliver Sawodny, Tobias Mahl And Uti Blessing, "Modeling And Torque Estimation Of An Automotive Dual Mass Flywheel", American Control Conference, 2009.
2. Bjorn Bolund, Hans Bernhoff, Mats Leijon, "Flywheel Energy And Power Storage Systems", Renewable And Sustainable Energy Reviews, 11(2007) 235-258.
3. Jordan Firth, Jonathan Black, "Vibration Interaction In A Multiple Flywheel System", Journal Of Sound And Vibration, 331(2012) 1701-1714.
4. Paul D. Walker*, Nong Zhang, "Modelling Of Dual Clutch Transmission Equipped Powertrains For Shift Transient Simulations", Mechanism And Machine Theory, 60 (2013) 47-59.
5. Li Quan Song, Li Ping Zeng, Shu Ping Zhang, Jian Dong Zhou, Hong En Niu, "Design And Analysis Of Dual Mass Flywheel With Continuously Variable Stiffness Based On Compensation Principle", Mechanism And Machine Theory, 79(2014) 124-140.
6. Manuel Olivaresa, Pedro Albertosb "Linear Control Of The flywheel Inverted Pendulum", ISA Transactions 53(2014) 1396-1403

Design and Implementation of Rapid Searching Framework for Relational Database

Ms Sonam Borhade¹, Prof. Pankaj Agarkar²

1. PG student of Computer Engineering, Dr. D.Y Patil School of Engineering Lohegaon, Pune, India,

borhade.sonam@gmail.com, 8600646751

2. Prof. Pankaj Agarkar, Dr. DYP School of Engineering Lohegaon, Pune, India, pmagarkar@gmail.com.

Abstract— Information explosion opens a challenge for researcher in information retrieval and search. As emergence of digital repositories and information explosion there is clear need of technique to organize information. This need day by day attracts researchers to give better techniques in area of information retrieval and search for large database. Organizations depend on relational database for transaction processing and they prefer selection operation to process in large database. Therefore, when data goes beyond few million records selection operation take lot of time to process such database. In this operation, indexes build on columns and if there are number of tables then it require more time to process whole transaction and result in performance degradation. Searching framework must be nice choice for this kind of transaction processing.

Apache LUCENE is nowadays most widely used popular searching framework found in many applications. Toward this end, paper addresses shortcomings of selection operation: the clear need to faster record fetching from big database and offload selection work and with that, it suggests one alternative as LUCENE Indexing. Here we implemented fast searching framework with help of lucene for relational database. Records searched in lucene and then used in mysql for further transaction. Performance of both mysql search and lucene search get evaluated.

Keywords— Performance Evaluation, Information Retrieval and Search, Lucene Indexing.

INTRODUCTION

Nowadays emergence of digital libraries and information exchange in information technology area there is clear need for improved techniques to organize large quantities of information. Organizations mostly use relational database for transaction processing, which use selection operation for searching records. However, if data goes beyond few million records selection operation take more time to process such data to retrieve records from large dataset and put load on database. To do good performance it requires more number of servers on price of increased licensing cost. Searching framework is one nice choice to search records in such case. To offload selection work from database and to achieve faster record retrieval experience there is need of better searching framework. As relational database require in organizations for transaction processing, cannot replace it with searching framework. So here clear need of an external searching framework, which helps to achieve better performance on selection and sequential search for relational database. Apache LUCENE is nowadays most widely used popular searching framework used in many applications. This paper focus on LUCENE technology which well known for its searching capabilities. Records searched in LUCENE and then used in database.

Main objective of this work is to study LUCENE technology for indexing data and using this technology to implement searching and indexing of 1 million files from raw content set. Resulting index optimized for searching. Raw content set is a collection of user's information. Purpose of this work is to allow users a convenient full text search method and evaluate performance of relational database and LUCENE indexing to analyze which give best results. As discussion focused on LUCENE technology, some question has come in to mind that what is actually LUCENE? Why choose LUCENE as solution? Moreover, how it is suitable for our need? Therefore, reminder discussion gives answer of these questions.

A. What is LUCENE?

LUCENE originally written by Dough Cutting and is now licensed under Apache software license [3]. A common misconception with LUCENE is, it is ready to use search application. In fact, LUCENE is an information retrieval library entirely written in java a free open source project. LUCENE is scalable and high performance IR library for full text indexing and searching and can add easily to any application. We can build application on top of LUCENE [3]. LUCENE having several built in analyzers, which handle spell correction, compound words, case sensitivity. For fast record retrieval it first index available data then apply search on index. . LUCENE is format independent so it can index and search files available in any format. For indexing it, extract text from data available in any format. To achieve better search results parsing and analysis play a supplementary role with indexing and searching [3,4]. LUCENE stores indexing internally in documents form, documents contain fields internally and every field have field name. Every field name having value associated with it [3]. Document contains multiple fields. To search, search on field of documents. Therefore, when we add database entries, each row treated as document and document as fields. Every document stored by unique document id. For searching in LUCENE document Id is required. LUCENE provides only document IDs for searching. Document Id

also used to retrieve document. The document IDs are unique but not permanent. We can add documents and delete documents entries. Therefore, IDs for deleted documents do remain unused. LUCENE periodically performs compression of index. In compression, LUCENE collects document IDs of deleted documents for reuse, where document IDs change, that is why one cannot depend on LUCENE document IDs.

B. Why Choose LUCENE?

Rather than LUCENE, there are technologies available like Xpian, which is search engine library written in C++, Minion is a search engine written in java from Sun Labs, Egothor is much similar to LUCENE, is java library for full text indexing and searching. However, all of them are not suitable for this proposed work and not able to customize and build in existing application. In addition, solr from apache LUCENE project is open source search platform for enterprise. This is for web based project and based on LUCENE for indexing. Solr can be nice choice in future cause easily migrates from LUCENE to solr. LUCENE is promising choice for this proposed work because apache developer's community writes it entirely in java that used widely and supported therefore we are using LUCENE.

C. How LUCENE suitable for proposed work?

As discussed in above lines about what is LUCENE we found answer of our third question is that searching is where LUCENE is strong. Therefore, to build external searching framework it is better suitable for our need. We are using Apache LUCENE framework to provide searching facility [1]. We are trying to evaluate the framework in which the records searched in LUCENE [2], and then they used in database operations. Performance of both LUCENE indexing and database operation evaluated for performance. Therefore, LUCENE is better suited for our need. In this paper, searching module used as plugin to evaluate performance. In addition, we can use this in existing projects.

RELATED WORK

We surveyed some real world search applications mentioned below which switched toward lucene to achieve better searching and working superb until now.

A. NetFlix [3]

NetFlix is one of the open source search application designed by Reed Hastings. This application offer movies on very less rent and without late fee. Idea of NetFlix was born because of video stores asking for too much rent and late fee. NetFlix powered by solr, which is LUCENE search server. Fuzzy search can add in LUCENE [4], in NetFlix fuzzy search added to LUCENE. LUCENE provide auto-completion feature in NetFlix for movie names as well as spelling correction of misspelled actor names. When user enters query NetFlix suggests movie titles, which are relevant to query. For this application, LUCENE regularly index and search millions of movie records in sub seconds and free from licensing cost.

B. Monster [3]

Monster is very well known job and carrier search engine used worldwide. Monster posts number of jobs any one time. Up to 2008 monster having 150 million resumes in its database and per month, 63 million job seekers served. Today, approximately 300 to 400 queries have been running on 40 milliseconds of average response time. To provide better service to both customers and employees and to stay in market monster have requirements like: High volume of data management, Need to maintain constant updates of inventory, Need to provide faster results on users query, Refine search for end users without any performance degradation ,Overcome technology barriers which limit information scope, Security concerns to maintain users privacy. Integrate scalable and flexible approach. To complete such increasing need monster uses LUCENE is as solution. LUCENE makes clusters of high volumes data to reduce size of index. For faster results of query LUCENE, use real time indexing here for freshers. To enable refined search LUCENE gives faceted search and 'single click' filters. LUCENE having intuitive search capabilities that helps for deeper searching of resumes and jobs browsing. In addition, it provides security controls for users information management and having unlimited scalability and customization based on open source software.

C. LinkedIn [3]

Linked in have challenges: To manage varying database where every second new users join and add their profiles, Achieve real time indexing of unstructured data, Providing immediate response to query in crucial hours, Giving linguistic support and institutive browsing, easy integration to different platforms like web 2.0 tools to make user profiles which takes data form number of sources. Therefore, to overcome such challenges LinkedIn chose LUCENE as solution to implement search. LUCENE provides index segmentation through which large data managed by limiting index base and achieve faster response for query. Here LUCENE provides faceted search through some advanced features like auto completion of contacts and better view of search. LUCENE give relevant records that are helpful here which sort between users profile and profiles, which does not match to that profiles and give result in sub seconds. LUCENE provide solution by integrating with recent web tools, which gives flexibility; for example can add videos in search results.

D. U.S Food and Drug Administration [3]

Food and Drug Administration (FDA) is one agency in Health and Human Services department under U.S government. This agency control and inspect safety of medical foods, veterinarian products, cosmetics and tobacco. FDA has big library of information in which many records available from optical character recognition to recent digital formats. So to manage such kind of information, FDA switched to semantic mining framework using LUCENE. Major requirement of FDA was to integrate petabytes of data available in different intranet of enterprises. Therefore, in such situation LUCENE is providing way to search across different enterprise repositories and detect data duplication. Here LUCENE's Content Analysis and query analysis algorithm help fast and relevant record retrieval. Filter in LUCENE manage security and access control policies. By using Lucene integration is possible with existing enterprise infrastructure to reduce TCO.

E. MUFIN [5]

In 2011, research accomplished to integrate LUCENE search in MUFIN [5]. The primary purpose was to study LUCENE technology and implement content-based image retrieval for indexing large data. MUFIN is existing Multi feature indexing network has basic requirement to organize available 100 million collection of image based on CoPhIR data set. Therefore, by using LUCENE, user interface built for users and integrated into existing MUFIN website.

There are many indexing types available in LUCENE [6] basic types are NIO FS Directory, Simple FS Directory, and RAM Directory. Indexes stored in actual system through Simple FS Directory. This is useful for large indices. NIO FS Directory stores index to hard disk through JAVA IO API. RAM Directory is way to store all indexes in RAM. This is suitable for smaller indices that can be fully loaded in memory and destroyed after termination of application. As the index held in memory, it is comparatively faster [7]. Search results in LUCENE shown in relevant manner and first it gives relevant results. In this present work for transaction processing all records are required. Therefore, we do not need relevance. For multiple fields search, LUCENE search queries used. Research in [8] gives new approach to access information, which solves problem where user required to submit whole query and to find information from results users always face try and see approach. Author proposes interactive fuzzy search through which system able to search on the fly as user types keywords of query. Small input errors neglected.

PROGRAMMER'S DESIGN

A. Schematic Representation of Proposed Work

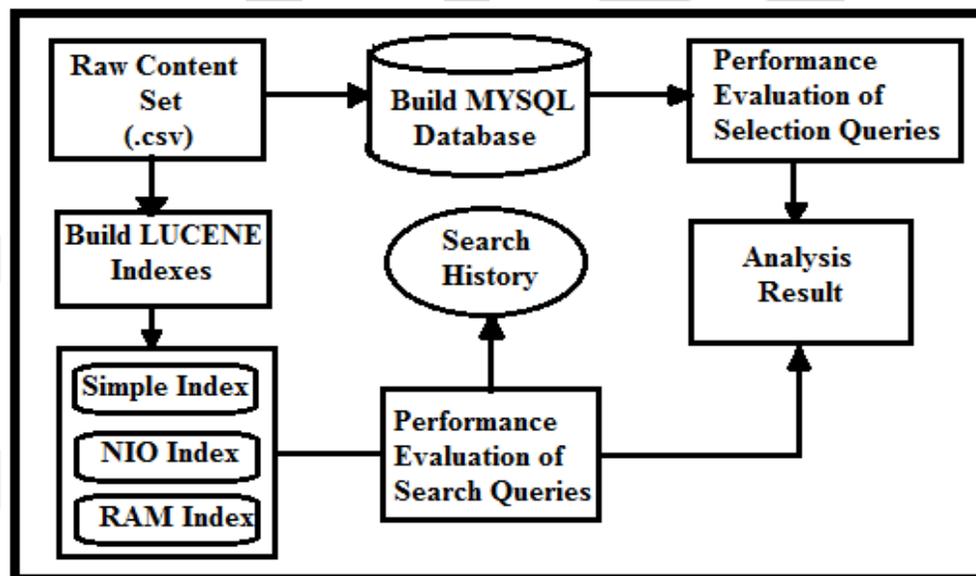


Figure1. Evaluation Workflow

In this proposed work, our focus on performance evaluation of LUCENE indexes and MYSQL database for record fetching experience. In addition, here we are trying to give better alternative for selection operation held in large database to search records faster. Therefore, indexing from apache LUCENE used, with that we are building three LUCENE indexes and will test them with different records to check which suitable for our purpose. At the same time, we are also building MYSQL database and will test it. Searching Module will apply on both database and LUCENE Indexes and search history will maintain. For outcome, performance of both LUCENE indexes and MYSQL database will compare and generate results.

Architecture of proposed work consists four major phases in first phase creation of MYSQL database and LUCENE indexes from available raw content. Then search for records on LUCENE indexes and MYSQL database. Then performance evaluation will be on LUCENE indexes and MYSQL database. In Fourth phase, all the outcomes of MYSQL database and LUCENE indexes analyze for results.

B. Mathematical Model

System:

$S=System$

$S=I, O, BD, BLI, PED, PEL, R$

Input to System:

$I=RF$

$RF=Raw\ File\ Input.$

Output:

$O=DB, SI, NI, RI, R$

$DB=Relational\ Database$

$SI=Simple\ File\ System\ Directory\ Index.$

$NI=NIO\ File\ System\ Directory\ Index.$

$RI=RAM\ Directory\ Index.$

$R=Analysis\ Result.$

Functions:

$BD(RF) RF \rightarrow DB$

Build MYSQL database from raw data.

$BL(RF) RF \rightarrow SI, NI, RI$

Create LUCENE Indexes from raw data.

$PED(DB, Q) DB, Q \rightarrow Td$

Achieve query time (performance measure) for selection queries from MYSQL database.

$PEL(SI, NI, RI, Q) SI, NI, RI, Q \rightarrow Tl$

Achieve performance measure in LUCENE for distinct indexes.

$A(Td, Tl) Td, Tl \rightarrow R$

Make Analysis Result from two performance measures.

We are evaluating the performance of record retrieval from apache LUCENE indexes with relational database. Using LUCENE, one can search records faster so, can use in database for different transactions. The search history maintenance is implemented which can be used by anyone who wants to maintain user search history. Per user, search history maintainer will allow to show search history of particular user. This will enhance the LUCENE searching feature. This system evaluates the use of LUCENE searching framework to perform data searching and retrieval from big databases. The searching performance evaluation will held on MYSQL database and different LUCENE indexes. Then comparison and analysis will held to see that which arrangement gives best performance. We are using LUCENE indexes Ram Index, Simple Index, and NIO Index. Then we will check performance of these three indexes with different records to analyze, which is best.

Exact match keywords displayed by Lucene scoring formula as below:

$$\sum t \text{ in } q (t f(t \text{ in } d) idf(t) boost(t, \text{field in } d) lengthNorm(t, \text{field in } d)) coord(q, d) queryNorm(q) \text{ [6].}$$

Here we can evaluate different lucene query which exact match on keywords will help to give same results as mysql so reduce overhead of processing of extra results.

Below given the system configuration used to take performance measure.

Processor: 1.7 GHz, Core i5

RAM: 4GB, Hard disk: 160 GB,

OS: Fedora 17, java environment: openjdk-1.7.

Apache Lucene 3.6, mysql 5.5

Dynamic Programming and Serialization

Different users have different queries or can be common queries.

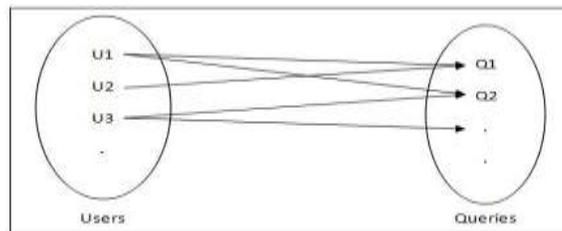


Figure 2: Dependencies between user and queries.

To evaluate performance of each index, each query get tested on every index.

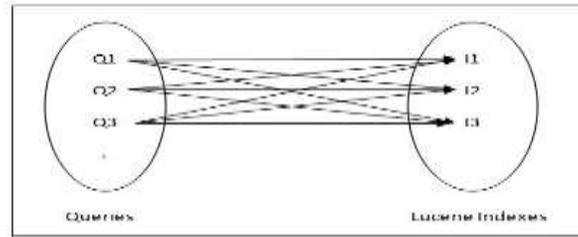


Figure 3: Dependencies between queries and LUCENE indexes.

RESULTS AND DISCUSSION

In performance evaluation the multi threading is used for performing searching as running multiple threads simultaneously and the searching in LUCENE is performed faster so large requests from users are handled properly. The number of input request to input response time is constant in range so the graph will be almost linear.

MYSQL search performance

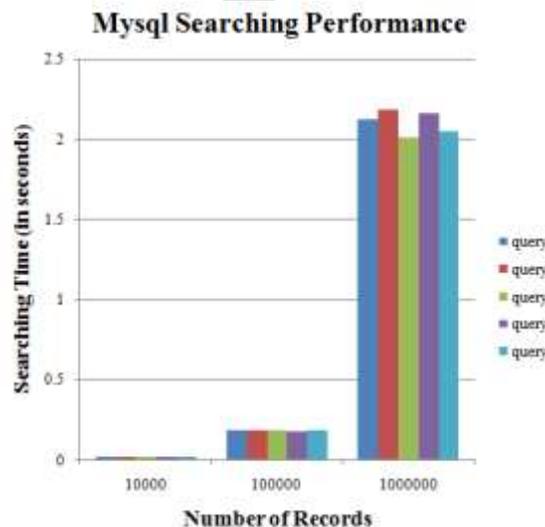


Figure 4: MYQL searching performance

For this evaluation we used 1 million records general user information with 28 columns, which is inserted in mysql as well as used to create index in lucene. The user ID is used as primary key to identify particular user information record. The searching is performed in three phases using 10,000 records, 100,000 records and 1 million records.

Figure 4 above showing the mysql searching performance for three phases.

Regardless of search query the searching time in mysql is nearly constant, because mysql searches entire table for any search query which requires the same time for same number of records. The sharp increase in searching time shows that searching time is linearly proportional to number of records. Searching time is not related to how many number of records matches our search query.

Lucene Index Building Performance:

Figure 5 and figure 6 shows Lucene Indexing performance. In figure 5 while running single thread for indexing we can analyze that RAM index takes less time as compare to Simple and NIO index.

Figure 6 shows Lucene Indexing performance while running 4 threads. Building Lucene Indices required slightly less time than single threading approach. With multithreading approach size of Index increases slightly. As RAM index stores data completely in physical memory the RAM index with stored fields is not practical for indices greater than few hundred megabytes in size.

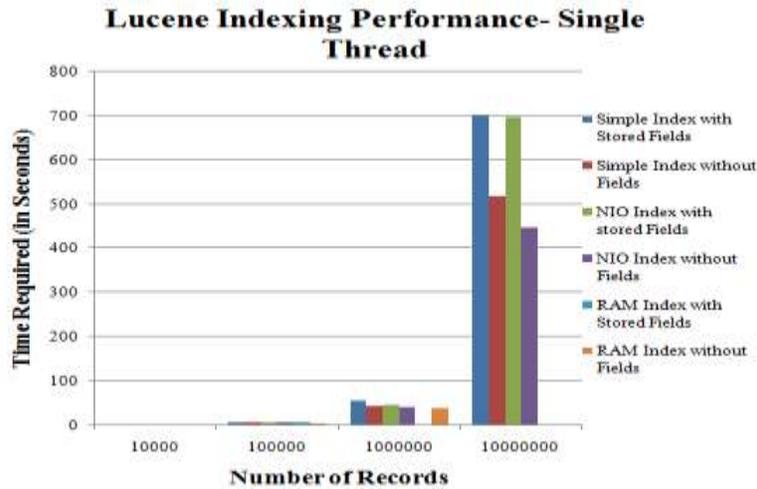


Figure 5: Lucene Indexing performance using single thread

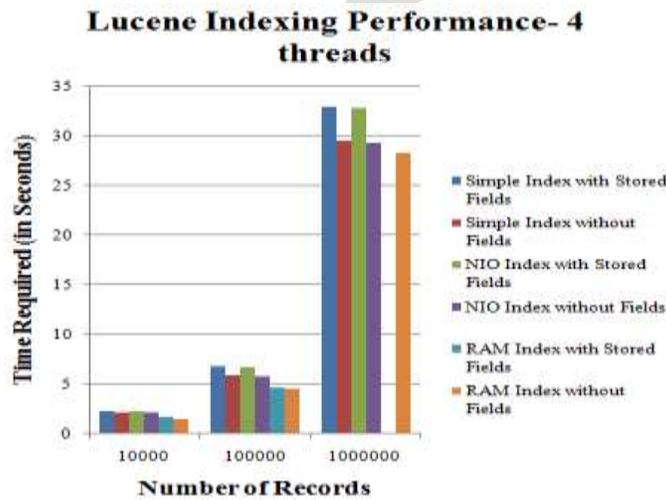


Figure 6: Lucene Indexing performance using 4 threads

Lucene Searching Performance

Figure 7,8,9 shows below Lucene Searching Performance for 10000, 100000, 1 million records. By this analysis it articulates that as compared to MySQL searching, Lucene takes very less time. For any type of query, RAM searching is best. But it has a limitation of physical memory present on the system.

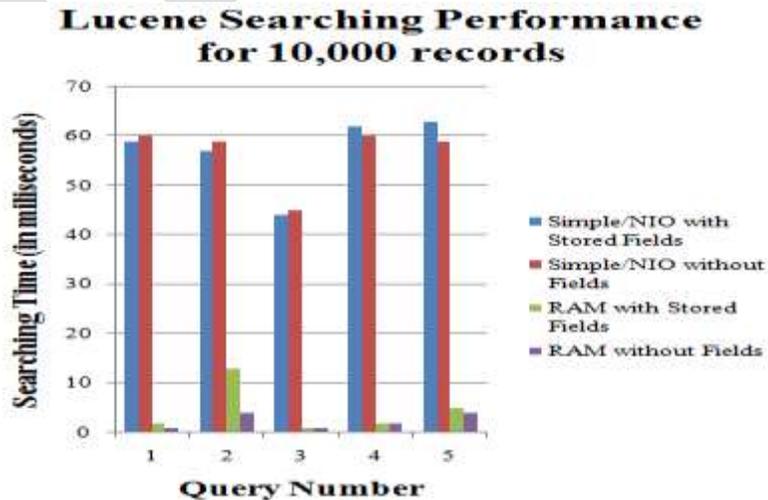


Figure 7: Lucene searching performance for 10,000 records

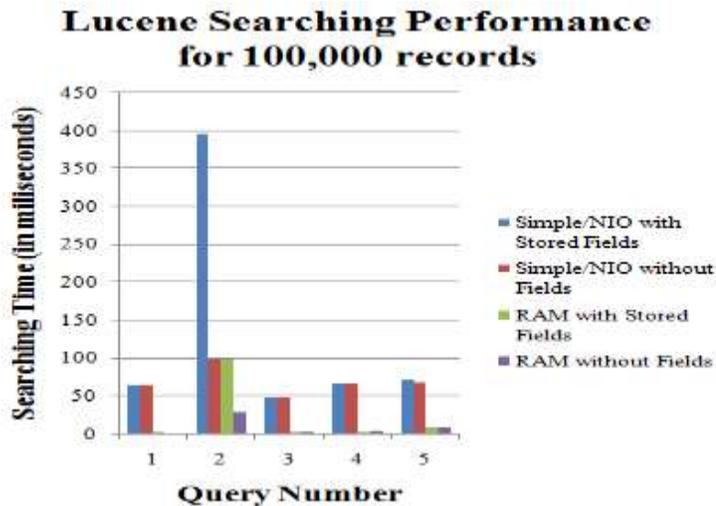


Figure 8: Lucene searching performance for 100,000 records

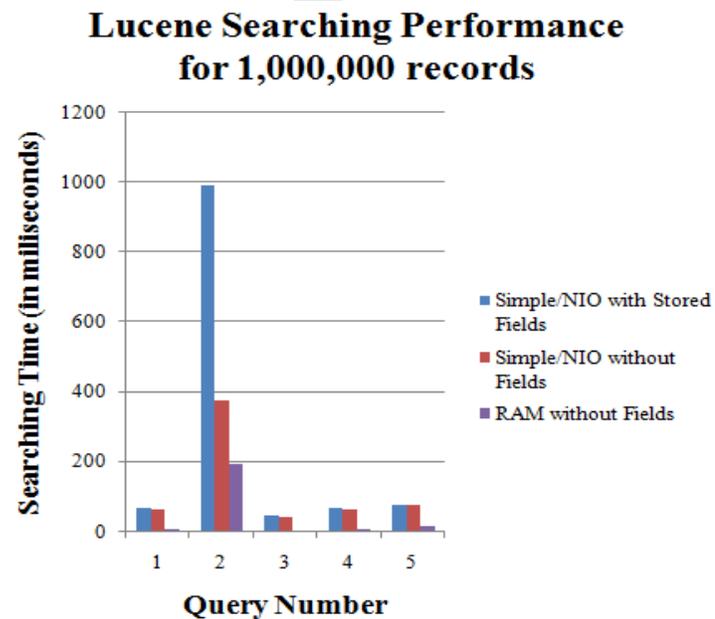


Figure 9: Lucene searching performance for 1 million records

ACKNOWLEDGMENT

I take this opportunity to express my deep sense of gratitude towards my esteemed **guide Prof. Pankaj Agarkar** for giving me this splendid opportunity to select and present this dissertation topic and for encouragement & providing me with the best facilities for my presentation work.

I would like to thank TechModi pvtltd, pune who sponsor this project work and gave me opportunity to work with them, I always thankful for their indispensable support, priceless suggestions and for most valuable time lent as and when required.

CONCLUSION

Lucene searching is very fast, so we can use it to retrieve records in large databases. Although inserting is slow multiple threads can be used to build index. Index with data stored give less performance than index without data stored, and in our scenario data storage is not required as we can retrieve data from database.

Further we can evaluate indexing capability provided by mysql, also bulk search performance need to be evaluated using multithreading we can differentiate performance between Simple and NIO indexes. Memory mapped index is new index which can be evaluated for searching. The search history maintenance module provides additional feature to lucene searching framework. Module can be optionally added as plugin at any time to existing system.

This system uses multithreading for searching multiple queries simultaneously on the single server. We can develop the multi server searching which will use multiple servers for processing searching queries. For index building the same server is used. We can use multiple servers for index creation, which will duplicate the indexes.

REFERENCES:

- [1] Apache Team, "Apache documentation", Online At <http://LUCENEn.apache.org/core/3.6.1/index.html> (as of 7 January, 2014)
- [2] Deng Peng Zhou, "Delve inside the LUCENE indexing mechanism", Online At <http://www.ibm.com/developerworks/library/wa-LUCENE/> (as of 14 January 2014)
- [3] A Lucid Imagination White Paper "The Case for LUCENE/Solr: Real World Search Applications" January 2010.
- [4] Gualiang Li, Shengyue Ji, Chen Li, Jianhua Feng, "Efficient fuzzy full-text type-ahead search", The VLDB Journal (2011) 20:617–640 DOI 10.1007/s00778-011-0218-x.
- [5] Lucie Molkova, "Indexing Very Large text Data", Brno, spring 2011.
- [6] Michael McCandless, Erik Hatcher, Otis Gospodnetic, "LUCENE in Action" 2nd edition, Manning Publications Co, 2010.
- [7] Amol Sonawane, "Using Apache LUCENE to search text" Online At <http://www.ibm.com/developerworks/opensource/library/os-apache-LUCENEsearch/> (as of 11 December 2013)
- [8] Shengyue Ji, Guoliang Li, Chen Li, Jianhua Feng, "Efficient Interactive Fuzzy Keyword Search", Apr 20-24, 2009, ACM 978-1-60558-487-4/09/04

Design of Wireless Medical Monitoring System

Prof. Pravin W. Jaronde¹, Prof. Mangesh D. Ramteke², Prof. Nilesh P. Bobade³

¹Department of Electronics Engineering, DMIETR, Wardha, India, pravinwj@rediffmail.com, 09665783191

Abstract— Medical Monitoring Systems are the most important in the fast developing nation population increases demands for caretaking. These systems use wireless technologies to transmit vital signs for medical evaluation. This paper describes the design of a wireless sensor network based on Zigbee technology. It is mainly used for collecting and transferring the various monitoring information about the patients in hospitals. This application consists of Zigbee based network, having three types of sensors connected to the transmitter section those are Heart rate sensor, Temperature sensor, Oxygen sensor. These sensors are directly connected to the patient and the status of the patient is sensed by the sensors. The same data is send wirelessly to the receiver section which is with the medical representative and by that receiver module he will get all updates of their patients. It is fast, reliable and cheap cost.

Keywords— Micro-controller; Heart rate sensor; Temperature sensor; Oxygen sensor; Zigbee technology; Wireless network; Transmitter section; Receiver section

1. INTRODUCTION

This system is proposed to be used for general ward patients as they are often associated with acute conditions that require regular supervision. The technology used here is Wireless Sensor Network(WNS). WSN is used worldwide due to its ability of self organizing and scalability. The vital signs associated with general ward monitoring are body temperature, Oxygen level, Heart pulse rate of the patient. Patients are monitored using high cost wired technology which makes difficult for the patient to move and hence it reduces mobility and introduces complexity. To overcome these limitations, Wireless technology is introduced in the hospitals. This paper describes the wireless sensor network based on Zigbee technology. It is mainly used for collecting and transferring the various monitoring information about the patients in hospital. This application consist of Zigbee based network, three sensors i.e. Heart rate sensor, Temperature sensor, Oxygen sensor.

2. LITERATURE REVIEW

Patient monitoring systems become a important topic. These systems use wireless technologies to transmit vital signs for medical valuation. Paper [1] describes the wireless sensor network based on Zigbee technology. It is mainly used for collecting and transferring the various monitoring information about the patients in hospital. This application consists of Zigbee based network, four sensors, master, two sub-master and slave combination.

The technology used in [2] is Wireless Sensor Network (WSN). The vital signs associated with general ward monitoring are body temperature, humidity, smoke and movement of the patient. Zigbee is a Wireless standard which comes under IEEE 802.15.4. Zigbee is a wireless standard used in hospitals and orphanages due to its ability of low-cost, low-power, fault tolerance and quality of service. Zigbee have the ability to connect a large number of devices into a single network. ZigBee technology uses the globally available, license-free 2.4GHz frequency band.

This paper [3] keep track on heartbeat count and temperature of patient should be easy to use, portable, light weighted, small size etc so that it give freedom of mobility for patient. The devices which can be carried everywhere to keep track on patient's health. This device that is a heartbeat sensor would help them to keep track on heartbeat counts of a patient and check for any abnormalities. If any varied change takes place it is notified. This notification would help to take an appropriate action at an instance of a time. This would save patients from the future health problem which would arise. This would also help patient's concern doctor to take an appropriate action at proper time.

3. HARDWARE

In this paper hardware used is LCD display, Zigbee, ATmega 16 Microcontroller, Heart rate sensor, Temperature sensor, Oxygen sensor.

3.1 ZIGBEE

Zigbee is a low-cost, low-power, wireless mesh networking proprietary standard [1]. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries, and the mesh networking provides high reliability and larger range. Range of Zigbee is from 30 meters-1km. The technology is intended to be simpler and less expensive than other WPANs such as Bluetooth. Its protocols are intended for use in embedded applications requiring low data rates and low power consumption. Its current focus is to define a general-purpose, inexpensive, self-organizing mesh network that can be used for industrial control, embedded sensing, medical data collection, smoke and intruder warning, building automation, home automation, etc. Specification for a suite of high level communication protocols using small, low-power digital radios based on an IEEE 802 standard for personal area networks.



Fig. 3.1. Zigbee Module

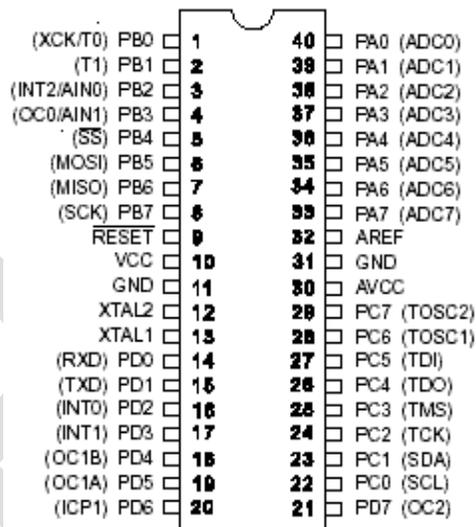


Fig. 3.3. ATmega 16 Microcontroller Pin Diagram

Zigbee devices are often used in mesh network form to transmit data over longer distances, passing data through intermediate devices to reach more distant ones. This allows Zigbee networks to be formed ad-hoc, with no centralized control or high-power transmitter/receiver able to reach all of the devices. It is targeted at applications that require a low data rate, long battery life, and secure networking. It has a defined rate of 250kbit/s, best suited for periodic or intermittent data or a single signal transmission from a sensor or input device consumer and industrial equipment that require short-range wireless transfer of data at relatively low rates. Transmission rates vary from 20 to 900, Data rates of 250 kb/s, 40 kb/s and 20 kb/s home networking, automotive networks, industrial networks, interactive toys, remote metering, battery operated products, building automation, personal healthcare, industrial control, residential or light commercial control, consumer electronics, PC and peripherals, etc.

3.2 LCD DISPLAY

The LCD display is used to visualize the output of different sensors as received the signal from the transmitter block to the receiver interfaced with the microcontroller. Thus LCD display plays a vital role to see the output and give information of the patient.

3.3 ATMEGA16 MICROCONTROLLER

The ATmega16 microcontroller used in this lab is a 40-pin wide DIP (Dual In Line) package chip. This chip was selected because it is robust, and the DIP package interfaces with prototyping supplies like solderless bread boards and solder-type perf-boards. This same microcontroller is available in a surface mount package, about the size of a dime. Surface mount devices are more useful for circuit boards built for mass production. ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family

4. DESCRIPTION OF TRANSMITTER SECTION

Transmitter section of the monitoring health care system consists of a Zigbee network which is made up of sensor nodes as shown in fig.4. To keep the moment of the patient intact with the sensors on the body,

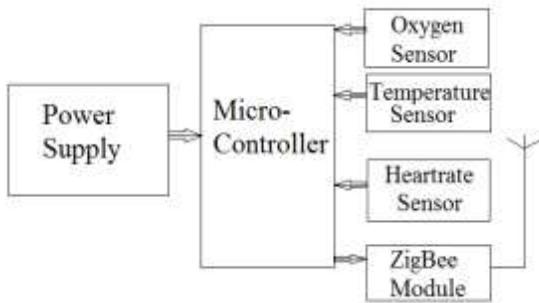


Fig. 4.1 Transmitter block diagram

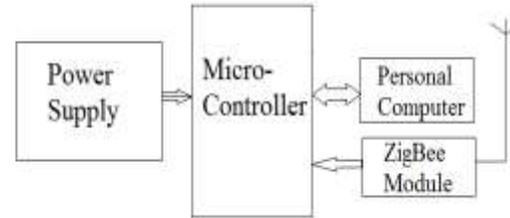


Fig. 5.1 Receiver block diagram

the wireless sensors are required to be minimized and portable. These sensors are temperature, heart rate and oxygen which are the basic requirements wards of patient. There is a microcontroller to which sensors and power supply is connected. The Zigbee module is used for transferring the data to the receiver connected to other part of circuit i.e. receiver circuit. We are using Microcontroller ATmega 16 for this project.

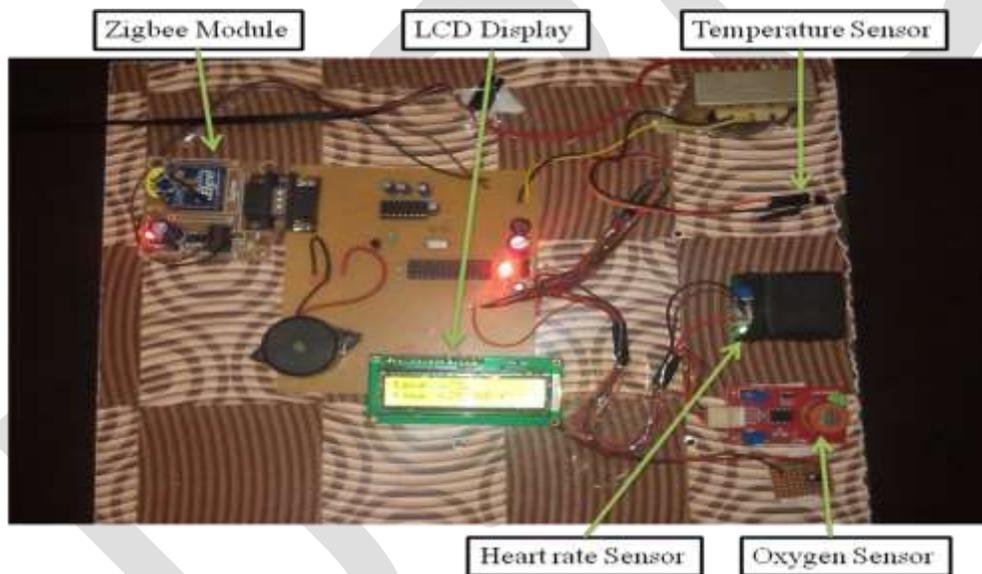


FIG. 4.2 Transmitter Block

Transformer is used for the power supply of the all microcontroller and digital sensors. As we need DC power supply for atmega16 and current sensors we used rectifier after transformer which convert 5V AC into the 5V DC which is not pure DC but contains ripples for removing the ripples we use capacitor, which remove ripples from the supply and give 5V DC. The supply is given to the circuit using transformer. The three sensors are connected to microcontroller to respective port. The Zigbee module is having four terminals Rx, Tx, ground & supply.

Rx is connected to pin no 15, Tx is connected to pin no 14. Supply 3.2V is given for making the module run. The temperature sensor is connected to pin no 40. Heart rate sensor is connected to pin no 39. Oxygen sensor is connected to pin no 38. Second terminal of all sensors is combined and connected to Vcc and third terminals of all sensors are connected to ground. All sensors sense the physiological information of patient and provide information to the microcontroller. The microcontroller sends the data to receiver side though Zigbee transmitter module.

5. DESCRIPTION OF RECEIVER SECTION

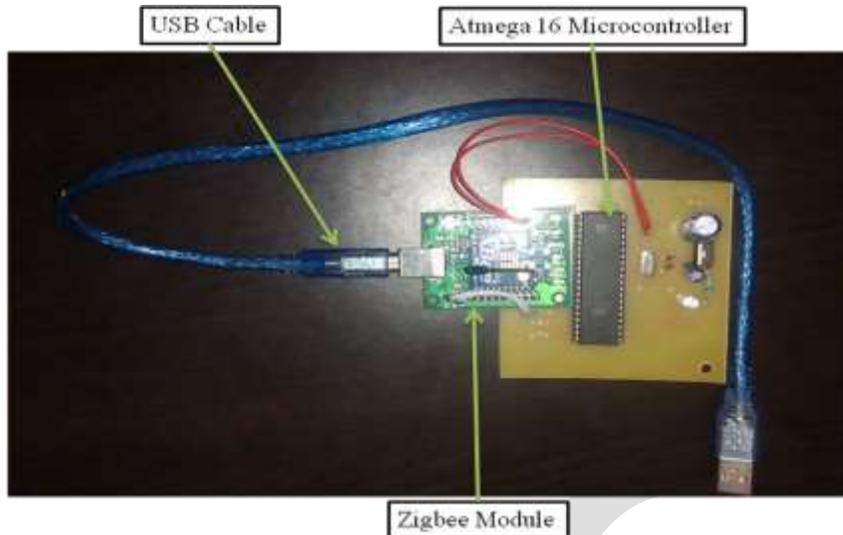


FIG. 5.2 Receiver Block

The information sent by the Zigbee Module is received wirelessly by the other Zigbee Module at the receiver section as shown in the Fig.5.1. Zigbee Module will transfer the data to the some control device. If a mismatch occurs, that is if the collected data is more than the limit defined then alert signals are issued. Alert signals are issued to alert the staff taking care of the patient and to provide better cure. If the collected data is within the limits then the value of the sensed data will be displayed on LCD and PC Display. Besides, the buzzer alarms to alert the staff, these two other alert systems are also used here. All the components are connected according to the requirements and mounted on PCB. LCD is made available for the nurses and the staff at the main receiver section. LCD is connected to the microcontroller for displaying the conditions.

The display, Zigbee module & USB port is connected to the Microcontroller. The information sent by the Zigbee module is received wirelessly by the other Zigbee module at the receiver section. Zigbee module will transfer the data to the some controlled device for controlling action ATmega 16 microcontroller is used.

Controller will match the limit predefined in the code of the microcontroller. If a mismatch occurs, i.e. if the collected data is more than the limit define then alert signal are issued. Alert signals are issued to alert the staff taking care of the patient and to provide better cure. If the collected data is within the limit then the value of sense data will be displayed on LCD Display. Besides, the buzzer alarm to alert the staff two other alert system is also used here. All the components are connected according to requirement and mounted on PCB.

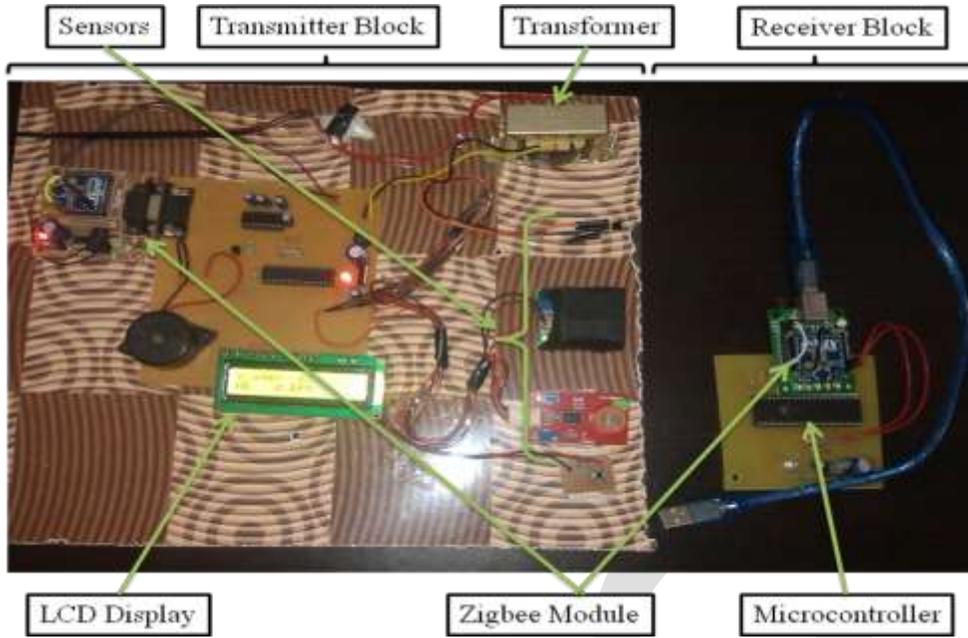


Fig. 6. Wireless Medical Monitoring System

6. RESULT

After completion of the project design the complete project is as per fig.6. In the project we have two sections transmitter section and receiver section. As we have three sensors all the sensors are working properly and it shows the status and condition of the patient which we can see on the LCD display as shown in fig. 6.1.

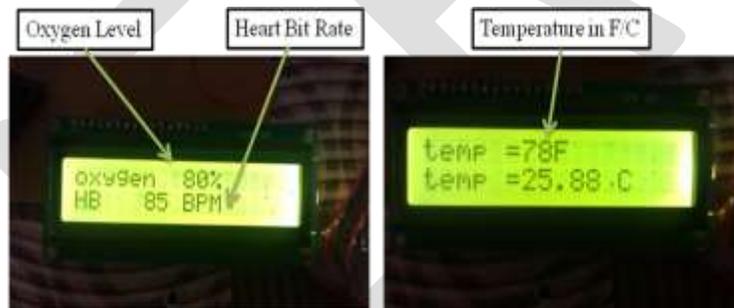


Fig. 6.1. a) Oxygen and Heart bit reading b) Temperature Reading

7. CONCLUSION

We have analyzed the wireless patient health monitoring system of temperature, heartbeat and oxygen of human being using Zigbee technology providing low cost effective solution. As it is wireless device it more comfortable and reliable for patient as well as medical representative, also the cost of cables is reduced here, high speed, low power consumption, more effective and highly efficient system. It provides continuous monitoring of the vital signs of the patient over long periods of time until an abnormal condition is captured and hence critical situations can be overcome. Any abnormalities in health conditions are informed via display as the receiver. The system to upgrade existing health monitoring systems in the hospitals by providing monitoring capability and thus a better cure. This intelligent monitoring system provides long term monitoring capability useful for the staff in the hospitals and reduces their workload.

8. FUTURE DEVELOPMENT

As we increase the sensors or development in biomedical trend more parameter can be sense and monitor which will drastically improve the efficiency of the wireless monitoring system in biomedical field. For improving the wide range of communication for the long distance web based technology can be used.

REFERENCES:

- [1] Amruta Nagarkar, M.N. Kakatkar, "Zigbee based wireless patient monitoring." *IJSETR, Volume 2, Issue 2, February 2013*,
- [2] Malika, Charu Rana, "An Indore Wireless Zigbee Based Patient Monitoring System for Hospitals." *IJESR, Vol 04, Issue 02; March-April 2013*.
- [3] Manisha Shelar, Jaykaran Singh, Mukesh Tiwari, "Wireless Patient Health Monitoring System." *International Journal of Computer Applications (0975 – 8887) Volume 62– No.6, January 2013*.
- [4] Rajasekaran, Kumaran, "Human health monitoring using wireless sensor network (WSN)." 12, December 2013.
- [5] Shyr-Kuen Chen, Tsair kao, Chai- Tai Chan, Chih-Ning Huang, Chih-Yen Chiang, Chin-Yu Lai, "A Reliable Transmission Protocol for ZigBee Based Wireless Patient Monitoring." *IEEE Trans Inf. Technol. Biomed., vol.16, No.1 JANUARY 2012*.
- [6] J. S. Choi and M. Zhou, "Performance analysis of Zigbee based body sensor networks." in *Proc. IEEE Conf. Syst., Man Cybern., 2010*, pp. 2427–2433.
- [7] Jin-Shyan Lee, Yu-Wei Su, and Chung-Chou Shen Hsinchu, Taiwan, "A Comparative Study of Wireless Protocols: Bluetooth, UWB, ZigBee, and Wi-Fi." *The 33rd Annual Conference of the IEEE Industrial Electronics Society (IECON) Nov. 5-8, 2007, Taipei, Taiwan*.
- [8] Goutam Motika, Abinash Prusty, "Wireless Fetal Heartbeat Monitoring System Using ZigBee & IEEE 802.15.4 Standard." *2011 Applications of Information Technology, 978-0-7695-4329-1/11 \$26.00 © 2011 IEEE DOI 10.1109/EAIT.2011.89*.
- [9] Guojin Li, Jing Han, "Application of the Medical Care System Based on ZigBee Technology." *2012 IEEE Symposium on Electrical & Electronics Engineering (EEESYM) pp 301-303*.
- [10] Ming Xu Longhua Ma, "Design and Implementation of a Wireless Sensor Network for Smart Homes." *International Workshop on Mobile Cyber-Physical Systems (MobiCPS 2010), in conjunction with UIC2010, IEEE, pp 239-243*.
- [11] U.Varshney, "Improving wireless health monitoring using incentive-based router cooperation." *Computer*, vol. 41, pp.56–62, May 2008.
- [12] E. Jovanov, A. O'Donnel, A. Morgan, B. Priddy, and R. Hormigo, "Prolonged telemetric monitoring of heart rate variability using wireless intelligent sensors and a mobile gateway." in *Proc. Eng. Med. Biol., 24th Annu. Conf. Annu. Fall Meet. Biomed. Eng. Soc. EMBS/BMES Conf., 2002. Proc. 2nd Joint, oct. 2002*, vol. 3, pp. 1875–1876.
- [13] Chai Jihong, (2011), "Patient Positioning System in Hospital Based on Zigbee." *International Conference on Intelligent Computation and Bio-Medical Instrumentation*, pp 159-162.
- [14] Ovidiu Apostu, Bogdan Hagi, Sever Paşca, "Wireless ECG Monitoring and Alarm System Using ZigBee" *2011 The International Symposium on ADVANCED TOPIC IN ELECTRICAL ENGINEERING 2068-7966/ATEE 2011*
- [15] Warsuzarina Mat Jubadi, Siti Faridatul Aisyah Mohd ahak, "Heartbeat Monitoring Alert via SMS." *978-1-4244-4683-4/09/\$25.00 ©2009 IEEE*

Modeling and Analysis of RBTS IEEE-6 BUS System Based On Markov Chain

Miss.Vijayalaxmi Dharwad, PG scholar of Electrical and Electronics Engineering Department SDMCET, Dharwad-58002, vijaya.dharwad@gmail.com

Dr.S.B.Karjagi Professor of Electrical and Electronics Engineering Department, SDMCET, Dharwad-58002, sbkarajgi@gmail.com

Abstract— Modern facility is incredibly vast and extremely tough to keep up. The reliability evaluation of the ability system is additionally very complex and extremely tedious task. Whole power grid is separated in to generation, transmission and distribution systems. In this work we are concentrating solely on the reliability analysis of the generation system. There are various methods are available to judge the reliability of the generation system. These methods are differing in time consumption and technology. Compared to simulation method Markov method has more advantages. In Markov chain and Frequency and Duration of system, transient and steady-state probabilities are calculated using RBTS IEEE-6 BUS System.

Keywords— Reliability, Adequacy, Generation model, Load model, Risk indices, Markov chain, Frequency and Duration of states, De-rated states.

INTRODUCTION

The reliability evaluation of whole power system is very tedious task. The reliability evaluation of whole power system is sub divided into system security and system adequacy. Security of the system deals, the response of the system to the dynamic perturbations which are arising within the system. Adequacy of the system deals, the ability of sufficient energy from the generating units to meet the load requirement.

In the practical, during dynamic perturbations, the response of the power system is not easy to identify. Therefore in this work we are concentrating only on the adequacy assessment of the power system. The power system is sub divided in to three functional zones to evaluate the reliability of the system. The functional zones are generation facility, transmission facility and distribution facility. Using these functional zones the power system is again divided in to three hierarchical levels as shown in figure 1[1][2][3].

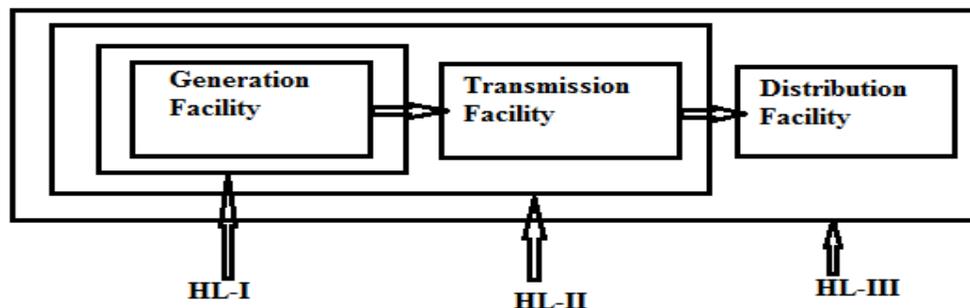


Fig 1: functional zones and hierarchical levels.

In figure 1 the HL-I deals, the reliability evaluation of only generation system. HL-II deals, the realibility evaluation of the both generation and transmission sysytems. HL-III deals, the reliability evaluation of the generaion, transmission and distribution systems. In this work we are concentrating on the reliability evaluation of the generaion system (HL-I).

Adequacy assessment of the generation system deals, the performance of the generating units to meet the required load demand under constraints. In the adequacy assessment the Generation system and the peak load demand is considered. The conductor line is ignored during this assessment as shown in figure2 [1][2][3]

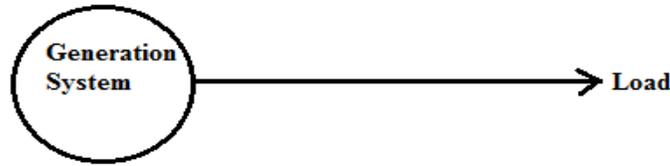


Fig 2: adequacy assessment of HL-I.

ADEQUACY ASSESSMENT OF GENERATION SYSTEM

Adequacy assessment of the generation system has three steps to carry out reliability evaluation as shown in figure 3. First, create the generation model using COPT. Second, create load model using peak loads. Third, combine these two models to get risk model. Risk model is to find the risk indices of the adequacy assessment [1][2][3].

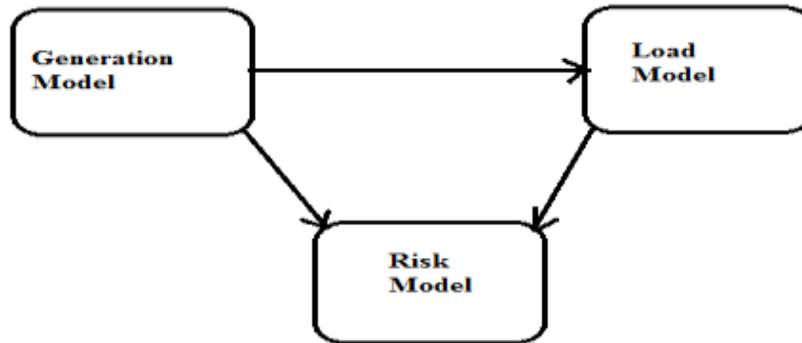


Fig 3: reliability evaluation of generation system.

GENERATION MODEL

There are many methods to create generation model. Adequacy assessment is sub divided into deterministic approach and probabilistic approach. The deterministic approach does not consider all kinds of perturbations in the analysis compared to probability approach [4][5]. Probability approach is sub divided into Monte Carlo simulation and analytical method. Monte Carlo simulation requires more time and it is slow convergences compared to analytical method [6][7]. Therefore during this work we have a tendency to concentrating solely on analytical ways.

In conventional method adequacy assessment of the generation system is carried out by creating capacity outage probability table (COPT). COPT is created by using generating capacity units and Forced Outage Rate (FOR) of generating units. In analytical method Markov process is explained. It will be explained in section III [8].

LOAD MODEL

Load model is created by using daily or monthly or yearly peak loads with respect to time in seconds or minutes or hours as shown in figure 4. Where Q_k is the outage capacity and t_k is the time at outage of unit k [1][2][5].

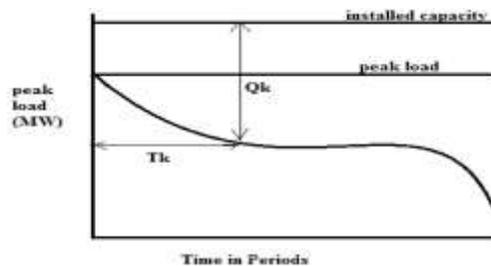


Fig 4: load model

RISK MODEL

Risk model is to find the risk indices such as LOLE, LOEE, EENS, Frequency and duration of system etc. In this work we are concentrating on the Frequency and Duration of states, transient and steady state probabilities.

FREQUENCY AND DURATION OF STATES

The frequency and duration can be calculated as shown in figure 5 [3].

Frequency of encountering State i

$$= P(\text{being in State } i) \times (\text{rate of departure from State } i)$$

$$= P(\text{not being in State } i) \times (\text{rate of entry into State } i).$$

Mean Duration in State i,

$$m_i = 1 / \text{rate of departure from State } i. \quad (\text{eq-1})$$

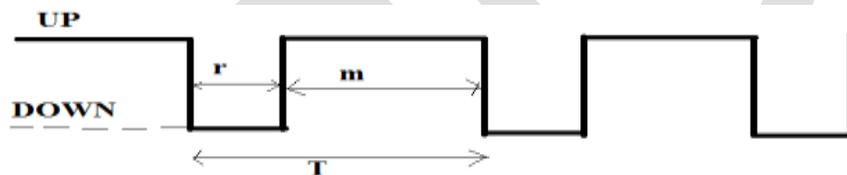


Fig 5: mean time/state diagram of a single component system.

Where,

$$m = \text{MTTF} = 1 / \lambda$$

$$r = \text{MTTR} = 1 / \mu$$

$$T = \text{MTBF} = m + r = 1 / f$$

And

$$\text{Availability} = m / (m + r) = m / T = 1 / \lambda \times T = f / \lambda$$

$$\text{Unavailability} = r / (m + r) = r / T = 1 / T \times \mu = f / \mu$$

MARKOV CHAIN

Markov chain is one of the analytical methods which are used measure the reliableness of the facility system. A Markov process has simplest modeling approach, converges, applicable to modeling of complicated system.. Therefore In this work Markov chain is used to appraise the reliableness of the generation system.

Markov chain is used to examine the future probabilities of the system. It does not depend on the past history data of the system or memory less system. The probabilities of the system are carried out using the present data of the system. Using these results we can predict the behavior of the system in future also used for extension of the power system. Therefore Markov chain is widely used in the all engineering applications [10][12]

In markov chain the reliability is calculated using FOR (Forced Outage Rate), which is known as un-availability (U) and it is given by,

$$FOR = \frac{\text{forced outage hours}}{\text{in service hours} + \text{forced outage hours}}$$

$$FOR = \frac{\lambda}{\lambda + \mu} \quad A = 1 - FOR$$

Where,

A = unit availability λ = unit failure rate
 μ = unit repair rate U = unit unavailability.

Markov model is represented in terms of number of states and its state transitions. The two-state markov model is shown in figure 6. Where state 1 represents the unit is in upstate and state 2 represents the unit in down state.

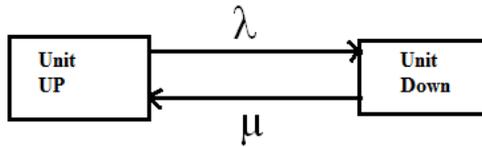


Fig 6: Two-state model of the Markov chain

From figure 6 we can obtain the steady state values for probabilities of each state. Using these values we can predict the behavior of the system. The steady state probabilities can be written as [11][13],

$$P1 = P_{up}, \quad P2 = P_{down}.$$

$$P1 = \lambda / (\lambda + \mu), \quad P2 = \mu / (\lambda + \mu).$$

$$A = 1 - \prod_{i=1}^n Q_i \quad Q_p = \prod_{i=1}^n Q_i$$

$$\frac{1}{\lambda_p} = \left(\frac{1}{\lambda_1} + \frac{1}{\lambda_2} \dots \dots + \frac{1}{\lambda_n} \right) - \left(\frac{1}{(\lambda_1 + \lambda_2)} + \frac{1}{(\lambda_1 + \lambda_3)} \dots \dots + \frac{1}{(\lambda_1 + \lambda_n)} \right) + \left(\frac{1}{(\lambda_1 + \lambda_2 + \lambda_3)} + \dots \dots \dots + \left((-1)^{n+1} \frac{1}{\sum \lambda_n} \right) \right)$$

(eq-2)

Where,

A = unit availability
 Q_i = unit unavailability of unit i
 Q_p = unavailability of parallel units
 λ_p = failure rate of parallel units.

The equations of state probabilities are, P₁+P₂+P₃+P₄=1

$$\frac{dP1}{dt} = -(\lambda1 + \lambda2)P1(t) + \mu1P2(t) + \mu3P3(t)$$

$$\frac{dP2}{dt} = \lambda1P1(t) - (\mu1 + \lambda2)P2(t) + \mu2P4(t)$$

$$\frac{dP3}{dt} = \lambda2P1(t) - (\mu2 + \lambda1)P3(t) + \mu1P4(t)$$

$$\frac{dP4}{dt} = \lambda2P2(t) + \lambda1P3(t) - (\mu1 + \mu2)P4(t)$$

(eq-3)

In general,

$$\frac{dP}{dt} = A P(t)$$

Where

A= stochastic transitional probability matrix, P(t)= vector of the state probabilities

$$A = \begin{bmatrix} -(\lambda1 + \lambda2) & \lambda1 & \lambda2 & 0 \\ \mu1 & -(\lambda2 + \mu1) & 0 & \lambda2 \\ \mu2 & 0 & -(\lambda1 + \mu2) & \lambda1 \\ 0 & \mu2 & \mu1 & -(\mu1 + \mu2) \end{bmatrix}$$

Using the transition matrix several reliability indexes is obtained like the chances of every state with relation to time, the system steady state probability, and MTTF are quickly obtained. These results will be used in the operation, maintenance and programming of power grid in line with the various interval of Δt .

Applying Laplace transformer to the eq-1

$$P(t) = k_0 e^{-\lambda_1 t} + k_1 e^{-\lambda_2 t} + k_2 e^{-\lambda_3 t} + \dots \dots \dots \quad (eq-4)$$

Where,

k_0, k_1, k_2, \dots are coefficients depend on the equation and initial conditions.

$\lambda_1, \lambda_2, \lambda_3, \dots$ are eigen values of matrix A.

AVAILABILITY OF WHOLE GENERATION SYSTEM

The states of the power system is divided into acceptable W and unacceptable state U, which are $W = \{P1, P2, P3\}$ $U = \{P4\}$.

$$A(t) = \sum_{k \in W} P_k(t) = P1(t) + P2(t) + P3(t) \quad (eq-5)$$

CASE STUDY

The adequacy assessment is carried out by using RBTS IEEE-6 BUS SYSTEM. The single line diagram of RBTS system is shown in figure 7. The generation system data is shown in table 1 and load demand is shown in figure 8 and figure 9 [9].

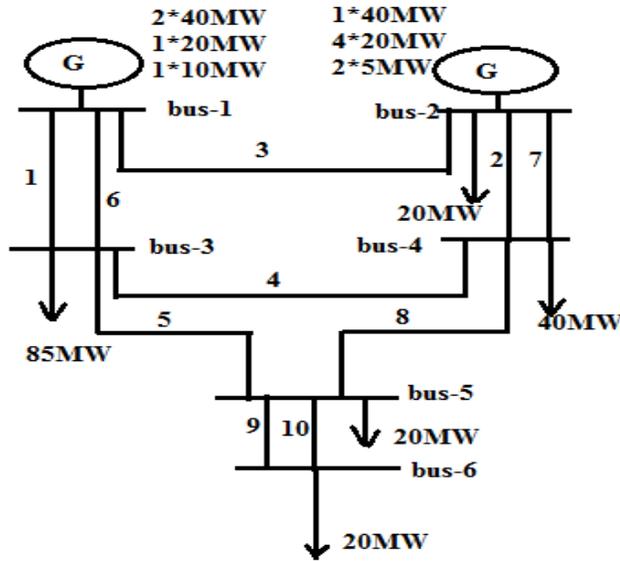


Fig 7: Single line diagram of the IEEE 6-BUS RBTS.

Table1: Generation system data

No: of Units	Unit Size(MW)	Type of generator	Failure rate/yr= λ	Repair rate/yr= μ	FOR
2	5	Hydro	2.0	198.0	0.010
1	10	Thermal	4.0	196.0	0.200
4	20	Hydro	2.4	157.6	0.015
1	20	Thermal	5.0	195.0	0.025
1	40	Hydro	3.0	147.0	0.020
2	40	Thermal	6.0	194.0	0.030

SIMULATION RESULTS

The Markov model for IEEE 6–BUS SYTEM is shown in figure 8. In this system we are considering one component at bus 1 and second component at bus 2. Therefore IEEE 6-BUS SYSTEM is represented as TWO-COMPONENT MODEL. Failure rates of the two components are λ_1 and λ_2 . Repair rates of the two components are μ_1 and μ_2 . Using (eq-2) the values of failure and repair rates are calculated and is given below,

$$\lambda_1 = 2.3182e-4/hr \quad \mu_1 = 2.3214/hr$$

$$\lambda_2 = 1.141609e-4/hr \quad \mu_2 = 38.0517/hr$$

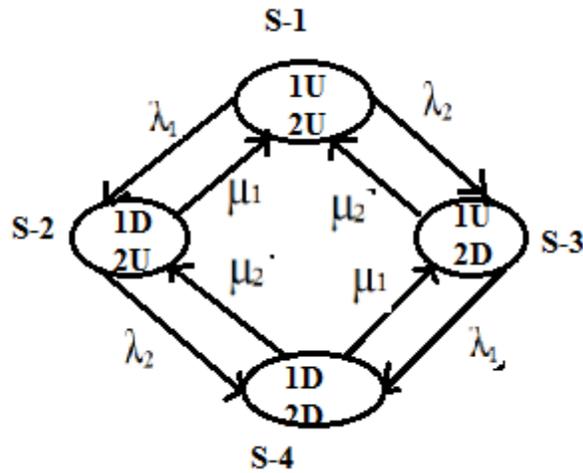


Fig 8: Two-component Markov model.

From (eq-3)

$$A = \begin{bmatrix} -3.4598e-4 & 2.3182e-4 & 1.1416e-4 & 0 \\ 2.3214 & -2.3215 & 0 & 1.1416e-4 \\ 38.0500 & 0 & -38.0519 & 2.3182e-4 \\ 0 & 38.0517 & 2.3214 & -40.3731 \end{bmatrix}$$

Substituting all these values in eq-4, we obtain probability of each state with respect to time, are **TRANSIENT PROBABILITIES** or **SHORT TERM PROBABILITIES**.

$$\begin{aligned} P1(t) &= 0.9995 + ((4.788e-5) * \exp(-2.3218 * t)); & P2(t) &= 9.985e-5 + ((1) * \exp(-2.3218 * t)); \\ P3(t) &= 2.98e-6 + ((.1554) * \exp(-2.3218 * t)); & P4(t) &= 2.98e-10 + ((.4906) * \exp(-2.3218 * t)); \end{aligned} \tag{eq-6}$$

Plotting these probabilities vs time as,

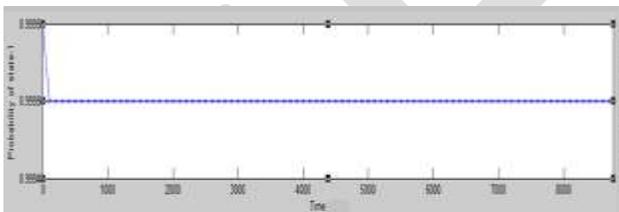


Fig 9: Probability of state-1.

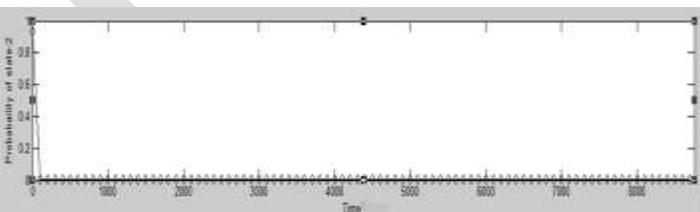


Fig 10: Probability of state-2.

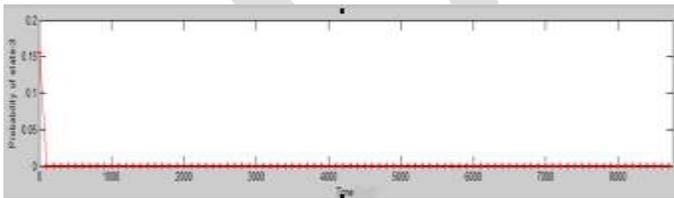


Fig 11: Probability of state-3.

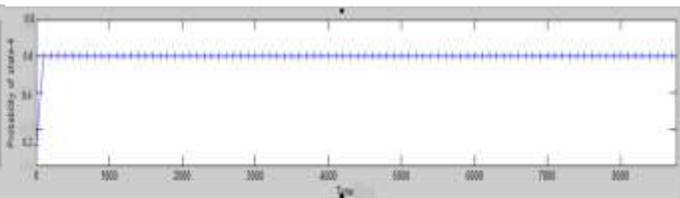


Fig 12: Probability of state-4.

As $t \rightarrow \infty$ the eq-6 becomes, is **STEADY STATE PROBABILITIES** or **LONG TERM PROBABILITIES**.

$$\begin{aligned} P1 &= 0.9995 \\ P2 &= 9.985e-5 \\ P3 &= 2.98e-6 \\ P4 &= 2.98e-10 \end{aligned}$$

OR

The state operations are,

State 1: P1upXP2up

State 2: P1down x P2up

State 3: P1downXP2up

State 4: P1downXP2down

The steady state probabilities are,

State 1: $\mu_1 \mu_2 / (\lambda_1 + \mu_1)(\lambda_2 + \mu_2) = 0.999897$

State 2: $\lambda_1 \mu_2 / (\lambda_1 + \mu_1)(\lambda_2 + \mu_2) = 9.9851e-5$

State 3: $\mu_1 \lambda_2 / (\lambda_1 + \mu_1)(\lambda_2 + \mu_2) = 2.9998e-6$

State 4: $\lambda_1 \lambda_2 / (\lambda_1 + \mu_1)(\lambda_2 + \mu_2) = 2.9956e-10$.

Frequency and duration of the each state is calculated from (eq-1) as shown in table 4 and table 5.

Table 4: Frequency and Duration of states

State no	State probability	Rate of departure	Frequency of encounter in state i	Mean duration of state i
1	P1=P1up x P2up	$\lambda_1 + \lambda_2$	$P1x(\lambda_1 + \lambda_2)$	$1/(\lambda_1 + \lambda_2)$
2	P2=P1down x P2up	$\lambda_2 + \mu_1$	$P2x(\lambda_2 + \mu_1)$	$1/(\lambda_2 + \mu_1)$
3	P3=P1up x P2down	$\lambda_1 + \mu_2$	$P3x(\lambda_1 + \mu_2)$	$1/(\lambda_1 + \mu_2)$
4	P4=P1down x P2down	$\mu_1 + \mu_2$	$P4x(\mu_1 + \mu_2)$	$1/(\mu_1 + \mu_2)$

Table 4: Frequency and Duration of states

State no and probability	Rate of departure	Frequency of encounter in state i (f/hr)	Mean duration of state i (hr)
P1=0.999897	3.4598e-4	3.45944e-4	2890.3404
P2=9.9851e-5	2.3215	2.3180e-4	0.4307
P3=2.9998e-6	38.0519	1.14148e-4	0.0262
P4=2.9956e-10	40.3731	1.2094e-8	0.0247

From (eq-5) the availability of generation system is **A=0.9960**

DE-RATED STATES

There are six-units in Two-components, therefore there will be $2^6= 64$ states. The Markov model is obtained by considering de-rated states. It is shown in figure 13 all the state transitions have not shown in the figure13.

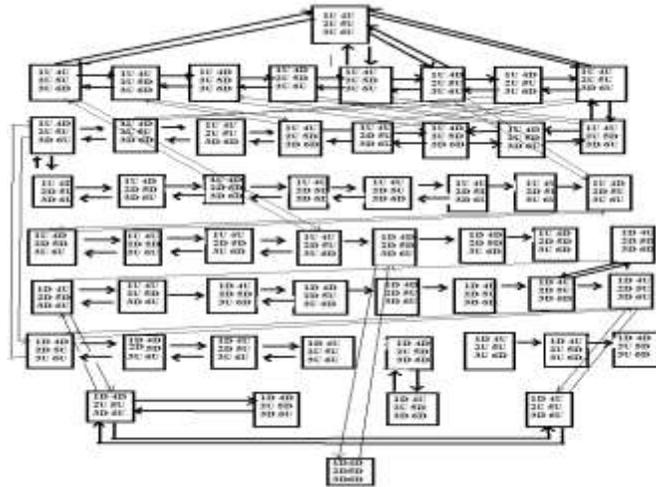


Fig 13: Markov Model of the generation system by considering De-rated states.

The Steady-State Probabilities of each state of Markov Model of the generation system by considering De-rated states are,

STATE NO	PROBABILI TY	STATE NO	PROBABILIT Y
P1	0.921400	P28	3.5898E-8
P2	9.2389E-5	P29	2.3571E-6
P3	1.4000E-6	P30	3.5981E-4
P4	0.0140	P31	1.3469E-14
P5	2.8571E-8	P32	1.3501E-10
P6	0.1686	P33	8.8649E-9
P7	2.8638E-4	P34	8.8443E-13
P8	1.8760E-6	P35	6.6001E-13
P9	0.01880	P36	4.3376E-10
P10	3.8376E-4	P37	4.3438E-7
P11	5.8446E-6	P38	6.6155E-9
P12	5.8310E-10	P39	2.1284E-5
P13	3.82873E-8	P40	4.3438E-7
P14	1.8760E-6	P41	6.6155E-9
P15	2.8571E-8	P42	6.6001E-13

P16	2.8638E-4	P43	3.2340E-11
P17	0.0236	P44	4.3337E-11
P18	4.8216E-4	P45	5.2531E-13
P19	9.8401E-6	P46	2.5740E-11
P20	1.14644E-3	P47	1.2612E-9
P21	1.4614E-11	P48	8.2817E-8
P22	2.8638E-4	P49	8.3010E-4
P23	4.8104E-8	P50	1.6940E-5
P24	7.3432E-6	P51	3.4573E-7
P25	0.0236	P52	5.2654E-9
P26	7.3432E-6	P53	2.5740E-11
P27	0.09792	P54	2.8638E-4

CONCLUSION

The modeling and analysis of IEEE-6 bus system using Markov model has resulted that the probability of acceptable states is decreasing as time scale is increases and probability of unacceptable state is increasing as time scale is increases in figure 9-12. Frequency and duration values of each state has resulted that, frequency and duration values are decreases as state increases. The frequency and duration of state-1 is highest. Complexity has increased by considering de-rated states but it gives same results of Two-component model values by neglecting very low values.

REFERENCES:

- [1] Roy Billington, "Reliability Assessment of Large Electric Power Systems", Kluwer academic Press/springer india, 2008
- [2] R.Billington and a.N.allen, "Reliability Evaluation of Engineering Systems; Concepts and Techniques", springer, 1992.
- [3] R.Billington and R.N.Allen, "Reliability Evaluation Of Power System", second edition, 1996.
- [4] Yaw-Juen Wang, "A Method Integrating Deterministic and Stochastic Approaches for the Simulation of Voltage Unbalance in Electric Power Distribution Systems", IEEE Member, IEEE Transactions On Power Systems, Vol. 16, No. 2, May 2001.
- [5] L. S. Low L. Goel "Incorporating Deterministic Criteria in the Probabilistic Framework for Composite Generation and Transmission Systems," Senior Member, IEEE, School of Electrical and Electronic Engineering Nanyang Technological University, Singapore, 2000.
- [6] Asim Kaygusuz, Baris Baykant Alagoz, Murat Akcin, Cemal Keles , Abdulkерim Karabiber, Ozan Gul "Monte Carlo Simulation-Based Planning Method For Overload Safe Electrical Power Systems," Inonu University, Bingol University, Department of Electrical and Electronics Engineering, Turkey Journal of Electrical Engineering.
- [7] A. Sankarakrishnan R. Billinton "Effective Techniques For Reliability Worth Assessment In Composite Power System Networks Using Monte Carlo Simulation", Power Systems Research Group University of Saskatchewan Saskatoon, Canada, IEEE Transactions on Power Systems, Vol. 11, No. 3, August 1996
- [8] Lovleen gupta, Nittin Narang, Thesis on "Composite System Reliability Evaluation", power systems and electric drives, Tharapur University, 2009.
- [9] R. Billinton, S. Kumar, N. Chowdhury, K. Chu, K. Debnath, L. Goel, E. Khan, P. Kos, G. Nourbakhsh, J. Oteng-Adjei, "A Reliability Test System For Educational Purposes - Basic Data," Power Systems Research Group University of Saskatchewan Saskatoon, Saskatchewan CANADA, IEEE Transactions on Power Systems, Vol. 4, No. 3, August 1989.
- [10] Dr. Attila Csenki, "The Number of Working Periods of a Repairable Markov System during a Finite Time Interval", Aston University; Aston Triangle; Birmingham, IEEE Transactions on Reliability, Vol. 43, NO. 1, March 1994.

- [11] Wenchen LI, Lu Sun, Weimei Zou, Chunqing Luo, “Power System Reliability Analysis of System Based on PSASP and Fault Enumeration Method and Applications”, China Electric Power Research Institute-China, China International Conference on Electricity Distribution (CICED), Shenzhen, 23-26 Sep. 2014.
- [12] Aleksandamr. Stankovi, Edwina . Marengo “A Dynamic Characterization of Power System Harmonics Using Markov Chains”, Northeastern University Boston, IEEE Transactions on Power Systems, Vol. 13, No. 2, May 1998
- [13] Qinru Qiu, Massoud Pedram, Qing Wu, “Stochastic Modeling of a Power-Managed System—Construction and Optimization”, IEEE Transactions On Computer-Aided Design Of Integrated Circuits And Systems, VOL. 20, NO. 10, OCTOBER 2001

IJERGS

Secure VoIP Transmission through VPN Utilization

Prashant Khobragade
Department of Computer Science & Engineering
RG CER
Nagpur, India
prashukhobragade@gmail.com

Disha Gupta
Department of Computer Science & Engineering
RG CER
Nagpur, India
disha.g14@gmail.com

Abstract —Voice over IP (VoIP) is one of the rapidly growing communication technologies. However, the widely used VoIP protocol suite, H.323 is unable to maintain its performance when it is concerned with scalability. To overcome these limitations and to manage and establish multimedia sessions Session Initiation Protocol (SIP), a lightweight application layer protocol was designed. But being a text-based protocol it has high vulnerability to security attacks. Thus to provide users with a secure communication platform methods are required to pursue protection for SIP VoIP system. At the same time QoS is also to be maintained to assure service's performance and to avoid degradation of speech quality. Thus, the proposed approach is based on virtual private network (VPN) tunneling utilization for securing communication on VoIP network while maintaining the quality.

Index Terms—Voice over IP (VoIP), H.323, Session Initiation Protocol (SIP), Virtual Private Network (VPN).

I. INTRODUCTION

As a result of the rapid technological advancement, long distance communication has become a common need and thus one of the important aspects of human lives. Telecommunication has been proved as a great medium for the distant educational resources, business promotion, voice communication and entertainment. Besides its large impact on economic market, it has also lead to social closeness among the people from all over the world.

The development of special-purpose switching chips, coupled with highly reliable fiber-optic transmission systems, has made it possible to build economical, ubiquitous, high-speed packet-based data networks. Similarly, the development of very fast, inexpensive digital signal processors (DSPs) has made it practical to digitize and compress voice and fax signals into data packets. The natural evolution of these two developments is to combine digitized voice and fax packets with packet data, creating integrated data-voice networks.

Voice over Internet Protocol (VoIP) is a rapidly emerging technology for voice communication that uses the ubiquity of IP-based networks to deploy VoIP-enabled devices in enterprise and home environments. A VoIP application encodes, transmits and decodes voice signals over the internet

in the form of packets. As only one network is used to deal with two kinds of streams instead of using traditional separate data and voice networks, much more cost reduction can be achieved on the service [1]. The VoIP networks replace the traditional public-switched telephone networks (PSTNs), as these can perform the same functions, with more convenience and ability to reduce call expenses.



Fig.1. Basic VoIP Environment

These functions generally include signaling, data basing, call connect-disconnect, and coding-decoding. A brief description of these functions is given as follows:

I. *Signaling*: Signaling in a VoIP network is accomplished by the exchange of IP datagram messages between the components. The format of these messages is covered by the standard data link layer protocols.

II. *Database services*: Database services are a way to locate an endpoint and translate the addressing that two networks use; for example, the PSTN uses phone numbers to identify endpoints, while a VoIP network could use an IP address and port numbers to identify an endpoint. A call control database contains these mappings and translations.

III. *Calls connect-disconnect (bearer control)*: The connection of a call is made by two endpoints opening communication sessions between each other. In the PSTN, the public (or private) switch connects logical channels through the network to complete the calls. In a VoIP implementation, a multimedia stream (audio, video, or both) is transported in real time. The connection path is the bearer channel and represents the voice or video content being delivered. When communication is complete, the IP sessions are released and, optionally, network resources are freed.

IV. *CODEC operations*: Voice communication is analogue, while data networking is digital. Analogue waveforms are converted into digital information by using a coder-decoder (CODEC).

While performing these operations VoIP faces two major challenges which are found to be more serious as compared to the traditional PSTN networks. These challenges are maintenance of quality of service and security. Due to extent of infrastructure sharing present in VoIP networks, it does not guarantee similar quality as in PSTN network.

Its service quality consists of the following factors: Network Availability, Latency, Jitter and Packet Loss [2]. Since VoIP is an application in information-technology oriented network, damages such as theft of data, privacy breach, loss of time, disabled or crippled service can be probably caused by the vast interconnection which contributed

to the advantage of Internet too [3]. Thus, balancing between QoS and security is important to SIP application [4] in VoIP.

This paper is organized as follows: Section II describes the background work. A provision for securing the VoIP server through VPN tunneling is proposed in Section III. Finally, Section IV concludes the paper and discusses the future scope.

V.BACKGROUND WORK

VI. VoIP Protocol Stack

VoIP technology employs a suite of protocols which can be categorized into signaling and data transfer protocols. The following figure [5] shows the essential protocols in a typical VoIP protocol stack.

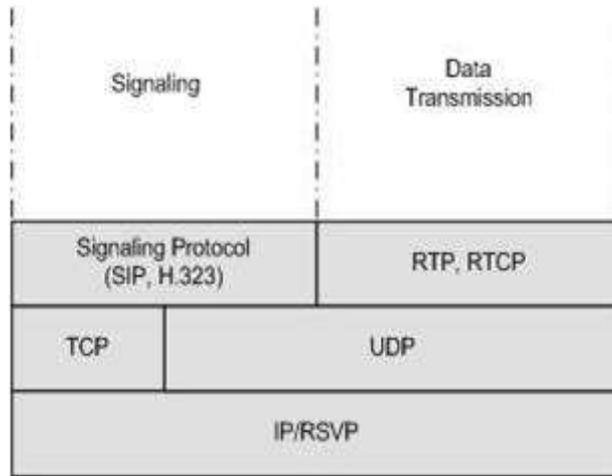


Fig.2. Essential protocols in a VoIP protocol stack

The signaling protocols are in charge of setting up, managing, controlling and terminating a session. The voice transmission protocols are responsible for transmitting the actual voice data across the network.

VII. Signaling Protocols

Both H.323 and SIP provide functionalities for call setup, management, and termination. These protocols enable negotiation of the codec to be used in voice data encoding and the delivery mechanisms (e.g. RTP [6] over UDP/IP [7]) for both protocols.

1) H.323

H.323 is a protocol suite that was designed to enable IP-based multimedia communications, and it was the first widely adopted and deployed VoIP protocol. H.323 protocol suite is shown in figure [8] below:

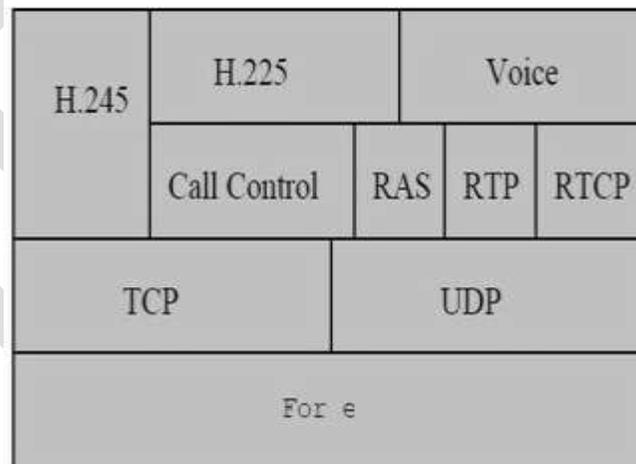


Fig.3. H.323 Protocol Suite

The core protocols contained in H.323 suite are:

- H.245 for opening and closing logic channels for each multimedia session. It is also in charge of capacity and codec negotiation. Two H.323 end points can set up a fast connection without a gatekeeper, by exchanging H.245 messages.
- H.225 for call setup, alert, connecting, and call termination.
- RAS (Registration, Admission, Status) is used to phone management. It establishes logical channels between phones and gatekeepers that manage these phones. Without appropriate RAS communication, a phone cannot place or receive phone calls.
- RTP is used for sending or receiving multimedia information.

While H.323 is the most widely used VoIP protocol suite, it has a number of drawbacks. Although it was originally designed to be used on a LAN, but when there are multiple domains, H.323 has a scalability problem as there is no easy way to perform loop

detection. The complexity which stems from the use of several protocol components, is another drawback. This also complicates firewall traversal. Furthermore, it has poor extensibility, which means it is hard to develop additional extensions for this protocol.

2) Session Initiation Protocol (SIP)

SIP [9] is a lightweight application layer protocol designed to manage and establish multimedia sessions such as video conferencing, voice calls, and data sharing through requests and responses. It is increasingly gaining favor over H.323 in the VoIP environment.



Fig.4. SIP in the Internet Multimedia Protocol Stack

Basic Architecture of SIP:

SIP is used for initiating, modifying, and terminating a two-way interactive user session that involves multimedia elements such as video, voice, instant messaging, online games, and virtual reality [10]. SIP is used in association with its other IETF sister protocols like the SAP, SDP and MGCP (MEGACO) to provide a broader range of VoIP services. The SIP architecture is similar to HTTP (client-server protocol) architecture. It comprises requests that are sent from the SIP user client to the SIP Server. The Server processes the request and responds to the client. A request message, together with the associated response messages makes a SIP transaction.

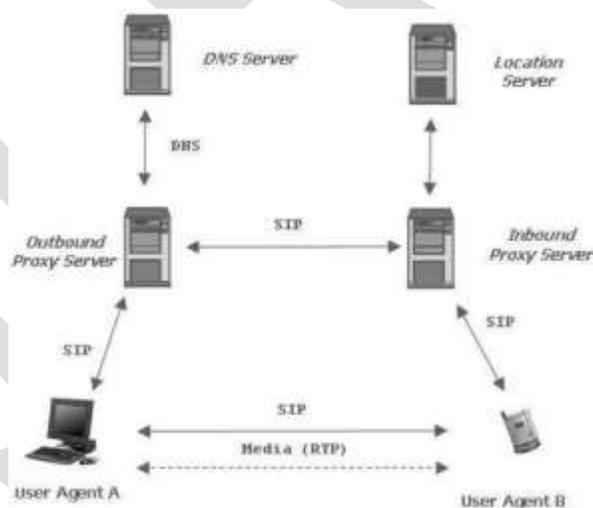


Fig.5. SIP Architecture

SIP is a better candidate for VoIP in terms of simplicity, extensibility and scalability. Since SIP is just an application layer signaling protocol, many security mechanisms are optional and little attention has been given to SIP security features [11]. Compared to its competitor H.323, SIP is more vulnerable on security aspect. This protocol is text-based, which means that there can be some important information, user's encryption for example, encoded into SIP message and unfortunately, these data are usually the goals of attackers to hike or modify. It will be fatal to both users and service provider for privacy breach.

VIII. Virtual Private Network (VPN)

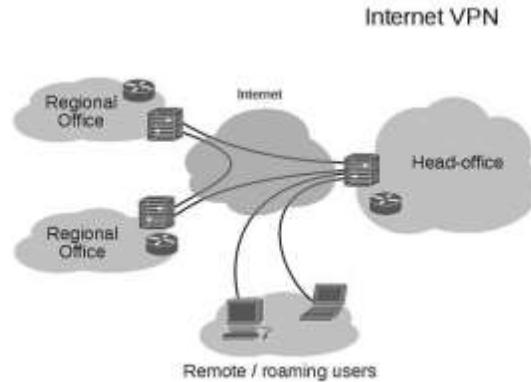


Fig.6. Scenario of a Virtual Private Network

A virtual private network (VPN) extends a private network and the resources contained in the network across public networks like the Internet. It enables a host computer to send and receive data across shared or public networks as if it were a private network with all the functionality, security and management policies of the private network. This is done by establishing a virtual point-to-point connection through the use of dedicated connections, encryption, or a combination of the two. The VPN connection across the Internet is technically a wide area network (WAN) link between the sites but appears to the user as a private network link—hence the name "virtual private network" [12].

IX. VPN Security Model

VPNs typically require remote access to be authenticated and make use of encryption techniques to prevent disclosure of private information. Its security model provides:

- Confidentiality
- Sender authentication
- Message integrity

X. VPN Security Protocols

VPNs provide security through tunneling protocols and security procedures [13] such as encryption. The security protocols include the following:

- IPsec (Internet Protocol Security) was developed by the Internet Engineering Task Force (IETF), for IPv6, which requires it. This standards-based security protocol is also widely used with IPv4. Layer 2 Tunneling Protocol frequently runs over IPsec. Its design meets most security goals: authentication, integrity, and confidentiality. IPsec functions through encrypting and encapsulating an IP packet inside an IPsec packet. De-encapsulation happens at the end of the tunnel, where the original IP packet is decrypted and forwarded to its intended destination.
 - Transport Layer Security (SSL/TLS) can tunnel an entire network's traffic or secure an individual connection.
 - Datagram Transport Layer Security (DTLS) is used to solve the issues SSL/TLS has with tunneling over UDP.
 - Microsoft Point-to-Point Encryption (MPPE) works with the Point-to-Point Tunneling Protocol and in several compatible implementations on other platforms.
 - Microsoft's Secure Socket Tunneling Protocol (SSTP) tunnels Point-to-Point Protocol (PPP) or Layer 2 Tunneling Protocol traffic through an SSL 3.0 channel.
 - Secure Shell (SSH) offers VPN tunneling to secure remote connections to a network or inter-network links.

XI. PROPOSED WORK

A secure client-server VoIP application can be implemented with two major considerations. First, the integrity of the voice information needs to be preserved; that is, the information must arrive to its destination exactly as it was sent originally. Secondly, the

confidentiality of the voice information needs to be guaranteed. Therefore, voice over IP installations should incorporate effective solutions to both of these security requirements with high performance and balanced Quality of Service (QoS).

Session Initiation Protocol is notoriously difficult to pass through a firewall because it uses random port numbers to establish connections. The proposed system utilizes virtual private network (VPN) tunnels to connect a remote phone to the VoIP Server. It requires that prior placing or receiving phone calls, the VPN connection would need to be up and running.

XII. Architecture for the Proposed Solution

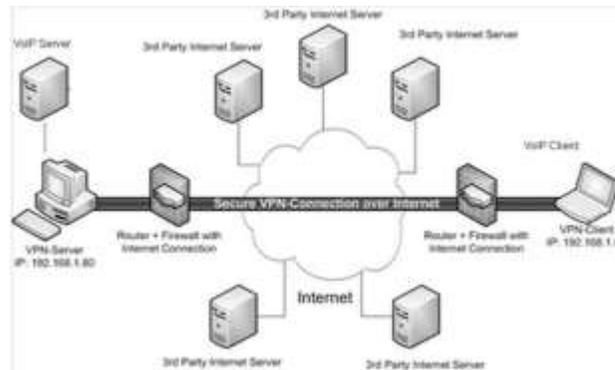


Fig.7. Architecture of proposed VoIP VPN Network

The proposed solution combines VoIP and virtual private network technologies to offer a method for delivering secure voice. Because VoIP transmits digitized voice as a stream of data, the solution accomplishes voice encryption quite simply, applying standard data-encryption mechanisms inherently available in the collection of protocols used to implement a VPN.

XIII. Security Implementation through VPN Tunnel

The basic working of the VoIP application is based on the packet exchange between the VoIP server and VoIP clients who want to communicate. All the VoIP clients send their packets to the VoIP server first which then in turn routes the packet to the destination client. To make this client-server communication secure from VoIP server's point of view, the VPN server establishes tunnel between the client and the server. The VPN server provides security to the VoIP server by encapsulating the digitized voice within IP packets, then encrypting the digitized voice using IPsec, and finally routes the encrypted voice packets securely through a VPN tunnel. At the remote site, another VoIP client decodes the voice and converts the digital voice to an analog signal for delivery to the phone. The same is repeated in reverse order whenever VoIP client sends the packet to the VoIP server.

XIV. CONCLUSION & FUTURE SCOPE

VoIP technology is still at the early stage of adoption, and attacks against deployments have been largely unheard of or undetected. As VoIP increases in popularity and numbers of consumers, so does the potential for harm from a cyber attacks. In the proposed solution implementation of VPN tunnel is suggested between the VoIP server and VoIP client. VPN service providers allow flawless communication over the Voice over IP. It provides secured communications between VoIP clients with signaling and media encryption. One of the major features of VPN is no additional configuration and maintenance. This makes it a cost effective security solution for VoIP Server.

Being is a hardware intensive service, sometimes VPN's can take some time to setup, which leads to unnecessary delays. If the strain of encrypting and decrypting traffic on the VPN appliance becomes burdensome, the result may again be delayed VoIP packets and may cause jitter on the VoIP phone. Efficient techniques to resolve above two issues would enable the VPN tunnel to provide enhanced security for VoIP servers in future.

REFERENCES:

- [1]. X. Wei, Y. Bouslimani, K.Sellal, "VoIP Based Solution For the Use over A Campus Environment", IEEE - CCECE, 2012
- [2]. CCS-WG, "Quality of Service (QoS) Standard for Telephone Services", <http://www.ofta.gov.hk/en/ad-comm/tsac/cc->

paper/ccs2005p11.pdf, 2005.

- [3]. David Schneider, "The state of network security", Network Security, Volume 2012, Issue 2, 2012.
- [4]. X. Wei, K. Sellal and Y. Bouslimani, "Security Implementation for a VoIP Server", International Conference on Computer Science and Service System, 2012.
- [5]. D. Endler, and M. Collier, "Hacking Exposed VoIP: Voice Over IP Security Secrets & Solutions (Hacking Exposed)", McGraw-Hill Osborne Media, 2006.
- [6]. H. Schulzrinne, S. Casner, R. Frederick et al., "RFC1889: RTP: A Transport Protocol for Real-Time Applications" Internet RFCs, 1996.
- [7]. RFC768, "UDP, User Datagram Protocol, IETF Standard" August, 1980.
- [8]. I.Rec."H.323, Packet based Multimedia Communications Systems, <http://www.itu.int/rec/T-REC-H.323/en/>," Telecommunication Standardization Sector of ITU.
- [9]. RFC 3261, "SIP: Session Initiation Protocol", 2002.
- [10]. J. Rosenberg, H. Schulzrinne, G. Camarillo, A. Johnston, J. Peterson, R. Sparks, M. Handley, and E. Schooler. "SIP: Session Initiation Protocol." RFC 3261 (Proposed Standard), June 2002. Updated by RFCs 3265, 3853.
- [11]. Mason, Andrew G. Cisco Secure Virtual Private Network. Cisco Press, 2002.
- [12]. Walsh, Thomas and Kuhn, Richard, "Challenges in Securing Voice over IP". IEEE Security & Privacy Magazine, Volume 3, Issue 3, May-June 2005, pages 44-49.
- [13]. Recommendation ITU-T G.114, "One Way Transmission Time", Int'l Telecomm. Union, 1988.

M-Commerce

Kush Dhingra¹, Abhishek Bhardwaj², Aashish Aggarwal³

¹IP University, Sirifort College of Computer Technology and Management
8, Institutional Area, Rohini Sector-25, New Delhi
descentdhingra@yahoo.com

+91 9650629941

²IP University, Sirifort College of Computer Technology and Management
8, Institutional Area, Rohini Sector-25, New Delhi
abhi14.amity@gmail.com

³IP University, Sirifort College of Computer Technology and Management
8, Institutional Area, Rohini Sector-25, New Delhi
aa03397@gmail.com

ABSTRACT- The purpose of the research paper is to identify the progress and future direction of M-commerce. Here buying and selling of good and services is done by equipment called mobile which is wireless handled device. M-commerce is the next generation of E-commerce which enable user to access internet without need of a place plugin. Today, mobile is not use for sending message or calling but it also used for other ways like web browsing etc. The technology used in M-commerce based on wireless application protocol (WAP). M-commerce helps in improving relationship with customer.

Keywords: E-commerce, M-commerce, customer, PDA's

Introduction

In M-commerce transaction can be completed on equipment called mobile phone or Telephone which make possible transactions through a wireless telecommunication network. But if we talk about E-commerce, E-commerce is type of industry where buying and selling of good and services are conducted on internet and other computer networks. E-commerce includes trading of good and services and electronic material. M-commerce is the extension of E-commerce. Now days, due to advanced technologies the wireless and mobile technologies are conducted from wired Network to wireless Network [3].

While users conduct e-banking or they had to purchase product they don't need to use personal computer due to M-commerce. Means that with the use mobile phone to personal digital assistants (PDA's) they can do various activities. We can also say that "M-commerce is a subset of E-commerce".

M-commerce can also be defined as "any transaction having a monetary value that can be conducted through a mobile communication networks or a Wi-Fi network" [1].

Business-to-consumer transactions conducted from a mobile device are also known as M-commerce.

Objectives of M-commerce

Main objectives for M-commerce are as follows:-

1. To find out what are the benefits of M-commerce.
2. To find out what problems are going to face by M-commerce.
3. To find out How M-commerce can be grown.

M-commerce services

M-commerce provide various services such as-

1. Mobile e-Banking services (check out account information and money transfer).
2. Mobile trade services that is buying/selling, stock quotes etc.
3. News such as sports, headline, weather etc.
4. Online booking tickets of movies or railways/airline.
5. Hotel booking or reservation through mobile [6].

M-commerce Scope

Research area mainly focuses upon M-commerce

Benefits and hurdles in India. Research is emphasized upon what difficulties are being faced by M-commerce industry in India and how they can be deal with the best of their efforts. Research paper also gives stress in finding the level of M-commerce [1].

Significance

The significance of M-commerce are as follows:

1. M-commerce industry, it helps to understand that what problems are being faced to start the M-commerce business.
2. Government to analysis those factors which are responsible for growth of M-commerce business in India and how these factors can be enlarged by making rules and regulations for development of M-commerce industry as well as development of nation[1].

Merits of M-commerce

The Merits of M-commerce are as follows:

1. As we know now a days M-commerce is growing rapidly, the number of mobile phones is growing now a days. M-commerce help each individual to do his/her work smoothly according to their schedule. The benefits of M-commerce are as follows:
2. Easy to carry mobile- As Mobile device is easy to carry by user, it helps user to avoid to go to shops physically as it also help to avoid once use of laptops.
3. Saves time-For making an m-commerce transaction it is not needed that the user needs to plug in his laptop or PC and wait for the system to reload. It is enough that you just hit a single button on your mobile device.
4. Quicker access-connecting through a mobile is faster than dial-up connections using wire line modems.
5. Electronic Wallet-Analysts believe that easy mobile payment is one of the main prerequisites for the success of m-commerce, when the mobile phone can functions as an electronic wallet for mobile payments, including micropayments, application developers and service providers will find it attractive to introduce new mobile communication services to the market.
6. Flexibility accessibility- Users can be accessible through their mobile phones and at the same time be accessible online to by logging on to various mobile messengers like Facebook, Twitter, Gmail and other networking platforms [1].

Demerits of M-commerce

1. Technology constraints of mobile devices (memory, Processing power, display capabilities, input methods).
2. Less Graphics Resolution-In comparison of computer/laptops mobile has less resolution. In other words product is not properly displayed compared to laptops/computer.
3. Less Functionality-As Mobile Phone Provide Less Functions compared to Laptops. Here functionality is limited for mobile phones.
4. Lack of Awareness- in India people do not aware about M-commerce. Literacy rate of India is grew by 74.04%, but in world literacy rate is 84% in 2011. People in India is Uncomfortable to buy products through M-commerce [1].

Difference between M-commerce and E-commerce

1. E-commerce means doing business transactions on the Internet using computers or laptops. Whereas, in M-commerce means doing business transactions on the Internet through the use of mobile devices.
2. M-commerce is very portable because mobile phones are very easy to carry. You can do your business transactions anywhere you go as long as you can access the Internet on your phone. Whereas in E-commerce, you have to do your transactions on the computer. Laptops are also portable but not as light as mobile phones.
3. M-commerce is usually charged through the caller's premium rates, charging the user's bill, or reducing the caller's credit, and also through mobile banking. Whereas, in E-commerce is charged through the use of swipe machines where you swipe your credit card. You can also transfer money through online banking and pay for products you have bought on the Internet using your credit card number.
4. M-commerce is available anywhere you go even if there is no Internet because the Internet is available in your mobile phone, whereas for E-commerce it is not available everywhere because not all places have an Internet connection [1].

Conditions of M-commerce in India

As we know mobile devices are becoming a part of our daily routine life, People use internet for various purposes which include: email, academic and financial information search, music and video on internet, chatting, online job search, gaming, booking tickets, hotel reservation, online news, internet telephony/video chat/voice chat, and online banking.

E-commerce has touched every field of human life from information search to entertainment, job search etc. [1]

Suggestion to improve M-commerce:

Indian government take necessary steps to improve M-commerce in India like building of infrastructure to improve internet connectivity, they had to start campaigns for M-commerce knowledge. As M-commerce is not new in India Government had to take steps to provide awareness of M-commerce in India.

CONCLUSION

The presence of M-commerce has improved the way how we conduct business. Still there is a lot of work, which can be done for M-commerce for its growth. M-commerce market grows in India due to growth of financial area and no. of smart phone buyer are increasing. But if we talk about India, it still take some year to develop compare to nation like China which is developing very fast. Due to M-commerce our time saves due to online transaction on mobile which is less expensive compared to E-commerce.

REFERENCES:

- [1] Benefits and drawbacks of M-commerce in India: A review (A research paper by Dr. Sachin Yadav & Mr. Anand Vyas).
- [2] E-commerce versus M-commerce: Where is the dividing line? (A research paper by Priscilla Omenedo & Paul Bocij).
- [3] From E-commerce to M-commerce: Research directions (A research paper by Franz Lehner & Richard T. Watson).
- [4] Challenges and Success Factors in M-commerce Relationship Management: A Systematic Literature Review Protocol (A research paper by Muhib Ullah & Siffat Ullah Khan).
- [5] New perspective on M-commerce research (A research paper by Shintaro Okazaki).
- [6] M-commerce Services (A research paper by Ljupco Antovski & Marjan Gusev).
- [7] Okazi, S. (2005). New Perspectives on m-commerce Research. Journal of Electronic commerce Research, 6(3), 160-164.
- [8] Ravi Tondon Swarup Mandal, and D. Saha, "M-commerce issues and challenges," 2003.
- [9] L.J., "M-commerce", amazing! CJRW," vol.2002, 2001.
- [10] J. Sim and C. Wright, "Research in Health Care," GL537TH, UK: Stanley Thrones Publishers Ltd. 2000.
- [11] Website," <http://www.corethree.net/mobile-commerce-crm.html>.

Privacy Protection in Personalized Web Search by hiding sensitive nodes of hierarchical user profile using GreedyDP and GreedyIL

Uday Dattatraya More
(Student, Dr .D. Y. Patil Insti.
Of Engg. & Tech., India)
(pokharkarkavita@gmail.com)

Kavita Tushar Nanekar
(Student, Dr .D. Y. Patil Insti.
Of Engg. & Tech., India)

Sana Sahar Murtuza Sothe
(Student, Dr .D. Y. Patil Insti.
Of Engg. & Tech., India)

Sharmila A.Chopade
(Faculty, Dr .D. Y. Patil Insti.
Of Engg. & Tech., India)

(ssothe@rediffmail.com)

Abstract-Personalized web search (PWS) has provided its effectiveness in improving the quality of various search services on the Internet. Personalized search is a promising way to improve the accuracy of web search, and has been attracting much attention now days. But effective, personalized search requires aggregating and collecting user information, which cause privacy infringement for many users; these infringements have become one of the main obstacles to deploying personalized search applications, and great challenge of how to do privacy preserving personalization. We study privacy protection in PWS applications that model user preference as hierarchical user profiles. We propose a PWS framework called UPS (User customizable Privacy-preserving Search) that can adaptively generalize profiles by queries while respecting user specified privacy requirements. Our runtime generalization has aims of keeping a balance between two predictive metrics that evaluate the utility of personalization and the privacy risk of exposing the user generalized profile.

Keyword- Privacy, Taxonomy, Web search, Servers, Sensitivity, profile, Privacy protection, personalized web search, utility, risk

1 Introduction:

Web search engines have made enormous contributions to the web and society. They make finding information on the web quick and easy. However, they are far from optimal. For a given query, a personalized Web search can provide different results for different users or organize results differently to each user, based upon their interests and information needs. Personalized web search differs from generic web search because it returns identical research results to all users for identical queries, independent of varied user interests and information needs. A major deficiency of generic search engines is that they follow the “one size fits all” model and are not adaptable to individual users. This is typically shown in cases such as these:

- 1) Different users have different backgrounds and interests. They may have completely different information needs and goals when providing exactly the same query. For example, a biologist may issue “mouse” to get information about rodents, while programmers may use the same query to find information about computer peripherals. When such a query is issued, generic search engines will return a list of documents on different topics. It takes time for a user to choose which information he/she really wants, and this makes the user feel less satisfied. Queries like “mouse” are usually called ambiguous queries. Statistics has shown that the vast majority of queries are short and ambiguous. Generic web search usually fails to provide optimal results for ambiguous queries.
- 2) 2. Users are not static. User information needs may change over time. Indeed, users will have different needs at different times based on current circumstances. For example, a user may use “mouse” to find information about rodents when the user is viewing television news about a plague, but would want to find information about computer mouse products when purchasing a new computer. Generic search engines are unable to distinguish between such cases. Personalized web search is considered a promising solution to these problems, so it can provide different search results based upon the information as per user need. It exploits user information and search context in learning to which sense a query refers. Consider the query “mouse” mentioned above: Personalized web search can disambiguate the query by gathering the following user information:
 1. The user is a computer programmer not a biologist.
 2. The user has just input a query “keyboard,” but not “biology” or “genome.” Before entering this query, the user had just viewed a web page with many words related to computer mouse, such as “computing,” “input device,” and “keyboard.”

Such irrelevance is largely due to the enormous variety of users contexts and backgrounds as well as the ambiguity of text. Personalized web search (PWS) is a general category of search techniques aiming at providing better search results, which are adjust for individual user needs. As the expenditure, user information has to be collected and analyzed to figure out the user intention behind the issued query.

The solutions to PWS can generally be divided into two types

1. Click -Log –Based :-

The click-log based methods are clear-cut and simple, they simply impose bias to clicked pages in the user's query history, although this method has been demonstrated to perform consistently and remarkably well, it can only work on repeated queries from the same user, which is a strong limitation enclose its application.

2. Profile Based :-

To provide personalized search results to users, personalized web search maintains a user profile for each individual. A user profile stores approximations of user tastes, interests. It is generated and updated by exploiting user-related information. Such information may include:

- a) Demographic and geographical information, including age, gender, education, language, country, address, interest areas, and other information.
- b) Search history, including previous queries and clicked documents. User browsing behavior when viewing a page, such as dwelling time, mouse click, mouse movement, scrolling, printing, and bookmarking, is another important element of user interest.
- c) Other user documents, such as bookmarks, favorite web sites, visited pages, and emails. The external user data stored in a user client is useful to personalize individual search results.

User information can be specified by the user (explicitly collecting) or can be automatically learnt from a user's historical activities (implicitly collecting). As the vast majority of users are reluctant to provide any explicit feedback on search results and users interests, many works on personalized web search focus on how to automatically learn user preferences without involving any direct user efforts. Collected user information is processed and organized as a user profile in a hierarchical structure, depending on the need of personalization algorithm. This can be completed by creating vectors of URLs/domains, keywords, topic categories or the like.

Although there are pros and cons for both types of PWS techniques, the profile-based PWS has indicate, more effectiveness in improving the quality of web search freshly, with increasing usage of personal and behavior information to profile its users. The users' reluctance to disclose their private information during search has become a major barrier for the wide proliferation of PWS. Privacy issues are rising from the lack of protection for such data. In fact, privacy concerns have become the major barrier for wide proliferation of PWS services.

Server side and client side implementation:

Personalized web search can be implemented on either server side (in the search engine) or client side (in the user's computer or a personalization agent). For server-side personalization, user profiles are construct, updated, and stored on the search engine side. User information is directly include into the ranking process, or is used to help process earliest search results. The advantage of this architecture is that the search engine can use all of its resources, for example link structure of the complete web, in its personalization algorithm. Also, the personalization algorithm can be easily accommodate without any client efforts. This architecture is accepted by some general search engines such as Google Personalized Search. The disadvantage of this architecture is that it brings high storage and computation costs when millions of users are using the search engine, and it also enhance privacy concerns when information about users is stored on the server.

For client-side personalization, users information is collected and stored on the client side (in the user's computer or a personalization agent), usually by installing a client software or plug-in on a user's computer. In client side, not only the user's search behavior but also his contextual activities (e.g., web pages viewed before) and personal information (e.g., emails, documents, and bookmarks) could be incorporated into the user profile. This allows the construction of a much richer user model for personalization. Privacy concerns are also reduced since the user profile is strictly stored and used on the client side. Another benefit is that the raised in computation and storage for personalization can be distributed among the clients. A main drawback of personalization on the client side is that the personalization algorithm cannot use some knowledge that is only available on the server side (e.g., Page Rank score of a result document). Furthermore, due to the limits of network bandwidth, the client can usually only process limited top results.

Challenges of Personalized Search

Despite the attractiveness of personalized search, there is no large-scale use of personalized search services currently. Personalized web search faces several challenges that retard its real-world large-scale applications:

1. Privacy is an issue. Personalized web search, especially server-side implement, requires collecting and aggregating a lot of user information including query and click through history. A user profile can reveal a large amount of private user information, such as hobbies, vocation, income level, and political inclination, which is clearly a serious concern for users. This could make many people nervous and feel afraid to use personalized search engines. A personalized web search will be not well received until it handles the privacy problem well.
2. It is really hard to infer user information needs accurately. Users are not static. They may randomly search for something which they are not interested in. They even search for other people sometimes. User search histories inevitably contain noise that is irrelevant or even harmful to current search. This may make personalization strategies unstable.
3. Queries should not be handled in the same manner with regard to personalization. Personalized search may have little effect on some queries. Some work investigates whether current web search ranking might be sufficient for clear/unambiguous queries and thus personalization is unnecessary.

2 Literature survey review:

1) A LargeScale Evaluation and Analysis of Personalized Search Strategies

Author: Z.Dou, R.Song, and J.-R. Wen,2007 Proc. Int'l Conf.

Method: A large scale evaluation framework for personalized search based on query logs,and then evaluate five personalized search strategies (including two click log based and profile based)using 12-days MSR query log.

Advantage: Search accuracy is evaluated by real user clicks recorded in query logs automatically.

Disadvantage: Personalization may lack effectiveness on some query

2) Implicit User Modeling for Personalized Search

Author: sX. Shen,B.Tan, and C.Zhai, pro 14th ACM Int'l Conf. Information and Knowledge Management (CIKM), 2005

Method:Here present a decision theoretic framework and develop techniques for implicit user modeling in information retrieval. They develop an intelligent clientside web search agent (UCAIR) that can perform eager implicit feedback.

Advantage: Search agent can improve search accuracy over the popular Google search engine.

Disadvantage: They generally lack user modeling and are not adaptive to individual users.

3) Personalizing Adaptive Web Search Based on User Profile Constructed without any effort from Users.

Author: K. Sugiyama, K. Hatano, and M. Yoshikawa Proc. 13th Int'l Conf., 2004.

Method: Propose several approaches to adapting search results according to each user's need for relevant information without any user effort, and then verify the effectiveness of our proposed approaches.

Advantage: User's preferences can be achieved by user profile based on modified collaborative filtering with detailed analysis of user's browsing history in one day.

Disadvantage: Each user needs different information for his/her query. Therefore, the search results should be adapted to users with different information needs.

4) Mining Long-Term Search History to Improve Search Accuracy

Author: B.Tan,X.Shen, and C.Zhai,Proc. ACM SIGKDD Int'l Conf. Knowledge Discovery and Data Mining (KDD), 2006

Method: Statistical language modeling based methods to mine contextual information from long term search history.

Advantage: Exploit it for a more accurate estimate of query language model.

Disadvantages: The web search engines, suffer from the problem of documents to return is "one size fits all" the decision of which documents to return is based on query, without consideration of a particular.

3 System Description:

UPS framework assumes that the queries do not contain any sensitive information, and aims at protecting the privacy in individual user profiles while retaining their usefulness. UPS Framework which generalized profile s for each query according to user specified privacy requirements. The problems of privacy preserving personalized search as Risk Profile Generalization, with its NP-Hardness proved. A Trade o_ between search quality and level of privacy protection achieved from generalization. Generalization algorithms are used namely GreedyDP and GreedyIL to find out an utilization of user search and improving performance.

1. User fire a query 'q' through a proxy refer as an on-line profiler to the server.

2. Then generalized profile is created by a proxy and both generalized profile and query are passed to the server.

3. Server gives response 'r' back to the proxy, then it decides either to re-ranked the search or provide as it is result to client as per the query.

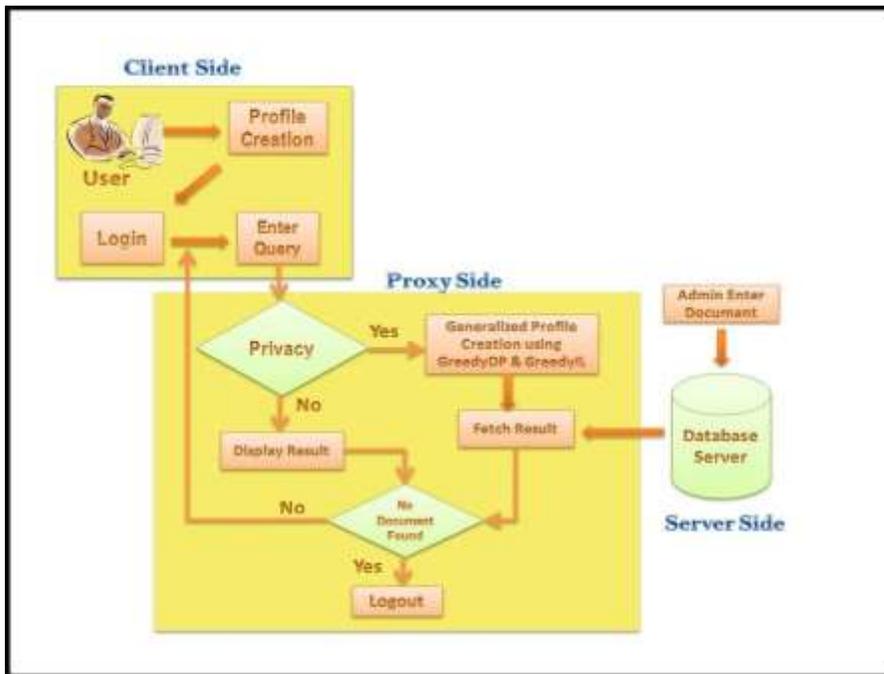


Fig: System Architecture

Advantages

1. PWS System enhances the stability of the search quality.
2. System avoids the unnecessary exposure of the user profile.
3. PWS System provides runtime profiling, which in effect optimizes the personalization utility while respecting user's privacy requirements.
4. System allows for customization of privacy needs.
5. Does not require iterative user interaction.
6. System is Client side completely.

Limitation

1. System is depends upon Proxy Server.
2. Proxy Server Failure fails the whole system.
3. System gives the results in "Text " format.
4. Only one user Login at a time to System.

3.1 Modules :

1. User Registration And Login Module :

This module accepts username , id and password and authenticates the user after user registration .The basic task of this module is to login system and obtained services from Server.

2. Profile Construction Module :

This module consist of a pro_le construction followed by:

- (a) First assume that the user's preferences are represented in a set of plain text documents, denoted by D.
- (b) Detect the respective topic in R for every document d is a element of D and split the query by using "@" sign.

3. Privacy Customization Module :

This module includes the Customization of user by users profile by calculating the cost of each node from the Document D. And Specifying the sensitive node and Non sensitive node. Provides the Privacy by hiding sensitive node.

4. Query Topic Mapping Module :

This module consist of query topic mapping which gives the seed profile in terms of result. Mapping is takes place in between Query and Taxonomy profile 'T'. All non-sensitive nodes set to 0 ,and removes the sensitive node from profile by applying Prune-leaf technique.

5. Profile Generalization Module :

This Module involves the Generalization of profile using seed profile and query by applying fusion of GreedyDP, GreedyIL

3.2 Algorithm:

Input: G_0 :Seed Profile ,q:Query, δ :Privacy Threshold

Output: Generalized Profile G_* from GreedyIL(H,q, δ)

Assumes:

Q: Generate IL priority Queue
i: iteration index, initialized to 0
t: topics

Steps:

- 1) Find the Discriminating Power(DP) of Query and Repository= $(\text{Profile Granularity} + \text{Topic Similarity}) / (\text{Expected IC of Topics})$ and if Discriminating Power(DP) of Query and Repository is less than μ then
- 2) Find the Profile Granularity of Query and Repository= $\text{Summation of } (\text{Pr}(t|q,G) * \text{IC}(t)) - H(t|q,G)$
- 3) Find the Topic Similarity of Query and Repository= $\text{IC}(\text{lca}(\text{TG}(q)))$
- 4) Find the Information Content $\text{IC}(t) = \log^{-1} \text{Pr}(t)$
- 5) Find the $\text{Pr}(t) = \text{Pr}(t|\text{root}(R))$
- 6) find the Information Loss of each topic
- 7) find the risk of query and seed profile = $\text{Risk}(q,G) / \text{Summation of sen}(s)$,while $\text{Risk}(q,G) > \delta$
- 8) parent of each topic
- 9) Process Prune Leaf as $G_i \rightarrow G_{i+1}$ by eliminating t (topics)
If t has no sibling then
Prune leaf only operates on single topic t also insert into Q
Else If t has sibling then
Merge t into shadow sibling node
If No operations on t 's sibling in Q then
Prune leaf only operates on single topic t also insert into Q
Else Update IL-values for all operations on t 's sibling in Q
- 10) Update i And goto step 7
- 11) Return G_i as G_* goto step 1
- 12) Return Root(R) as G_*

3.3 Experimental Results:

3.3.1 Accuracy

According to practical evaluation following graph shows the time required for execution of system as per numbers of Nodes. Figure show that as the numbers of nodes increases the time required for user is also increases.

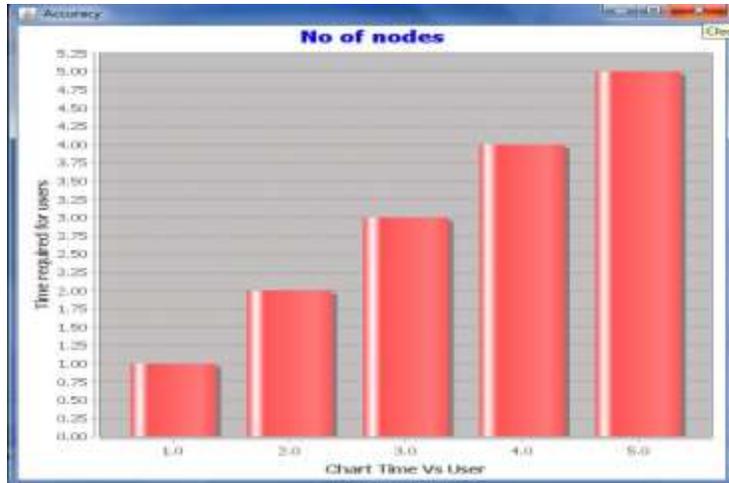


Fig:Time Vs User

5 Key Applications:

Personalized web search is considered a promising solution to improve the performance of generic web search. Currently, Google and other web search engines are trying to do personalized search.

6 Future Work and Conclusion:

This paper presented a client-side privacy protection framework called UPS for personalized web search. UPS could potentially be adopted by any PWS that captures user profiles in a hierarchical taxonomy. The framework allowed users to specify customized privacy requirements via the hierarchical profiles. For future work, we will try to resist adversaries with broader background knowledge, such as richer relationships among topics (e.g., exclusiveness, sequentiality, and so on), or capability to capture a series of queries from the Victim. We will also seek more sophisticated methods to build the user profile, and better metrics predict the performance (especially the utility) of the UPS.

7 Acknowledgement:

The authors would like thanks to the publishers, researchers for making their resources available and teachers for their guidance. We also thank the college authority for providing the required infrastructure support. Finally, we would like to extend heartfelt gratitude to friends, family members.

REFERENCES:

- [1] G. Chen, H. Bai, L. Shou, K. Chen, and Y. Gao, "Ups: Efficient Privacy Protection, in Personalized Web Search," Proc. 34th Int'l ACM SIGIR Conf. Research and Development in Information, pp. 615- 624, 2011.
- [2] J. Conrath, "Semantic Similarity based on Corpus Statistics and Lexical Taxonomy," Proc. Int'l Conf. Research Computational Linguistics (ROCLING X), 1997.
- [3] D. Xing, G.-R. Xue, Q. Yang, and Y. Yu, "Deep Classifier: Automatically Categorizing Search Results into Large-Scale Hierarchies," Proc. Int'l Conf. Web Search and Data Mining (WSDM), pp. 139-148, 2008.
- [4] Y. Zhu, L. Xiong, and C. Verdery, "Anonymizing User Profiles for Personalized Web Search," Proc. 19th Int'l Conf. World Wide Web (WWW), pp. 1225-1226, 2010.
- [5] J. Castellí-Roca, A. Viejo, and J. Herrera-Joancomartí, "Preserving User's Privacy in Web Search Engines," Computer Comm., vol. 32, no. 13/14, pp. 1541-1551, 2009.
- [6] A. Viejo and J. Castellí-Roca, "Using Social Networks to Distort Users' Profiles Generated by Web Search Engines," Computer Networks, vol. 54, no. 9, pp. 1343-1357, 2010.
- [7] X. Shen, B. Tan, and C. Zhai, "Privacy Protection, in Personalized Search," SIGIR Forum, vol. 41, no. 1, pp. 4-17, 2007

Identification of disguised voices using feature extraction and classification

Lini T Lal, Avani Nath N.J,

Dept. of Electronics and Communication, TKMIT, Kollam, Kerala, India

linithyvila23@gmail.com, 9495052225

Abstract— Voice disguising is the process of altering or changing one's own voice to dissemble his or her own identity. It is being widely used for illegal purposes. Voice disguising can have negative impact on many fields that use speaker recognition techniques which includes the field of Forensics, Security systems, etc. The main challenge of speaker recognition is the risk of fraudsters using voice recordings of legitimate speakers. So it is important to be able to identify whether a suspected voice has been impersonated or not. In this paper, we propose an algorithm to identify disguised voices. The Mel Frequency Cepstral Coefficients (MFCC) is one of the most important feature extraction technique, which is required among various kinds of speech applications. Voice disguising modifies the frequency spectrum of a speech signal and MFCC-based features can be used to describe frequency spectral properties. The identification system uses mean values and correlation coefficients of MFCC and its regression coefficients as the acoustic features. Then Support Vector Machine (SVM) classifiers are used to classify original and disguise voices based on the extracted features. Accurate detection of voices that are disguised by various methods was obtained and the performance of the algorithm is phenomenal.

Keywords— Disguised voices, MFCC, regression coefficients, mean value, correlation coefficients, SVM

INTRODUCTION

Voice is unique for every individual. So this voice can be used to verify the identity of a person. Voice identification and speaker recognition is used in many fields like Automatic Speaker Recognition Systems (ASRS), Audio forensics, Biometric access control systems etc. But such voice disguise identification systems often suffer from the question of disguised voices. Voice disguising is the process by which a speaker's voice tone gets changed and helps in hiding his/her identity. Voice disguising can be divided into two broad groups: Intentional voice disguising and unintentional voice disguising.

Unintentional modifications are caused by emotional conditions like excitement, stress etc. or by physical illness such as cold, sore throat etc. Intentional voice variations include the voice changes where people try to evade detection. Intentional variations can be further divided into two groups. Electronic voice disguising and non-electronic voice disguising. Electronic voice disguising modifies the voice electronically by using some electronic software. It modifies some specific parameters like the frequency, speaking rate, duration etc. in order to change the voice. Nowadays a wide variety of audio editing software such as Audacity, Cool Edit, PRAAT etc. are available. Non-electronic voice disguising on the other hand alters voice mechanically by hindering the speech production system itself. These include speaking with pinched nostrils, whispered speech, using a bite block or handkerchief over the mouth while speaking and so on. Voice disguising can be used for many useful purposes. This technique is used in television and radio interviews for the secure transmission of spoken information without revealing the identity of the speaker. The other applications of voice disguising include entertainment, speech coding, speech synthesis etc. But since voice disguising can be easily achieved using some electronic softwares and simply by altering voice naturally it is a common practice to use the voice disguising for illegal purposes nowadays.

Only a few studies have been reported yet on the identification of such disguised voices. Early studies on voice disguising classify both electronic and non-electronic voice disguising as voice conversion and voice transformation [3]. Voice conversion consists the modification of source speaker voice to sound like a target speaker voice, and voice transformation is the different possibilities to change one or more parameters of the voice [2]. Voice disguising can introduce great variations in the acoustic properties of voice such as fundamental frequency (F_0), intensity, speaking rate etc. Considering the two common voice disguising patterns of raising the voice pitch and lowering it, magnitude of F_0 change and its intensity is much greater in high pitched voices than that in low-pitched voices. Also for low-pitched voice

speakers show consistent tendency of decreasing the speaking rate by slowing down their speech [9]. The performance of Automatic Speaker Recognition Systems (ASRS) is greatly degraded by the presence of disguised voices. The effects of different non-electronic disguising patterns on SRS are different. Among the different disguising patterns available whispered speech, masking over the mouth and raised pitch highly degrades the performance of the Speaker Recognition Systems. FASRS is independent of language and dialect. Therefore it is resistant to foreign accent disguising [8]. Spectral analysis of speech signals provides interesting ways to describe the speech signal in terms of parameters or features. Among the different parameters available Mel Frequency Cepstral Coefficients (MFCC) are the most commonly used feature for speaker/speech recognition applications. MFCC well explains the frequency spectrum of a given voice signal and a disguised one. The identification system for disguised voices is based on the idea that the mean values and correlation coefficients ie, statistical moments of the MFCC, delta MFCC and double delta MFCC varies from that of the disguised voices. The feature extraction stage is one of the important stages. Given a learning problem and a finite training database, SVMs properly weight the learning potential of database and the capacity of the machine and so the classification of the voice as original and disguised is done using Support Vector Machine (SVM)[12].

METHODOLOGY

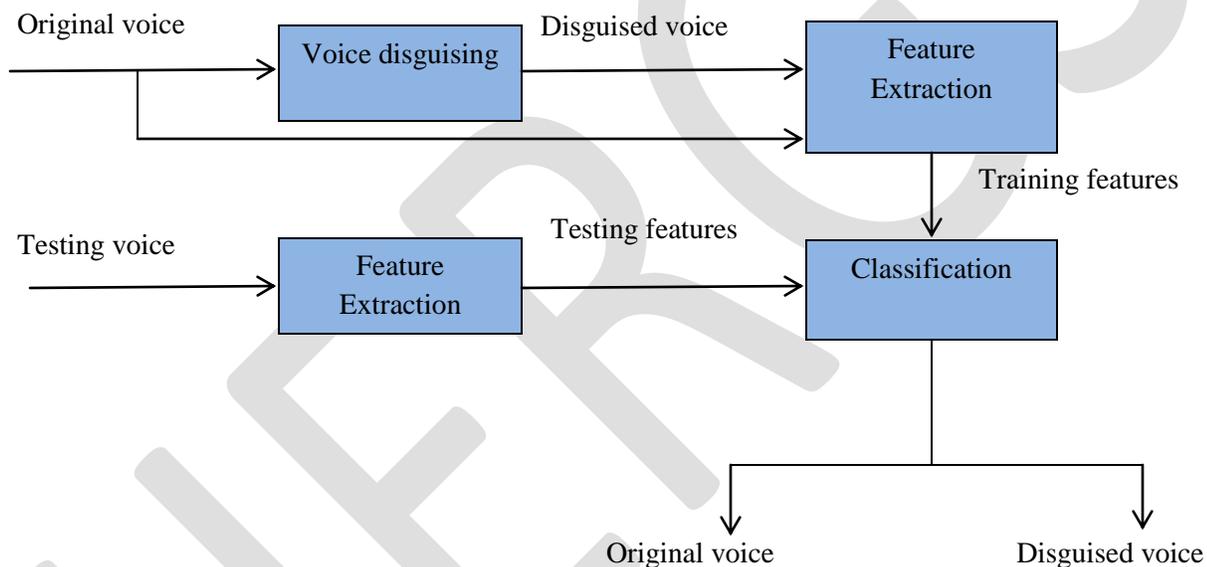


Fig. 1. Block diagram of disguised voice identification system

1) Database collection

Original and disguised voices are required as input speech signal for disguised voice detection. Speech recordings were collected from the students of TKM Institute of Technology, Kerala. Database of about 40 students were used for training which consists of 20 male and 20 female students. The speech recording was text and language independent. They were allowed to speak for more than 2s. The recordings were made at 16 kHz sampling rate and 16 bit quantization.

For electronic voice disguising the voice changing software Audacity was used. Semitones were used as the disguising factor. Disguising factor ranging from +1 to +11 and -1 to -11 were chosen and therefore 22 different kinds of disguised voices were created from each of the original voice collected.

For non-electronic disguising three types of disguising patterns ie, speaking with pinched nostrils, covered mouth and bite block were selected. Each subject were asked to speak on their normal voice and using all the three above non-electronic disguising methods.

In the testing stage, database was collected from 20 speakers who were not included in the training stage. Electronically disguised database was created using Audacity from each original voice by choosing two or three different disguising factors from the total available 22 disguising factors. Non-electronically disguised database was selected from the speech recordings of the test subjects spoke using the above mentioned disguising patterns.

2) Voice disguising

Voice disguising is done electronically and non-electronically

2.1) Electronic voice disguising

Electronic voice disguising, in effect, modifies the pitch of the voice. An effective time domain technique used for the pitch modification of a given voice is the voice resampling. Voice resampling is a mathematical operation that rebuilds a continuous waveform from its samples and then samples that waveform again at a different rate. Let the original short-time speech signal $x(n)$, of duration D and pitch P , be resampled by a factor of $1/\alpha$ to get the signal $x'(n)$. The resampled signal is of duration D' and pitch P' . Then the relation between the original signal and the resulting resampled signal is given as:

$$D' = \frac{D}{\alpha} \quad (1)$$

$$X'(\omega) = 1/\alpha X(\frac{\omega}{\alpha}) \quad (2)$$

$$P' = \alpha P \quad (3)$$

where $X(\omega)$ and $X'(\omega)$ are the frequency spectrum of the original signal and the resampled signal respectively. When the value of $\alpha < 1$, the $X(\omega)$ is compressed in frequency domain and the pitch is lowered. Otherwise $X(\omega)$ is stretched and the pitch is raised. But during voice resampling the duration D of the original signal is changed to D' along with the change in pitch. Such duration alteration may result in that the speed of the voice signal $x'(n)$ is too fast or too slow when compared to the original signal $x(n)$. So in order to adjust the duration D' back to D time-scale modification can be used. The Synchronized Over-Lap Add (SOLA) algorithm is the mostly used technique for time-scale modification. Here the original voice signal is firstly decomposed into frames and several frames are repeated or discarded while leaving others unchanged. The idea of the SOLA technique is shown in figure 1.

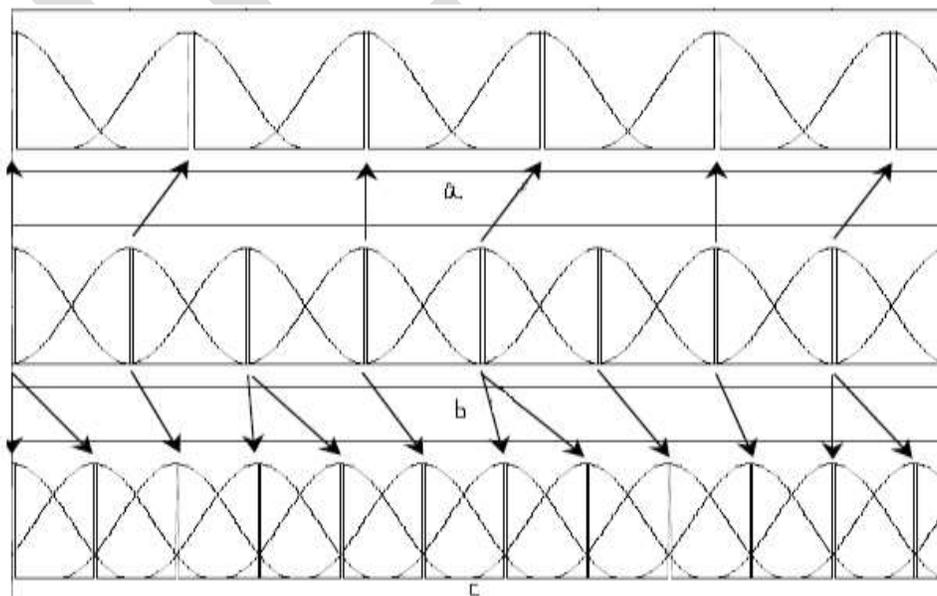


Fig. 2. Basic idea of SOLA algorithm. (a) Down-shifted signal. (b) Original signal (c) Up-shifted signal

During time-scale modification, the duration and speed of voices are changed without affecting the frequency contents and pitch. The duration D' of the resampled signal is adjusted back to the duration D of the original signal by using time-scale modification by a factor of α . The duration D'' and pitch P'' of the resulting time-scale modified signal $x''(n)$ is related to the original signal as:

$$D'' = \alpha D' = D \quad (4)$$

$$P'' = P' = \alpha P \quad (5)$$

The original signal $x(n)$ is disguised to $x''(n)$ by combining voice resampling by a factor of $1/\alpha$ with timescale modification by a factor of α . Then the disguising factor α is given as:

$$\alpha = \frac{P''}{P} \quad (6)$$

If $\alpha > 1$, P is raised. Otherwise, if $0 < \alpha < 1$, P is lowered. In phonetics, voice pitch is always measured by 12-semitones-division, implying that pitch can be raised or lowered by 11 semitones at most. So this semitone can also be used as a disguising factor to modify the pitch of the given voice. ie, the value of the disguising factor can range from ± 1 to ± 11 . This algorithm forms the basis of the voice disguising method used in almost all disguising softwares.

2.2) Non-electronic voice disguising

Many different methods are available for non-electronic voice disguising. Changing one's own voice does not require special ability. This category of voice disguise alters the voice by using a mechanic system to hinder the speech production system, which includes pen in the mouth, handkerchief over the mouth, pinched nostrils, bite block etc. These also includes changing the prosody like dialect, accent or pitch register to get a low or high frequency voice modification, in order to trick the identity perception. Whispered speech, creaky voice, raised pitch, lowered pitch etc. are also examples of this category.

3) Feature extraction

MFCC is based on the known variations of the human ear's critical bandwidth with frequency. Human perception of frequency contents of sounds does not follow a linear scale. Perceptual analysis emulates human ear non-linear frequency response by creating a set of filters on non-linearly spaced frequency bands. Therefore for each voice tone with an actual frequency f , measured in Hz, a subjective pitch is measured on a scale called the 'Mel' scale. The name 'Mel' comes from the word melody to indicate the scale is based on pitch comparisons. Mel scale follows a linear scaling for frequencies less than 1 KHz and a logarithmic scaling for frequencies above 1 KHz. The Mel scale is a logarithmic mapping from physical frequency to perceived frequency and the cepstral coefficients extracted using this frequency scale are called MFCC. MFCCs are widely used in Automatic Speaker Recognition Systems (ASRS). The cepstral features obtained are roughly orthogonal since DCT is used and also MFCC is less sensitive to additive noise than some other feature extraction techniques such as Linear Predictive Cepstral Coefficients (LPCC). Delta and delta-delta coefficients of MFCC also known as differential and acceleration coefficients can also be used.

Following steps are used for MFCC extraction:

a) Pre-emphasis

Pre-emphasis is a technique used in speech processing to enhance high frequencies of the signal. In this step speech sample is passed through a filter which emphasizes higher frequencies. The speech signal generally contains more speaker information in the higher frequencies than in the lower frequencies. Pre-emphasis step will increase the energy of the signal at higher frequencies. Also it removes some of the glottal effects. Pre emphasis can spectrally flatten the signal.

b) Framing

Speech is a time varying signal. But on short time scale it is somewhat stationary. Therefore it is important to use short time spectral analysis. In framing the continuous time speech signal is broken into short time speech segments. The frames are of length 20-30 ms. The voice signal is divided into $N=256$ samples and adjacent frames are overlapped by $M=100$.

c) Windowing

This is the process in which the speech frames and the window is being multiplied. The framed signal results in discontinuity at the start and at the end of the frame. This spectral distortion is minimized by using window to taper the voice sample to zero at both the beginning and at the end of each frame. If the window being defined is $W(m)$ with $0 \leq m \leq N - 1$, where N stands for quantity of samples within every frame, then the output after windowing $Y(m)$ is given as :

$$Y(m) = X(m) \cdot W(m) \quad (7)$$

$X(m)$ is the input speech signal.

d) Fast Fourier Transform(FFT)

Fast Fourier Transform is used to convert each frame of N samples from time domain into frequency domain.

e) Mel Frequency warpping

The cochlea of the human ear performs a quasi-frequency analysis. The analysis in the cochlea takes place on a non-linear frequency scale. This scale is approximately linear up to about 1000 Hz and is approximately logarithmic thereafter. The Mel frequency scale has linear frequency spacing below 1000 Hz and logarithmic spacing above 1000Hz. In Mel frequency warping magnitude frequency response is multiplied by a set of 20 triangular band pass filters in order to get smooth magnitude spectrum. The formula to compute the Mel for a given frequency f in Hz is:

$$\text{Mel}(f) = 2595 \cdot \log_{10} \left(1 + \frac{f}{700} \right) \quad (8)$$

f) Cepstral analysis

The basic human speech production model is considered as a source-filter model. Here the source represents the air expelled from the lungs whereas the filter gives shape to the spectrum of the signal. According to the speech production model the source $x(n)$ and the filter impulse response $h(n)$ are convoluted. This convolution can be represented in time domain as:

$$s(n) = x(n) * h(n) \quad (9)$$

which in frequency domain becomes

$$S(z) = X(z) \cdot H(z) \quad (10)$$

g) Discrete Cosine Transform(DCT)

DCT is a compression step. So it keeps only the first few coefficients. Higher coefficients represent fast changes in the filter bank energies and it can degrade the performance of the system. The advantage of taking the DCT is that the resulting coefficients are real valued, which makes subsequent processing easier.

Delta and delta-delta coefficients can be calculated as follows:

$$d_t = \frac{\sum_{n=1}^N n(c_{t+n} - c_{t-n})}{2 \sum_{n=1}^N n^2} \quad (11)$$

From frame 't' computed in terms of static coefficients c_{t+n} to c_{t-n} . Typical value for N is 2. The MFCC feature vector describes only the power spectral envelope of a single frame. The information in the dynamics of the speech is given by its derivative coefficients. Each of the delta feature represents the change between frames and each of the double delta features represents the changes between the frames in the corresponding delta features.

Mean values and correlation coefficients of the MFCC coefficients are calculated as follows:

Consider speech signal with N frames, assuming V_{ij} to be the j^{th} component of the MFCC vector of the i^{th} frame, and V_j to be the set of all such j^{th} components, V_j can be expressed as:

$$V_j = \{v_{1j}, v_{2j}, v_{3j} \dots v_{Nj}\} \quad \text{for } j=1,2,\dots,L \quad (12)$$

Then the mean value of the speech signal can be calculated by using the equation:

$$E(j) = E(V_j) \quad \text{for } j=1,2,\dots,L \quad (13)$$

and the correlation coefficients can be found out by the equation:

$$CR_{jj'} = \frac{cov(v_j, v_{j'})}{\sqrt{VAR(V_j)}\sqrt{VAR(V_{j'})}} \quad (14)$$

Using this method mean values and correlation coefficients of the derivative coefficients of MFCC can also be calculated.

4) Classification

The next step in the identification of disguised voices is the classification of the extracted features. Support Vector Machines (SVMs) are a useful technique for data classification. A classification task usually involves separating the available data into training and testing sets. Each instance in the training set contains one "target value" (i.e. the class labels) and several "attributes" (i.e. the features or observed variables). The goal of SVM is to produce a model (based on the training data) which predicts the target values of the test data given only the test data attributes. The feature vector is extracted from the input training database and is used to train SVM with linear kernel. Then the features are also extracted from the testing database. Based on the attributes the voice is classified to the two labels 'original' and 'disguised'. SVM classifies data by finding the best hyper plane that separates all data points of one class from those of the other class. The best hyper plane for an SVM means the one with the largest margin between the two classes. Margin means the maximal width of the slab parallel to the hyper plane that has no interior data points.

RESULTS AND DISCUSSIONS

The electronic disguising is done using the voice changing software 'Audacity' by changing the semitone. The MFCC and its delta and double delta coefficients are extracted. The plots of MFCC, delta MFCC and double delta MFCC of the original and disguised speech samples are obtained. From the plots we can find that, the values of MFCC of original and disguised voices for the 19 coefficients in different frames varies.

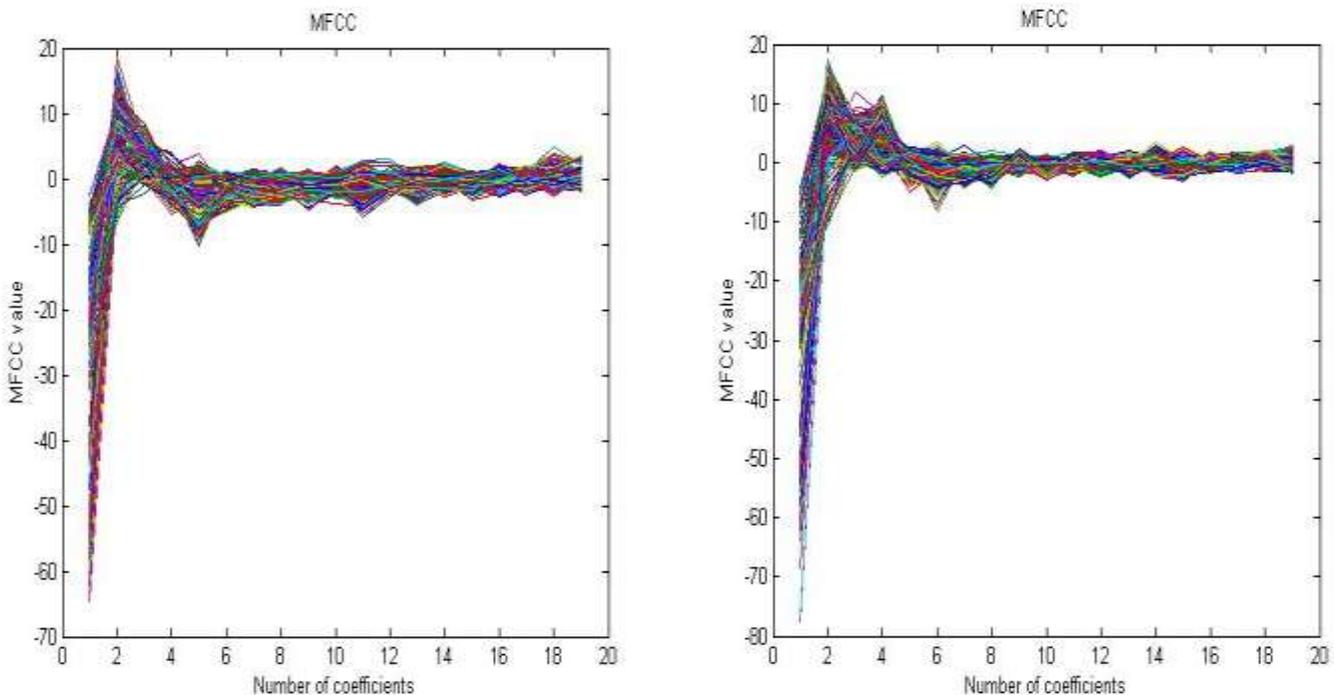


Fig. 3. (a) Plot of MFCC values of original signal (b) Plot of MFCC values of disguised voices

From figure 4 (a) and (b) and figure 5 (a) and (b) it can be shown that the values of delta and double delta coefficients also varies in original and disguised voices

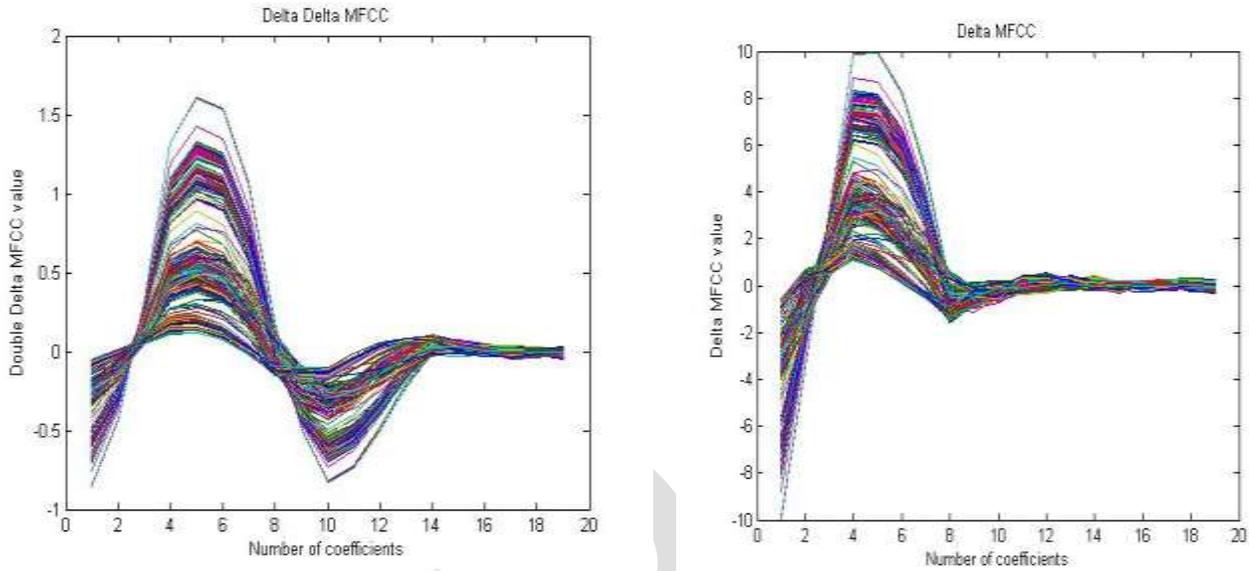


Fig.4 . (a)Plot of delta MFCC values of original signal (b) Plot of delta MFCC values of disguised voices

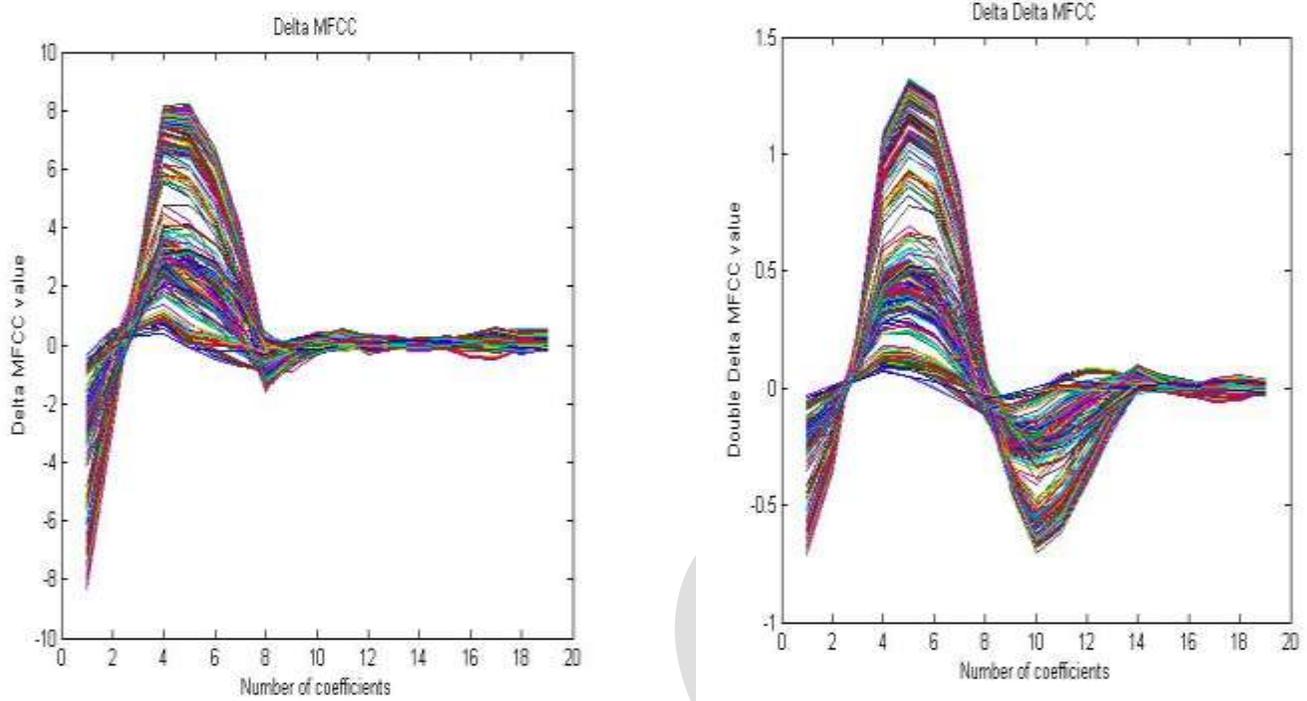


Fig..5. (a)Plot of double delta MFCC values of original signal (b) Plot of double delta MFCC values of disguised voices

Two groups or classes are available namely 'original' and 'disguised'. Each group contains five files of database. For each sound file 6 features are extracted. Mean values of MFCC, delta coefficient and double delta coefficients and correlation coefficients of MFCC, delta and double delta coefficients are extracted. The values obtained by training the SVM with original and disguised database is given in figure 6.

Input	MFCC_mean	Δ MFCC_mean	$\Delta\Delta$ MFCC_mean	MFCC_cor	Δ MFCC_cor	$\Delta\Delta$ MFCC_cor
Original_1	0.854513861	0.43766744	0.037328908	0.713409656	0.806615573	0.85267349
Original_2	0.852312305	0.232190341	0.021636408	0.746558737	0.82483205	0.883283102
Original_3	0.366831535	0.408029645	0.035184401	0.855394937	0.943177259	0.969329013
Original_4	1.588524462	0.611154582	0.052898724	0.835482474	0.921329618	0.945658435
Original_5	0.515569469	0.420110008	0.035373873	0.749316113	0.87930297	0.91942945
Disguised_1	0.849806189	0.412126409	0.035192529	0.684584729	0.732634794	0.777914411
Disguised_2	1.460441037	0.228004574	0.023757484	0.734898562	0.768952403	0.850083591
Disguised_3	0.406159968	0.365971249	0.031963578	0.83519446	0.922125002	0.959562725
Disguised_4	2.023699569	0.599729079	0.052397196	0.831394262	0.910726224	0.939287983
Disguised_5	0.536636052	0.40241669	0.033599232	0.731551888	0.856941227	0.901733759

Fig. 6. Feature values

CONCLUSION

This work focuses on the identification of disguised voices. Disguised voices can cheat human ears and Automatic Speaker Recognition Systems (ASRS). Voice disguise is being widely used for illegal purposes. An offender can disguise his voice and create fake audio evidences. Thus it will negatively influence the authenticity of evidences. So the identification of disguised voices is inevitable in the field of audio forensics. The identification of disguised voices can be used as preliminary step in speaker recognition tasks to know whether the testing voice is disguised or not. Mel Frequency Cepstral Coefficients (MFCC) based features are used here for separating disguised voices from original voices. The idea used here is that the MFCC statistical moment values vary when a voice gets disguised. So the mean value and correlation coefficients of the MFCC features and its derivative coefficients are calculated. Based on the acoustic feature vector obtained, classification of a given speech database as 'original' or 'disguised' is done using SVM classifier.

REFERENCES:

- [1] Haojun Wu, Yong Wang, Jiwu Huang "Identification of electronic disguised voices" IEEE Trans. Information Forensics and Security., vol.9, no.3, pp. 489-500, March. 2014.
- [2] R. Rodmann "Speaker recognition of disguised voices: A program for research" in Proc. Consortium Speech Technol. Conjunct. Conf. Speaker Recognit. Man Mach., Direct Forensic Appl., pp. 9-22, 1998.
- [3] P. Perrot, G. Aversano, G. Chellot "Voice disguise and automatic detection: Review and perspectives" in Progress in Nonlinear Speech Processing, NY. USA: Springer-Verlag, pp. 101-117, 2007.
- [4] P. Perrot, G. Chellot "The question of disguised voices" J. Acoust. Soc. Amer., vol 123, no.5, pp. 3878-1-3878-5, June 2008.
- [5] H. J Kunzel, J. Gonazalez-Rodriguez, J.Ortega Gracia "Effect of voice disguise on the performance of a forensic automatic speaker recognition system" in Proc. IEEE Int. Workshop Speaker Lang. Recognit., pp.1-4, June 2004.
- [6] Haojun Wu, Yong Wang, Jiwu Huang "Blind detection of electronic disguised voices" in Proc, IEEE ICASSP, vol.1, no.3, pp. 3013-3017, February 2013.
- [7] Haojun Wu, Yong Wang, Jiwu Huang, Y.Deng "Blind detection of electronic voice transformation with natural disguise" in Proc, Int. Workshop on Digital Forensics Watermarking, LNCS 7809, pp. 336-343, 2012.
- [8] S.S Kajarekar, H.Bratt, E.Shriberg, R.de Leon "A study of intentional voice modifications for evading automatic speaker recognition" in Proc, IEEE Int. Workshop Speaker Lang. Recognit., pp. 1-6, June 2006.
- [9] T. Tan "The effect of voice disguise on automatic speaker recognition" in Proc, IEEE Int. CISP, vol 8, pp. 3538-3541, October 2010.
- [10] Cuiling Zhang "Acoustic analysis of disguised voices with raised and lowered pitch" in Proc. ISCSLP} pp. 353-357, 2012.

- [11] H. Hollien “The acoustics of crime: The new science of Forensic Phonetics”, NewYork: Plenum press ,1990.
[12] Chih Wei hsu, Chih Chuang Chang, Chih-Jen Lin “A practical Guide to Support Vector Classification” Department of Computer science, National Taiwan University, April 15, 2010

IJERGS

NATURAL LANGUAGE DATABASE INTERFACE

Aniket Khapane¹, Mahesh Kapadane¹, Pravin Patil¹, Prof. Saba Siraj

¹Student, Bachelor of Computer Engineering

SP's Institute of Knowledge College Of Engineering, Pune.

Abstract: This paper presents a natural language interface to relational database. It introduces some classical NLDBI products and their applications and proposes the architecture of a new NLDBI system including its probabilistic context free grammar, the inside and outside probabilities which can be used to construct the parse tree, an algorithm to calculate the probabilities, and the usage of dependency structures and verb sub categorization in analysing the parse tree. Some experiment results are given to conclude the paper.

Keywords: Natural Language database Interface (NLDBI), Structured Query Language (SQL), Syntax analysis, Semantic analysis, Tokens, Tokenizing, Database, Natural Language Processing.

1. INTRODUCTION

N Question Answering (QA) domain, many QA systems, such as START, Ask MSR, NSIR have been developed to support the users searching the correct information about some topics. Among these systems, START may be considered as the best system that can return the good answers for users. However, START is only able to answer questions about concepts, but it could not answer the questions about causes and methods.

Furthermore, we had investigated an open source QA system. That is Open-Ephyra; it is an open framework for question answering (QA). It retrieves answers to natural language questions from the Web and other sources. It was developed on Java framework. This system has: a dictionary, a set of questions, method to find out the correct answers for questions. Once receiving a question, the system classify question into one of defined categories of question to analyse and split keywords base on the dictionary. After that, Open Ephyra uses these keywords to search in data set paragraphs that contain them. The result will be estimated adequate degree and the best result will be display to user.

After considering these QA systems, we assume that current QA systems perform the question processing base on this principle:

- Match the query to existing queries form.
- Generate a set of keywords or a set of queries in knowledgebase.
- Determine the result that fit to the question and generate the answer.
- Without semantic model of query.

In our research project, we specially focus our interests on building a particular QA system model appropriately used in the domain of document retrieval.

2. SOME RELATED EARLIER WORKS

Research in Natural Language Interface for Relational Databases began as far back as the 20th century. Since then the study and interest has continued to grow tremendously such that the area has become the most active in Human-Computer Interaction. The first Natural Language Interface for Relational Databases appeared in the 1970s, the NLIDB system was called LUNAR. After the development of the first NLIDB, many were built which were supposed to be an improvement on the apparent flaws of LUNAR. The presentation and acceptance of LUNAR was huge. The reason for such huge success with NLIDBs includes the fact that there are real-world benefits or payoffs that can be derived from this area of study, other fact is that the earlier experimented domain was a single

domain where execution of non-complex systems are easy and easily adaptable. Same feat were not achieved in the area of using complex databases. We highlight below, the development of some NL interfaces.

A. Lunar (1971)

Man had accomplished the complex task of both having a physical presence on the moon and that of positioning satellites in space that can bring results from observations done on the moon. Information of rock samples brought back from the moon, for example, chemical information were stored in a database, while literature reference on various samples were stored in another database. LUNAR helped provide answers to queries about any of the two information about a rock sample by the use of these databases. LUNAR had linguistic limitations and was able to handle 78% of user-requests.

B. Philia [Philips Question Answering Machine] (1977)

This system works by having a clear-cut distinction of the syntactic parsing and semantics of the user-defined query. It has three layers of semantic understanding:

- a. English Formal Language
- b. World Model Language
- c. Database Language

Together, these three layers work to answer user-defined queries. Users did not achieve so much acceptance as the earlier developed LUNAR.

C. Ask (1983)

Ask was a complete information management system with an in-built database and the ability to communicate with multiple external databases using several computer applications which are accessible to users through the user's natural language query. Learning is the ability of a system to experience change based on a certain experience with an input such that it can perform an activity better and more efficiently next time. Since ASK had the ability to be taught new concepts by the user during conversation with the user, it can be said that ASK was a learning system.

D. Team (1987)

TEAM was an NLIDB whose developers concerned themselves with portability issues, as they wanted it to be easily implementable on a wide range of systems without compatibility issues. It was designed to be easily configured by database administrators with no knowledge of NLIDB. These feat affected the functionality of TEAM.

E. Precise (2004)

PRECISE introduced the concept of Semantically Tractable Sentences which are sentences whose semantic interpretation is done by the analysis of some dictionaries and semantic constraints. It was developed by Ana-Maria Popescu, Alexander Yates, David Ko, Oren Etzioni, and Alex Armanasu in 2004 at the University of Washington. When a natural language query is given to PRECISE, it takes the keywords in the sentence of the query, and matches the keywords to corresponding database structures. This, in fact is the major strength of PRECISE. PRECISE does this matching in two stages. The first is to narrow down the possible keywords using the Maximum Flow algorithm which finds a feasible, constraint-satisfying flow through a Flow Network having just a single source and a single sink, such that the flow is maximum; where a flow network is a directed graph in which each edge has a capacity and each edge receives a flow. By using the Maximum Flow algorithm, the maximum number of keywords is obtained, thereby increasing the chance of the natural language sentence to be accurately transformed to a formal SQL query as there will be enough keywords to compare with the PRECISE dictionary. The second stage is to analyse the syntactic structure of the sentence. PRECISE also has its own limitations.

Generally, some major flaws have been common to these interfaces and their ability to handle natural language processing. Users' feedback system has not been thoroughly handled in existing systems. Such systems learn when the user prompts command such as save text on the interface. This is worsened by the fact that, though they are considered as a NLI, their knowledgebase has been a concern in recent times such that can only get results that keyword based. The area of natural language that can be handled by NLIDBs is just a small subset, and this subset is even difficult to define due to Natural language complexity and the existence of ambiguity.

3. EXISTING SYSTEM

In relational databases, to retrieve information from a database, one needs to write a query in such way that the computer will understand and produce the desired output. The Structured Query Language (SQL) is normally used for retrieving data. The SQL normally are based on a Boolean interpretation of the queries. But some user requirements may not be answered explicitly by a classic querying system. It is due to the fact that the requirements' characteristics cannot be expressed by regular query languages.

4. PROPOSED SYSTEM

Problem statement/System Architecture Our proposed system NLDBI first transform the natural language question into transitional logical query, expressed in some internal meaning illustration language. The intermediate logical query expresses the meaning of the user's question in terms of high level world concepts. The logical query is then translated into the database's query language, and evaluated against the database.

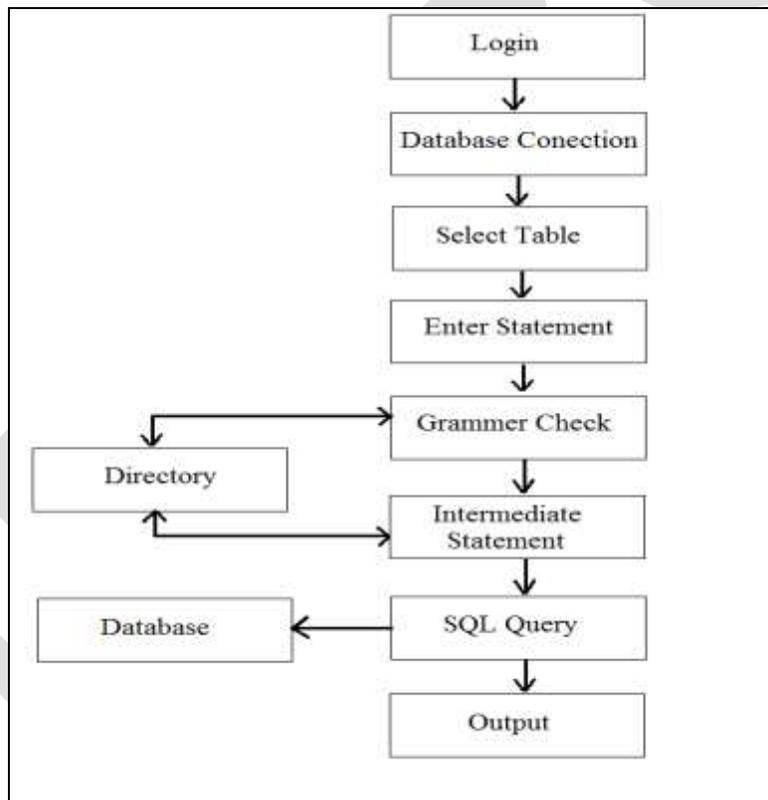


Fig 1: System Architecture

5. MATHEMATICAL MODEL

Table 1. Mathematical model

Sr No.	Description	Observation/Remarks
1	<p>Let S be the system</p> $S = \{S1, S2, S3, S4\}$ <p>Where,</p> <p>S1=module that checks grammar</p> <p>S2=module that tokenize input</p> <p>S3=module that generate parse tree</p> <p>S4=module that generate SQL query</p>	<p>S identifies system set</p>
2	$S1 = \{I, O, P, G, In, Cr, S, F\}$ $P = \{I, G, E\}$ $G = \{G1, G2, G3\}$ <p>Where,</p> <p>I= Query in English Language</p> <p>O= Intermediate query in English language</p> <p>In=Enter English statement</p> <p>Cr=Constraint</p> <p>S= Grammar of English query is correct</p> <p>F= Grammar is wrong</p> <p>G=function that check grammar</p> <p>E=function that gives error exception</p> <p>G1=function that scans input statement</p> <p>G2=function that checks semantic of input</p>	<p>The module that checks grammar.</p> <p>Constraint:</p> <ul style="list-style-type: none"> • Question must be in English statement • Meaningful statements • Question must be in a Wh. form.

	<p>G3=function that divide input into parts</p>	
<p>3</p>	<p>S2={ I, O, P, In, Cr, S, F}</p> <p>P={C, T}</p> <p>Where,</p> <p>I= Intermediate query in English language</p> <p>O= Tokens</p> <p>In= Meaningful statement</p> <p>Cr= Constraint</p> <p>S= Tokens generated</p> <p>F= Unidentified token</p> <p>C=function that scans input</p> <p>T=function that tokenize statement</p>	<p>The module that generate tokens from input statement</p> <p>Constraint:</p> <ul style="list-style-type: none"> • Tokens should be having alphabets only
<p>4</p>	<p>S3={ I, O, P, In, Cr, S, F}</p> <p>P={ M }</p> <p>Where,</p> <p>I= Tokens</p> <p>O= Intermediate query with mapped keywords</p> <p>P=Function that generate parse tree</p> <p>In= Tokens</p> <p>Cr=Constraints</p> <p>S= Keyword found in directory</p>	<p>The module that generate parse tree and maps keywords from directory</p> <p>Constraint:</p> <ul style="list-style-type: none"> • Keyword should be present in directory

	<p>F= Keyword on found in directory</p> <p>M=function the keywords from database</p>	
5	<p>S4={ I, O, P, In, Cr, S, F }</p> <p>P={Q, X, R}</p> <p>Where,</p> <p>I= Intermediate query with mapped keywords</p> <p>O= SQL Query</p> <p>P=function that generate SQL query</p> <p>In= Intermediate query with mapped keywords</p> <p>Cr=Constraints</p> <p>S= Valid SQL query generated</p> <p>F=Invalid SQL query generated</p> <p>Q=function that generate SQL query</p> <p>X=function that retrieve data from database</p> <p>R=function that display result</p>	<p>The module that generate SQL query and retrieve result.</p> <p>Constraint:</p> <ul style="list-style-type: none"> • Complete intermediate query • All of the table names column name should be present in intermediate query

6. SYSTEM REQUIREMENTS

6.1 Functional Requirement:

6.1.1 User Interface:

Swing GUI

6.1.2 Hardware Requirement:

Processor: Dual Core

RAM: Minimum 1 GB

HDD: Minimum 80 GB

Operating System: Minimum Windows XP.

6.1.3 Software Requirements

Table 2: Software requirement of NLDBI system

	Software	Minimum	Recommended
Design Tool	Rational Rose	2000e	2000e
Development Tools	NetBeans	NetBeans 7.0	
Development Kit	JDK		
Development Platform	Windows	Windows XP	Windows XP
Others	Microsoft word	Word 2007	Word 2003

6.2 Non Functional Requirement:

6.2.1 Performance Requirement:

Server programs are supposed to serve multiple requests simultaneously on various TCP/IP connections. Client loads vary and so do requests per client. Taking that into consideration, the performance parameters of servers include the following: number and type of requests per second; latency time, measuring in milliseconds how long it takes to complete each new connection or request; throughput or the amount of data transmitted in response to a request measured in bytes per second. Finally, the server model, whether client-side or server-side, used to execute server programs establishes scalability. Scalability is a system property that refers to a system or network's ability to manage increasing workloads well and the ability to expand gracefully.

6.2.2 Safety Requirement:

The data handled in the Morphing Portal system is very vital. The server should always be confirmed to run properly and the data are saved to the database at consecutive intervals. Power is a significant feature and the power supply should be always taken care of. An Uninterrupted Power Supply is always recommended.

6.2.3 Software Quality Attribute:

A. Reliability:

The system will be designed with reliability as key feature:

- The system is guaranteed of providing the services to user according to his login information.
- This system is guaranteed to be reliable with maximum time.

B. Maintainability:

The system will be developed using the standard software development conventions to help in easy review and redesigning of the system. The system will be backed up by a full fledged documentation of the product which is available online as well as free to download.

C. Availability: The System is available on administrator demand.

7. DIAGRAMS

7.1 Data flow Diagram – Level 0

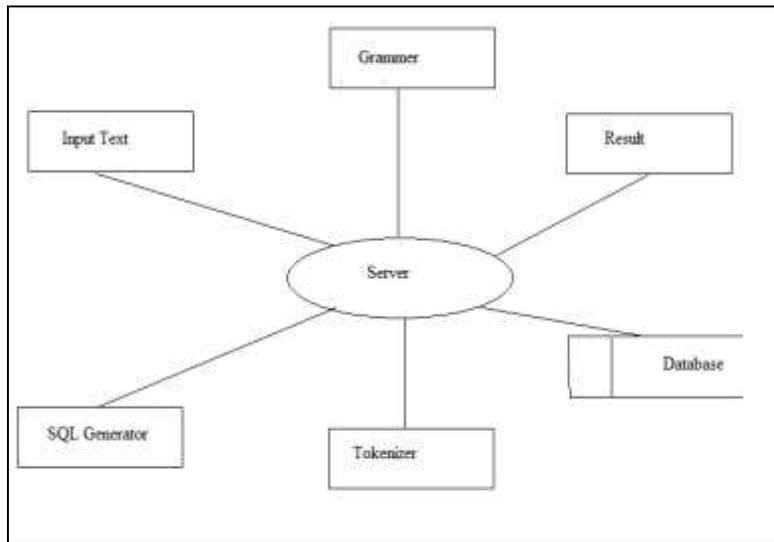


Fig 2: Dataflow diagram level 0

Data Flow Diagram Description

First User has to login then if login is invalid then exit else User proceeds. After successful login user has to input text. Grammar of input text is checked. Input text is tokenized. SQL Query is generated. Query is executed and result is fetched. If query is valid then result is displayed to User else exit. Users can logout from system. (As per shown in figure 2)

7.2. Sequence Diagram

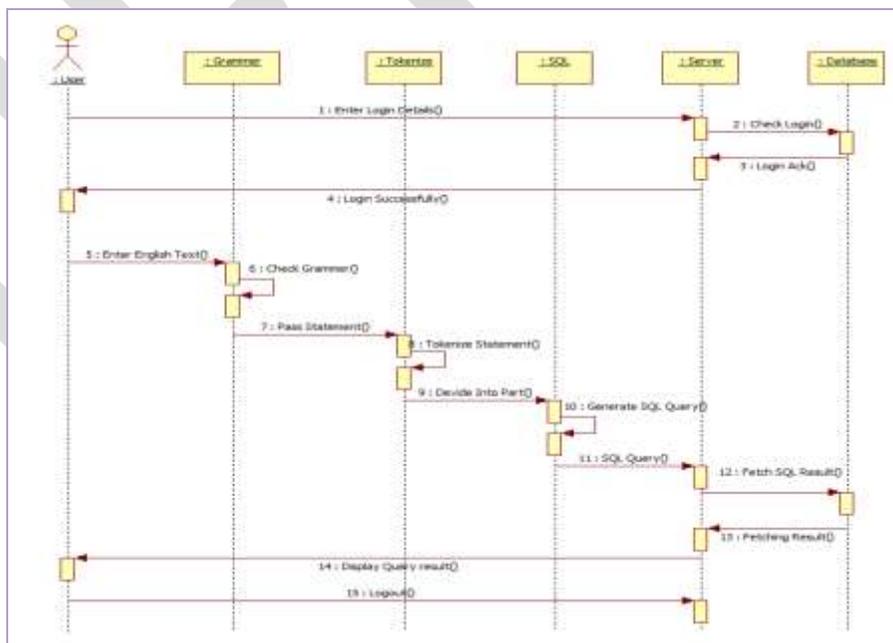


Fig 3: Sequence diagram

8. PERFORMANCE ANALYSIS

Table 3: Performance Table

Total Number of Input NL query	Correct Interpretation	Correct with additional information	Incorrect Interpretation	No Response
100	70	10	25	05

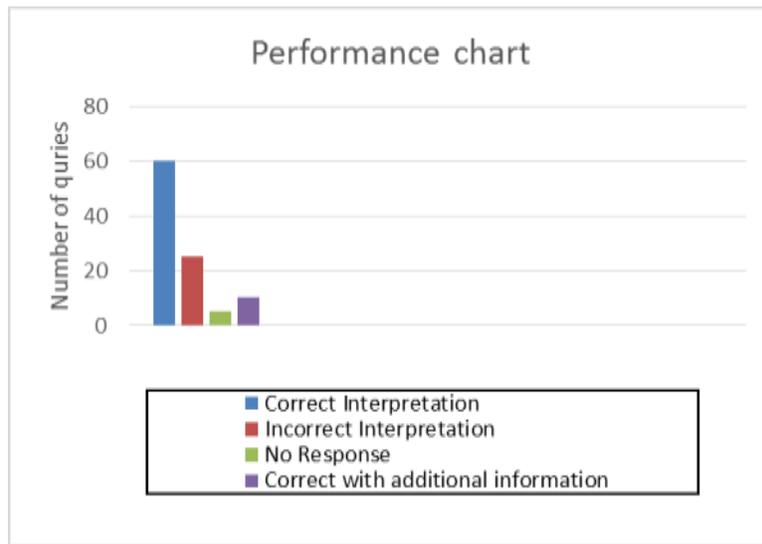


Fig 4: Performance chart

9. CONCLUSION

Natural Language Processing can bring powerful enhancement to virtually any computer program interface. This system is currently capable of handling simple queries with standard join conditions. Because not all forms of SQL queries are supported, further development would be required before system can be used within NLDBI. Alternative for integrating a database NLP component into the NLDBI were considered and assessed.

10. FUTURE SCOPE

- To design user interface for administrator where application can be tuned for new database.
- To execute queries that include aggregate function like sum (), max (), min ().
- To add the features to execute insert type of queries.
- To add features execute DDL statement like create, alter, drop type of queries.

To implement application for regional language like Marathi.

REFERENCES:

- [1] "NATURAL LANGUAGE INT ERFACE USING SHALLOW PARSING" by RAJENDRA AKERKAR and MANISH JOSHI International Journal of Computer Science and Applications, Vol. 5, No. 3, pp 70 – 90.
- [2] "A noval hindi language interface for databases" by Mr Mahesh Singh and Ms Nikita Bhati, International Journal of Computer Science and Mobile Computing Vol. 3, Issue. 4, April 2014, pg.1179 – 1189.

- [3] "Recent Developments in Natural Language Interface to Database Systems" by Preeti Verma and Kulwant Kaur, International Journal of Innovation and Research in Computer Science, ISSN: 2349-2783, pg 20-26.
- [4] "Efficient Transformation of a Natural Language Query to SQL" for Urdu by Rashid Ahmad, Mohammad Abid Khan and Rahman Ali, Proceedings of the Conference on Language & Technology 2009.
- [5] "An Algorithm for Solving Natural Language Query Execution Problems on Relational Databases" by Enikuomihin A.O., Okwufulueze D.O., (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 3, No. 10, 2012, pg 169-175.
- [6] "Natural language query processing using probabilistic context free grammar" by Arati K. Deshpande and Prakash. R. Devale, International Journal of Advances in Engineering & Technology, May 2012, IJAET ISSN: 2231-1963, Vol. 3, Issue 2, pp. 568-573.
- [7] "NATURAL LANGUAGE QUERY PROCESSING" by GaurRao and Dr.S.H.Patil, International journal of computer applications in applications in engineering, technology and sciences (IJ-CA-ETS), ISSN: 0974-3596, October '09 - March '10, Volume 2: Issue 2, Pg: 1-6.
- [8] "Incremental Information Extraction Using Relational Databases" by Luis Tari, iee transactions on knowledge and data engineering, vol. 24, no. 1, January 2012, pg 86-99.
- [9] "Natural language Interface for Database: A Brief review" by Mrs. Neelu Nihalani, Dr. Sanjay Silakari and Dr. Mahesh Motwani, IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 2, March 2011, ISSN (Online): 1694-0814, pg 600-608.
- [10] "Natural language query processing using semantic grammar" by Gauri Rao, 2 Chanchal Agarwal, Snehal Chaudhry, Nikita Kulkarni and Dr. S.H. Patil, (IJCSE) International Journal on Computer Science and Engineering, Vol. 02, No. 02, 2010, 219-223

Design, Manufacturing & Analysis of Hydraulic Scissor Lift

Gaffar G Momin¹, Rohan Hatti², Karan Dalvi³, Faisal Bargi⁴, Rohit Devare⁵

Department of Mechanical Engineering^{1, 2, 3, 4, 5}, Pimpri Chinchwad College of Engineering, Nigdi-44^{1, 2, 3, 4, 5}

Email:

gaffarmomin01@gmail.com¹, hattirohan@gmail.com², coolkd01@gmail.com³, faizalnajeeb761@gmail.com⁴, rohitdevare318@gmail.com⁵

Abstract— The following paper describes the design as well as analysis of a hydraulic scissor lift. Conventionally a scissor lift or jack is used for lifting a vehicle to change a tire, to gain access to go to the underside of the vehicle, to lift the body to appreciable height, and many other applications. Also such lifts can be used for various purposes like maintenance and many material handling operations. It can be of mechanical, pneumatic or hydraulic type. The design described in the paper is developed keeping in mind that the lift can be operated by mechanical means by using pantograph so that the overall cost of the scissor lift is reduced. In our case our lift was needed to be designed a portable and also work without consuming any electric power so we decided to use a hydraulic hand pump to power the cylinder. Also such design can make the lift more compact and much suitable for medium scale work. Finally the analysis of the scissor lift was done in ansys and all responsible parameters were analyzed in order to check the compatibility of the design values.

Keywords— Hydraulic scissor lift, pantograph, hand pump, vonmises stresses, ansys.

Introduction-

A hydraulic pallet lift is a mechanical device used for various applications for lifting of the loads to a height or level. A lift table is defined as a scissor lift used to stack, raise or lower, convey and/or transfer material between two or more elevations. The main objective of the devices used for lifting purposes is to make the table adjustable to a desired height. A scissor lift provides most economic dependable & versatile methods of lifting loads; it has few moving parts which may only require lubrication. This lift table raises load smoothly to any desired height. The scissor lift can be used in combination with any of applications such as pneumatic, hydraulic, mechanical, etc. Lift tables may incorporate rotating platforms (manual or powered); tilt platforms, etc, as a part of the design.

Scissor lift design is used because of its ergonomics as compared to other heavy lifting devices available in the market. The frame is very sturdy & strong enough with increase in structural integrity. A multiple height scissor lift is made up of two or more leg sets. These types of lifts are used to achieve high travel with relatively short platform.

Industrial scissor lifts & tilters are used for a wide variety of applications in many industries which include manufacturing, warehousing, schools, grocery distribution, military, hospitals and printing.

The scissor lift contains multiple stages of cross bars which can convert a linear displacement between any two points on the series of cross bars into a vertical displacement multiplied by a mechanical advantage factor. This factor depends on the position of the points chosen to connect an actuator and the number of cross bar stages. The amount of force required from the actuator is also amplified, and can result in very large forces required to begin lifting even a moderate amount of weight if the actuator is not in an optimal position. Actuator force is not constant, since the load factor decreases as a function of lift height.

Types of lifts can be classified as follows:-

Classification based on the type of energy used

(a) Hydraulic lifts

(b) Pneumatic lifts

(c) Mechanical lifts

Classification based on their usage

(a) Scissor lifts

(b) Boom lifts

(c) Vehicle lifts

2.MATERIAL SELECTION

It is necessary to evaluate the particular type of forces imposed on components with a view to determining the exact mechanical properties and necessary material for each equipment. A very brief analysis of each component follows thus:

- I. Scissors arms
- II. Hydraulic cylinder
- III. Top plat form
- IV. Base plat form
- V. Wheels

Scissors Arms: this component is subjected to buckling load and bending load tending to break or cause bending of the components. Hence based on strength, stiffness, plasticity and hardness. A recommended material is stainless steel.

Hydraulic Cylinder: this component is considered as a strut with both ends pinned. It is subjected to direct compressive force which imposes a bending stress which may cause buckling of the component. It is also subjected to internal compressive pressure which generates circumferential and longitudinal stresses all around the wall thickness. Hence necessary material property must include strength, ductility, toughness and hardness. The recommended material is mild steel.

Top Platform: this component is subjected to the weight of the workman and his equipment, hence strength is required, the frame of the plat form is mild steel and the base is wood.

Base Platform: this component is subjected to the weight of the top plat form and the scissors arms. It is also responsible for the stability of the whole assembly, therefore strength. Hardness and stiffness are needed mechanical properties. Mild steel is used.

3.DESIGN THEORY AND CALCULATION

In this section all design concepts developed are discussed and based on evaluation criteria and process developed, and a final here modified to further enhance the functionality of the design.

Considerations made during the design and fabrication of a single acting cylinder is as follows:

- a. Functionality of the design
- b. Manufacturability
- c. Economic availability. i.e. General cost of material and fabrication techniques employed

Hydraulic cylinder:

The hydraulic cylinder is mounted in inclined position. The total load acting on the cylinder consists of:

- Mass to be put on lift : 500 kg

Taking FOS = 1.5 for mass in pallet

$500 \times 1.5 = 750$ kg rounding the mass to 800kg

- Mass of top frame= 22.5 kg
- Mass of each link: $5\text{kg}(5 \times 8)=40\text{kg}$
- Mass of links of cylinder mounting=4kg

- Mass of cylinder=8.150kg

Total Mass : $22.5+40+8.150+4+800 = 874.65 \text{ kg}$

Total load = $874.65 \times 9.81 = 8580.316 \text{ N}$

Scissors lift calculations:

For a scissor lift Force required to lift the load is dependent on,

Angle of link with horizontal

Mounting of cylinder on the links

Length of link.

Formula used

Where W = Load to be lifted

$$S = a^2 + L^2 - 2aL \cdot \cos \alpha$$

S = Distance between end points of cylinder.

L= length of link = 0.6 m

α = angle of cylinder with horizontal.

Now the maximum force will act on the cylinder

When the cylinder is in shut down position i.e when the scissor links are closed .For calculations we will consider $\alpha=30^\circ$

Thus substituting $\alpha=30^\circ$ in eqn (1), We get $F=8580.316 \text{ N}$

Selecting 63mm diameter cylinder

Area of the cylinder= force/pressure

$$\begin{aligned} \text{Area} &= (3.14 \cdot 63^2) / 2 \\ &= 3117.24 \text{ mm}^2 \end{aligned}$$

Pressure =(Force/Area)

$$\begin{aligned} &= (8580.316 / 3117.24 \cdot 10^{-6}) \\ &= 27.52 \text{ bar} \end{aligned}$$

4.DESIGN OF LINK

Now Let H_{y0} =Mass applied on the lift=800kg

B=Mass of the lit which the cylinder needs to lift=74.65kg

H_{yi} =Total weight =8580.316N

- Only two forces are calculated here
 1. Forces at the end of link: as forces at ends of link are same in magnitude.
 2. Force at middle of link.
- In our case, the levels are numbered from the top.

For level 1 $X_1 = X_{Bi-1}$

For level 2 $X_2 = X_{Bi}$

The angle of cylinder with horizontal is $\theta=20^\circ$.

$H_{yi}=8580.316 \text{ N}$

$$X_2 = H_{yi} \cdot i \frac{\cot \theta}{2}$$

$$\begin{aligned} &= 8580.316 \cdot 1 \cdot 0.5 \cdot (\cot 20/2) \\ &= 11787.112 \text{ N} \end{aligned}$$

Resultant of X_2 & $H_{yi}/4$

$$R_1 = \sqrt{(11787.112)^2 + (8580.316/4)^2}$$

$$R_1 = 11980.708 \text{ N.}$$

Above force will act on all the joints at end of each link.

Now force acting on the intermediate point of link is given by,

$$X_{mi} = (2i-1) * H_{yo} * \frac{\cot\theta}{2} + (2i^2 - 2i + 1) * b_y * \frac{\cot\theta}{4}$$

$$= H_{yo} * \frac{\cot\theta}{2} + (2i^2 - 2i + 1) * b_y * \frac{\cot\theta}{4}$$

$$= (7848 \times 0.5 \times \cot 20^\circ) + (732.316 \times 0.25 \times \cot 20^\circ)$$

$$= 11512.48N$$

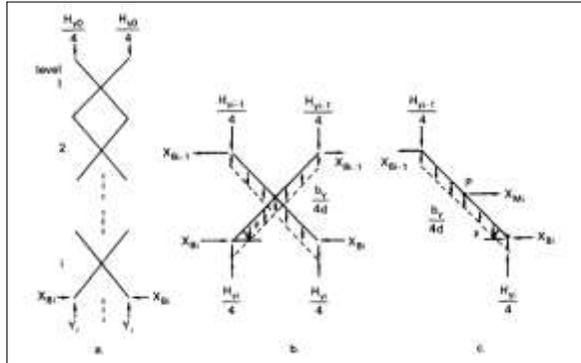


Fig No-1, Free body diagram for force applied in y direction

5. DESIGN FOR FABRICATION

For the link design it has been considered that, the entire load is acting on half of the link length.

Length of the entire link = 720mm.

Length of the link considered as the beam for the calculation purpose = 360mm.

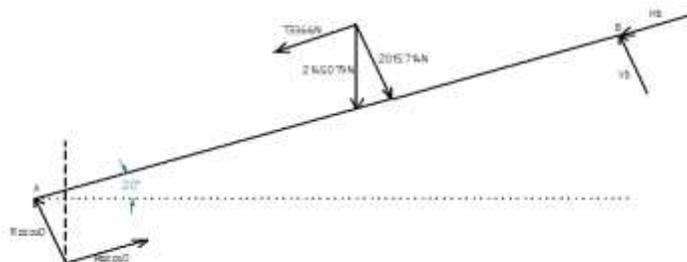
The load pattern on the top platform is considered to be U.D.L.

Hence, the load pattern on the link is uniformly varying load (U.V.L.) due to its inclination with horizontal.

The calculation is done for the link in shut height position, i.e. when the angle made by the links with horizontal is 20° .

The length of the pin from the intermediate pin to the bottom roller is considered as a beam. The forces acting on the beam are-

- The reaction offered by the base to the roller, R_A resolved into 2 components.
- The reactions offered by the intermediate pin, H_B, V_B .
- The force due to (Payload + Platform weight) resolved into two components, along the length of the link and perpendicular to the length of the link.



W = force per unit length of the beam can be evaluated as follows,

As the load pattern of U.V.L. is a triangle, we can say,

$$W \text{ (total force perpendicular to the link)} = (1/2) * \text{base} * w$$

$$H_{yi} = 8580.316 \text{ N}$$

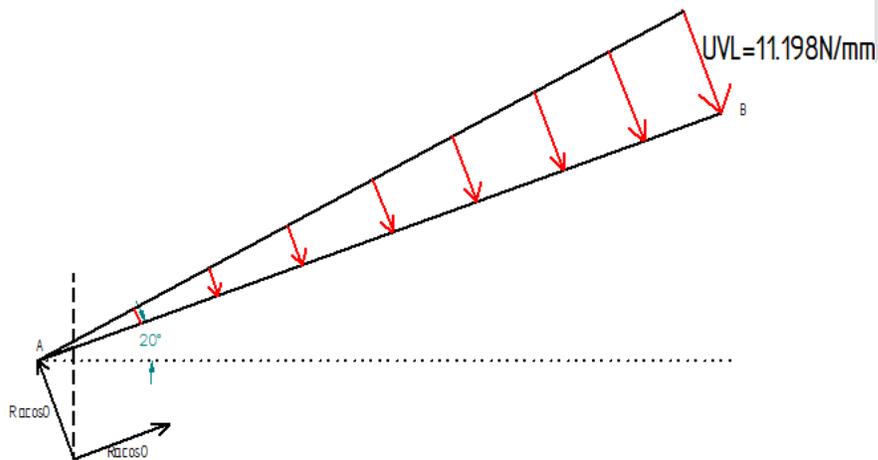
$$H_{yi}/4 = (8580.316/4) = 2145.079 \text{ N}$$

$$2145.079 \cos(20^\circ) = 2015.714 \text{ N}$$

$$2145.079 \sin(20^\circ) = 733.66 \text{ N}$$

$$\text{Now } 2015.714 = (1/2) * 360 * W$$

$$W = 11.198 \text{ N/mm}$$



Taking moment about point A,

$$V_B * 360 - [(2015.714 * 360) * \frac{2}{3}]$$

Therefore,

$$V_B = 1343.089 \text{ N}$$

$$\sum F_y = 0 \text{ , gives}$$

$$V_B + R_A \cos(20) - 2015.714 = 0$$

Putting value of V_B from equation (1) in equation (2), we get,

$$1343.809 + R_A \cos(20) - 2015.714 = 0$$

$$\text{Therefore } R_A = 715.026 \text{ N}$$

$$\text{Therefore, } R_A \cos(20) = 671.904 \text{ N}$$

$$R_A \sin(20) = 244.55N$$

$$\sum F_x = 0 \text{ gives}$$

$$R_A \sin(20) + 733.63 = H_B$$

$$\text{Therefore, } H_B = 489.08N$$

$$\frac{M}{I} = \frac{\sigma}{Y}$$

Where, M = Maximum Bending moment on the link considered as beam.

Y = distance of the neutral axis from the farthest fiber = h/2.

σ_B = allowable bending stress

$$= \frac{S_{ut}}{f.o.s.}$$

$$= \frac{250}{4}$$

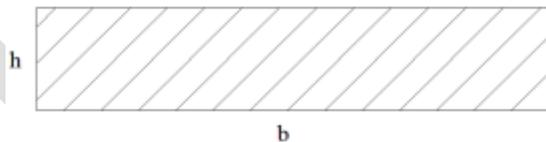
$$= 62.5 \text{ MPa}$$

I = Moment of Inertia of the link c/s about the X-X (horizontal) axis

$$= \frac{bh^3}{12}$$

Where, b = width of the link

h = thickness of the link



Now the maximum bending moment is at the point of zero shear force.

And Maximum bending moment is given by $(w \cdot l^2) / (9\sqrt{3})$

$$B_{\max} = (11.198 \cdot 360^2) / (9\sqrt{3})$$

$$= 93098.423N.mm$$

Substituting in $(M/I) = (\sigma_b/Y)$

Assume $Y = h/2$ and $b = 4h$

$$h = 13.07$$

rounding the value to available dimensions $h = 15mm$ and $b = 60mm$

6.DESIGN OF MOVING END PIN

$$\tau_{all} = 0.5 * 380 / FOS$$

$$= 63.33 \text{ Mpa}$$

$$63.33 = 4 * F / 3.14 * D^2 * 2$$

$$= 10.76 \text{ mm}$$

D = 12mm.....selecting standard value

7.ANALYSIS OF THE LIFT IN ANSYS SOFTWARE

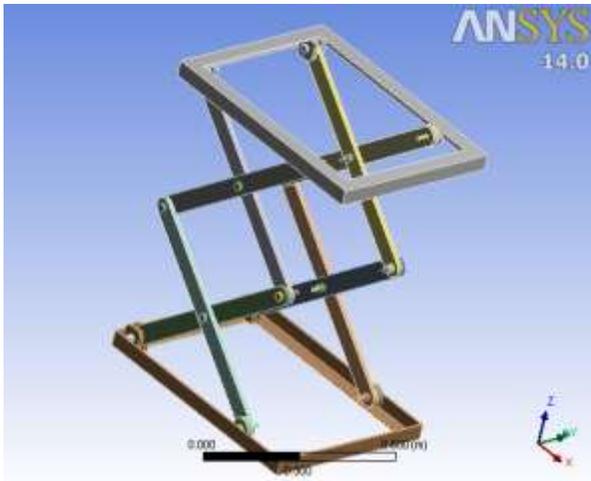


Fig No-2,ISO Assembly

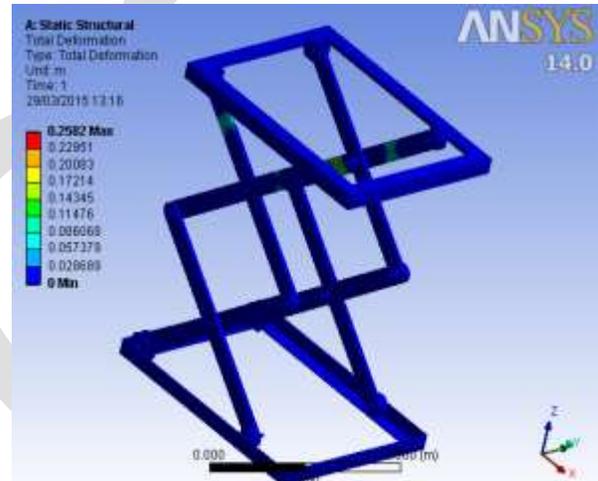


Fig No-3,Deformation Analysis

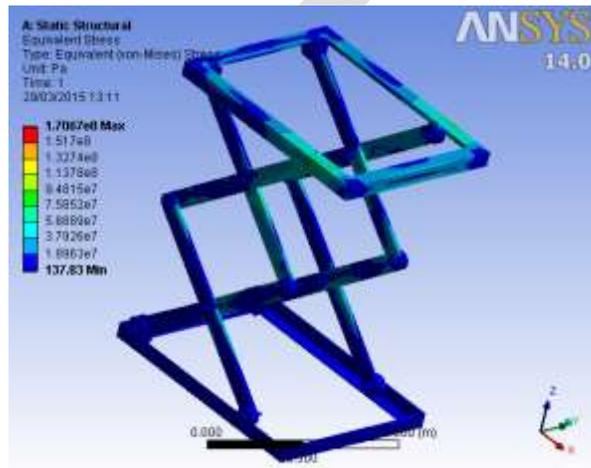


Fig No-3,Vonmises stress analysis

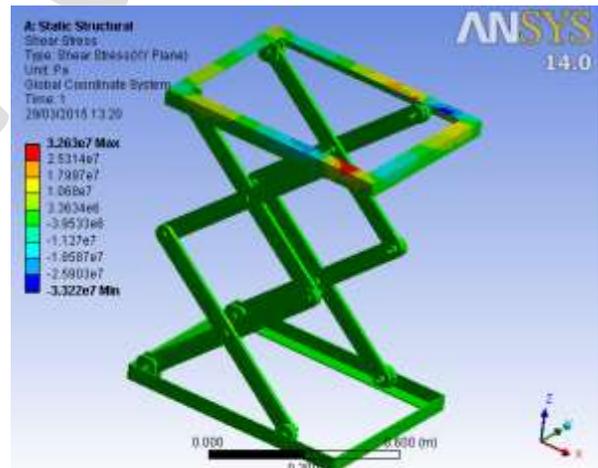


Fig No-4,Shear stress analysis

Analysis of results-

TYPE	MINIMUM	MAXIMUM
VONMISES STRESS	137.83 N/mm ²	170.67N/mm ²

DEFORMATION	0mm	25mm
SHEAR STRESS	-332.2N/mm ²	326.3N/mm ²

8.CONCLUSION

The design and fabrication of a portable work platform elevated by a hydraulic cylinder was carried out meeting the required design standards. The portable work platform is operated by hydraulic cylinder which is operated by a handpump ergonomics of a person or an operator working in the company premises is a responsibility of an organization. It is an important thing to give some comfort to the operator. Hence, by making this hydraulic lifter we improved the comfort level of the operator working on the cold forging machine.

Ergonomics, material handling and providing comfort to the operator was our main motive behind developing this lifter This was considered as a radical improvement in the productivity by the company.

The scissor lift can be design for high load also if a suitable high capacity hydraulic cylinder is used. The hydraulic scissor lift is simple in use and does not required routine maintenance. It can also lift heavier loads. The main constraint of this device is its high initial cost, but has a low operating cost. The shearing tool should be heat treated to have high strength. Savings resulting from the use of this device will make it pay for itself with in short period of time and it can be a great companion in any engineering industry dealing with rusted and unused metals.

REFERENCES:

1. Industrial Hydraulics Manual, Vickers 935100-B. Esposito, Fluid Power with application, prentice hall.
2. Hydroteck Engineering Company Series Heavy Duty NFPA Tie Rod Cylinders Catalogue.
3. Indian Standard DIMENSIONS FOR HOT ROLLED STEEL BEAM, COLUMN, CHANNEL AND ANGLE SECTIONS (Third Revision) IS 808:1989.
4. Mathematical analysis of Actuator forces in a scissor lift, Technical document 2643, May 1994 by H. Spackman. AD-A283 906
5. Mathematical analysis of Actuator forces in a scissor lift, Technical document 1550, May 1989 by H. Spackman AD-A225 220
6. Vector Mechanics for Engineers, Ferdinand Bear and E Russel Johnston, TATA McGraw Hill Publication

BOOTSTRAP: Mining of Comparable Things

Kanchan Kundgir, Poonam Dere, Surabhi Mohite, Priti Mithari

Dr. D.Y. Patil Institute of Engineering and Technology, mohitesurabhi3@gmail.com, 7387841278

Abstract— Making Comparisons between things is a typical part of human decision making process. But however, it is difficult to know what are to be compared and what can be the alternatives. For e.g., if someone is interested in certain products such as digital cameras, then he /she would want to know what the alternatives are and compare different cameras before making any purchase. This type of comparison activity is very common in our daily life but requires high knowledge skill in order to make much better choice. Therefore, to address this difficulty, we are presenting a system to automatically mine comparable entities from comparative questions that users posted online. In this paper, we focus on finding a set of comparable entities provided a user's input entity. For example, provided an entity like Nokia N95 (a mobile phone), we want to find comparable entities such as Nokia N82, Blackberry and so on. To ensure high precision and high recall, we are developing a system that uses weakly-supervised bootstrapping method for comparative question identification and comparable entity extraction by leveraging a large online question archive. Our system calculates the precision and recall for a particular session depending on the correct comparators suggested. The result varies depending on the sessions. The results will prove to be very useful in helping users' exploration of alternative choices by suggesting comparable entities based on other users' prior requests.

Keywords— Bootstrapping method, Comparable entity mining, Information extraction, Part Of Speech Tags, sequential pattern mining, comparators, Weakly supervised mining, Precision, Recall.

INTRODUCTION

In decision-making process, comparing alternative options is one of the necessary steps that we carry out daily. But this activity requires high knowledge expertise to make better choice. For instance, while doing shopping of a laptop one must have detailed knowledge of its specifications like Processor, Storage, Graphics, Memory, Display, etc. In such cases, it becomes difficult for an individual with insufficient knowledge to make a good decision on which laptop to buy and also comparing the alternative options for the same.

Magazines such as PC Magazine, Consumer Reports and online media like CNet.com which makes efforts in providing editorial comparison content and surveys. The comparison activity in the World Wide Web normally involves- search for applicable web pages enclosing information regarding the targeted products, discovering competing products, and recognizing their pros and cons. Our focus, in this paper, is on finding a set of comparable entities provided a user's input entity. For e.g., provided an entity like Nokia N95 (mobile phone), we would want to find entities that are comparable like iPhone, Blackberry, Nokia N82, HTC and etc. In order to extract comparable entities from relative matter, we first need to find out whether the question is relative or not.

Our effort on comparable entity mining is related to the study on entity and relation removal in information extraction. According to our definition, a comparative question has to be a query with intention to contrast at least two entities. We exploit this insight and develop a weakly supervised bootstrapping means to identify comparative questions and extract comparable entities at the same time.

- *Comparative questions*: A question whose purpose is to compare two or more entities and these entities are explicitly mentioned in the question.
- *Comparator*: An entity in a comparative question which is to be compared [3].

According to the definitions, Q1 & Q2 below are not comparative questions whereas Q3 is. "Mumbai" and "Pune" are comparators.

Q1. "Which one is better?"

Q2. "Is Pune the best city?"

Q3. "Which city is better Mumbai or Pune?"

The results will be very useful in helping users' exploration of alternative choices by suggesting them comparable entities based on other previous users' requests.

SYSTEM OBJECTIVES

Project planning involves project scope which includes the determination and the documentation of a list of specific project objectives, tasks, deliverables, costs and deadlines. The following is the scope of our project:

1. To develop a system that will automatically mine comparable entities from comparative questions that users posted online so as to help them making better choices by suggesting alternatives.
2. The goal of this system is mining comparators from comparative questions and furthermore, provides and rank comparable entities for a user's input entity appropriately.
3. The objective of this system is helping users exploration of alternative choices by suggesting comparable entities based on other users prior requests.

RELATED WORK

1. Overview

In terms of discovering related items for an entity, their work is similar to the research on recommender systems, to recommend items to a user. Recommender systems are similar between items and/or their statistical correlations in user log data [4]. For example, Amazon recommends products to its customers based on their own previous purchase; similar customers' previous purchase, and similarity between products. Comparable item is not equivalent to Recommending an item for finding customer item. In Amazon, the purpose of recommendation is to entice their customers to add more items to their shopping carts by suggesting similar or related items.

In the case of comparison, they help users explore alternatives, i.e., helping them make a decision among comparable items. For example, it is reasonable to recommend "iPod speaker" or "iPod batteries" if a user is interested in "iPod," but they are not comparing them with "iPod." However, items that are comparable with "iPod" such as "iPhone" or "PSP" which were found in comparative questions posted by users are difficult to be predicted simply based on item similarity between them. Although they are all music players, "iPhone" is mainly a mobile phone, and "PSP" is mainly a portable game device. They are similar but also different therefore beg comparison with each other. It is clear that comparator mining and item recommendation are related but not the same. Their comparator mining is related to then research on entity and relation extraction in information extraction [4], [6],[7].

2. Supervised Comparative Mining Method

Major contribution of authors Jindal and Liu (J&L) on mining comparative sentences and relations, in their system used class sequential rules (CSR) and label sequential rules (LSR). CSR maps a sequence pattern $S(s_1, s_2, \dots, s_n)$ to class C. Class C is either comparative or non-comparative question, and LSR maps an input sequence pattern $S(s_1 s_2 \dots s_i \dots s_n)$ to a labeled sequence $S'(s_1 s_2 \dots s_i \dots s_n)$ by replacing one token s_i in the input sequence with a designated label (l_i). This token is referred as the anchor [7], [8].

J&L work on this method and treated comparative sentence identification as a classification problem and comparative relation extraction is called as an information extraction problem. They first manually created a set of 83 keywords is similar to the indicators of comparative sentences. These keywords were then used as pivots to create part-of-speech (POS) sequence data. The Table 1 below shows brief view of the Literature Survey [1].

The following were the drawbacks of this method:

- i. The performance of J&L's method depends mainly on a set of keywords which are an indicative of comparative sentence.
- ii. Because users can express comparative sentences or questions in many different ways and to have a high recall, a large annotated training corpus is required which makes this an expensive process
- iii. CSRs and LSRs introduced by J&L was mostly a combination of POS tags and keywords. In spite of all these, it is a surprise that their rules achieved high precision but low recall.[11]

TABLE I
LITERATURE SURVEY[1]

PROPOSED SYSTEM

Sr. no	Paper Name	Conference	Approaches	Advantages	Disadvantages
1	Identifying Comparative Sentences in Text Documents.	ACM SIGIR Conf. Research and Development in Information Retrieval, 2006.	Combination of class sequential rule (CSR) mining and machine learning [8].	Extract comparative sentences from text is useful for many applications	It can achieve high precision but suffer from low recall.
2	Mining Comparative Sentences and Relations	Artificial Intelligence (AAAI '06), 2006.	Identify comparative sentences from the texts and to extract comparative relations to its identified comparative sentences [9].	Evaluating an entity or event is to directly compare it with a similar entity or event.	It can achieve high precision but gives low recall.
3	Comparable Entity Mining from Comparative Questions	Proc. 48th Ann. Meeting of the Assoc. for Computational Linguistics (ACL '10), 2010.	Mining the comparators from given entities of comparative questions [5].	Identifies comparative questions and extracts that comparators simultaneously using one single pattern	Their rules achieved high precision but low recall.
4	Relational Learning of Pattern Match Rules for Information Extraction	Proc. 16th Nat'l Conf. Artificial Intelligence and the 11th Innovative Applications of Artificial Intelligence (AAAI '99/IAAI '99), 1999.	Desired information can be extracted from natural language texts [6].	It can be research on relation and entity extraction in information extraction	The learned patterns employ limited syntactic and semantic information to identify potential slot fillers and their surrounding context.
5	Mining Knowledge from Text Using Information Extraction.	ACM SIGKDD Exploration Newsletter, vol. 7, no. 1, pp. 3-10, 2005.	Information extraction extracts structured data or knowledge from unstructured text [10].	Information Extraction is extracting structured data from unstructured or semi-structured web pages.	Cannot reduce demanding corpus-building requirements of information system.
6	Learning Surface Text Patterns for a Question Answering System	Proc. 40th Ann. Meeting on Assoc. for Computational Linguistics (ACL '02), pp. 41-47, 2002	Automatically learning such regular expressions from the web, for given types of questions [11].	Their system assumes each sentence to be a simple sequence of words & searches for repeated word orderings as evidence for useful answer phrases.	The system does not classify or make any distinction between upper and lower case letters.

In our proposed system, we perform two main activities:

1. Comparator mining

2. Comparator ranking

1. COMPARATOR MINING

For mining Comparators from comparative questions, we've used **weakly supervised method**.

Weakly Supervised method for Comparator Mining: In our approach, a sequential pattern is defined as a sequence $S (s_1s_2...s_i...s_n)$ where s_i can be a word, a POS tag, or a symbol denoting either a comparator ($\$C$), or the beginning ($\#start$) or the end of a question ($\#end$). A sequential pattern is called an indicative extraction pattern (IEP) if it can be used to identify comparative questions and extract comparators in them with high reliability[1].

1.1 Mining Indicative Extraction Patterns

Our **weakly supervised method** is based on two assumptions:

- 1) If a sequential pattern can be used to extract many reliable comparator pairs then it is very likely to be an IEP.
- 2) The pair is capable to compare if a comparator pair can be extracted by an IEP.

Based on these two assumptions, we design our boot- strapping algorithm. There are two key steps in this method:

- 1) Pattern generation
- 2) Pattern evaluation

1.1.1 Pattern generation

The three kinds of sequential patterns are generated from sequences of questions are as follows [5]:

- i) Lexical patterns- Lexical patterns indicate sequential patterns consisting of only words and symbols ($\$C$, $\#start$, and $\#end$).
- ii) Generalized patterns- A lexical pattern can be too specific. So we generalize lexical patterns by replacing one or more words their POS tags.
- iii) Specialized patterns- we perform pattern specialization by adding POS tags to all comparator slots. For example, from the lexical pattern '< $\$C$ or $\$C$ >' and the question 'ipod or zune?', '< $\$C=NN$ or $\$C=NN$ >' will be produced as a specialized pattern [3].

1.1.2 Pattern evaluation

According to the following equation, the reliability score $R^k(p_i)$ for a candidate pattern p_i at iteration k is calculated:

$$R^k(p_i) = \frac{\sum_{\forall cp_j \in CP^{k-1}} N_Q(p_i \rightarrow cp_j)}{N_Q(p_i \rightarrow *)}$$

Where,

$R^k(p_i)$ = Reliability score at iteration

P_i = Candidate pattern,

cp_j = known reliable comparator pairs,

CP_{k-1} = reliable comparator pair repository accumulated until the (k-1)th iteration,

$N_Q(x)$ = number of questions satisfying a condition x ,

$p_i \rightarrow cp_j$ = cp_j can be extracted from a question by applying pattern p_i ,

$p_i \rightarrow *$ = any question containing p_i

All the candidate patterns are evaluated and the pattern whose reliability score is greater than threshold γ is stored as IEPs in IEP database.[3]

1.2 Comparator extraction

By applying learned IEPs, we can easily identify comparative questions and collect comparator pairs from comparative questions existing in the question repository. Given a question and an IEP, the details of the process for Comparator extractions are as follows:

1. Generate sequence for the comparative question. If the IEP is a pattern without generalization, we just need to tokenize the questions and the sequence is the list of resulted token
2. If IEP is a specialized pattern, the POS tag of extracted comparators should follow the constraints specified by the pattern.

According to above observation, we examined the following strategies:

1. Random strategy

2. Maximum length strategy
3. Maximum reliability strategy[3]

2. COMPARATOR RANKING

The remaining issue is to rank possible comparators for a user input. The ranking method that we have used is **Comparability-Based Ranking Method**.

A comparator would be more interesting if it is compared with the entity more frequently.

Based on this, we define a simple ranking function $R_{\text{freq}}(c;e)$ which ranks comparators according to the number of times that a comparator c is compared to the user's input e in comparative question archive Q :

$$R_{\text{freq}}(c;e) = N(Q_{c,e})$$

Where $Q_{c,q}$ is a set of questions from which c and e can be extracted as a comparator pair.

This ranking function can also be called as Frequency-based Method. [3]

DESIGN AND IMPLEMENTATION

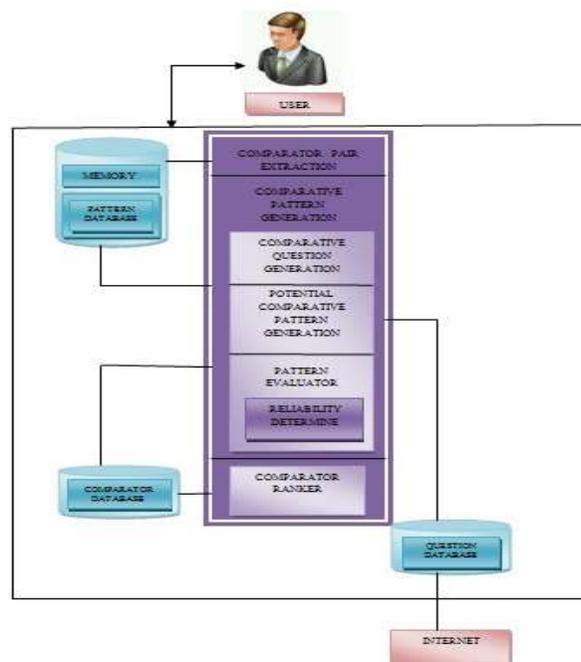


FIGURE: PROPOSED SYSTEM CONSISTING OF SEVERAL SUBSYSTEMS

OUR SYSTEM CONSISTS OF THE FOLLOWING MODULES:

1. **Algorithm:** This algorithm accepts question queue and comparator queue which is extracted from the question dataset. This algorithm check in the comparator queue if it contains any existing comparator i.e. which is already present in database. If is already present, it is removed from the queue. Same thing is followed for question queue. Then comparator queue and question queue are stored into the database.
2. **Database** contains DatabaseManager.
DatabaseManager is responsible for all the database operations. DatabaseManager is interface between the project and the database (MySQL in our case)
DatabaseManager has methods to
 - add comparator in the database.
 - add question into repository
 - check if a word is comparator
 - extract POS tag for a word

- extract pattern depending on POS for a word
 - get count for a comparator
 - save comparator for a comparator
 - save comparator for a question
 - extract comparator from a comparator pair with one of the comparator of pair as input (i.e. recommendation)
3. **Pattern Generator** which generates the 3 required pattern for Bootstrap algorithm:
 - Lexical Pattern
 - Specialised Pattern
 - Generalised Pattern
 4. **Model** contains model class for comparator pair. Model class hold the information of comparator extracted from database. Model class helps us to have operations on the objects get easily executed.
 5. **GUI** takes care of the UI part of the system. Has responsibility to show the UI and accept the user interaction as input. The UI components helps to load dataset into question, execute Bootstrap, show recommended suggestion, show pattern for question.
 6. **Recommendation** is responsible to provide UI for recommendation system. It takes input as comparator and displays recommendation for comparator in the descending order of frequency count.

ALGORITHM

```
Algorithm 1 Weakly-Supervised Model  
Input:  $CP, G$   
Initialize solution:  $Q \leftarrow [], P \leftarrow [], P_{new} \leftarrow \{\}, CP_{new} \leftarrow CP$   
1. Repeat  
2.  $P \leftarrow P + P_{new}$   
3.  $Q_{new} \leftarrow ComparativeQuestionIdentify(CP_{new})$   
4.  $Q \leftarrow Q + Q_{new}$   
5. for  $q_i \in G$  do  
6.     if  $IsMatchExistingPatterns(P, q_i)$  then  
7.          $Q \leftarrow Q - q_i$   
8.     end if  
9. end for  
10.  $P_{new} \leftarrow MineGoodPatterns(Q)$   
11.  $CP_{new} \leftarrow \{\}$   
12. for  $q_i \in G$  do  
13.      $cp \leftarrow ExtractComparableComparators(P, q_i)$   
14.     if  $cp \neq NULL$  and  $cp \notin CP$  then  
15.          $CP_{new} \leftarrow CP_{new} + \{cp\}$   
16.     end if  
17. end for  
18. until  $P_{new} = \{\}$   
19. return  $P$ 
```

FIGURE: PSEUDOCODE OF THE BOOTSTRAPPING ALGORITHM[3].

STEPS FOR BOOTSTRAPPING ALGORITHM:

- i. The bootstrapping process starts with a single IEP.
- ii. Then extract a set of initial seed comparator pairs from it.
- iii. For each comparator pair all questions containing the pair are retrieved from a question collection and regarded as comparative questions.
- iv. From comparative questions and comparator pairs all possible sequential patterns are generated and evaluated by measuring their reliability score defined in the Pattern Evaluation.
- v. Patterns evaluated as reliable are IEPs and are added into an IEP repository.

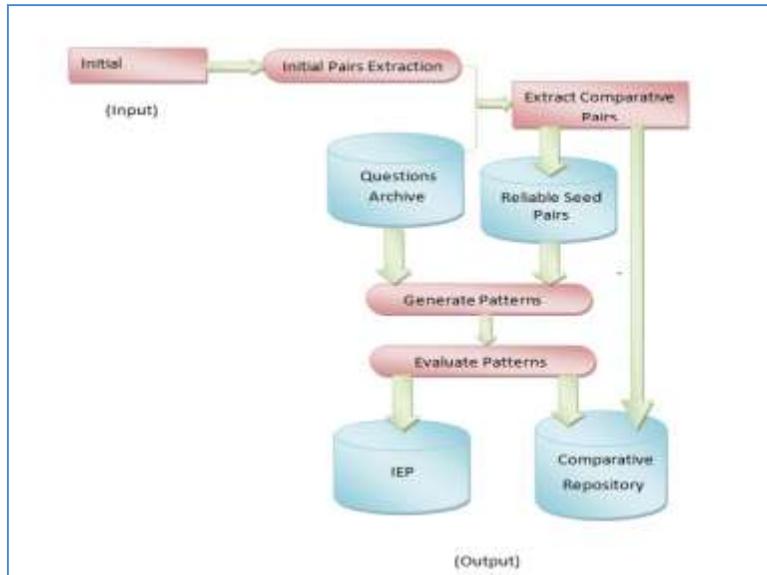


FIGURE: BOOTSTRAPPING ALGORITHM

EXPERIMENTAL RESULTS

Precision: It is the ratio of number of relevant comparable entities retrieved to the total number of irrelevant and relevant comparable entities retrieved. It has been expressed in percentage as:

$Precision\% = \frac{A}{A+C} * 100\%$ where,

A - number of relevant comparable entities retrieved,

C - number of irrelevant entities retrieved.

Recall: It is the ratio of number of relevant comparable entities retrieved to the total number of relevant comparable entities in the database. It has been expressed in percentage as:

$Recall\% = \frac{A}{A+B} * 100\%$ where,

A - number of relevant comparable entities retrieved,

B - number of relevant entities not retrieved.

**TABLE II
 EXPERIMENTAL RESULTS**

Sr. No.	Question(Input)	Comparators retrieved(Output)	Precision (%)	Recall (%)
1.	Which city is better, Pune or Baramati?	Sangali Satara iOS Paris Bhopal Nashik Pune	83.33	46.15

2.	Which mobile is better, samsung or iphone?	Nokia apple Apple nokia Samsung	100.0	80.0
3.	Which is better nokia or iphone?	Samsung samsung nokia	100.0	50.0
4.	Which is better Pune or Satara?	Sangali Baramati iOS Paris Bhopal	80.0	41.67
5.	Which city is better NYC or Pune?	Sangali Satara Baramati iOS Paris Bhopal NYC	83.33	50.0

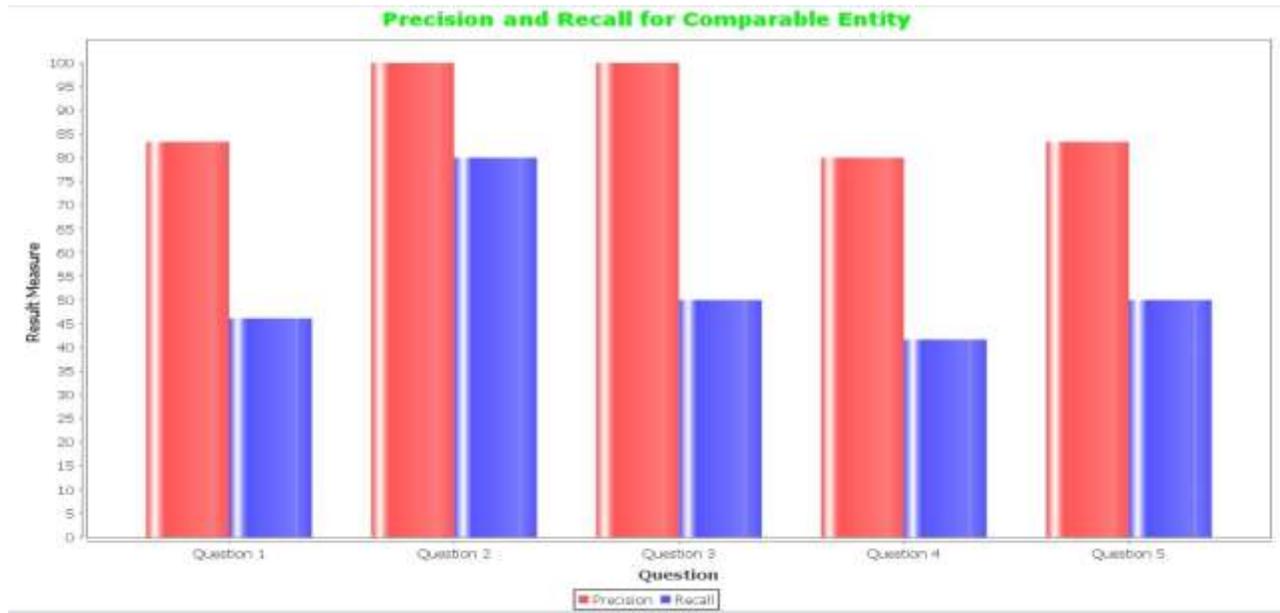


FIGURE: BAR GRAPH OF EXPERIMENTAL RESULTS FOR PRECISION AND RECALL

ACKNOWLEDGMENT

The authors wish to thank the researchers, publishers for making their resources available and teachers who provided them valuable assistance to the writing of the research summarized. Finally, they extend their heartfelt gratitude to their friends for assisting in the collection of the topics and their family for the help and inspiration extended. This paper was presented in part at International Journal of Advancement in Engineering Technology, Management And Applied Science, September 14 with paper title "A Study on Comparable Entity Mining from Comparative Questions".

CONCLUSION

In this paper, we present a new supervised method for identifying comparative questions and extraction of comparator pairs at the same time along with providing entities in rank. Our proposed system's key insight is that a good comparative question identification pattern should extract good comparator pairs, and a good comparator pair should occur in good comparative questions to bootstrap the extraction and identification process. This method considerably improves recall in together tasks whilst maintain elevated precision. Our system has user-friendly GUI.

Comparator mining outcome can be useful for commerce exploration or product recommendation organization. For instance, automatic proposition of comparable entities can help out users in their assessment activities earlier than building their acquire decision. In addition, the outcome can make available helpful information to companies which would like to recognize their competitors.

REFERENCES:

- [1] Kanchan Kundgir, Poonam Dere, Surabhi Mohite, Priti Mithari, "A Study on Comparable Entity Mining from Comparative Questions", International Journal of Advancement in Engineering Technology, Management And Applied Science, vol. 1 Issue 4, ISSN-number 2349-3224, September 14.
- [2] Kanchan Kundgir, Poonam Dere, Surabhi Mohite, Priti Mithari, "Research on Comparable Entity Mining from Comparative Questions", National Conference on "Advancements in Computer and Information Technology" (NCACIT-15), 2015
- [3] Shasha Li, Chin-Yew Lin, Young-In Song, and Zhoujun Li, "Comparable Entity Mining from Comparative Questions," IEEE Transactions On Knowledge And Data Engineering, vol. 25, no. 7, 1498-1509, 2013.
- [4] Shasha Li, Chin-Yew Lin, Young-In Song, and Zhoujun Li, "Comparable Entity Mining from Comparative Questions," Proc. 48th Ann. Meeting of the Assoc. for Computational Linguistics (ACL '10), 2010.
- [5] M.E. Califf and R.J. Mooney, "Relational Learning of Pattern- Match Rules for Information Extraction," Proc. 16th Nat'l Conf. Artificial Intelligence and the 11th Innovative Applications of Artificial Intelligence (AAAI '99/IAAI '99), 1999.
- [6] C. Cardie, "Empirical Methods in Information Extraction," Artificial Intelligence Magazine, vol. 18, 1997, 65-79.

- [7] N. Jindal and B. Liu, "Identifying Comparative Sentences in Text Documents," Proc. 29th Ann. Int'l ACM SIGIR Conf. Research and Development in Information Retrieval (SIGIR '06), 2006, 244-251.
- [8] N. Jindal and B. Liu, "Mining Comparative Sentences and Relations," Proc. 21st Nat'l Conf. Artificial Intelligence (AAAI '06), 2006.
- [9] R.J. Mooney and R. Bunescu, "Mining Knowledge from Text Using Information Extraction," ACM SIGKDD Exploration Newsletter, vol. 7, no. 1, 2005, 3-10.
- [10] D. Ravichandran and E. Hovy, "Learning Surface Text Patterns for a Question Answering System," Proc. 40th Ann. Meeting on Assoc. for Computational Linguistics (ACL '02), pp. 41-47, 2002.
- [11] Shrutika Narayane, Sudipta Giri, "A Review on Comparable Entity Mining", Vol. 2, Issue 12, International Journal of Innovative Research in Computer and Communication Engineering, December 2014.
- [12] Lanka Sri Naga Deepthi, Y.L.Sandhya Rani, "The Use of Comparative Questions in Comparable Entity Mining", Vol. 5, Issue 4, International Journal of Computer Science And Technology, Oct - Dec 2014

IJERGS

Protection of DC Motor from Field Failure

Chinmay Moharil¹, Deeksha Radke²

1 Research Scholar, Electrical Engineering Deptt K.D.K. College of Engineering, Nagpur

chinmamoharil007@gmail.com

2 Asst. Professor, Electrical Engineering Deptt K.D.K. College of Engineering, Nagpur

deeksha09@yahoo.com

Abstract—DC motors find a wide range of use in various fields because of their small size and high energy output. Field failure of DC motor is very common phenomenon. This paper presents a low cost system for the protection of DC motor from field failure. The purpose of this field failure relay is to protect the motor from the damage of field failure and also provide a simple speed control technique. Operational amplifier and microcontroller together works as field failure relay. The class-E chopper is used to rotate the motor in either directions and for breaking. The pulse width modulation technique is used for smooth speed control. The concept of op-amp in field failure protection can be extended for application to different DC motor drives such as: series, separately excited and permanent magnet DC motor.

Keywords— DC motor; field failure protection; smooth speed control; operational amplifier; microcontroller; class-E chopper; pulse width modulation.

INTRODUCTION

Direct current (DC) motor has already become an important drive configuration for many applications across a wide range of powers and speeds. The ease of control and excellent performance of the dc motor will ensure that the number of applications using them will continue to grow for the foreseeable future. These motors are main building blocks in different industries. Their malfunction will not only lead to repair or substitution of the motor, but also effect major financial losses due to unpredicted process downtime. Reliable protection of dc motors is essential for reducing the motors malfunction rate and prolonging motors life. If the main field of a shunt motor or a compound motor is extremely weakened or if there is complete loss of main field excitation, a serious damage to motor can occur under certain condition of operation. Since the speed of a dc motor is inversely proportional to flux, its speed tends to rise rapidly when the flux is decreased. If the field failure occurs, the armature will draw heavy current (as good as short circuit condition), the motor speed will raise dangerously high level. Therefore to protect these motors use of power electronic control offers not only better performance caused by precise control and fast response, but also maintenance, and ease of implementation. In parallel with the advance in power electronic there have been great advance in microcontroller-based control systems due to the microcontroller flexibility and versatility.

METHODOLOGY

Principle of operation of DC motors: The DC motor utilizes this concept by changing the direction of the current flowing through the brushes into the coiled wire in the armature. A permanent magnet creates a constant magnetic field, and when current runs through the coils, a force is created that turns the armature. The direction of the rotating force is given by the Fleming's Left Hand rule When the armature has turned far enough, the brushes are now in contact with the opposite ends of the coiled wire, effectively reversing the polarity of the voltage across the coil and reversing the current flow, which create a force that spins the armature further in the same direction. [9]

DC shunt motor: In case of a shunt wound dc motor or more specifically shunt wound self excited dc motor, the field windings are exposed to the entire terminal voltage as they are connected in parallel to the armature winding as shown in the figure below.

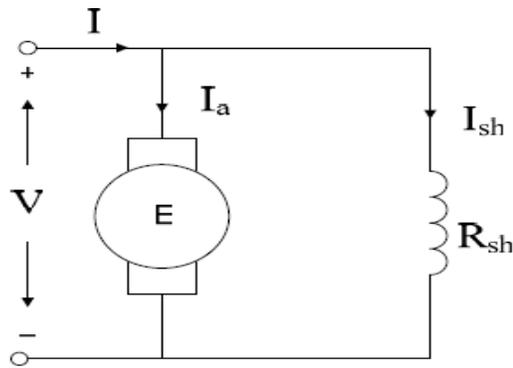


Fig.1. DC Shunt Motor

To understand the characteristic of these types of DC motor, let us consider the basic voltage equation given by

$$E = E_b + I_a R_a \dots \dots \dots (1)$$

Where, E, E_b, I_a, R_a are the supply voltage, back emf, armature current and armature resistance respectively

$$E_b = k_a \phi \omega \dots \dots \dots (2)$$

since back emf increases with flux ϕ and angular speed ω , Now substituting E_b from equation (2) to equation (1) we get,

$$E = k_a \phi \omega + I_a R_a$$

$$\omega = \frac{E - I_a R_a}{k_a \phi} \dots \dots \dots (3)$$

The torque equation of a dc motor resembles,

$$T_g = K_a \phi I_a \dots \dots \dots (4)$$

This is similar to the equation of a straight line, and we can graphically representing the torque speed characteristic of a shunt wound self excited dc motor as

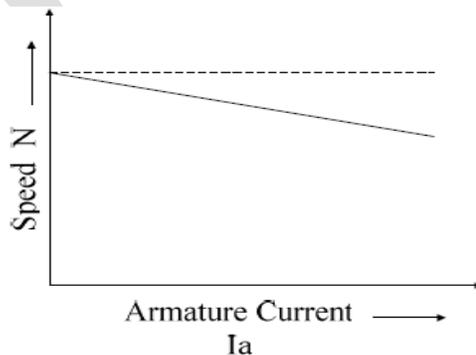


Fig.2. Torque speed characteristics

The shunt wound dc motor is a constant speed motor, as the speed does not vary here with the variation of mechanical load on the output. Therefore this motor is widely used in many constant speed applications where the speed is to be maintained constant irrespective of load. [11]

Operational Amplifier: An op-amp operates on analog input. It can be used to amplify or attenuate this input, and to carry out mathematical operations such as addition, subtraction, integration, and differentiation. Because of their wide range of uses, op-amps are encountered in most electric circuits.

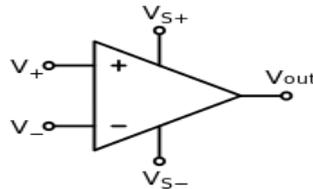


Fig.3. Op-Amp

The fundamental function of an op-amp is to greatly amplify the differential between the two inputs, and output the result. If input at $V(+)$ is greater than at $V(-)$, the op-amp will amplify and output a positive signal; if $V(-)$ is greater, the op-amp will output an amplified negative signal. Two other features of a typical op-amp are: (a) the input impedance is extremely high, and (b) the output impedance is extremely low. Because the op-amp's gain is so high, even small differences in the inputs will rapidly drive the output voltage to its maximum or minimum value. For this reason, op-amps are usually connected to a negative feedback.[8]

Op-Amp as Comparator: A comparator circuit compares two voltages and outputs either a 1 (the voltage at the plus side; VDD in the illustration) or a 0 (the voltage at the negative side) to indicate which is larger. Comparators are often used, for example, to check whether an input has reached some predetermined value. In most cases a comparator is implemented using a dedicated comparator IC, but op-amps may be used as an alternative. Comparator diagrams and op-amp diagrams use the same symbols.

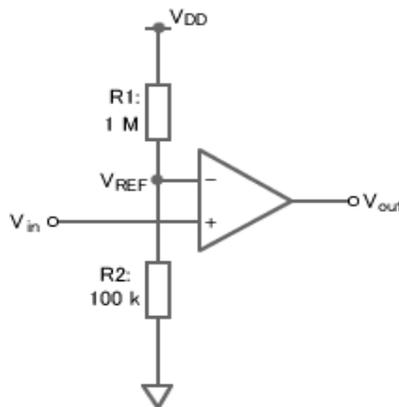


Fig.4. Comparator Circuit

Figure 4 shows a comparator circuit. Note first that the circuit does not use feedback. The circuit amplifies the voltage difference between V_{in} and V_{REF} , and outputs the result at V_{out} . If V_{in} is greater than V_{REF} , then voltage at V_{out} will rise to its positive saturation level; that is, to the voltage at the positive side. If V_{in} is lower than V_{REF} , then V_{out} , will fall to its negative saturation level, equal to the voltage at the negative side. In practice, this circuit can be improved by incorporating a hysteresis voltage range to reduce its sensitivity to noise. [8]

HARDWARE DESIGN

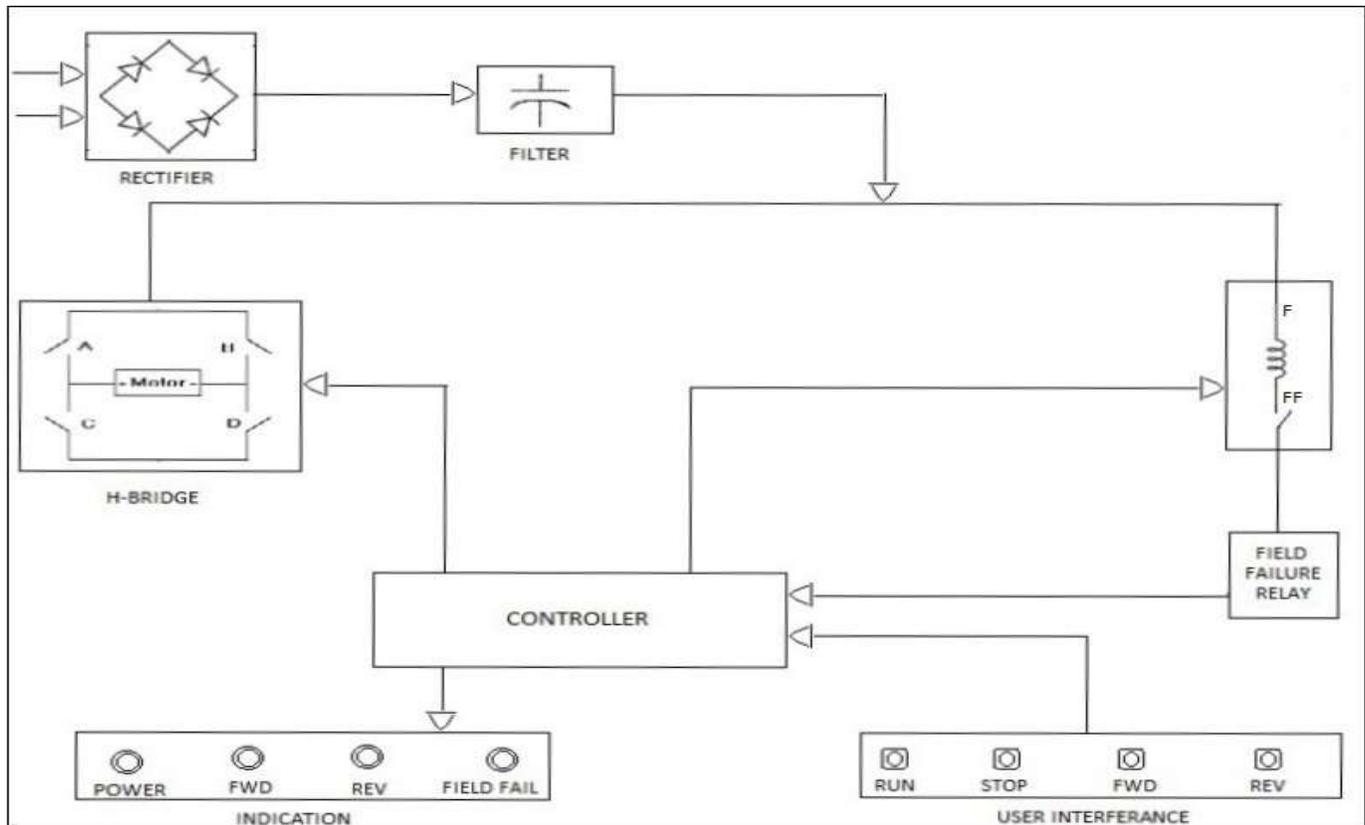


Fig.1. Block diagram of field failure relay system

The ATmega8 is a low-power CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega8 achieves throughputs approaching 1 MIPS per MHz, allowing the system designed to optimize power consumption versus processing speed. It has 8K bytes of In-System Programmable Flash with Read-While-Write capabilities. 23 general purpose I/O lines and 32 general purpose working registers & Three flexible Timer/Counters with compare modes allows user to connect with ant digital equipment. [12]

The silicon bridge rectifier (kbp1000w-g) is a bridge rectifier module in which four diodes are arranged in bridge foam to convert ac signal into dc signal. The module has four terminals two of them for ac input and remaining two for dc output. During the positive half cycle of the input signal two of the four forward biased diodes conducts and during negative half cycle the remaining two conducts in this way load is supplied during both the half cycles. An electrolytic capacitor is used which filters the ripples from the output of bridge rectifier. [10]

The driver IC-IR2110 is high voltage, high speed power MOSFET and IGBT drivers with independent high and low side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. Logic inputs are compatible with standard CMOS or LSTTL output, down to 3.3V logic. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. Propagation delays are matched to simplify use in high frequency applications. The floating channel can be used to drive an N-channel power MOSFET or IGBT in the high side configuration which operates up to 500 or 600 volts. [12]

The operational amplifier(lm358) Ic consist of two independent, high- gain, internally frequency-compensated op-amps, specifically designed to operate from a single power supply over a wide range of voltages. The low-power supply drain is independent of the magnitude of the power supply voltage. Application areas include transducer amplifiers, DC gain blocks and all the conventional op-amp circuits, which can now be more easily implemented in single power supply systems. For example, these circuits can be directly supplied with the standard + 5 V, which is used in logic systems and will easily provide the required interface electronics with no additional power supply. In linear mode, the input common-mode voltage range includes ground and the output voltage can also swing to ground, even though operated from only a single power supply voltage. [12]

The IGBT (FGA25N) is a three-terminal power semiconductor device primarily used as an electronic switch as it was developed, came to combine high efficiency and fast switching. It switches electric power in many modern appliances variable-frequency drives (VFDs), electric cars, trains, variable speed refrigerators, lamp ballasts, air-conditioners and even stereo systems with switching amplifiers. Since it is designed to turn on and off rapidly, amplifiers that use it often synthesize complex waveforms with pulse width modulation and low-pass filters. In switching applications modern devices boast pulse repetition rates well into the ultrasonic range—frequencies which are at least ten times the highest audio frequency handled by the device when used as an analog audio amplifier. Using Fairchild's proprietary trench design and advanced NPT technology, the 1200V NPT IGBT offers superior conduction and switching performances, high avalanche ruggedness and easy parallel operation. This device is well suited for the resonant or soft switching application such as induction heating, microwave oven. [10]

The voltage regulator (LM7805) IC is three-terminal positive regulator which is available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut-down, and safe operating area protection. If adequate heat sinking is provided, they can deliver over 1 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components for adjustable voltages and currents. [12]

CIRCUIT DIAGRAM

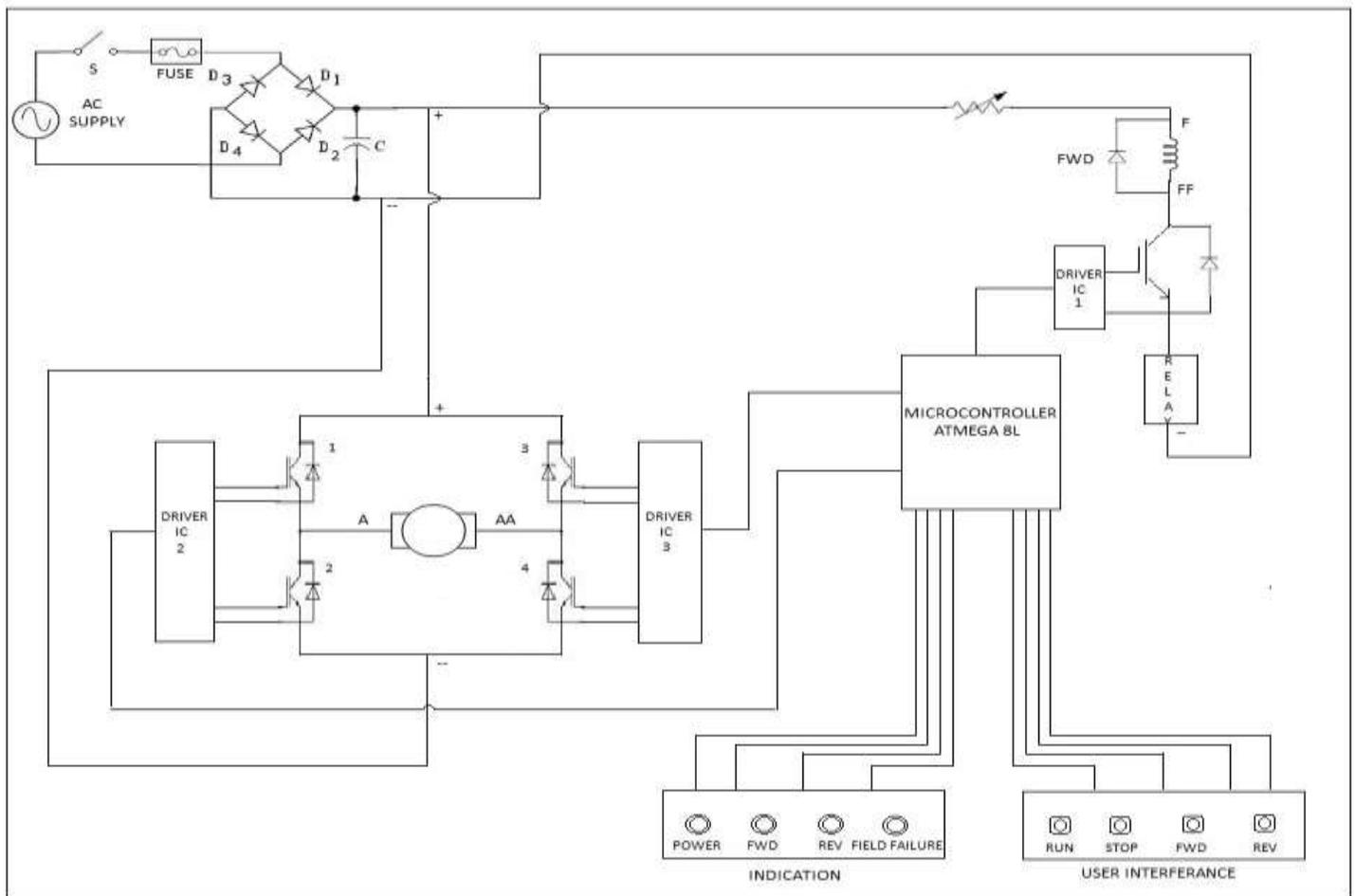


Fig.2.Circuit Diagram

WORKING

In the circuit diagram shown above the rectifier circuit is used to convert AC supply into DC signal. The electrolytic capacitor is used to remove ripples from the DC signal. The field failure relay (contains operational amplifier and microcontroller) the operational

amplifier sense the current flowing in the field winding. During the abnormal condition operational amplifier sends the signal to the microcontroller and supply to the armature is tripped using H-bridge. During the normal condition the function of H-bridge is to rotate the motor in forward or reverse direction and break the supply to the armature in fault condition. It consists of IGBT which is used as a switch. The H-bridge is controlled by driver IC depending on microcontroller input. Microcontroller provides timing and control signal to various components of the circuit.

Auxiliary supply of 12V is provided to driver IC's and linear voltage regulator is used to provide constant 5V supply to microcontroller and field failure relay. Using user interface microcontroller can be commended for desired function such as run, stop, forward and reverse operation of dc motor. Using these keys the user can set the motor to run in any one of the following modes namely forward motoring, reverse motoring, forward braking and reverse braking. The Hardware of this system including bridge rectifier and filter circuit, chopper using IGBT, control keys, microcontroller, field failure sensor is shown below.



Fig.3.View of Hardware Module

RESULT

Protection system for field failure protection of DC motor is successfully implemented and relay is tested for different values of current through field winding, various operations such as forward motoring, reverse motoring, forward braking and reverse braking

successfully performed. We have tested our project on 3HP motor and 5HP motor. The following observation table shows the results. For given motor rating, the speed and the operating time of field failure relay is observed.

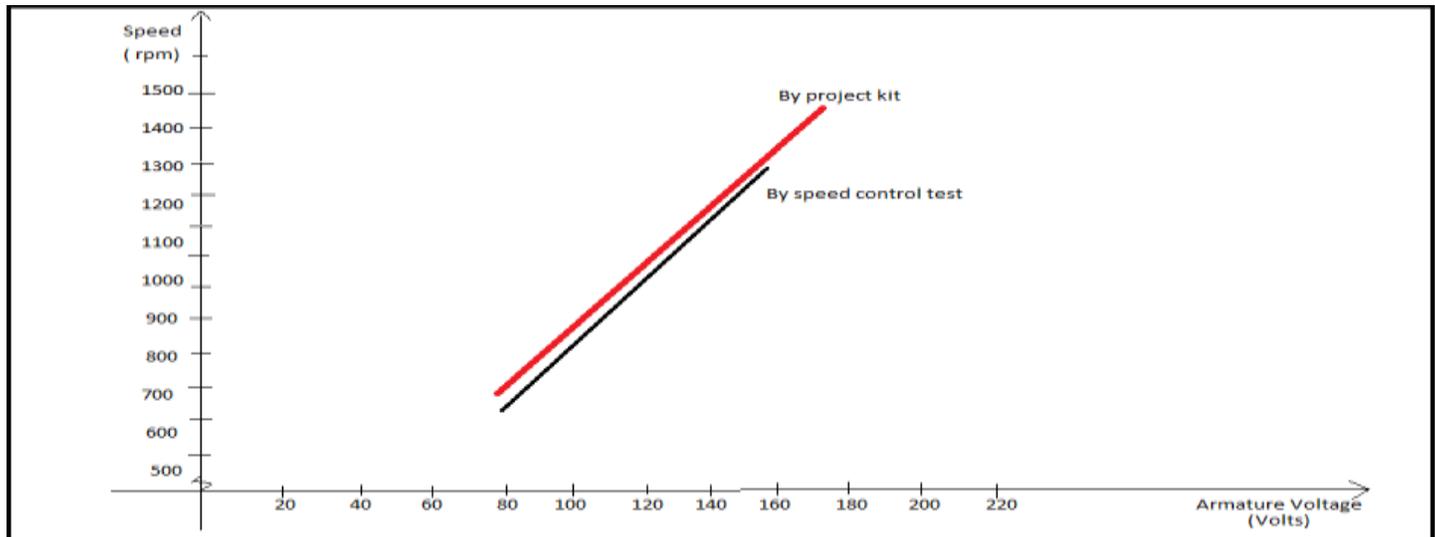
Sr. No.	Motor Rating	Speed in rpm (Min)	Speed in rpm (Max)	Operating time of field failure relay (seconds)
1	3HP,220V,12A,1500rpm	76	1150	0.3
2	5HP,220V,19A,1500rpm	94	1280	0.2

The comparative observation table for speed control test using rheostat control and by the project kit is shown below.

Rating of DC motor: 5HP, 220V, 12A, 1500 rpm. Field current: 0.5A

Serial Number	By speed control test		By the project kit	
	Armature voltage	Speed in rpm	Armature voltage	Speed in rpm
	80	640	80	651
1	100	820	100	860
2	120	970	120	995
3	140	1130	140	1175
4	160	1280	160	1350
5	180	1300	180	1420
6				

The comparative graph of the two tests:



CONCLUSION

A low cost protection of dc motor from field failure and also simple speed control method can be implemented. Which consists of field failure relay (i.e. the operational amplifier and micro controller) which is used to sense the field failure and cut armature from the main circuit so that the motor is saved from its effects. On the other hand, the class E chopper can not only be used for speed controlling in different direction but also for braking. This system can be extremely suitable for detecting/ sensing absences of field current, directional reversal, speed control, soft starting.

REFERENCES:

- [1] S.Thakur, D. Fredrickson, "adjustable- speed drives motor protection applications and issues", "IEEE march 2014".
- [2] Ciprian Afanasov, Mihai Rata, "Speed control of Dc motor using 4 quadrant chopper and bipolar control strategy", "Buletinul AGIR nr.3/2013".
- [3] Jeetandra singh Chauhan, Sunil Semwal, "Microcontroller based speed control of dc geared motor through RS-232 Interface with PC", "International Journal Of Engineering Research And application", "January 2013".
- [4] Nazanin Afrasiabi, Mohammadreza Hairi Yazdi, "Dc motor control using chopper", "GJSET Publishing 2013".
- [5] Bimbhra, P.S., Power Electronics. New Delhi, Khanna Publisher, 2010.
- [6] Dubey, G.K., Fundamentals of Electrical Drives. New Delhi, Narosa Publishing House, 2010.
- [7] Mohammad H. Rashid, "Power Electronics circuits, device and applications," Prentice Hall Publication, Second Edition, 2003,.
- [8] Ramakath A. Gikwad, "Op-Amp and Linear Integrated Circuits," Prentice-Hall Publication, Fourth Edition, 2003,.
- [9] B.L. Theraja and A.K.Theraja, "Electrical Technology," S.Chand and Company Ltd., Twenty Fourth Edition, vol.2, 2008,.
- [10] [http://www. Alldatasheet4u.com](http://www.Alldatasheet4u.com) for various components datasheet.
- [11] Ashfaq Husain "Electrical Machines," Dhanpat Ray and company Ltd Second Edition, 2005.
- [12] <http://www.mouser.com> for various components datasheet

Vehicle Detection and Classification from Satellite Images Based On Gaussian Mixture Model

R.SHARAN KUMAR, shaksharan@gmail.com, PG Student, T.MANI, Assistant Professor,
Department of Electronics and Communication Engineering,
Jay shriram group of institutions,
Tirupur-638660.

Abstract— A dynamic vehicles are identified using background elimination techniques. The background removal method uses in the concept of GMM. This approach is tracking distinct feature, such as corner, edge line. The advantage of this approach is to tolerate partial occlusion, and not sensitive to image quality relative to other tracking methods, The SIFT features used here to an vehicle detection. This is done by using the images captured from the satellite. Each image is processed separately and the number of cars has been counted This method starts with a screening of asphalted zones to restrict the areas to detect cars and thus reduce false alarms. Then it will perform a feature extraction process given by the scalar invariant feature transform in which a set of key points is identified in the obtained image and opportunely defined. Successively, using a support vector machine classifier it discriminates between key points assigned to cars and all the others. The final step of the method is focused on grouping the key points belonging to the same car to get a “one key point–one car” relationship. Finally, the number of key points finally identified gives the amount of cars present in the scene.

keywords— Car detection, Feature extraction, Gaussian Mixture Model(GMM), Support Vector Machine(SVM), Scale Invariant Feature Transform (SIFT) ,Histrogram Of Gradient,Car Keypoint Merging.

I.INTRODUCTION

A new detection approach of automatic car counting method using satellite vechile images consists of two phases training phase and detection phase. In the training phase, image extract several features which includes local edge corner features and image colors. And to subtract the background using GAUSSIAN MIXTURE MODELS (GMM)[7]. It is the mixture of the Gaussian model distribution of background pixels that will be the scene to establish the statistical model for each pixel, and periodically update the background. This method uses background subtraction which ameliorates the adaptive background cumulation model and makes the system learn more expeditious and more accurately, as well as habituate efficaciously to transmuting environments. The objective of this research is to monitor the activies at traffic intersection for detecting the congestions, and then soothsay the traffic flow. **1**It has widely been realized that increases of preliminary transportation infrastructure and widened road, have not been able to relieve city congestion. As a result, many investigators have paid their attentions on Intelligent Transportation System (ITS), such as predict the traffic flow on the basis of monitoring the activities at traffic intersections for detecting congestions[2]. To better understand traffic flow, an increasing reliance on traffic surveillance is in a need for better vehicle detection such at a wide-area.

After background removal detection phase feature extraction has SIFT feature to detect the cars by using keypoint classification to eliminate more points from the list of keypoints by finding those that have low contrast or are poorly localised on an edge[2]. From a set of reference image SIFT keypoints of objects are first extracted and stored in a database By comparing individually each feature from the new image with this database, an object is recognized into a new image and using the Euclidean distance of the feature vectors the candidate matching features is found[15]. Subsets of keypoints that satisfies the object and its location, orientation and scale in the new image are identified from the full set of matches to filter out good matches[3].

Afterwards, using SVM the extracted features are used in order to classify pixels as nonvehicle pixel or vehicle pixel[5],[8]. It will not perform region based classification, which highly depends on results of the color segmentation algorithms such as mean shift. It is not neccessary to generate the multi-scale sliding windows either. The distinguishing features of the defined framework is that the detection task is given based on the pixel wise classification. Finally above all method are over and the result of counted cars in the satellite image is obtained.

In this paper, the screening step of asphalted zones to restrict the areas where detecting cars and thus to reduce the probability of false alarms. Then it will performs a feature extraction process given by the scalar invariant feature transform(SIFT) to which a set of consistent keypoints is identified. The algorithm then aims at the classification of these keypoints by discriminating between the points which belong to cars and all the others by a support vector machine (SVM) classifier[14]. The final step of procedure is focused on the grouping the keypoints belonging to the same car to get a “one key point–one car” relationship[1],[5]. At the end of the procedure, the number of key points finally identified gives the amount of cars present in the scene.

The main differences between our method and those available in the literature are as follows:

- 1) the car detection and description mechanisms;
- 2) our method is invariant to the car orientations;
- 3) it associates several pointers with the same car making the detection process more robust but requires a merging operation;
- 4) it allows handling occlusion problems due to shadows or trees for instance;
- 5) it combines the detection process with a screening operation of the asphalted areas;
- 6) it does not require a dictionary of precise car models.

II. IMPLEMENTATION OF PROPOSED SYSTEM

A. Screening

To make the detection faster and to reduce the number of false alarms, we restrict the investigated area by analyzing only regions where cars usually can be found. Assuming that cars are present only over areas covered by asphalt implies that a screening of these regions is needed.

B. Background Removal

In surveillance applications the first step is background removal. It reduces the computation required by the downstream stages of the surveillance pipeline. Background subtraction reduces the space to be searched in the video frame for object detection by filtering and removing the uninteresting background from the video. Here Gaussian Mixture Model (GMM) algorithm for background elimination [1].

C. Gaussian Mixture Model (GMM)

The traditional Gaussian mixture model uses a mixture of the Gaussian model distribution of background pixels that will be the scene to establish the statistical model for each pixel, and periodically update the background [7]. The Gaussian model based on the scene to pure only when the background images with each pixel to calculate the mean and standard deviation, and the future prospects of the background information as a basis for classification. Another method is to calculate the probability of classification through the foreground and background pixels using the Bayesian classifier, or with the probability of hidden Markov model to achieve the classification of foreground and background.

The Gaussian mixture model is a single extension of the Gaussian probability density function. As the GMM can approximate any smooth shape of the density distribution, so often used in image processing in recent years for good results. Assuming the Gaussian mixture model consists of and the combination of Gaussian probability density function, the Gaussian probability density function of each has its own mean, standard deviation, and weight, the weights can be interpreted by the corresponding Gaussian model of the frequency, they more often appear in the Gaussian model the higher the weight [4]. The higher frequency of occurrence, then find the maximum weight on the Gaussian probability density function, finally, the Gaussian probability density function of the means pixel value is background image.

III. FEATURE EXTRACTION

Fig 1 represent the process and step of feature extraction. In this stage the local features detect the image frames. In this feature extraction perform edge detection, corner detection, color transformation and classification. It perform a feature extraction process based on scale invariant feature transform (SIFT).

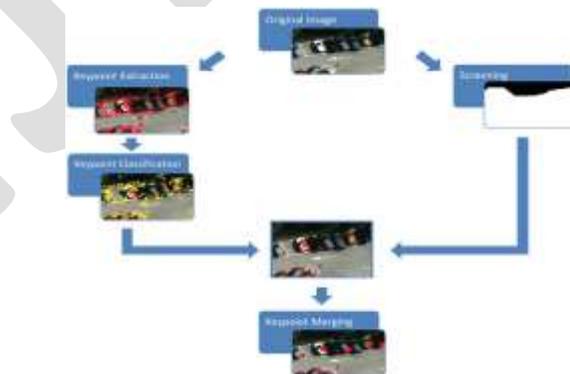


Fig 1 Diagram for feature extraction

IV. SCALE INVARIANT FEATURE TRANSFORM (SIFT)

From a set of reference image SIFT keypoints of objects are first extracted and stored in a database. By comparing individually each feature from the new image with this database, an object is recognized into a new image and using the Euclidean distance of the feature vectors the candidate matching features is found. Fig 2 describes keypoints assing to the cars. Subsets of keypoints that satisfies the object and its location, orientation and scale in the new image are identified from the full set of matches to filter out good matches.



Fig 2 shows keypoint assing to the cars

The resoluteness of consistent clusters is performed rapidly by utilizing an efficient hash table and implementation in the generalized Hough transform. Each clusters of 3 or more features that accede on an object and then subject to further detailed model of verification and subsequently discarded the outliers. Determinately that a particular set of probability features designates the presence of an objects is computed, given the precision of fit and number of probable erroneous matches. Object matches and pass all the tests can be identified as veridical with high confidence. The algorithm firstly constructs a Transformation coefficients reduced matrix, and then smooths the DC Coefficients to generate the Tranformation Domain coefficients reduced images. Based on which SIFT feature is extracted. The experimental results show that with low loss of accuracy. SIFT feature extraction algorithm can significantly improve the computational efficiency of feature extraction, and will have great practical value in the condition of high real-time requirements. SIFT algorithm, increases the computational time significantly. The image doubling is eschewed but the search for extrema is performed over the whole image including first and the last scale. If any image is doubling that case the pixel comparing the image and carried out only with available neighbors.

V. DIFFERENT FUNCTION OF KEYPOINTS

A. Keypoint Localization

This stage attempts to eliminate more points from the list of keypoints by finding those that have low contrast or are poorly localised on an edge. This is achieved by calculating the Laplacian. This removes extrema with low contrast. To eliminate extrema based on poor localisation it is noted that in these cases there is a large principle curvature across the edge but a small curvature in the perpendicular direction in the difference of Gaussian function. If this difference is below the ratio of largest to smallest eigenvector, from the 2x2 Hessian matrix at the location and scale of the keypoint, the keypoint is rejected.

B. Keypoint Descriptor

Antecedent steps founded the keypoint locations at the particular scale and assigned orientation to them. This ascertained invariance to image location, scale and rotation. This is need to evaluate a descriptor vector for the each keypoint such that the descriptor is partially invariant and highly distinctive to the remaining variations such as 3D viewpoint, illumination, etc. This step that is performed on the image is most proximate in scale to the keypoint's scale.[10] A set of orientation histograms is first engendered on the 4x4 pixel neighborhoods with 8 bins each. This histograms are then computed from the magnitude and orientation values of the samples in a 16 x 16 region around the keypoints such that each histogram contain samples from a 4 x 4 subregion of the pristine neighborhood region. The magnitudes are further then weighted by a Gaussian function with equipollent to one moiety the width of the descriptor window. This descriptor then becomes a vector of all values of these histograms. The vector has 128 elements since there are $4 \times 4 = 16$ histograms with 8 bins each. These vector is then normalized to unit length to enhance invariance to affine transmutations in illumination[1]. A threshold of 0.2 is then applied and the vector is once again normalized in order to reduce the effects of non-linear illuminations. Albeit, the dimension of the descriptor seems to be high, then descriptors with lower dimension than this do not perform as such across the range of matching tasks. So the computational cost still remains low due to the approximate method utilized for finding the most proximate-neighbor. Longer descriptors perpetuate to do more better but not that by much and there is a supplemental peril of incremented sensitivity to distortion and occlusion. It is shown that feature matching precision is above 50% for the viewpoint changes of up to 50 degrees. Therefore minor affine changes are invariant by SIFT descriptors[6]. Matching precision is withal quantified against number of keypoints varying in the testing database to test the

distinctiveness of SIFT descriptors and it is shown that matching precision decreases only very remotely for prodigiously and sizably voluminous database sizes, thus betokening that SIFT features are highly distinctive.

C.Orientation Assignment

The SIFT-feature location is resolute, A main orientation is assigned to each feature predicated on local image gradients. For each pixels of the region around the feature locations the orientation and gradient magnitude are computed respectively. From the SIFT feature description, it is evident that SIFT-feature algorithm can be understood as a local image operators which takes the transforms and an input image it into an accumulation of local features. To utilize the SIFT operator for object apperception purposes, it is applied on two object images, a model and a test image, its for the case of a victuals package[3],[10]. As shown, the model object image is an image of the object alone taken in predefined conditions, while the test image is an image of the object together with its environment. To find corresponding features between the two images, which will lead to remonstrate apperception, different feature matching approaches can be utilized. According to the Most proximate Neighborhood procedure for each feature in the model image feature set the corresponding feature must be probed for in the test image feature set. The corresponding features is one with the most diminutive Euclidean distance to the feature. A dyad of corresponding features is called a match. To determine whether the match is positive or negative, a threshold can be utilized.

D.Keypoint Classification

Once the set of keypoints, with their respective descriptors is extracted, the goal of the next stage of the process is the discrimination between keypoints which belong to cars and keypoints which represent all other objects ("background"). Since the dimension of the extracted features is relatively large, it is recommended to adopt a suitable classification method such as the SVM classifier. Before applying a classification based on an SVM classifier, further information will add. In fig 3 the Structure of the SIFT descriptor to the keypoint descriptor in order to potentially improve its discrimination power.



Fig 3 Image of keypoint classification

The first six features will add are related to color information. Indeed, the think that the addition of some proprieties strongly associated with the object itself can lead to a better discrimination.

Table 1 keypoint classification accuracy in percent

Features	Car	Background	Total
SIFT	27.72	98.49	98.15
SIFT + Color	50.07	98.61	98.37
SIFT + Morphology	52.75	98.67	98.40
SIFT + Color + Morphology	48.81	98.7	98.34

The table1 describe the SIFT description vector, obtained at the end of the feature extraction procedure, takes origin from the results achieved with extra color and morphological features. Indeed, the addition of 24 features (i.e., RGB, HSV, and 3×6 morphological features) allows us to improve the results of the keypoint classifications. Even if car colors can be very heterogeneous, in numerous cases, their colors appear dissimilar to the appearance of dominant objects in the contextual environment (e.g., asphalt, houses, and green areas) [9]. For this reason, the think that the use of features linked to colors spaces can help in the discrimination.

VI. CAR KEYPOINT MERGING

At the end of the keypoint classification procedure, the number of keypoints associated with the car class can be larger than the number of cars itself. The reason is that it is likely that a single car is marked by more than one keypoint. Let $K_c = \{k_1, k_2, \dots, k_N\}$ be the set of N keypoints found for the car class in the considered image $I(x, y)$; the goal is to estimate the number of cars present in $I(x, y)$ and to identify them in a univocal manner. To pursue this scope, it will develop an algorithm to group the keypoints which belong to the same car. Since the merging is performed in the spatial image domain, it will rely on a merging criterion based on a spatial distance between the keypoints in order to identify neighboring keypoints and possibly merge them into a unique keypoint representing the car on which they lie. This method is shown in fig 4.



Fig 4 Car Keypoint Merging

The main steps of our merging algorithm are summarized.

Step 1: The spatial coordinates of the keypoints contained in the set K_c are used as input of the algorithm.

Step 2: To the vector of parameters, a further parameter m is added and initialized to 1. It will act as a counter to keep trace of the number of “merging operations” done with that keypoint.

Step 3: A matrix $N \times N$ containing the Euclidean distances in the spatial domain between all keypoints is computed.

Step 4: The two keypoints (k_i, k_j) with the smallest distance d_{min} are selected.

Step 5: If $d_{min} < T_m$ (threshold) $\rightarrow k_i$ and k_j are merged into a new point k_t which will replace the two keypoints in the set K_c .

Step 6: The matrix containing the distances is then recomputed with the new point.

Steps 3–6 are repeated until $d_{min} > T_m$.

Step 7: Assuming that the points with a value of m smaller than 2 are isolated points only the points with $m > 1$ are kept. The number of resulting merged keypoints represents finally the estimation of the cars present in the image. This step is useful to detect.

VII. RESULTS AND DISCUSSION

A. Using MATLAB Software to detect the result.

Satellite Image

Below image is taken from the satellite for counting the cars using SVM classification.



Fig 5 Input Image Taken From Satellite

B. Image Frame Using Histogram Of Gradient

To convert the original image to image frame using histogram of gradient to frame the image by using cell size, block size and block overlapping methods.



Fig 6 Output Of Histogram Of Gradient

C. Background Removal Using GMM

To subtract the background removal by using gaussian mixture model to subtract the poor pixel from the image.

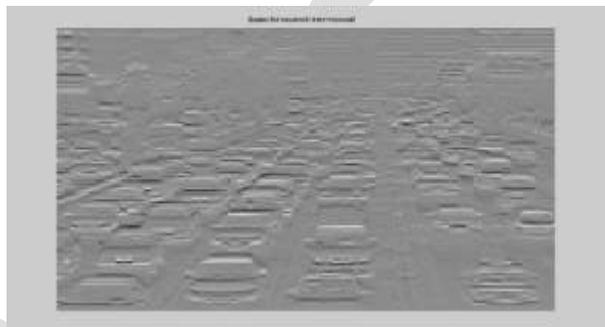


Fig 7 Output Of Background Removal

D. Noise Reduction

The image contains a lot of noise in the pixel using lowpass filter reduce the noise in noise reduction method.

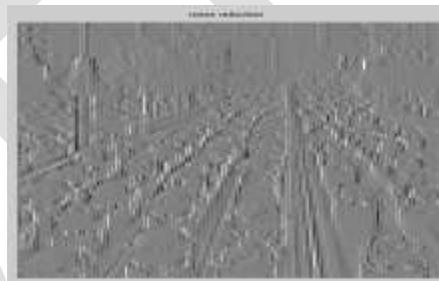


Fig 8 Output Of Noise Reduction

E. Edge Detection

Using edge detection method the edges of the cars are identified in the below image.



Fig 9 Output Of Edge Detection

F.Feature Extraction Using SIFT

In feature extraction the SIFT transform used to assign the keypoint for the cars and detect the keypoint classification and keypoint descriptor.

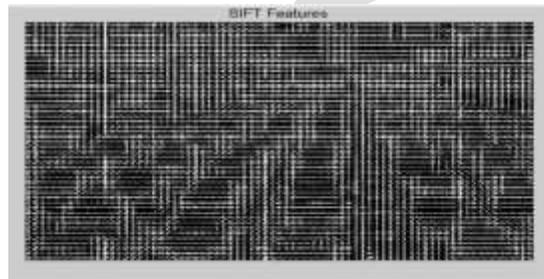


Fig 10 Output of Feature Extraction

G.Car Counting Using SVM Classification

By using SVM classification to access the hyperplane of the image and counting the cars in the given image.



Fig 11 Output Of Automatic Car Counting Method Using Satellite Vehicle Image

VIII.CONCLUSION

The automatic car counting detection have four-stage of procedure to develop the satellite images.The procedure start with a background removal using GMM to detect the regions covered by asphalt assuming that usually cars in an asphalted regions. This procedure permits us to reduce the false alarms. The second stage is feature extraction in this SIFT is used to assing keypoints to images using HOG.The third stage is SVM classification to merge all the keypoints in an image. This step is necessary because, at the end of the keypoint classification, a car is typically identified by more than one keypoint. Final stage is counting the cars in satellite images.Furthermore, Detecting all vechile using morphological filter and reduce the noises in the satellite images

REFERENCES:

- [1] Thomas moranduzzo and Farid melgani,(2014) “Automatic car counting method for an unmanned aerial vehicle images”, senior member,IEEE transaction on remote sensing and geoscience, pp.1635-1647
- [2] S. Wang,(2011) “Vehicle detection on aerial images by extracting the corner features for rotational invariant shape matching,” in Proc. IEEE Int. Conf. Comput. Inf. Technol., pp. 171–175.
- [3] S. Agarwal, A. Awan, and D. Roth,(2004) “Learning to detect objects in images via a sparse, part-based representation,” IEEE Trans. Pattern Anal. Mach. Intell., vol. 26, no. 11, pp. 1475–1490.
- [4] E. Pasolli, F. Melgani, and M. Donelli,(2009) “Automatic analysis of GPR images: A pattern-recognition approach,” IEEE Trans. Geosci. Remote Sens., vol. 47, no. 7, pp. 2206–2217.
- [5] N. Ghoggali, F. Melgani, and Y. Bazi,(2009)“ A multiobjective genetic SVM approach for relegation quandaries with circumscribed training samples,”IEEE vol. 47, no. 6, pp. 1707–1718,
- [6] N. Ghoggali and F. Melgani,(2008) “Genetic SVM approach to semisupervised multitemporal classification,” IEEE Geosci. Remote Sens. Lett., vol. 5, no. 2, pp. 212–216.
- [7]Y. F. Yang,(2009) Algorithm of image Classification Based on Image Feature, Modern electronic technique 32-14: 81-82, 86.
- [8] Q. Tan, J. Wang, and D. A. Aldred,(2008) “Road vehicle detection and the relegation from very-high-resolution color digital orthoimagery predicated on object-oriented method,” in Proc. IEEE Int. Geosci. Remote Sens.Symp,pp. 475–478.
- [9] W. Burger and M. Burge,(2007) Digital Image Processing—An Algorithmic Introduction Using Java, 1st ed. New York, NY, USA: Springer-Verlag.
- [10] D. Lowe, “Distinctive image features form scale-invariant keypoints,”Int. J. Comput. Vis., vol. 60, no. 2, pp. 91–110, 2004.
- [11] K.Nikolos,K.P.Valavanis, N. C. Tsourveloudis, andA. N.Kostaras.(2003),“Evolutionary algorithm based on offline/online path planner for navigation,” IEEE Trans. Syst., Man, Cybern. B, Cybern., vol. 33, no. 6, pp. 898–912.
- [12] C.Schlosser, I. Reitherger, and S. Hinz,(2003) “Automatic car detection in the high resolution urban scenes based on adaptive model,” in Proc. 2nd IEEE Joint Workshop Remote Sens. Data Fusion Urban Areas, pp. 167–171.
- [13] H. Moon, A. Rosenfeld, and R.Chellappa,(2002) “Performance analysisof a simple vehicle detection algorithm,” Image Vis. Comput., vol. 20,no. 1, pp. 1–13, .
- [14] J. Gleason, A. V. Nefian, X. Bouysounousse, T. Fong, and G. Bebis,(2011)“Vehicle detection from aerial imagery,” in Proc. IEEE Int. Conf. Robot.Autom.,, pp. 2065–2070.
- [15] R. Fergus, P. Perona, and A. Zisserman,(2003) “Object class recognition by unsupervised scale-invariant learning,” in Proc. Conf. Comput. Vis. Pattern Recognit., pp. 264–271

Detecting Malicious Traffic in Wireless Mesh Network

1 Ankur Rajput, 2 Sachin Goyal, 3Ratish Agrawal
1Cyber law& Information Security, NLIU, Bhopal, Madhya Pradesh, India
2, 3 Information Technology, RGPV, Bhopal, Madhya Pradesh, India

ABSTRACT- Wireless Mesh networks are intelligent work of electronics rely on wireless medium to communicate cheaper, dwindle and in cost efficient way which gained the interest of many of organizations. But the implementation of wireless nodes is always a matter of concern as they are vulnerable to many attacks. Creating Malicious nodes are favorite target of attackers. In recent years; malware has proliferated into wireless networks as these networks have grown in vogue and pervasiveness. Researcher in this report propose a inbuilt framework for every mesh network like a honey pot specially designed for crafted packets which initially detect suspicious behavior, and suspicious entries regarding a particular node reaches a set threshold, that node is declared ambiguous then all the traffic at that node will be again send for root kit analysis at the virtual environment which was created inside that honey pot to detect zero days exploits and reduce the false positives.

Keywords: Cross Word Mesh Network (CMN), Dominant Attacks, Malicious Nodes, crafted packets, Honey pots, Bot Minor Detection, Intrusion Detection System (IDS).

I. INTRODUCTION

Malwares poses a corporeal threat to the wireless computing infrastructure which is not fixed even as nodes are mobile these days due to mesh environment and there is no root node to control, each and every node know details about neighbor for communication, so attackers launch attacks on every nodes that vary from the less nosy confidentiality or privacy attacks, such as traffic analysis & eavesdropping, to the more nosy methods that disrupt the nodes normal functions to get privileges mostly are malware attacks and even alter the network traffic to destroy the integrity of the information, such as unauthorized access and session hijacking attacks [1], [2].The boom of wireless network in organization on one hand and on the other side unauthorized attackers spreading malware and creating hosts as Bots for various different attacks has motivated to design effective security mechanism for detecting malicious traffic at mesh network.

Researcher planned for creating an integrated countermeasure to prevent from zero days hazards before the attackers compromise the single node. Dominant attacks on these networks such as the worm hole [3], sinkhole [4], and Sybil [5], that bestow vulnerabilities in the routing protocols are researched a lot and their best defense mechanism, have been investigated before they were actually launched by the researcher .Momentous research has been done in detecting intrusion in ad hoc networks and most of researchers faced the problem of detecting malicious node in wireless sensor network facing huge number of false positives. Three well known research papers on detecting malicious nodes in sensor networks are “Mitigating Routing misbehavior by Marti et al.” [6], Towards Intrusion Detection in WSN by Loanis and Dimitriou [7], and Suspicious Node Detection by Signal Strength by Junior et al. [8]. Different approaches are followed by each researcher, Signal strength was used to detect malicious node in [8], where message transmission is considered suspicious if strength is incompatible with geographical position was adequately effective as in result, else other were poorer as estimated by researchers. Xiao et al. developed a mechanism for rating sensors in terms of correlation by exploring Markov Chain [9].Atakli et al. [10] presented a malicious node detection scheme using weighted trust evaluation for three-layer hierarchical network architecture. Core values are selected to identify malicious nodes behaving opposite to the sensor readings which are amended depending on the distribution of acquaint ant nodes. Another Remolded detection scheme based on weighted trust evaluation

was proposed in [11]. Amending the core values at each node was the new scheme used, few of management schemes have been proposed in routing and communications [12]. Some efforts are also being made to combine communication and data trusts [13]. But malware coders still compromised these nodes as graph shown by 2014 annual security reports of Cisco [14], Semantics [15] & McAfee [16].

In this paper researcher as preliminary proposed an Associate-based malicious node detection scheme for wireless mesh networks taken light from “Neighbor-Based Malicious Node Detection in Wireless Sensor Networks”& “Malicious Node Detection Using Confidence Level Evaluation” in a Grid-Based Wireless Sensor Network by Sung-Jib Yim, Yoon-Hwa Choi which identifies nodes to be malicious if they don’t behave similar to normal nodes and then for identifying Botnet and root kits used Bot minor Architecture framework on suspicious nodes[17].Researcher of this paper was influenced by node detection mechanism considering grid based network achieving Confidence levels and weighted majority voting are employed to detect and isolate malicious nodes, without sacrificing normal nodes and degrading event detection accuracy [18] [19].

A more recent report from McAfee says "malware continues to grow" [20]. Thousands of new malware appear very quickly, reports from G Data and King soft Laboratory said. Many security researchers are using different mechanism to detect malicious nodes but are lacking as malwares are becoming smarter every day and polymorphic malware are the newcomer in this destructive game of defeating the opponent as they are capable of self-reproduction, and adopts different identity from its parent nodes. Root kits are the major concern as they were hidden and packed inside the processes make them much harder to detect. So here in this report after analyzing the suspected node all the inbound and outbound traffic passing through that node passed through the virtual machine presented inside the honey pot and further analysis would be done following the process level approach to detect all the Zero Day attack and reduce false positives.

PRELIMINARY

The preparation of Detection of malicious node and then analyzing root kit via honey pot needs a Network model in which we can perform both the scenarios for identifying malware.

CROSS WORD MESH NETWORK

A Cross-word Puzzle shape mesh network is assumed divided into four square shaped grids A through D and L is the length of sides as illustrated in figure 1

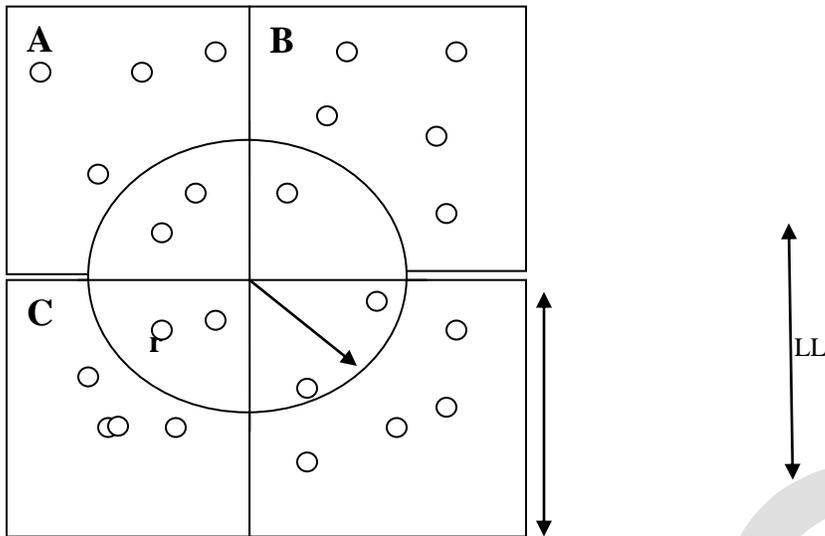


Figure 1: Mesh Network with 4 grids

Each Mesh node is assumed to know its own location, immediately after implementation the network carries out grid construction process, and each node figures out the grid in which they belongs. Mesh nodes in each grid form a cluster, where a cluster head is selected dynamically and all the other nodes in the cluster communicate directly with the cluster head. Two types of communication are defined here for malicious node detection: one for communication between the cluster head and cluster members and the other for communication between neighboring cluster heads.

Now come in picture the threshold test say majority voting, but the decision made by cluster heads might not be accurate for small event regions due to insufficient number of event nodes at each grid and lowering the threshold might be needed to achieve high event detection performance, causing a considerably high false alarm rate, unless the number of malicious nodes is negligibly small. So we will consider inter grid communication by finding the center of the nodes re- porting an alarm, and then apply a threshold test to the estimated event region.

PRE MODEL FOR FAULT DETECTION

In order to detect malicious nodes, Researcher defines a model for the nodes behavior assuming that all the nodes become malicious randomly and independently with the same probability P_m and it is assumed that each malicious node sends its report inconsistent with the actual sensor reading with the probability P_{ma} which means that malicious node will report 1(0) with the probability P_{ma} when actual reading is 0(1). In appendage normal sensor nodes are also assumed to report against their readings, randomly and independently, with the same probability P_r . Hence malicious nodes must be detected and isolated in the presence of such faults and events.

FALSE ALARM DETECTION

Identifying malicious nodes can create plenty of false alarms thus detecting them would be the major task in an event region. Figure 1 defines the event region which is used throughout the detection process assumed to be a circle with radius r , although the proposed scheme can be applied to event regions of other shapes with minor modifications. Now selecting threshold value for event detection to be malicious, the size of region plays an important role. In our case size of grid is L and radius is r so average number of node will be

$$N_a = d \cdot \pi r^2 / L^2$$

Where d is the average number of sensor nodes, now comes the vital task to set the threshold value of nodes for detection and theoretically it is easy to set the threshold for large event region as compare to small event region because on small event nodes when region lies across multiple adjacent grids and in that case choosing proper threshold might be difficult or sometimes impossible to satisfy both high event detection accuracy and low false alarm rate.

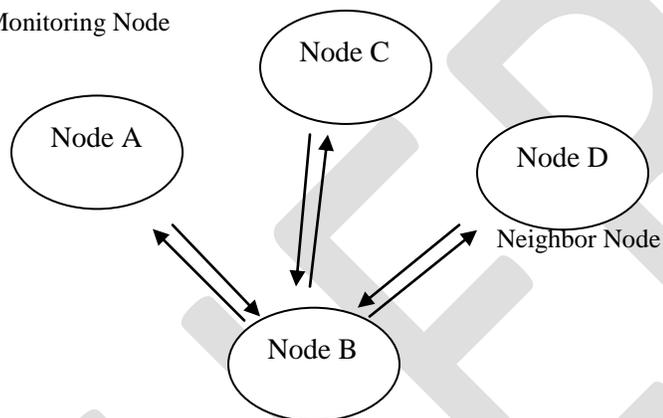
NODE DETECTION MECHANISM

Monitoring Mechanism

Dynamic and scalable nature of mesh node is the key term used here to detect the malicious node by observing the behavior of neighbor nodes, for example message sending node A observes the packet receiving node B functioning and converts itself to monitoring node and audit the behavior of node B when it send packets to other neighbor nodes to check whether it alters the packet contents other than adding its header information. If there is a difference between the original and actual messages greater than a certain threshold, the message is considered suspicious and updated in the table that Node B is now considered suspicious. Each node builds a Suspicious Node table containing the reputation of nodes in the cluster and table contains the node ID, the number of suspicious and unsuspecting entries. Nodes update this table every time they identify suspicious activity.

Neighbor Node

Monitoring Node



Suspicious Node

Figure 2: Suspicious Node Detection

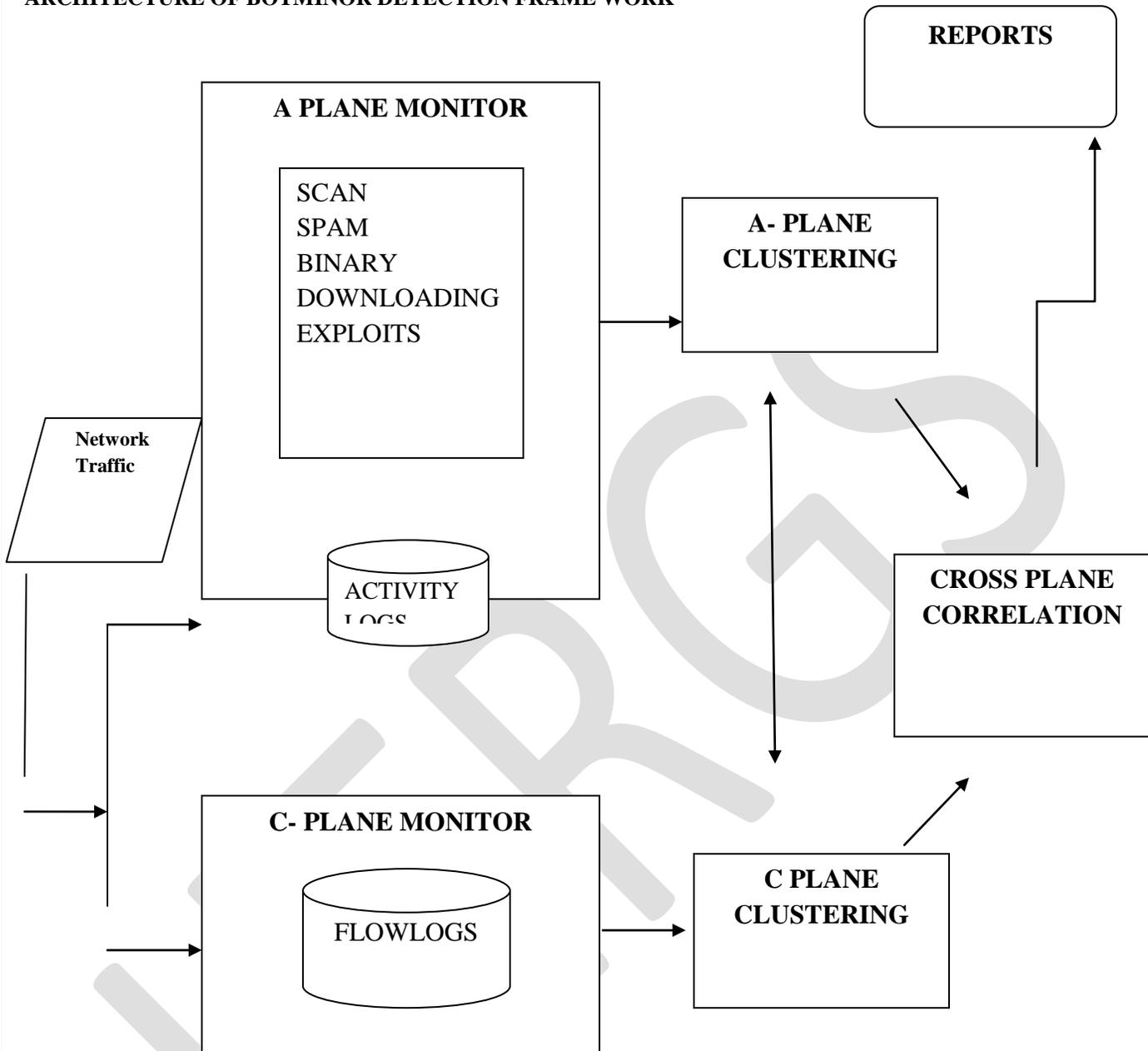
A malicious node is a compromised node in which attacker has somehow managed to break the encryption and has gained access to the secure keys and routing protocols of the Mesh network. After analyzing the behaviors.

monitoring node get the details of compromised credentials and this proposed model could be a countermeasure for these attacks.

BOT MINOR DETECTION

Bots are autonomous program performing the tasks which are more recent trend in malicious development. As we had detected suspicious node by behavior analysis but when it comes to root kits many times they bypass the strings signatures, behavior patterns very easily by hiding the process in linker and causes harm like zero days exploits. In order to avoid the botnet attack researcher presented botminer detection framework architecture which monitors the network traffic of suspicious node and perform two phase monitoring and clustering then analyze the cross plane correlation and generates the report which is so effective as activity logs and flow logs are compared and clustering process detect the hidden malwares.

ARCHITECTURE OF BOTMINOR DETECTION FRAME WORK



It was proposed to monitor communication and actions of suspicious nodes in specified events to check whether there were any kind of overlapping between two sets. For Example If two nodes behaves similarly in communicating with some other entity or in performing action then there is chances that they must belongs to a specific botnet. Monitoring would be the first phase and traffic is sent to different monitoring systems A-PLANE Monitor and C-PLANE Monitor.

MONITORING SYSTEM

C-PLANE MONITOR

C-plane monitor captures network flows and record information on who is talking to whom. Network flows you can just imagine out of all the packets you observe raw network packets on the network, you just summarize this communication in flows so basically you have IP address of source, IP address of destination, source port, source destination and some information about what happens in the

flow for example number of bytes exchanged, time duration of exchanged packets exchanged per flow and stuff like that to understand exactly flow representation. Payload information is not considered at this level.

A-PLANE MONITOR

A-plane monitor log information on who is doing what and basically analyzes outbound traffic through the monitored traffic and tries to detect several malicious activities that internal node might perform. System tries to observe whether a node is starting a scan activity or its sending large quantity of spams basically to check Denial of service attack.

CLUSTERING SYSTEM

Now once we have the information of C-plane Monitor we just group together similar communications to group nodes communicating in similar manner. To speed up this process system performs basic filtering and white listing to eliminate internal to internal communication within a network which is already checked via node detection mechanism and white listing to eliminate destinations that are frequently contacted by hosts in general as common as famous website like Google and Yahoo etc.

Same mechanism is followed with A-plane data we get the list of clients performing malicious activity then initial cluster is performed on their activity for example grouping together nodes which are performing scanning then other group of host sending spams and nodes that try to perform DDOS, Binary Downloading etc. All on their own class and then we look for another type of clustering within each cluster for instance if you perform scan, we'll look towards what destination or towards which port then system creates different clusters. Idea is basically you have clusters of communications and clusters of activities you want to see whether you have overlapping hosts to check whether one host appears in many cluster which is done in cross plane correlation basic approach is to cross check clusters in the two plans for finding interesting intersection basically and at the end each node has given a score and based on this score if it's above the threshold then you will flag the host is been infected with the particular bot. The approach overall is quite effective with very low false positive rate and it's a good step forward to detect bot infection at network level.

CONCLUSION & FUTURE WORK

The malicious node detection mechanism with Bot minor framework prevents many routing attacks on mesh environment such as Wormholes, Sinkholes, Sybil attacks, Distributed Denial of Service and Botnet attacks. The criteria to detect maliciousness of node are also compared with set threshold which help in achieving less false positive rates and many organization are just performing single node mechanism which may lead to zero day attacks. Hence to avoid that they must consider defense in depth approach by following both the method to achieve security.

The major problems I faced while the detection is that approach rely on noisy behavior as observing communication and activity traffic. All the listed activity which we focused are noisy in general for example scanning looking for open ports, in denial of service sending large amount of data or sending unsolicited emails. But in practical scenario things are quite different attackers try to compromise silently on that account in future I will be using the same approach but add the another correlation approach at network level.

REFERENCES:

1. D. Welch and S. Lathrop, "Wireless security threat taxonomy," in Information Assurance Workshop, 2003. IEEE Systems, Man and Cybernetics Society, pp. 76–83, 2003
2. A. Herzog, N. Shahmehri, and C. Duma, "An ontology of information security," International Journal of Information Security and Privacy, vol. 1, no. 4, pp. 1–23, 2007.
3. Y. Hu, A. Perrig, and D. Johnson, "Packet leashes: a defense against wormhole attacks in wireless networks," in IEEE INFOCOM 2003. Twenty-Second Annual Joint Conference of the IEEE Computer and Communications Societies, vol. 3.
4. C. Karlof and D. Wagner, "Secure routing in wireless sensor networks: Attacks and countermeasures," Ad Hoc Networks, vol. 1, no. 2-3, pp. 293–315, 2003.
5. J. Douceur, "The Sybil attack," in Peer-to-Peer Systems, First International Workshop, IPTPS 2002, Cambridge, MA, USA, March 7-8, 2002, Revised Papers, pp. 251–260.
6. Marti, S., T. J., Lai, K. and Baker, M. "Mitigating routing misbehavior in mobile ad hoc networks". In Proceedings of the 6th Annual International Conference on Mobile Computing and Networking (MobiCom 2000) August 6-11, 2000, Boston, USA. Boston, MA, ACM Press, pp. 255-265.
7. Loanis, K. and Dimitrou, T. "Towards intrusion detection in wireless sensor networks". In Proceedings of the 13th European Wireless Conference, April 1-4, 2007, Paris, France.
8. Junior, W., Figueiredo, T. and Wong, H. "Malicious node detection in wireless sensor networks". In Proceedings of the 18th International Parallel and Distributed Processing Symposium (IPDPS'04), April 26-30, 2004, Santa Fe, New Mexico
9. X.-Y. Xiao, W.-C. Peng, C.-C. Hung and W.-C. Lee, "Using Sensor Ranks for In-Network Detection of Faulty Readings in Wireless Sensor Networks," International Workshop Data Engineering for Wireless and Mobile Access, Beijing, 10 June 2007, pp. 1-8.
10. I. M. Atakli, H. Hu, Y. Chen, W.-S. Ku and Z. Su, "Malicious Node Detection in Wireless Sensor Networks Using Weighted Trust Evaluation," Proceedings of Spring Simulation Multi-Conference, Ottawa, 14-17 April 2008, pp. 836-843.
11. L. Ju, H. Li, Y. Liu, W. Xue, K. Li and Z. Chi, "An Improved Detection Scheme Based on Weighted Trust Evaluation for Wireless Sensor Networks," Proceedings of the 5th International Conference on Ubiquitous Information Technology and Applications, Sanya, 16-18 December 2010, pp. 1-6.
12. M. Momani and S. Challa, "Survey of Trust Models in Different Network Domain," International Journal Ad Hoc, Sensor & Ubiquitous Computing, Vol. 1, No. 3, 2010, pp. 1-19.
13. M. Momani, S. Challa and R. Alhmouz, "Can We Trust Trusted Nodes in Wireless Sensor Networks?" International Conference Computer and Communication Engineering, Kuala Lumpur, 13-15 May 2008, pp. 1227-1232.
14. <http://www.cisco.com/web/offers/ip/2014-annual-security-report/>
15. http://www.semantic.com/security_response/publications/threatreport.jsp
16. <http://www.mcafee.com/in/resources/reports/rp-quarterly-threat-q4-2013.pdf>
17. BotMiner: Clustering Analysis of Network Traffic for Protocol- and Structure-Independent Botnet Detection Guofei Gu, Roberto Perdisci, Junjie Zhang, and Wenke Lee.
18. Neighbor-Based Malicious Node Detection in Wireless Sensor Networks by Sung-Jib Yim, Yoon-Hwa Choi Department of Computer Engineering, Hongik University, Seoul, Korea Wireless Sensor Network, 2012, 4, 219-225

19. Malicious Node Detection Using Confidence Level Evaluation in a Grid-Based Wireless Sensor Network Min-Cheol Shin, Yoon-Hwa Choi Department of Computer Engineering, Hongik University, Seoul, Korea Wireless sensor Network 2013,5, 52-60
20. McAfee and Lab, 2014 Threats Predictions. 2014

IJERGS

BIOTECHNIQUES TO REDUCE THE GREEN HOUSE GASES

Moshami S Shah*¹, Vinutha Moses²

¹ Student, Department of Biotechnology, Sapthagiri College of Engineering Bangalore, Karnataka, India

moshmis2010@gmail.com, +91-8123461284

ABSTRACT: The Greenhouse Effect is a natural process that warms the Earth, and it is quite necessary for our survival. In atmosphere gases like water vapor (clouds), carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) act as a natural blanket by preventing the sun's heat energy from radiating back into space. The natural greenhouse effect helps warm the Earth's surface by as much as 33°C, and without it, would be very tough to survive as it would be too cold^[1]. There has been an increase in Green House Gases (GHGs) since pre-industrial times, which have led to a marked increase in atmospheric GHG concentrations causing global warming. The largest growth in Global GHG emissions between 1970 and 2004 has come from various energy sectors like transport from burning of more fossil fuels, industry, land use like deforestation, land use change, forestry, agriculture, from buildings. The building sector has a high level of electricity use; hence total direct and indirect in this sector is much higher compared with direct emissions. Due to an increase in GHGs, which leads to the greenhouse effect in turn global warming causing melting of ice glaciers in the Polar Regions of the earth, disturbing earth's natural bio-geochemical cycles and harm to all ecosystems. The GHGs like carbon dioxide, methane, nitrous oxide, Freon gas and chloroflourocarbons (CFC's) are major gases in different concentrations affecting the atmosphere and leading to global warming.

Keywords: Greenhouse gases (GHG's), Agriculture, Biotechnique, Chloroflourocarbons, Nitrogen, Freon gas, Impact.

1. HISTORY AND SOURCES OF GREEN HOUSE GASES: Svante Arrhenius was a Swedish scientist that was the first to claim in 1896 that fossil fuel combustion may eventually result in enhanced global warming and proposed a relation between atmospheric carbon dioxide concentrations and temperature. In the 1940's there were developments in infrared spectroscopy for measuring long-wave radiation. At that time it was proven that increasing the amount of atmospheric carbon dioxide resulted in more absorption of infrared radiation. It was also discovered that water vapor absorbed totally different types of radiation than carbon dioxide. Gilbert Plass summarized these results in 1955. He concluded that adding more carbon dioxide to the atmosphere would intercept infrared radiation that is otherwise lost in space, warming the earth. In the late 1950's and early 1960's Charles Keeling used the most modern technologies available to produce concentration curves for atmospheric CO₂ in Antarctica and Mauna Loa. These curves have become one of the major icons of global warming. In the 1980's, finally, the global annual mean temperature curve started to rise. People began to question the theory of an upcoming new ice age. In the late 1980's the curve began to increase so steeply that the global warming theory began to win terrain fast. Environmental NGO's (Non-Governmental Organizations) started to advocate global environmental protection to prevent further global warming. In the 1990's, scientists started to question the greenhouse effect theory, because of major uncertainties in the data sets and model outcomes. 1998 was globally the warmest year on record, followed by 2002, 2003, 2001 and 1997. The 10 warmest years on record have all occurred since 1990. The climate records of the Intergovernmental Panel on Climate Change (IPCC) are still contested by many other scientists, causing new research and frequent responses to skeptics by the IPCC. This global warming discussion is still continuing today and data is constantly checked and renewed. Models are also updated and adjusted to new discoveries and new theory³. The main human activities that increase GHG's are energy use in automobiles, goods transport, etc., air conditioning, and agriculture. US is the leading GHG emitter, comprising nearly 20% of the global average emissions, then the former soviet republics comprise the next largest joint emitter at near 14% of global emissions, followed by china(10%), Japan (5%), Brazil, Germany, India (each~ 4%)^[4].

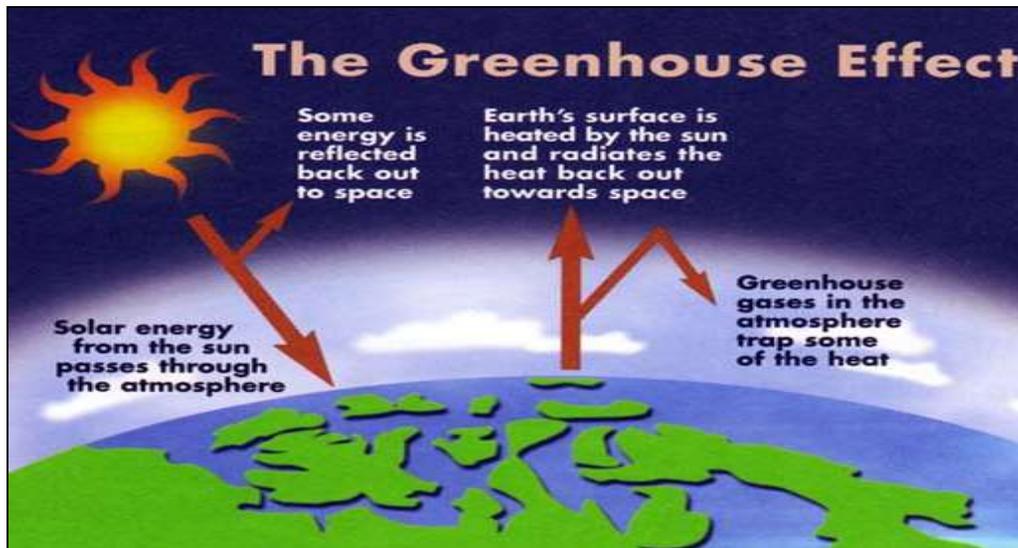


Fig 1: Natural mechanism of Green House Effect ^[2]

2. ENERGY CHAPTERS OF GREEN HOUSE GASES IN THE YEAR 2011

- In 2011, agricultural soil management was the largest source of N₂O emissions, and enteric fermentation was the second largest source of CH₄ emissions in the United States.
- The industrial end-use sector includes CO₂ emissions from fossil fuel combustion from all manufacturing facilities, in aggregate. This sector also includes emissions that are produced as a by-product of the non-energy-related industrial process activities. The variety of activities producing these non-energy-related emissions includes methane emissions from petroleum and natural gas systems, fugitive CH₄ emissions from coal mining, by-product CO₂ emissions from cement manufacture, and HFC, PFC, and SF₆ by-product emissions from semiconductor manufacture, to name a few. Since 1990, industrial sector emissions have declined. The decline has occurred both in direct emissions and indirect emissions associated with electricity use. However, the decline in direct emissions has been sharper ^[5]

3. TYPES OF GREEN HOUSE GASES (GHG'S)

3.1 Carbon dioxide is present in the highest concentration by far. Based on 1990 concentrations, carbon dioxide is said to be responsible for almost 60% of the total greenhouse effect when efficiency and concentration are considered. Its concentration is increasing in the atmosphere due in large part to the extensive burning of coal and other fossil fuels for energy production. Another cause of CO₂ increase is the destruction of large areas of trees that leads to a reduction in the use of carbon dioxide for photosynthesis.

3.2 Methane is present in the atmosphere at less than 1% levels of carbon dioxide, and it is 25 times more efficient as a greenhouse gas. And which contributes 10% of the total greenhouse effect. The primary anthropogenic sources of methane gases is combustion of fuel, the decomposition of organic materials associated with wetlands, rice paddies and livestock manure.

3.3 Nitrous oxide is a 6% of total greenhouse gases and it is produced from the use of fertilizers and industrial activities.

3.4 Freon gas is mainly used to make refrigerant materials for refrigerators and air conditioners, detergents for non-conductors, and semi-conductors, and just about every spray product. Released Freon gas in the atmosphere stays intact for more than 400 years. And its heat absorption rate is 16 thousand times that of carbon dioxide.

3.5 Hydrogen Fluoride Carbon and Phosphorus Fluoride Carbon these gases have been used in alternatives to Freon gases for refrigerators and other chemical sulfur hexafluoride which keeps increasing in the world wide usage for gas circuit breakers, fire extinguishers and explosion proof substances which leads to greenhouse effect.

Hence the emission rate of carbon dioxide is the highest among all other greenhouse gases. Methane and nitrous oxide are impossible to control and as they originate from the natural world. Few studies have found that the change of carbon dioxide concentration is proportion temperature

4. FACTORS AFFECTING GREEN HOUSE GASES:

1. The total energy influx from the sun, which depends on the earth's distance from the sun and on solar activity
2. The chemical composition of the atmosphere (what gases are present and in what concentrations) and
3. The ability of the earth's surface to reflect light back into space

The only factor that has changed significantly in the last 100 years is the chemical composition of the atmosphere and that is because of human activity.

5. IMPACTS OF GHG's

5.1 ENVIRONMENTAL IMPACT

- Overall increase in the earth's temperature.
- Global warming will decrease snow, sea ice & glaciers, rising in sea levels and coastal flooding.
- Storms & heat waves are likely to increase in frequency and severity.
- Many wild species will have difficulty in adapting to a warmer climate & will likely experience greater stress from diseases and invasive species ^[2].

5.2 HUMAN HEALTH IMPACT

- Increased temperatures & severe extreme weather events could lead to increased risks of death from dehydration & heat stroke.
- Increased risk of respiratory & cardiovascular problems and certain types of cancers.
- The risk of water-, food-, vector- and rodent-borne diseases may increase ^[2].

5.3 ECONOMIC IMPACT

- Agriculture, forestry, tourism and recreation could be affected by changing weather patterns ^[2]
- Human health impacts are expected to place additional economic stress on health and social support systems ^[2]
- Damage to infrastructure (e.g., roads and bridges) from extreme weather events is expected to increase ^[2].

6. METHODS THAT ARE INITIATED TO REDUCE GREEN HOUSE GASES:

1. Research into a low greenhouse gas (GHG) emission electricity aims to develop cost effective and progressive reductions in emissions from stationary energy generation facilities of greater than 30 megawatts in capacity.
2. Energy Transformed research aims to develop innovations that reduce greenhouse gas (GHG) emissions from the transport sector.
3. Developing and implementing renewable energy technologies to deliver sustainable power for the future.
4. Developing solutions for low emission fuels
5. GHG's and carbon management in forests by Bio- sequestrations which is a natural complement to technological developments to mitigate GHG's. Biosequestrations can be achieved by planting more trees reducing the rate of deforestation and protecting existing forests from disturbances such as a fire ^[6]
6. Bioeconomy is an emerging term for the sustainable production and conversion of biomass for a range of food, health, fiber and industrial products and energy.

7. GREEN HOUSE GAS EMISSIONS FROM INDIAN AGRICULTURE

Globally, agriculture accounts for 54% of anthropogenic CH₄ 58% of N₂O emissions; agriculture soil is the major contributor to the greenhouse effect. The research on GHGs emission from Indian agriculture started in 1990s, when, based on very limited measurements done elsewhere, it was reported that Indian rice fields emit 37.5Mt methane per year. The current estimates show that Indian rice fields covering an area of 43.86 million ha (Mha) emit 3.37 Mt of methane. The nitrous oxide emission from Indian agricultural soils is 0.14 Mt. Several attempts have been made to estimate CH₄ emission from Indian rice fields. ^[7] According to report of Indian Network for Climate change Assessment, the net emission of GHG's from India was 1728 million tons (Mt) of CO₂ eq in the year 2007 ^[8].

Methane is produced during the microbial decomposition of organic matter under anaerobic conditions. Potential source of methane is seen from rice fields submerged with water, because of continuous submerged soils, organic carbon content and use of organic manure increases methane emission. Burning of crops also contributes to the global methane emission these entire major source of methane is enteric fermentation in ruminants. Nitrogenous fertilizers are the source of nitrous oxide in fertilized soils and indigenous nitrogen from the unfertilized soil and burning of crops also emits nitrous oxide the content of soil water also the availability of carbon

enhances the production of nitrous oxide. Generally, residues from nine crops (rice, wheat, cotton, maize, millet, sugarcane, jute, rapeseed-mustard and groundnut) are burnt in the field. Total crop residues generated by these nine major crops are about 566 Mt of which about 93 Mt is subjected to burning in the fields. Burning of crop residues in fields emitted 0.25 Mt of CH₄ and 0.007 Mt of N₂O in 2007^[8]. The burning of rice straw contributed the maximum (39%) to this GHGs emission. Large-scale burning of rice residues in Punjab, Haryana and western Uttar Pradesh is a matter of serious concern not only for GHGs emission, but also for problems of pollution, health hazards and loss of nutrients^[9]. Emission of GHGs due to burning of crop residue field has, however, remained almost similar over the years.

1. Enteric Fermentation	63.4%
2. Rice cultivation	20.9%
3. Soils	13.0%
4. Manure management	2.4%
5. On field burning of crop residues	35.9%

Table 1: Reason for GHG's From Agricultural Activities

7.1 Scientific Strategies Agriculture can help in Mitigating GHGS emission.

The following strategies have been recommended for mitigating methane emission from rice cultivation.

- Altering water management, particularly promoting intermittent irrigation and mid season drainage;
- Improving organic matter management by promoting aerobic degradation through composting or incorporating it into the soil during off-season drained period;
- Use of rice cultivars with few unproductive tillers, high root oxidative activity and high harvest index; and
- Application of fermented manure such as biogas slurry in place of unfermented farmyard manure^[10]. A single mid-season drainage may reduce seasonal methane emission. This emission could be reduced further by intermittent irrigation, yielding a 30% reduction as compared to mid-season drainage^[11]
- Nitrous oxide can be reduced by using the specific nitrification inhibitors such as nitrapyrin and dicyanediamide. Plant derived organics can also act as natural inhibitors like neem oil, neem cake and karanja seed extract.
- Low carbon agriculture technology like Gross Domestic Product (GDP), decarbonized economy that has a minimal output of GHG's emission in the biosphere.
- Carbon dioxide – soils act both as a source and sink for carbon dioxide emission the net flux is very small. Hence it is balanced well from agriculture source.
- Use of urea super granules with sprinkler irrigation, site specific nutrient management and crop diversification has depicted ability to reduce Global Warming Potential (GWP).

7.2 Advantage: Low carbon agricultural technologies help in the savings of irrigation of water, provides provisions of tolerance to moisture and heat stresses, reduction in GHG's. And also the labor cost.

7.3 Constraints: there are a few drawbacks in low carbon agricultural technologies to reduce GHG's.

- High initial cost.
- Infrastructure and technical capability.
- Installation and maintenance.
- Risk in rainfall areas, weed problem.
- Lack of awareness
- Yield loss in the fields.

8. OTHER PREVENTIVE MEASURES:

- Replace electric hot water system with solar/ gas or 'heat pump' (uses < 1/3 the electricity of the element)^[4]
- Replace all incandescent globes with CFL's.
- Use fans, evaporative or room reverse cycle air conditioners; avoid large ducted systems. Only heat or cool the room you are in. Set thermostats heating 21° cooling 26° (each degree C of A/C increases emissions by 10%). Dress appropriately for the temperature^[4].
- Choose '4 or 5 star' rated fridge & washing machine; don't buy larger than you need.

- Choose a laptop computer; small flat screen TV. Large screens waste energy.
- Use of public transport & biofuels, which helps to minimize GHG's.

9. FUTURE ASPECTS

As we know that all the techniques which have been found is still having few constraints in some or the other way. There is much research required were trial and error methods practically be performed to try and overcome the constraints which are previously seen. Majorly the change can be made by every individual living on earth to protect it from the human activities by avoiding encroachments.

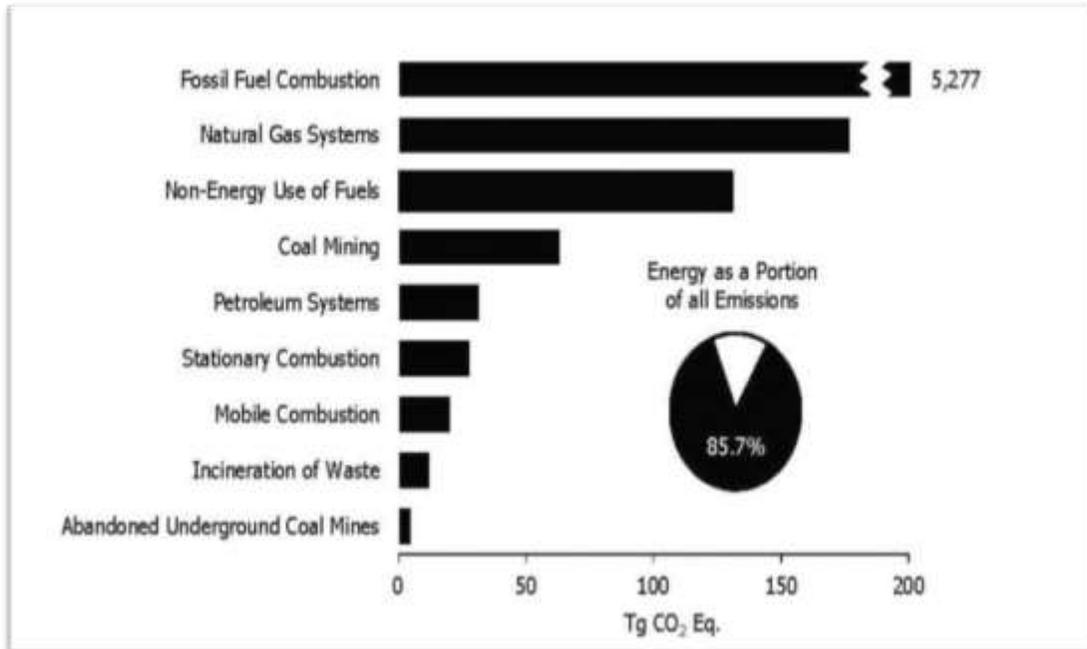


Fig 3: Sources of GHG's in the year 2011 ^[10]

Location	Methane (kg ha ⁻¹)	No. of observations	Average (kg ha ⁻¹)
Nadia, West Bengal	108-290	3	158
Purulia, West Bengal	110	1	110
Barrackpore, West Bengal	18-630	3	222
Jorhat, Assam	97-460	5	175
Tezpur, Assam	10-14	2	11.7
North 24 Parganas, West Bengal	145-462	2	305
Cuttack, Orissa	7-303	44	91
Bhubaneswar, Orissa	140-186	2	163
New Delhi	10-221	68	39
Allahabad, Uttar Pradesh	5	1	5
Kumarganj, Uttar Pradesh	20	1	20
Maruteru, Andhra Pradesh	150	1	150
Madras, Tamil Nadu	110-182	2	149
Trichur, Kerala	37	1	37
Trivandrum, Kerala	90	1	90
Kasindra, Gujarat	120	1	120
Pant Nagar, Uttarakhand	54-114	4	79
Karnal, Haryana	64-100	2	81
Varanasi, Uttar Pradesh	0.1-261	15	117
Raipur, Madhya Pradesh	4-109	6	34
Ludhiana, Punjab	452-1650	5	875

Fig 4: Seasonal Methane Emission from rice fields at different locations in India ^[11]

REFERENCES:

1. <http://www.dnrec.delaware.gov/>
2. <http://coraifeartaigh.wordpress.com/2012/06/21/no-man-made-global-warming-in-ireland-thank-you/>
3. <http://www.lenntech.com/greenhouse-effect/global-warming-history>
4. http://eesc.columbia.edu/courses/v1003/lectures/greenhouse_gas/
5. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2011).
6. <http://www.csiro.au/>.
7. **Mitra AP** (1991) Global Change: Greenhouse Gas Emissions in India — A Preliminary Report, No.1, Publications and Information Directorate, CSIR, p. 18-21.
8. **Matthews RB, Wassmann R and Arah J** (2000) Using a crop/soil simulation model and GIS techniques to assess methane emissions from rice fields in Asia. I. Model development. *Nutr. Cycl. Agroecosys.* 58: 141–159.
9. **Yan X, Ohara T and Akimoto H** (2003) Development of region specific emission factors and estimation of methane emission from rice fields in the East, Southeast and South Asian countries, *Global Change Biol.* 9:1-18.
10. **Bhatia A, Pathak H and Aggarwal PK** (2004) Inventory of methane and nitrous oxide emissions from agricultural soils of India and their global warming potential. *Curr. Sci.* 87(3): 317-324.
11. **Pathak H, Aggarwal PK, Roetter RP, Kalra N, Bandyopadhyaya SK, Prasad S, and Van Keulen H** (2003a) Modeling the quantitative evaluation of soil nutrient supply, nutrient use efficiency, and fertilizer requirements of wheat in India. *Nutr.* 65: 105-113. *Cycl. Agroecosys.*
12. **Pathak H, Singh R, Bhatia A and Jain N** (2006) Recycling of rice straw to improve crop yield and soil fertility and reduce atmospheric pollution. *Paddy Water Environ.* 4(2): 111-117

TITLE: EXPERIMENTAL INVESTIGATION OF MIXED FIBER REINFORCED CONCRETE DEEP BEAM IN SHEAR

Mr. Kumbhar A. N¹, Assistant Prof. Kadam S. S²

¹ PG Student, SKN Sinhgad College of Engineering, Korti, Pandharpur, Maharashtra, India.

Email: kumbhar.akshayn@gmail.com (PH-7507550019)

² Assistant Professor Of Civil Engineering Department, SKN Sinhgad College of Engineering, Korti, Pandharpur, Maharashtra, India. Email: asganesk@rediffmail.com

Abstract — In this paper we discussing about the deep beam. As per the Indian standard a beam shall be considered as deep beam when the ratio of effective span to overall depth is less than 2 for simply supported & 2.5 for continuous beam. Because of their proportion they develop mechanism of force transfer quite different from slender beam. They transfer the load by shearing action rather than flexural action. Shear strength of concrete beam is a complex phenomenon so that it is not well defined. Therefore to improve shear strength & deformation of cement matrix mixed (Crimped steel - Polypropylene) fibers are used. The main reason of adding a steel fiber is to improve the energy absorption capacity, apparent ductility, crack resistance & crack control. Also polypropylene fiber is improving compressive strength, shear strength, resistance to aggressive agents, micro crack control. Therefore we use mixed fibers (Crimped steel - Polypropylene) as reinforcement in concrete to improve homogeneous, isotropic characteristics, Tensile & shear response by arresting micro crack, crack penetration & propagation. The several recently published articles & technical papers dealing with implementation of mixed fibers in concrete matrixes.

Keywords — Shears strength, mixed (Crimped steel-Polypropylene) fibers, Deep Beam, Diagonal tension, Concrete, compressive strength, Cracks etc.

INTRODUCTION

Deep beams are structural members loaded as simple beam but load transformation of deep beam is quite different from the slender beam. Deep beam transfer heavy gravity load primarily through shearing action by forming a diagonal cracks. Due to its nature deep beams are not used for ordinary structures they are used heavily loaded & important structures like high rise building, pile caps, load bearing wall, irrigation projects, and plate elements in folded plates. Now one question arises in mind is that which beam we call deep beam. As per the bureau of Indian standard code method the deep beam is a beam having a ratio of clear span to depth is less than 2 for simply supported beam & 2.5 for continuous beam.

Flexural or shear failure are the two main failures occurs in reinforced concrete beams. When bending stresses is more than shear stresses than flexural failure occurs mostly in long span beam. Deep beams result in failure in shear below the ultimate flexural capacity of the beam. Simple beam theory is does not consider the effect of shear & the effect of stresses on planes parallel to neutral axis due to this it cannot applicable to deep beam. A effect of these is that the plane section do not remain plane & perpendicular to the neutral plane after deformation. The shear action in the deep (web) beam is predominant. A significant amount of load is carried to support by compressive thrust joining the loading point & support reaction. The possible failure modes of deep beams could be diagonal failure & bearing failure.

Concrete is primarily used as construction material all over the world in due to its compressive strength, high mouldability, structural, & economic considerations but with them concrete is brittle material & very weak in tensile & shear strength. We can calculate the comp strength of concrete but there is no direct way to find out the tensile & shear strength of concrete. Due to non-homogeneous, heterogeneous & non-linearity in its material response concrete does not feasible to apply a shearing action i.e. direct shearing force in a plane. Due to these various debates & controversies takes place from the beginning of 20th century. The flexural & shear failure are very sudden & unexpected & sometimes violent & catastrophic. Therefore whole knowledge of different modes of shear failures & mechanism involved is necessary to prevent them.

To decrease the brittleness & increase the resistance to cracking, reinforcement with short randomly distributed fibers has been successfully used & final composites is known as fiber reinforced concrete (FRC). The performance of FRC depends on many factors such as fiber material properties, fiber geometry, fiber volume, matrix property & interface properties. Most type of FRC used in practice contains only one type of fiber i.e. steel fiber. In concrete a small cracks is always presents in orders of micron. The rapid fracture & unstable propagation is occurred due to the conversion of micron crack into the micro crack by increasing & joining the cracks to each other when external load is applied on them. Therefore for good result different types of fibers may combine. Steel fibers can be used either to boost the shear capacity or to replace the web reinforcement in conventional RCC deep beams & synthetic fibers can be used to control the micro cracks. Therefore the objective of these work is to study the effect of addition of different percent of mixed fibers (crimped steel-Polypropylene) varying clear span to depth ratio.

SUMMARY OF PREVIOUS RESEARCH

There are various research papers on the deep beam related its flexural & shear strength. Actually a research was mostly done on flexural strength as compared to shear strength. Due to these shear strength in reinforced concrete deep beams has been the subject to many controversies & debates since the beginning of 20th centuries. We are collect the information from various journals, research papers etc. some of them are discussed below.

1.0 REVIEW PAPER

A) Roberts:-

In these paper Roberts studied the behavior of deep beams under shear failure & results of a number of tests on deep fiber reinforced concrete beam were presented.

In these beam longitudinal reinforcement used in constant rate and in place of conventional shear reinforcement different percentage of steel fibers is used. All beams are tested under two point loading. He use the 0.38 mm diam. & 38 mm long “Duo form” brass coated steel fibers. A single 16 mm diam. HYSD deformed bar is used as a longitudinal reinforcement, A concrete of a grade 39 mpa to 48 mpa is used throughout the experiment. He made a three sets of specimens were made with 0%, 0.85%, 1.3% by volume of steel fibers with each set consist of 3 beam.

The result obtained after testing the beam specimen indicate that the inclusion of steel fibers in the concrete increases the ultimate flexural capacity & also resistance to shear failure.

B) Krishna Rao:-

To study the behaviours of moderate deep beams in shear & flexure Krishna Rao use additional material polypropylene fiber & replacing 20% fly ash for cement.

For overall Experiment he done a following things. The clear span to depth ratio used hears is 2.0. To check the behaviour of deep beam in shear and flexure strength polypropylene is used in three stages in different percentages such as 0%, 0.5%, 1% with the three different grades of concrete is 15 mpa, 20 mpa, & 25 mpa. The 20 % of cement is replaced by using the fly ash.

As comp strength of concrete specimen increases with the increasing percentage of fibers. Also shear & flexural strength of beam specimen is increases from 0% to 1% fibers. In this case the ultimate failure is observed as a gradual not a sudden.

C) Ramadevi:-

Ramadevi state that the analysis the behavior of RC beam is strengthens by using mixed fiber reinforced concrete (HFRC).

As per 10262-2009 beam is casted for M-25 grade of concrete. The mixed fibers used are polyolefin & steel (crimped) fibers in various proportion from 0.5%, 1%, 1.5% & 2% of volume of concrete. The admixture used in these is superplasticizer conplast SP 3370 for achieving desired workability.

During lading & deflection of fiber specimen mixed fibers increase the flexural strength as compared to original specimen.

D) S. K. Madan & S. P. Singh:-

Singh & S. K. Madan replace the web reinforcement by using steel fibers for reinforced concrete deep beam in shear.

For this purpose he casted total 18 beams which tested under two point top loading up to failure. He use a straight steel fibers having a diameter 0.45 mm, length 40.5 mm & aspect ratio with three volume fraction (0%, 1%, 1.25%) & three shear span to depth ratio (0.75, 1.0, 1.25) All beams were of rectangular cross section, 90 mm wide & 260 mm deep, 700 mm long with 2 bars of 10 mm diameter as a longitudinal reinforcement. The clear span to overall depth ratio varies from 1.69 to 2.5 M-20 grade of concrete is used through the whole experiment.

The test result shows that the use of short steel fibers in concrete mix provides clear shear reinforcement in deep beams & provides better crack control & deformation. Both the First crack & ultimate crack strength in shear also increased.

E) S. P. Singh & A. P. Singh & V. Bajaj:-

Sigh & bajaj evaluate the strength & flexural toughness of mixed fiber reinforced concrete (HFRC) containing different combinations of steel & polypropylene fibers.

To obtain the flexural strength under four point static flexural loading beam specimens of size 100 mm x 100 mm x 500 mm is used. In addition to obtain a compressive strength of concrete cube specimen of size 150 mm 150 mm 150 mm which is also tested. In the specimen steel & polypropylene fibers are used in the mix proportions of 100-0%, 75-25%, 50-50%, 25-75%, o-100% by volume of a total volume fraction of 1%. He uses corrugated steel fibers 35 mm long, 2 mm wide & 0.6 mm in thickness & homo-polymer fibrillated polypropylene fibers. In HFRC to increase comp strength, flexural strength & flexural toughness a fiber combination of 75% of steel fibers plus 25% of polypropylene fibers is used to give appropriate result.

F) Venu R. Patel, Pandya:-

Venu R. Patel & Pandya study the shear strength of Polypropylene Fibre Reinforced Concrete (PPFRC) moderate deep beams without stirrups.

For that he use a beam having a span to depth ratio 2.0, 2.4, 3.0, 4.0. He casted & tested total 16 numbers of beams out of this 4 numbers of beams were tested to failure under two point symmetrical loading and 12 numbers of beams were tested to failure under central point loading. During loading of whole experiment Venu patel study complete shear deformational behaviour along with load-deflection response, crack patterns and modes of failure. Venu patel evaluate the ultimate shear strength from the experimental results & compared with shear strength obtained from various empirical equations.

These comparison shows that the shear strength obtained by experimentally give more accurate result. Polypropylene fibres can be used to replace stirrup partially with proper design of concrete.

G) Abhishek Kumar Singh, Anshul Jain and Deependra Singh:-

The intent of this research is to investigate and compare the compressive and flexural strength of concrete for various mixture proportion of concrete.

For increasing tensile and flexural strength of concrete fiber reinforced concrete is a largely used. There are various types of fibers such as steel, polypropylene, glass and polyester are mostly used in concrete. So Abhishek kumar singh is study the effect of addition of polypropylene and steel fibers on the compressive and flexure strength of fiber reinforced concrete. For that he use a Polypropylene & steel fibers in varying proportion i.e. Polypropylene fibers use in 0% to 0.45% & steel fibers of 0% to 2% by volume of concrete.

The test results clarified that use of polypropylene and steel fibers at 0.15% and 1% respectively showed considerable increase in strength of 47.10 MPa and 58.20 MPa at 7 and 28 days respectively. The behaviour of concrete under flexural loads was found to be consistently improved compared with reference mix design.

METHODOLOGY

Methodology to be adopted is

- 1] To find out design of M-35 grade of concrete by performing all basic test on cement, sand & aggregate as per IS code.
- 2] Casting a RCC deep beams by varying fiber volume fraction (0%, 1.5%, and 2.5%) & clear span to depth ratio (1.87, 1.76 & 1.66)
- 3] Testing these RCC deep beams under two point loads for shear failure.
- 4] To investigate the effects of addition of mixed (Crimped steel - Polypropylene) fibers to concrete in compression.
- 5] To investigate the effects of addition of mixed (Crimped steel - Polypropylene) fibers to concrete in shear.

ACKNOWLEDGMENT

I would like to sincere thanks to my guide Assistant Prof. Kadam S. S for the support & guidance they have provided to us enduring patience, motivation & valuable time. He gave me to be a gratefully appreciated when he holding responsibility as assistant professor in civil Engineering department.

I also grateful to Prof. Pise Head Of Department of civil Engineering Department For providing all necessary facility. I extend sincere thanks to Principal Dr. K. J. Karande for his guidance & inspiration.

I express deep sense of gratitude to all staff member for their co-operation. I finally sincere thanks to all those who directly Or indirectly help me.

CONCLUSION

This paper describes the implementation of the mixed (Crimped steel - Polypropylene) fibers in to the concrete then First crack shear strength & ultimate shear strength increases with increasing percentage of fibers. The compressive strength is also increased with increasing fibers percentage is checked by casting cubes. It also improves the strength & deformation characteristics of cement base matrixes. By using steel fibers we also eliminate the conventional stirrups in some percentage. Mixed (Crimped steel – Polypropylene) fibers achieve all these things by converting brittle cement matrixes in to the ductile material by arresting a micro cracks & resistance to crack propagation.

REFERENCES:

- [1.] T. M. Roberts & N. L. Ho (1982). "Shear failure of deep fiber reinforced concrete", The International Journal of Cement Composites and Lightweight Concrete, Vol-4, pp. 145-152.

[2]. M.V. Krishna Rao, N.R. Dakshina Murthy and V. Santhosh Kumar “Behaviour of Polypropylene fibre reinforced Fly ash concrete deep beams in Flexure & Shear” ASIAN JOURNAL OF CIVIL ENGINEERING (BUILDING AND HOUSING) VOL. 12, NO. 2 (2011)[3.] K. Ramadevi & D. L. Venkatesh Babu “Flexural Behavior of Hybrid (Steel-Polypropylene) Fibre Reinforced Concrete Beams” European Journal of Scientific Research ISSN 1450-216X Vol.70 No.1 (2012), pp. 81-87 © EuroJournals Publishing, Inc. 2012

[4].S. K. Madan, G. Rajesh Kumar and S. P. Singh (2007). “Steel fibers as replacement of web reinforcement for RCC deep beams in shear”, Asian Journal of Civil Engineering, Vol-8(5), pp. 479-489.

[5].Vinu R. Patel, Pandya “Ultimate shear strength of Fibrous moderate deep beams without stirrups” Int. Journal of Applied Sciences and Engineering Research, Vol. 1, No. 2, 2012 © 2012 by the authors – Licensee IJASER- Under Creative Commons License 3.0 Research article

[6].Abhishek Kumar Singh, Anshul Jain and Deependra Singh “ Evaluation Of Mechanical Properties For Polypropylene And Steel Fiber Reinforced Concrete” International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 4, April - 2013 ISSN: 2278-0181

[7] Emma Slater, Moniruzzaman Moni and M. Shahria Alam (2012). “Predicting the shear strength of steel fiber reinforced concrete beams”, Construction of Building Materials, Vol-26, pp. 423-436.

[8] Vengatachalapathy (2010). “Behavior and ultimate strength of steel fiber reinforced concrete (SFRC) deep beams with and without openings”, International Journal of Civil and Structural Engineering, Vol-1(3), pp. 509-517.

[9] Londhe R. S. (2010) Experimental investigation on shear strength of SFRC beams reinforced with longitudinal tension steel rebar’s: Asian Journal of Civil Engineering and Housing, 11(3):385-395.

[10] American Concrete Institute Committee (2005) Building code requirements for structural concrete (ACI 318-05) and commentary (ACI 318R-05): American Concrete Institute, Detroit, Michigan, USA.

[11] Dinh H. and Wight J. K. (2011) Shear strength model for steel fiber reinforced concrete beams without stirrup reinforcement: Journal of Structural Engineering, ASCE, 137(10):1039-1051.

[12] K. Ramadevi & D. L. Venkatesh Babu “Flexural Behaviour of Hybrid (Steel-Polypropylene) Fibre Reinforced Concrete Beams” European Journal of Scientific Research ISSN 1450-216X Vol.70 No.1 (2012), pp. 81-87 © Euro Journals Publishing, Inc. 2012

[13] Marijan Skazlić “Development and Application of Hybrid Fibre Reinforced Concrete” The university of Wisconsin Milwaukee centre for by product utilisation, on sustainable construction material & technology, June 28-June 30 2010.

[14] Jimmy Susetyo, Paul Gauvreau, and Frank Vecchio (2011).“Effectiveness of steel fiber as minimum shear reinforcement”, *ACI Structural Journal*, Vol-108(4), pp. 488-496.

[15] Yoon-Keun Kwak, Eberhard, Woo-Suk Kim and Jubum kim (2002). “Shear strength steel fiber reinforced concrete deep beams without stirrups”, *ACI Structural Journal*, Vol-99(4), pp. 530-538.

[16] Leong C.L. and Tan K.H. (2003) Proposed revision on CIRIA design equation for normal and high strength concrete deep beams: *Mag. Concrete Res.*, 55(3): 267-278.

[17] American Concrete Institute Committee (2005) Building code requirements for structural concrete (ACI 318-05) and commentary (ACI 318R-05): American Concrete Institute, Detroit, Michigan, USA.

[16] IS 456 (2000) Indian standard code of practice for plain and reinforced concrete for general building construction

Vibration Analysis of Laminated Triangular Plate by Experimental and Finite Element Analysis

¹R.R. Chaudhari, ²Y.R. Falak

¹(Mech. Engg. Department, Late G.N. Sapkal College of Engineering, Nashik,
Savitribai Phule Pune University, Pune, India)

²(Mech. Engg. Department, Sandip Institute of Technology and Research Center, Nashik,
Savitribai Phule Pune University, Pune, India)

rrcchaudhari@gmail.com

Abstract— This present paper deals with analysis of triangular plate with free-clamped-free boundary condition for different materials. The analysis performed for isotropic right triangular plate and for symmetrically laminated/composite triangular plates. For symmetrically laminated/composite triangular plate different materials as FRP, rubber, plastic are consider. The work is divided into two parts i.e. FEM analysis and experimental modal analysis. The object of modal analysis is to find out modal parameters as frequency and mode shapes. In experimental work, triangular plates fabricated and by using FFT analyzer, the modal parameters are determined. The results obtained in analysis compared graphically.

Keywords— Triangular Plate, Vibration analysis, modal analysis, laminated plates.

INTRODUCTION

Plates are important structural element in engineering applications, such as ship structure, aero plane structure, pressure vessel, missile liquid container etc.[2] Flat triangular plate with variable thickness are used in aerodynamic lifting and stabilizing surfaces on rocket, guided missile and high speed aircraft. The application of plate theories has recently become very important with the of speed turbo machines. Turbo machines employ rotating plates or blades; these cantilevered plates are most severely stressed element subjected to highly fluctuating forces. The dynamic analysis of these elements is of critical importance for safe operation of these units.

Laminated/composite plates are used in aerospace engineering application because of their many advantages over isotropic plates, for example, composites have higher strength-to-weight and stiffness-to-weight ratios. Maximization of these advantages can lead to better and more spacecraft that are economical design.[1]

STATEMENT OF PROBLEM

In present, case the right angle triangular plates of material Mild Steel and Aluminum as shown in figure. Every plate has thickness of $h = 3$ mm and other sides as 150mm and 100 mm as shown in figure 1.

In the second case, laminated/composite right angle triangular plate having three layers and thickness for every layer as 1 mm and remaining sides same as above is considered. Every layer of composite material bonded together by matrix material. The problem is to determine natural frequencies of the plates in both cases with boundary condition as free-clamped-free.

The objective of the work is to formulate the plates of triangular shape under free-clamped-free boundary condition and with different materials.

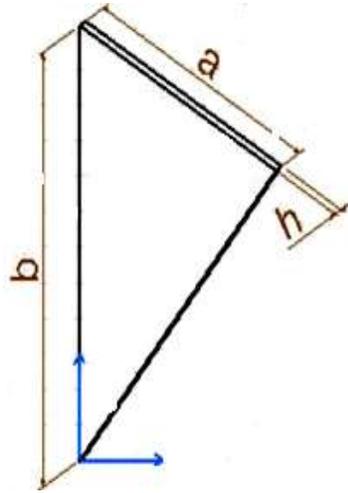


Figure.1 Geometry of triangular plate

FINITE ELEMENT ANALYSIS

Due to development, high speed Finite Element has become a powerful tool for the solution of wide range of engineering problems. The basic idea of FEM is to find the solution of complicated problems to improve the solution by spending more computational efforts. The ANSYS program is a large-scale multipurpose finite element program that may be use for solving several classes of engineering analysis.

The plate model prepared in ANSYS. The plates are in two different structures one is in basic solid plate of M.S. and Aluminum and other is laminated plate of given dimensions having thickness of 3 mm. Below fig 2 shows the mesh model of M.S. plate in ANSYS.

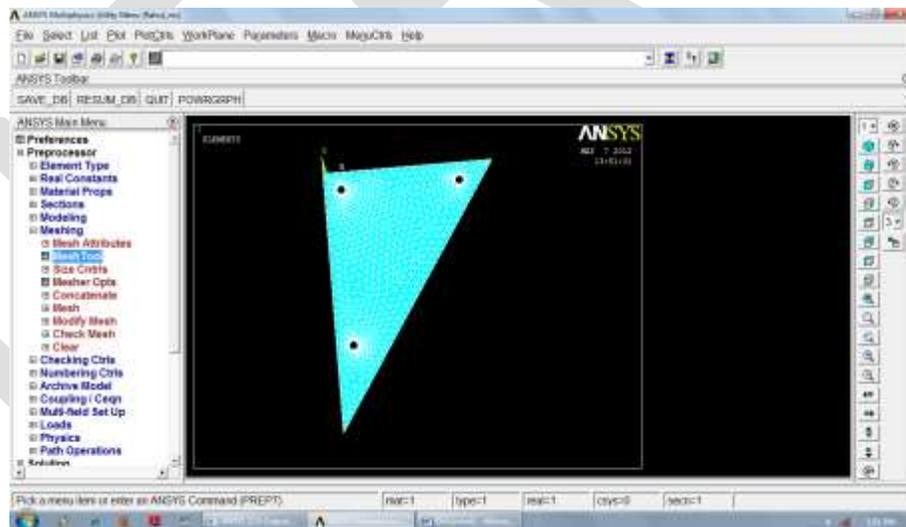


Figure.2 Triangular Plate (M.S.) mesh in ANSYS

EXPERIMENTAL METHOD

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

EXPERIMENTAL SETUP

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

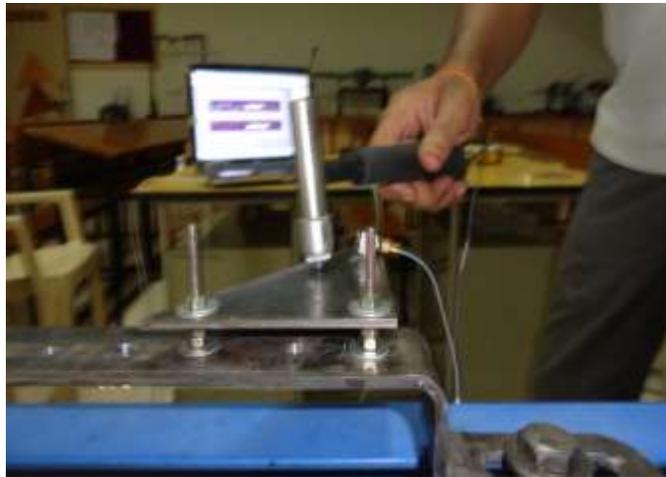


Figure.3 Experimental Setup for M.S. plate

RESULTS

For Mild Steel Plate Young's Modulus $E = 2.1 \times 10^{11} \text{ N/m}^2$, Density $\rho = 7850 \text{ kg/m}^3$, Poisson's ratio $\gamma = 0.3$, for Aluminum plate Young's Modulus $E = 70 \times 10^9 \text{ N/m}^2$, Density $\rho = 2710 \text{ kg/m}^3$, Poisson's ratio $\gamma = 0.33$, for FRP (Fiberglass Reinforced Polymer) Young's Modulus $E = 3 \times 10^6 \text{ N/m}^2$, Density $\rho = 1799 \text{ kg/m}^3$, Poisson's ratio $\gamma = 0.25$, for Rubber Young's Modulus $E = 0.1 \times 10^9 \text{ N/m}^2$, Density $\rho = 1200 \text{ kg/m}^3$, Poisson's ratio $\gamma = 0.49$, for PVC (Polyvinyl chloride) Young's Modulus $E = 4.1 \times 10^5 \text{ N/m}^2$, Young's Modulus $E = 4.1 \times 10^5 \text{ N/m}^2$, Poisson's ratio $\gamma = 0.38$. It is observed that the natural frequencies for M.S plate is much higher as compared to laminated plates. It is also seen that among laminated plates the frequencies for rubber-laminated plate is lower as compare to PVC and FRP material. Same effect would observe for Aluminium composite plates. The first natural frequency for Al plate is about 202.60 Hz meanwhile the first natural frequency for rubber composite plate is 113.367 Hz which is again much lower as compare to other composite plates of Al.

Factors Responsible for Result Variations

1) Mass Loading Effect

The mass effect of instrumentation can cause an effect on measured vibration spectrum which give deviation in the result.

2) Boundary Conditions

It is very difficult to achieve the exact boundary conditions for testing the model. This is the main cause for variation in the results.

The results of FEM and experimentation tabulated below.

Results of FEM Analysis

Mode No.	Frequency(Hz)							
	MS	MS-Rub-MS	MS-FRP-MS	MS-PVC-MS	Al	Al-Rub-Al	Al-FRP-Al	Al-PVC-Al
1	199.02	141.14	164.18	157.684	202.60	113.367	164.25	155.684
2	847.26	267.68	228.06	227.40	851.22	217.142	222.28	224.55
3	1379.2	327.28	429.26	348.06	1368.9	282.542	435.37	342.76

Table.1 Natural Frequencies Values obtained from FEM Analysis for All Plates for The Condition Free-Clamped-Free Right Triangular Plate.

Results of Experimental Modal Analysis

Mode No.	Frequency (Hz)							
	MS	MS-Rub-MS	MS-FRP-MS	MS-PVC-MS	Al	Al-Rubber-Al	Al- FRP - Al	Al - PVC - Al
1	183.89	146.82	170.43	142.38	188.93	121.17	154.51	146.82
2	844.28	270.19	232.13	230.54	875.06	192.80	193.80	217.23
3	1370.89	314.27	433.94	340.59	1319.12	275.01	440.18	353.91

Table.2 Natural Frequencies Values obtained from FEM Analysis for All Plates for The Condition Free-Clamped-Free Right Triangular Plate.

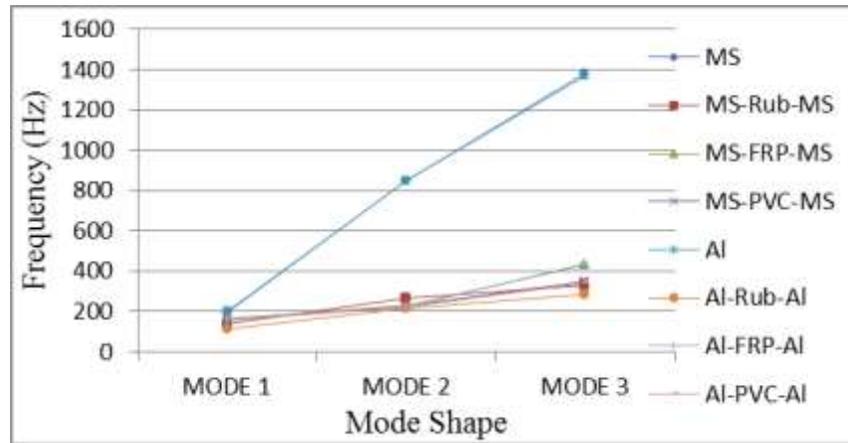


Figure.3 Variation in The Values of Natural Frequencies obtained from FEM Analysis, For All Plates.

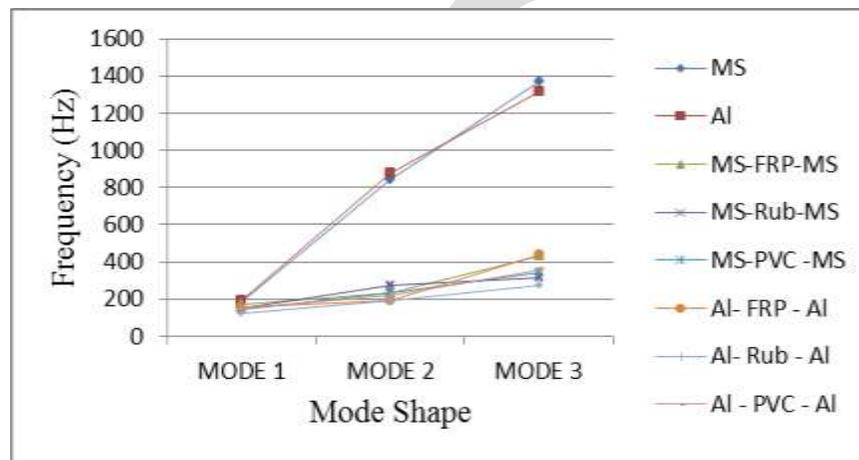


Figure.4 Variation in The Values of Natural Frequencies obtained from FEM Analysis, For All Right Triangular Plate.

CONCLUSIONS

The major objective of this dissertation work is to find the modal parameters i.e. natural frequencies and mode shapes of isotropic triangular plate and for laminated/composite plates. In this work dynamic analysis of triangular plate by using FEM and experimental analysis is carried out. Results from FEM and experimental are compared to verify the practical feasibility.

It is clearly shows that as material for the plate changes from Mild Steel to Aluminum, and for laminated/composite plate Mild Steel to Aluminum-rubber-Aluminum, natural frequencies shifts from upper side to lower side as shown in the figures 3 and 4.

As there is change in material, natural frequency changes, due to changes in material density. The percentage variation in the results obtained from FEM analysis and experimental modal analysis is up to 10%.

REFERENCES:

- [1] K.M Liew T.C.Chiam "The Free Flexural Vibration of Symmetric Angle Ply Triangular Composites Laminates" Journal of Sound and Vibration 1994, 169(5) pp, 633-654.
- [2] Y.K.Cheung a, D. Zhou b, "Three-dimensional vibration analysis of cantilevered and completely free isosceles triangular plates", International Journal of Solids and Structures 39 (2002) pp- 673-687.
- [3] D. J. Gorman "A Highly Accurate Analytical Solution For Free Vibration Analysis of Simply Supported Right Triangular Plates" Journal of Sound and Vibration (1983) 89 (1), pp, 107-118.

- [4] D. J. Gorman, "Accurate Free Vibration Analysis of Right Triangular Plates With One Free Edge", *Journal of Sound and Vibration* (1989) , 131(1), pp- 115-125.
- [5] D. J. Gorman, "Free Vibration Analysis Of Right Triangular Plates With Combinations of Clamped-Simply Supported Boundary Conditions", *Journal of Sound and Vibration* (1986) 106(3), pp - 419-431.
- [6] Eugenio Onate and Francisco Zarate "Rotation-free triangular plate and shell elements", *International Journal For Numerical Methods In Engineering Int. J. Numer. Meth. Engg.* 47, pp-557-603 (2000)

IJERGS

Simultaneous Localization and Mapping in Maze Solving

Divya Bhaskaran, Charushree MB, Abhijith M , Dr Jitendranath Mungara

RV College of Engineering, divyabhaskaran93@gmail.com,+919886219466

Abstract— Simultaneous Localization and Mapping is the process by which a robot is able to place itself in, and map out its environment. This twofold solution has proved to be a breakthrough in the quest to attain an autonomous robot. However the solution pertains to only a small set of spaces. To improve upon this, efforts are being made to cover not just localization, but also global localization and the kidnapped robot problem. The Kalman Filter algorithm and the Markov Localization algorithms are being replaced by the Monte Carlo Algorithm which represents a belief as a set of particles instead of approximating posteriors in parametric forms. The Rao-Blackwellised particle filter further reduces the particle space. Scan mapping and improving the odometry can further improve this filter method.

Keywords— Automated System, Simultaneous Localization and Mapping(SLAM), Maze Solving, Posteriors, Particle, Rao – Blackwellized Particle Filter (RBPF), Odometry.

INTRODUCTION

The rapid growth in the technology in our times is greater than ever. More and more autonomous robotic devices are infiltrated in the lives of people making theirs easier. The research of building smart robotic vehicles is a largely funded initiative. In many cases, autonomous robots can be the best option for specific missions. Conservative ways of rescuing survivors are time consuming and harmful for the survivors. Instead, we can have unmanned autonomous robotic vehicles which carry out rescue operations. Being equipped with the necessary sensory devices, unmanned autonomous robotic vehicles can scan the environment sending precious information to the rescue teams about the location of survivors. Additionally, there are also places where use of robots is the only way to achieve a work. Space exploration, nuclear plants, chemical factories, or any environment unreachable for humans, could be explored by an autonomous robot. So, independent mapping and localization for a robot became one of the main goals in robotics technology. This is a complex problem, and is not totally solved today. The main difficulties are the accuracy of measurements and the real-time processing in tandem with the minimum processing power available in most of the embedded systems. The entire above problem can be subdivided into three sub problems: Localization, Mapping and Path Planning.

Simultaneous localization and mapping, or SLAM[1], is a process very central to optimize and automate the system. The name refers to the twofold solution whereby a robot is able to map out its environment and also place itself in that environment. In other words, to learn a map of the robot's environment using the robot's sensors. For autonomous mobile robots, learning maps is often essential. Being able to automatically navigate in an environment is dependent on having a map, and manually creating this map is often a hard and labor intensive effort. Maintenance can prove costly enough to render the robot unusable. Equipping the robot with sensors and software enabling it to solve this task by itself can be of great importance to the success of the robot system. Autonomous mobile robots also need to be able to localize themselves in their environment. Some sensor arrays could provide a full state estimate, such as an overhead camera combined with computer vision software. This solution is used primarily when the environment restricted to a small surface, such as in the Micro Robot World Cup Soccer Tournament (MiroSot) [2]. In such applications, the full robot position can be computed directly. However, this does not account for changes in the size and nature of the environment. For a robot exploring unprepared indoor environments, its location most often has to be computed from several sensor scans, and is dependent on a map. Importantly, the problem of SLAM consists of two mutually dependent sub problems. If a complete and accurate map existed, simpler algorithms could have been utilized for generating position estimates. Likewise, if a complete history of accurate positions existed for the robot, map learning would be reduced to writing sensor data to a map representation. It is hard to estimate which process comes first. For this reason, the problem is recognized to be hard, and it requires a search for a solution in a high-dimensional space of possible locations.

LITERATURE SURVEY

The maze solving problem is one of the most popular trends in the field of robotics. In fact IEEE designed a “Micromouse” competition dating back to the 70s, which has become such a craze, that it is now held at regional, national and international levels all over the world. It is an amalgamation of elements of electronics, control, mechanical and software engineering and provides the perfect platform to teach mechatronics to students across all the fields.

In the late 1940's, Claude Shannon built a Maze Solving Mouse. His maze consisted of a 25 square checkerboard maze with aluminum walls which were removable. A motorized carriage was underneath the board of the maze which provided power to the mouse through magnetic coupling. Relay circuits provided logic and memory to navigate the maze and remember the solution. The downside to this method was that the path determined was not the optimum path and the mouse performed very badly in a maze with no walls at all.

The findings of Shannon instigated Moore[3] to come up with a solution to optimize the path through a maze. He reconstituted the problem as an abstract one as a number of points that could be visited and available passageways between them.

Moore's algorithm operated as follows. From the starting position, all points that could be reached in one step were marked by “1”. From there, all the yet unmarked places that could be accessed in one additional step were marked by “2”. From there the yet unmarked places were marked by “3” which could be reached in yet another additional step. This iterative process continued until the final point was reached. This method however, worked in abstract mazes with fewer positions, connected by an irregular array of passageways.

Ivan E Sutherland's-“*A Method for Solving Arbitrary-Wall Mazes by Computer*” IEEE member (1969) talks about solving mazes with extended open areas where arbitrary walls are placed. It reduces large open areas containing many parts to a small set of shortest paths. Then Moore's algorithm is used. However, this paper covers only a computer simulation of a vehicle and not an actual real world thing.

Jianping Cai, Xuting Wan, Meimei Huo and Jiazhong Wu's-“*An Algorithm of Micromouse Maze Solving*” Zhejiang University City College, Hangzhou, China(2010), proposes a maze solving algorithm called “Partition central Algorithm”, which is used to find the shortest path in a micromouse competition maze. A standard 16*16 maze was divided into 12 partitions. Depending on the absolute direction of the micromouse and the partition location exploring rules alter when the micromouse walks to optimize the maze exploration process.

A generic 3-D simulation platform with multiple with multiple viewpoints was presented that could be used for education and research purposes by Jianpang Cai, Meimei Huo, Jiazhong Wu, Bin Song's-“*Micromouse Competition Training Method-Based on 3D Simulation Platform*” Zhejiang University City College, Hangzhou, China(2010) offer many characteristics that differentiate it from its 2D version. It offered a platform for students to participate in the IEEE Micromouse competition based on the 3D simulation platform. It offered a complete example suitable for large scale student participation. This proved the popularity of the competition.

Apart from the micromouse competition, various methods were developed for solving mazes using different techniques. One such one was by Adil M.J Sadik, Maruf A Dhali, Hasib M.A.B Farid, Tafhim U Rashid, A Syeed's-“*A Comprehensive and Comparative Study of Maze Solving Techniques by Implementing Graphy Theory*”(2010), state how without the use of Artificial Intelligence, the maze solving algorithms are most ineffective. Graphical and non graphical solutions were developed to increase the efficiency. In that realm however, graph theories triumph non graph theories. By proper interpretation and mathematical modeling, it is possible to find the shortest distance between any two nodes. Some algorithms employed were *Depth First Search, Breadth first search, Flood Fill or Bellman Ford algorithm*.

The solution to SLAM-Simultaneous Localization and Mapping has been one of the notable successes of the robotics community. Hugh Durrant-Whyte, Fellow and Tim Bailey's-“*Simultaneous Localization and Mapping (SLAM) Part I The Essential Algorithms*” and “*Simultaneous Localization and Mapping Part 2*” covers the probabilistic form of the SLAM problem, essential solution methods and significant implementation. Part II discusses the recent advances and new formulations of the SLAM problem for large scale environments.

Problems with current methods are:

1. They are not always designed for a dynamic and constantly changing environment.
2. The constant problem of whether mapping should come before localizing or the other way around. Likewise, if a complete history of accurate positions existed for the robot, map learning would be reduced to writing sensor data to a map representation [4]. It's a chicken and egg problem [5].

METHODOLOGY

For the proper implementation of SLAM in maze solving, the following are crucial:-

III.I Map Representations

Several map representations are recognized for SLAM purposes, and most of them can be put in one of two categories: landmark-based maps and occupancy grid maps [5].

III.I.I Landmark-based maps

Landmark-based maps are based on landmarks, which are features in the environment. Landmarks can be corners, line segments or points. The landmarks are seen as distributed in a continuous space. In other words, each landmark is associated with a position in space. The landmarks are assumed to be relatively sparse and unambiguous [6].

III.I.II Occupancy Grid maps

Occupancy grid maps can be seen as regarding everything as landmarks. The individual sensor measurements are assumed to be individually not very distinctive, but dense [6]. Grid maps discretize the environment into a grid – for regular maps a grid of two dimensions. They can have a variety of different ways of representing a cell, everything from a simple binary bit to tree structures [6].

III.II Sensors

The choice of sensors for performing SLAM is large, and different types of sensors are used in different contexts. Autonomous underwater vehicles can use sonar, while unmanned aerial vehicles can use radar systems, infrared cameras or other means of sensing. The focus of this paper is on autonomous indoor wheeled robots

The system consists of:

III.I.I Range Sensors:

While it is not strictly required, most autonomous mobile robots have some form of range sensor. A range sensor can tell the distance to the nearest object in a given direction or sector. Ultrasonic, IR and laser based systems (LIDAR) are common, while vision systems based on digital cameras represent another alternative.

The range sensors form the method of detecting obstacles, facilitating the generation of a map and location tracking of the robot relative to them, whether the map be landmark or grid map based. The range sensors also play a role in correction of odometric errors where odometric sensors are present.

III.I.II Odometric sensors:

In order to efficiently and correctly cope with more situations, many robot designs and SLAM approaches also include odometric sensors, that is, sensors which measure the distance traveled. A naive SLAM algorithm could be solely based on odometry and dead reckoning where range sensor readings are written to the map based on the position deduced by odometric measurements. Such mapping with raw odometry most often gives inconsistent results, since errors accumulate and are never corrected. For these reasons, LIDAR often is preferred.

While the individual distance measurements of a LIDAR might have higher uncertainty, there are usually so many of them, allowing for a more precise estimate to be deduced through scan matching, comparing several scans and inferring their relative positions. For instance, [7] reports that the probability distribution $p(z|x)$ is much more peaked than $p(x|x', u)$, meaning the probability of obtaining the reading z given a position x is less uncertain than the probability of the position x given the previous position x' and an odometric reading u .

III.III Scan Matching

Scan matching is a concept frequently used in SLAM algorithms. For some algorithms, scan matching is the most central aspect. Combining range sensor measurements from one range sensor revolution, hereafter called scans, can be used to estimate the movement of the robot between these scans. Measurements originating from other range sensors are represented in a coordinate system fixed to the sensor unit. When the robot and sensor move, the coordinate system in which the range scans are given is moved relative to world and map coordinates. Scan matching is the procedure of aligning different range scans to a world or map coordinate system, based solely on the scans themselves, or with the help of other inputs. In this view, scan matching aligns range scans to each other, or to a previously obtained or static map [8].

III.IV Particle Filters

The most effective solution to the mobile robot localization problem is *position tracking*. In this field an effective algorithm would be the Kalman filter algorithm where the posterior distribution of the robot poses conditioned on sensor data. However in the *global localization problem* and the *kidnapped robot problem*, this algorithm is ineffective. Instead, a better algorithm would be that of *Monte Carlo localization algorithm* (MCL). It can accommodate arbitrary noise distributions (and nonlinearities in robot motion and perception). Thus, MCL avoids a need to extract features from the sensor data.

The key idea of MCL is to represent the belief by a set of samples (also called: particles), drawn according to the posterior distribution over robot poses. In other words, rather than approximating posteriors in parametric form, as is the case for Kalman filter and Markov localization algorithms, MCL represents the posteriors by a random collection of weighted particles which approximates the desired distribution.

DESIGN AND IMPLEMENTATION

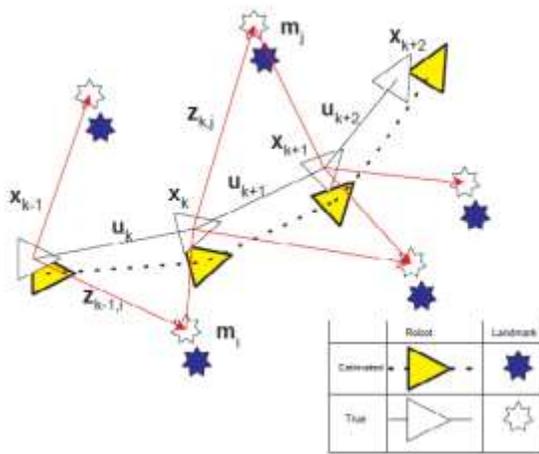


Fig 4.1: The essential SLAM problem.

Consider a mobile robot moving through an environment taking relative observations of a number of unknown landmarks using a sensor located on the robot as shown in Figure 2. At a time 'k' we have:

X_k =State vector describing the location and orientation of the vehicle.

U_k =Control vector used to drive the vehicle to state x_k at time k. It is applied at time k-1.

M_i =A vector describing the location of the i^{th} landmark whose true location is time invariant.

Z_{ik} =Observation taken by the vehicle of the i^{th} landmark at the time 'k'. If multiple observations of the landmark are taken or if the landmark is irrelevant to the problem, it is z_k .

In addition we have:

$X_{0:k}=\{x_0, x_1, x_2, \dots, x_k\}=\{x_{0:k-1}, x_k\}$ which is the history of locations.

$U_{0:k}=\{u_0, u_1, u_2, \dots, u_k\}=\{u_{0:k-1}, u_k\}$ which is the history of control inputs.

$m_{0:k}=\{m_0, m_1, m_2, \dots, m_k\}=\{m_{0:k-1}, m_k\}$ which is all the landmark observations.

IV.I. Rao –Blackwellized Particle Filter (RBPF) based SLAM.

The high dimensional state space of the SLAM problem makes the application of particle filters computationally infeasible. However it is possible to reduce the sample space by using RBPF [9]. SLAM posterior is as follows:

$$P(x_{1:t}, m | z_{1:t}, u_{0:t-1}) = P(x_{1:t} | z_{1:t}, u_{0:t-1}) * P(m | x_{1:t}, z_{1:t})$$

Where,

$P(x_{1:t}, m | z_{1:t}, u_{0:t-1})$ is the SLAM posterior,

$P(x_{1:t} | z_{1:t}, u_{0:t-1})$ is the robot path posterior. $X_{1:t}$ is localization which is carried out using MCL.

$P(m | x_{1:t}, z_{1:t})$ is the mapping with known poses. 'M' is the pose estimate from MCL.

The particle filter is used to represent the potential trajectories of the robot. Each particle carries its own map and we now have joint posteriors of the poses of the robot and the map.

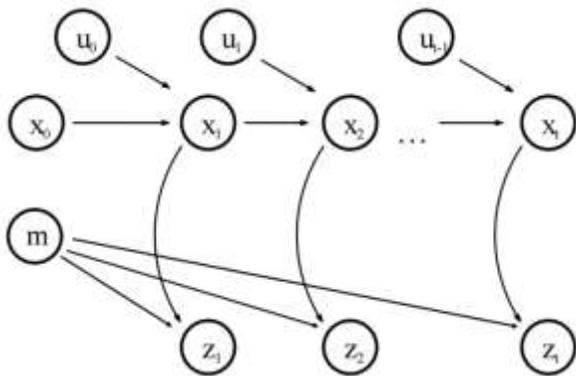


Fig 4.2 A graphical model of the Rao-Blackwellized Mapping.

IV.II. Pose Correction using Scan Mapping

In the case of Rao Blackwellized mapping in grid maps, the maps are quite big and since every particle has its own map, the number of particles needs to be contained. To improve this, we improve on the pose estimate before particle filtering.

We maximize the position of the i^{th} pose relative to the $(i-1)^{\text{th}}$

$$\mathbf{x}_i^* = \arg \max_{\mathbf{x}_i} \mathbf{P}(z_i | \mathbf{x}_i, \mathbf{m}_{i-1}) * \mathbf{P}(\mathbf{x}_i | \mathbf{x}_{i-1}^*, \mathbf{u}_{i-1})$$

Where:

z_i is the current measurement,

$(\mathbf{x}_i, \mathbf{m}_{i-1})$ is the map constructed so far

\mathbf{u}_{i-1} is the robot motion.

IV.III. RBPF SLAM with Improved Odometry

Scan matching provides a locally consistent pose correction. Pre correct short odometric sequences using scan matching and then using them as input to Rao Blackwellized Particle Filter. The advantage is that fewer particles are needed since the error in the input is reduced.

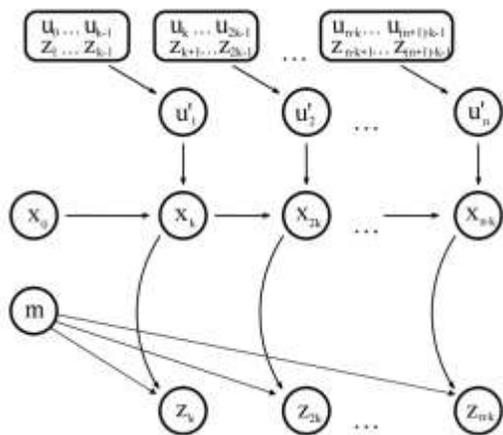


Fig 4.3 Graphical model for mapping with improved Odometry.

This method uses Odometry as the input as opposed to scan matching in the standard RBPF. The number of partitions also varies from 500 to 2,000.

EXPERIMENTAL RESULTS

The following are the outputs produced from implementing the methods provided:

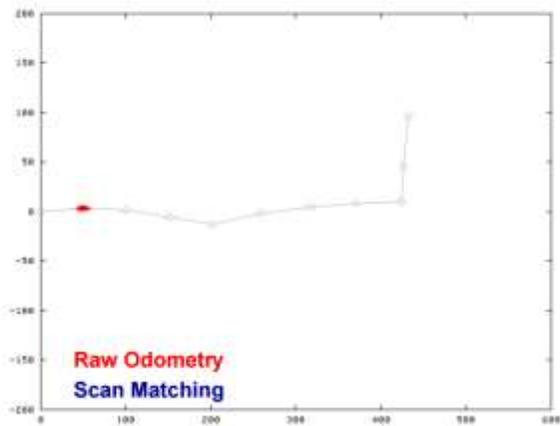


Fig 5.1 Motion Model for Scan Matching



Fig 5.2 RBPF Slam with Improved Odometry

CONCLUSION

In the field of motion, Simultaneous Localization and Mapping was a breakthrough in terms of reaching the goal of autonomy.

The SLAM method provides a solution to the key problem of mapping and localization for any autonomous robot. The past decade, in particular, has seen substantial progress in our understanding of the SLAM problem and in the development of efficient and robust algorithms. However in large-scale mapping, global localization, kidnapped robot problem, problems involving many vehicles and in mixed environments with sensor networks and dynamic landmarks, SLAM still has a long way to go. The delayed data-fusion concept complements batch association and iterative smoothing to improve estimation quality and robustness. Appearance-and pose-based SLAM methods offer a radically new paradigm for mapping and location estimation without the need for strong geometric landmark descriptions. These methods are opening doors to new ideas and making links back to fundamental principles in robotics.

FUTURE WORKS

The key challenges for SLAM are in larger and more persuasive implementations and demonstrations. Some of the problem include reducing the number of particles, covering not just indoor localization but also global localization and kidnapped robot problem, which is perhaps most applicable in war fields.

Even though the progress has been substantial, the scale and structure of many environments are limited. The challenge now is to demonstrate SLAM solutions to large problems and scope where robotics can truly contribute: driving hundreds of kilometers under a forest canopy or mapping a whole city without recourse to global positioning system (GPS), to create smart cars and to demonstrate true autonomous localization and mapping of structures such as the Barrier Reef or the surface of Mars. SLAM will contribute in making all this possible.

REFERENCES:

- [1] Hugh Durrant-Whyte, Fellow, IEEE and Tim Bailey “Simultaneous Localization and Mapping Part 1 The Essential Algorithms”.
- [2] Prahlad Vadakkepat, Tong Heng Lee, and Liu Xin. Application of evolutionary artificial potential field in robot soccer system. In IFSA World Congress and 20th NAFIPS International Conference, 2001. Joint 9th, pages 2781–2785. IEEE, 2001
- [3] E.Moore, ”Shortest path through a maze”, Annals of the Computation Laboratory of Harvard University, Vol 30,Cambridge Mass:Harvard University Press,1959,pp,285-292
- [4] Michael Montemerlo, Sebastian Thrun, Daphne Koller, Ben Wegbreit, et al. Fastslam: A factored solution to the simultaneous localization and mapping problem. In Proceedings of the National conference on Artificial Intelligence, pages 593–598. Menlo Park, CA; Cambridge, MA; London; AAAI Press; MIT Press; 1999, 2002
- [5] S. Thrun, W. Burgard, D. Fox, et al. Probabilistic robotics, volume 1. MIT press Cambridge, MA, 2005.
- [6] Austin I Eliazar and Ronald Parr. Dp-slam 2.0. In Robotics and Automation, 2004. Proceedings. ICRA '04. 2004 IEEE International Conference on, volume 2, pages 1314–1320. IEEE, 2004
- [7] Giorgio Grisetti, Cyrill Stachniss, and Wolfram Burgard. Improved techniques for grid mapping with rao-blackwellized particle filters. Robotics, IEEE Transactions on, 23(1):34–46, 2007..
- [8] Stefan Kohlbrecher, Oskar von Stryk, Johannes Meyer, and Uwe Klingauf. A flexible and scalable slam system with full 3d motion estimation. In Safety, Security, and Rescue Robotics (SSRR), 2011 IEEE International Symposium on, pages 155–160. IEEE, 2011

Hybrid Image Compression Based On Fuzzy Logic Technology

Neha Pandey , Himani Agrawal

Student-shri shankra college of engineering,Bhilai

neha20pandey@yahoo.com 09907157136

Abstract— In this paper, the comparison between Hybrid Image Compressions methods and Image Compression based on fuzzy logic is discussed. The Hybrid Comparison Method is a combination of both the DWT and DCT Image Compression method. When more than one compression technique are applied to compressed one image for high value of PSNR (peak signal to noise ratio) and CR (compression ratio) this process is called hybrid compression technique. For reducing MSE (mean square error) and for contrast enhancement Fuzzy Logic is applied to same image. The proposed work is designed using MATLAB.

Keywords— DCT, DWT, CR, PSNR, MSE.

INTRODUCTION

The basic rule of compression is to reduce the numbers of bits required to represent an image. In a computer an image is represented as an array of numbers, integers to be more specific, that is called a digital image. Two major components of compression are redundancy and irrelevancy reduction. Redundancy reduction aims at eliminating duplication from the image. Irrelevancy reduction are neglects the parts of the signal that will not be noticed by the signal receiver, namely the Human Visual System (HVS).

In this paper firstly we have discussed two important Image compression method DWT (Discrete wavelet transform) and DCT (Discrete cosine transform).

The term 'wavelet' comes from the fact that they integrate to zero; when wave up and down across the axis. Many wavelets also display a property ideal for compressed signal representation: orthogonality. This property confirms that data is not over represented. A signal can be decomposed into many shifted and scaled representations of the original mother wavelet. A wavelet transform can be used to decompose a signal into component wavelets. Once this is done the coefficients of the wavelets can be decimated to remove some of the details. Wavelets have the great advantage of being able to separate the fine details in a signal. Very small wavelets can be used to isolate very fine details in a signal, while very large wavelets can identify coarse details. [1]

The Discrete Cosine Transform (DCT) has been shown to be near optimal for a large class of images in energy concentration and decorrelating. It has been implemented in the JPEG and MPEG coding standards. The JPEG process is a widely used form of lossy image compression that centers on the DCT. The DCT works separating images into parts of differing frequencies. During a step called quantization where part of compression actually occurs, the less important frequencies are discarded, hence the use of the term "lossy". Then, only the important frequencies that remain are used retrieve the image in the decompression process. As a result, reconstructed images contain some distortion. The jpeg method is used for both color and black and white images. Importance of image compression increases with advancing communication technology. [2]

Fuzzy logic is a useful technique in image contrast enhancement. It is provided by the application of fuzzy sets theory and fuzzy inference systems. The fuzzy sets theory's groundwork was set by Prof. Zadeh in 1965, followed later on by the fuzzy logic basis, established in 1973 since then the applications of fuzzy sets theory and fuzzy logic to scientific computing are very vast and still continue to develop along with other modern algorithms in the area of soft computing.

1) HYBRID IMAGE COMPRESSION

Hybrid Image compression method is a transform technique that will exploit advantages of DCT and DWT, to get compressed image. Hybrid DCT-DWT transformation gives more compression ratio compared to JPEG and JPEG2000, conserving most of the image information and construct good quality of reconstructed image. Hybrid (DCT+DWT) Transform reduces blocking artefacts, false contouring and ringing effects which normally seen in DWT or DCT techniques.[3]

- **Compression Procedure**

- The input image is first converted to gray image from colour image.
- After this whole image is divided into size of 32x32 pixels blocks. Then 2D-DWT applied on each block of 32x32 block, by applying 2 D-DWT, four details are produced. Out of four sub band details, approximation detail/sub band is further transformed again by 2 D-DWT which gives another four sub-band of 16x16 blocks. Above step is followed to decompose the 16x16 block of approximated detail to get new set of four sub band/ details of size 8x8.as shown in fig 1

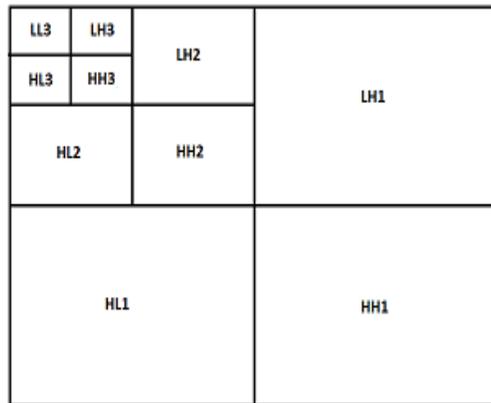


Fig No.1 Wavelet Filter Decomposition

- Than after getting four blocks of size 8x8, we use the approximated details for computation of discrete cosine transform coefficients.

The forward 2D_DCT transformation coefficient is calculated by the following equation:

$$C(u,v)=D(u)D(v)\sum_{x=0}^{N-1}\sum_{y=0}^{N-1}f(x,y)\cos\left[\frac{(2x+1)u\pi}{2N}\right]\cos[(2y+1)v\pi/2N]$$

Where,u,v=0,1,2,3,.....,N-

1

The inverse 2D-DCT transformation is given by the following equation

$$F(x,y)=\sum_{v=0}^{N-1} D(u) D(v) d(u, v) \cos \left[\frac{(2x+1)u\pi}{2N} \right] x \cos(2y + 1)v\pi/2N$$

Where $D(u) = (1/N)^{1/2}$ for $u=0$

$D(u) = 2/(N)^{1/2}$ for $u=1, 2, 3, \dots, (N-1)$

➤ These coefficients are then quantize and send for coding.

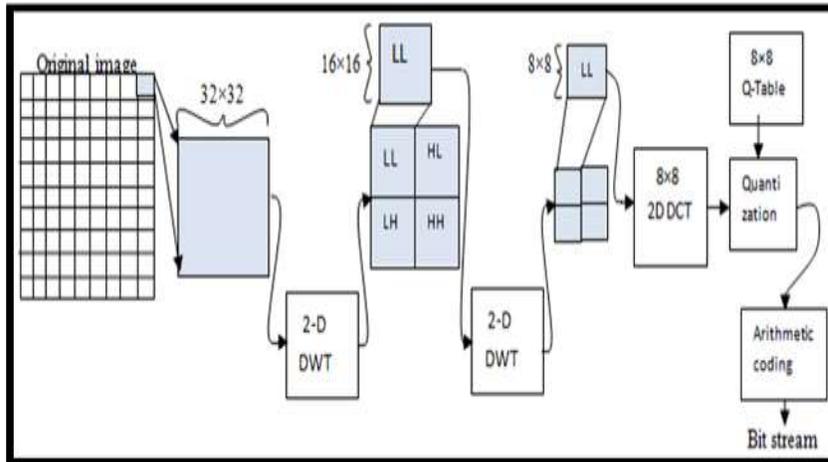


Fig No.2 Block Diagram of Hybrid image compression encoder

➤ In decoder section just opposite work is done. , we decode the quantized DCT coefficients and compute the inverse two dimensional DCT (IDCT) of each block. Then block is dequantized. Further we take inverse wavelet transform of the dequantized block. Since the level of decomposition while compressing was two, we take inverse wavelet transform two times to get the same block size i.e. 32x32. This procedure followed for each block received.

2) FUZZY LOGIC TECHNOGOY BASED HYBRID IMAGE COMPRESSION

Many difficulties in image processing arise because the data/tasks/results are uncertain. This uncertainty, however, is not always due to the randomness but to the ambiguity and vagueness. Beside randomness which can be managed by probability theory, there are three other kinds of uncertainty in the image processing, they are:

1. Grayness ambiguity
2. Geometrical fuzziness
3. Uncertain knowledge

So the fuzzy logic used for

1. Fuzzy techniques are powerful tools for knowledge representation and processing
2. Fuzzy techniques can manage the vagueness and ambiguity efficient.

Fuzzy image enhancement is based on gray level mapping into a fuzzy plane, using a membership transformation function. The aim is to generate an image of higher contrast than the original image by giving a larger weight to the gray levels that are closer to the mean gray level of the image than to those that are farther from the mean. An image I of size $M \times N$ and L

gray levels can be considered as an array of fuzzy singletons, each having a value of membership denoting its degree of brightness relative to some brightness levels. For an image I , we can write in the notation of fuzzy sets:

$$I = \bigcup_{mn} \alpha_{mn} / g_{mn} \quad m = 1, 2 \dots M \text{ and } n = 1, 2 \dots N$$

Where g_{mn} is the intensity of (m, n) th pixel and α_{mn} its membership value

The membership function characterizes a suitable property of image (e.g. edginess, darkness, textural property) and can be defined globally for the whole image or locally for its segments. In recent years, some researchers have applied the concept of fuzziness to develop new algorithms for image enhancement. [4]

The principle of fuzzy enhancement scheme is illustrated in Figure (3).

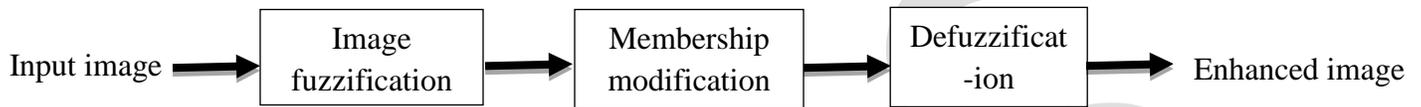


Figure No.3 The Main Principles of Fuzzy Image Enhancement

• **Compression Procedure**

- First read the input image. Convert color image to gray image and applied DWT process on it.
- 2D-DWT applied on each block of 32x32 block, by applying 2 D-DWT, four details are produced. Out of four sub band details, approximation detail/sub band is further transformed again by 2 D-DWT which gives another four sub-band of 16x16 blocks.
- In higher frequencies sub bands (LH, HH, and HL) fuzzy logic is applied to enhance PSNR value. And reduce the Mean Square Error.
- In lower frequency (LL) 2D-DWT is again perform which divides LL to LL1, LH1, HL1, and HH1.
- Then DCT transform is applied to both lower (LL1) and. This process will further increases the compression ratio.

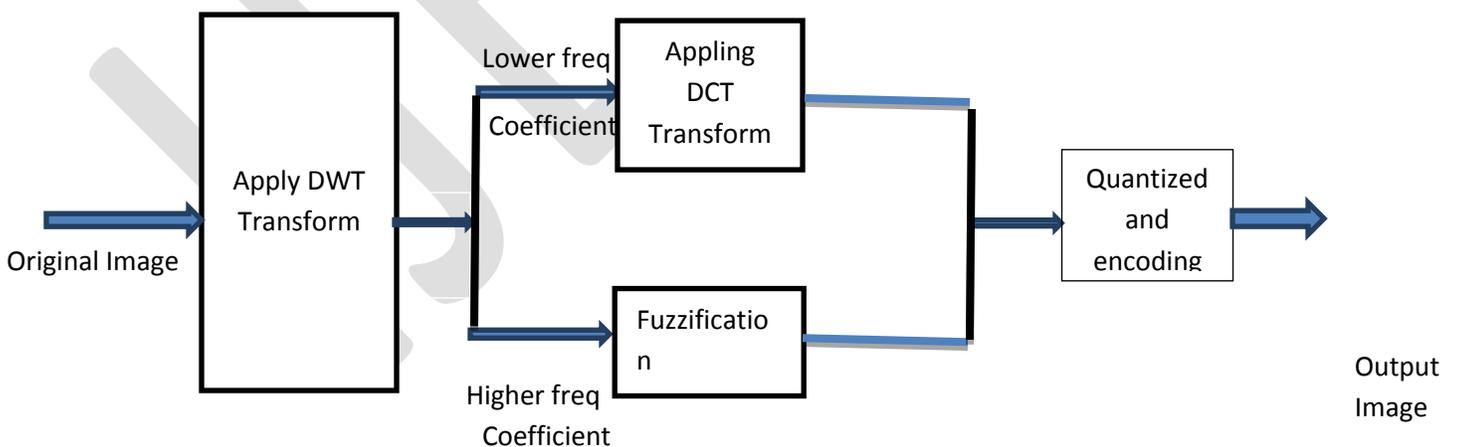


Fig No.4 image compression based on Fuzzy logic technology

3) COMPARATIVE ANALYSIS AND RESULTS

For comparative analysis codes for Hybrid (DWT-DCT) and Hybrid image compression based on fuzzy logic techniques were written in MATLAB and results are tabulated in table 1 the compression ratio CR is high for Hybrid transform as compare to standalone transforms. DWT comprises between compression ratio and superiority of reconstructed image, it adds noise to the image for improvement in the reconstructed image. Hence DWT technique is useful in medical applications. DCT gives less compression ratio but it is computationally efficient compared to other techniques.

Original Image



Fuzzy logic based Hybrid image compression

Compressed Image



Hybrid image compression



Comparison Table No.1

S no.	Method applied	PSNR (in dB)	MSE Value
1	Hybrid Image compression	30.4799	54.1857
2	Image compression based on fuzzy logic	32.8746	31.2164

4) CONCLUSION

In this paper comparative analysis of various Image compression techniques for different images is done based on three parameters mean square error (MSE), peak signal to noise ratio (PSNR). Our results shows that we can attain higher compression ratio by Hybrid technique but damage of information is more. DWT gives better compression ratio without losing more information of image. Drawback of DWT is, it needs more processing power. DCT overcomes this disadvantage since it needs less processing power, but it gives less compression ratio. DCT uses blocks of image, but there is still correlation exists across blocks. Hybrid transform provides higher compression ratio but for getting that clearness of the image is partially tradeoff. By applying fuzzy logic the image quality has been enhanced so it will increase PSNR value of compressed image. And also reduce Errors. Fuzzy based Hybrid image compression used in medical images.

REFERENCES:

1. M. Mozammel Hoque Chowdhury and Amina Khatun Department of Computer Science and Engineering Jahangirnagar University Savar, Dhaka-1342, Bangladesh "Image Compression Using Discrete Wavelet Transform" IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 4, No 1, July 2012.
2. YOGITHA S.K., 2SAVITRI RAJU "FUZZY BASED IMAGE ENHANCEMENT IN THE COMPRESSED DOMAIN" Dept of ECE, SDM College of Engineering & Technology, Dharwad, India.
3. Archana Deshlahra, G. S. Shirnewar, Dr. A.K. Sahoo." A Comparative Study of DCT, DWT & Hybrid (DCT-DWT) Transform ".Assistant Professor, National Institute of Technology Rourkela, Orissa (India).
4. Aboul Ella Hassanien and Amr Badr Kuwait University College of Business Administration" A Comparative Study on Digital Mamography Enhancement Algorithms Based on Fuzzy Theory". Studies in Informatics and Control, Vol.12, No.1, March 2003
5. Swarnibhar Majumderi North Eastern Regional Institute of Science and Technology (Deemed University), Arunachal Pradesh, India" Image Compression using Lifting Wavelet Transform" International Conference on Advances in Communication, Network, and Computing.2010.
6. Anitha s" Image Compression Using Discrete Cosine Transform & Discrete Wavelet Transform" International Journal of Scientific & Engineering Research Volume 2, Issue 8, August-2011
7. Harmandeep Singh Chandi, V. K. Banga" 2-Dimensional Image Compression using DCT and DWT Techniques".
8. A. Dwivedi "A Novel Hybrid Image Compression Technique: Wavelet" Proc. of ASID '06, 8-12 Oct, New

Delhi -MFOCPN

9. Ashutosh Dwivedi, N Subhash Chandra Bose, Ashiwani Kumar, Prabhanjan Kandula, Deepak Mishra, Prem K Kalra Department of Electrical Engineering, Indian Institute of Technology Kanpur
10. Veerpal kaur, Gurwinder kaur “Hybrid Image Compression Using DWT, DCT and Huffman Coding Techniques” International Journal of Advanced Research in Computer Science and Electronics Engineering (IJARCSEE) Volume 1, Issue 7, September 2012
11. SRIRAM.B, THIYAGARAJAN.S” HYBRID TRANSFORMATION TECHNIQUE FOR IMAGE COMPRESSION” Journal of Theoretical and Applied Information Technology 31st July 2012. Vol. 41 No.2
12. L. Huang “Image compression based on fuzzy technique and wavelet transform” Institute of Information & Mathematical Sciences Massey University at Albany, Auckland, New Zealand

Light Transmitting Concrete- A New Innovation

Patil Gaurao S., Patil Swapnal V.

(Student, Department of Civil Engineering, Imperial college of Engineering, Pune, India)
(Assistant Professor, Department of Civil Engineering, Imperial college of Engineering, Pune, India)

gaurav.ptl@gmail.com
swapnalpatil123@rediffmail.com

Abstract-- Building energy saving and safe evaluation for engineering structures have obtained the worldwide attention. It is much of importance for developing a new kind of building material, which can integrate green energy saving with self-sensing properties of functional material. In this paper, based on the excellent properties of light guiding and elasto-optic effect of optical fiber, a novel smart transparent concrete is researched by arranging the optical fibers into the concrete. To evaluate the effectiveness of the smart transparent concrete, the light guiding based on white light test, long-term durability based on freezing and thawing test and chloride ion penetration test, and self-sensing property based on stress elasto-optic effect test are made respectively. The experiments results show that the smart transparent concrete has good transparency, mechanical and self-sensing properties.

Keywords-- Attractive building material, Energy Saving, Fiber Bragg Grating, Green Construction Material, Plastic Optical Fiber, Smart Transparent Concrete, Structural Health Monitoring.

INTRODUCTION:

Due to economic development and space utilization requirements, high-rise buildings and skyscrapers are mostly built downtown in metropolitan areas around the world, especially countries with great populations. Those buildings are isolated biosphere only based on man-made lights to maintain people's optical activities. It is considered to be one of the best sensor materials available and has been used widely since the 1990s. Hungarian architect, Aron Losonczy, first introduced the idea of light transmitting concrete in 2001 and then successfully produced the first transparent concrete block in 2003, named LiTraCon . However his transparent concrete did not have smart sensing properties. In this paper, a smart transparent concrete - novel construction material was manufactured with POF by drilling through the cement and mortar in order to utilize the light guiding ability of POF. The main purpose was to use sunlight as a light source in order to reduce the power consumption of illumination. Additionally, experiments to study the mechanical performance of the concrete infused with POF were carried out.

LiTraCon rooms will be brightened and proximal objects situated on the brighter side of a LiTraCon wall will be revealed as silhouettes on the other side. Though the optical fibers compose only 4% of the concrete, some light is transmitted because of their parallel arrangement in a matrix between to the two outer surfaces of each block. Load-bearing structures can also be built from these blocks, since glass fibers have no negative effect on the strength of the concrete. The blocks come in various sizes and with an option of embedded heat-isolation. Since not everyone appreciates the look of exposed concrete, LitraCon is creating light-transmitting building blocks in other textures and colors as well.

PRINCIPLE:

Thousands of optical glass fibers form a matrix and run parallel to each other between the two main surfaces of each block. The fibers mingle in the concrete because of their insignificant size and they become a structural component as a kind of modest aggregate. So, the surface of can be built with these blocks and the blocks can be produced in various sizes and with embedded heat-isolation.

Litracon is a combination of optical Fiber s and fine concrete. It can be produced as prefabricated building blocks and panels. Due to the small size of the Fiber s, they blend into concrete becoming a component of the material like small pieces of aggregate. In this manner, the result is not only two materials - glass in concrete - mixed, but a third, new material, which is homogeneous in its inner structure and on its main surfaces as well.

The glass Fiber s leads light by points between the two sides of the blocks. Because of their parallel position, the light-information on the brighter side of such a wall appears unchanged on the darker side. The most interesting form of this phenomenon is probably the sharp display of shadows on the opposing side of the wall. Moreover, the color of the light also remains the same.



Fig.1 Transparent wall

This new product, then, is a combination of optical fibers and fine concrete and can be produced as building blocks or panels. The fibers blend into the concrete and become part of the material like small pieces of aggregate. You not only get two materials, glass in concrete, but a third new material, which is homogeneous in its inner structure and on its main surfaces, too.

LITERATURE REVIEW:

Research and Development of Plastic Optical Fiber Based Smart Transparent Concrete

Zhi Zhou^{1,2}, GeOu, Ying Hang, Genda Chen, Jinping Ou, School of Civil Engineering, Harbin Institute of Technology, Harbin 150090, P.R. China Center for Infrastructure Engineering Studies, Missouri Univ. of Science and Tech., Rolla, MO 65401-0710, USA School of Civil and Hydraulic Engineering, Dalian University of Technology, Dalian, 116024, P.R. China

Structural Health Monitoring (SHM), it is an architectural energy and 13% of that energy is used to power lighting. At present, green structures focus greatly on saving energy with promising technology for field applications in civil infrastructure. Due to economic development and space utilization requirements, high rise buildings and skyscrapers are mostly built downtown in metropolitan areas around the world, especially those countries with great populations. Those buildings are isolated biosphere only based on man-made lights to maintain people's optical activities. For example, China consumes 25% of global indoor thermal systems. However, in the area of illumination fields, there is very little research offering relevant solutions. Research on the intrinsic characteristics of the optical identity in construction materials is still at its infancy. Due to its outstanding light guiding and sensing advantages, such as anti-electromagnetic interference capability, small dimensions, distributed measurement and anti-corrosion characteristics, optical Fiber s have been widely adopted in the communication and sensing fields. It is considered to be one of the best sensor materials available and has been used widely since the 1990s. Hungarian architect, Aron Losonczy, first introduced the idea of light transmitting concrete in 2001 and then successfully produced the first transparent concrete block in 2003, named LiTraCon.

MATERIALS:

1. Optical Fibers-

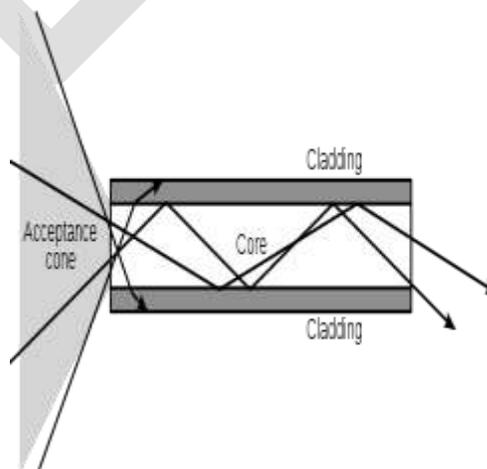


Fig 2. Total Internal Reflection

When light traveling in an optically dense medium hits a boundary at a steep angle (larger than the critical angle for the boundary), the light is completely reflected. This is called total internal reflection. This effect is used in optical fibers to confine light in the

core. Light travels through the fiber core, bouncing back and forth off the boundary between the core and cladding. Because the light must strike the boundary with an angle greater than the critical angle, only light that enters the fiber within a certain range of angles can travel down the fiber without leaking out. This range of angles is called the acceptance cone of the fiber. The size of this acceptance cone is a function of the refractive index difference between the fiber's core and cladding.

2. Translucent Stone-



Fig. 3. Translucent Stone

This naturally occurring stone is highly scissile; so this material can be worked into thinnest layers. These layers are so thin that when backlit, the light can pass through the stone and thereby generates impressive visual effects. The always unique mineral structure, the different colors and different light transmissions generates an always unique materiality, which will convince in various applications, like in interior design, in exhibition design as well as in furniture and display design.

3. Cement-

Selection of the type of cement will depend on overall requirement for the concrete such as strength and durability.

4. Fine Aggregate-

All normal concreting sands are suitable for Litracon. Both crushed and rounded sand can be used. A minimum amount of fine arising from binders and sand must be achieved to avoid segregation. Another deficiency in aggregate is poor gradation. The use of filters is suggested as means of overcoming this problem. At present, a trial and approach is used to fix the type and amount filter. Alternative, particle packing model should be used to reduce the number of experimental trials. The overall idea is to overcome local deficiencies in aggregate shape and to arrive at required packing characteristic irrespective of aggregate. In the view of an increase awareness of the same, use of manufactured sand and other alternative fine aggregate has become essential. In fact, river sand is simply not available in future years.

CHARACTERISTICS:

- Permits the passage of light through the set concrete, permitting colors, shapes and outlines to be seen through it
- Having a resistance to compression that varies from 150 MPa up to 250 MPa
- Having maximum water absorption of 0.35%.
- Having a maximum oxygen index of 25%.
- Having a thermal conductivity of 0.21 W/m °C.
- Having an elastic limit greater than 60 MPa.
- Having a Young's Modulus from 2750 MPa to 3450 MPa
- From its characteristics and composition, can be a conductor of electricity, dispensing with interior.
- From its mechanical and optical characteristics, can be used for purposes that are both architectural and aesthetic, and also structural and under conditions of service equal to and even different from those of a traditional concrete.

APPLICATIONS:

1. Illuminate Your Walls-

Galaxy Translucent Concrete can be used as building material for interior and exterior walls. If sunshine illuminates the wall structure then eastern or western placement is recommended; the rays of the rising or setting sun will hit the optical glass fibers in a lower angle and the intensity of the light will be bigger. Besides the traditional applications of a wall, the light transmitting concrete can also be used as wall covering illuminated from the back.



Fig. 4. Wall Illuminated By Litracon

2. Creative with Design-

The building units are versatile and can be used in many areas of design. You can also create a logo with colorful figures, inscriptions and pictures.



Fig.5. Creative Column

Translucent Concrete Stairs-

With Impact Lighting Inc's Linear LED fixtures our Galaxy Translucent Concrete product can be used in horizontal and vertical applications such as feature stairs, walls, flooring, tables and counter tops.



Fig.6. Translucent Concrete Stairs

ADVANTAGES:

- Translucent concrete inserts on front doors of homes, allowing the resident to see when there is a person standing outside.
- Translucent concrete walls on restaurants, clubs, and other establishments to reveal how many patrons are inside.
- Ceilings of any large office building or commercial structure incorporating translucent concrete would reduce lighting costs during daylight hours.
- Lane markers in roadways could incorporate various colors in the translucent concrete, allowing for dynamic adjustments when required by traffic fluctuations.
- Sidewalks poured with translucent concrete could be made with lighting underneath, creating lit walkways which would enhance safety, and also encourage foot travel where previously avoided at night.
- The use of translucent concrete in an outer wall of an indoor stairwell would provide illumination in a power outage, resulting in enhanced safety.
- Subways using this material could be illuminated in daylight.
- Speed bumps in parking lots and driveways could be illuminated from below, making them more visible and therefore more effective.

DISADVANTAGES:

- It is precision material and the correct procedure need to be followed.
- It is extremely important to ensure the integrity of optic strands if they break within the product property would almost be neglected.
- Costing of this material is difficult as the techniques are just start to develop.

CONCLUSION:

A smart transparent concrete is aesthetically pleasing. POF-based transparent concrete could be regarded as an art which could be used in museums and specific exhibitions rather than just a construction material. Although ease of construction is to be compromised, the material is bound to be accepted universally due to its advantages. With the concept of green technology catching up, electrical supply, being supplemented by natural sources, it becomes absolutely necessary to utilize the natural resource. Although Litracon has yet to be made available for commercial use, it has already been suggested that buildings made with the material could save electricity that would otherwise be required for daytime lighting. When light transmitting properties were examined, the test results have revealed that the produced concrete can be cut into different shapes without losing its transparent property and it can be used as architectural concrete on roofs of special buildings. Moreover, this light transmitting concrete can be utilized in the production of special types of home furniture.

REFERENCES:

- [1] Z. Zhou, J.P. Ou, and B. Wang. "Smart FRP-OFGB Bars and Their Application in Reinforced Concrete Beams". Proceedings of the First International Conference on Structural Health Monitoring and Intelligent Structure, Japan: 861~866, 2003.
- [2] F. Ansari. "Practical Implementation of Optical Fiber Sensors in Civil Structural Health Monitoring". Journal of Intelligent Material Systems and Structures, 18(8):879-889, 2007.
- [3] Inaudi D., and Glisic, B. "Development of distributed strain and temperature sensing cables", 17th International Conference on Optical Fiber Sensors. Proceedings of SPIE, 5855:222-225, 2005.
- [4] Z.S. Wu, B. Xu, K.J. Hayashi, et al. "Distributed Optic Fiber Sensing for A Full-scale PC Girder Strengthened with Prestressed PBO Sheets", Engineering Structures, 28:1049-1059, 2006
- [5] Kalymnios, D. "Plastic Optical Fibers (POF) in sensing – current status and prospects", 17th International Conference on Optical Fiber Sensors SPIE, 5855, 2005.
- [6] T. Kurashima, T. Usu, K. Tanaka, et al. Application of fiber optic distributed sensor for strain measurement in civil engineering. SPIE, 3241: 247~258, 1997.
- [7] Y.Q.Liu, C.F. Ge, D.H. Zhao, et al. High-Sensitivity Long-Period Fiber Grating Temperature Sensor Based on Intensity Measurement. SPIE, 3740:492~495, 1999.
- [8] K.S.C. Kuang, M. Maalej, S.T. Quek. Hybrid optical fiber sensor system based on fiber Bragg gratings and plastic optical fibers for health monitoring of engineering structures. Proc. of SPIE, 6174(61742P) : 1-12, 2006.
- [9] C. Vázquez, A.B. Gonzalo, S. Vargas and J. Montalvo. Multi-sensor system using plastic optical fibers for intrinsically safe level measurements. Sensors and Actuators, 116:22-32, 2004.
- [10] Victoria Bailey, "Translucent Concrete", MEEN 3344-001

- [11] Scherafe, T. “fabric Structure outpaces applications: Recent structural developments expand the range of fabric options”, Building design and construction, pp.128-138, 1988.
- [12] D.D.L. Chung. Cement reinforced with short carbon fibers: a multifunctional material. Composites: Part B.31:511-526, 2000

IJERGS

Analysis of Super-Finishing Honing Operation with Old and New Plateau Honing Machine Concept

Aniket Kishor Deshpande , Harshal Anil Bhole, Laxman Ashok Choudhari

Dept. of Mechanical ,Dr. D.Y Patil College of Engineering, Ambi.

Affiliated to University of Pune.

Emails: aniket.aniketdeshpande@gmail.com

Contact: 9028404390

Abstract: In this paper, an attempt was made to study the dependencies between average and maximum roughness in relation to long-stroke honing to different abrasive grain size tools and honing speeds using old and new plateau honing concept. A study to investigate the effect of cylinder liner honing angle on hydrodynamic lubrication between piston ring and cylinder liner. Honing angles between 25-75° were investigated to find the effect of honing angle on film thickness. The plateau-honing is an ultra-finishing process as a result of two machining processes: rough honing with big size abrasive grains and finish honing with very small size abrasive grains to eliminate peaks on the surface of the piece. It is a very complex process depending on many parameters.

Keywords: Plateau Honing, Honing Angles, Piston Ring, Cylinder Liner, Crankshaft honing

1. Introduction:

Typically a machining process known as honing is used to apply the desired finish to the cylinder liner surface. The grooves that the honing process leaves behind are crucial in controlling the amount of oil available in the contact, by both retaining oil on the liner surface and improving the distribution of oil. Another function of the honing texture is to allow wear debris, generated during boundary lubrication around TDC, to be channeled away from the conjunction so as to cause only minimal damage and scratching to the smooth plateau which are crucial for fluid film generation. In this study the effect of applying the honing to hydrodynamic lubrication is investigated.

Very few studies have investigated the effect of honing parameters, and in particular honing angle, on lubrication performance. Therefore this may be an area that has great potential for optimization, and changing a parameter such as honing angle should not add any significant costs to cylinder liner manufacture.

1.1 Honing technology:

Honing is a precision stock removal process for practically all raw materials. The main application is the machining of bores, but it can also be used for plane surfaces, waves or untrue bores. The goal is improving size and shape, or rather, optimizing the tribological characteristics. This means defined surface properties which arise during friction processes, such as in bearings, engines, transmissions and machine elements. With honing, bore accuracy of less than 1 µm diameter tolerance and surface accuracy of less than 0.04 µm are achieved. As a comparison,

a human hair has a diameter of about 60 µm, and a paper clip is about 1,000 µm. Compared to other processes such as internal grinding, honing is not only easier, faster and more cost-effective, it is also more precise.



1.2 Plateau Honing:

One way to obtain this roughness profile is the mechanical process of plateau-honing. It consists of a rough honing with big size abrasive grains followed by a finish honing with very small size abrasive grains until peaks on the surface of the piece have been partially eliminated (fig. 1).

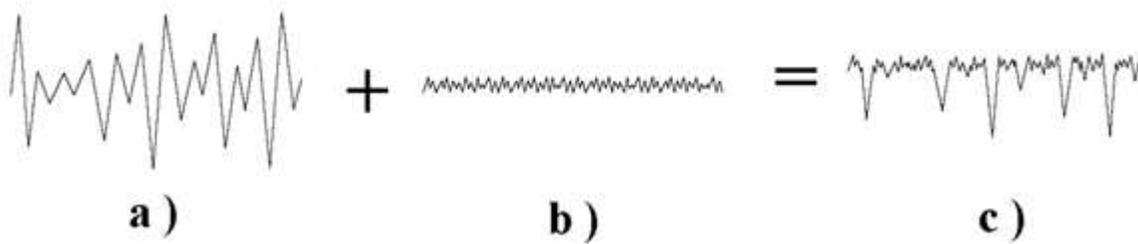


Figure 1. Roughness Profile: a). Rough, b). Plateau, c). Plateau-Honing.

2. Honing Surface Parameters:

2.1 Surface Roughness:

To characterize surface roughness, the following average roughness heights parameters are used Ra , Rz , and the Abbott firestone curve. But these parameters depend on the characteristics of the two machining processes and, therefore, they are not suitable for planning or controlling each of them separately (Fig. 2).

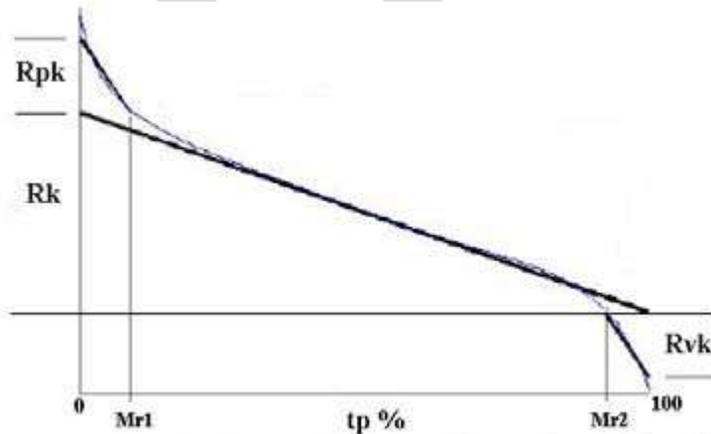


Figure 2. Abbott-Firestone Curve and parameters.

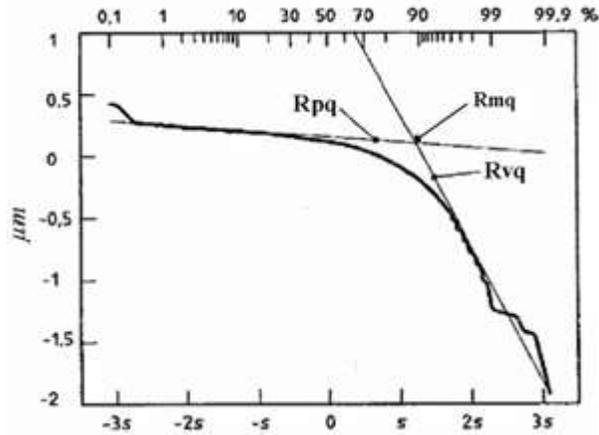


Figure 3. Curve Material probability curve and parameters.

A large number of procedures and parameters have been investigated for a better characterization of roughness. Those with the probability curve defined by the standard ISO 13565-3 stand out among those that offer a better capacity of correlation with each roughing and finishing processes (fig. 3).

Supposing a Gaussian behaviour of the heights of roughness on a honed surface, given that the Abbott material curve is a form of representation of the accumulated probability, this curve represented by semi-logarithmic axis is a straight line: heights in ordinates and standard deviation in abscissas, or what is the same, heights in ordinates and the logarithm of the percentage of material in abscissas. The slope of the line corresponds to the quadratic average roughness R_q of the roughness profile (fig. 3).

In the plateau-honing, result of two honing processes, the probability curve will be formed by two straight lines, each one with the R_q of the corresponding roughness profile (fig. 4).

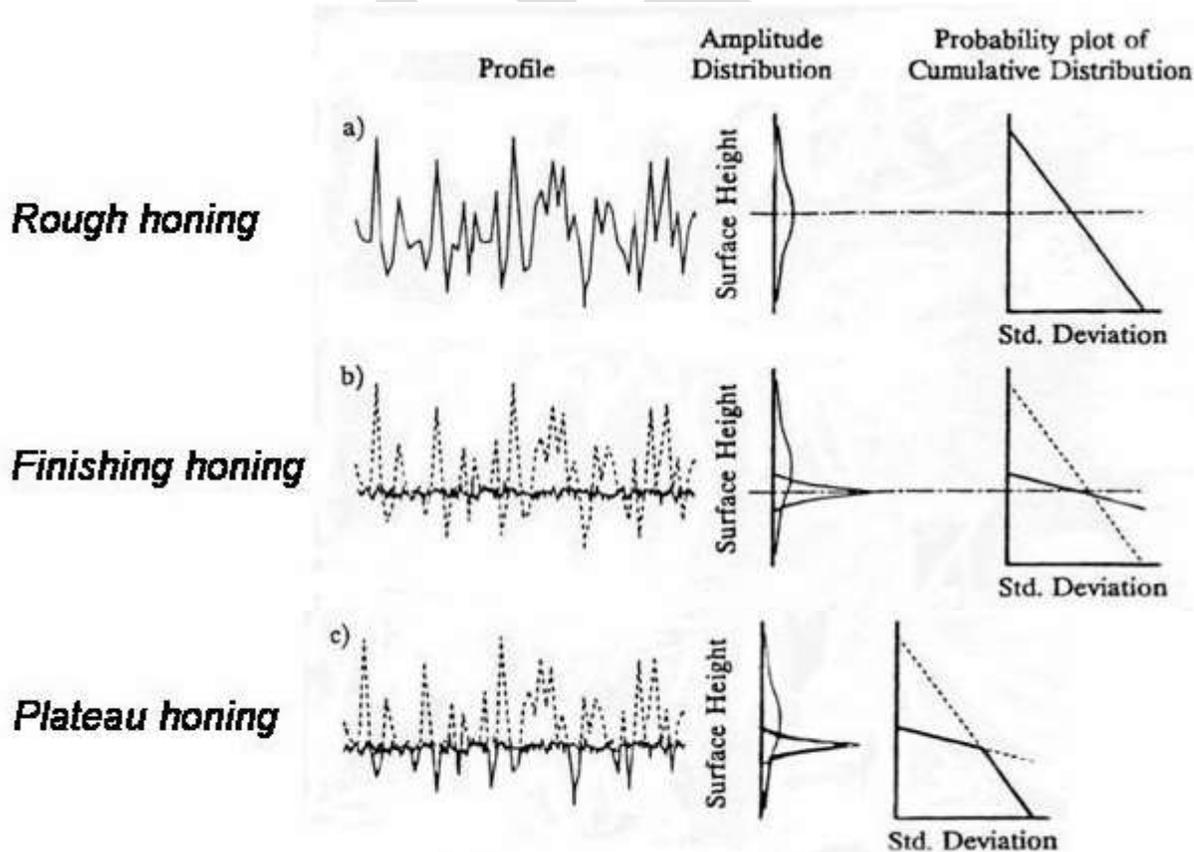


Figure 4. Combination of processes of honing.

Using the probability curve, the surface roughness is defined by three parameters:

- *Rpq*: Quadratic average roughness of the finish honing
- *Rvq*: Quadratic average roughness of the rough honing
- *Rmq*: Percentage of material eliminated by the finishing process

Using these parameters, it is possible to control each process separately. For this, it is necessary to relate roughness parameters with the variables that characterize the tools and working conditions for each honing process.

2.2 Lubrication:

Plateau honing is a process that improves cylinder wall surface finish by removing tiny peaks of torn or folded material and increasing bearing area. This type of finish allows lubricant to collect in the remaining valleys, improving lubrication control and retention. It also extends the life of components such as piston rings and seals because there are no peaks of material for them to remove during initial break-in. This reduces the time it takes to seat a new set of rings as well as initial ring wear, blow by and oil consumption. The engine delivers good compression right away, there is no blue smoke in the exhaust, emissions and oil consumption are reduced, and the rings last longer because they have not had to wear to conform to the bores. A plateau bore surface also provides increased bearing area to support the rings while retaining enough depth in the crosshatch for good oil retention and lubrication.

3. Relation Of These Surface Parameters With Pollution Norms:

To ensure reliable performance and prolonged service life of products, its components require to be manufactured not only with high dimensional and geometrical accuracy but also with high surface finish. The surface finish has a vital role in influencing functional characteristics like wear resistance, fatigue strength, corrosion resistance and power loss due to friction. In case of auto components, surface parameters become more and more stringent to meet the norms in terms of noise levels, pollution, etc. necessitating closer control of surface integrity. Significant progress has been made, in recent years, in wide varieties of surface-finishing technologies including micro finishing, honing, lapping and Burnishing. Since, each process is designed to generate a particular geometrical surface and to correct specific irregularities, selection of a right kind of finishing process is very important to achieve the potential benefits.

Surface Improvements (India) Limited, in association with Nagel, Germany and Nagel, India have been able to successfully establish plateau honing parameters in a wide range of IC engine cylinders, mostly cast iron. This is particularly important in view of the strict pollution control norms in automobiles. Appropriate use of conventional or diamond rough honing followed by the right grades of base and plateau honing combination has yielded excellent results. This has brought a new level of achievement in critical surface finish and geometry parameters, so important to meet Euro norms. It is well known that achieving the correct grade of plateau honing brings in the twin benefits of both vastly reduced oil consumption and more importantly vastly reduced harmful emission. This makes conformity with Euro norms and easier tasks.

3.1 Basic norms for heavy duty commercial engines:

Deterioration Factor

i) Vehicle manufacture may opt for fixed deterioration factor

Engine Type	Test Cycle	CO	HC	NMHC	CH4	NOx	PM
Diesel Engine	ESC	1.1	1.05	---	---	1.05	1.1
Diesel Engine	ETC	1.1	1.05	---	---	1.05	1.1
CNG,LPG or Gaseous fuelled engine	ETC	1.1	1.05	1.2	1.2	1.05	---

ii) Alternatively, vehicle manufacture may opt for evaluation of deterioration factor by minimum service accumulation period

Category of vehicle	Min. service accumulation period in km
Category N1 vehicles	100000
Category N2 vehicles	125000
Category N3 vehicles with GVW ≤ 18000kg	125000
Category N3 vehicles with GVW > 18000kg	167000
Category M2 vehicles	100000
Category M3 vehicles with GVW ≤ 7500kg	125000
Category M3 vehicles with GVW > 7500kg	167000

Heavy Duty Vehicles (GVW>3500 kg) Emission Regulation History

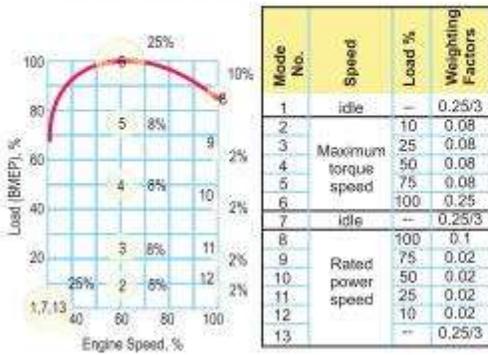
	Effective date	CO (g/kWh)	THC (g/kWh)	NOx (g/kWh)	PM (g/kWh) ^d	Free accl. smoke (m-)	Remarks
Diesel, CNG or LPG Engines	1.4.1991 -1.4.1992 (1991 -1992 Norms)	14.00	3.50	18.00	NA	2.45	Exhaust gas opacity standard was effective from 01.04.1991
	1.4.1996 (1996 Norms)	11.20	2.40	14.40	NA	2.45	
	1.4.2000 (BS II)	4.50	1.10	8.00	0.36 ^a	2.45	For diesel vehicles with GVW >3500
		4.50	1.10	8.00	0.36 ^a 0.81 ^d		For diesel vehicles with GVW ≤ 3500
	24.10.01 in NC Territory of Delhi (BS-II)	4.00	1.10	7.00	0.15	2.45	For diesel vehicles with GVW >3500 & For diesel vehicles with GVW ≤ 3500

a- For engines with power exceeding or not exceeding 85 kw.
 b- For engines with power exceeding 85 kw.

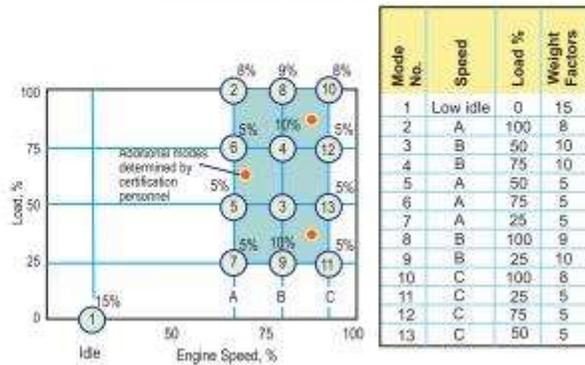
c- For engines with power equal to or less than 85 kw.
 d- Only for Diesel engines

TEST CYCLES

Indian 13 Mode Emission Cycle (BS-I & BS-II)

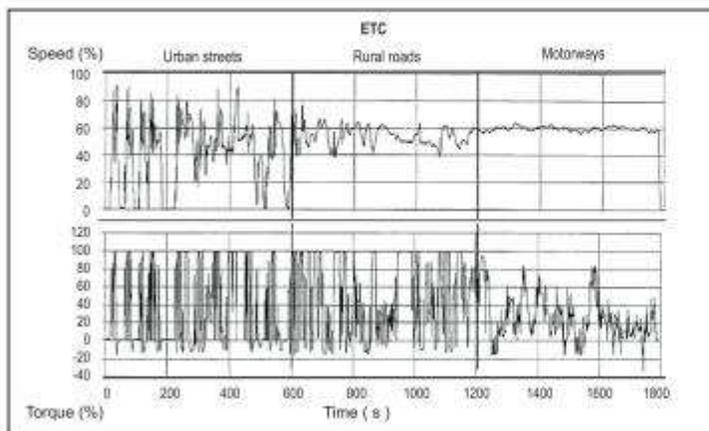


Engine Steady state cycle (ESC) (BSIII & BSIV)

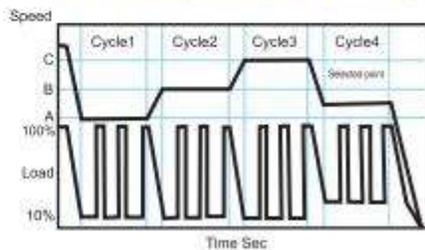


Engine Transient Cycle (ETC) (BS - III & BS - IV)

ETC Dynamometer Schedule



ELR Test Sequence (BS - III & BS - IV)



IV) EMISSION STANDARDS FOR CNG & LPG DRIVEN VEHICLES

- i) Mass emission standards for vehicles when operating on CNG shall be same as are applicable for gasoline vehicles with the exception that HC shall be replaced by NMHC, where $NMHC = 0.3 \times HC$
- ii) Mass emission standards for vehicles when operating on LPG shall be same as are applicable for gasoline vehicles with the exception that HC shall be replaced by RHC, where $RHC = 0.5 \times HC$
- iii) Crank case emission and SHED test are not applicable in CNG/LPG mode.
- iv) Applicable emission norms for CNG & LPG driven vehicle

Category	Applicable Emission Norms
OE CNG/ LPG Category M and Category N Vehicles with GVW=3500kg, 3 wheelers and 2 wheelers	Prevailing gasoline norms *
CNG/LPG Category M and Category N Vehicles with GVW= 3500kg, 3 wheelers and 2 wheelers retro fitment from Gasoline	Prevailing gasoline norms
CNG/LPG Category M and Category N Vehicles with GVW= 3500kg, 3 wheelers and 2 wheelers retro fitment from Diesel	Prevailing diesel norms**
CNG/LPG Category M and Category N Vehicles with GVW > 3500kg, manufactured upto 1st April 2010	Prevailing diesel engine norms based on 13-mode steady-state engine dynamometer test or 13 -mode Engine steady state cycle as applicable **
CNG/LPG Category M and Category N Vehicles with GVW > 3500kg, manufactured on and from 1st April 2010	Prevailing diesel engine norms **

* - Vehicle having option for bi-fuel operation and fitted with limp-home gasoline tank of capacity not exceeding 2 liters, 3 liters and 5 liters respectively on 2W, 3W and 4W are exempted from emission test, crankcase emission test and SHED test in gasoline mode.

** - PM limit is not applicable

4. Applications:

- Critical surface finish and geometry parameters.
- Vital importance in reaching the euro norms.
- Prolonged service life of products.

5. New Machine Concept

Presently the honing for cylinder bores is carried out on Nagel Cylinder bore honing machine, where there are three spindles for rough, finish honing and brushing. Here the spindles are fixed and cylinder block is moving.

Crankshaft honing is carried out on a Nagel horizontal ream honing machine. Fixed diameter reamer is passed through the crankshaft bearing caps to achieve the required surface finish.

These two operations are carried out on separate machines and hence they occupy more space, more energy is consumed and also prolonged processing time.

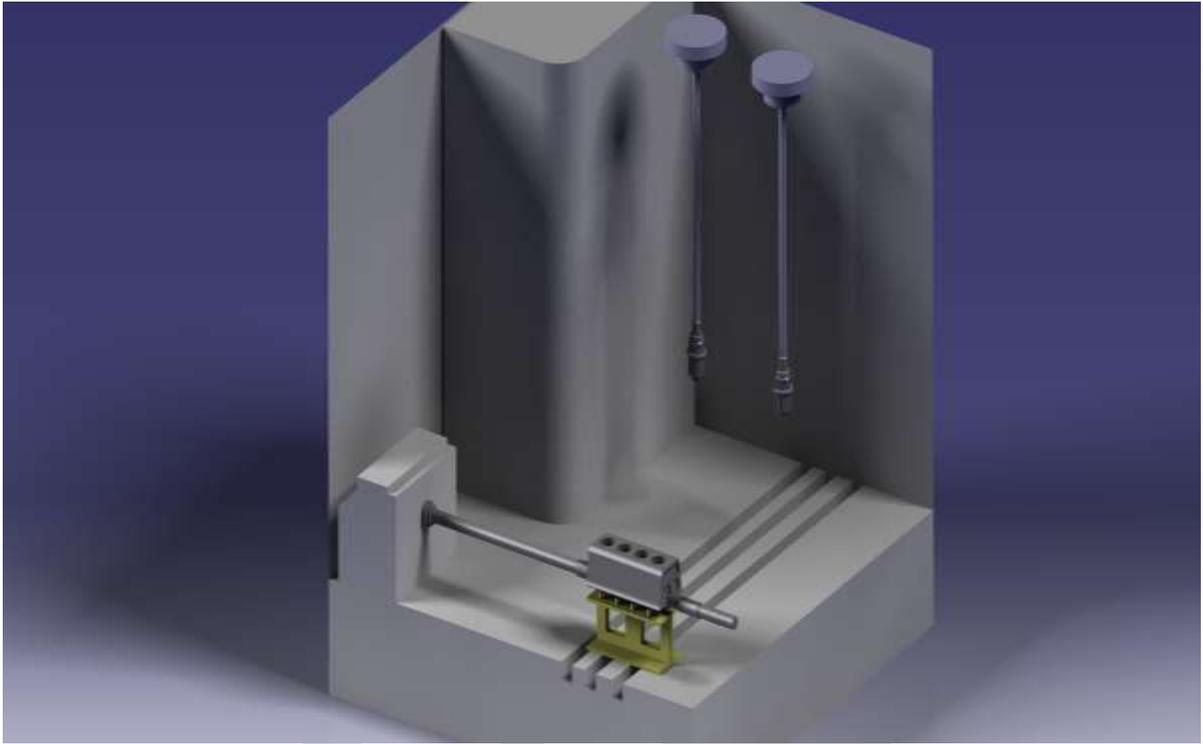
Our suggestion:

Due to these incurred drawbacks we suggest the use of new machine in which is introduced by Nagel itself, which includes a combination of these operations on a single CNC machine i.e. cylinder honing and crankshaft ream honing.

Advantages of new machine:

- Time required for processing both these operations is reduced up to 50%.
- Machine space required will be reduced.
- It is well operated by single operator whereas earlier two operators were required.
- Easy to maintain.
- Reduction in handling damages.
- Total cost required is been reduced due to single controller for both operations.
- Consumption of cutting oil/hydraulic oil/lubricating oil will be reduced.

Catia Model of New Machine



6. Conclusion:

The presented analysis allows obtaining the parameters for the plateau-honing process from the parameters of the corresponding rough and finishing honing processes eventually reaching the required euro norms.

REFERENCES:

- [1] 10th International Research/Expert Conference "Trends in the Development of Machinery and Associated Technology" TMT 2006, Barcelona-Lloret de Mar, Spain, September 11-15
- [2] Ueda, T., Yamamoto, A., An analytical investigation of the honing mechanics, ASME Journal of Engineering for Industry Vol. 106 (1984) p. 237-41.
- [3] Coba M., Ferre R., Vivancos J., Gonzalez H., Characterization of hydraulic cylinder surface generated by honing and plateau-honing superfinish methods, 9th Int. Research/Expert Conf. TMT'05, Antalya, Turkey, 2005.
- [4] MC. Malburg, J. Raja, DJ. Whitehouse, Characterization of Surface Texture Generated by Plateau Honing Process, CIRP Annals - Manufacturing Technology, 42 (1993) pp. 637-639.
- [5] D. Vrac, L. Sidjanin and D. Milikic: The Influence of Honing Regime on Quality of Surface Finished by Honing, Proceedings of XXXII Conference on production engineering with foreign participants, Novi Sad, Serbia (2008) pp. 117-120

Secured Reversible Data Hiding in Encrypted Images by Using Multi Level Data Encryption

Sabeena Shukkoor, Yasim Khan M

Department of Electronics and Communication
College of Engineering Poonjar, CUSAT
Kottayam, India
sabeenashukkoor@gmail.com

Abstract— Now a days, more attention is paid to reversible data hiding (RDH) in encrypted images, since it maintains the important property that the original cover can be losslessly recovered after embedded data is extracted while protecting the image content's properly. All the existing methods embed data by reversibly vacating room from the encrypted images, which may be subject to some errors on data extraction and/or image recovery. This paper presents a novel method by reserving room before encryption with a traditional RDH algorithm which makes much easier for the data hider to reversibly embed data in the encrypted image. This method achieve the property of real reversibility, which means data extraction and image recovery are free of errors. The proposed method also uses an additional data encryption key for improving the security. Experiments show that this novel method can embed more than 10 times as large payloads for the same image quality as the previous methods.

Keywords—Image encryption, Reversible data hiding, Privacy protection, Histogram shift, Additional data encryption, Reserving room before encryption, Peak signal to noise ratio.

INTRODUCTION

Reversible data hiding (RDH) and Non reversible data hiding are the two different data hiding techniques used. In RDH, the original image is recovered with out any loss after extracting the embedded data where as in Non-reversible data hiding once the image is distorted it cannot be reconstructed back. RDH is used where the image and the data have equal importance. This technique is widely used in medical imaging, military purpose, law forensics etc, where distortion of the original cover is not allowed. The term data hiding comes from the word Steganography, which is the art of hiding secret data into a carrier to convey secret messages confidentially. Digital images are used as carriers. The original image is the cover image and the image up on which data is embedded is known as stego image. Some distortions may occur in the stego image due to data embedding and these distortions are known as embedding distortions. A good embedding algorithm creates only less embedding distortions.

In Providing secrecy for images, encryption [1] is an effective and popular means since it converts the original and meaningful content to incomprehensible one. Some promising applications can be generated if RDH can be applied to encrypted images. If the data base of a medical image is stored in a data center, these datas can be embedded into the encrypted version of a medical image via RDH technique by using a server. The server [2] can manage the image or verify its integrity by using the notations without having the knowledge of the original content. Here actually patient's privacy is being protected. At the same time, a doctor can decrypt and restore the image for further diagnosing by using the same encryption key.

Many RDH techniques are available now a days based on lossless compression such as histogram modification [3], difference expansion (DE) [4] etc. Among these, histogram based techniques are commonly used. The histogram is modified using .Histogram based methods so that the secret data can be embedded in to the modified histogram. In [5], Ni et al proposed histogram based method in which data is embedded in to the image based on zero/peak pixel value. This method is simple and utilizes short execution time. This technique also have high stego image quality, but embedding capacity is low. This algorithm does not work if the image is having a flat histogram. It also has overflow or underflow problem.

The objective of the proposed method is to develop an RDH scheme with increased security. In order to increase the security an additional data encryption is introduced in the proposed technique.

The rest of this paper is organized as follows. The previous methods of reversible data hiding is explained in section 2, proposed method of data hiding is described in section 3, experimental and theoretical analysis is presented in section 4, and finally conclusions in section 5.

PREVIOUS METHOD

The methods proposed in [6]-[8] can be summarized into the framework, vacating room after encryption (VRAE). In this framework, a content owner encrypts the original image using a standard cipher with an encryption key. After the encrypted image is produced, the content owner hands over it to a data hider and the data hider can embed some additional data into the encrypted image by losslessly vacating some room according to a data hiding key. Then a receiver, sometimes the content owner himself or an authorized third party can extract the embedded data with the data hiding key and then recover the original image from the encrypted version according to the encryption key. This method is illustrated in Figure 1(a).

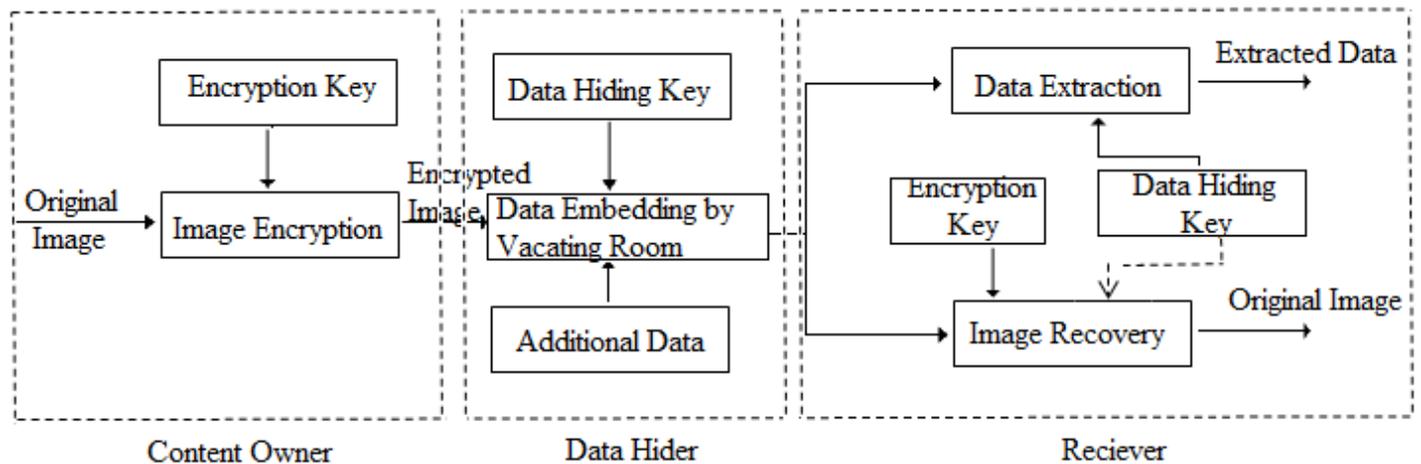


Figure 1(a): Framework of Vacating Room After Encryption

The methods in [6]–[8], encrypts every bit-planes with a stream Cipher, the encrypted 8-bit gray-scale images are generated. The method in [6] segments the encrypted image into a number of non-overlapping blocks sized by $a \times a$; and each block is used to carry one additional bit. The pixels are pseudo-randomly divided into two sets S_1 and S_2 in each block according to a data hiding key. If the extra bit to be embedded is 0, flip 3 LSBs of each encrypted pixel in S_1 , otherwise flip the 3 encrypted LSBs of pixels in S_2 . For data extraction and image recovery, the receiver flips all 3 LSBs of pixels in S_2 to form a newly decrypted block, and flips all the 3 LSBs of pixels in S_1 to form another new block; one of them will be decrypted to the original block. The original block is assumed to be smoother than interfered block and the embedded bit can be extracted. There is a risk in the bit extraction and image recovery when divided block is relatively small (e.g., $a = 8$) or has much fine-detailed textures.

Hong *et al.* [7] reduced the error rate of Zhang’s method [6] by fully exploiting the pixels in calculating the smoothness of each block. The extraction and recovery of blocks are performed according to the descending order of the absolute smoothness difference between two candidate blocks and recovered blocks can further be used to evaluate the smoothness of unrecovered blocks.

PROPOSED METHOD

In the proposed method the order of creating space for data embedding and encryption is reversed. i.e., space to embed data is reserved prior to image encryption and using some RDH technique data is embedded into these specified areas. This method is known as “reserving room before encryption (RRBE)” [9] scheme.

In the proposed framework, reserving room before encryption (RRBE), the content owner first reserve some space on original image and then convert the image into its encrypted version with the encryption key. The data embedding process in encrypted images is reversible, so the data hider only needs to accommodate data into the extra space created. The data extraction and image recovery are free of errors [15], which identical to that of Framework VRAE. The ideal operator for reserving room before encryption are standard RDH algorithms and can be easily applied to Framework RRBE to achieve better performance when compared with Framework VRAE. Due to this new framework, the redundant image content is losslessly compressed and then encrypts it with respect to protecting privacy and is illustrated in Figure 1(b).

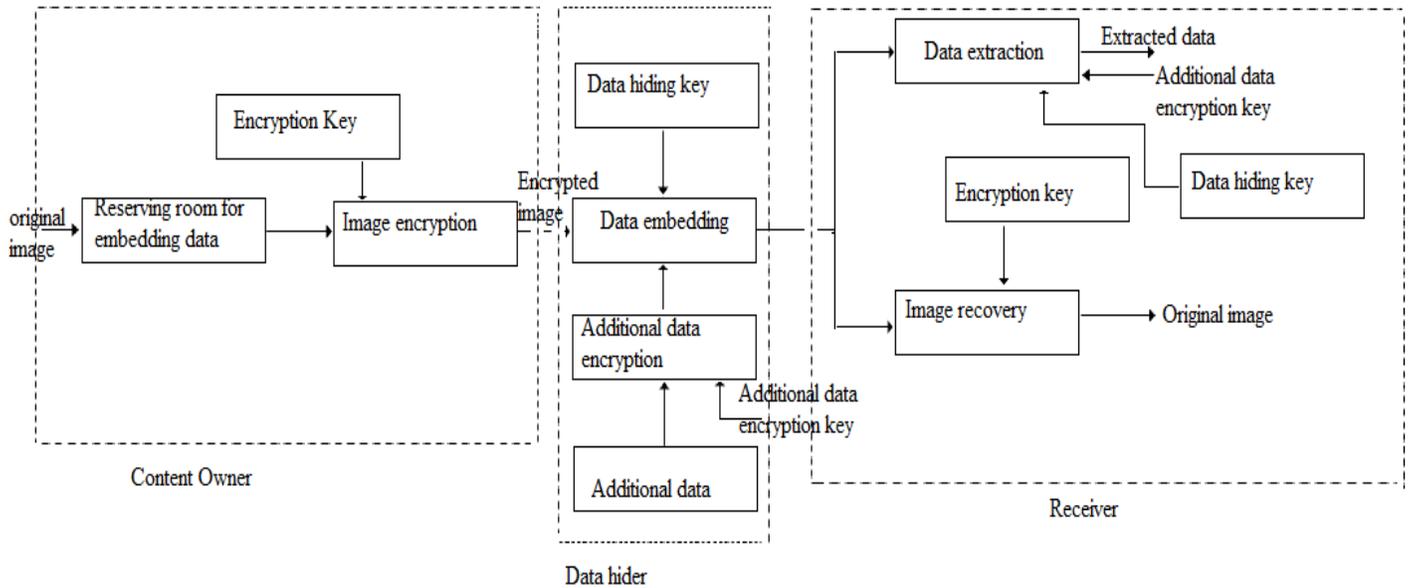


Figure 1(b): Reserving Room Before Encryption with additional data encryption

The proposed method is of four stages:

- Generation of encrypted image
- Additional data Encryption
- Encrypted Data hiding in encrypted image
- Data extraction and Image recovery

A. Generation of Encrypted Images

An encrypted image can be generated using 3 steps : Image partition, Self reversible embedding and Image encryption.

1. Image Partition

The goal of this step is to divide the image into two parts say, A and B using a smoothness function so that a smoother area B is constructed on which standard RDH algorithm [10], [11] can achieve better performance. Consider an original image I of size $M \times N$ and pixel $C_{i,j} \in [0,255], 1 \leq i \leq M, 1 \leq j \leq N$. At first the size of to be embedded message is calculated and denoted as I. The original image is divided into several overlapping blocks along the rows, whose number is determined by I. Each block having m blocks, where $m = \lfloor l/N \rfloor$ and the number of blocks can be calculated by $n = M - m + 1$. Each block is overlapped by the previous block. A function f is defined to measure the smoothness of each block.

$$f = \sum_{u=2}^m \sum_{v=2}^{N-1} \left| C_{u,v} - \frac{C_{u-1,v} + C_{u+1,v} + C_{u,v-1} + C_{u,v+1}}{4} \right| \quad (1)$$

Block containing higher value of f will be the more complex textured area. The content owner selects the particular block with the highest f to be A, and puts in front of the image which is concatenated by rest part which is considered as B with fewer textured area, shown in Figure 2.

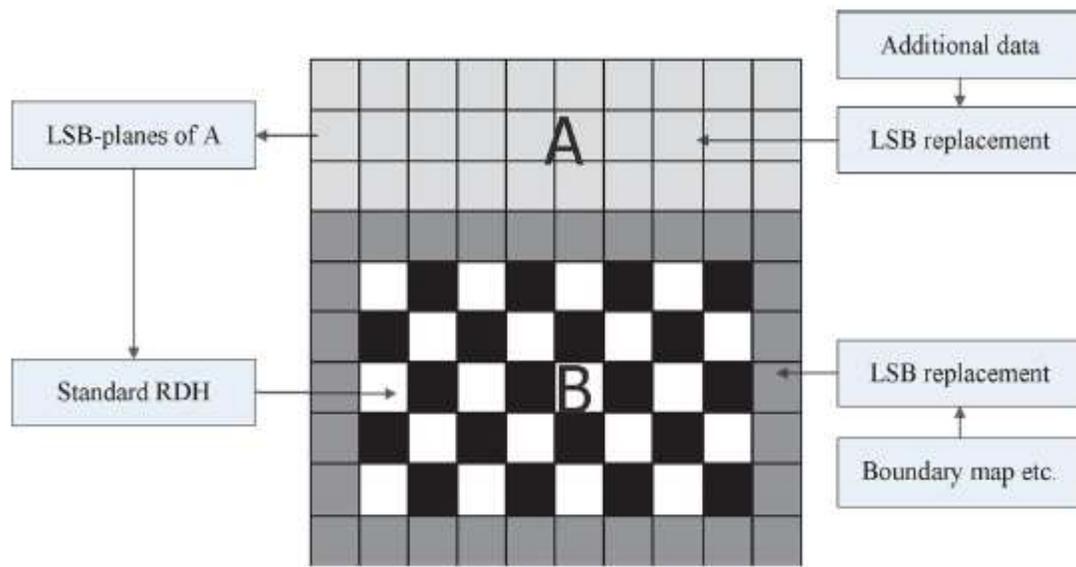


Figure 2: Illustration of image partition and embedding process

2. Self-Reversible Embedding

The main goal of this step is to embed the LSB planes of A into B using any of the RDH algorithm. Interpolation method is one of the commonly used RDH algorithm used in this paper. Pixels in part B are divided into 2 sets: white and black pixels. White pixels are those whose indices satisfy $(i + j) \bmod 2 = 0$ and black pixels are $(i + j) \bmod 2 = 1$. Then each value of white pixel is estimated by interpolation value obtained with four black pixels surrounding it using the equation given below:

$$B'_{i,j} = w_1 B_{i-1,j} + w_2 B_{i+1,j} + w_3 B_{i,j-1} + w_4 B_{i,j+1} \quad (2)$$

where the weight $w_i, 1 \leq i \leq 4$, is determined in the same way proposed in [10]. The estimating error is calculated by, $e_{i,j} = B_{i,j} - B'_{i,j}$ and then the data are embedded into estimating error sequence using histogram shift. After calculating all the values of white pixels the estimating error of black pixels are also calculated using modified white pixels and data are embedded into estimated error sequence of white pixels. If more data have to be embedded multilayer embedding can be used. In order to embed messages for every single layered embedding two estimating error sequence are required. By using bidirectional histogram shift, the messages are embedded into the error sequence, ie, the estimated error histogram is divided into two, right and left. The highest point in each part is denoted as RM and LM and the zero point in each part denoted as RN and LN. For ideal images $RM = 0$ and $LN = -1$. To embed messages into RM all values between $RM+1$ and $RN-1$ are shifted towards right by one. The embedding process in the left part is similar, but the shifting direction is left.

The overflow/underflow problem in this method is eliminated by embedding data only on those pixels whose values ranges between 1 and 254. Problem occurs when non-boundary pixels such as 1 is changed to 0 or 254 to 255. These newly generated boundary pixels are known as pseudo boundary pixels. So a boundary map is maintained to identify whether the boundary pixels are pseudo or natural. A binary sequence bit "0" is used to denote natural boundary pixel and "1" for pseudo boundary pixel. The marginal area can be selected to embed boundary map. The parameters such as RN, LN, RM, LM, payload, start row, end row of A in original image are embedded into marginal area.

3. Image Encryption

Image Encryption can be done using any encryption algorithm. After rearranged self-embedded image denoted by X, is generated, we can encrypt X to construct the encrypted image, denoted by E. By using a stream cipher, the encryption version of X can be obtained. For example, a gray value $X_{i,j}$ ranging from 0 to 255 can be represented by 8 bits, $X_{i,j}(0) X_{i,j}(1), \dots, X_{i,j}(7)$ such that,

$$X_{i,j}(k) = \left\lfloor \frac{X_{i,j}}{2^k} \right\rfloor \bmod 2, \quad k = 0, 1, \dots, 7 \quad (3)$$

The encrypted bits $E_{i,j}(k)$ can be calculated through exclusive-or operation

$$E_{i,j}(k) = X_{i,j}(k) \oplus r_{i,j}(k), \quad (4)$$

where $r_{i,j}(k)$ is generated via a standard stream cipher determined by the encryption key. Finally, we embed 10 bits information into LSBs of first 10 pixels in encrypted version of A to tell the data hider the number of rows and the number of bit-planes he can embed information into. It is important that after image encryption, the data hider or a third party can not access the content of original image without the encryption key, thus privacy of the content owner being protected.

B. Additional Data Encryption

After encryption the encrypted image X is sent to the data hider. The data hider does not have any access to the real image. The main goal of additional data encryption is to improve the security of the secret/additional data, before embedding it to the encrypted image. Additional data encryption is done with the help of an additional data encryption key. In the receiver section, only the person having this additional data encryption key can retrieve the secret data. This provides higher security to the secret data. Anyone who does not possess the additional data encryption key could not extract the additional data. The simple XOR cipher is the encryption algorithm used for performing the additional data encryption and it operates according to the principles given below:

$$\begin{aligned} A \oplus 0 &= A, \\ A \oplus A &= 0, \\ (A \oplus B) \oplus C &= A \oplus (B \oplus C), \\ (B \oplus A) \oplus A &= B \oplus 0 = B, \end{aligned}$$

where \oplus denotes the exclusive disjunction (XOR) operation. This operation is sometimes called modulus 2 addition (or subtraction, which is identical). With this logic, a string of text can be encrypted by applying the bitwise XOR operator to every character using a given key. To decrypt the output, merely reapplying the XOR function with the key will remove the cipher.

The XOR operator is extremely common as a component in more complex ciphers. Its primary merit is that it is simple to implement, and that the XOR operation is computationally inexpensive. If the key is random and is at least as long as the message, the XOR cipher is much more secure than when there is key repetition within a message[18][19]. When the keystream is generated by a pseudo-random number generator, the result is a stream cipher. With a key that is truly random, the result is a one-time pad, which is unbreakable even in theory.

C. Encrypted Data Hiding in Encrypted Image

After encryption the encrypted data is embedded into the encrypted image. In the encrypted image, the region up on which data to be embedded are already identified and taken into front which is denoted as A_E . After knowing how many bit-planes and rows of pixels he can modify, the data hider simply adopts LSB replacement to substitute the available bit-planes with additional encrypted data. Anyone who does not possess the data hiding key could not extract the additional data.

D. Data Extraction and Image Recovery

Data extraction is the process reverse to data embedding and image decryption is the process reverse to image encryption. If the receiver having the keys i.e. image encryption key and additional data encryption key and data hiding key, he can decrypt the image and extract the data[10][11]. If he has only encryption key he can only decrypt the image, he can't extract the data. If he is having only data hiding key he can extract the data, but cannot decrypt the image. If he is having only additional data encryption key he can only extract the encrypted data but cannot decrypt the data without data hiding key (since using multi data encryption) and also cannot decrypt the image.

EXPERIMENTS AND RESULTS

In this section, the simulation results and testing of performance of the proposed scheme by the additional data encryption and additional data encryption key analyses are presented. All the experiments have been performed on a personal computer with a 2.4 GHz Intel Core2 i3 processor, 2G memory and 250 GB hard disk with a Windows 7 operating system. The proposed method has been tested on standard publically available images such as Lena, Airplane, Barbara, Peppers and Boat and each image is of size 512 x 512.

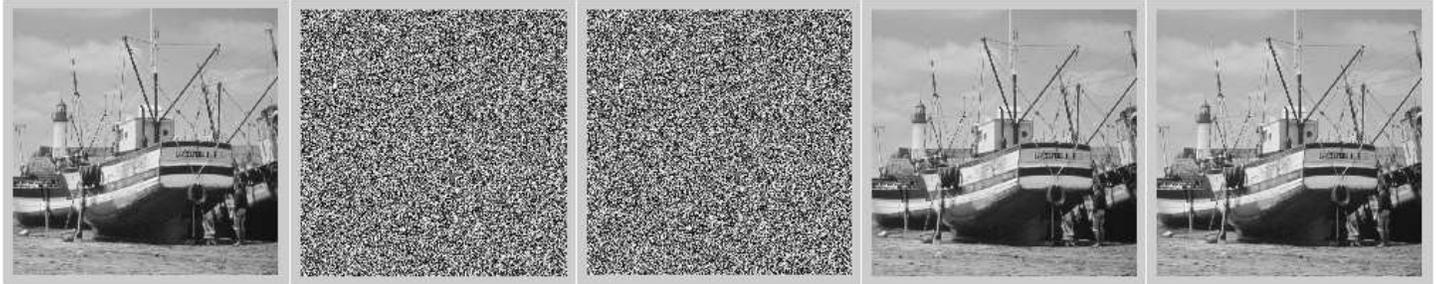


Figure 3: (a) Original Image, (b) Encrypted Image, (c) Encrypted Data, (d) Decrypted Image, (e) Recovered Image

Implementation Issues

The peak signal-to-noise ratio (PSNR) is the objective criteria to find out the quality of the images after decryption. PSNR is the ratio between a signal's maximum power and the power of the signal's noise. Each picture element (pixel) may get changed when an image is modified. Logically, a higher value of PSNR is good because it means that the signal to noise ratio is higher. Signals can have a wide dynamic range, so PSNR is usually expressed in decibels, which is a logarithmic scale. PSNR values of the test images [12] are recorded and evaluated in order to check the quality of images and to check the efficiency of the proposed algorithm. To achieve high PSNR the following measures have to be taken.

a) Boundary Map

Boundary map is used to distinguish between natural and pseudo boundary pixels. Its size is a criteria to the applicability of the proposed approach. In most cases no boundary map is needed. Table 1 shows the boundary map size of the five standard images. The marginal area of the image must be large enough to record the boundary map. From Table 1 we can find that the images Lena, Airplane, Barbara and Boat are not using any boundary map for various embedding rates. But in the case of pepper image, up to an embedding rate of 0.4 bpp it can hold boundary map. Beyond that embedding rate for pepper, it does not have enough marginal pixels to hold boundary map. So embedding data in image pepper beyond 0.4 bpp is not possible in 1-LSB plane.

Boundary map size (bits)

Embedding rate (bpp)	0.005	0.01	0.05	0.1	0.2	0.3	0.4	0.5
Lena	0	0	0	0	0	0	0	0
Airplane	0	0	0	0	0	0	0	0
Barbara	0	0	0	0	0	0	0	0
Baboon	0	0	0	0	0	2	18	109
Peppers	0	1	43	92	291	797	1741	-----
Boat	0	0	0	0	0	0	0	0

Table 1: Length of boundary map under various embedding rates.

b) Choice of LSB Plane Number

According to the proposed algorithm at first the image is divided into two parts A and B. The size of A is determined by the size of the message to be embedded and also by the number of LSB planes reversibly embedded in B. The choice of multiple LSB planes increases the size of B with an increase in embedding capacity. Table 2 shows the PSNR comparison between three different choices of LSB planes for five test images under various embedding rates measured by bits per pixel (bpp). From Table 2 we can find that single LSB plane is better at a low embedding rate of less than 0.2 bpp. For an embedding rate of 0.2 bpp and beyond, the choice of multiple LSB planes flips between 2 and 3 for a longer PSNR value.

		PSNR Results (dB)							
Embedding Rate(bpp)		0.005	0.01	0.05	0.1	0.2	0.3	0.4	0.5
Lena	1 LSB Plane	67.16	63.44	55.46	52.33	49.07	45.00	40.65	35.84
	2 LSB Plane	66.48	62.65	54.69	51.55	48.39	45.10	42.56	39.46
	3 LSB Plane	64.41	60.94	52.95	49.96	46.79	43.98	41.91	39.53
Airplane	1 LSB Plane	65.94	63.18	57.02	54.20	50.98	48.26	44.67	40.78
	2 LSB Plane	65.48	62.33	55.91	53.05	49.87	48.10	45.05	42.73
	3 LSB Plane	63.47	60.97	53.87	50.79	47.65	45.79	43.88	42.19
Barbara	1 LSB Plane	65.39	62.56	55.56	51.46	47.68	43.56	39.24	34.80
	2 LSB Plane	65.00	61.85	54.72	50.71	47.25	43.70	40.78	37.53
	3 LSB Plane	63.33	60.50	53.16	49.36	45.98	42.81	40.34	37.58
Baboon	1 LSB Plane	57.49	55.71	50.19	46.17	40.68	35.87	31.16	25.92
	2 LSB Plane	57.43	55.47	49.87	45.92	40.41	36.47	33.08	29.85
	3 LSB Plane	57.10	55.13	49.23	45.40	40.09	36.33	32.96	30.19
Peppers	1 LSB Plane	63.77	61.30	54.17	51.02	46.00	42.08	36.91	-----
	2 LSB Plane	63.67	60.53	53.50	50.50	46.16	42.65	39.47	35.76
	3 LSB Plane	62.34	59.54	52.22	49.18	45.43	42.10	39.40	36.87
Boat	1 LSB Plane	67.22	64.13	56.75	52.62	49.10	45.21	41.24	35.99
	2 LSB Plane	66.72	63.26	55.75	51.71	48.40	44.98	42.46	39.98
	3 LSB Plane	64.57	61.34	53.73	50.02	46.71	43.81	41.70	39.46

Table 2: PSNR comparison for three different LSB-plane choices under various embedding rates.

CONCLUSION

Reversible data hiding (RDH) now a days plays an important role because it holds the ability to recover the cover image without any distortion. Encryption is also used along with RDH for privacy protection. All the available RDH techniques is implemented in encrypted images by vacating extra space after encryption. Moreover data hiding is done by simple LSB method in which the data is unsecure. In the proposed method extra space to embed data is reserved before encryption so, all traditional RDH algorithms could achieve better performance by using the proposed system without losing secrecy. More specifically, the system is well secured. The proposed method also proves to be a better solution in saving space for storing secret information. This method also makes use of additional level of encryption while embedding secret data. Furthermore, this novel method can achieve real reversibility, separate data extraction and greatly improvement on the quality of marked decrypted images and it also achieves higher security by the use of additional data encryption. In the present systems data is embedded as plain text. To increase the security some additional encryption level can be used for encrypting the data to be embedded so that the encrypted data can be embedded in the encrypted image. During the first extraction at the receiver side encrypted data is retrieved as output. When the additional data key is used the original data can be retrieved.

REFERENCES:

- [1] A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone, *Handbook of Applied Cryptography*. Boca Raton, FL, USA: CRC, 1996.
- [2] K. Hwang and D. Li, "Trusted cloud computing with secure resources and data coloring," *IEEE Internet Comput.*, vol. 14, no. 5, pp. 14–22, Sep./Oct. 2010.
- [3] J. Hwang, Kim and J. U Choi, "A reversible watermarking based on histogram shifting," *Int. Workshop on Digital Watermarking, Lecture Notes in Computer Science, Jeju Island, Korea, 2006*, vol. 4283, pp. 348–361, Springer-Verlag.
- [4] A. M. Alattar, "Reversible watermark using the difference expansion of a generalized integer transform," *IEEE Transactions on Image Processing*, Vol. 13, 2004, pp. 1147-1156.
- [5] Z. Ni, Y. Shi, N. Ansari, and S. Wei, "Reversible data hiding," *IEEE Trans. Circuits Syst. Video Technol.*, vol. 16, no. 3, pp. 354–362, Mar. 2006.
- [6] X. Zhang, "Reversible data hiding in encrypted images," *IEEE Signal Process. Lett.*, vol. 18, no. 4, pp. 255–258, Apr. 2011.
- [7] W. Hong, T. Chen, and H. Wu, "An improved reversible data hiding in encrypted images using side match," *IEEE Signal Process. Lett.*, vol. 19, no. 4, pp. 199–202, Apr. 2012.
- [8] X. Zhang, "Separable reversible data hiding in encrypted image," *IEEE Trans. Inf. Forensics Security*, vol. 7, no. 2, pp. 826–832, Apr. 2012.
- [9] W. Zhang, K. Ma, X. Zhao, N. Yu, F. Li "Reversible data hiding in encrypted images by reserving room before encryption," *IEEE trans. Info. forensics and security*, vol. 8, no. 3, pp. 553–558, March 2013.
- [10] L. Luo *et al.*, "Reversible imagewatermarking using interpolation technique," *IEEE Trans. Inf. Forensics Security*, vol. 5, no. 1, pp. 187–193, Mar. 2010.
- [11] V. Sachnev, H. J. Kim, J. Nam, S. Suresh, and Y.-Q. Shi, "Reversible watermarking algorithm using sorting and prediction," *IEEE Trans.*
- [12] Miscellaneous Gray Level Images [Online]. Available: <http://decsai.ugr.es/cvg/dbimagenes/g512.php>
- [13] *Circuits Syst. Video Technol.*, vol. 19, no. 7, pp. 989–999, Jul. 2009.
- [14] Tian, "Reversible data embedding using a difference expansion" *IEEE Trans. Circuit Syst. Video Technol.*, vol. 13, no. 8, pp. 890–896, Aug. 2003.
- [15] D. M Thodi and J. Rodriguez, "Expansion embedding techniques for reversible watermarking," *IEEE Trans. Image Process.*, vol. 16, no. 3, pp. 721–730, Mar. 2007.
- [16] Y. Hu, H.K Lee, Chen and J. Li, "Difference Expansion based reversible data hiding using two embedding direction," *IEEE trans. multimedia*, vol. 10, no. 8, pp. 1500–1512, 2008
- [17] K. H Jung and K. Y Yoo, "Data hiding method using image interpolation," *Journ. Of Compute standard and interfaces*, vol. 31, pp. 465–470, 1996.
- [18] Churchhouse, Robert (2002), *Codes and Ciphers: Julius Caesar, the Enigma and the Internet*, Cambridge: Cambridge University Press, ISBN 978-0-521-00890-7
- [19] Tutte, W. T. (19 June 1998), *Fish and I*, retrieved 7 October 2010 Transcript of a lecture given by Prof. Tutte at the [University of Waterloo](#)

Effect of algae on seedling growth of “Queen of Forages

Dr.N.H.Brahmbhatt^{1*}, Haresh.S.Kalasariya²

¹Associate Professor, V.P & R.P.T.P Science college, Botany Department,
V.V.Nagar,Anand-388120
Naina_bbhath@yahoo.co.in

²Department of Life-Science-HNGU, Patan
Hareshahir22@gmail.com

Abstract- Algae make a major contribution to the fertility of soil. It has been suggested that algae assist higher plant growth by supplying growth substances. In the present work, *Oscillatoria* sp. and *Spirogyra* sp. were used as inoculum in plate culture and pot culture of *Medicago sativa* L. The result revealed that addition of all algal extracts can enhance seed germination, seedling growth, length of radical, number of leaves and plant height. In plate culture, Weed extract of *Spirogyra* sp. promoted the germination and seedling growth of treated seed. The field studies also revealed substantial increase in % of germination, No. of leaves and Plant height of alfalfa under the effect of weed extract. Statistical analysis showed that there are significant differences in % germination, length of radical, plant height, root length and number of leaves as compared to control.

Keywords: *Spirogyra* sp.; *Oscillatoria* sp.; *Medicago sativa* L.; seed germination; % germination; Plant height; Length of radical;

1 INTRODUCTION

Alfalfa (*Medicago sativa* L.) is a widely grown perennial herbaceous legume. Valued as a forage crop due to its high feeding value and wide adaptability, alfalfa is an important rotational crop, providing soil structure, nitrogen contribution, and pest management benefits. Alfalfa is highly valued for animal feed because of its high protein content, high intake potential, and digestibility. Alfalfa can provide the sole plant component in many livestock feeding programs when supplemented with the proper minerals. The majority of alfalfa is grown in mixture with perennial forage grasses to extend the usefulness of the crop and reduce alfalfa induced bloating in animals. Alfalfa will tolerate rotational grazing, but stands may be weakened under heavier grazing pressure. Alfalfa may be grown in pure stands for quality livestock feed high in crude protein, for on-farm storage as dried hay or haylage or for dehydration processing into meal or pellets.

Alfalfa is an important rotational crop. Alfalfa improves soil structure due to the effects of a large deeply penetrating taproot that contributes to soil aeration and organic matter content. Established alfalfa when plowed down, contributes significantly to the nitrogen requirement of following crops in the rotation. A thick forage stand containing at least 50% legume such as alfalfa, will contribute 100 kg/ha nitrogen to the nitrogen requirement of the following crop. Alfalfa also serves as an important break crop for pests specific to other crops, especially cereal and corn crops. Alfalfa, along with other cultivated crops such as clover and canola, is a source of pollen for foraging honey bees. From agro-biological point of view, alfalfa gathers a number of particularities: resistance to drought and low temperatures, good revaluation of irrigation water, high capacity for regeneration after mowing, high rate of competitiveness.(4)Algae are a very large and diverse group of eukaryotic organisms, ranging from unicellular genera such as *Chlorella* and the diatoms to multi-cellular forms such as the giant kelp, a large brown alga that may grow up to 50 meters in length. It has been estimated that there are about 9,000 species of macroalgae broadly classified into three main groups based on their pigmentation (for example, Phaeophyta, Rhodophyta, and Chlorophyta, or the brown red and green algae, respectively). Some Species are used as biofertilizers in agriculture. (13)

The benefits of Algae as sources of organic matter and fertilizer nutrients have led to their use as soil conditioners for centuries. About 15 million metric tones of algal products are produced annually, a considerable portion of which is used for nutrient supplements and as bio-stimulants or biofertilizers to increase plant growth and yield.(5) Numerous studies have revealed a wide range of beneficial

effects of algal extract applications on plants, such as early seed germination and establishment, improved crop performance and yield, elevated resistance to biotic and abiotic stress, and enhanced postharvest shelf-life of perishable products.(6)(7)

2 METHODOLOGY

2.1 Algal Biomass and growth Condition

The algae obtained from natural lake. According to its morphology and microscopic observations it is identified as Spirogyra species and Oscillatoria species belonging to green algae and brown green. Figure 5 and 6 shows the microscopic image of both algal sp.

2.2 Growth medium:-

Bold's basal growth medium and BG 11 medium used for Spirogyra species and Oscillatoria species. Both species was grown in several 1-l glass jars containing medium (modified Bold basal medium AND BG 11 medium) in order to obtain stock algal culture to be used during the experiments.(8)(9)

2.3 Algae Extract

The cultures were harvested and the cells washed with distilled water. Cell extracts were made by grinding the algae in distilled water with a pestle and blender. An algal suspension containing 5.0 g fresh algal material in 500 ml of distilled water is referred to as a 1% extract.

2.4 Germination of seeds by plate method

Air-dried seeds of lucerne were soaked in water extracts of both algae sample for 24h. Seeds, without algal extract, served as control. Percentage of germination was estimated by spreading 10 seeds on filter papers placed in glass Petri-dishes containing 5.0 ml of a cell extract. Petri dishes containing seeds with 5.0 ml of distilled water served as a control. The Petri-dishes were placed at natural illumination at 25 °C.(5)(12)

2.5 Pot Method

Ten healthy seeds of alfalfa plant were then grown in 1 liter pots for 60 days. No fertilizer was applied, but soil of treated seedlings was sprayed with 200 ml of algal extract every seven day, respectively. From respective pots after every 10 days interval, Count the number of germinated seed, No. of leaves & Plant heights.

2.6 Statistical analysis

Statistical analysis was performed with one way ANOVA, using software KyPlot Version 2.0 beta 13(©1997-2000 Koichi Yoshioka). Means were separated using the Least Significant Difference (LSD) test at $P < 0.05$.(10)(5)

3. Tables and Figures

Table 1 The Effect of Algae Extract on *Medicago sativa* in Plate culture

	CONTROL	SAMPLE 1	SAMPLE 2
% GERMINATION	0.88 ± .02	0.84 ± .04	0.86 ± .04
LENGTH OF RADICLE	20.09 ± 6.17	25.64 ± 7.39	32.11 ± 10.996

* Significant at the 0.05 level

Table 2 The Effect of Algae Extract on *Medicago sativa* in Pot Culture

POT METHOD	CONTROL	SAMPLE 1	SAMPLE 2
%GERMINATION	0.58 ± 0.08	0.48 ± 0.03	0.54 ± 0.09
NO. OF LEAVES	23.76 ± 6.92	27.54 ± 7.64	19.25 ± 5.94
PLANT HEIGHT	21.34 ± 6.62	19.38 ± 5.71	15.47 ± 5.01

* Significant at the 0.05 level Sample 1 = Oscillatoria sp. Sample 2 = Spirogyra sp.

Table 3 ANOVA of % Germination in Plate Culture & Length of radical of germinated seed

		SS	DF	Ms	F(CAL)
% GERMINATION IN PLATE METHOD	BETWEEN GROUPS	0.004	2	0.002	0.33
	WITHIN GROUPS	0.072	12	0.006	
	TOTAL	0.076	14		
LENGTH OF RADICLE OF GERMINATED SEED	BETWEEN GROUPS	361.9812	2	180.991	0.51
	WITHIN GROUPS	4217.032	12	355.933	
	TOTALS	4633.013	14		

*Significant at the 0.05 level

Table 4 ANOVA of % Germination in Pot Culture, Leaf Number & Plant Heights

		SS	DF	MS	F(CAL)
%GERMINATION IN POT METHOD	BETWEEN GROUPS	0.0211	2	0.011	0.3992
	WITHIN GROUPS	0.397	15	0.025	
	TOTAL	0.42	17		
NO.OF LEAVES	BETWEEN GROUPS	206.93	2	103.46	0.3657
	WITHIN GROUPS	4243.12	15	282.88	
	TOTALS	4450.06	17		
PLANT HEIGHT	BETWEEN GROUPS	107.21	2	53.61	0.264
	WITHIN GROUPS	3050.10	15	203.33	
	TOTAL	3157.33	17		

* Significant at the 0.05 level



Fig.1

10 Days Pot Method

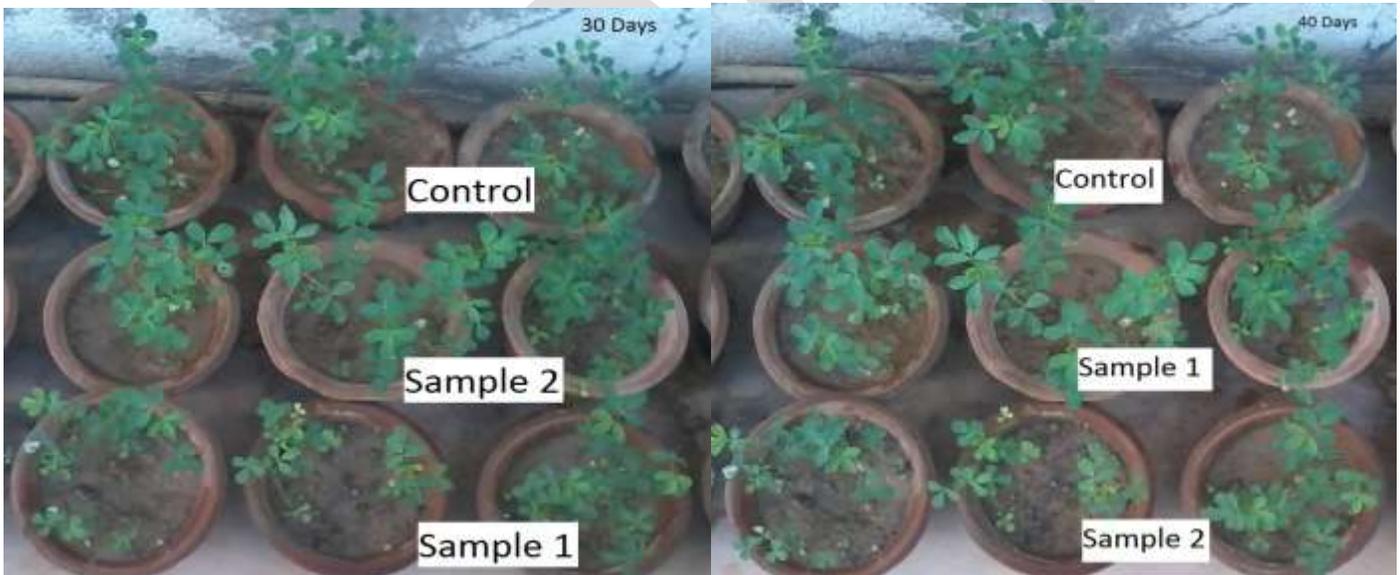


Fig.2 30 Days Pot Method

Fig.3 40 Days Pot Method



Fig.4 50 Days Pot Method

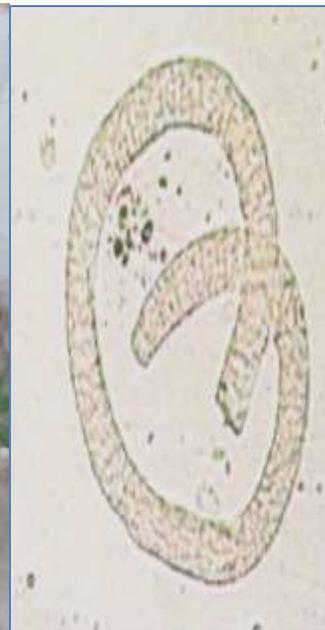


Fig.5 *Oscillatoria* sp.



Fig.6 *Spirogyra* sp.

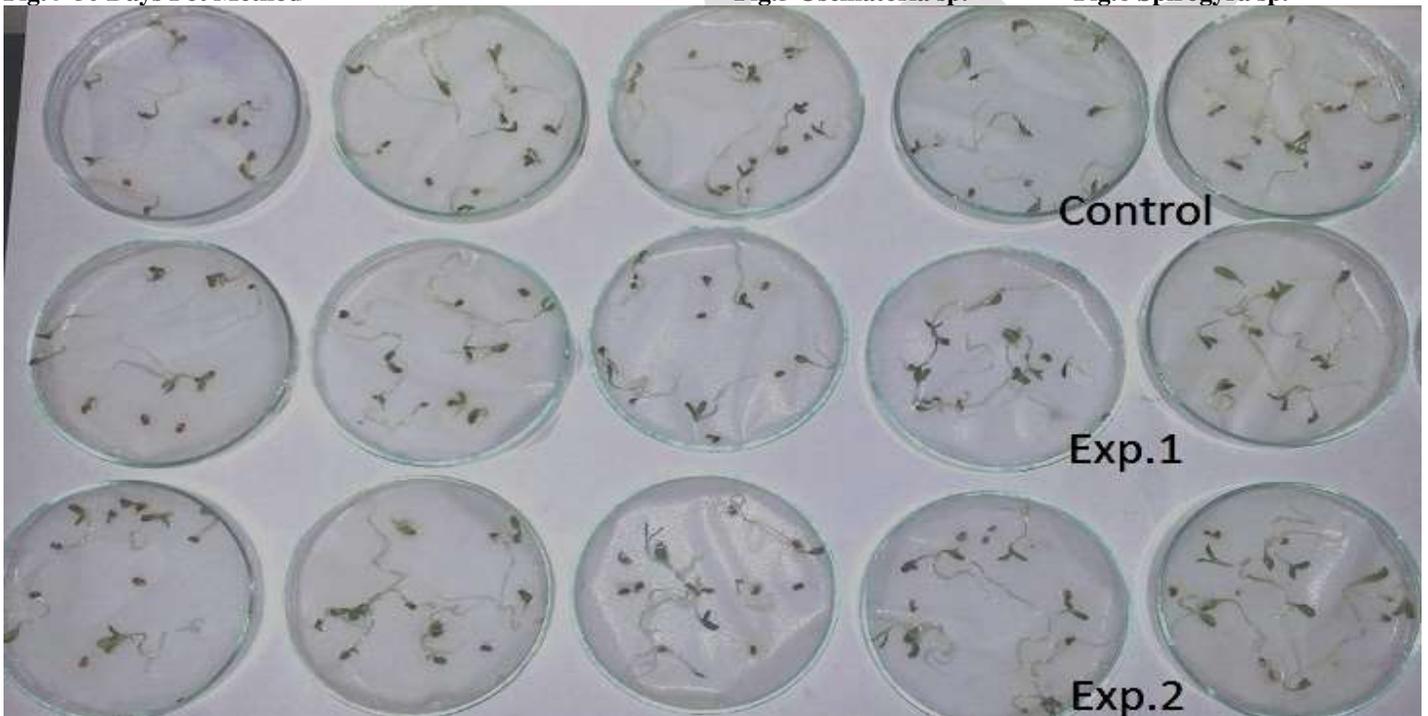


Fig.7 Plate Method After 4 Days

4 RESULTS AND DISCUSSION

In the plate culture of alfalfa, the germination of seeds soaked with algae extract was faster as compared to seeds soaked in distilled water as control. For untreated seeds of alfalfa germination began after 36 hours, whereas germination of seeds treated with several algae extract began earlier. In treated seeds, however, length of radical of germinated seed were recorded higher than control after 6 days. Whereas seed treated with *Spirogyra* sp. was recorded higher than seed treated with *Oscillatoria* sp..

In pot culture of lucerne plant, comparison of control and treatment plants with one way ANOVA showed that treatment groups have a significant difference in seed germination, plant height and number of leaves as compared to control. However, effect of algal culture is not the same for all parts of plants and in different plants. In addition, effect of different algal inoculum was not the same in different plants. For example, *Spirogyra* sp. showed more positive effect on most vegetative characters of alfalfa plant, whereas *Oscillatoria* sp. showed less positive effect on vegetative characters of studied plants. Also among several studied vegetative

characters, leaf number highest in the plants treated by *Oscillatoria* sp. as compare to the plants treated by distilled water and *Spirogyra* sp.. Plant height showed the most difference in seed treatments by *Spirogyra* sp. whereas least differences in seed treated by *Oscillatoria* sp.

5 CONCLUSION

The results obtained in the first part of this work showed that presoaking seeds by algal extract accelerates seed germination and radical length of germinated seed. The second part of this research revealed that algal extract can enhance plant growth. Statistical analysis confirm that there is a significant difference in plant height, number of leaf, Percentage germination treated plants as compared to control. The review of literatures showed that the production of growth substances and vitamins by the algae may be partly responsible for the greater plant growth and yield. The capacity for biosynthesis of growth promoting substances such as auxins, amino acids, sugars and vitamins (Vitamin B12, Folic acid, Nicotinic acid and Pantothenic acid) also can enhance plant growth. The other reason that can suggest for increased plant growth by using algae extract is that, the growth of algae in soil seems to influence the physical and chemical properties of soil. The water stable aggregate significantly increase as a result of algal growth and thereby improves the physical environment of the plants. Results of this study showed that *Spirogyra* sp. have ability to promote vegetable growth higher than *Oscillatoria* sp..and they are appropriate candidate for the formulation of a biofertilizer. *Spirogyra* sp. needed more study for application as a biofertilizer.

6 ACKNOWLEDGMENT

I am thankful to my Dissertation Guide Dr. Nayana H. Brahmabhatt for guide me throughout my work and provide me motivation and knowledge during the work. I am thankful to Department of Lifescience, HNG University, Patan for provide me laboratory infrastructure for experimental analysis.

REFERENCES:

1. Jefferson County, Producing Dairy Quality Alfalfa Forage University of Idaho,134 N Clark, Room 30, Rigby, ID 83442 208-745-6685 Fax 208-745-6686
2. Dwain Meyer, Professor of Plant Sciences, Agricultural Experiment Station -Seed Germination, Seedling Growth, Vegetative Development R-648, (Revised), January 1999
3. Davis P.H. Robinson, What are Dairy Nutritionists Looking for in Alfalfa Hay? Cooperative Extension Specialist University of California, CA 95616-8521 UCCE
4. Moore, G, Sanford, P & Wiley, T 2006, *Perennial pastures for Western Australia*, 17 Department of Agriculture and Food Western Australia, Bulletin 4690
5. Z. Sharitamadari et al. Study of soil blue-green algae and their effect on seed germination and plant growth of vegetable crops *Rostaniha* 12(2): 101-110 (2011)
6. Wajahatullah Khan et al. Seaweed Extracts as Biostimulants of Plant Growth and Development Received: Plant Growth Regulators (2009) 28:386–399 DOI 10.1007/s00344-009-9103-x
7. R.M.S. Sengar, Seema Bhaduria and Poonam Sharma, The Effect Of Cyanobacterial Toxin On Seed Germination Indian J.Sci.Res.1(2) : 41-45, 2010
8. N. Daneshvar et al. Biodegradation of the Textile Dye Malachite Green by Microalgae *Cosmarium* sp. International Journal for Science and high Technology and Environmental Sciences
9. Mohamed Saad et al. Decolorization of Malachite Green and Methylene Blue by Two Microalgal Species, International Journal of Chemical and Environmental Engineering October 2012 Volume 3, No.5
10. Nadiya A Al-Saady et al. A Study on Germination Rate, Dry Matter Weight and Amylase Activity of *Medicago sativa* L. (alfalfa) under Induced NaCl Stress Adv Crop Sci. Tech 2013, 1:3 <http://dx.doi.org/10.4172/2329-8863.1000108>

11. Hassan S. Namkeleja et al. Allelopathic Effect of Aqueous Extract of *Argemone mexicana* L on Germination and Growth of *Brachiaria dictyoneura* L and *Clitoria ternatea* L. American Journal Of Plant Sciences, 2013, 4, 2138-2147 published online November 2013 (<http://www.scirp.org/journal/ajps>)(<http://dx.doi.org/10.4236/ajps.2013.411266>)

12. Sedigheh sadeghi et al. Allelopathic effect of *Helianthus annuus* (sun flower) on *Solanum nigrum* (Black Nightshade) seed germination and growth at laboratory condition Journal Of Horticulture science and ornamental plants 2(1):32-37, 2010 ISSN 2079-2158

13. Abdulkadir Mfilinge, Effect of Rhizobium Inoculation and Supplementation with Phosphorus and Potassium on Growth and Total Leaf Chlorophyll (Chl) Content of Bush Bean *Phaseolus vulgaris*, L. Agricultural Sciences, 2014, 5, 1413-1426 Published Online December-2014 in SciRes. <http://www.scirp.org/journal/as>
<http://dx.doi.org/10.4236/as.2014.514152>

Abbreviations :

SS = SUM OF SQUARE

SD = Standard deviation

Df = Degree of Freedom

S.E.M= Standard error mean

Ms = mean square

IMPLEMENTATION OF MIMO-OFDM TRANSCEIVER ARCHITECTURE DESIGN WITH SIMULINK

Shrutika Suryawanshi

MTech ETRX, Department of Electronics Engineering, G.H.Raisoni College of Engineering, Nagpur

Email: shruti.es@gmail.com

Prof. L.P. Thakare

Assistant Professor, Department of Electronics Engineering, G.H.Raisoni College of Engineering, Nagpur

Email: laxman.thakare@raisoni.net

Dr. A.Y. Deshmukh

Professor and Dean, Department of Electronics Engineering, G.H.Raisoni College of Engineering, Nagpur

Abstract— In modern world of communication systems, various new methods have developed to replace the previous conventional techniques that provide data communication with high speed. As wireless communication guidelines were developed it became necessary to develop new techniques like Orthogonal Frequency Division Multiplexing (OFDM) for data security and reliability while data transmission. Idea behind the high spectral efficiency of OFDM is elimination of guard bands and use of the overlapping but orthogonal subcarriers. The communication process to optimize the energy consumption level on the original transmission input signal level and the signal process is to effectively improve the wireless communication applications. This technology is to be modified using the HARDWARE based VLSI architecture. The architecture will improve the transceiver performance in 802.11 MIMO-OFDM systems. This system will be designed the 4*4 MIMO-OFDM architecture in MATLAB-simulink software.

Keywords— MIMO, OFDM, QAM, FFT, IFFT, Intercarrier Interference, MATLAB-simulink.

I. INTRODUCTION

The need of high data rate with the bulk of data to be transmitted have led to the improvisation of old and new techniques used for communication. Previous technologies were focused on quality of the signals to be maintained throughout the communication path. On contrary today's scenario focuses on quality as well as high data rate. As wireless communication guidelines were developed, it became the necessity to focus on multi-user supporting technique like OFDM for data security and reliability while data transmission.

OFDM is a special type of multi-carrier transmission technique where a single data stream is transmitted over a number of lower rate subcarriers. In high speed digital communication, the OFDM technique is widely used against frequency selective fading and inter-symbol interference.

MIMO system is the wireless communication system with multiple antennas at the transmitter and receiver has received remarkable attention because of its ability to increase system capacity and performance with acceptable bit error rate (BER) in proportion with the number of antennas. The fusion of MIMO-OFDM is advantageous [1]. Fig.1 shows the generalized block diagram for the OFDM system.

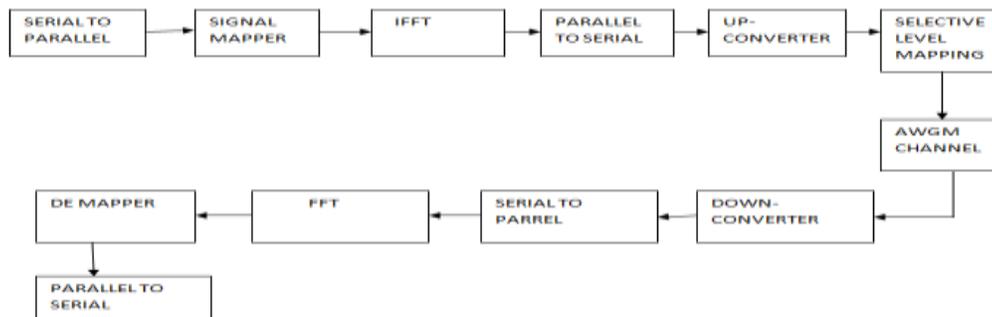


Fig.1 Generalized block diagram for the OFDM system[2]

The use of multiple-input multiple-output (MIMO) signal processing with orthogonal frequency division multiplexing (OFDM) can provide enhanced data rates for the next generation wireless communication systems. But as MIMO-OFDM system transmits multiple data streams, it requires various independent baseband processors. This increases its hardware complexity tremendously when compared with single-input single-output OFDM (SISO OFDM) systems. A very high data throughput rate is provided by the IEEE 802.11n standard based on the MIMO OFDM system.

In proposed system blocks in simulink unit are designed. And to modify the block arrangement in overall OFDM-MIMO unit and to develop the sub system functions also. This process is to optimize the transmission timing about MIMO architecture process. The system generator and Xilinx software are used to implement the hardware architecture about simulink 802.11 MIMO-OFDM system design. Section II presents the work related to reducing the complexity of the MIMO-OFDM system design. Section III presents the proposed model for the 802.11 MIMO-OFDM system design and section IV concludes the paper.

II. RELATED WORK

There are various methods which have been used for designing MIMO OFDM system. A high level Matlab Simulink spatially multiplexed (SM) 4 x 4 MIMO OFDM transceiver encoded at half rate using 64 size FFT was designed and implemented on Spartan Virtex 6 FPGA kit [1]. The simulation, VHDL codes, RTL Schematics and Test Bench for the entire 4 X 4 MIMO OFDM model were obtained to substantiate its functionality.

A spatially multiplexed real time 4 x 4 MIMO OFDM transceiver using 16 QAM was designed and implemented on Spartan Vitex-6 FPGA kit with help of Matlab Simulink, Xilinx and System Generator. A single channel of MIMO transmits four data streams, hence can outbring four times the data rate per channel without extra bandwidth and transmit power. Data rate up to 216 Mbps was accomplished. Each single model were developed and tested using Test bench for its error free functionality and finally all the blocks were collectively mapped. For the implementation of 4 X 4 MIMO OFDM model, the simulation, VHDL codes, RTL Schematics and Test Bench were obtained.

The system designed using VHDL, synthesized using high level synthesis tool and targeted on Xilinx Spartan 3e device. Presented design is simulated on ISE simulator and the results are presented [2]. Resources utilization for transmitter and receiver is given in this paper. The design utilizes the Intellectual Property (IP) cores provided by Xilinx for floating point multiplication, addition, subtraction and division. DIT radix-2 butterfly approach is used to calculate IFFT and FFT.

Idea behind the high spectral efficiency of OFDM is elimination of guard bands and use of the overlapping but orthogonal subcarriers. High rate data stream is divided into a number of low rate data streams that are transmitted over a number of multiplexed orthogonal subcarriers. The low rate data streams allow adding sufficient guard time between two symbols which was very small in high rate data stream. This helps in enabling the system to perform well in dispersive channel which causes the symbols to spread in time and interfere with each other called as inter symbol interference (ISI).

This paper gave the hardware implementation of OFDM system on Spartan 3 FPGA using VHDL language for designing the system. As the number of subcarriers in the system increases, processing time required to calculate IFFT and FFT also increases. The advantage of increasing the subcarrier is the increased spectral efficiency of the system. Device utilization of the transmitter and receiver shows that the device is utilized well below its capacity. Further by increasing the number of subcarriers and by making highly pipelined architecture for IFFT and FFT the system performance could be improved in terms of processing time required in transmitter and receiver.

The custom hardware for MIMO-OFDM system based on FPGA consuming low power was designed [3]. The transmitters and the receivers both were designed for Xilinx Spartan 3E and Spartan 3A FPGA devices. The design was implemented on the FPGA and experiments were performed to substantiate the design. The proposed work [3] proved that a system with very low power can be designed using FPGA device which can provide higher data rate as compared to the ordinary systems and it can be rearranged according to the condition.

This paper study leads to a low power low cost FPGA based reconfigurable architecture which offers effective communication. As it uses the OFDM, it offers faster and huge amount of data transmission without significant interference. It is observed that the data rate is directly proportional to the order of the system. This design is a very simple yet low power consuming and predicted to be an efficient communication chip.

The low power base-band OFDM transmitter and receiver were designed with memory based recursive FFT in FPGA. In the MIMO-OFDM communication system the FFT processor is the most speed calumniatory part. One of the major concerns is low power in this system. The design was implemented by radix-8 FFT and it is observed that the power consumption was decreased by 28% as compared to radix-4 FFT. The architecture [4] had three main pros (a) less number of butterfly iteration to minimize power consumption, (b) pipeline structure of radix-8 butterfly to accelerate clock frequency,(c) even distribution of memory access to utilize efficiency in SRAM ports. The speed performance of the design easily satisfied the requirements of most of the applications and used less number of gates and hence reduced cost and power consumption.

The performance ascertains of four different channel coding and interleaving techniques for MIMO-OFDM communications systems was given. Based on the power dissipation, hardware implementation resources requirement and BER a comparison was done. It [5] presented a low-latency and memory-efficient interleaver implementation method for the MIMO-OFDM communication system. It was the best scheme as far as the power dissipation and hardware resource implication was concerned, which was particularly important

The implemented systems [5] show a regular improvement in the BER performance and as the constellation size increases there is an increase in the hardware resource utilization, power dissipation, and initial latency. This methodology also provided an effective way to design the IEEE 802.16 system for FPGA. The data rate of the standard was doubled with the help of efficient design methodologies and optimization. Here 64-QAM technique was best among BPSK, QPSK, 16-QAM, and 64-QAM.

The two MIMO-OFDM, E-SDM systems were designed and implemented on hardware of FPGA-based DSP Development Kit. In the systems, orthogonal transmission beams was formed between transmit and receive sides and also optimal transmit input data was adaptively allocated. In addition, a simple detection was used at a receiver to totally eliminate sub-stream interference [6]. The main contribution of this paper was to present the design and implementation of 2x2 and 2x3 MIMO-OFDM ESDM systems on FPGA Altera Stratix DSP Development KIT using Verilog HDL.

Results of BER performance of the systems show that the design is valid and reliable. The comparison of the system performance with that of MIMO-OFDM SDM systems was also performed. Outperformance of MIMO-OFDM E-SDM systems has been shown. The consumption of FPGA elements in the design [6] is also calculated. It is seen that though the E-SDM technique gives a better performance, its hardware consumption is higher than the SDM and STBC techniques due to the complexity of its algorithm.

A design of a variable-length FFT/IFFT processor and its implementation to cover various specifications of OFDM applications is implemented using Verilog HDL in FPGA. The technique of OFDM is famous for its evincing strength against frequency-selective fading channel. The inverse Fast Fourier Transform (IFFT) and FFT operations are used as the demodulation/ modulation in the OFDM systems, and the sizes were varied for FFT/IFFT operations for distinct applications of OFDM systems. The programmable SDF FFT processor can be applied to various OFDM communication systems. This architecture employs a scheme of adding counter to achieve the goal with reduced hardware complexity and also has the advantage of less memory size and lower power consumption [7].

There are various methods which have been used for designing MIMO OFDM system. Idea behind the high spectral efficiency of OFDM is elimination of guard bands and use of the overlapping but orthogonal subcarriers. As the number of subcarriers in the system increases, processing time required to calculate IFFT and FFT also increases which further increases the spectral efficiency of the system. By increasing the number of subcarriers and by making highly pipelined architecture for IFFT and FFT the system performance could be improved in terms of processing time.

III. PROPOSED MODEL

The proposed system improves the energy level for the data transmission process in wireless communication system. This system can be used in all type of wireless communication applications. The application mainly focused by the energy consumption level on data transmission unit. The MIMO-OFDM block is to optimize the block and sub system arrangement for proposed system methodology and to reduce the process in the transceiver architecture for the MIMO-OFDM architecture process. This process is to develop the data transmission using MIMO-OFDM 802.11 architecture. The proposed system architecture is design to simulink software and to convert the VHDL code and to implement the hardware VLSI simulation in Xilinx software architecture.

It consists of a serial to parallel/parallel to serial converter, QAM modulator/demodulator and an IFFT/FFT module. The transmitter consists of an input bit stream, serial to parallel converter, constellation mapping, IFFT. The receiver consists of FFT, parallel to serial converter, demodulation, and output bit stream.

A. Transmitter:

Data bits are given as a inputs to the transmitter. In order to scatter the input sequence to avoid the dependence of input signals power spectrum on the actual transmitted data these bits passed through the scrambler. Scrambler randomizes the bit sequences. Encoding of data bits can be done with the help of convolution encoder. The mapper is used for mapping and puncturing of data bits; Puncturing removes the some of the parity bits. Different operations of MIMO parser on input data bit are specifically based on spatial multiplexing (SM) and space time block coding (STBC). The protection of data from burst errors during transmission is done by using interleaving. This increases the diversity of wireless system. Pilot insertion plays important role to prevent inter carrier interference. The IFFT block transforms frequency domain signal into time domain signal. Guard interval is introduced to protect orthogonality of subcarriers and the independence of subsequent OFDM symbol.

B. Receiver:

The receiver blocks depend on methods used to code the signal in transmitter as it performs exactly opposite operation. The receiver can be divided into three different parts viz. FFT, Synchronization and MIMO detection unit. After receiving the symbol cyclic prefix should be eliminated. Then data is transmitted to the FFT block. FFT block converts time domain signal to frequency domain Receiver is designed separately before connecting it to transmitter. FFT is calculated using an algorithm developed for transmitter. DIT radix-2

butterfly is used to calculate FFT and IFFT. The receiver is designed on Xilinx Project Navigator using VHDL coding. Similar to transmitter, receiver also uses the IP cores for floating point complex multiplication, additions and subtractions. Receiver operations are broken in to different processes and merged to have complete system. After FFT operation, demodulation is done for demodulation look up table approach is used. Once the bits are recovered from the received constellation, the reception is completed. For 4 point and 8 point transmitter separate receivers are designed and tested. Once the design code is ready it is simulated on ISE simulator for timing analysis and then synthesized on kit. Fig 2. shows the design of block diagram in MATLAB simulink.

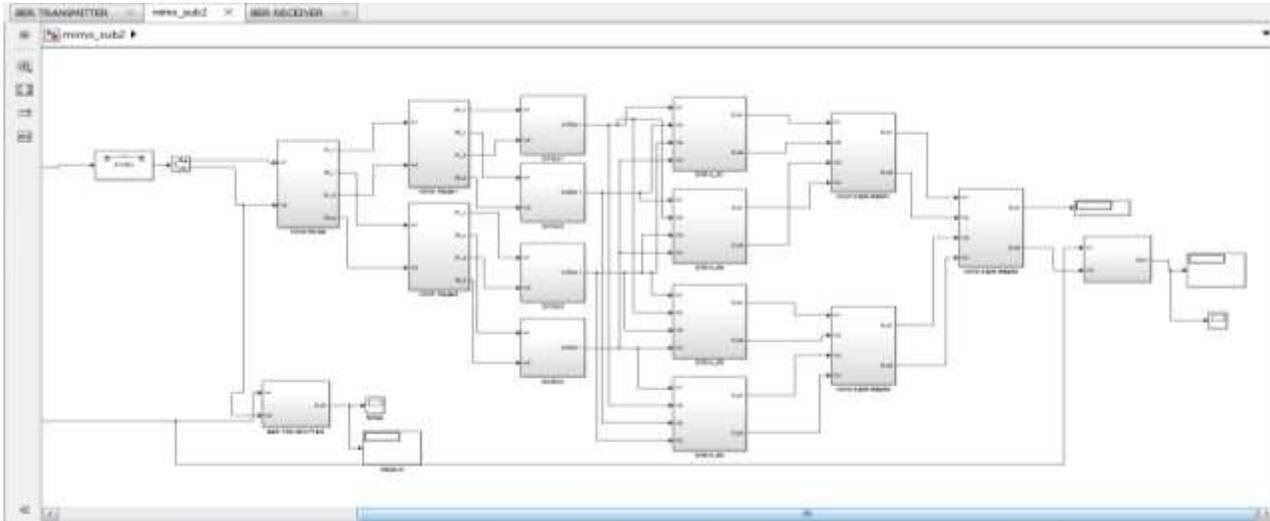


Fig.2 Block Diagram design in MATLAB simulink

IV. SIMULATION RESULTS

The data rate is the ratio of no of data bytes used with the time delay. The data size usage will be 16 K byte. The overall time will be 0.847ns. Data rates up to 1347.2 Mbps are accomplished by transmitting large number of bits/symbol. Thus higher order QAM are required for high data rates. However, as the number of bits per symbol increases, the scheme is more susceptible to the noise and Inter-Symbol Interference. The VHDL codes, RTL Schematics, Test Bench, and power is obtained for the 4 X 4 MIMO OFDM model.

A. RTL Schematic and Test Bench Generation

The VHDL codes and its RTL schematics are obtained for the whole model using the ISE Project Navigator. The overall RTL schematics for all the sub models can be viewed inside the main model. With help of ModelSim the test bench simulation is obtained for verifying the correctness of the simulink model. Fig 3 shows the RTL schematic.

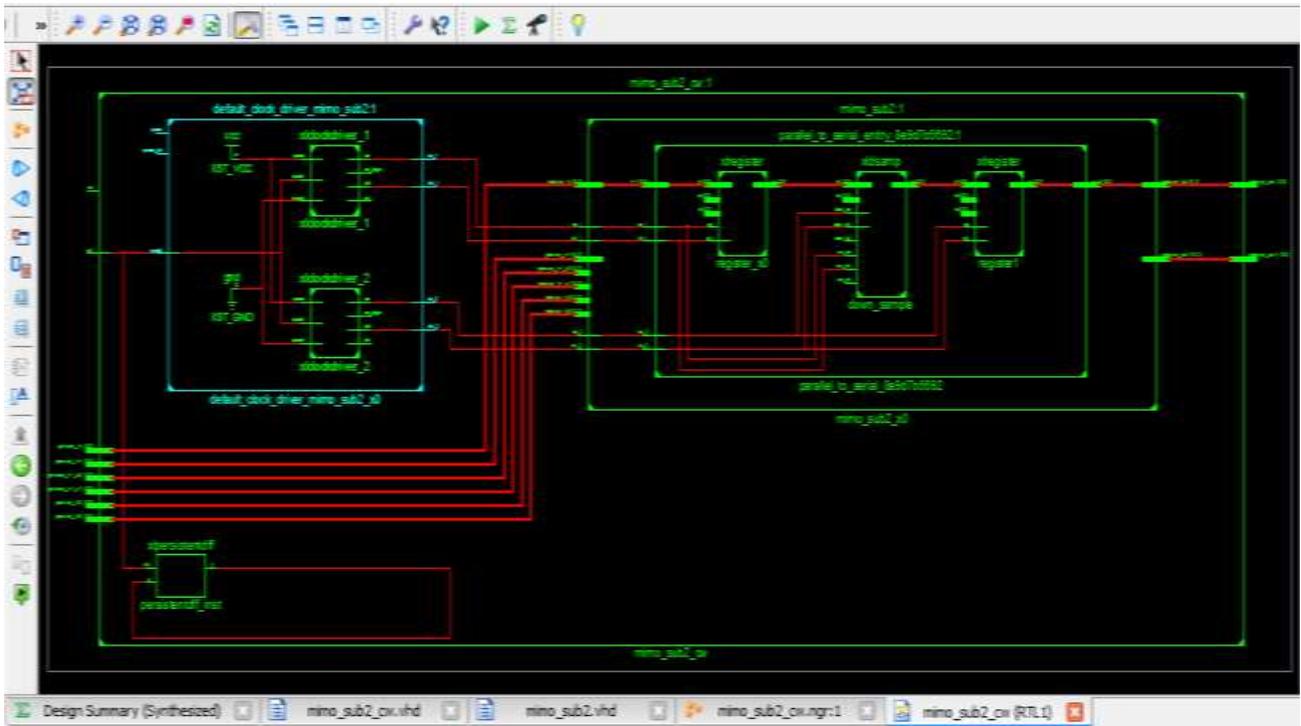


Fig.3 RTL Schematic View

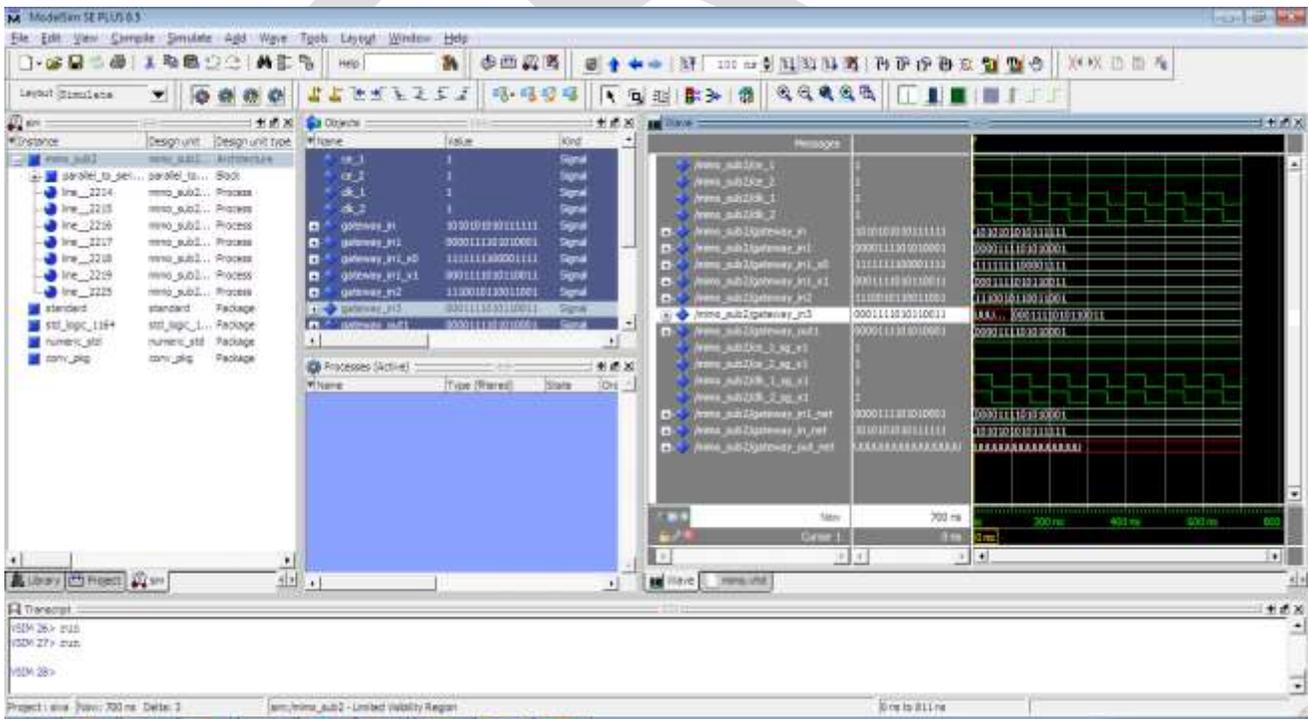


Fig.4 Simulation of 4X4 MIMO-OFDM model in ModelSim

B. Power Estimation

The hardware implementation of the design can bring out some important design issues like operating temperature, power consumption, , time delay ,operating frequency that are very important parameters while designing a chip. The design parameter readings taken with the help of Xilinx System Generator are as shown in Table-I.

TABLE I
SIMULINK DESIGN RESULTS

Design issue	Proposed Work
Total dynamic power (in watts)	0.050
Total quiescent power (in watts)	0.085
Total power (in watts)	0.135
Junction temperature (in *c)	30
Maximum frequency (in MHz)	1187.546
Maximum period (in ns)	0.842
No. of IOB used	65
No. of 4 input LUT's used	61
No. of slice flip flop used	60
No. of slices used	60
Data rate(Mbps)	1347.2

V. CONCLUSION

In the design and implementation of OFDM transmitter and receiver, the fusion of MIMO with OFDM results in less BER. The bit error rate with QPSK for OFDM using MATLAB simulation is presented. The BER performance varies and the transmitted bits are received at the receiver section. For this system design on hardware, the MATLAB /SIMULINK software gives visual

modeling tool set that offers the user a library which helps to simulate each hardware components behavior. Then in future work the whole design can be implemented on spartan6 FPGA device. The implementation of this type of design on FPGA is better as compared to ASIC in terms of cost and general purpose MPU in terms of speed. An FPGA means field programmable gate array which supports implementation of relatively large logic circuits.

REFERENCES

- [1] Rajesh S. Bansode , Prajakta Borole , “Hardware Implementation of an OFDM Transceiver for 802.11n systems”, International Journal of Scientific & Engineering Research, Volume 4, Issue 6, June-2013.
- [2] S. Chavan , P. S. Kurhe , K. V. Karad , “FPGA Based Implementation Of Baseband OFDM Transceiver Using VHDL”, (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (3) , 2014.
- [3] Subhankar Bhattacharjee#, Sanjib Sil#, Sayan Dey#, Amlan Chakrabarti, “Simulation, Design and Analysis of a Low Power MIMO-OFDM System and its Implementation on FPGA”, 2011 IEEE.
- [4] Chi-Hong Su and Jen-Ming Wu, Member, IEEE, “ Reconfigurable FFT Design for Low Power OFDM Communication Systems”, 2006 IEEE.
- [5] Zafar Iqbal, Saeid Nooshabadi, *Senior Member*, IEEE, and Heung-No Lee, *Member*, IEEE, “Analysis and Design of Coding and Interleaving in a MIMO-OFDM Communication System”, IEEE Transactions on Consumer Electronics, Vol. 58, No. 3, August 2012.
- [6] Nguyen Trung Hieu¹, Bui Huu Phu, Vu Dinh Thanh, and Yasutaka Ogawa, DCSELAB, University of Technology, Vietnam National University – Hochiminh City, Vietnam, “ FPGA Implementation of MIMO OFDM Eigenbeam-Space Division Multiplexing Systems for Future Wireless Communications Networks”, 2013 IEEE.
- [7] M.Merlyn, ECE, Jayaram College of Engg & Tech., Trichy, India, “FPGA Implementation Of FFT Processor With OFDM Transceiver”, 2010 IEEE.
- [8] R.Deepa, Iswarya S, G.DivyaShri, P. MahathiKeshav, P.JaganyaVasan, and SenthilMurugan.S “Performance of Possible Combinations of Detection Schemes with V-BLAST for MIMO OFDM Systems,” in IEEE pp. 140-144. 978-1-4244-8679-3/11. Coim-batore, India. 2011.
- [9] Chun-Lung Hung, Syu-Siang Long, and Muh-Tian Shiue Department of Electrical Engineering, National Central University, Jhongli, Taiwan, “A Low Power and Variable-Length FFT Processor Design for Flexible MIMO OFDM Systems”, 2009 IEEE.
- [10] Soler-Garrido, D. Milford, M. Sandell, and H. Vetter, “Implementation and evaluation of a high-performance MIMO detector for wireless LAN systems,” *IEEE Trans. Consumer Electron.*, vol. 57, no. 4, pp. 1519–1527, Nov. 2011.
- [11] C.-S. Choi, Y. Shoji, and H. Ogawa, “Implementation of an OFDM baseband with adaptive modulations to grouped subcarriers for millimeter-wave wireless indoor networks,” *IEEE Trans. Consumer Electron.*, vol. 57, no. 4, pp. 1541–1549, Nov. 2011.
- [12] H. Phu, Y. Ogawa, T. Ohgane, and T. Nishimura, “Robust performance of MIMO-OFDM systems using E-SDM in time-varying fading environments,” *Proc. IEEE APWCS 2006*, Aug. 2006, pp. 295–299.
- [13] Y.-W. Lin and C.-Y. Lee, “Design of an FFT/IFFT processor for MIMO OFDM systems,” *IEEE Trans. Circuits Syst. I, Reg. Papers*, vol. 54, no. 4, pp. 807-815, Apr. 2007.
- [14] Simon Haene, David Perels and Andreas Burg “A Real Time 4-Stream MIMO-OFDM Transceiver: System Design, FPGA Implementation, and Characterization,” in *IEEE Jour.* Vol 26, No 6, pp. 877-889, 2008

An Art of Generating Automatic Timetable Using Genetic Algorithm

Dipesh Mittal¹, Mohammed Sunasra², Hiral Doshi³

Bachelors of Engineering, Department of Information Technology, Atharva college of Engineering, University of Mumbai, India^{1,2,3}

Email: dipeshpawanmittal@gmail.com¹

Contact: +919920479186¹

Abstract— Timetable creation is a very arduous and time consuming task. To create timetable it takes lots of patience and man hours. Time table is created for various purposes like to organize lectures in school and colleges, to create timing charts for train and flight schedule and many more. To create timetable it requires sufficient amount of time and man power. In the below paper we have tried to reduce these difficulties of generating timetable by using Genetics Algorithm. By the use of Genetic algorithm we are able to reduce the time required to generate timetable and generate a timetable which is more accurate, precise and free of human errors. The manual system of preparing time table in colleges with large number of students is very time consuming and usually ends up with various classes clashing either at same room or with same teachers having more than one class at a time. To overcome all these problems we propose to make an automated system. Presently this timetable is prepared manually, by manipulating those of earlier years, with the only aim of producing a feasible timetable.

Keywords— Genetic algorithm, timetable, constraints, chromosomes, mutation, crossover, fitness function.

INTRODUCTION

The class timetabling problem is a typical scheduling problem that appears to be a tedious job in every academic institute once or twice a year [3]. In earlier days, time table scheduling was done manually with a single person or some group involved in task of scheduling it manually, which takes a lot of effort and time. Planning timetables is one of the most complex and error-prone applications.

Timetabling is the task of creating a timetable while satisfying some constraints. There are basically two types of constraints, soft constraints and hard constraints. Soft constraints are those if we violate them in scheduling, the output is still valid, but hard constraints are those which if we violate them; the timetable is no longer valid [1].

The search space of a timetabling problem is too vast, many solutions exist in the search space and few of them are not feasible. Feasible solutions here mean those which do not violate hard constraints and as well try to satisfy soft constraints. We need to choose the most appropriate one from feasible solutions. Most appropriate ones here mean those which do not violate soft constraints to a greater extent [1]. Using Genetics Algorithm, a number of trade-off solutions, in terms of multiple objectives of the problem, could be obtained very easily. Moreover, each of the obtained solutions has been found much better than a manually prepared solution which is in use.

LITERATURE SURVEY

Genetic algorithms are general search and optimization algorithms inspired by processes and normally associated with natural world. Genetic algorithm mimics the process of natural selection and can be used as a technique for solving complex optimization problems which have large spaces [10]. They can be used as techniques for solving complex problems and for searching of large problem spaces. Unlike many heuristic schemes, which have only one optimal solution at any time, Genetic algorithms maintain many individual solutions in the form of population. Individuals (parents) are chosen from the population and are then mated to form a new individual (child). The child is further mutated to introduce diversity into the population [10]. Rather than starting from a single point within the search space, GA is initialized to the population of guesses. These are usually random and will be spread throughout the search space. A typical algorithm then uses three operators, selection, crossover and mutation, to direct the population toward convergence at global optimum. A GA, as shown in fig.1 requires a process of initializing, breeding, mutating, choosing and killing. It can be said that most methods called GAs have at least the following elements in common: Population of chromosomes, Selection according to fitness, Crossover to produce new offspring, and random mutation of new offspring.

```
Create a population of creatures.  
Evaluate the fitness of each creature.  
While the population is not fit enough:  
{  
Kill all relatively unfit creatures.  
While population size < max;  
{  
Select two population members.  
Combine their genetic material to create a new creature.  
Cause a few random mutations on the new creature.  
Evaluate the new creature and place it in the population.  
}}.
```

Fig 1: Top Level description of a GA [6]

A. GA Operators

1) Chromosome representation: Chromosome is a set of parameters which define a proposed solution to the problem that the genetic algorithm is trying to solve. The chromosome is often represented as a simple string. The fitness of a chromosome depends upon how well that chromosome solves the problem at hand.

2) Initial population: The first step in the functioning of a GA is the generation of an initial population. Each member of this population encodes a possible solution to a problem. After creating the initial population, each individual is evaluated and assigned a fitness value according to the fitness function. It has been recognized that if the initial population to the GA is good, then the algorithm has a better possibility of finding a good solution and that, if the initial supply of building blocks is not large enough or good enough, then it would be difficult for the algorithm to find a good solution.

3) Selection: This operator selects chromosomes in the population for reproduction. The fitter the chromosome, the more times it is likely to be selected to reproduce [11].

4) Crossover: In genetic algorithms, crossover is a genetic operator used to vary the programming of a chromosome or chromosomes from one generation to the next. It is analogous to reproduction and biological crossover, upon which genetic algorithms are based. Cross over is a process of taking more than one parent solutions and producing a child solution from them. There are methods for selection of the chromosomes. This operator randomly chooses a locus and exchanges the subsequences before and after that locus between two chromosomes to create two offspring. For example, the strings 10000100 and 11111111 could be crossed over after the third locus in each to produce the two offspring 10011111 and 11100100. The crossover operator roughly mimics biological recombination between two single-chromosome organisms [11].

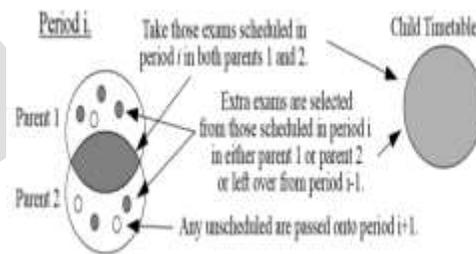


Fig 2: Crossover Operator [9]

5) Mutation: Mutation is a genetic operator used to maintain genetic diversity from one generation of a population of genetic algorithm chromosomes to the next. It is analogous to biological mutation. Mutation alters one or more gene values in a chromosome from its initial state. In mutation, the solution may change entirely from the previous solution. Hence GA can come to better solution by using mutation. This operator randomly flips some of the bits in a chromosome. For example, the string 00000100 might be

mutated in its second position to yield 01000100. Mutation can occur at each bit position in a string with some probability, usually very small [11].

6) Fitness Function: The fitness function is defined over the genetic representation and measures the quality of the represented solution. The fitness function is always problem dependent. In particular, in the fields of genetic programming and genetic algorithms, each design solution is commonly represented as a string of numbers referred to as a chromosome. After each round of testing, or simulation, the idea is to delete the 'n' worst design solutions, and to breed 'n' new ones from the best design solutions. Each design solution, therefore, needs to be awarded a figure of merit, to indicate how close it came to meeting the overall specification, and this is generated by applying the fitness function to the test, or simulation, results obtained from that solution.

IMPLEMENTED APPROACH

In order to deal with timetabling issues we have implemented a system which would mechanically generate timetable for the institute. Course and lectures will be scheduled in accordance with all possible constraints and given inputs and thus a timetable will be generated.

There are few steps involved in the overall functioning of genetic algorithm which is stated below:

- Create population and then check the fitness function of each chromosome of the population.
- If the chromosome is unfit for processing kill it and proceed further.
- Describe the population size that is the maximum number of chromosome to be there in initial population and then select two chromosomes from the same which will act as parent.
- From the parent chromosome a child chromosome is created and then again the fitness function of the child chromosome is checked if it is fit for the operation it is passed into the system or else killed.

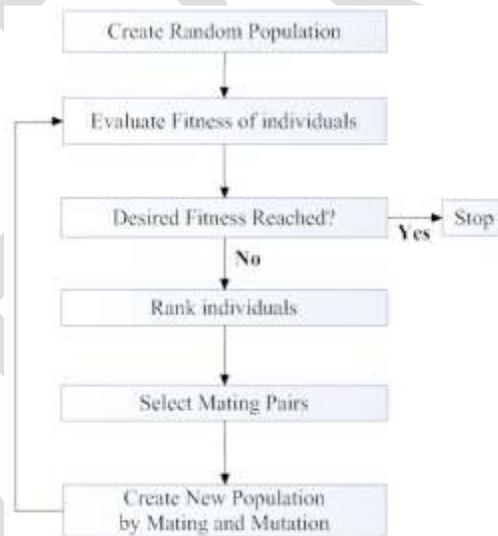


Fig 3: Flow graph of genetic algorithm

Structure of time table generator consists of input data, relation between the input data, system constraints and application of genetics algorithm.

A. Input Data

The input data contains:

- 1) *Professor*: Data describes the name of lecturers along with their identification number.
- 2) *Subject*: Data describes the name of courses in the current term.
- 3) *Room*: Data describes the room number and their capacity.
- 4) *Time intervals*: It indicates starting time along with duration of a lecture.

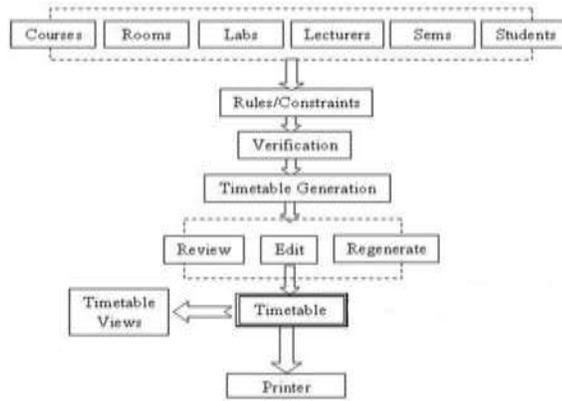


Fig 4: General view of Timetable Generator [4]

B. System Constraints

System constraints are divided into 2 categories:

- 1) **Hard Constraints:** The timetable is subjected to the following four types of hard constraints, which must be satisfied by a solution to be considered as a valid one:
 - a. A student should have only one class at a Time.
 - b. A Teacher should have only one class at a time.
 - c. A room should be booked only for one class at a time.
 - d. Some classes require classes to have particular equipment. For example, audio visual equipment, projectors etc.
- 2) **Soft Constraints:** These are the constraints that are of no great concern but are still taken into contemplation. They don't need to be satisfied but the solutions are generally considered to be good if they are satisfied.
 - a. Courses must be eventually distributed.
 - b. Students should not have any free time between two classes on a day.
 - c. Scheduling of teachers should be well spread over the week.

3) Constraints Relations Pertaining to Timetable Generation:

The timetabling algorithm consists of set of different lists, such as Teachers List, Subjects List, Rooms List, Times Slots List, Semesters List, and Days List. The input will be taken from user.

a. Teacher-Subject Constraint

In this constraint, Teacher is assigned to various Subjects. A Teacher can be assigned to more than one subject.



Fig 5: Teacher Subject Mapping

b. Teacher –Time Slot Constraint

A Teacher may have some hours as favourable hours and some as forbidden hours for conducting lectures. Our algorithm will consider this constraint checking.

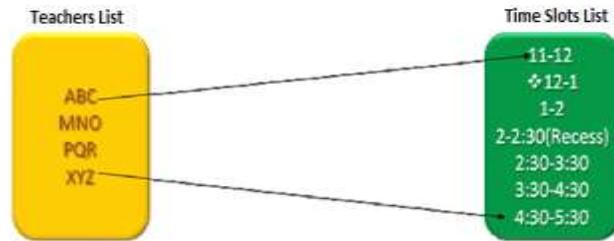


Fig 6: Teacher Timeslot Mapping

c. Teacher-Year Constraint

A Teacher can teach more than one year simultaneously. Algorithm must consider this association.



Fig 7: Teacher Year Mapping

When all data is entered in the all lists and when all constraints are mentioned by user. Then whole matrix is created in memory which helps algorithm to check constraints and perform allocation.

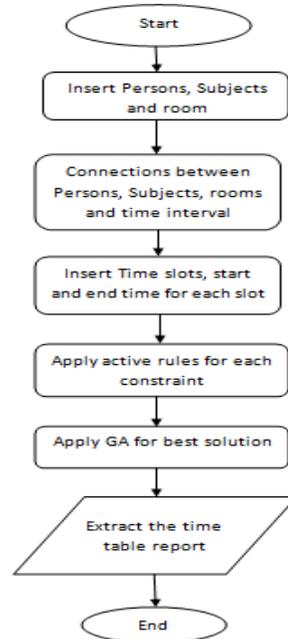


Fig 8: The structure of time table generator [7]

RESULT

Working with real data in real situation was our goal. So we used the data from the Department of Information Technology, Atharva College of Engineering, University of Mumbai. We've entered the raw data for a semester (courses being offered with their corresponding professors). Our implementation which is developed in C# used a .NET framework for representing chromosomes, generations and processing the evolution. We ran our tests on a dual core 2 GHz CPU with 2 GB of RAM.

Atharva College Of Engineering					
Regular	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
9:00 To 10:00	Computer Networks Practicals	Web Programming Practicals	Applied Mathematics-IV (Navita Agraval)	Applied Mathematics-IV (Navita Agraval)	Applied Mathematics-IV (Navita Agraval)
10:00 To 11:00	Computer Networks Practicals	Web Programming Practicals	Applied Mathematics-IV (Navita Agraval)	Computer Networks (Suvarna Jadhav)	Computer Networks (Suvarna Jadhav)
11:00 To 12:00	Computer Networks (Suvarna Jadhav)	Computer Networks (Suvarna Jadhav)	Computer Organization&Architecture (Sumita Chandak)	Computer Organization&Architecture (Sumita Chandak)	Computer Organization&Architecture (Sumita Chandak)
12:00 To 13:00	Computer Organizations&Architecture (Sumita Chandak)	Automata Theory (Mamata Ghelot)	Automata Theory (Mamata Ghelot)	Automata Theory (Mamata Ghelot)	Web Programming (Poonam Joshi)
13:00 To 14:00	LUNCH BREAK	LUNCH BREAK	LUNCH BREAK	LUNCH BREAK	LUNCH BREAK
14:00 To 15:00	Web Programming (Poonam Joshi)	Web Programming (Poonam Joshi)	Web Programming (Poonam Joshi)	Information Theory& Coding (Reena Mahe)	Information Theory& Coding (Reena Mahe)
15:00 To 16:00	Information Theory& Coding (Reena Mahe)	Information Theory& Coding (Reena Mahe)	Applied Mathematics-IV Tutorials (Rogini Bazaz)	Automata Practicals (Snigdha W)	Information Theory & Coding Practicals (Jayshree Jha)
16:00 To 17:00					

Fig 9: Result

FUTURE SCOPE

The future scope of the implemented system is listed below which can be applied to the system with further studies:

- The application can generate time tables of various departments of an institute simultaneously on single system.
- Online time tabling is also possible. But the administrator will have the control over generating timetables, to avoid the misuse of the given access to students as well as faculty.
- In online time table scheduling application, the details and qualifications of the professors and details of student identity and attendance can be viewed by clicking on particular subject or professor and classes respectively.
- The time table of all the classrooms containing respective lectures, professors and semesters in the entire day can be viewed. The vacancy of the classrooms and labs can also be shown.
- The time table for faculties and labs can also be generated independently.

ACKNOWLEDGMENT

We are thankful to Prof. Nileema Pathak, Prof. Sumita Chandak and Prof. Renuka Nagpure, Department of Information Technology, Atharva college of Engineering.

CONCLUSION

As discussed, an evolutionary algorithm, genetics algorithm for time tabling has been implemented. The intention of the algorithm to generate a time-table schedule automatically is satisfied. The algorithm incorporates a number of techniques, aimed to improve the efficiency of the search operation. By automating this process with the help of computer assistance timetable generator can save a lot

of precious time of administrators who are involved in creating and managing various timetables of the institutes. Also the timetables generated are much more accurate, precise than the ones created manually. The project reduces time consumption and the pain in framing the timetable manually. The benefits of this approach are simplified design and reduced development time.

REFERENCES:

- [1] M. Doulaty, M. R. Feizi Derakhshi, and M. Abdi, "Timetabling: A State-of-the-Art Evolutionary Approach", *International Journal of Machine Learning and Computing*, Vol. 3, No. 3, June 2013.
- [2] Anirudha Nanda, Manisha P. Pai, and Abhijeet Gole, "An Algorithm to Automatically Generate Schedule for School Lectures Using a Heuristic Approach", *International Journal of Machine Learning and Computing*, Vol. 2, No. 4, August 2012
- [3] Dilip Datta, Kalyanmoy Deb, Carlos M. Fonseca, "Solving Class Timetabling Problem of IIT Kanpur using Multi-Objective Evolutionary Algorithm". *KanGAL* 2005.
- [4] Anuja Chowdhary, Priyanka Kakde, Shruti Dhoke, Sonali Ingle, Rupal Rushiya, Dinesh Gawande, 'Time table Generation System', *International Journal of Computer Science and Mobile Computing*, Vol.3 Issue.2, February- 2014.
- [5] Mughda Kishor Patil, Rakhe Shruti Subodh, Prachi Ashok Pawar, Naveena Narendrasingh Turkar, "Web Application for Automatic Time Table Generation", *International Journal of current Engineering and Technology*, E-ISSN 2277-4106, P-ISSN 2347-5161.
- [6] Sandeep Singh Rawat, Lakshmi Rajamani, "A Time table Prediction for Technical Educational System using Genetic Algorithm", *Journal of Theoretical and Applied Information Technology*, 2005-2010JATIT.
- [7] Bharka Narang, Ambika Gupta, Rashmi Bansal, "Use of Active Rules and Genetic Algorithm to Generate the Automatic Time-Table", *International Journal of Advances in Engineering Sciences*, Vol.3 (3).
- [8] Alberto Colomi, Marco Dorigo, Vittorio Maniezzo, "A Genetic Algorithm to Solve the Time Table Problem", *Computational Optimization and Applications Journal*.
- [9] Rupert Weare, Edmund Burke and Dave Elliman, "A Hybrid Algorithm for Highly Constrained Timetabling Problem", *Computer Science Technical Report* No. NOTTCS-TR-1995-8.
- [10] D. Abramson, J. Abela, "A Parallel Genetic Algorithm for Solving the School Timetabling Problem", *15 Australian Computer Science Conference, Hobart*, Feb 1992.
- [11] Dipesh Mittal, Hiral Doshi, Mohammed Sunasra, Renuka Nagpure "Automatic Timetable Generation Using Genetic Algorithm" *International Journal of Advance Research in Computer and Communication Engineering*. Vol. 4, Issue 2, Feb 2015.
- [12] Melanie Mitchell, "An Introduction To Genetic Algorithm", *A Bradford Book The MIT Press*, Fifth printing 1999.
- [13] David A. Coley, "An Introduction To Genetic Algorithms For Scientists And Engineers", *World Scientific Publishing Co. Pvt. Ltd.*, 1999

AN ANALYTICAL STUDY ON IRIS RECOGNITION SYSTEM: A SURVEY

Gourav Sachdeva, Dr. Bikrampal Kaur

M.tech, Professor, Department of Information Technology

Chandigarh Engineering College, Landran (Mohali)

gouravsachdeva8@gmail.com, cecm.infotech.bpk@gmail.com

9914191588

ABSTRACT- The iris recognition is a kind of the biometrics technologies based on the physiological characteristics on the fingerprint, palm print, face and sound etc, the iris has some rewards such as individuality, stability, high recognition rate, and non infringing etc. Iris recognition is regarded as the most reliable and accurate biometric identification system available. In this paper, it is described the common methods of Iris Recognition along with some feature extraction techniques and matching methods. This paper will help in future in choosing the best optimal method for Iris Recognition.

KEYWORDS- Iris, Wavelets, Hamming, Gabor, SIFT, ACO, Feature Extraction

I. INTRODUCTION

All these biometric identification technique, iris recognition is most prominent technique. Iris recognition systems are gaining interest because it is stable over time. Iris scan has been developing an identification/verification system capable of positively identifying and verifying the identity of individuals. The unique patterns of the human iris, used for overcoming previous shortcomings. The iris indicates the color part of the human eye. It is a circular membrane of the former face of the ocular sphere. It is pierced with a black hole called the pupil which allows the light penetration to the retina. The iris is used to adapt this light quantity by papillary dilation or constriction. The iris is a combination of several elements [1]. The visual appearance of the iris is directly related to its Multi-layered construction. The forward layer is divided into two essential regions, the central pupillary zone and the surrounding zone. The border between these areas is known as the collarette. The iris has been found to be incredibly unique individual to individual, in both color and structure. In fact, it has been discovered by both ophthalmologists and anatomists, investigating large numbers of eyes that even the left and right eye of an individual exhibit differences in

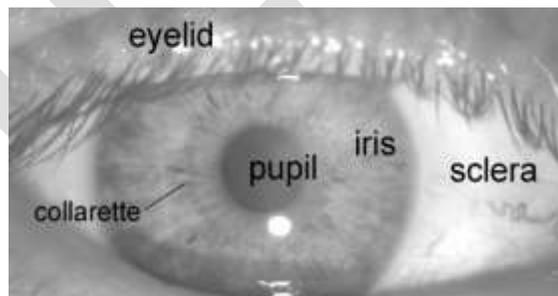


Figure 1 Biometric Iris

their iris pattern. Also, the pattern appears to very little after childhood. In various study it shows that the iris is most fully developed and also grows little after childhood. However, after teenage years a person's iris pattern to be expected remains same for rest of the life. Thus, the iris recognition pattern is deliberated to be the most reliable and accurate biometric identification system available and widely used in automated personal identification. And among many biometrics techniques, iris detection is one of the most hopeful approaches due to its high reliability for personal identification [2].

II. IRIS RECOGNITION SYSTEM

A major approach for iris recognition today is to generate feature vectors corresponding to individual iris images and to perform iris matching based on some distance metrics [3–6]. Most of the commercial iris recognition systems implement a famous algorithm using iris codes proposed by Daugman [3]. One of the difficult problems in feature-based iris recognition is that the matching performance is significantly influenced by many parameters in feature extraction process (e.g., spatial location, direction, center frequencies and size parameters for 2D Gabor filter essential part), which may vary depending on environmental factors of iris image acquisition. Iris recognition is an automated method of biometric identification than uses mathematical pattern-recognition techniques on images of the irides of a persons eyes, whose composite random patterns are single and can be seen from some space. Not to be puzzled with another, less common, ocular-based technology, retina scanning, and iris recognition uses camera technology with subtle infrared illumination to acquire images of the detail rich, complicated structures of the iris. Digital templates prearranged from these patterns by mathematical and statistical algorithms allow the identification of a person or someone pretending to be that person. To enhance the presentation of recognition, the iris recognition process is useful to left and right irises separately and the corresponding distance scores are generated for each iris of a person. These scores are joint using the weighted sum fusion rule which further increases their cognition rate. Iris recognition system is composed of segmentation, normalization, characteristic encoding and matching [7]. Iris recognition is an attractive technology for identity authentication for several reasons. Few people can't use the technology as most individuals have at least one eye. In a few instances even blind people have used iris recognition successfully, as the skill is iris recognition pattern-dependent, not vision dependent. Once an individual is enrolled, re-enrollment requirements are uncommon. With other biometric technology, change in voice timbre, weight, hairstyle, finger and hand size, cuts or even the effect of manual work can trigger the need for re-enrollment. Iris recognition is ideal for handling applications requiring management of large user groups, such as a National Documentation function might require. Iris Access platforms integrate well with large database back ends like Microsoft SQL and Oracle 9i. In a UK Government-commissioned study, Iris ID's Iris Access platform searched records nearly 20 times faster than the next fastest technology. Iris ID has developed a high speed matching engine, Iris Accelerator, designed to deliver 10 million+ matches per second. Iris recognition involves nothing more than taking a digital picture of the iris pattern (from video), and recreating an encrypted digital pattern of that pattern. 512 byte iris template are encrypted and cannot be re-engineered or reconstituted to produce any sort of visual image. Iris recognition then affords high level defense against identity robbed, a rapidly growing offense. The imaging process involves no lasers or bright lights and authentication is essentially non-contact. Iris recognition has a good, convenient and intuitive user interface.

Iris recognition is the most excellent authentication process accessible nowadays. While many fault it for scanning of retina, iris detection basically involves taking a representation of the iris; this depiction is used exclusively for verification. But what makes iris recognition the authentication system of choice?

1. **Stable** - The distinctive pattern in the individual iris is formed by 10 months of age, and remains unaffected all through one's lifetime.
2. **Uniqueness** - The possibility of two irises producing the similar system is nearly impossible.
3. **Flexibility** - Iris detection skill simply integrates into obtainable security systems or operates as an impartial.
4. **Reliability** - A characteristic iris pattern is not disposed to theft, loss or negotiation.

III Previous Techniques

S. No.	Author	Method
1	Padma Polash, Maruf Monwar et.al [8]	The paper deal with the High Transform and Gabor filters. This paper presented an iris recognition system in order to verify both the uniqueness of the human iris and also its performance as a biometric identification. A biometric system provides automatic identification of an individual based on a unique feature or characteristic possessed by the individual.
2	Miyazawa, Kazuyuki, Koichi Ito, Takafumi Aoki, Koji Kobayashi, and Hiroshi Nakajima et.al [9]	The paper based on phase-based image matching. This paper presents use of phase components in two-dimensional discrete Fourier transforms of iris images makes possible to achieve highly robust iris recognition with a simple matching algorithm. Trial evaluation using the CASIA iris image database (ver. 1.0 and ver. 2.0) clearly demonstrates an efficient performance of the proposed algorithm.
3	Himanshu Srivastava [10]	The paper deals with the Canny Edge Detector & Circular Hough Transformation technique. This paper presents a personal identification using iris recognition system with the help of six main steps i.e. image achievement, localization, separation, normalization, feature extraction and matching and also these six steps consists numbers of minor steps to complete each step.
4	M. Vatsa, R. Singh, A. Noore et. al [11]	The paper deals with the 1D log polar Gabor wavelet and Euler numbers. They presents the 1D log polar Gabor wavelet which is used to remove the textural features, and Euler numbers which are used to take out topological features of the iris. The proposed choice strategy uses those features to authenticate an individual's identity while maintaining a low false rejection rate.
5	Hematian, Amirshahram, Asrulnizam Abd Manaf, Suriayati Chuprat, Reza Khaleghparast, and Sajjad	The paper deals with the Field-Programmable Gate Array (FPGA) technique. In this paper they proposed a prototype design for iris recognition based on field-programmable gate array in order to improve iris recognition performance by

	Yazdani. [12]	similar computing. Time-consuming iris recognition sub-processes are fully implemented in parallel to achieve best performance.
6	Zhonghua Lin, Bibo Lu et. al [13]	The paper deals with the Morlet wavelet transform technique. This paper presents an iris recognition method based on the imaginary coefficients of Morlet wavelet transform. Firstly, it locates the iris, after that makes normalization to the iris image. Secondly, it makes one measurement Morlet wavelet transform row by row to the iris image in the useful iris area.
7	Nguyen, K., Fookes C., Sridharan S., Denman, S. [14]	The paper deals with Super-resolution method. Uncooperative iris identification systems at a distance suffer from poor resolution of the captured iris images, which considerably degrades iris recognition performance. Super resolution methods have been employed to enhance the resolution of iris images and improve the recognition performance.
8.	Vijay Prakash Sharma, Sadhna K. Mishra, Deepika Dubey et. al [15]	The paper deals with the optimization technique i.e. Ant Colony Optimization(ACO) and Wavelet Transform and compared with the Hough circular transform recognition technique. The paper describes the authentication with some drawback is that the process of feature selection in iris recognition using wavelet and colony optimization process is very complex.
9.	Weijie Zhao, Xiaodong Chen, Ji Cheng, Linhua Jiang et. al [16]	The paper deals with the Scale invariant feature transform(SIFT) technique which uses segmentation, matching and evaluation by generating the key point descriptors. They focused to find the more specific key points to improve the accuracy.

Table-1 Previous Techniques

IV. CONCLUSION AND FUTURE SCOPE

Iris recognition is one of the most effective biometric techniques used for security purposes. In this paper various feature extraction and matching techniques has been discussed which is used for classification. The previous techniques help us to design an optimized authentication so that we will get high accuracy rate, less False Acceptance rate and less False Rejection rate.

REFERENCES:

- [1] Wayman, J., Jain, A., Maltoni, D., Maio, D.: Biometric Systems. Springer (2005).
- [2] Pankanti, Sharath, Ruud M. Bolle, and Anil Jain. "Biometrics: The future of identification" *Computer* 33, no. 2 (2000): 46-49.
- [3] Daugman, John G. "High confidence visual recognition of persons by a test of statistical independence." *Pattern Analysis and Machine Intelligence, IEEE Transactions on* 15, no. 11 (1993): 1148-1161.
- [4] Ma, Li, Tieniu Tan, Yunhong Wang, and Dexin Zhang. "Efficient iris recognition by characterizing key local variations." *Image Processing, IEEE Transactions on* 13, no. 6 (2004): 739-750.
- [5] Boles, Wageeh W., and Boualem Boashash. "A human identification technique using images of the iris and wavelet transform." *IEEE transactions on signal processing* 46, no. 4 (1998): 1185-1188.

- [6] Tisse, Christel-loic, Lionel Martin, Lionel Torres, and Michel Robert. "Person identification technique using human iris recognition." In *Proc. Vision Interface*, pp. 294-299. 2002.
- [7] Wildes, Richard P. "Iris recognition: an emerging biometric technology." *Proceedings of the IEEE* 85, no. 9 (1997): 1348-1363.
- [8] Padma Polash, P., and M. Maruf Monwar. "Human iris recognition for biometric identification." In *Computer and information technology, 2007. iccit 2007. 10th international conference on*, pp. 1-5. IEEE, 2007.
- [9] Miyazawa, Kazuyuki, Koichi Ito, Takafumi Aoki, Koji Kobayashi, and Hiroshi Nakajima. "A phase-based iris recognition algorithm." In *Advances in biometrics*, pp. 356-365. Springer Berlin Heidelberg, 2005.
- [10] Srivastava, Himanshu. "Personal Identification Using Iris Recognition System, a Review." *International Journal of Engineering Research and Applications (IJERA)* 3, no. 3 (2013): 449-453.
- [11] Vatsa, M., R. Singh, and A. Noore. "Reducing the False Rejection Rate of Iris Recognition Using Textural and Topological." *International Journal of Signal Processing* 2, no. 2 (2005).
- [12] Hematian, Amirshahram, Asrulnizam Abd Manaf, Suriyati Chuprat, Reza Khaleghparast, and Sajjad Yazdani. "Field programmable gate array system for real-time IRIS recognition." In *Open Systems (ICOS), 2012 IEEE Conference on*, pp. 1-6. IEEE, 2012.
- [13] Lin, Zhonghua, and Bibo Lu. "Iris recognition method based on the imaginary coefficients of Morlet wavelet transform." In *Fuzzy Systems and Knowledge Discovery (FSKD), 2010 Seventh International Conference on*, vol. 2, pp. 573-577. IEEE, 2010.
- [14] Nguyen, Kien, Sridha Sridharan, Simon Denman, and Clinton Fookes. "Feature-domain super-resolution framework for Gabor-based face and iris recognition." In *Computer Vision and Pattern Recognition (CVPR), 2012 IEEE Conference on*, pp. 2642-2649. IEEE, 2012.
- [15] Sharma, Vijay Prakash, Sadhna K. Mishra, and Deepika Dubey. "Improved Iris Recognition System Using Wavelet Transform and Ant Colony Optimization." In *Computational Intelligence and Communication Networks (CICN), 2013 5th International Conference on*, pp. 243-246. IEEE, 2013.
- [16] Zhao, Weijie, Xiaodong Chen, Ji Cheng, and Linhua Jiang. "An application of scale-invariant feature transform in iris recognition." In *Computer and Information Science (ICIS), 2013 IEEE/ACIS 12th International Conference on*, pp. 219-222. IEEE, 2013

Biodecolorization Of Reactive Dyes By *Spirogyra* sp. & *Oscillatoria* sp.

Dr.N.H.Brahmbhatt¹, Dr.R.T.Jasrai²

¹V.P & R.P.T.P Science College, V.V. Nagar, Anand,

Associate Professor

E mail: naina_bbhatt@yahoo.co.in

²R K Parikh Arts & Science College, Petlad

Associate Professor

E.mail: rtjasrai@yahoo.com

Abstract- In recent years the ability of microorganisms on decolorizing of textile wastewater has received much attention due to the environmental persistence and toxicity of these pollutants. In this paper biodegradation of Blue dye and Red dye, by *Spirogyra* species and *Oscillatoria* species were investigated. The results obtained from batch experiments revealed the ability of the algal species in removing the dye. The effects of operational parameters include different algal biomass & effect of pH on decolorization efficiency were examined. All assays were conducted in duplicates.

Keywords— Biodegradation; Bluedye; Decolorization; *Oscillatoria* sp.; Red dye; *Spirogyra* sp.;

1 INTRODUCTION

Water is life but now a-days due to the advancement in industrialization, it is spoiling a lot. Many contaminants present in wastewater, such as acids, bases, toxic organic and inorganic dissolved solids, and colors. Among them, colors are considered the most undesirable and are mainly caused by dyes [1]. Presence of colour and its causative compounds has always been undesirable in water used for either industrial or domestic needs. Different colouring agents like dyes, inorganic pigments, tannins, lignins etc. usually impart colour. Amongst complex industrial wastewater with various types of colouring agents, dye wastes are predominant [2]. This wastewater not only toxic to the biological world, but it also has a dark colour, which blocks sun light. By these reasons, it causes many problems to the ecosystem [3]. The number of dyes presently used in textile industry is about 10,000. Among these dyes, Blue dyes and Yellow dyes constitute the largest and the most important class of commercial dyes. Both dyes are widely used in textile, plastic, leather, and paper industries as additives. The removal of both dyes in aquatic environment is important because some types of dyes are toxic to aquatic organisms .

The processes such as ozonation, photooxidation, electrocoagulation, adsorption, activated carbon, membrane filtration and flocculation are applied for color removal from textile effluents. Such methods are often very costly and although the dyes are removed, accumulation of concentrated sludge creates a disposal problem. There is a need to find alternative biodegradations that are effective in removing dyes from large volumes of effluents and are low in cost such as biological or combination systems [9][10].

In recent years a number of studies have focused on some microorganisms, which are able to biodegrade, and biosorb dyes in wastewaters. A wide variety of microorganisms capable of decolorizing a wide range of dyes include some bacteria: *Escherichia coli* ; *Pseudomonas luteola*; *Aeromonas hydrophila*; *Kurthia* sp.; fungi: *Aspergillus niger* ; yeasts: *Saccharomyces cerevisiae*, *Candida tropicalis*, *C. Lipolytica* ; algae: *Spirogyra* sp.; *Chlorella vulgaris*. [6][7][10][8][17]

Algae are microscopic, photosynthetic organisms, which typically inhabit aquatic environments, soil and other exposed locations. So, the present study aims to investigate the potential of the *spirogyra* sp. and *oscillatoria* sp. for decolorization of the solution containing a textile dye. The effect of operational parameters on biodegradation of Blue dye and Red dye was also studied.

2 Materials and Methods

2.1 Algal Biomass

The algae obtained from natural lake. According to its morphology and microscopic observations. It is identified as *Spirogyra sp.* and *Oscillatoria sp.* belonging to green algae and blue green (brown green). Fig.(10,11) shows the microscopic image of both algal sp.

2.2 Growth medium

BBM (Bold's basal medium) and BG 11 (Blue Green 11) used for *Spirogyra sp.* and *Oscillatoria sp.* Both species was grown in several 1-l glass jars containing medium (modified Bold basal medium AND BG 11 medium) in order to obtain stock algal culture to be used during the experiments.

2.3 Dye analysis

Dye analysis was performed at Green Circle, Inc, Research lab. At Baroda [Recognized By Ministry of Environment and Forests. New Delhi under EPA 1986 and GPCB approved Environmental Auditor – (Schedule - 2)]. Table (1) shows the analysis report of both dye.

The Blue dye & Red dye used in this study. The absorbance was measured with a spectrophotometer at the maximum absorption wavelengths ($\lambda_{max}=619$ nm). Decolorization was determined by absorbance reduction. The dye concentration in mg per liter was determined from absorbance calibration curve of standard solutions. The efficiency of color removal was expressed as the percentage ratio of the decolorized dye concentration to that of initial one (Eq. 1).

$$\text{Percentage of decolorization} = \frac{\text{Initial absorbance} - \text{Final absorbance}}{\text{Initial absorbance}} \times 100$$

....eq.1

2.4 Batch decolorization operation

The experiments were conducted in 250 ml Erlenmeyer flasks containing 100 ml of respective dye solution. The effect of different algal biomass as well as pH were studied to know the decolorization efficiency. The experiments were operated at static incubation.

3 Figures and Tables

Table 1 Dye analysis report

Sr. No	PARAMETER	UNIT	BLUE DYE	RED DYE
1	PHYSICAL APPEARANCE	-	BLUE COLORED TURBID LIQUID WITH TOO MUCH SUSPENDED PARTICLES AND ODORLESS	BROWNISH RED COLOR LIQUID WITH VERY FEW SUSPENDED PARTICLES AND COLORLESS
2	pH	-	7.68	7.23
3	COLOR	UNIT	7.6	20.6

4	TOTAL SUSPENDED SOLID	MG/L	460	56
5	TOTAL DISSOLVED SOLID	MG/L	3984	13036
6	BIOCHEMICAL OXYGEN DEMAND (3 DAYS AT 27 °C)	MG/L	206	723
7	CHEMICAL OXYGEN DEMAND	MG/L	960	2640
8	CHLORIDE AS Cl^{2-}	MG/L	840	3480
9	SULPHATE AS SO_4^{2-}	MG/L	240	708
10	TOTAL CHROMIUM AS CR	MG/L	BDL	0.76
11	COPPER A CU	MG/L	0.84	0.56
12	IRON AS FE	MG/L	0.52	1.26
13	MANGANESE AS MN	MG/L	1.02	0.27
14	NICKEL AS NI	MG/L	0.26	1.60

BDL=Below Detectable Limit

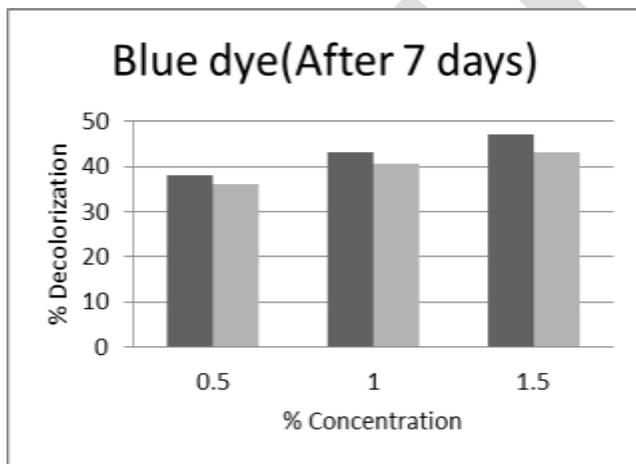


Figure 2

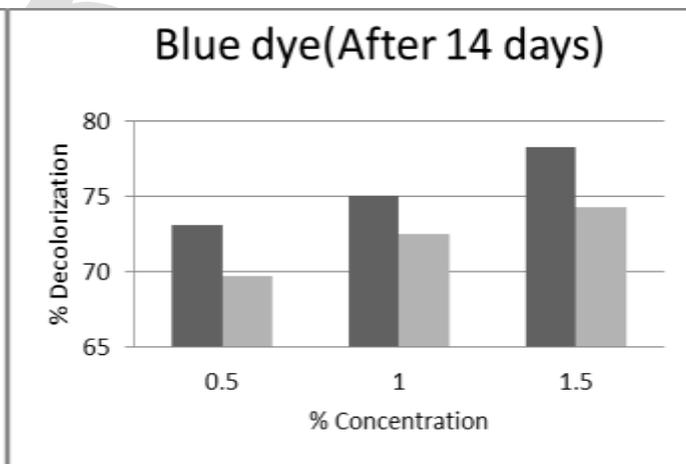


Figure 3

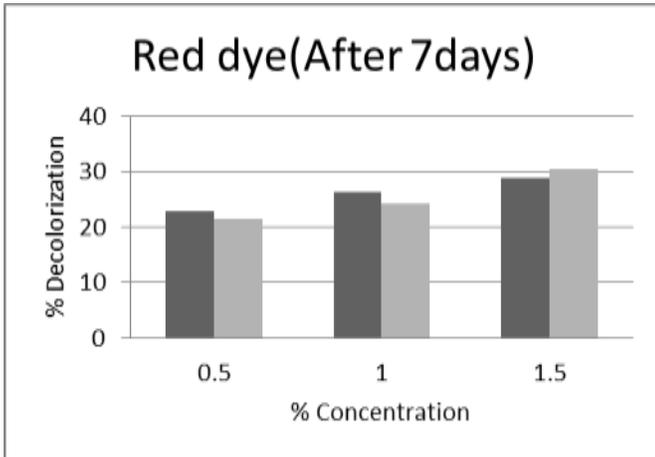


Figure 4

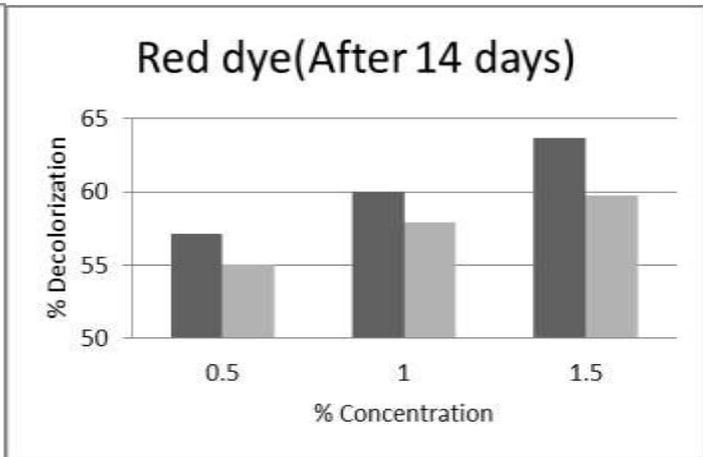


Figure 5

Above figure shows the effect of Diff. concentration of Algal biomass on Decolorization of dyes by Spirogyra sp. & Oscillatoria sp.

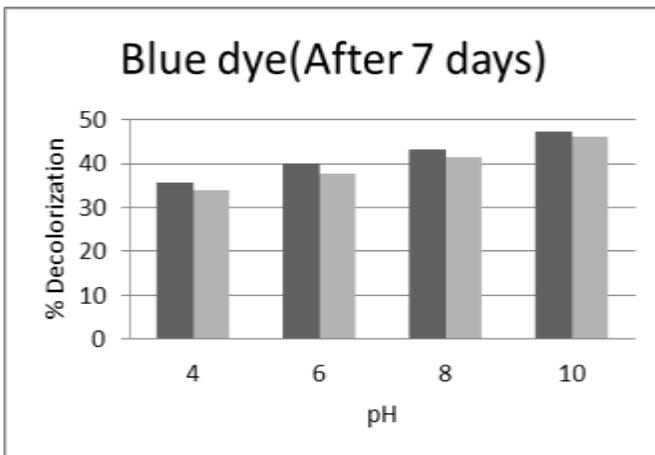


Figure 6

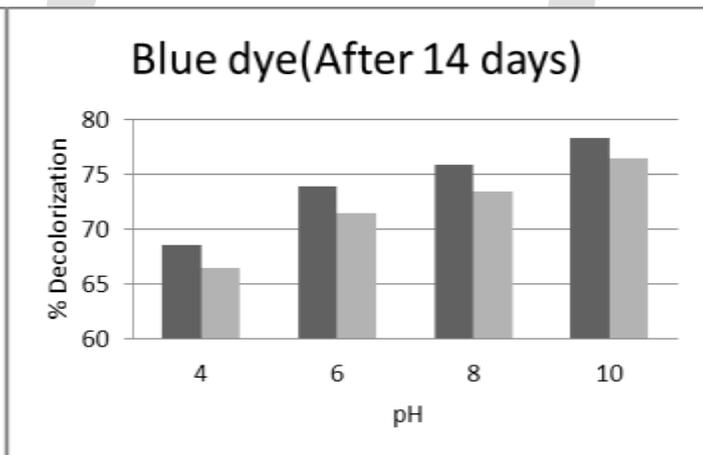


Figure 7

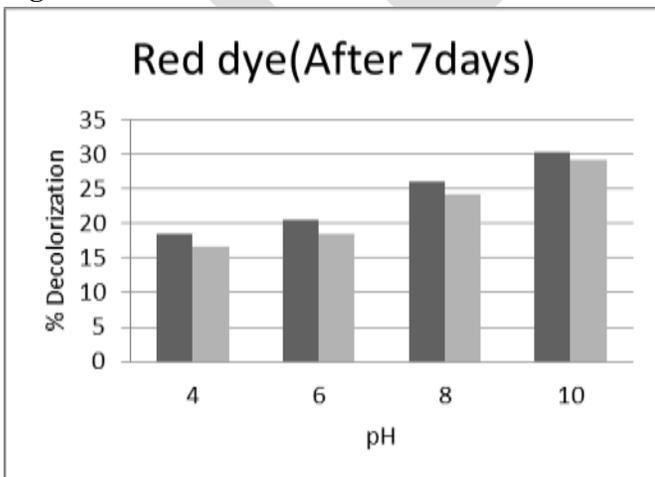


Figure 8

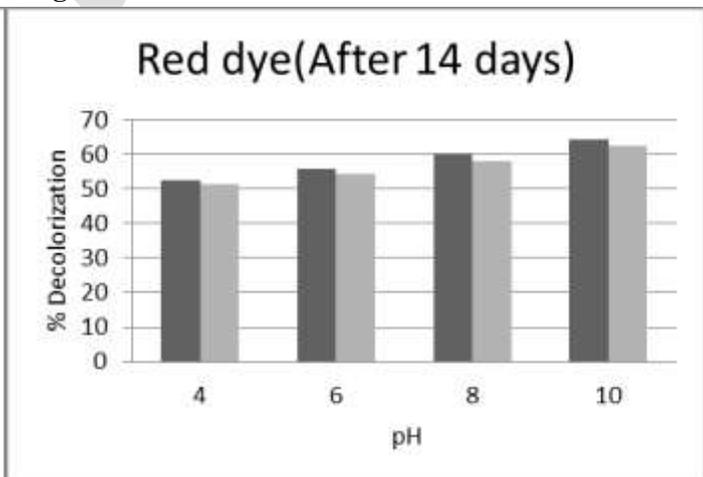


Figure 9

Above figure shows the effect of Diff. pH on Decolorization of dyes by Spirogyra sp.& Oscillatoria sp.



Figure 10



Figure 11

4 Results

Figures (2-5) shows % decolorization of Blue dye and Red dye by different algal biomass (0.5 %,1.0 % & 1.5 %). There was an increased in the decolorization rate with an increase time duration. The results obtained from present investigation revealed the ability of Spirogyra sp. and Oscillatoria sp. in biodegradation of both dyes. The 1.5 % algal concentration of Spirogyra and Oscillatoria sp. showed about 78.28% and 74.30 % decolorization of blue dye in 14 days duration. Where as in case of red dye, 63.68 % and 59.73% decolorization were monitored by Spirogyra sp. & Oscillatoria sp. respectively for the same period

The pH of the solution significantly affects the adsorption of dyes by algal biomass. Figures (6-9) shows % decolorization of Blue dye and Red dye by adjusting the pH at 4,6,8 & 10 respectively. At pH 10, the more effective dye adsorption capacity of algae was observed. At pH 10, Spirogyra sp. and Oscillatoria sp. showed about 78.29% and 76.48 % decolorization of blue dye in 14 days duration. Where as in case of red dye, 64.21 % and 62.63 % decolorization were monitored by Spirogyra sp. & Oscillatoria sp. respectively for the same period

5 Conclusion

In this research study it has been found that the Spirogyra sp. and Oscillatoria sp. are an easily available aquatic algae and has sufficient biodegradation potential for removing blue dye and Red dye from its aqueous solution under optimized conditions of temperature 33-40°C. It has been also found that Spirogyra sp. has more potential to phytoremediate than Oscillatoria sp. Whereas with increasing pH Spirogyra sp. Shows better decolorization than Oscillatoria sp. Keeping in view of this research study, concludes that both species of algae can be used for removing blue and yellow dye from its aqueous solution. Knowledge from present work may be employed on large scale at actual contamination sites. Our future study aims to find out the mechanism of this biodegradation of blue dye and yellow dye by Spirogyra sp. and Oscillatoria sp.

6 Acknowledgements

The authors are grateful to GUJCOST for financial assistance for this project.

REFERENCES:

- [1] Biological decolorization of dye solution containing Malachite Green by microalgae Cosmarium sp. By N. Daneshvar a, M. Ayazloo, A.R. Khataee, M. Pourhassan, University of Tabriz, Tabriz, Iran
- [2] Adsorption and desorption studies of a water soluble dye, Quinolone Yellow, using waste materials. By Gupta, V.K., Mittal, A., Gajbe, V., 2005 Interf. Sci. 284, 89–98.
- [3] An Innovative Approach to Biodegradation of Textile Azo Dyes by native bacterial strains , Pakistan journal of Biological science 11(10): 1310-1316, 2008 an article by Hanan Hafez Umer, Tanta University.

- [4] Land Contamination & Reclamation, 15 (3), 2007 DOI 10.2462/09670513.831, article by, S.M. Imamul Huq & J.C. Joardar.
- [5] Algae as a Potential Bioremediation Tool for Atrazine Contamination Written by Kyle Enot and Advised by Tracy Gartner
- [6] Decolorization and Degradation of textile Azo dyes by *Corynebacterium* sp. Isolated from industrial effluent by Usman Aftab. Department of Microbiology and molecular genetics, University of the Punjab, New campus, Lahore 54590, Pakistan
- [7] Isolation and Identification of Bacterial Culture for Azo Dye Degrading Capability by Murty Srinivas D., Patel Suhagi D., Soni Rakesh and Bhatt Nikhil P.G. Department of Microbiology, Gujarat Vidyapeeth, Sadra. Dist. Gandhinagar, (Gujarat), INDIA
- [8] Biodegradation of the Textile Dye Malachite Green by Microalgae *Cosmarium* sp. By N. Daneshvar, M. Ayazloo, A.R. Khataee, M. Pourhassan Water and Waste Treatment Research Laboratory, Department of Applied Chemistry, Faculty of Chemistry, University of Tabriz, Tabriz, Iran
- [9] Photo catalytic degradation of two commercial dyes in aqueous phase using photo catalyst TiO₂ Meeti Mehra and T. R. Sharma K. G. K. Degree College, Moradabad, India
- [10] Bioaugmentation of Azo Dyes Azeem Khalid, Muhammad Arshad, and David Crowley Department of Environmental Sciences, University of California, Riverside, CA 92521, USA
- [11] Microbial degradation of Textile Dye (Remazol Black B) by *Bacillus* spp. ETL-2012 by Maulin P Shah, Applied and Environmental Microbiology Lab, Enviro Technology Limited (CETP), Ankleshwar- 393 002, Gujarat, India
- [12] Decolorization and degradation of Azo dye - Remazol Black B by newly isolated *Pseudomonas putida* by S. Kannan, K. Dhandayuthapani and Mazher Sultana Department of Zoology, Manonmanium Sundaranar University, Tirunelveli, Tamil Nadu, India.
- [13] Physico-chemical parameters for testing of water – A review by P.N. Sawant. Department of Engineering Chemistry, Bharati Vidyapeeth's College of Engineering, Near Chitranagari, Kolhapur, Maharashtra, 416013 (INDIA)
- [14] Study on treatment process of effluent in Bulk drug industry by NV. Srikanth Vuppala and V. Saritha. Basic Science Department, Aditya Engineering College, Kakinada, Andhra Pradesh, India.
- [15] Biodegradation of aromatic compounds by microalgae by Kirk T. Semple & Ronald B. Cain. Department of Environmental Science, Institute of Environmental and Natural Sciences, Lancaster University, Lancaster LA1 4YQ, UK
- [16] An Innovative Approach to Biodegradation of Textile Azo Dyes by native bacterial strains in Iran by Mohammad Reza. Department of Microbiology, Islamic Azad University, Lahijan branch, Lahijan, Iran
- [17] Algal Decolorization and Degradation of Monoazo and Diazo Dyes by Hanan Hafez Omar. Department of Botany, Faculty of Science, Tanta University, Tanta, Egypt
- [18] Decolorization of Malachite Green and Methylene Blue by Two Microalgal Species by Mohamed Saad Abd-El-Kareema & Hala Mohamed Tahab. Botany and Microbiology -Department, Faculty of Science, Alexandria University, Alexandria, Egypt
- [19] Degradation of phenolic compounds by freshwater algae by Ellis, B.E. (1977) Plant Sci. Lett. 8, 213-216

**D & R
I & A**



Publication

International Journal of Engineering Research and general science is an open access peer review publication which is established for publishing the latest trends in engineering and give priority to quality papers which emphasis on basic and important concept through which there would be remarkable contribution to the research arena and also publish the genuine research work in the field of science, engineering and technologies

**International Journal Of Engineering Research and
General Science
ISSN 2091 - 2730**