Proceeding
Of
International Conference on Mechanical, Electronics and Computer Engineering (ICMECE-2014)

Date: 14th December, 2014,
Raipur

Editor-in-Chief

Dr. S.P.Anandaraj
Sr. Asst. Professor
SR Engineering College,
Warangal

Organized by:

TECHNICAL RESEARCH ORGANISATION INDIA
Website: www.troindia.in

ISBN: 978-81-930280-5-6

About Conference

Technical Research Organisation India (TROI) is pleased to organize the International Conference on Mechanical, Electronics and Computer Engineering (ICMECE-2014)

ICMECE is a comprehensive conference covering the various topics of Engineering & Technology such as Computer Science, Electronics and Mechanical. The aim of the conference is to gather scholars from all over the world to present advances in the aforementioned fields and to foster an environment conducive to exchanging ideas and information. This conference will also provide a golden opportunity to develop new collaborations and meet experts on the fundamentals, applications, and products of Computer science and Electronics. We believe inclusive and wide-ranging conferences such as ICMECE can have significant impacts by bringing together experts from the different and often separated fields of Computer,Electronics & Mechanical. It creating unique opportunities for collaborations and shaping new ideas for experts and researchers. This conference provide an opportunity for delegates to exchange new ideas and application experiences, we also publish their research achievements. ICMECE shall provide a plat form to present the strong methodological approach and application focus on Computer science, Electronics & Mechanical engineering that will concentrate on various techniques and applications. The conference cover all new theoretical and experimental findings in the fields of Computer science, Electronics & Mechanical engineering or any closely related fields.

Topics of interest for submission include, but are not limited to:

Computer Science & Engineering
Electronics Engineering
Aeronautical Engineering
Environmental Engineering
Nano-Technology,
Genetic Engineering
Materials and Metallurgical Engineering
Soft computing
Aeronautical Engineering
Agricultural engineering
Civil engineering
Engineering Science
Network Engineering
Software Engineering
Structural Engineering
System Engineering
Telecommunication Engineering
And many more....

Organizing Committee

Prof. Shravani Badiganchala

Assistant professor, Shiridi sai institute of science and engineering

Prof. Surjan Balwinder Singh
Associate Professor in the Electrical Engineering Department,
PEC University of Technology, Chandigarh.

Dr. Shilpa Jindal ,
PEC University of Technology (Deemed University), Chandigarh
ji_shilpa@yahoo.co.in

Prof. S. V. Viraktamath
Dept. of E&CE S.D.M. College of Engg. & Technology Dhavalagiri, Dharwad

Subzar Ahmad Bhat
Assistant Professor, Gla University
Dr. G.Suresh Babu
Professor,Dept. of EEE,CBIT, Hyderabad

Prof .Ramesh
Associate Professor in Mechanical Engineering,
St.Joseph's Institute of Technology

Prof.Amit R. Wasnik
Sinhgad Institute of Technology, Pune, Maharashtra

IIT KHARAGPUR
Prof. Rajakumar R. V.
DEAN Acadedemic, rkumar @ ece.iitkgp.ernet.in
Prof. Datta D., ddatta @ ece.iitkgp.ernet.in
Prof. Pathak S S,r,ssp @ ece.iitkgp.ernet.in

XIMB,BHUBANESWAR
Prof Dr. Subhajyoti Ray.M-Stat, (ISI); Fellow, IIM(A),
Dean academic,XIMB-subhajyoti@ximb.ac.in ,
Prof.Andrew Dutta

Prof. Saveeta Mohanty

Dr. S. Peppin

Prof. Dipak Misra

Dr. W.S. William

Prof. Sunil agrawal

TABLE OF CONTENTS

Editor-in-Chief

Dr. S.P.Anandaraj

Editorial

The conference is designed to stimulate the young minds including Research Scholars, Academicians, and Practitioners to contribute their ideas, thoughts and nobility in these two integrated disciplines. Even a fraction of active participation deeply influences the magnanimity of this international event. I must acknowledge your response to this conference. I ought to convey that this conference is only a little step towards knowledge, network and relationship.

The conference is first of its kind and gets granted with lot of blessings. I wish all success to the paper presenters.

I congratulate the participants for getting selected at this conference. I extend heart full thanks to members of faculty from different institutions, research scholars, delegates, TROI Family members, members of the technical and organizing committee. Above all I note the salutation towards the almighty.

Editor-in-Chief:
Dr. S.P.Anandaraj
Sr. Asst. Professor
SR Engineering College,
Warangal

SECURING DATA USING MODIFIED RECURSIVE MODULO -2 AND KEY ROTATION OPERATION

[1]Sonali sahu, [2]Prateeksha Pandey
[1]M.Tech Scholar, Department of Comp. Sci. & Engg.,
Chhatrapati Shivaji Institute of Technology, Durg, Chhattisgarh, India
[2]Assistant Professor, Department of comp.Sci. & Engg.
Chhatrapati Shivaji Institute of Technology
Email: [1]sonalisahu181990@gmail.com, [2]Prateekshapandey@csitdurg.in

***Abstract*- When it comes about information security, sending a message needs to be secured in order to protect the message from being used by an un-authorized user. As I studied various paper there are having various algorithms that secure the data like RSA, DES, TDES also. This paper helps in providing more security to the message as it scramble the message first to an unintelligible format as it shuffles the letter of the input message in order to protect the message and then recursive modulo-2 is applied and finally followed with key Rotation operation. In Recursive Modulo-2 and key Rotation operation a block of n bits is taken as an input stream where n varies from 4 to 256, from a continuous stream of bits and the techniques operates on it to generate the intermediate encrypted stream[1]. This technique directly involves all the bits of blocks in a Boolean operation and a session key. Using of scramble provides more security to the message send by the sender.**

Keywords- *scramble, securing message using Recursive MODULO-2 and Key Rotation operation, Cipher text, Block cipher, Session key*

I. INTRODUCTION

In the developing region of the cryptography solid conventions are utilized viably as a part of the method of ensuring secret data amid its transmission over a system.

Data is encoded at the senders end utilizing an encryption convention and a key. On arriving at the objective point, the undertaking of decoding is executed using an unscrambling convention along side a key to recover the source data. Encryption and decoding are in nut shell termed as cryptography. On the premise of the keys utilized as a part of the whole process, there exists two classification of cryptography. The modern field of cryptography can be divided into several areas of study: Symmetric key cryptography, public key cryptography, cryptanalysis, cryptography primitives, cryptosystems.

Symmetric key cryptography refers to encryption method in which both sender and receiver share the same key .symmetric key cipher are implemented as either block cipher or stream cipher. A block cipher and enciphers input in blocks of plain text as opposed to individual character. The input form used by a stream cipher.

In public key cryptography refers to encryption method in which both sender and receiver uses different key. public key cryptography can also be used for implementing digital signatures key. The objective of cryptanalysis is to discover a few shortcoming or frailty in a cryptographic plan, along these lines allowing its subversion or evasion. it is a typical misinterpretation that each encryption technique can be broken.

A significant part of the hypothetical work in cryptography concerns cryptographic primitives

calculations with essential cryptographic properties and their relationship to other cryptographic problems.

One or more cryptographic primitives are frequently used to create a more intricate calculation, called a cryptographic framework, or cryptosystem. Cryptosystems are intended to give specific usefulness while ensuring certain security properties . Cryptosystems utilize the properties of the basic cryptographic primitives to help the framework's security properties.The main objective of this project is

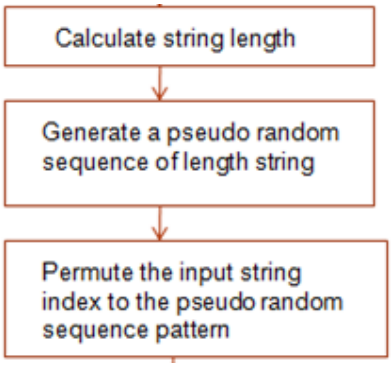
- To develop one system which provide the high security to the information.
- Reduces the crypt analysis.

Area 2 of the paper manages the standard of his paper. . A proposal for key generation described in section 3. Results are given in section 4. . Conclusions are given in section 5 and references are drawn in section 6.

II. PROPOSED TECHNIQUE

This techniques operates in three phases:

a. first phase scramble the message using scrambler.



b. second phase encrypt the message using Recursive Modulo-2 Operation of Paired bits of a stream[1].

The technique consider the plaintext from the first phase as a stream of finite number of bits N , and is divided into a finite number of blocks, each also containing a finite number of bits n ,where , 1<=n<=N.

The principle of Recursive Modulo-2 Operation is discussed in following manner:

Let P = $s_0^0\ s_1^0\ s_2^0\ s_3^0\ s_4^0 \ldots . s_{n-1}^0$ is a block of size n in the plaintext. Then the first intermediate block $I_1 = s_0^1\ s_1^1\ s_2^1\ s_3^1\ s_4^1 \ldots . . s_{n-1}^1$ can be generated from P in the following way:

$$s_0^1\ s_1^1 = s_0^0\ s_1^0 \oplus s_2^0\ s_3^0$$

$$s_2^1\ s_3^1 = s_0^0\ s_1^0 \oplus s_4^0\ s_5^0$$

$s_i^1\ s_{j+1}^1 = s_{i-j}^0\ s_{i-j+1}^0 \oplus s_{i+j+2}^0\ s_{i+j+3}^0$, 0<=i<(n-1), 0<=j<(n-1); $\oplus$ stands for the exclusive-OR operation.

In the same way, the second intermediate block $I_2 = s_0^2\ s_1^2\ s_2^2\ s_3^2\ s_4^2 \ldots . . s_{n-1}^2$ of the same size (n) can be generated by:

$$s_0^2\ s_1^2 = s_0^1\ s_1^1 \oplus s_2^1\ s_3^1$$

$$s_2^2\ s_3^2 = s_0^1\ s_1^1 \oplus s_4^1\ s_5^1$$

$s_i^2\ s_{j+1}^2 = s_{i-j}^1\ s_{i-j+1}^1 \oplus s_{i+j+2}^1\ s_{i+j+3}^1$,0<=i<(n-1) ,1<=j<(n-1); $\oplus$ stands for the exclusive-OR operation.

c. Third Phase encrypt the output of above phase by Recursive Key Rotation[1].

The technique considers the encrypted message from the first phase (here third encrypted block) as a stream of finite number of bits N, and is divided into a finite number of blocks, each also containing a finite number of bits n, where, 1<= n <= N.

*The rules to be followed for generating a cycle are as follows:

1. Consider any source stream of a finite number (where N=2n, n =3 to 8) and divide it into two equal parts.

2. Consider any key value (key= 2n, where n=1 to 7) depends upon the source stream that is, key value is the half of the source stream).

3. Make the modulo-2 addition (X-OR) with the key value to the first half of the source stream, to get the first intermediate block.

4. Make the modulo-2 addition with the key value (but now the key value is reversed) to the last half of the source stream to get the second intermediate block.

The same operation is performed for whole stream number of time with a varying block sizes. K such iteration is done and the final intermediate stream after k iterations generates the cascaded form of the encrypted stream. All of the different block sizes and k constitute the key for the session.
This key may be considered as session key for that
particular session. This process is repeated until the source stream is generated.
If this process continues for a finite number of iterations, the source block P is regenerated forming a cycle, which depends on the value of block size n. Any intermediate block in the recursive process may term as intermediate encrypted block and any block can be taken as the input for the second phase.

III. Generation of Session Key

To ensure the successful encryption of the proposed technique with varying size of blocks, a 114-bit key format consisting of 12 different segment has been proposed here [2,3,4,5,6,7,8] For the segment of rank the R, there can exist a maximum of N=218-R blocks, each of unique size of S=218-R, R starting from 1 and moving till 14[1].

- Segment with R=1 formed with the first maximum 131072 blocks, each of size 131072 bits
- Segment with R=2 formed with the next maximum 65536 blocks, each of size 65536 bits
- Segment with R=3 formed with the next maximum 32768 blocks, each of size 32768 bits
- Segment with R=4 formed with the next maximum 16384 blocks, each of size 16384 bits
- Segment with R=5 formed with the next maximum 8192 blocks, each of size 8192 bits
- Segment with R=6 formed with the next maximum 4096 blocks, each of size 4096 bits
- Segment with R=7 formed with the next maximum 2048 blocks, each of size 2048 bits
- Segment with R=8 formed with the next maximum 1024 blocks, each of size1024 bits
- Segment with R=9 formed with the next maximum 512 blocks, each of size 512 bits
- Segment with R=10 formed with the next maximum 256 blocks, each of size 256 bits
- Segment with R=11 formed with the next maximum 128 blocks, each of size 128 bits
- Segment with R=12 formed with the next maximum 64 blocks, each of size 64 bits
- Segment with R=13 formed with the next maximum 32 blocks, each of size 32 bits
- Segment with R=14 formed with the next maximum 16 blocks, each of size 16 bits.

IV. Result

When we using this proposed approach definitely we will protect out data by attackers. it provides level of security. In connection with the Brute-force attack of decrypting the message by the hackers ,it may be difficult to decrypt the message if the message is encrypted using the proposed key system or like manner.

V Conclusion

The technique presented here is implemented for different categories of files like .cpp, .exe,.doc,.dll, .sys. When this technique is implemented with X-NOR or other operations using the same logic it will not generate a cycle so this logic cannot be implemented with the other operations. This technique is implemented on 1.3 GHZ processor. In table 2 it is seen that as the file size increases the encryption time as well as decryption time increases. For this technique only eight bits blocks are taken, and the third intermediate block is considered here as encrypted stream, so the time required to get the encrypted stream is always be larger than that of decryption because only one iteration is required to get the source stream in the decryption part, since this technique generates a cycle.

VI. REFERENCES

[1] J.K.Mandal , P.K.Jha, “Securing Message Using Recursive Modulo-2 and Key Rotation Operation”, International Conference on

computational intelligence Modeling Techniques and Applications (CIMTA)2013.

[2] Mandal J. K. and Dutta S. "A Space-Efficient Universal Encoder for Secured Transmission", International Conference on Modeling and Simulation (MS' 2000- Egypt), Cairo, April 11-14, pp-193-201,2000.

[3] Jha P. K.,Mandal .J.K, S. Shakya " Encryption through cascaded recursive key rotation and arithmetic operation of a session key (CRKRAO)" accepted to the Technical publication of the Engineering Association of Nepal, Kathmandu.

[4] D. Welsh , "Codes and Cryptography", Oxford: Claredon Press, 1988

[5] J.Seberry and J.Pieprzyk, "An introduction to computer security",Australia : Prentice hall of Australia 1989
.

[6] C. Coupe, P. Nguyen and J. Stern," The Effectiveness of Lattice Attacks against Low-Exponent RSA"Proceeding of Second International Workshop on Practice and Theory in Public Key Cryptography, PKC'99, vol1560, of lecture notes in Computer Science, Springer-Verlag, , pp 204-218,1999.

[7] RSA Vulnerabilities", Journal of Cryptology, vol 10, pp 233-260,1997.

[8] M. WIENER, "CRYPTANALYSIS OF SHORT RSA SECRET EXPONENTS", IEEE TRANSACTIONS ON INFORMATION THEORY, VOL 36, PP 553-558,1990.

AO* ALGORITHM FOR SOLVING TRAVELLING SALESMAN PROBLEM

[1]Shraddha Ramteke, [2]Mrs. Deepty Dubey
[1]M.Tech Research Scholar, Computer Science & Engg. Dept.
Chattrapati Shivaji Institute of Technology,Durg, India
[2]Associate Professor, Computer Science & Engg.Dept.
Chattrapati Shivaji Institute of Technology,Durg, India
Email: [1]shraddharamteke7@gmail.com,[2]deepty.shukla@gmail.com

Abstract—**According to travelling salesman problem (TSP), an NP Hard problem, given a number of cities and the distances between each couple of cities, the aim is to find the smallest possible route that goes to each city exactly once and returns to the origin city i.e. find a least cost Hamiltonian cycle. It is definitely an NP-hard problem, important in operations investigation and theoretical computer scientific discipline. In the theory involving computational complexity, the decision version in the TSP where, given any length L, the task is to decide whether the graph offers any tour shorter than L belongs to the class of NP-complete issues. Thus, it is possible which the worst-case running time for virtually every algorithm for the TSP increases super-polynomial or perhaps exponentially with the quantity of cities. Heuristic search is definitely an AI search technique that employs heuristic to its moves. Heuristic is a rule of thumb that probably leads into a solution. Heuristics play a major role in search strategies because of exponential nature of the most extremely problems. Heuristics help to reduce the quantity of alternatives from an exponential number into a polynomial number. In AI, heuristic search incorporates a general meaning, and an increasingly specialized technical meaning. Within a general sense, the term heuristic is utilized for any advice which is often effective, but just isn't guaranteed to work always. The major aim of this research work is to use the concept of AO* for solving the TSP to get the optimal Hamiltonian route.**

Keywords—AO* alogrithm, Travelling Salesman Problem (TSP).

I. INTRODUCTION

[1]Travelling Salesman Problem is a combinational problem consisting of some cities and some edges connecting one city to other. TSP can be represented by a graph G (V, E), where V is the set of vertices (cities) and E is the set of edges (path) between each of the two vertices specific to the graph. TSP is to discover the shortest path in the graph G setting up a least cost Hamiltonian Cycle. If there exists a path between two cities i and j, then the distance between these cities can be computed as-.

$$d_{ij} = \sqrt{(x_i - x_j)^2 - (y_i - y_j)^2}$$

TSP deals with real time scenario for a traveling salesman, where the most important for him to follow the shortest and optimal path having the minimum cost so as to gain maximum profit and to deliver the goods lesser time as much as possible. Path optimization is one of the major problems while travelling from the source to

destination city visiting each city only once. Path can be calculated using many strategies but to decide the best possible strategy according to the number of cities is a difficult task.

TSP Heuristic: [2]Whenever the salesman is at town i this individual chooses as their next city i. e., the city j which is why the c (i, j) charge, is the bare minimum among all c(i, k) charges, where k will be the pointers of the city the salesman has not visited yet. In case more than one citygives the particular minimum cost, the city with the smaller k is going to be chosen. This greedy algorithm selects the lowest priced visit in each step and won't care whether this will lead to a correct solution or not.

Basic Approach for solving TSP:
1. Initialize cities for tour.
2. Start from root.
3. Select next city in tour with minimum cost.
4. Repeat step 3 until an optimum cost Hamiltonian cycle is formed.

Input

Network formed from *n* cities
Cost c(i,j) of traveling from one city to next city, w*here* i & j = 1,2,3 . . , *n*.
Start with initial city.

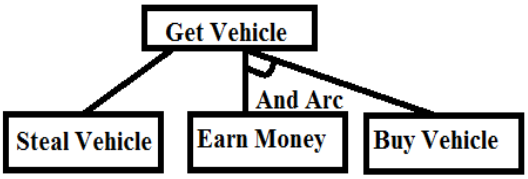
Output

A least cost Hamiltonian cycle.

II.PROPOSED METHODOLOGY

*A. Applying AO*for solving TSP*

When a problem can be split into a set of sub problems, where each sub problem can be solved separately and a combination of these will be a solution, AND-OR graphs or AND - OR trees are used for representing the solution. The decomposition of the problem or problem reduction generates AND arcs. One AND are may point to any number of successor nodes. All these must be solved so that the arc will rise to many arcs, indicating several possible solutions. Hence the graph is known as AND - OR instead of AND.



And Or Graph Example

An algorithm to find a solution in an AND - OR graph must handle AND area appropriately. A Star algorithm cannot work with AND - OR graphs correctly and efficiently.

*AO*Algorithm-*

Procedure Proposed AO* algorithm for TSP
Let G consists only to the node representing the initial state call this node INIT.
Calculate h' (INIT).
Until INIT is labeled SOLVED or h´(INIT) becomes greater than FUTILITY,
Repeat the following procedure.
Trace the marked arcs from INIT and select an unbounded node NODE.
Generate the successors of NODE .if there are no successors then assign FUTILITY as h' (NODE). This means that NODE is not solvable. If there are successors then for each one called SUCCESSOR, that is not also an ancestor of NODE do the following
(a) Add SUCCESSOR to graph G
(b) If successor is not a terminal node, mark it solved and assign zero to its h ' value.
(c) If successor is not a terminal node, compute its h' value.
Propagate the newly discovered information up the graph by doing the following. Let S be set of nodes that have been marked SOLVED. Initialize S to NODE. Until S is empty `repeat the following procedure;
(a) Select a node from S call if CURRENT and remove it from S.
(b) Compute h' of each of the arcs emerging from CURRENT, Assign minimum h' to CURRENT.
(c) Mark the minimum cost path as the best out of CURRENT.
(d) Mark CURRENT SOLVED if all of the nodes connected to it through the new marked are have been labeled SOLVED.
(e) If CURRENT has been marked SOLVED or its h ' has just changed, its new status

must propagate backwards up the graph, hence all the ancestors of CURRENT are added to S.

End Loop

End Loop

III. EXPECTED OUTCOME

In this paper, AO* search algorithm is modified and proposed for solving the travelling salesman problem. Also on applying AO* algorithm for TSP, we can obtain the optimal solution as the least cost Hamiltonian route. On various integer input range, the proposed AO* procedure can provide the solution for travelling salesman problem.

References

[1] http://en.wikipedia.org/wiki/Travelling_salesman_problem

[2] http://www.personal.kent.edu/~rmuhamma/

[3] Compgeometry/MyCG/CG-Applets/TSP/notspcli.htm

A SURVEY ON BRING YOUR OWN TECHNOLOGY [BYOT]: APPLICATIONS & SECURITY

[1]Ajaykumar Mishra, [2]Kuntesh Jani
[1,2]Government Engineering College, Sector 28, Gandhinagar
Email: [1]ajaymishra8491@gmail.com , [2]kunteshjani@gecg28.ac.in

Abstract- BYOT (Bring Your Own Technology) , also known as BYOD (Bring Your Own Device) is a business policy to allow employees to bring their own devices at their work. The same device is used in and out of the corporate office and during outside use, it may be connected to insecure internet and critical corporate data become public when device is lost. This can be a big threat to the office as well as business strategies and future policies are derived from this data. This paper discusses about several issues on BYOT and provides solution on loss of device.

Keywords- BYOT, BYOD, Mobile Security, BYOD strategies, Mobile Device Management Technology, Enterprise Security

I. INTRODUCTION

Bring your own technology (BYOT) is a new trend and new emerging technology in business work. It is a business policy that adopted by management where they allow the use of personally owned devices like smart phones, i-pads, tablets etc. at the work place for accessing mails and databases and corporate data etc.[1].

The technology knowledge of information today is well leveraged with all the technologies like smart phones, tablets and internet etc. That has to be made them available to the entire world 24*7. This availability and flexibility people are demanding in their work life also, so that they can do their tasks anywhere and anytime.

It is the new emerging technology that allows the employee in the organization to bring their own devices in the organization and get access the information shared in the organization for that work.

Many organizations are adopting the BYOD strategy subsequently, as they recognize that employees have grown up more familiar and flexible with mobile

devices and used these devices as the key means of connecting, interacting with others, and increasingly using their mobile devices for work-related purposes[2]. Eighty-eight per cent of IT directors involved in a recent survey (300 were involved) believe that employee morale is improved with an organization's BYOD policy [3].

Advantages of BYOT:

1. Employees have the freedom of choosing the type of device they want to use, because employees can use their own choice of device in the workplace and he/she is flexible to use.
2. Reduces the cost of on-going end-user management i.e. the maintenance and keep the devices and applications are no more the responsibility of the organization. Therefore the organization doesn't need to look after the hardware and software as this is done by the employees themselves.[1]
3. BYOT can increase the engagement of the employees in the workplace and also after office hours.
4. Employees can access the corporate data outside of the organization or

workplace, so that they can 'work from home' at their ease'.

5. Reduces the training time thereby increasing the productivity and efficiency of the employees [1].

Disadvantages of BYOT:

1. Data Leakage.
2. Most of the people evaluate to company's network through wi-fi connection which is unencrypted.
3. The antivirus and malware which are dangerous for the user and the system as well.
4. The second risk that comes to mind is the stolen devices.
5. BYOD has resulted in data breaches. [7] For example, if an employee uses a smartphone to access the company network and then loses that phone; untrusted parties could retrieve any unsecured data on the phone. Another type of security breach occurs when an employee leaves the company, they do not have to give back the device, so company applications and other data may still be present on their device.[4]
6. Loss of control & visibility: Organizations have less visibility of the security environment for BYOT compared to a traditional networked environment.

II. LITERATURE REVIEW

Abstract of literature:

Managing organizations' networks has become increasingly complex with the "Bring Your Own Techonolgy" or BYOD phenomenon. BYOD is no longer an option for most organizations; rather it's the standard for business in the digital era. It is important to have well-defined policies for what's supported and accessed in organizations. This research study highlights findings from an organizational survey conducted in the upper Midwest region about organizational strategies in coping with BYOD. Recommendations are made to benefit other organizations in adopting strategies for BYOD.[2]

B.Y.O.D. (Bring Your Own Device) or according to some B.Y.O.T. (Bring your own technology) is a recent trend that has been observed where employees bring personally-owned mobile devices to their workplace to access company resources such as email, file servers , databases as well as their personal data. The concept of 'Bring your Own Device' is gaining momentum at the workplace. Most of the companies in India and abroad have applied this policy in their work environment by the end of 2012. Using personal devices at work is beneficial in some ways like more productivity, flexibility, freedom and choice etc. Besides it this policy has some risks as well like the prime issue of data security. It is found in the literature reviews that the organization who embraces BYOD policy found their employees happier, productive and collaborative. Hence the study was done with the primary objective of finding the views of respondents from different sectors and industries for the same. It also depicts the different threats that can be observed and also concludes whether application of this policy will be lucrative for the different type of organizations.[1]

BYOD (Bring Your Own Device) is a business policy to allow employees to bring their own devices at their work. The same device is used in and out of the corporate office and during outside use, it may be connected to insecure internet and critical corporate data become public. This can be a big threat to the office as well as business strategies and future policies are derived from this data. In this paper an approach is explained to guard against this type of threat and to secure the corporate data even outside the corporate premises.[5]

Problem identified

There is a way to it by distributing and managing Virtual Private Network (VPN) solutions for all the mobile devices where

employee can access the. Company's network through Wi-Fi connection which is unencrypted [1].

According to Ted Schadler, Sr. Vice President of Forrester Research, "The total cost of BYOD is higher than not supporting BYOD." [1] Because the cost of the implement BYOD policy security.

Risk that comes when device has been lost or stolen, then the most difficult situation faced is of changing the email and password.[1]

In addition, 45 percent of devices were reported to be stolen or lost. [2].

Organizations need to purchase an MDM (Mobile Device Management) system to monitor mobile devices, in addition to providing training programs for employees regarding BYOD. MDM software is used to secure, monitor, manage and support the mobile devices deployed in enterprises. [5]

To Secure the BYOD there are three major ways like Organization should be implement the MDM software to protect the BYOD ,Secondly to use some kind of the utility to secure the data and outside of the organization. An utility may have web browser like appearance and all the business tools must be assessed within this utility. For e.g.; Virtual Machine [5] . And third way that is to use some proprietary encryption algorithm instead of Standard algorithm which is to be used in utility. [6].

The devices must be protected with well strong and complex password. Hence an organisation should look for a management solution that means real time visibility of usage and also give alarm when the employee is about to cross the edge of limit.[1]

The key issues are security, fragmented software and according to the study the companies which have to provide implementation to this policy are Accenture, AirWatch, Alcatel-Lucent, Apple, ARM, Asus, Atmel, Authentec, Barclays, Cisco, Citrix, Dropbox , Enterproidz, Fiberlink, Good Technology, Google, HP, HTC, IBM, Ikea, Intel, Intuit,Juniper Networks,LG, Mformation, Microsoft, MobileIron, Motorola,Nokia, OKLabs, PwC,Red Bend,RIM,Samsung, SAP, Sony, SOTI, Sybase, Symantec, Tangoe, Taptera,T-Mobile, Verizon,Vmware,Vodafone, Wavelink, Zenprise .[1]

III. EXISTING METHODS AND DRAWBACKS – A COMPARATIVE STUDY

NAC technology inspects whether or not a user PC (terminal) complied with security policy before it accesses an internal network, and thus controls network access according to the state of the terminal being abnormal. However, BYOD environment has a special security requirement, which is to protect corporate data by isolating users of abnormal behaviors in addition to ensuring the use of diverse personal devices and work continuity. Therefore, NAC solution alone is not sufficient in handling security issues occurring in BYOD environment.

MDM provides a comprehensively protective function for a variety of channels subject to data leaks, such as operating apps, camera, recorder and Wi-Fi, and, at the same time, a function to administer control on company-wide monitoring and user environment through the central management console. There are problems in the access control based on MDM system that provides a function to directly control personal devices in BYOD environment. MDM is an application. Therefore, access control and monitoring of other applications are difficult. In addition, system-level network layer access and behavioral analysis for network data are impossible. Above all, it is difficult to distribute and spread this method because individual users are reluctant about MDM agent installation on their personal devices in

demanding their privacy protection. At the same time, as a result of continuous version management on diverse terminals, the related costs increase.

To improve on these weaknesses, an access control method based on a link between NAC and MDM is proposed as of late. This method provides effective network blocking function through limited terminal information collection. However, it still has such limitations as lack of a real-time terminal device status check function and security issues concerning terminals not installed with MDM agent.

The first component of any virtualization system is the hypervisor: the software that allows the host machine to run virtual machines. There are a variety of hypervisors available addressing a range of applications from server to desktop environments. It demands more investment and makes organization architecture more complex. Context Awareness based Dynamic Access Control is comprised of a collection system, a detection system and a control system. This system collects context information of a device under agentless mode. It is to collect context information through network analysis following user authentication when the users' terminal devices try to access a corporate network. The collected context information is analyzed by the detection system, and thus abnormal and malicious behaviors are detected. But this requires continuous monitoring applying a large system payload and trade off.

IV. CONCLUSION

Even though there are currently a number of BYOD security solutions in the market, these solutions are either vulnerable to a large number of security threats or require modifications of the underlying mobile device OS.

V. REFERENCES

1. Ms.NiharikaSingh,B.Y.O.D. Genie Is Out Of the Bottle – "Devil Or Angel",Journal of Business Management & Social Sciences Research,(Dec-2012).

2. Marzie Astani, Kathy Ready, Mussie Tessema, "BYOD Issues And Strategies In Organization",(2013).

3. Reisinger, Don. "BYOD Taking the Enterprise" by Storm. http://www.CIOInsight.com.

4. Wiech, Dean. "The Benefits and Risks Of BYOD". Manufacturing Business Technology.

5. Mr. Vishal Gupta, Deepak Sangroha, LovekeshDhiman,An Approach to Implement Bring Your Own Device(BYOD) Securely, International Journal of Engineering Innovation & Research,(Sep-2012).

6. University of Oregeon Factors for consideration when developing a bring your own device(BYOD),July 2012 7. http://en.wikipedia.org/wiki/Bring_your_own_ device 8. BYOD Bring Your Own Device – an introduction _ Self Service & Zero Level support.html

8. Eun Byol Koh, Joohyung Oh, and Chaete Im , "A Study on Security Threats and Dynamic Access Control Technology for BYOD, Smart-work Environment", International MultiConference of Engineers and Computer Scientists,(March 2014)

9. Dennis Gessner, Joao Girao, Ghassan Karame, Wenting Li," Towards a User-Friendly Security-Enhancing BYOD Solution", NEC Technical Journal,(March 2013)

SIMULATION OF AIR-STEAM GASIFICATION OF RICE HUSK USING ASPEN PLUS

[1]Arun K. Mohandas, [2]Rupesh S, [3]C. Muraleedharan, [4]P. Arun
[1,2,3,4]Department of Mechanical Engineering, National Institute of Technology Calicut
Email: [1]arunkm102@gmail.com, [2]mailtorupeshs@gmail.com, [3]murali@nitc.ac.in, [4]arun.p@nitc.ac.in

Abstract—A thermodynamic equilibrium model for air-steam gasification of rice husk is developed using Aspen Plus (Advanced System for Process Engineering Plus) process simulator.
The model is based on Gibbs free energy minimisation and tar formation is incorporated using FORTRAN subroutine.
The prediction accuracy of the developed model is determined by comparing the model predicted syngas composition with experimental results and found to be in fair agreement. Effect of key operating parameters on syngas composition, gas yield and first law efficiency is analysed using the developed model .For an equivalence ratio of 0.25, steam to biomass ratio of 1 and temperature of 1000 K, hydrogen mole fraction, first law efficiency and heating value of syngas are found to be 23.78 %, 76.14 % and 5.038 MJ/Nm^3, respectively.

Index Terms—Gasification, equilibrium model, Aspen Plus, syngas.

I. INTRODUCTION

Biomass is one among the most promising renewable energy resources and its utilisation through gasification is in line with the requirements of sustainable development.

Biomass gasification is a complex process consisting of different steps, namely drying, pyrolysis, combustion and gasification of pyrolysis products.

Mathematical models have been used extensively to investigate biomass gasification due to high costs and difficulties associated with experimentation.

Among the methods available for modelling gasification, thermodynamic equilibrium model (TEM) is one of the simpler approaches and can be used as a preliminary tool to analyse the effect of feedstock and process parameters on gasification process. Thermodynamic equilibrium modelling can be achieved through two approaches namely, stoichiometric and non-stoichiometric [1]. Non-stoichiometric equilibrium modelling is useful when temperature and pressure are known and reaction stoichiometry is unknown. However non-stoichiometric equilibrium modelling employing Gibbs free energy minimisation is relatively complex. Aspen Plus process simulator [2] provides an easier alternative for simulating non-stoichiometric models.

The Aspen Plus process simulator has been used extensively to simulate several complex processes such as coal conversion and petroleum refining using well written flexible

Fortran subroutines [3]. Doherty *et al*. [4] simulated a circulating fluidised bed gasifier using Aspen Plus and studied the effect of preheating of air on gasifier performance and composition of syngas. Air gasification of olive kernel in a pilot scale bubbling fluidised bed gasifier was simulated by Michailos and Zabaniotou [5] in Aspen Plus by using a combination of two approaches-Gibbs free energy minimisation and reaction kinetics. Mathieu and Dubuisson [6] simulated wood gasification and concluded that air preheating has no significant impact on efficiency beyond a certain critical air temperature. Mansaray *et al.* [7] developed two models to simulate the performance of a dual-distributor-type fluidised bed gasifier where the first model used an overall equilibrium approach, and the hydrodynamic complexities of the reactor were incorporated in the second one. Nikoo*et al.* [8] modelled the reactions taking place in the bed and freeboard of a fluidised bed reactor separately by adopting governing hydrodynamic equations for a bubbling bed and kinetic expressions for the char combustion. Gasification of wood in a downdraft gasifier was simulated by Pavie*et al.* [9] to predict the composition of flaming pyrolysis gas and producer gas. Kumar *et al*. [10] simulated corn stover and distiller grains gasification using Aspen Plus and predicted the flow rate and composition of product gas.

The present work deals with the simulation of air-steam gasification of rice husk in a fluidised bed gasifier using Aspen Plus software, based on Gibbs free energy minimisation.

II. MODELLING APPROACH

A. Assumptions

The following assumptions are made for developing the model:

(i) Gasifier is a steady state system with uniform temperature and pressure throughout.

(ii) The residence time of the gases in the gasifier is high enough to establish thermodynamic and chemical equilibria.

(iii) All the gases behave ideally.

(iv) Gases except H_2, CO, CO_2, CH_4, and N_2 are considered asdilute.

(v) N_2 is inert in the entire process.

(vi) Biomass is made up of Carbon, Hydrogen and Oxygen.

(vii) Steam is supplied under superheated condition of 1 bar and 300 ^oC.

(viii) All elements in biomass except Sulphur take part in the chemical reactions.

(ix) Tar is modelled as benzene.

B. Aspen Plus Model

The different stages considered in Aspen Plus simulation are decomposition of the feed, gasification reactions and gas solid separation.

The Aspen Plus yield reactor (RYield) is normally used when reaction stoichiometry is unknown but yield distribution is known. Biomass is given as an input material stream to the RYield reactor which decomposes it into components including Hydrogen, Oxygen, Sulphur, Nitrogen and ash based on the ultimate analysis.

The Gibbs reactor (RGibbs) is used when reaction stoichiometry is unknown, but the reactor temperature and pressure are known. It can model single phase chemical equilibrium or simultaneous phase and chemical equilibria. The components of biomass are fed into the RGibbs along with the gasifying agents, air and steam. The Gibbs reactor predicts the constituents of syngas through Gibbs free energy minimisation.

The Gibbs reactor is followed by a separation column to separate gases and solids.

All the components are integrated to model the gasification process and the process flow sheet is shown in Fig. 1.

Rice husk, the feed stock used is defined as a nonconventional solid and is specified by its proximate and ultimate analyses. The stream class used for modelling is MCINCPSD as it includes the substreams mixed, conventional solids and nonconventional solids. All the gases are taken as mixed substreams, char as conventional solid substream, biomass and ash

as nonconventional solid substreams.

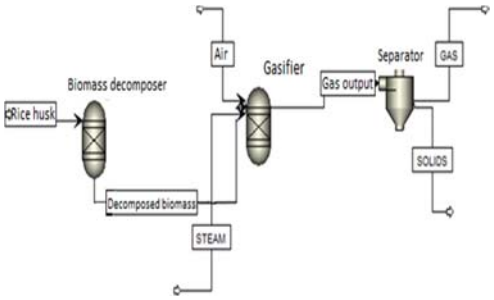


Fig. 1 Process Flowsheet

C. Model Validation

The accuracy of the model is checked by comparing the gas composition predicted by the model with the experimental results of Campoy *et al.* [11]. The comparison is shown in Fig. 2.

D. Model Application

The developed model is used to analyse the effect of temperature, steam to biomass ratio (SBR) and equivalence ratio (ER) on syngas composition, gas yield and first law efficiency. Lower heating value of the dry product gas is estimated from the gas composition and is expressed in volume basis as [12],

$$\mathrm{LHV} = 10.79\,\mathrm{Y_{H_2}} + 12.26\mathrm{Y_{CO}} + 35.81\mathrm{Y_{CH_4}} \quad (1)$$

The flow rate of dry synthesis gas was calculated using the relation [12],

$$V_{dg} = \frac{V_m \times (m_{N_a} + m_{N_b})}{Y_N M_N} \quad (2)$$

Gasification efficiency of the process is given by

$$\eta_{\mathrm{gas}} = \frac{\text{Energy content in the product gas}}{\text{Energy content in biomass+Energy content in steam}} \quad (3)$$

Table. 1 Proximate and ultimate analyses of rice husk [13]

Proximate analysis (wt. %)		Ultimate analysis (wt. %)	
Moisture	12	C	34.35
Volatile Matter	58	H	5.22
Ash	18	O	57.66
Fixed Carbon	12	N	2.43
		S	0.31

III. RESULTS AND DISCUSSION

A. Effect of ER, SBR and Temperature on gas composition

The effects of equivalence ratio, steam to biomass ratio and temperature on product gas composition are shown in the Figs. 3-5. It is seen that the volume fraction of carbon dioxide increases while that of all other gaseous species decreases with increase in ER. The shifting of the process towards combustion with increase in air flow rate is the reason for this. Similar variations were reported by Puig-Arnavat *et al.* [14] and Rupesh *et al.* [15].

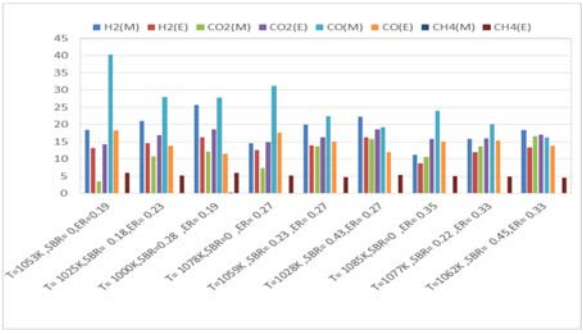


Fig. 2 Comparison between experimental and model results. E: Experimental result; M: model results.

Fig. 4 depicts the variation in product gas composition with steam to biomass ratio. The hydrogen concentration increases with SBR but the rate of increase declines gradually.

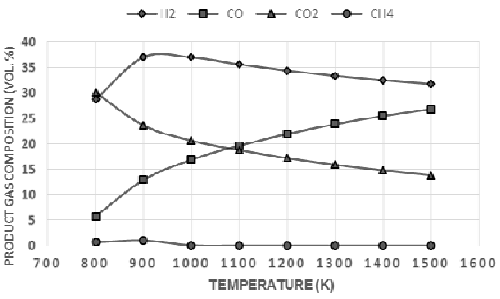


Fig. 3 Variation of syngas composition with temperature

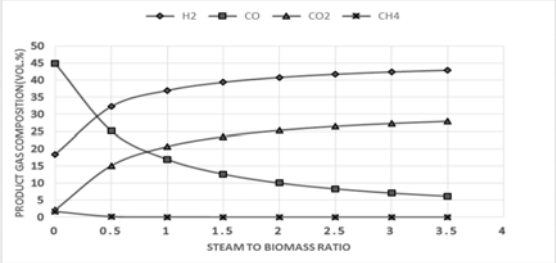


Fig. 4 Variation of syngas composition with SBR

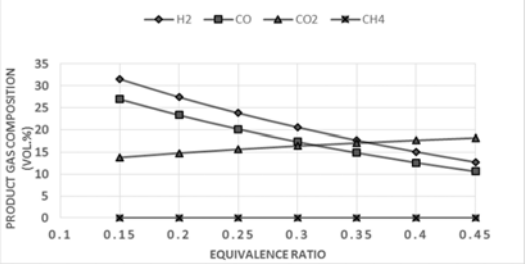


Fig. 5 Variation of product gas composition with ER

The combined effect of water gas, steam methane reforming and water gas shift reactions is responsible for this increase. It can also be noted that with steam addition the mole fraction of carbon dioxide increases while that of carbon monoxide decreases. The exothermic nature of water gas shift reaction is responsible for the rapid increase in CO_2 at lower temperatures.

It is also found that hydrogen concentration initially increases with reactor temperature up to a maximum value and then shows a gradual decrease similar to the variation reported by Lv *et al.* [16]. This is due to the exothermic nature of the water gas shift reaction.

At higher temperatures the reaction proceeds in the reverse direction as per Le-Chatelier's principle which results in a decrease in Hydrogen concentration. The endothermic char gasification reaction, water gas reaction, methane reformation and the reversal of water gas shift reaction contribute to the increase in carbon monoxide concentration with temperature. The yield of carbon dioxide and methane are found to decrease with temperature. Methane concentration decreases as the endothermic steam methane reforming proceeds in the forward direction and the exothermic methanation reaction proceeds in the reverse direction.

B. Effect of ER, SBR, and Temperature on Efficiency

The variation of efficiency with process parameters is shown in Figs. 6-8. It is observed that the efficiency initially increases as steam is supplied and then decreases with increase in steam to biomass ratio. This decrease in efficiency is due to the increased energy input in the form of steam. As the equivalence ratio increases the LHV of the product gas decreases, which again results in a decrease in efficiency. For a steam to biomass ratio of 1 and equivalence ratio 0.25 the maximum efficiency of 77.83% is achieved at 1500 K.

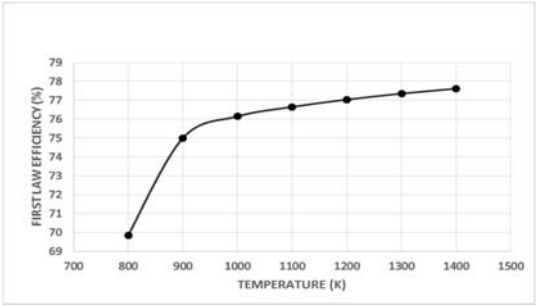


Fig. 6 Variation of first law efficiency with temperature

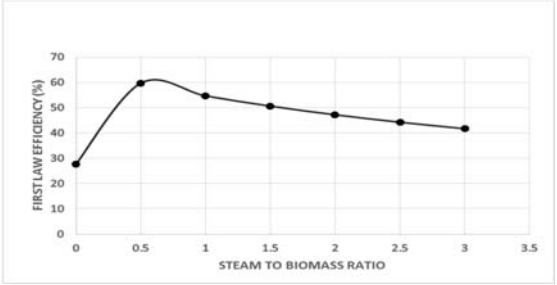


Fig. 7 Variation of first law efficiency with SBR

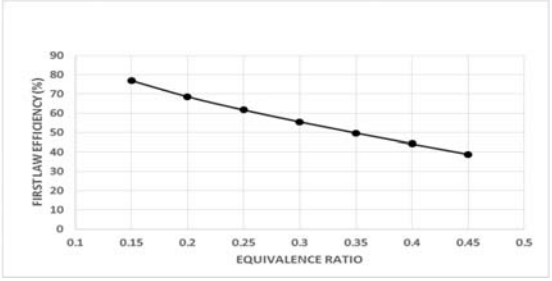


Fig. 8 Variation of first law efficiency with ER

IV. CONCLUSION

A one compartment Aspen Plus model was developed to simulate air-steam gasification of rice-husk in a fluidised bed gasifier and the

effect of process parameters on gasifier yield and efficiency was investigated. For an SBR of unity and ER of 0.25, the maximum hydrogen yield was found to be 37.05 % at 1000 K. A two compartment model incorporating reaction kinetics may give better results.

REFERENCES

[1] P. Basu, Biomass Gasification and Pyrolysis: Practical Design and Theory, Academic Press, London, UK, 1st edition, 2010.

[2] Aspen Technology, Inc., ASPEN PLUS User Models, Cambridge: Aspentech,2006.

[3] C. Franco, F. Pinto, I. Gulyurtlu and I. Cabrita, "The study of reactions influencing the biomass steam gasification process," Fuel, Vol. 82, pp. 835-842, 2003.

[4] W. Doherty, A. Reynolds, D. Kennedy. Simulation of a Circulating Fluidised Bed Biomass Gasifier Using ASPEN Plus – A Performance Analysis, in A. Ziebik, Z. Kolenda, and W. Stanek (eds). Proc. 21st International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems, Krakow, Poland, 2008, pp. 1241-1248.

[5] Stavros Michailos, Anastasia Zabaniotou, Simulation of Olive Kernel Gasification in a Bubbling Fluidized Bed Pilot Scale Reactor, Energy Conversion and Management, Vol. 43,2002, pp. 1291–1299.

[6] Mathieu P., Dubuisson R. Performance analysis of a biomass gasifier. Energy Conversion and Management 2002,Vol. 43, pp. 1291-9.

[7] K. G. Mansaray, A. M. Al-Taweel, A. E. Ghaly, F. Ham- dullahpur and V. I. Ugursal, "Mathematical Modelling of a Fluidized Bed Rice Husk Gasifier," *Energy Sources*, Vol. 22, No. 1, 2000, pp. 83-98.

[8] Mehrdokht B. Nikoo, Nader Mahinpey, Simulation of biomass gasification in fluidized bed reactor using ASPEN PLUS, Biomass and Bioenergy, Vol.32, 2008, pp.1245-1254.

[9] Frederic Paviet, FlorentChazarenc, MohandTazerout, Thermo Chemical Equilibrium Modelling of a Biomass Gasifying Process Using ASPEN PLUS, International Journal of Chemical Reactor Engineering, Vol. 7, 2009, Article A40.

[10] Kumar, A.; Noureddini, H.; Demirel, Y.; Jones, D.D.; Hanna, M.A. Simulation of corn stover and distillers grains gasification with Aspen Plus, Trans. ASABE 2009, 52, pp. 1989–1995.

[11] M. Campoy, A. G´omez-Barea, A. L. Villanueva, and P. Ollero,"Air-steam gasification of biomass in a fluidized bed under simulated autothermal and adiabatic conditions," Industrial and Engineering Chemistry Research, vol. 47, no. 16, pp. 5957–5965,2008.

[12] S. Kaewluan and S. Pipatmanomai, "Potential of synthesis gas production from rubber wood chip gasification in a bubbling fluidised bed gasifier," *Energy Conversion and Management*, vol.52, no. 1, pp. 75–84, 2011.

[13] Sajith, U.K., Rupesh, S., Muraleedharan, C., Arun, P.: Characterisation of Biomass for Gasification, National conference on Latest Trends in Mechanical Engineering, Palakkad. March 2014.

[14] M. Puig-Arnavat, J. C. Bruno, and A. Coronas, "Modified thermodynamic equilibrium model for biomass gasification: a study of the influence of operating conditions," *Energy & Fuels*, vol. 26, no. 2, pp. 1385–1394, 2012.

[15] Rupesh, S., Muraleedharan, C., Arun P.: Analysis of Hydrogen Generation through Thermo-chemical Gasification of Coconut Shell Using Thermodynamic Equilibrium Model Considering Char and Tar. International Scholarly Research Notices. 2014, 1-9, 2014.

[16] P.M. Lv, Z. H. Xiong, J. Chang, C. Z.Wu,Y.Chen, and J. X. Zhu, "An experimental study on biomass air-steam gasification in a fluidized bed," *Bioresource Technology*, vol. 95, no. 1, pp. 95–101,2004.

A SURVEY PAPER ON DIFFERENT TECHNIQUES OF DOCUMENT CLUSTERING

[1]Mamta Mahilane, [2]Mr. K. L. Sinha
[1]M.Tech Scholar, [2]Sr. Assistant Professor
Department of Comp. Sci. & Engg.
Chhatrapati Shivaji Institute of Technology, Durg
Chhattisgarh, India
Email: [1]mamta.csit@gmail.com , [2]khomlalsinha@csitdurg.in

***Abstract*—Now these days, there is great increase in the amount of information available on Internet. Also the amount of data kept in computer files and databases is rising at an amazing rate. Document clustering has been investigated for use in a number of different areas of text mining and information retrieval. In this paper various document clustering techniques are discussed along with their pros and cons. Clustering is currently one of the most crucial techniques for dealing with massive amount of information on the web and system. The principle of clustering depends on the concept of dividing a set of objects into a specified number of clusters on the basis of characteristics found in the actual data. Finally, we proposed the future techniques and methodologies which promise to enhance the ability of computer system in the field of text mining and information retrieval.**

***Keywords*—clustering, text mining, data mining, information retrieval.**

I. Introduction

Data mining and knowledge discovery in databases have been attracting a significant amount of research, industry, and media attention. Historically the notion of finding useful patterns in data has been given a variety of names including data mining, knowledge extraction, information discovery, information harvesting, data archaeology, and data pattern processing [11]. Data mining or knowledge discovery in database is the non-trivial extraction of implicit, previously unknown and potentially useful information from the data. Data mining is the application of specific algorithms for extracting patterns from data. This includes a number of technical approaches, such as clustering, data summarisation, classification, finding dependency networks, analysing changes and detecting anomalies [12]. The term *data mining* has been mostly used by statisticians, data analysts, and the management information systems (MIS) communities.

Data mining applications can be broadly divided into two categories namely, business and e-commerce data mining, scientific, engineering and health care data mining.Other application areas include crime detection, mortgage loan delinquency prediction, portfolio management, risk analysis etc.

II. Problem Identification

Every day, people encounter a large amount of information and for further analysis and management; they store or represent it as data. One of the vital means in dealing with these data is to classify or group them into a set of categories called clusters. Cluster can be defined as a set of like elements. Elements from various clusters must not alike [5]. In order to

understand a new fact or to experience a new object, people always try to search the features that can characterize it, and then compare it with other known facts or objects, based on the similarity or dissimilarity, according to some certain standards or rules. Actually, classification is very simple activity that plays an important and vital role in the long history of human development. Basically, classification systems are either supervised or unsupervised, depending on whether they assign new inputs to one of a finite number of discrete supervised classes or unsupervised categories, respectively [6], [7], [8]. In supervised classification, the mapping from a set of input data vectors to a finite set of discrete class labels, is modelled in terms of some mathematical function, $y=y(X,W)$ where W is a vector of adjustable parameters. The values of these parameters are determined by an inductive learning algorithm, which is aimed to minimize an experimental risk functional on a finite data set of input–output; for example $(X_i,Y_i),i=1.....N$, where N is the finite cardinality of the available representative data set [6], When the inducer algorithm terminates or a convergence point occurs, an induced classifier is generated.

In unsupervised classification, no labeled data are available [9]. Clustering is an unsupervised learning data mining technique. The principle of clustering depends on the concept of dividing a set of objects into a specified number of clusters on the basis of characteristics found in the actual data. Clustering can be done without the knowledge of the category structure of class or pre-assumptions. They use the technique to define similarity or dissimilarity among the objects [4]. The keynote of clustering is to make individual clusters, i.e. partition the data into groups so that most similar objects are to be found within the group. The aim of clustering is to maximize the intra similarity values and to minimize inter similarity values. Document clustering has been investigated for use in a number of different areas of text mining and information retrieval. Initially, document clustering was investigated for improving the extraction in information retrieval systems. It was only an efficient way of finding the nearest neighbors of a document. More recently, clustering has been proposed for use in browsing a collection of documents or in organizing the results returned by a search engine in response to a user's query [1].

Clustering has been used in many application domains, including biology, medicine, anthropology, marketing and economics. Clustering applications include plant and animal classification, disease classification, image classification, pattern recognition, and document retrieval. The objectives of clustering is to uncover natural clustering, to make guess about the data and to find consistent and valid organization of data.

III. Clustering Algorithm

Most document clustering algorithms can be classified into two groups namely "partitioning" and "Hierarchal" algorithms. Hierarchical techniques produce a nested sequence of partition, with a single, all-inclusive cluster at the top and single clusters of individual points at the bottom. The result of a hierarchical clustering algorithm can be graphically displayed as tree, called a dendogram. Dendrogram graphically displays the merging process and the intermediate clusters.

There are two basic approaches to generating a hierarchical clustering:

A. Agglomerative

Start with the points as individual clusters and, step-by-step, merge the most similar or closest pair of clusters. This requires a definition of cluster similarity or distance.

B. Divisive

These techniques take the opposite approach from agglomerative technique. In this case, we need to decide, at each step, which cluster to split and how to perform the split.

The partitional clustering method partitions the database into predefined number of clusters. Partitional algorithm construct partitions of a database of *N* objects into a set of *k* clusters. The cluster construction is performed by determining the optimal partition with respect to an objective function. It usually adopts the iterative optimization paradigm. K-means and

k-medoid are the two main categories of partitioning algorithm. In K-means algorithm, each cluster is represented by the center of gravity of the cluster, while in k-medoid algorithm the cluster is represented by one of the object of the cluster located near the center [13].

The remaining part of this section lists the various clustering algorithms those are in use now these days, and there is a short introductory information about some of these clustering algorithms in table(1).

Clustering Algorithms

1. *Hierarchical*
   - Agglomerative

   Single linkage, complete linkage, average linkage, balanced iterative reducing and clustering using hierarchies (BIRCH), clustering using representatives (CURE), robust clustering using links (ROCK), centroid linkage, median linkage.
   - Divisive

   divisive analysis (DIANA), monothetic analysis (MONA), Bisecting k-means (BKMS).
2. *Squared Error-Based (Vector Quantization)*
   K-Means, iterative self-organizing data analysis technique (ISODATA), genetic - means algorithm (GKA), partitioning around medoids (PAM).
3. *Mixture Densities based*
   Gaussian mixture density decomposition (GMDD).
4. *Graph Theory-Based*
   Delaunay triangulation graph (DTG), highly connected subgraphs (HCS), Chameleon,
5. *Combinatorial Search Techniques-Based*
   Genetically guided algorithm (GGA), TS cluster affinity search technique (CAST), clustering identification via connectivity kernels (CLICK) clustering, SA clustering.
6. *Fuzzy*
   Fuzzy C-means (FCM), mountain method (MM), possibilistic C-means clustering algorithm (PCM), fuzzy-shells (FCS).
7. *Kernel-Based*
   Kernel K-means, support vector clustering (SVC).
8. *Large-Scale Data Sets*
   Clustering Large Applications (CLARA), Clustering Large Applications based upon RANdomized Search (CLARANS), CURE, BIRCH, Density-based spatial clustering of applications with noise (DBSCAN), Density-based Clustering (DENCLUE), Wave Cluster, fuzzy clustering (FC).

[Table (1): Document Clustering Techniques]

Clustering Algorithm	Compatibility of handling high Dimensional data	Complexity	Type	Advantage	Disadvantage
DBSCAN	NO	$O(N^2)$ *[TIME]* $O(N^2)$ *[SPACE]*	Hierarchical	• DBSCAN is resistant to noise and can handle clusters of various shapes and sizes • DBSCAN has a notion of noise, and is robust to outliers. • DBSCAN can find arbitrary shape cluster.	• DBSCAN does not work well when dealing with clusters of varying densities or with high dimensional data not entirely deterministic • DBSCAN depends on the distance measure • Multi density dataset are not complete by DBSCAN. • Run time complexity is high.
CLARA	NO	$O(K(40+K)^2+K(N-K))^4$ *[TIME]*	Partitional	• Good clustering performance for unbiased sampling.	• If the sampling is biased we cannot have a good clustering • Trade off-of efficiency
CLARANS	NO	Quadratic in total performance	Partitional	• It is more effective than both PAM and CLARA • Handles outliers	• Iterative • The clustering quality depends on the sampling method
Average link	YES	$O(N^2)$ *[TIME]* $O(N^2d)$ *[SPACE]*	Hierarchical	• Quite Simple	• Less efficient than single link • sensitive to the shape and size of clusters
k-means	NO	O(NKd) [TIME] O(N) [SPACE]	Partitional	• If variables are huge, then K-Means most of the times computationally faster than hierarchical clustering, if we keep k smalls. • K-Means produce tighter clusters than hierarchical clustering, especially if the clusters are globular.	• Difficult to predict K-Value. • With global cluster, it didn't work well. • Different initial partitions can result in different final clusters. • It does not work well with clusters (in the original data) of Different size and Different density
BIRCH	NO	O(N) [TIME] O(N) [SPACE]	Hierarchical	• Scales linearly • It is also an incremental method that does not require the whole data set in advance. • It makes full use of available memory to derive the finest possible sub-clusters while minimizing I/O costs.	• It cannot handle all kinds of distance functions or dissimilarity function.

[Table (1): Document Clustering Techniques (Continue)]

Clustering Algorithm	Compatibility of handling high Dimensional data	Complexity	Type	Advantage	Disadvantage
Single Link	YES	O(N2) [TIME] O(N2d) [SPACE]	Hierarchical	• Quite Simple	• Low efficiency • Create clusters with long chains • sensitive to the presence of outliers and the difficulty in dealing with severe • differences in the density of clusters • displays total insensibility to shape and size of clusters
Complete link	YES	O(N2) [TIME] O(N2d) [SPACE]	Hierarchical	• Quite Simple	• Expensive • Complete-linkage is not strongly affected by outliers, but can break large clusters, and has trouble with convex shapes
MST	YES when using Dunn's Index value [16].	O(N2) [TIME] O(N2) [SPACE]	Partitional/ hierarchical	• Solves the problems of single link	• Quite complicated
PAM	NO	O(dK(N-K)2) [TIME] O(N2) [SPACE]	Partitional	• more robust against outliers • can deal with any dissimilarity measure • easy to find representative objects per cluster • more robust than k-Means in the presence of noise and outliers	• It is more costly than the k-Means method, • Like k-means, it requires the user to specify k

IV. Conclusion

In this paper we studied and summarized the different kind of clustering techniques in table form. We also discussed about the advantages and disadvantages of clustering techniques. A good clustering of text requires effective feature selection and
a proper choice of the algorithm for the task at hand. So this paper provides a quick review of the different clustering techniques in data mining.

References

[1] Michael Steinbach, George Karypis, Vipin Kumar, "A Comparison of Document Clustering Techniques",

[2] Xiaohui Cui, Thomas E. Potok, "Document Clustering Analysis Based on Hybrid PSO+K-means Algorithm", Journal of Computer Sciences (Special Issue): 27-33, 2005.

[3] Rui Xu, Donald Wunsch, "Survey of Clustering Algorithms", IEEE transactions on neural networks, vol. 16 no. 3, may 2005

[4] K. Rajendra Prasad, or. P.govinda rajulu, "A Survey on Clustering Technique for Datasets using Efficient Graph Structures", International Journal of Engineering Science and Technology Vol. 2 (7), 2010, 2707-2714.

[5] Margaret H. Dunham, Data Mining : Introductory and Advanced topic, Pearson education, 2011.

[6] L. Bobrowski and J. Bezdek, "C-Means Clustering with the l and l norms"," IEEE Trans. Syst., Man, Cybern., vol. 21, no. 3, pp. 545–554, May-Jun. 1991.

[7] V. Cherkassky and F. Mulier, Learning From Data: Concepts, Theory, and Methods", New York: Wiley, 1998.

[8] R. Duda, P. Hart, and D. Stork, "Pattern Classification", 2nd ed. New York: Wiley, 2001.

[9] B. Everitt, S. Landau, and M. Leese, "Cluster Analysis", London:Arnold, 2001.

[10] Jain, R. Duin, and J. Mao, "Statistical Pattern Recognition: A Review," IEEE Trans. Pattern Anal. Mach. Intell., vol. 22, no. 1, pp. 4–37, 2000.

[11] Jain, A.K., M.N. Murty and P.J. Flynn, "Data Clustering: A Review" ACM Computing Survey, 31:264-323, 1999.

[12] M. Steinbach, G. Karypis, V. Kumar, "A Survey of Document Clustering Techniques", Text Mining Workshop, KDD, 2000.

[13] Arun K.Pujari, Data Mining Techniques, University publication, 2001

[14] Deepti Sisodia, Lokesh Singh, Sheetal Sisodia, Khushboo saxena, "Clustering Techniques: A Brief Survey of Different Clustering Algorithms", International Journal of Latest Trends in Engineering and Technology (IJLTET), Vol. 1 Issue 3 September 2012.

[15] Yogita Rani, Dr. Harish Rohil, "A Study of Hierarchical Clustering Algorithm", International Journal of Information and Computation Technology. ISSN 0974-2239 Volume 3, Number 11 (2013), pp. 1225-1232.

[16] Dr. B. Eswara Reddy1 and K. Rajendra Prasad, "Reducing Runtime Values in Minimum Spanning Tree based Clustering by Visual Access Tendancy", International Journal of Data Mining & Knowledge Management Process (IJDKP) Vol.2, No.3, May 2012.

A SURVEY ON DATA MINING TECHNIQUES FOR CLASSIFICATION OF IMAGES

[1]Preeti lata sahu, [2]Ms.Aradhana Singh, [3]Mr.K.L.Sinha
[1]M.Tech Scholar, [2]Assistant Professor ,[3]Sr. Assistant Professor,
Department of Comp. Sci. & Engg.
Chhatrapati Shivaji Institute of Technology, Durg Chhattisgarh, India
Email: [1]preetitanu5@gmail.com, [2]aradhanasingh@csitdurg.in ,[3]khomlalsinha@csitdurg.in

***Abstract*— With the improvement of internet and the accessibility of picture catching gadgets such as digital cameras, image scanner, the span of digital image accumulation is expanding quickly. This article reviews the current state of classification techniques, compares various classification techniques used to implement on the images such as Decision Tree, Artificial Neural Network, k- Nearest Neighbor, Genetic algorithm, Differential Evolution by highlighting the point of interest and weakness of each of the techniques. Finally, a discussion of the future techniques and methodologies which promise to enhance the ability of computer system to classify the image and current research challenges are pointed out in the field on classification of images.**

***Keywords*— Classification, Decision Tree, Artificial Neural Network, k- Nearest Neighbor, Genetic algorithm, Differential Evolution.**

I. Introduction

The amount of data kept in computer files and databases is developing at revolutionary rate. Data mining is defined as finding hidden information in a database [1]. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use [2]. The data mining model that is created can be either predictive or descriptive in nature.

A predictive model makes a prediction about estimation of information utilizing known results found from diverse information. It may be focused around the utilization of other verifiable information. It includes classification, regression, time series analysis and prediction. A descriptive model recognizes patterns or relationships in data. Clustering, summarization, association rules and sequential analysis are usually viewed as descriptive in nature.

Some basic data mining task are classification, clustering, sequential analysis, association rule. Classification maps data into predefined groups or classes. It is often referred to as supervised learning because the classes are determined before examining the data [1]. Clustering is like classification with the exception of that the groups are not predefined, but rather defined by the data alone. It alternatively referred to as unsupervised learning or segmentation. Sequential analysis is used to determine sequential patterns in data. These patterns are based on a time sequence of actions. These patterns are similar to associations in that data are found to be related but the relationship is based on time. Association refers to the data mining task of uncovering relationships among data. The best example of this type of application is to determine association rules. An association rule is a model that identifies specific types of data association.

There are various commercial ventures that are already using data mining on a regular basis. Some of these organizations include retail stores, hospitals, banks and insurance agencies. Many of these organizations are consolidating data mining with such things as statistics, pattern recognization and other vital tools. Data mining can be utilized to discover patterns and connections that would overall be hard to discover. This technique is well known with many businesses because it permits them to learn more about their customers and make smart marketing decisions. Some other application of data mining is loan/credit card approval; fraud detection in telecommunication, financial transaction; in medicine field, it analyzes patient disease history and finds relationship between diseases.

II. Problem Definition

The aim of the classification process is to categorize all pixels in a digital image into one of several classes. Classification includes a broad range of decision-theoretic approaches to the identification of images. All classification algorithms are based on the assumption that the image in input depicts one or more features and that each of these features belongs to one of several distinct classes. Image classification analyzes the numerical properties of various image features and organizes data into categories. Classification algorithms typically employ two phases of processing: training and testing. In the initial training phase, characteristic properties of typical image features are isolated and, based on these, a unique description of each classification category, i.e. training class, is created. In the subsequent testing phase, these feature-space partitions are used to classify image features [4].

Before classifying the images into classes, image preprocessing is necessary to be done on images. It produces a smooth approximation of the data and performs discontinuity detection. Classification of data is used to assign corresponding levels with respect to groups with homogeneous characteristics, with the aim of discriminating multiple objects from each other within the images classification will be executed on the basis of feature, such as density, entropy, texture etc. in the feature space [5].

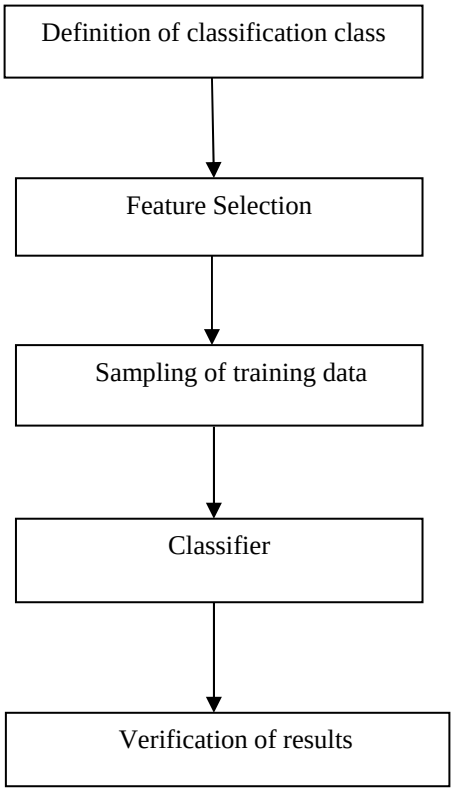


Fig.1 Procedure of Classification

III. Proposed Methodology

There are different techniques of classification of images:

A. Decision Tree
B. Artificial Neural Network
C. k-Nearest Neighbor
D. Genetic Algorithm
E. Bayesian Theorem

a. Decision Tree

Decision tree builds classification or regression models in the form of a tree structure. It breaks down a dataset into smaller and smaller subsets while at the same time an associated decision tree is incrementally developed. The final result is a tree with decision nodes and leaf nodes. A decision node has two or more branches. Leaf node represents a classification or decision. The topmost decision node in a tree which corresponds to the best predictor called root

node. Decision trees can handle both categorical and numerical data [6].

b. Artificial Neural Network

Artificial neural networks were initially developed according to the elementary principle of the operation of the (human) neural system. Since then, a very large variety of networks have been constructed. All are composed of units (neurons), and connections between them, which together determine the behaviour of the network. This network consists of three or more neuron layers: one input layer, one output layer and at least one hidden layer. In most cases, a network with only one hidden layer is used to restrict calculation time, especially when the results obtained are satisfactory. All the neurons of each layer (except the neurons of the last one) are connected by an axon to each neuron of the next layer [12].

c . k- Nearest Neighbour

k-nearest neighbors is a simple algorithm that stores all available cases and classifies new cases based on a similarity measure (e.g., distance functions). The idea behind this method is to build a classification method using no assumption about the form of the function, $y=f(x_1,x_2,x_3,...x_p)$ that relates the dependent variable, y, to the dependent variables $x_1,x_2,x_3,...,x_p$. The only assumption we make is that it is a "smooth" function. This is a non parametric method because it does not involve estimation of parameters in an assumed function form such as the linear form that we encountered in linear regression [13]. k-nearest neighbor has been used in statistical estimation and pattern recognition.

d. **Genetic Algorithm**

Algorithm is started with a set of solutions called population. Solutions from one population are taken and used to form a new population. This is motivated by a hope, that the new population will be better than the old one. Solutions which are selected to form new solution are selected according to their fitness - the more suitable they are the more chances they have to reproduce. This is repeated until some condition is satisfied. Genetic Algorithms (GAs) are adaptive heuristic search algorithm based on the evolutionary ideas of natural selection and genetics.

e. **Bayesian Theorem**

Bayesian classifiers are the statistical classifiers. They are able to predict class membership probabilities such as the probability that a given tuple belongs to a particular class. Naïve Bayes classification is based on the Bayes rule. Classification is made by combining the impact that the different attributes have on the prediction to be made. The approach is called naïve because it assumes the independence between the various attribute values [1].

Explaining all of these algorithms is beyond the scope of this paper, there is short introductory information about some of these classification algorithms are shown in table 1.

[Table (1): Different classification techniques]

Methods	Fundamental	Work of Classifier	Pros	Cons	Application
Genetic algorithm	• algorithm is started with a set of solutions called population. Solutions from one population are taken and used to form a new population. This is motivated by a hope, that the new population will be better than the old one. Solutions which are selected to form new solution are selected according to their fitness.	• classifier is a set of rule based system suited to rule discovery algorithm. The rule must lend themselves to process that extract and recombine "building blocks" from currently useful rules to form new rules, and rules must interact simply and in a highly parallel fashion.	• Solve problem with multiple solution. • Easily transferred to existing simulation and models.	• Certain optimization problem cannot be solved by means of genetic algorithm. • There is no absolute assurance that a genetic algorithm will find a global optimum.	• airlines Revenue Management, Audio watermark insertion/ detection, RNA structure prediction.
Artificial Neural Network	• initially developed according to the elementary principle of the operation of the neural system.	• Composed of units and connection between them, which together determine the behavior of the network.	• parallel processing • network learning	• no structured methodology available in artificial neural network. • greater computation burden.	• Airline security control, OCR system, sales forecasting, target marketing, prediction of stock price index.

Table (1): Different classification techniques (continue)]

Methods	Fundamental	Work of Classifier	Pros	Cons	Application
Decision Tree	• powerful, straight forward and easy classification algorithm. • represented by rule if then else condition to classify the data items.	• Recursively partition a dataset of records using depth first approach until all the data item belong to a particular class are identified.	• construction does not require any domain knowledge. • Handle high dimension data. • Implement in parallel and series fashion.	• output attribute must be categorical. • limited to one output attribute.	• in decision making system, teaching, research area.
Bayesian Network	• powerful probabilistic representation. • graphical model. • Also called belief network.	• This classification learns from training data the conditional probability of each attribute. A_i given the class label C. • Classification is then done by applying Bayes rule to compute the probability of C given the particular instances of $A_{i...}A_n$ and then predicting the class with highest posterior probability.	• simplify the computation. • exhibit high accuracy and speed when applied to large database.	• the assumption made in class conditional independence. • lack of available probability data.	• in computational biology and bioinformatic, medicine, document classification, information retrieval, semantic search, image processing, data fusion, etc.
k-Nearest Neighbor	• is one of the best known distance base algorithm • is considered as statistical learning algorithm.	• When given an unknown sample, a k-nearest neighbor classifier searches the pattern space for the k training sample. • It is lazy learning algorithm.	• analytically traceable. • uses local information which can yield highly adaptive behavior. • implement in parallel and simple.	• large storage requirement. • highly susceptible to the curse of dimensionality • slow in classifying test tuple that are closest to the unknown sample.	• in pattern recognition, image databases, internet marketing, cluster analysis, etc.

IV. CONCLUSION

Data mining offers guarantee to uncover hidden patterns within large amounts of data. These hidden patterns can potentially be used to predict future behavior. The availability of new data mining algorithms, however, should be met with caution. First of all, these techniques are only as good as the data that has been collected. Good data is the first requirement for good data exploration. Assuming good data is available, the next step is to choose the most appropriate technique to mine the data. However, there are tradeoffs to consider when choosing the appropriate data mining technique to be used in a certain application. There are definite differences in the types of problems that are conductive to each technique. The "best" model is often found by trial and error: trying different technologies and algorithms. Often times, the data analyst should compare or even combine available techniques in order to obtain the best possible results. In this paper, we studied and summarized the different kinds of classification techniques and their pros and cons.

References

[1] Data Mining Introductory and Advanced Topics, Margaret H. Dunhum

[2] http://en.wikipedia.org/wiki/Data_mining

[3] An Introduction to Data Mining, prof. S. Sudarshan, CSE Dept, IIT Bombay

[4] http://homepages.inf.ed.ac.uk/rbf/HIPR2/classify.htm

[5] http://www.jars1974.net/pdf/12_Chapter11.pdf

[6] http://www.saedsayad.com/decision_tree.htm

[7] http://en.wikipedia.org/wiki/Decision_tree_learning

[8] Rokach, Lior; Maimon, O. (2008). *Data mining with decision trees: theory and applications*. World Scientific Pub Co Inc. ISBN 978-9812771711

[9] http://en.wikipedia.org/wiki/Artificial_neural_network#Real-life_applications

[10] A Compréhensive Study of Artificial Neural Networks, Vidushi Sharma, Sachin Rai, Anurag Dev, Volume 2, Issue 10, October 2012.

[11] Classifier Systems and Genetic Algorithms, L.B. Booker, D.E. Goldberg and J.H. Holland

[12] Artificial Neural Network as a classification method in the behavioural science, David Reby, Sovan Lek, Ioannis Dimopoulos, Jean Joachim, Jacques Lauga, Ste´phane Aulagnier, 1996.

[13] Insight into Data Mining, K.P.Soman, Shyam Diwakar,V.Ajay.

APPLICATION OF EIGENFACE IN FACE RECOGNISTION

[1].Harsha Patil [2].Abhishek R Gowda, [3.] Chandrashekar
[1,2,3](BE STUDENT,ECE DEPT. DBIT)

ABSTRACT:

In modern times, face recognition has become one of the key aspects of computer vision for the commercial and law enforcement applications. One of the ways to accomplish this is by comparing selected features from the image and a facial database. To achieve this goal we are using Mean shift algorithm, which is a simple iterative procedure that shifts each data point to the average of data points in its neighborhood. For Gaussian kernels, mean shift is a gradient mapping. It often adopts the color histogram in RGB which is sensitive to lighting variations. The proposed technique relies on a segmentation of the area under analysis into a set of color homogenous regions. The proposed system needs to be initialized by feeding it a set of training images of faces. This is used to define the face space which is set of images. In this colored image will be converted to Eigen faces then mean shift algorithm used extract features of face. Haar classifier is used to detect the face from the database.

Keywords: Mean shift, Eigenface, Haar classifier.

INTRODUCTION

The face recognition [6][19] problem involves searching an existing face database for a face, given a description of the face as an input. The face identification problem is one of accepting or rejecting a person's claimed identity by searching an existing face database to validate input data. Our system uses general facial descriptions as input to retrieve images from a database. Users may utilize this system to identify images by just entering general descriptions, removing the constraint of input images for face recognition and identification purposes. Our approach draws inspiration from the fact that humans describe faces using abstract and often subjective feature measures such as the shape of a face, the color of the skin, hair color etc.. These semantic descriptions, supplied by humans are immune to picture quality and other effects that reduce the efficiency of contemporary face recognition and identification algorithms [16][19]. We will identify the possible facial features [3] that may lead to better recognition while coming to our present feature set. The usage of these images is very broad and wide, such as the security systems case, where it can be used for remote conference, search in database, people identification etc. In today's scenario the increase of terrorist attacks, motivates countless works in this area. Security cameras are placed in supermarkets, shopping centers, subways, downtown, parks, Airports, buses, and so on trying to help for the identification of guilty people, besides reducing crimes and illegal things that happening in the surrounding. Unfortunately, until now, security systems need human supervision, which causes significant failures. Here, we propose an investigation method, which is the base of well-known face

recognition algorithm[2][4], The primary task at hand is, given still or video images require the Mean Shift Based Face Recognition System identification of the one or more segmented and extracted from the scene, where upon it can be identified and matched.

Problem Definition:

The development of face identification has been past from the year to years. In recent years to identify any persons face they used to make a sketch or draw an image. It used to take more amount of time and the difficulties in face recognition are very real time and natural. The face image can have head pose problem, illumination problem facial expression can also be a big problem. Hair style and aging problem can also reduce the accuracy of the system. There are three major research groups, which propose three different approaches to the face recognition problem. The largest group has dealt with facial characteristics. The second group performs human face identification based on feature vectors extracted from profile silhouettes. The third group uses feature vectors extracted from a frontal view of the face. The first method is based on the information theory concepts in other words on the principal component analysis methods. The second method is based on extracting feature vectors from the basic parts of a face such as eyes, nose, mouth and chin. The task consists of detecting all the faces in a digital image. Detecting faces is a complex process that produces from an input image, a set of images or positions referring to the faces on the input image and the third one is the clustering of the image using local maxima points. In this project we propose new Face recognition using Mean shift algorithm. Colored image will be converted to Eigen faces then mean shift algorithm used extract features of face. Haar classifier is used to detect the face from the database.

Existing Method

The image is segmented into different parts like eyes, nose, lips and forehead and so on. It has the following steps,

i) Add Image ii) Clip Image

iii) Construct Image IV) Identification

(a)Add Image:

Add Image is a module that is considered with adding image along with the complete details of the person of whom we are taking image. In this we add Image by importing from the Internet and store them in our system and database. This module is mainly considered for adding details of the criminals like name, age, alias name, gender, location, state, Arrested Date, etc. At the time of the adding image we give some criminal id to that particular person, so that it can be easily added to the database with any duplication of the data.

(b)Clip Image

This modules main function is to divide the images into different pieces such as hairs, forehead, eyes, nose and lips and store them in the database and also creates the files onto our system.

(c)Constructing Image

Based on the eyewitnesses we are going to construct the images. The witness will give us instruction by looking onto the screen on which there will be the parts of the images like eyes, hairs etc.

(d)Identification

Him/her as the criminal else we add that new image again to the database. Mean shift treats the points the feature space as a probability density function. Dense regions in feature space correspond to local maxima or modes. So for this module contains the interface to take the image from above module and it compares or searches with the images already there in the

database. If any image is matched then we identify each data point, we perform gradient ascent on the local estimated density until convergence. The stationary points obtained via gradient ascent represent the modes of the density function.

Proposed work

The proposed method includes mean shift algorithm, Eigenfaces with haar classifier. In the proposed work, the idea is to compute all possible rectangular areas in the image. Fortunately, this can be done in a single pass over the image using a recurrence formula:

Or, to put it simple,A Haar Classifier is a technique which was originally intended for the facial recognition but it can be used for any other object. The most important feature of the Haar Classifier is that, it quickly rejects regions that are highly unlikely to be contained in the object. The core basis for Haar cascade classifier object detection is the Haar-like features These features, rather than using the intensity values of a pixel, use the change in contrast values between adjacent rectangular groups of pixels. The variance of contrast between the pixel groups are used to determine relative light and dark areas. The value of a Haar-like feature is the difference between the sums of the pixel gray level values within the black and white rectangular regions. In an integral image, the area for any rectangular region in the image can be computed by using only 4 array accesses. The picture below may hopefully help in illustrating this Point.

Fig 6.1

The given image is than converted to RGB color histogram by calculating Eigen values. Many images of a person are captured in different orientations and are maintained as a database. Whenever that person is captured in image or a video he will be identified. Mean Shift Based Face Recognition System. There is several face recognition techniques [16][20] proposed utilizing various types of features for example LBP, Wavelet. Eigen Face recognition is well accepted due to simplicity and efficiency. Eigenfaces are made by extracting characteristic features from the faces. The input images are normalized to line up the eyes and mouths. They are then resized so that they have the same size. Eigenfaces can now be extracted from the image data by using a mathematical tool called Principal Component Analysis [1]

Simulation

In this face recognition process we have used color images as input which may be of different sizes. Hence they are resized to 256 x256. Eigen pictures are determined and mean shift is applied which are stored in database. In this way images are trained in database for different persons. To recognize any person, his Eigen picture is compared within the database by using haar classifier. The results are as shown below:

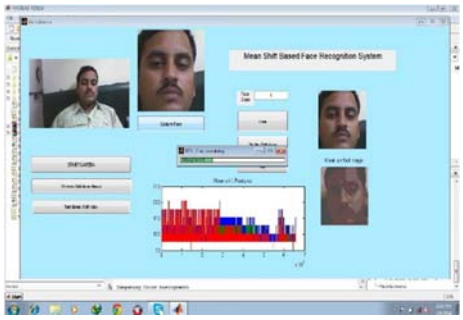


Fig 2

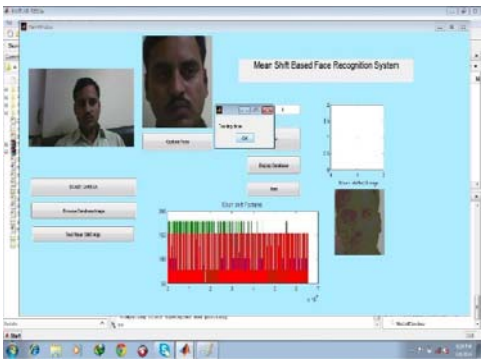


Fig 3

Conclusion

We have presented a face detection algorithm for color images that recognizes the particular face from the database. This project yields fairly accurate face detection results using the Eigenfaces and haar classifier with mean shift algorithm method. The Eigenfaces method is useful for its ability to compress large datasets into a small number of Eigenfaces; haar classifier is used to reject unwanted features from the image. Based on our results, we hypothesize that more diverse datasets require slightly more Eigenfaces for accurate representation. Our project demonstrates that the mean shift algorithm is an efficient and accurate technique for facial recognition. This paper work is carried out successful image recognition application using Eigenfaces, haar classifiers with mean shift algorithm. The system has been tested on a wide variety of face images, with many different angles. The system is giving very high accuracy. Hence by using Eigenfaces method with mean shift algorithm will further increase the accuracy of the system.

References

[1] K. Susheel Kumar, Shitala Prasad, "Real time face recognition using adaboost improved fast PCA algorithm" PES-KM Group, Newgen Software Technology, Greater Noida, INDIA

[2] Veronica Vilaplana, Ferran Marques, "Region based mean shift tracking application to face tracking" Technical University of Catalonia (UPC), Barcelona, Spain

[3] Phillip Ian Wilson Texas A&M University – Corpus Christi 6300 Ocean Dr., Corpus Christi, "Facial feature detection using haar classifiers" Journal of Computing Sciences in Colleges Volume 21 Issue 4, April 2006 Pages 127-133 Consortium for Computing Sciences in Colleges , USA

[4] P. S. Hiremath, Manjunath Hiremath, Mahesh R, "Face Detection and Tracking in Video Sequence using Fuzzy Geometric Face Model and Mean Shift" International Journal of Advanced Trends in Computer Science and Engineering, Vol.2 , No.1, Pages : 41-46 (2013) Special Issue of ICACSE 2013 - Held on 7-8 January, 2013 in Lords Institute of Engineering and Technology, Hyderabad

[5] Aurélio Campilho, Mohamed Kamel, "Image analysis and recognition" international conference, ICIAR 2004, Porto, Portugal, September 29-October 1, 2004". Berlin ; New York : Springer, c2004.

[6] W. Zhao, R. Chellappa, A. Rosenfeld, and J. Phillips, "Face Recognition: A Lite rapture Survey". ACM Computing Surveys, Vol. 35, No. 4, December 2003, pp

[7] Yu-Hsiang Wang Tutorial: Image Segmentation Graduate Institute of Communication Engineering National Taiwan University, Taipei, Taiwan, ROC

[8] E. Diday, "The dynamic cluster method in non-hierarchical clustering" J. Comput. Inf. Sci., vol. 2, pp. 61-88, 1973.

[9] D. Comaniciu and P. Meer, "Mean shift: a robust approach toward feature space Analysis" IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 24, no. 5, pp. 603-619, May 2002.

[10] Y. Cheng, "Mean shift, mode seeking, and clustering" IEEE Trans. Pattern Analysis and Machine intelligence, vol. 17, no. 8, pp. 790-799, Aug. 1995

[11] J. J. Ding, Y. H. Wang, L. L. Hu, W. L. Chao, and Y. W. Shau, "Muscle injury determination by image segmentation," CVGIP, Aug. 2010.

[12] K. S. Fu, "A survey on image segmentation, Pattern Recognition" vol. 13, pp. 3–16, 1981. Mean Shift Based Face Recognition SystemDept. of E&C, Basaveshwar Engg, College Bagalkot. Page 34

[13] R. M. Haralick and L. G. Shapiro, "Image segmentation techniques, " Computer Vision Graphics Image Process., vol. 29, pp. 100–132, 1985.

[14] Junguk Cho,Jason Oberg FPGA-Based Face Detection System Using Haar Classifiers FPGA'09, February 22-24, 2009, Monterey, California, USA.

[15] M. Turk and A. Pentland, "Eigenfaces for Face Detection/Recognition" Journal of Cognitive Neuroscience,vol. 3, no. 1, pp. 71-86, 1991

[16] Divyarajsinh N. Parmar, Brijesh B. Mehta, "Face Recognition Methods & Applications" Divyarajsinh N Parmar et al ,Int.J.Computer Technology & Applications, Vol 4 (1),84-86

[17] R Jafri, H R Arabnia, "A Survey of Face Recognition Techniques" Journal of Information Processing Systems Vol.5, No.2, June 2009.

[18] M. D. Kelly "Visual identification of people by computer" PhD thesis, Stanford University, Stanford, CA, USA, 1971.

[19] W. Zhao, R. Chellappa, P. J. Phillips & A. Rosenfeld, "Face recognitions literature survey", ACM Computing Surveys, Vol. 35, No. 4, December 2003, pp. 399–458.

[20] S. Suhas, A. Kurhe, Dr.P. Khanale, "Face Recognition Using Principal Component Analysis and Linear Discriminant Analysis on Holistic Approach in Facial Images database", IOSR Journal of Engineering e-ISSN: 2250-3021, p-ISSN: 2278-8719, Vol. 2, Issue 12 (Dec. 2012), ||V4|| PP 15-23

[21] M. A. Turk and A. P. Pentland, "Face Recognition Using Eigenfaces" 1991. Computer Vision and Pattern Recognition 1991 Proceedings CVPR '91. IEEE

ELECTRONIC BUS TRAVEL COMPANION FOR THE VISUALLY CHALLENGED

[1]Philip C. Jacob, [2]Sachin K. V., [3]Lyla B. Das
[1,2]Research Engineer, C-DOT, Bangalore, India
[3]Associate Professor, National Institute of Technology Calicut, Calicut, India
Email: [1]praveenleann@gmail.com, [2]sachinkvsuperb@gmail.com,[3]lbd@nitc.ac.in

Abstract—Technology has reached peaks beyond common man's imagination. With all the advancements, technology has been alleviating many human disabilities. This paper focuses on building a system which aims to help the visually impaired in identifying the correct bus to his/her destination. The system consists of two components : a hand-held device and infrastruc-ture. The user can interact with the device by speech. On the infrastructure side, Wi-Fi access is required at the bus stop by which the device can access the internet. A database, connected to the internet, contains ID and details of all the buses. The device also incorporates an RF communication module that reads the bus ID and informs the user through audio.

I. INTRODUCTION

Famous writer Helen Keller wrote in her essay 'Three Days to See', "I have often thought it would be a blessing if each human being were stricken blind and deaf for a few days at some time during his early adult life. Darkness would make him more appreciative of sight, silence would teach him the joys of sound." This research aims at improving the lives of those who are not able to see the beauty of the world around them. Transportation is always a big challenge for those who are visually impaired. It's virtually impossible for them to travel without a companion's aid. The best means for a blind person to travel independently is to use the public transport system. The task is simple in the case of trains and aeroplanes where there is a good public addressing system in place and even dedicated personnel are available. It becomes little tricky in the case of bus transportation. Such facilities are not feasible in bus stops, but buses are the main means of transport for the common man. Most of the visually challenged people come under this category. So they would greatly depend on buses for their travel. So the challenge is to devise a way that can help the visually challenged to safely board and travel in busesThe situation demands the intervention of technology. In this era, technology is helping mankind achieve things that were once thought as impossible. Now technology has to help a blind person to achieve a herculean task for him - travel independently... 'Electronic Bus Travel Companion for Visually Challenged' is a system that can help blind people to identify and board the correct bus to reach their destination. The system would make use of the public Wi-Fi facility in bus stops to provide this service. This is one of the main requirements of the system but Wi-Fi enabled bus stations are being constructed. So this requirement can be easily met.

Many research work had been done in helping the visually challenged in local transportation. Some have considered RFID alone in assisting the people [1]. It also includes the creation of a database which stores all the data of all the buses. The research work showed various RFID tags such as active, semi-passive and passive tags which could be used in this work. All the buses

with different RFID tags would be read at each bus stops and the route would be announced through a loud speaker at the bus stops [1]. This would mean installation of RFID readers and a system at all bus stops. The idea of RFID is used in this paper from [1].
An intelligent wireless bus station is another approach to help the visually challenged in boarding the required bus [2]. It also uses RFID, but along with wireless sensor network, Zigbee and other standards for communication. The research work is mainly the creation of a new protocol used in the creation of such a system.

In the RAMPE system, the user has a Wi-Fi enabled PDA which allows him to communicate to the internet to receive all data about the bus [3]. There is Wi-Fi connectivity at the bus stop that has internet connectivity. The user can interact with the PDA through speech. The details obtained about the bus is conveyed back to the user through speech again, ie. text to speech conversion. The idea of Wi-Fi connectivity at all bus stops is used here. The speech to text and text to speech conversions are also used here.

A bus identification system which uses RFID, text to speech, WLAN and RF communication with the bus has also been proposed [4]. The proposal shows the inclusion of a Braille keyboard for the user to enter the details of the destination. The RF communication with the bus informs the bus driver about the blind person waiting at the bus stop.

A project for helping the blind for easy navigation was mentioned in [5]. In the work, the use of Wireless Sensor Networks (WSNs) and Zigbee were mentioned. The Zigbee helps the bus find the blind person at the bus-stop. Also the blind is aided with GPS for moving towards the bus

II. BACKGROUND OF RESEARCH

Only a small fraction of the world population is visually challenged. But their life is completely different from those who can see. It's not that they can't see anything, blindness limits their lives to such an extent that they have to depend on others for even the simplest tasks. One of the main challenges that visually disabled people face is travelling.

Major section of the blind population has to depend on the public transport system because of the cost concerns. Compared to other means of transport, buses offer good connectivity at reasonable cost. But travelling by bus, on their own, is unthinkable for the visually impaired. They need another person's help for this. This greatly limits the person's mobility. A solution need to be found to this problem troubling the blind population worldwide.

'Electronic Bus Travel Companion for Visually Challenged' aims to solve the above problem and thus improve the lives of millions of visually challenged people all around the world. The system will assist the blind person to identify the bus to his/her destination, detect its presence and hence successfully board it. Additionally the system informs the bus driver regarding the presence of the blind person.

The system is a combination of hardware and software and comprises of mainly two parts, a hand-held device and Technical infrastructure. The hand-held device would be carried by the user. The device takes in the location and destination details from the user, collects the details of the buses to that destination. When the correct bus reaches the bus station the device identifies the bus through RF communication for which additional hardware is included in the device.

Infrastructure support is very much required for the system to be operational. The user device needs to access the internet to get the details of the buses. So, for this, an access network is required at the bus stop. A Wi-Fi access point is very much suitable for this as it provides quick and easy access to internet. So Wi-Fi access points are required at bus stops. Additionally, a server is to be created which would contain the information regarding the buses in its database and provide the required information based on

the query from the user device.

III. SYSTEM MODELLING

The system includes

1) Hand-Held device
2) Infrastructure

A. Hand-Held Device

The hand-held device will consist of

1) Hardware
2) Software

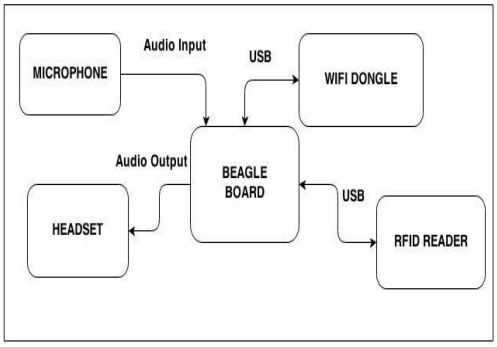


Fig. 1. Figure showing the interconnection of various hardware parts

Hardware

The hardware part (as shown in Fig.1 consists of the following:

1) Embedded Board: The Embedded board that the device is built on will consist of a CPU. This board will have an Operating System (OS), which helps scheduling different tasks and processes. One such platform is the BeagleBoard-xM. The BeagleBoard-xM [5] is an open source hardware platform intended for embedded applications. It has all facilities and capabilities of a mini computer. Some main features of the board are:

- Texas Instruments Cortex A8 1GHz processor
- Micron 4Gb MDDR SDRAM (512MB) 200MHz 4 USB host ports and 1 USB OTG
- Ethernet 10/100
- Stereo Audio in and Audio out with 3.5mm connector DVI-D connector
- RS-232 DB9 connector
- Micro SD-card slot

2) Wi-Fi Module: A Wi-Fi module is incorporated for connecting to the available Wi-Fi at the bus stops. This is a must needed option for various other future purposes.

3) RFID reader: The RF Communication module in the user device allows it to identify the correct bus based on the ID of the bus. Based on bus ID received from the Database, the user device reads the IDs of the incoming buses by RF communication. The ID received from bus is compared to the ones from database and the correct bus is identified

4) Microphone: A microphone is used to capture the speech from the user. It converts the sound signal to voltage signal. This voltage signal is taken into the system for further processing.

5) Headphone: Headphone is used to provide voice output to the user. The required directions from the software are sent to the headphone as audio signals through audio-out port from the system. These signals are converted to sound by the headphone and the user can listen to it.

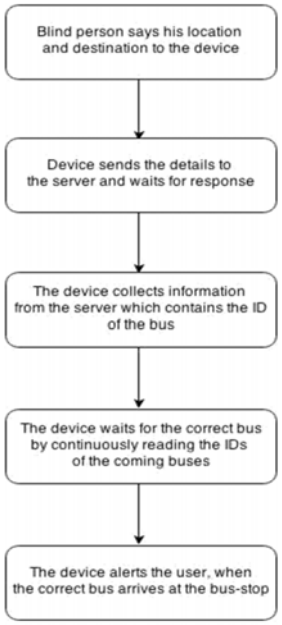


Fig. 2. Application Software flowchart

Software

The software component of the system consists of the following:

6) Operating System(OS): The OS is an embedded OS optimised for the embedded board used. The OS acts as a platform on which the application software works. It allows the application software to interact with the different hardware modules on the embedded board 7) Application Software: The entire functionality of the system lies on the application software (Fig. 2). The application software runs inside the OS environment and interacts with the hardware through the OS. It gives necessary directions to the user and gets the user's location and required destination. It sends this information to the server and receives the bus IDs from the server. From the RFID reader the tags of nearby buses are read. On finding a matching tag the required information is passed to the user.

8) Speech Recognition: The system uses speech recognition to collect the required information from the user. Speech recognition is integrated into the application software. The user is prompted to speak his/her required destination. This is recognized and sent to the server along with his/her current location.

9) Speech Synthesis: The system is required to interact with the user via voice. For this, speech synthesis is incorporated into the application software. This gives necessary directions to the user making it easy to operate.

B. Infrastructure

Infrastructure includes Wi-Fi access point, RF tags and server. The access point needs to be fixed at bus stop. The RF tags are located in buses. This allows the user device to communicate with the bus. The server provides information to the user device regarding the bus timings.

1) Wi-Fi Access Point: Wi-Fi access point located at bus stop will provide internet access. It works based on the IEEE 802.11 WLAN protocol and can support many users. It will provide internet access to all the devices connected to it. The wireless connectivity improves the user friendliness of the device as it can connect to internet without any user intervention.

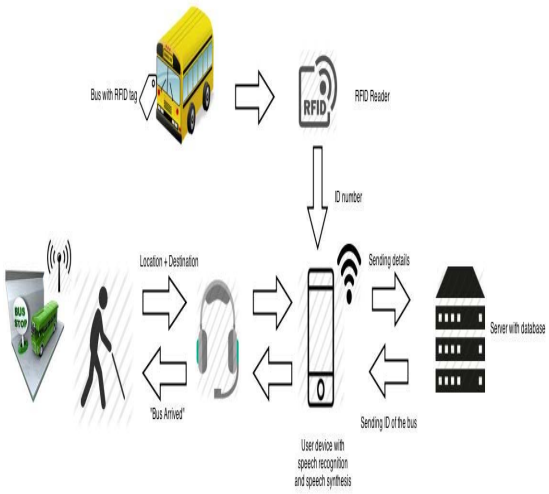


Fig. 3. Figure showing working of the whole system

2) RF Tag: The tag present in the bus communicates with the user device. The RF transceiver receives the query sent from the user device and responds to it by sending the unique ID of the bus.

3) Server: The server contains information regarding all buses in its database. The Database includes the bus ID, timing at different stops and route details. Based on the destination details and user location provided, the server searches the database and collects the IDs of the buses meeting the requirement and sends it back to the user.

IV. WORKING

A block diagram showing the working is given in Fig.3. The description is given below.

1) When the user reaches the bus stop, the user device automatically connects to the Wi-Fi access point located at the bus-stop through the Wi-Fi module on the device.
2) After ensuring network connectivity, the system asks the user to tell his/her location. The response from user is

recorded and recognized. The correctness is checked by speaking the recognized word to the user. The process is repeated if required.

3) Same process is repeated to get required destination from the user.
4) The location and destination information are sent to the server through internet. The server searches its database to find buses matching the location and destination requirements.
5) On finding the buses plying in the route required by the user at given point of time the tag numbers of the buses are sent to the user device over the internet.

The user device receives the tag numbers from the server. It scans its environment and reads nearby tags. When the read tag number matches with the received tag number, the arrival of the bus is confirmed and necessary directions are given to the user.

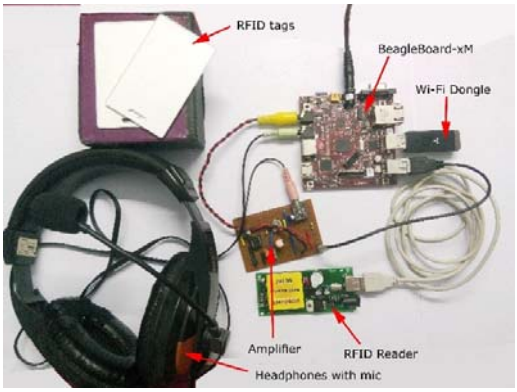


Fig. 4. Experimental Setup

V. EXPERIMENTAL SETUP

A. Hardware Setup

The hardware setup for the system is shown in Fig.4. The BeagleBoard-xM is the embedded board used. The Wi-Fi module is a USB Wi-Fi dongle connected to one of the USB ports in BeagleBoard-xM. The RFID reader is also connected to the board through USB. The headphone is connected to the audio-out port on the board, but the connection from microphone does not go directly to the board. The audio-in port of BeagleBoard-xM is designed for line level ie. it does not accept the microphone signal directly. The microphone output is given to an audio amplifier and the amplified signal at line level is given to audio-in of BeagleBoard-xM. The OS and Application software are contained in a micro SD card connected to the corresponding slot in the board.

B. Software Setup

The software setup consists of the OS and the Application software. Ubuntu operating system is used to boot the device. The version of Ubuntu used is specific to BeagleBoard-xM. In order to boot, the OS is mounted onto the micro SD card connected to BeagleBoard-xM. For this, the card is partitioned into two volumes. The OS kernel is placed in one volume and the file system in the other. The application software is located in the file system. The application starts operation as soon as the OS boots. The application software itself contains many smaller software modules. They are Speech recognizer, Speech synthesizer, RFID reader and Communication handler. Speech recognizer is written in Java with the help of CMU Sphinx open source library. This module is called to convert the voice recorded from the user into text. Popular open source speech synthesizer called eSpeak is used as the speech synthesizer. A regional language Malayalam was also incorporated along with English. This is done to aid users who prefer Malayalam over English. The RFID reader deals with the RFID hardware. The Communication handler deals with internet connectivity and communication with the server.

VI. RESULTS

Experiments were conducted based on the above features and the system worked well at all times. The only problem was the speech recognition software, which was made using Java, was not that accurate all the time, as the words used were places from Kerala. The incorporation of text-to-Malayalam conversion was done in helping those who did not understand English. The speech synthesizer output sounded more machine-like, because of non-availability of other good voices. Overall, the system gave good response.

VII. CONCLUSION

Through this research and experiment, an electronic system for helping the blind travel in

a bus was developed. Only minimum hardware were used to achieve this, and most of the processing done was through software.

In future, an economical guidance system, for helping the blind move towards the bus, has to be integrated to the above system for better functioning of the whole system REFERENCES

[1] M. Z. H. Noor, I. Ismail, and M. Saaid, "Bus detection device for the blind using rfid application," in 5th International Colloquium on Signal Processing Its Applications, 2009. CSPA 2009., pp. 247–249, March 2009.

[2] H.-Y. Zhou, G. de Sousa, J.-P. Chanet, K.-M. Hou, J.-J. Li, C. de Vaulx,
and M. Kara, "An intelligent wireless bus-station system dedicated to disabled, wheelchair and blind passengers," in IET International Conference on Wireless, Mobile and Multimedia Networks, 2006, pp. 1– 4, Nov 2006.

[3] O. Venard, G. Baudoin, and G. Uzan, "Field experimentation of the rampe interactive auditive information system for the mobility of blind people in public transport : Final evaluation," in 9th International Confer-ence on Intelligent Transport Systems Telecommunications,(ITST),2009,
pp. 558–563, Oct 2009.

[4] L. El Alamy, S. Lhaddad, S. Maalal, Y. Taybi, and Y. Salih-Alj, "Bus identification system for visually impaired person," in 6th International Conference on Next Generation Mobile Applications, Services and Tech-nologies (NGMAST), 2012, pp. 13–17, Sept 2012.

[5] G. Lavanya, W. Preethy, A. Shameem, and R. Sushmitha, "Passenger bus alert system for easy navigation of blind," in 2013 International Conference on Circuits, Power and Computing Technologies (ICCPCT),,
pp. 798–802, March 2013.

[6] BeagleBoard-xM Reference Manual.

DESIGN OF A LOW VOLTAGE PHASE LOCKED LOOP FOR CLOCK GENERATION

[1]Mannem Venkateswarlu, [2]K Sarangam
[1,2]Dept. of Electronics and Communication Engineering ,
National Institute of Technology, Warangal Andhra Pradesh, India
E-mail: [1]venky.mannem@gmail.com ,[2]sarangam.nitw@gmail.com

Abstract— **a 1.2V CMOS Phase Locked Loop (PLL) is designed in 0.18µm CMOS technology. The proposed PLL will generate the output clock frequency of 350 MHz with low power consumption. The PLL contains Phase Frequency Detector (PFD), Charge Pump (CP), Loop Filter, Voltage Controlled Oscillator (VCO) and Frequency Divider. These blocks are designed such that they will work under a low voltage supply. The Phase noise is -100dbc/Hz, power consumption calculated as 1mW.**

1. Introduction

Phase Locked Loops are widely used in wireless communication to generate high frequency clock from a reference frequency. The basic block diagram of a PLL is shown in Figure 1. A PLL is a closed-loop feedback system that sets fixed phase relationship between its output clock phase and the Phase of a reference clock. A PLL tracks the phase changes that are within the bandwidth of the PLL.

A PLL also multiplies a low-frequency reference clock, CKref, to produce a high frequency clock, CKout.

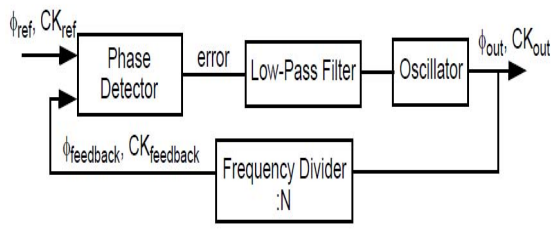


Figure 1 Block diagram of a PLL

This paper organized as follows:
Chapter 2 discusses the fundamentals of the PLL and Components. Chapter 3 discusses the architectures of phase frequency detector, charge pump, VCO and divider and their design. Chapter 4 the experimental results and gives the final conclusion.

2. Fundamentals of the PLL

Phase-locked loops (PLLs) generate well-timed on-chip clocks for various applications such as clock-and-data recovery, microprocessor clock generation and frequency synthesizer. The basic concept of phase locking has remained the same since its invention in the 1930s. However, design and implementation of PLLs continue to be challenging as design requirements of a PLL such as clock timing uncertainty, power consumption and area become more stringent. A large part of this research focuses on the design of a PLL for high-performance digital systems.

PLL Components

The block diagram of a charge-pump PLL is shown in Figure 2 [8]. A PLL comprises of several components: (1) phase or phase-frequency detector, (2) charge pump, (3) loop filter, (4) voltage-controlled oscillator, and (5) frequency divider. The functioning of each block is briefly described below.

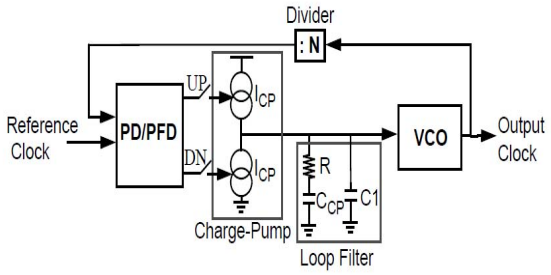


Figure 2 Block diagram of a charge pump PLL

1. Phase Detector or Phase-Frequency Detector

The phase detector (PD) compares the phase difference between two input signals and produces an error signal that is proportional to the phase difference. In the presence of a large frequency difference, a pure phase detector does not always generate the correct direction of phase error. Since the phase detector is insensitive to frequency difference at the input, upon start-up when the oscillator's frequency divided by N is far from the reference frequency, the PLL may fail to lock. The problem is known as an inadequate *acquisition range* of the PLL.

To remedy the problem, a phase-frequency detector (PFD) is used that can detect both phase and frequency differences.

Figure 3 conceptually demonstrates the operation of a PFD for two cases: (a) the two input signals have the same frequency, and (b) one input has higher frequency than another input. In both cases, the DC contents of PFD's outputs, *UP* and *DN*, provide information about phase or frequency difference.

One of the disadvantages that PFD suffers is dead-zone. Dead-zone is a small difference in the phase of the inputs that a PFD will not be able to detect. Dead zone is due to the delay time of the logic components and reset of the feedback path of the flip flops.

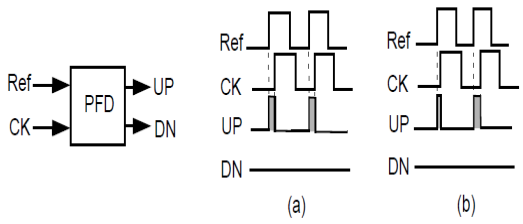


Figure 3 Operation of a PFD
(a) fref=fCK, φref#φCk and (b) fref>fCK

Figure 4 illustrates the dead zone problem. When the two clocks are very close to each other (small phase error),due to the delay time the reset delay, the output signals UP and DOWN will not be able to charge and no output will signal leading to losing this small difference.

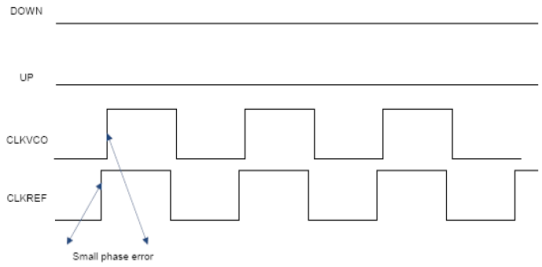


Figure 4 Illustrating Dead Zone

Plenty of solution has been done for this problem some of them reduce the delay time in the internal components of the PFDs, other solution eliminate the reset path by implementing new reset techniques that will not create a delay and produce a high speed PFDs. Therefore the proposed PFD architecture for the PLL is shown in figure 5.

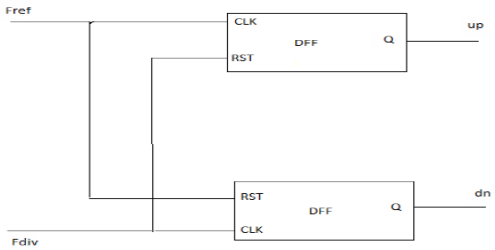


Figure 5 Proposed PFD circuit

Design of Positive edge triggered D-FF for high speed PFD circuit

The operation of proposed D-FF (shown in Fig 6) is as follows [3]. When the input clock and reset signals are low, node A is connected to VDD through m1, mr1, and charges the node A to VDD.

At the rising edge of the clock signal, node B is connected to ground through m3 & m4. Once the node A is charged to VDD, the node B is not affected by input clock signal. Because the charges at node A turns off the m3 & this prevents the node B from being pulled up. Therefore the node B is disconnected from input node. When the reset signal is applied, node A is disconnected from VDD by mr1 and is connected to ground by mr2. As soon as the

node A is discharged, the node B is pulled up through m2. The mr1 is added to prevent the short circuit that occurs whenever the reset signal is applied. When the clock signal is low while the reset signal is high, a current path is made from VDD to ground if mr1 is not provided. This increases the short circuit power consumption. Dynamic power consumption can be reduced by internal switching and speed is increased by shortening the input to output path.

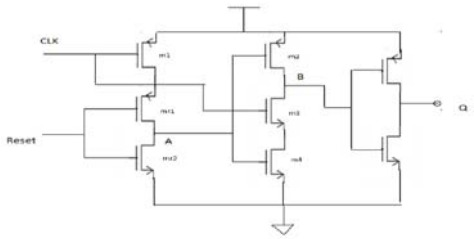


Figure 6 Proposed D-FF

2. Charge-Pump

The charge-pump circuit comprises of two switches that are driven with *UP* and *DN* outputs of PFD as shown in Figure 2.

The output of a PFD can be converted to DC (voltage/current) in many different ways. A more common approach [2] is to interpose a "charge pump" (CP) between the PFD and the loop filter. A charge pump consists of two switched current sources that pump charge into or out of the loop according to two logical inputs. Figure 8 illustrates a charge pump driven by a PFD and driving a capacitor. The circuit has three states. If QA = QB = 0, then S1 and S2 are off and Vout remains constant. If QA is high and QB is low, then I1 charges CP. Conversely, if QA is low and QB is high, then I2 discharges CP. Thus if, for example, A leads B, then QA continues to produce pulses and Vout rises steadily, called UP and DOWN currents, respectively, I1 and I2 are nominally equal.

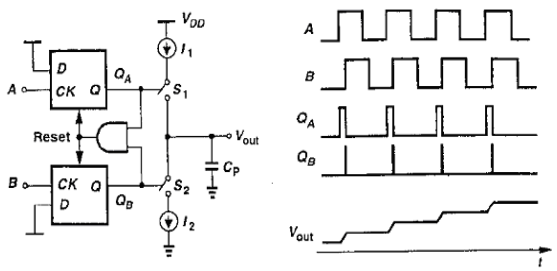


Figure 8 PFD with charge pump.

To implement a very low voltage charge pump, we start by designing and testing a low-voltage switched push-current source as shown in Fig 9[11].

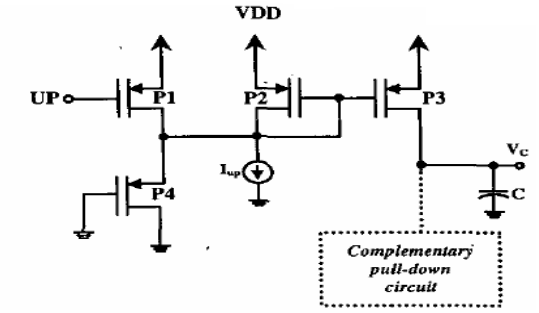


Figure 9 Proposed switched push-current source

For the proposed structure the minimum power supply that can be used is given by:

VDD = VSG-P2+ VDSAT

Where VSG.P2 is the source to gate voltage of transistor P2.

Design:

When UP signal is high the entire current is steered into the P2 device. So the P2 transistor is in saturation region. The current through the mosfet in saturation region is given by

ID = 0.5.(W/L).(μp.Cox)(Vgs+Vtp)^2

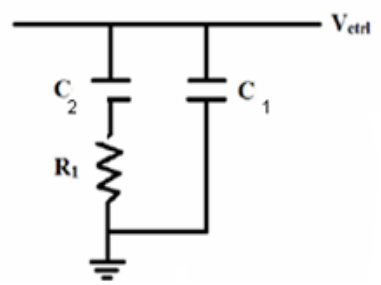
From the above equation if we assume the saturation voltage as 0.3 we can get the W/L ratio of P2 and P3 transistors.

The proposed architecture is differential circuit the W/Ls of DN signal transistor are same as the W/Ls of UP signal transistors.

3 Loop Filter

The loop filter is a 2nd order passive filter. Loop filter design is an important aspect of the clock generator design since the most performance parameters (phase noise, stability, lock time , reference spurs) of the clock generator depend on the loop parameters.

The loop parameters R1, C1 and C2 are designed for given PLL parameters ; Icp, Kvco and for specified loop bandwidth(ωc) and phase margin.



The reference frequency is 11MHz ,Therefore loop bandwidth = 1.1MHz
FN = 2.(Loopp Bandwidth)/(2∏(ξ+1/(4 ξ)))
where
FN = natural frequency, ξ = damping factor typically 0.707

From the above equation FN = 0.330MHz.
Then calculating C2 and C1

$$C_2 = \frac{I_{CP} \times K_{VCO}}{N \times (2\pi \times F_N)^2}$$

Icp = 65uA, Kvco = 680MHZ and N = 32
Therefore C2 = 320pF
C1 = C2/10
= 3.2pF
And calculating R1

$$R_1 = 2 \times \xi \times \sqrt{\frac{N}{I_{CP} \times K_{VCO} \times C_2}}$$

Therefore R1 = 2.12kΩ.
Summary
R1 = 2.12kΩ
C1 = 320pF
C2 = 3.2pF.

4 Voltage-Controlled Oscillator (VCO)

An oscillator is an autonomous system that generates a periodic output without any input. A CMOS ring oscillator shown in Figure 3 is an example of an oscillator. So that the phase of a PLL is adjustable, the frequency of oscillation must be tunable.

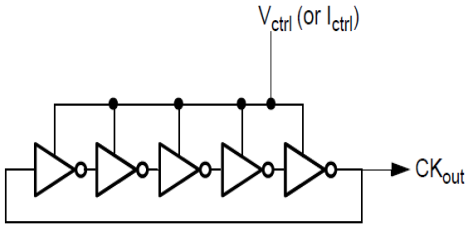


Figure 3 A five-stage ring oscillator

In the example of an inverter ring oscillator, the frequency could easily be adjusted with controlling the supply (voltage or current) of inverters. The slope of frequency versus control signal curve at the oscillation frequency is called voltage-to-frequency (or current-to-frequency) conversion gain, KVCO; KVCO=dfVCO/dVctrl evaluated at fVCO. Ideally, for the linear analysis to apply over a large frequency range, KVCO needs to be relatively constant.

Ring oscillators employing more than three stages are also feasible. The total number of inversions in the loop must be odd so that the circuit does not latch up. On the other hand, the differential implementation can utilize an even number of stages by simply configuring one stage such that it does not invert, as illustrated in figure 10.

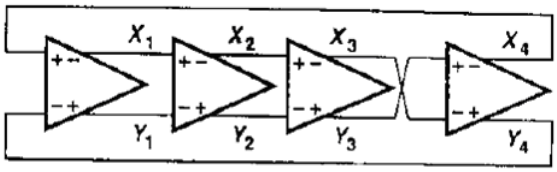


Figure 10: Four-stage differential ring oscillator

Figure 11 shows full-swing delay cell. These cells employ a P-latch or an N-Latch to speed up the transition of the output signal, and to ensure that logic state, once established, is insensitive to supply voltage variations. The sharpening of the transition edges reduces the amount of noise converted to timing jitter. As compared the delay cells shown in figure 11, the elimination of the biasing tail current source removes the effect of the up conversion of the flicker noise of the tail current source on the timing jitter. Also, voltage swing limit is no longer an issue and the cell has the capability to operate at a lower voltage. Note that in order to break the latch; the input transistors of the cells

have to be sufficiently large, resulting in a lower oscillation frequency.

These two attributes, fast transitions and rail-to-rail swing, cause the full-swing ring oscillator to reject intrinsic noise better than a partial-swing ring oscillator. It is well known that noise injections at transitions cause more phase error than when the output is saturated [5], [6]. Fast transitions cause this window of sensitivity to be very small. Rail-to-rail swing causes the charge swing at the oscillator output to be maximum. When the signal charge is maximum, the charge injection from noise sources is relatively smaller [5]. The full-swing oscillator does not have any mechanisms besides the basic pseudo-differential structure to minimize power supply noise conversion to phase noise.

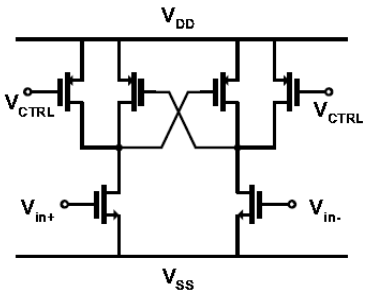


Figure 11 Proposed VCO delay cell

Design of VCO

$$f_{osc} \approx \frac{1}{2NC_L R_L} = \frac{I_{dd}}{2NC_L V_{SW}}$$

In this design the frequency is 350MHz
Therefore the Td = 0.357ns

Td = 0.69.Ron CL

CL is the load capacitance seen at the drain of load in each stage. It includes the parasitic capacitances of the drain terminal and gate to source capacitance of the next stage.

Cgs = Cox.WL

From the above equation we can get the W/L values of input transistors.

5 Divider

A frequency divider used for the project has to divide the VCO output frequency by a factor of 32 so that the output of the divider we can get is 11MHz. For the design of such a frequency divider five divide by 2 blocks are cascaded so that the output frequency of the divider circuit we can get is equal to output frequency of VCO divided by 32.

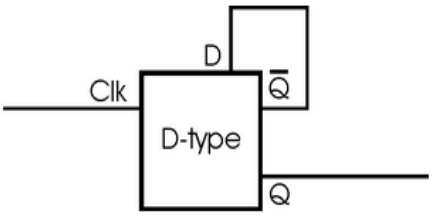


Figure 12: Divide by2 c

5 Experimental Results

Figures 12,13 shows the PFD outputs when CKref leads to CKvco and CKref lags to CKvco.

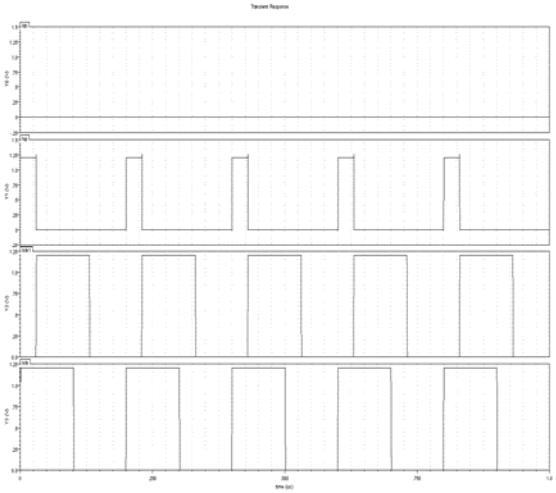


Figure12: Output of the PFD When CKref leads to CKvco

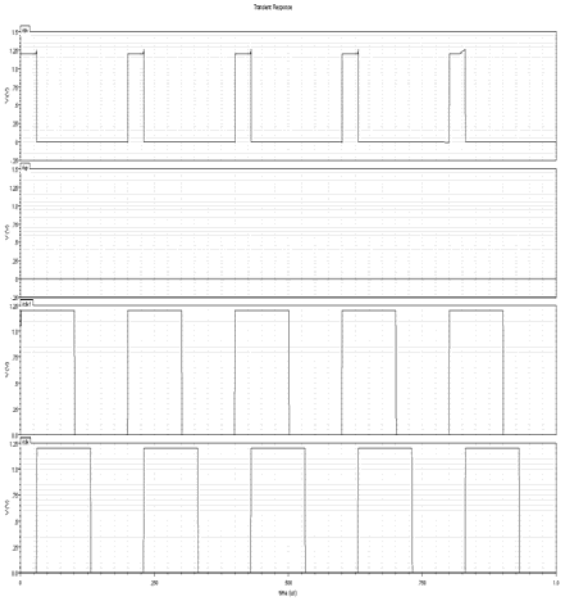


Figure 13: Output of the PFD When CKref lags to CKvco

Figures shows the CP outputs when charge pump output when CKref leads to CKvco and charge pump output when CKref lags to CKvco.

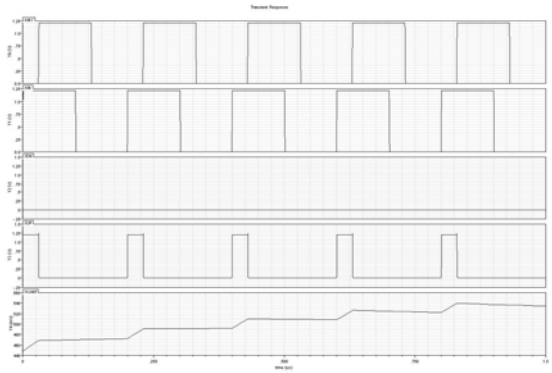


Figure 14: Charge pump output when CKref leads to CKvco

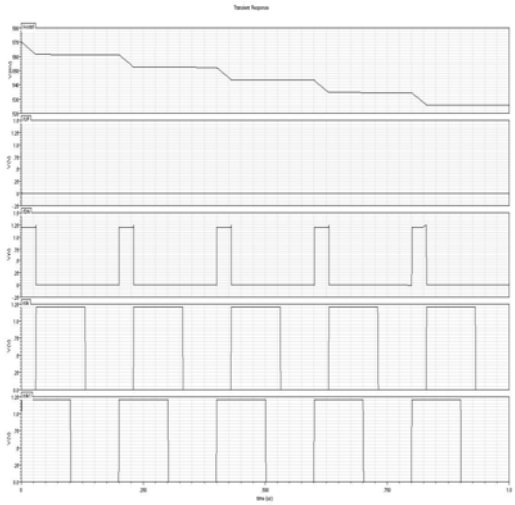


Figure 15: Charge pump output when CKref lags to CKvco

Figure16,17 shows the transient response of dfferential ring VCO.

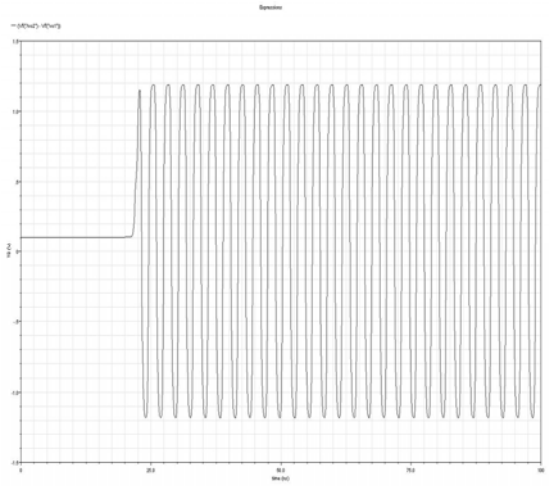


Figure 16: Transient response of differential ring VCO

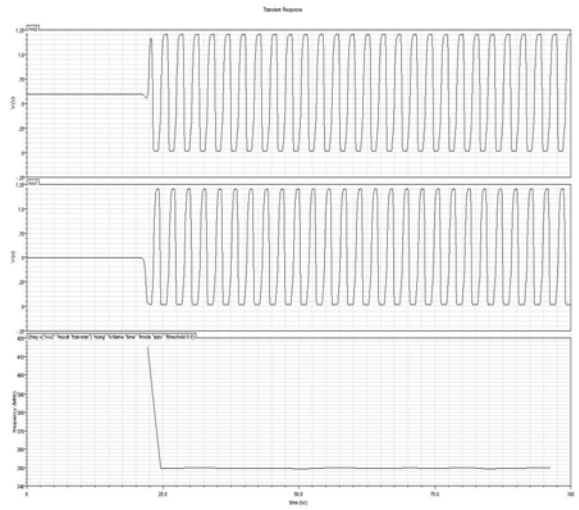


Figure17 Transient response of differential ring VCO with frequency

Figure 18 shows the output of divide by 32 circuit.

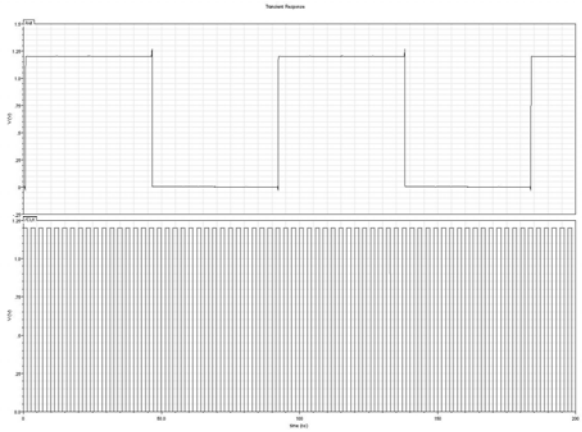


Figure 18: Output of divide by 32

The PLL described in this paper implemented in 0.18um CMOS technology. The PLL gives the output frequency of 350MHz with a low phase noise i.e -100dbc/Hz.

Conclusion

In this paper a low voltage PLL is designed and implemented in 0.18m CMOS technology with 350MHz output frequency, -100dbc/Hz, and 1us lock time with a power consumption of 1mW. The blocks for the PLL used are the low voltage topologies which will be worked on a 1.2V. It is favorable in low power, low cost transmitter design.

Table 1 shows the measured parameters and comparison with the previous designs.

Table 1: PLL mesured parametrs and comparisoin

	[1]	[10]	[11]	This work
Technology	.35um	.40um	.18um	.18um
Output Frequency	350MHz	340MHz	270MHz	350MHz
Vdd	3.3V	2.5V	1.8V	1.2V
Power Consumption	12mW	100mW	24mW	1mW
Lock range	100-560MHz	340-612MHz	100-500MHz	25-500MHz

References

[1] A Low-Jitter and Low-Power CMOS PLL for Clock Multiplication Xintian Shi, Kilian Imfeld, Steve Tanner, Michael Ansorge and Pierre-André Farine Institute of Microtechnology University of Neuchâtel Breguet 2, 2000 Neuchatel, Switzerland

[2] B. Razavi. Design of Analog CMOS Integrated Circuits. Mc Graw Hill, July 2000.

[3] K. Martin A. Rezayee. A coupled two-stage ring oscillator. IEEE Midwest Symp. Circuits and Systems, pages 878{881, 2001.

[4] Won-Hoy LEE, Sung-Dae LEE "A High speed, Low power phase frequency detector and charge pump circuits for High frequency Phase locked loop" IEICE trans.fundamentals,vol.E82-A,No.11, Nov2006

[5] P. Heydari, "Anylysis of the PLL jitter due to power/ground and substrate noise," IEEE trans. on circuits & systems I, vol. 51, pp. 2404-2416, Dec.2004.

[6] Liang Dai and Ramesh Harjani, "Design of low-phasenoise cmos ring oscillators," Analog and Digital Signal Processing, IEEE Journal of, vol. 49 Issue: 5, pp. V77 V80, May 2002.

[7] Joonsuk Lee and Beomsup Kim, **"A** low-noise fast-lock phase-locked loop with adaptive bandwidth control," Solid-state Circuits, IEEE Journal of, vol. 35 Issue: 8,pp.1137-1145 August 2000.

[8] P. Larsson, "A 2-1600 MHz CMOS clock recovery PLL with low-Vdd capability," IEEE JSSC, vol. 34, pp. 1951–1960, Dec. 1999.

[9] B. Razavi. RF Microelectronics. Prentice Hall, August 1998.

[10] D. W. Boerstler, "A low-jitter clock generator for microprocessors with lock range of 340-612 MHz," IEEE JSSC, vol. 34, pp. 513–519, April 1999.

[11] S. Williams, H. Thompson, M. Hufford and E. Naviasky, "An improved CMOS ring oscillator PLL with less than 4ps accumulated jitter," IEEE proceeedings of CICC 04, pp. 151-154, Sep. 2004.

[12] J. Lee and B. Kim, "A low-noise fast-lock phase-locked loop with adaptive bandwidth control," *IEEE J. Solid-State Circuits*, vol. 35, pp. 1137–1145, 2000.

[13] A New CMOS Charge Pump for Low-Voltage (1V) High-speed PLL Applications *Rola A. Baki and Mourad N. El-Gama1* Microelectronics And Computer Systems Laboratory, McGill University 3480 University Street Montreal, Quebec, Canada H3A 2A7.

[14] The Effect Of Power Supply Noise On Ring Oscillator Phase Noise Merrick Brownlee, Pavan Kumar Hanumolu, Un-Ku Moon, and Karti Mayaram School of EECS, Oregon State University, Corvallis, OR 97331.

[15] F. Herzel and B. Razavi, "A study of oscillator jitter due to supply and substrate noise," *IEEE Trans. Circuits Syst. II*, vol. 46, pp. 56–62, 1999.

[16] J. Maneatis, "Low jitter process-independent DLL and PLL based on selfbiased techniques," *IEEE J. Solid-State Circuits*, vol. 31, pp. 1723–1732, 1996.

[17] A. Hajimiri and T. Lee, "A general theory of phase noise in electrical oscillators," *IEEE J. Solid-State Circuits*, vol. 33, pp. 179–194, 1998.

[18] L. Dai and R. Harjani, "Design of low-phase-noise CMOS ring oscillators," *IEEE Trans. Circuits Syst. II*, vol. 49, pp. 328–338, 2002.

[19] T. Ahrens and T. Lee, "A 1.4-GHz 3-mW CMOS LC low phase noise VCO using tapped bond wire inductances," in *International Symp. On Low Power Electronics and Design*, 1998, pp. 16–19.

[20] Wideband PLL System as a Clock Multiplier Master of Science Thesis For obtaining the degree of Master of Science in Electrical Engineering at Delft University of Technology Aylin Donmez August 17, 2009 Faculty of Electrical Engineering , Delft University of Technology.

[21] An Overview of Low-Voltage VCO Delay Cells and a worst cae analysis of supply noise sensitivity Mohamad El-Hage and Fei Yuan Department of Electrical and Computer Engineering Ryerson University, Toronto, Ontario, Canada.

SIMULATION OF MRAC BASED SPEED CONTROL OF BRUSHLESS DC MOTOR WITH LOW-RESOLUTION HALL-EFFECT SENSORS

[1]Gundra Sunil, [2]B.Rajasekhar
(M.E), Control Systems, ANITS College, M.E , Asst.Professor, ANITS College ,
Email: [1]gundra.sunil@gmail.com, [2]rajasekhar.balla@gmail.com

Abstract—A novel speed estimation approach with control system based on model reference adaptive control (MRAC) is presented for low cost brushless dc motor drives with low-resolution hall sensors. The back EMF is usually used to estimate speed. But the estimation result is not accurate enough at low speeds because of the divided voltage of stator resistors and too small back EMF. Moreover, the stator resistor is always varying with the motor's temperature. A speed estimation algorithm based on MRAC was proposed to correct the speed error estimated by using back EMF. The proposed algorithm's most innovative feature is its adaptability to the entire speed range including low speeds and high speeds and temperature and different motors do not affect the accuracy of the estimation result. The effectiveness of the algorithm was verified through simulations and experiments.

Index Terms—Brushless dc motor, low-resolution hall sensor, model reference adaptive control, speed estimation

I. INTRODUCTION

Brushless dc (BLDC) motors are preferred as small horsepower control motors due to their high efficiency, silent operation, compact form, reliability, and low maintenance. However, the problems are encountered in these motor for variable speed operation over last decades continuing technology development in power semiconductors, microprocessors, adjustable speed drivers control schemes and permanent-magnet brushless electric motor production have been combined to enable reliable, cost-effective solution for a broad range of adjustable speed applications.

Due to the nonlinearity of the motor system, MRAC or model reference adaptive control which is one of a kind in adaptive control techniques is implemented. It is regarded as an adaptive servo system in which the desired performance is expressed in terms of reference model, which gives the desired response to a command signal. The nonlinearity occurs because the system transfer function varies or changes with the speed of the motor and the controller ought to be adaptive and robust for these changes.

Brushless dc (BLDC) motors usually use three or more Hall sensors to obtain rotor position and speed measurement. It would be necessary to inverse the time difference between two successive Hall sensor signals to obtain reliable speed measurement. Notice that there are only a few sensor signals available to the motor at low speeds. There may be 12 or 24 sensor pulses per round which depend on the number of poles. The sampling time, thus, becomes a variable according to the motor speed. These systems have uncertainty in a discrete time model and have a lot of difficulties to design speed regulators. Moreover, the sampling time is too long for speed regulations at low speeds. In order to make BLDC motors with low-resolution encoders work at very low speed and reduce the difficulty of speed regulators' design, several

methods have been developed to obtain high accurate speed measurement. These methods are commonly addressed as estimation methods. Instantaneous speed estimation based on a reduced-order disturbance torque observer provides the merits of simple structure and easy implementation [1]. But the high gain problem occurs in real application for mechanical noise and oscillation of system. In [2], a reduced-order extended Luenberger observer was proposed to reduce the sensitivity to the instantaneous speed estimation by the variation of the inertia moment. A computationally intensive Kalman filter is successfully used in dealing with velocity transients [3], but it is susceptible to the mismatch of parameters between the filter's model and the motor. In [4], a dual observer was proposed. The dual observer can estimate the rotor speed and position without time delay or bumps. All the observer-based methods share the feature of providing high accuracy of the speed estimation with satisfactory dynamic performance. But they suffer from the dependence on system parameters and need heavy computation [5]. A model free enhanced differentiator is proposed for improving velocity estimation at low speed [6], [7]. But the computation includes the fractional power of variables. Many other authors have suggested that accurate speed estimation can be obtained by using a low-resolution encoder, together with a position extrapolation algorithm, implemented in the drive control processor [8]–[12]. However, the estimation in [12] was dependent on the accuracy of position sensor and mechanical parameters. Hardware approaches involving a phase locked loop [13], [14] are feasible for a drive running at near-constant velocity, but may be unable to deal with transient velocity operation. For BLDC motors, the most popular speed estimation method may be based on back EMF. Operation rotor speeds determine the magnitude of the back EMF. At low speeds, the back EMF is not large enough to estimate the speed and position due to inverter and parameter nonlinearities. This paper presents a MRAC speed estimation algorithm by using the back EMF. The proposed algorithm can compensate the voltage occupied by the stator resistor adaptively at low speeds and is valid over the entire speed range. Moreover, the parameters of the algorithm can be commonly used for different BLDC motors.

II. DESCRIPTION OF ESTIMATION ALGORITHM

A. Model of BLDC Motors

The equivalent circuit of Y-connection BLDC motor is shown in Fig. 1 [15].

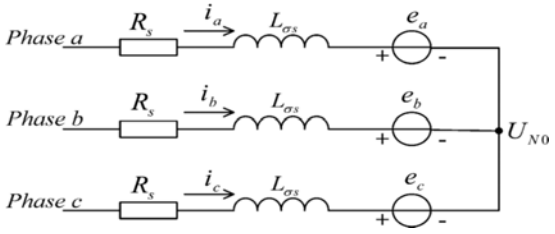


Fig.1.Equivalent circuit of a star connection BLDC motor.

A BLDC motor has three stator windings and permanent magnets on the rotor. Its voltage equation of three windings with phase variables is

$$\begin{bmatrix} v_{as} \\ v_{bs} \\ v_{cs} \end{bmatrix} = \begin{bmatrix} R_s & 0 & 0 \\ 0 & R_s & 0 \\ 0 & 0 & R_s \end{bmatrix} \begin{bmatrix} i_a \\ i_b \\ i_c \end{bmatrix} + \frac{d}{dt} \begin{bmatrix} L_{aa} & L_{ab} & L_{ac} \\ L_{ba} & L_{bb} & L_{bc} \\ L_{ca} & L_{cb} & L_{cc} \end{bmatrix} \begin{bmatrix} i_a \\ i_b \\ i_c \end{bmatrix} + \begin{bmatrix} e_a \\ e_b \\ e_c \end{bmatrix} \quad (1)$$

and the electromagnetic torque equation is

$$T_e = (e_a i_a + e_b i_b + e_c i_c) / \omega_m \quad (2)$$

Where u_a , u_b and u_c are the terminal phase voltages with respect to the power ground, *Rs* is the stator resistance of phase windings, *ia, ib* and *ic* are phase current, $L\sigma s = Ls - Lm$ is the equivalent inductance of phase windings,*Ls* and *Lm* are self inductance and mutual inductance, respectively, *ea, eb* and *ec* are trapezoidal back EMFs, U_{NO} is the neutral point to ground voltage, and ω_m is the speed of the rotor. As a BLDC motor, there are only two phases which have current at the same time. For this analysis,

the current from phase *a to* phase *b* is considered. There are following equations:

$$\begin{cases} i_a = -i_b \\ i_c = 0 \\ e_a = -e_b \\ T_e = \dfrac{2e_a i_a}{\omega_m} \end{cases} \quad (3)$$

and the line voltage between phase *a* and phase *b* is

$$u_{ab}=u_a-u_b=2R_s i_a+2L\sigma s\frac{di_a}{dt}+2e_a \quad (4)$$

Because the rotor of a BLDC motor is permanent magnet, the back EMFs are proportional to the electric speed of the rotor

$$e_a=-e_b=k_e\omega_r \quad (5)$$

where *ke* is back EMF coefficient and is a constant. According to (4) and (5), the speed of the rotor can be given as

$$\omega_m=(u_{ab}-2R_s i_a-2\sigma s\frac{di_a}{dt})/pk_e \quad (6)$$

and $\omega_r = p\omega_m/2$, where *p* is the number of poles of a motor

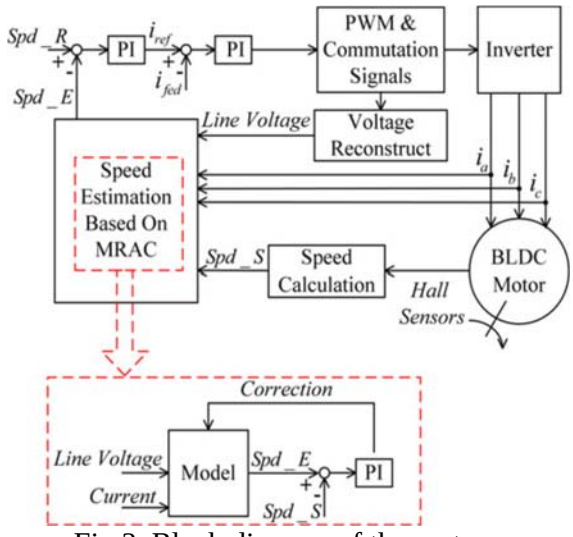


Fig.2. Block diagram of the system

In stable condition or when *ia* is changed very slowly *dia/dt* ≈ 0. Then, (6) can be rewritten as

$$\omega_m=(u_{ab}-2R_s i_a)/pk_e \quad (7)$$

B. Speed Estimation

The speed of the rotor can be calculated by voltage and current without Hall sensors with reference to (7). The line voltage u_{ab} can be estimated by pulse width modulation (PWM) signals. The phase current i_a can be sensed from hardware. R_s i_s a parameter of the motor and is proportional to the temperature. If the change of *Rs* is neglected, the estimated speed is very accurate especially at high speed but when a motor is working at low speed, the estimated speed is not accurate enough. It is mainly because the back EMF is too small comparing with R_s i_a. A small error of u_{ab} or *Rs ia* would lead to an inaccuracy of the estimated speed. *p* and k_e in (7) are constant for a known BLDC motor. But they are changed with different BLDC motors. Actually, *p* is usually on the plate of a motor and can be obtained easily. k_e, however, is seldom on the plate. Thus, there are two problems with the speed estimation based on the back EMF of BLDC motors. 1) The accuracy of the estimated speed is not enough at low speed and 2) *Rs* is not constant. It is varying by temperature. *p* and k_e are variables for different motors. Therefore, the algorithm based on (7) cannot be commonly used for different motors or in different conditions
for the same motor.

C. Basic Idea

Our objective is to solve these two problems mentioned above, a speed estimation algorithm based on MRAC was proposed. Fig. 2 shows the block diagram of the speed control system with the proposed speed estimation algorithm. It consists of a power circuit and control circuits which perform following functions: PWM strategy, current control, current commutation, speed estimation, and speed control.

The main blocks of the speed estimation is a MRAC-based regulator. The speed estimated by the back EMF and the speed calculated by Hall sensors are the inputs of the regulator. The output of the regulator is a correction variable for

the estimated speed. *Spd_E* is the estimated speed. *Spd_S* is the calculated speed by Hall sensors. If *Spd_E* is not equal to *Spd_S*, a correction is given by the PI regulator and then, *Spd_E* is calculated again based on the proposed model. The reference current *i*ref is changed by the speed regulator. Through the current regulator, the output voltage of the inverter is being tuned and *Spd_S* is changed. In this way, the PI regulator used in the estimation Algorithm is always working until *Spd_E* equals to *Spd_S.*

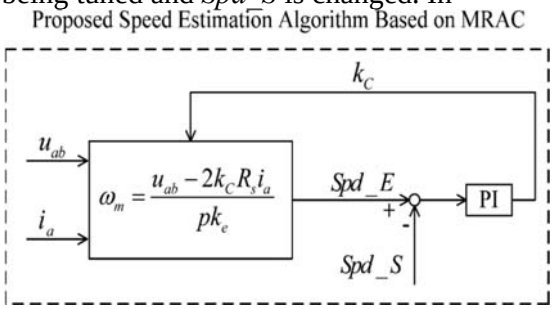


Fig3. Speed estimation algorithm considering the voltage compensation of stator resistor.

The basic block diagram brushless dc motor as shown Fig.4.The brush less dc motor consist of four main parts power converter, permanent magnet-synchronous machine (PMSM) sensors and control algorithm. The power converter transforms power from the source to the PMSM which in turn converts electrical energy to mechanical energy.

One of the salient features of the brush less dc motor is the rotor position sensors, based on the rotor position and command signals which may be a torque

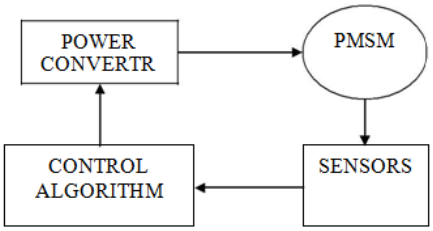


Fig.4 Basic Block Diagram of BLDC motor

command, voltage command, speed command and so on the control algorithms determine the gate signal to each semiconductor in the power electronic converter.

The structure of the control algorithms determines the type of the brush less dc motor of which there are two main classes voltage source based drives and current source based drives. Both voltage source and current source based drive used with permanent magnet synchronous machine with either sinusoidal or non-sinusoidal back emf waveforms .Machine with sinusoidal back emf may be controlled so as to achieve nearly constant torque. However, machine with a non sinusoidal back emf offer reduces inverter sizes and reduces losses for the same power level.

The model reference adaptive system (MRAS) is one of the major approaches for adaptive control. The model reference adaptive system (MRAS) is one of many promising techniques employed in adaptive control. Among various types of adaptive system configuration, MRAS is important since it leads to relatively easy- to-implement systems with high speed of adaptation for a wide range of applications.

One of the most noted advantages of this type of adaptive system is its high speed of adaptation. This is due to the fact that a measurement of the difference between the outputs of the reference model and adjustable model is obtained directly by the comparison of the states (or outputs) of the reference model with those

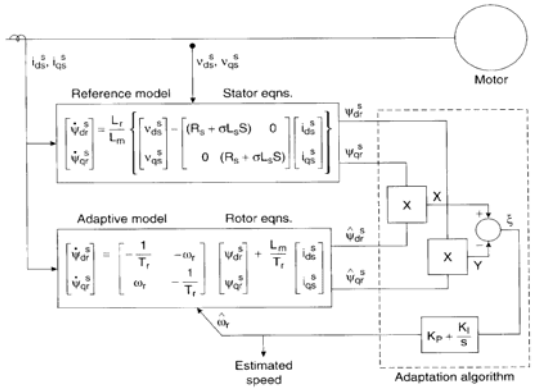


Fig 5 Basic Block Diagram of MRAS speed estimation

‘‘reference model’’ represents demanded of the adjustable system. The block dynamics of actual control loop. The block ‘‘adjustable model’’ has the same structure as the reference one, but with adjustable parameters instead of the unknown ones.

III.DESIGN OF ESTIMATION ALGORITHM BASED ON MRAC

For this analysis, the current from phase a to phase b is considered.

A. Speed Estimation Algorithm

The inaccuracy of the low speed estimation is mainly because of the divided voltage of the stator resistor. So an estimation algorithm considering the voltage compensation of the stator resistor is presented firstly. It is shown in Fig. 3. The estimated speed is calculated by using (7). In Fig. 3, where *Rs* is not accurate or changed with the temperature, *Spd_E* will not be equal to *Spd_S*. Because *kc* affects *Spd_E* and *Spd_E* is the input of the speed PI regulator, the speed PI regulator will change the output voltage to compensate divided voltage of the stator resistor adaptively. *kc* is always tuning until *Spd_E* equals to *Spd_S.* Therefore, the control system including this proposed speed estimation algorithm can keep the accuracy of the estimated speed at very low speed. The 2*kcRs ia* not only needs the value of *Rs* but also needs the value of current. Actually the output of the PI regulator proposed in Fig. 3 can completely compensate the divided voltage of the stator resistor. Therefore, a simple algorithm is proposed in Fig. 6 the *vc* is the output of the PI regulator and 2*kcRs ia* is replaced by *vc* .

B. Algorithm Approach Considering Different Motors

For different motors, the value of *p* and *ke* may be changed. *p* could be easily obtained from the plate of a motor. However,. *ke* is seldom shown on the plate. Therefore, the initial value of *ke* may be inaccuracy.

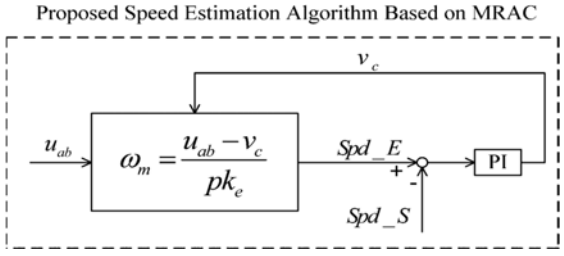


Fig.6. Approach to simplify algorithm.

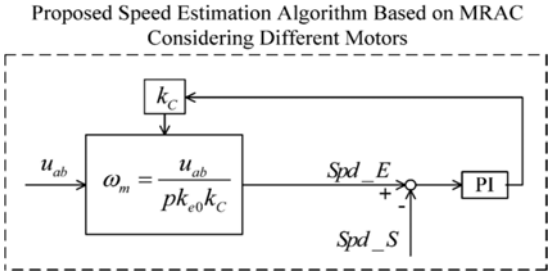


Fig 7. Estimation algorithm approach considering motors at high speed.

At high speed, the divided voltage of stator resistors can be neglected. The voltage on a motor is almost the back EMF. Then, referring to (7), an approach of the high speed estimated algorithm is proposed here.

$$\omega_m = u_{ab} / pk_e \qquad (8)$$

According to (8), *ke* produces great influence on the accuracy of the estimated result at high speeds. An approach of the high speed estimated algorithm was proposed based on Fig. 6. The block diagram is shown in Fig. 7. *ke*0 is the initial value of *ke* and *ke* = *ke*0*kC* . If *ke*0 is not accurate, the PI regulator will change the value of *kc* until *Spd_E* equals to *Spd_S*. In this way, the error of the estimated speed caused by the inaccuracy of *ke* is corrected by *kc* .

C. Speed Estimation Algorithm Considering Voltage Compensation and Different Motors

At low speed, the primary reason of the estimated inaccuracy is the effect of divided voltage on stator resistors. At high speed, the primary reason is the effect of inaccuracy of *ke* according to different motors. Therefore, a speed threshold is set. If *Spd_S* > *Spd_T_1*, the estimation algorithm shown in Fig. 7 is used and *kc* is the output of the regulator to correct the estimated speed. If *Spd_S* < *Spd_T_2*, the estimation algorithm shown in Fig. 6 is used and *vc* is the output of the regulator to compensate divided Voltage on stator resistors. Avoiding repeatedly jumping, there is a hysteresis value between *Spd_T_1* and *Spd_T_2*. The selection of *Spd_T_1* and *Spd_T_2* is based on the period of speed loop, the number of poles of BLDC, and the number of Hall-effect sensors. Following

rules can be used: 1) the longer the period of speed loop, the smaller the value of *Spd_T_1*. 2) The more the number of the poles of BLDC motor, the smaller the value of *Spd_T_1*. 3) The more the number of Hall-effect sensors, the smaller the value of *Spd_T_1*. 4) The hysteresis value between *Spd_T_1* and *Spd_T_2* can be selected by experimental results.

The flowchart of estimation algorithm is as shown below

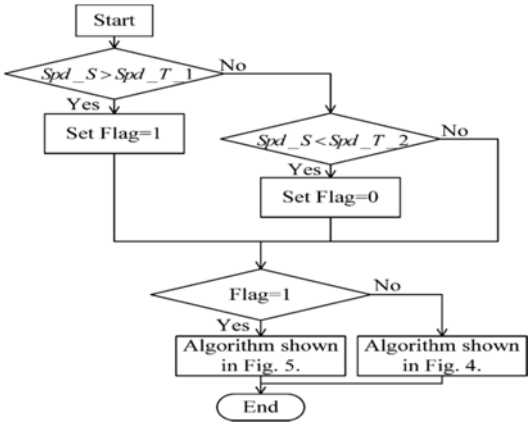


Fig.8.Flow chart of estimation algorithm.

IV. SIMULATION RESULTS

Firstly, outputs of BLDC motor i.e. voltage and current are converted into d-q axis with respective stator are given to Reference and Adaptive model of MRAC. Now these outputs i.e. voltage and current are inputs of MRAC in d-q axis. Finally the output of MRAC is given to PI Controller. By this way BLDC motor speed can be controlled.

The simulation results of MRAC based speed control of Brushless DC Motor with low resolution Hall Effect sensors is as shown below

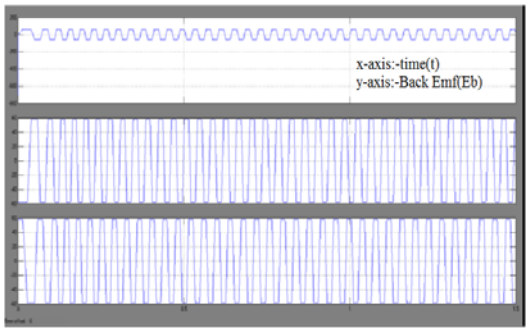


Fig.9.Back emf's of BLDC Motor with MRAC

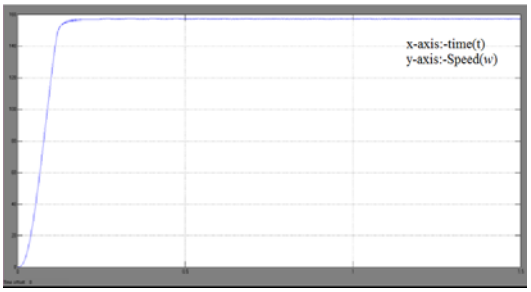


Fig.10.Speed Characteristics of BLDC Motor with MRAC

V.CONCLUSION

In this paper, a novel speed estimation algorithm based on MRAC is introduced. The proposed algorithm includes two regulators. One regulator corrects back EMF coefficient at high speed. The other regulator compensates the divided voltage of stator resistors at low speed. In this way, the estimation algorithm can work validly at both high speed and very low speed. The drive system with the proposed algorithm widens the speed range of BLDC motors. Moreover, it is not needed to tune parameters according to motors with different back EMF coefficient when using the estimation algorithm.

Extensive simulation have been performed and the results verify that the estimation algorithm proposed in this paper is effective.

REFERENCES

[1] N. J. Kim, H. S. Moon, and D. S. Hyun, "Inertia identification for the speed control of induction machines," *IEEE Trans. Ind. Appl.*, vol. 32, no. 6, pp. 1371–1379, 1996.

[2] K. B. Lee, J. Y. Yoo, J. H. Song, and I. Choy, "Improvement of low speed operation of electric machine with an inertia identification using ROELO," *IEE Proc.-Elect. Power Appl.*, vol. 151, no. 1, pp. 116–120, 2004.

[3] H.-W. Kim and S.-K. Sul, "A new motor speed estimator using Kalman filter in low-speed range," *IEEE Trans. Ind. Electron.*, vol. 43, no. 4, pp. 498–504, Aug. 1996.

[4] A. Yoo, S. K. Sul, D. C. Lee, and C. S. Jun, "Novel speed and rotor position estimation strategy using a dual observer for low resolution position sensors," *IEEE Trans. Power Electron.*, vol. 24, no. 12, pp. 2897–2906, Dec. 2009.
[5] R. Petrella, M. Tursini, L. Peretti, and M. Zigliotto, "Speed measurement algorithms for low resolution incremental encoder equipped drives: A comparative analysis," in *Proc. Int. Aegean Conf. Electrical Machines Power Electron,* Sep. 2007, pp. 780–787.
[6] Y. X. Su, C. H. Zheng, S. Dong, and B. Y. Duan, "A simple nonlinear velocity estimator for high-performance motion control," *IEEE Trans. Ind. Electron.*, vol. 52, no. 4, pp. 1161–1169, Aug. 2005.
[7] Y. X. Su, C. H. Zheng, P. C. Mueller, and B. Y. Duan, "A simple improved velocity estimation for low-speed regions based on position measurements only," *IEEE Trans. Control Syst. Technol.*, vol. 14, no. 5, pp. 937–942, Sep. 2006.
[8] J. Bu and L. Xu, "Near-zero speed performance enhancement of PM synchronous machines assisted by low-cost Hall effect sensors," in *Proc. 13th Ann. IEEE Appl. Power Electron. Conf. Exp.*, 1998, vol. 1, pp. 64–68.
[9] K. Hyunbae, Y. Sungmo, K. Namsu, and R. D. Lorenz, "Using low resolution position sensors in bump less position/speed estimation methods for low cost PMSM drives," in *Proc. IEEE 40th IAS Ann. Meeting Conf. Rec.*, 2005, vol. 4, pp. 2518–2525.
[10] S.Morimoto, M.Sanada, and T. Takeda, "Sinusoidal current drive system of permanent magnet synchronous motor with low resolution position sensor," in *Proc. IEEE 31st IAS Ann. Meeting Conf. Rec.*, 1996, vol. 1, pp. 9–14.
[11] R. D. Lorenz and K. W. Van Patten, "High-resolution velocity estimation for all-digital, AC servo drives," *IEEE Trans. Ind. Appl.*, vol. 27, no. 4, pp. 701–705, Jul./Aug. 1991.
[12]Z.Feng and P.P.Acarnley, "Extrapolation technique for improving the effective resolution of position encoders in permanent-magnet motor drives," *IEEE/ASME Trans. Mechatronics*, vol. 13, pp. 410–415, Aug. 2008.
[13] T.Emura and L.Wang, "A high resolution interpolator for incremental encoders based on the quadrature PLL method," *IEEE Trans. Ind. Electron,* vol. 47, pp. 84–90, Feb. 2000.
[14] C. Nasr, R. Brimaud, and C. Glaize, "Amelioration of the resolution of a shaft position sensor," in *Proc. Power Electron. Appl. Conf.*, Antwerp, Belgium, 1985, vol. 1, pp. 2.237–2.241.
[15] A. E. Fitzgerald, Charles KingsleyJr., and Stephen D. Umans, *Electric Machinery 6th edn*.Beijing:Tsinghua Univ. Press, 2003.

CONSERVATION OF NATURAL RESOURCES THROUGH LEVEL MONITORING OF WATER TANK

[1]Subham Bubna, [2]Rajat Nigam
B.tech, ECE Dept., Sikkim Manipal Institute of technology
Email:[1]subham.bubna@gmail.com, [2]rajatnigam1811@gmail.com

***Abstract*— An achievement in computer technology is used not only in business and industry but has also covered almost all fields, including control system where a computer system can be used to control the hardware in a flexible way. Therefore, computer based control system is become more common in recent development of control system. Computer-based control system also can be implemented for controlling flow of water in house or in buildings hence reducing the wastage of water (Conservation of Natural Resources) and avoiding dry-run of motor (Energy Conservation).**

Objective of this project is to monitor overhead tank and ground level tank. The aim of this research is to develop prototype of water level detection that can be viewed as a part of control system of river flow management system.

Keywords*— *Control system, Micro-controller, Ultrasonic, Sensor, Conservation

I. Introduction

The aim of this project is to develop prototype of water level detection that can be viewed as a part of control system of river flow management system. The system consist of two parts, transmitter and receiver modules. Transmitter module detect water level automatically, then transmit the data to controller. Ultrasonic sensor is used to detect the distance between sensor and the water surface. Ultrasonic sensors utilize the principle of sound reflection to measure the level of the water. Elapsed time required to transmit and receive the reflected ultrasonic wave is multiplied by the rapid propagation of sound in water in order to obtain the distance value. The calculation is performed by C language program that reside in microcontroller. The distance value then is transmitted. The water level then is displayed. Water level information is also displayed in LCD.

Two sensors are used to monitor a ground level water tank and a over head water tank. A water pump is connected in the ground level tank. When the water level in over head tank is below a certain level and there is sufficient amount of water in the ground level tank then water from ground level tank is transferred to over head tank. This will avoid the dry run of motor and will avoid the coil from burning (Energy Conservation).

Fig. 1 shows the water level controller. Microcontroller will monitor the values of both the sensors i.e. sensor 1 and sensor 2. Depending on the conditions the water flow will be controlled.

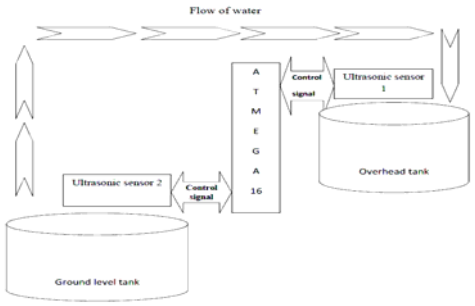


Figure 1. Block Diagram of Water Level Controller.

II. Circuit Theory

A. *ATMEGA 16*

Microcontroller literally means that micro-sized controller. The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers. The ATmega16 provides the following features: 16K bytes of In-System Programmable Flash Program memory with Read-While-Write capabilities, 512 bytes EEPROM, 1K byte SRAM, 32 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for Boundary scan, On-chip Debugging support and programming, three flexible Timer/Counters with compare modes, Internal and External Interrupts, a serial programmable USART, a byte oriented Two-wire Serial Interface, an 8-channel, 10-bit ADC with optional differential input stage with programmable gain (TQFP package only), a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the USART, Two-wire interface, A/D Converter, SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next External Interrupt or Hardware Reset. In Power-save mode, the Asynchronous Timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except Asynchronous Timer and ADC, to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator Oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low-power consumption. In Extended Standby mode, both the main Oscillator and the Asynchronous Timer continue to run.

B. *HC SR 04*

Ultrasonic Sensor (HC SR-04) module is low cost, high performance sensor and provides stable and high ranging accuracy. It's ranging distance is 2cm to 350cm with 3mm accuracy. The module includes ultrasonic transmitter, receiver and control circuit.

Sensor works on trigger (TTL-10usec) pulse provided by any device. When trigger pulse sends to the trigger pin of sensor. Then sensor module will send the 8 cycle of 40KHz ultrasonic pulses and receives echo signal after striking on object & reflect back which is detailed in a below shown Timing Diagram. The distance between the sensor and the object is calculated by measuring high level time of the Echo pulse which can be retrieved from ECHO pin of the sensor module. Fig. 2 shows the timing diagram of HC SR04.

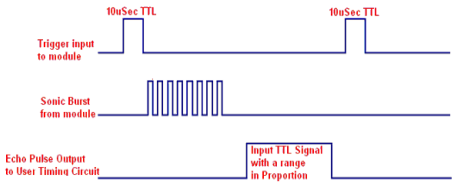


Figure 2. Timing Diagram of HC SR04.

C. *16*2 LCD Display*

Alphanumeric displays are used in a wide range of applications, including palmtop computers, word processors, photocopiers, point of sale terminals, medical instruments, cellular phones, etc. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Fig. 3 shows the pin configuration of LCD that needs to be connected to ATMEGA 16.

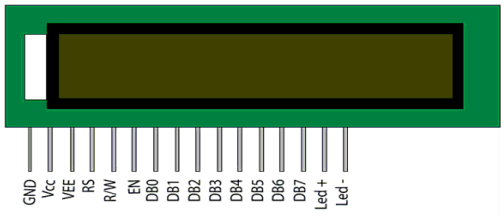


Figure 3. Pin Configuration of LCD

D. *L293D*

The L293D are quadruple high-current half-H drivers. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. It is designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

Fig. 4 shows the pin configuration of L293D Motor driver IC.

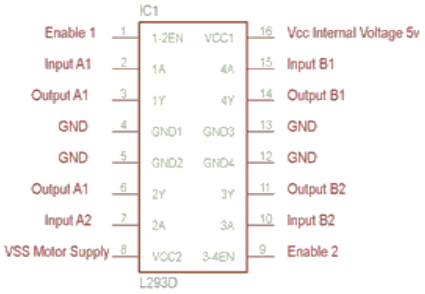


Figure 4. Pin Diagram of L293D.

E. *Relay*

A relay is an electrical switch that opens and closes under the control of another electrical circuit. The output of flip flop is connected to a relay. The '*NO*' contact of the relay is connected with the power supply to water pump. When this relay will be on, then the water pump will start and when it is off then the power supply to water pump will be cut off and hence it stops.

It is used to isolate two devices electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage.

For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit. Thus a small sensor circuit can drive, say, a fan or an electric bulb.

A relay switch can be divided into two parts: input and output.

The input section has a coil which generates magnetic field when a small voltage from an electronic circuit is applied to it. This voltage is called the operating voltage. Commonly used relays are available in different configuration of operating voltages like 6V, 9V, 12V, 24V etc.

The output section consists of contactors which connect or disconnect mechanically. In a basic relay there are three contactors: normally open (NO), normally closed (NC) and common (COM). At no input state, the COM is connected to NC. When the operating voltage is applied the relay coil gets energized and the COM changes contact to NO.

Fig. 5 shows the basic structure of relay.

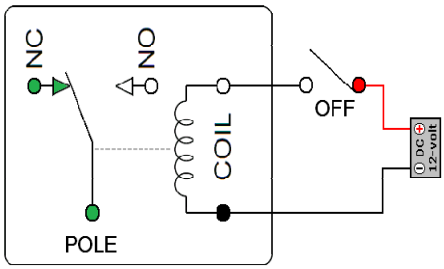


Figure 5. Relay Pin Diagram

F. *Light Emitting Diode*

A light emitting diode (LED) is a two-lead semiconductor light source.

When a suitable voltage is applied to the leads, electrons recombine with electron holes within the device, releasing electrons in the form of photons.

This effect is called electroluminescence and the colour of the light is determined by the energy band gap of the semiconductor.

An LED is usually very small in area & integrated optical components may be used to shape its radiation pattern.

Recent developments in LED permit them to be used in environmental and task lighting.

III. Hardware Implementation

A. *Connection of Atmega 16 and 16*2 LCD*

Fig. 6 shows the basic connections of the microcontroller i.e. VCC, GND, crystal oscillator.

LCD data pin is connected to port C of microcontroller.

Further it is followed by the interfacing of a 16*2 LCD Display. This LCD will display the reading of water in the tanks.

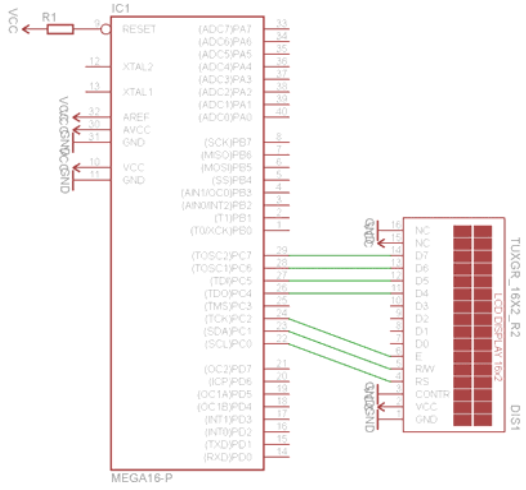


Figure 6. LCD Connection

B. *Connection of ultrasonic sensors with Atmega 16*

Connections of both the ultrasonic sensors along with the microcontroller are shown in the Fig. 7.

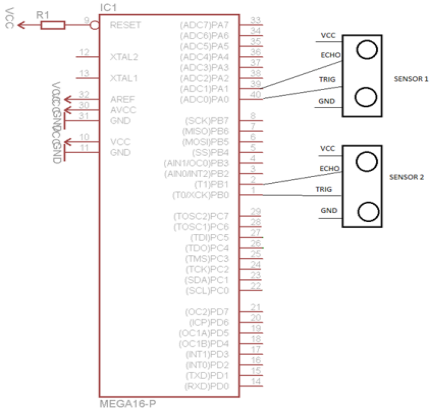


Figure 7. Interfacing of Ultrasonic Sensor With Atmega 16

C. *Connection of Motor Driver IC with Atmega 16*

Fig. 8 shows the connection of Motor Driver IC with Atmega 16. Output of microcontroller from pin 20 and 21 is connected to the motor driver IC. The output of motor driver IC from pin 3 and 6 is connected to the relay. This will give the input to the relay and will be followed by driving the water pump.

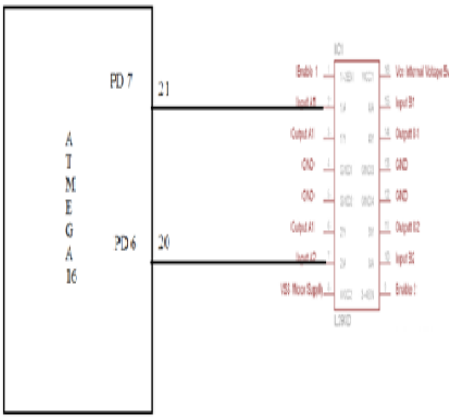


Figure 8. Connection of motor driver IC with Atmega 16

D. *Overall Connection*

Fig. 9-Both the sensors will sense the depth of water from both the tanks. If the water level in over head tank is less than a certain level and the water level in the ground level tank is greater than a certain level, then the controller will turn on the motor. The output of controller is fed to the motor driver IC. Output of motor driver IC is given to the relay. On the other side, relay is connected to 240V water pump. When the output of driver IC is high, the pump is turned ON and the water is transferred to the overhead tank, as the output of driver IC goes low, the pump is turned OFF.

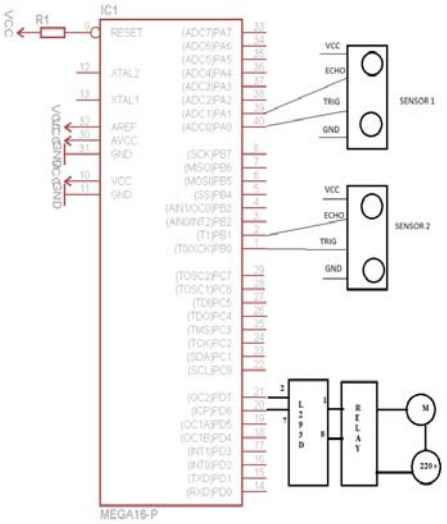


Figure 9. Connections of Sensors, LCD, L293D and Relay

E. *Flowchart*

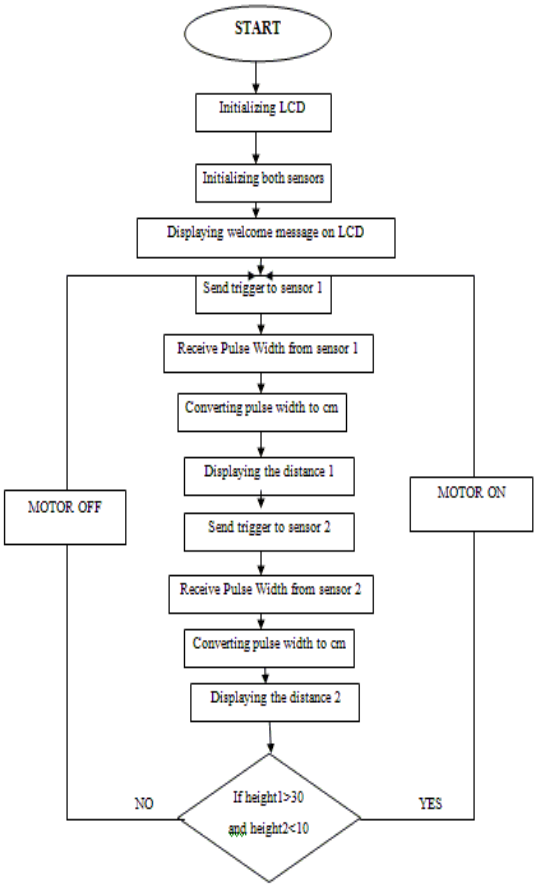


Figure 10. Flowchart of Water level controller

F. *Working*

- Initialize the LCD display so as to display the readings of the sensors.
- Initialize the sensors so as to transmit and receive a pulse and hence calculate the distance between the sensor and obstacle.
- Print a display message so as to verify the working of the LCD display.
- Send a trigger pulse from the transmitter of sensor 1.
- Receiver of the sensor 1 will receive the reflected pulse.
- Received pulse width needs to be converted into “cm”.
- Display the calculated distance 1.
- Send a trigger pulse from the transmitter of sensor 2.
- Receiver of the sensor 2 will receive the reflected pulse.
- Received pulse width needs to be converted into “cm”.
- Display the calculated distance 2.
- If the water in over head tank is more than 30 cm then the pump needs to bo stopped.
- If the water in ground level tank is less than 10 cm then stop the pump.
- If the water in ground level tank is greater than 10 cm then start the flow of water.

G. *Result*

Basically, prototype of Water Level Detection System consist of two modules, receiver and transmitter module. Transmitter module responsible to transmit and display data received from the ping sensor. Receiver module accepts the data transmitted from transmitter module and transfer it to the computer for further process.

Ultrasonic sensor is a proximity sensor that can be used to measure the distance of objects as far as 3 cm to 300 cm when the sensor is obstructed by an object. The position of the object must be measured perpendicular to the line of sight sensor. Otherwise there will be an imperfect reflection of ultrasonic waves and cause measurement errors. In addition, water surface must also be calm in order to detect the level of water correctly or at least with the minimum measurement error. Measurements were obtain by sending ultrasonic waves with a frequency of 40 KHz and speed of 344 m/s then ping will receive reflected wave, then generate the logic pulse. Basically, ping sensor consists of a 40 KHz signal generator chip, an ultrasonic speaker and an ultrasonic microphone. Ultrasonic speaker converts the signals into 40 KHz ultrasonic sounds while the microphone is used to detect the reflected sound. Ultrasonic sensor detects objects by sending ultrasonic sound and then "listens" to the echoes. Ping will only transmit ultrasonic sound when there is a trigger pulse from the microcontroller (high pulse for 3 µs). Ultrasonic sound with a frequency of 40 KHz is emitted in 200µs time. This sound will propagate in the air at speeds of 344,424 m/s (or 1 cm per 29.034µs), detect the object and then reflected back to the ping sensor. While waiting for the reflection, the ping sensor will generate a pulse. These pulses will stop (low) when the reflected sound is

detected by the ping sensor. Therefore, the distance between ping sensor and object is represented by pulse width. The microcontroller then simply measures the width of these pulses, converts them into a distance.

Then the data is processed by the Atmega 16 microcontroller. ATMega16 is the brain of module that controls the work of the sensor and calculates the distance based on the pulse width. Water level detected from ping sensor is also displayed on 2X16 LCD display. There are two types of interfaces that can be used in controlling the LCD which is 4 bits and 8 bits. In a 4-bit interface, the LCD only requires four data pins, DB4 (pin 11) - DB7 (pin14), which is connected with the controller. Number of pins required for controlling the LCD can be adjusted by setting it in initialization process. Basically the transmitted data is 8 bits, if 4-bits control is used, the process of sending data is done twice through 4 pin, DB4-DB7. 10 KΩ trimpot is used as a regulator to adjust the brightness of the LCD.

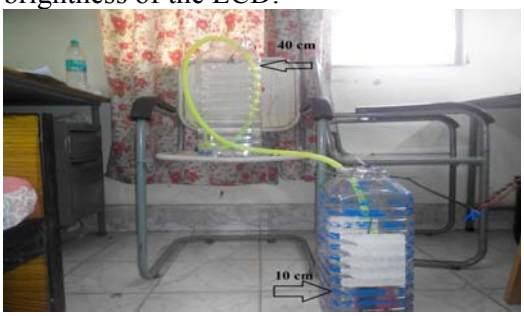


Figure 11. Water in ground level tank is greater than 10 cm

Fig. 11-When the water in the ground level tank is more than 10 cm and in the overhead tank is less than 40 cm, the water pump starts to deliver the water to the over head tank. As the water in over head tank reach 40 cm height, the pump will be automatically turned OFF.

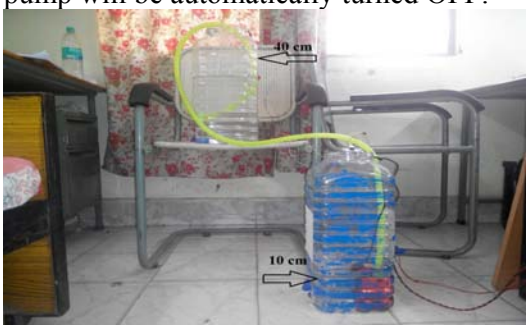


Figure 12. Water in ground level tank is equal 10 cm

Fig. 12-As the water in the ground level tank reach the height of 10 cm, so the motor is automatically turned OFF. This helps us in avoiding the dry run of motor.

If the height of ground level tank is greater than 10 cm but the height of water in over head tank is equal to 40 cm then also the motor will be turned OFF. This will be helpful in avoiding the over flow of water from over head tank. Thus helping us in the conservation of natural resources.

IV. Future work

The future work of this model lies in the overcoming the limitations and adding important features to maximize the safety purpose. It will be a great challenge to make the circuit water proof so that no hindrance could be caused by the weather. Secondly, other type of distance measurement sensor could be used. Such as laser type distance measurement sensor. Moreover, a DC motor controlled servo mechanism could be implemented to run the system automatically making the system more versatile and offering it new dimensions. However, to achieve higher precision in depth measurement the latest technology like DSP can be applied. This type of solution will filter the received wave form more accurately and remove the parasite reflection from the surrounding body. Furthermore, the distance measuring circuit can be modified also. The 15-20 KHz signal cannot travel for a longer distance. For a fair distance 40 KHz signal would be a better solution. Last but not the least, the quality of the ultrasonic transducer was not high enough for such precession application. The ultrasonic wave might have scattered around causing error in tending the actual surface of reflection. This added more error in calculation.

V. Application

There are several areas where this model can fit and contribute. Water level measurement equipment is becoming increasingly important for the implementation of water conservation programs in irrigation districts, water transporting systems, sea levels detection, earthquake alarms etc. This setup is very useful in the following sectors.

- Measurement of water levels upstream or downstream of canal check structure.
- Measurement of water levels at key remote monitoring points such as regulating reservoirs and tail end canal pools of a Hydro-electric power plant.
- Measurement of water levels on "critical flow" measurement devices in irrigation district canals, such as flumes or weirs.
- Measurement of water levels for water transporting system such as ships, boats. Failure or inaccuracies of the sensing equipment in this application can have catastrophic results such as collision between ships.
- Measurement of water levels on rising sea levels. Flooding caused by more frequently occurring storm surges is an indication of rising sea levels.
- Measurement of water levels as an indicator of Climate and Global Change.
- Measurement of water levels as an earthquake alarm.

VI. Conclusion

Prototype of Water Level Detection and controlling System has been tested. The main contribution of this performance is the ultrasonic sensor calibration by adjusting calculation of distance based on an actual data. Testing need to be carried out for the real fluctuated water surface condition to get the system performance in the real condition. The water level data is successfully displayed locally, therefore this prototype can be used as a part of the bigger system, such as, river flow management system which controls the stream to minimize the flood.

Since computer is used as a part of receiver module, therefore more sophisticated system can be developed to display and analysis time series water level data, instead of only displaying the current water level data. The construction and operation of the circuit is simple. It is also economical for the simplicity it offers. When measuring water level in sealed tanks in a wide temperature interval the propagation of ultrasonic signals needs to be improved. It is also required to increase the range of ultrasonic signals to measure the deep depth of different water sources. If all the future works can manipulate to the device then it will be an excellent in case measuring the depth of water and object detection.

Acknowledgment

I am extremely grateful to my project guides, **Mr. O. P.Singh (**Associate Professor, E & C Dept, SMIT**)** and **Mr. Dipanjan Bhattacharjee** (Assistant Professor, E & C Dept., SMIT) for insightful suggestions on the project work and for guiding me during the entire project with their encouragement, support and cooperation. I am also grateful to **Prof. (Dr.) R. N. Bera** (HOD, E & C Dept., SMIT), for allowing me to proceed with the project and providing me with the opportunity to embark on the subject, which has given me invaluable knowledge and experience. I would also like to extend my heart-felt thanks to my family and friends for their moral support, love and affection.

References

[1] S. D. Gupta, I. Md. Shahinur, A. A. Haque, A. Ruhul, and S. Majumder, "Design and implementation of water depth measurement and object detection model using ultrasonic signal system," *International Journal of Engineering Research and Development* , vol 4, Issue 3, October 2012.

[2] S. Jatmiko, A. B. Mutiara, and M. Indriati, "Prototype of water level detection system with wireless," *Journal of Theoretical and Applied Information Technology*, vol. 37 No.1. March 2012.

[3] [Online], "Atmega 16," in http://en.wikipedia.org/wiki/Atmel_AVR.

[4] [Online], "HC SR04," in https://www.tindie.com/products/upgradeindustries/hc-sr05-precision-ultrasonic-sensor/

[5] [Online], "L293D," in http://www.ti.com/lit/ds/symlink/l293d.pdf

IMPROVING ANNOTATION PROCESS AND INCREASE THE PERFORMANCE OF TAG DATA

[1]A.HARIKRISHNA,[2]Mr.K.BHASKAR NAIK,
[1]M.Tech, [2]ASSISTANT PROFESSOR,
Department of computer science,
SREEVIDYANIKETHAN ENGINEERING COLLEGE
Email id: [1]harisai511@gmail.com, [2]bhaskar.cse501@gmail.com

***ABSTRACT*- In nowadays so many organizations generate and share textual description of their products, services, action etc. It contains for most amount of structured information and which remains worried about unstructured information. If information extraction structural relation by using algorithm facilitating they are often more cost and inaccurate. When working top of a text it does not contains structural information. An alternative approach to the generation of the structured metadata by identifying document that are likely to contain information of interest .This data is going to be valuable for questioning the information base. Approach relies on the idea that humans are more likely to add the necessary metadata during creation time. Based on CADS (Collaborative Adaptive Data Sharing Platform) technique used to improving the visibility of the document with respect to the query workload by up to 50% only. So that Probing algorithm with Bayesian Approach technique was included, this is used to improve the effiencent of visibility of the document with respect to the querying workload more than 50 percent.**

***Keywords- annotation* of document, CADS, unstructured data, probing, metadata.**

I. INTRODUCTION

There are many application domains where users create and shared data for news websites, social Networking of groups and also disaster management networks. Current data sharing devices, Like content management software (e.g., Microsoft Share- Point), allow users to impart document and annotate (tag) them in an adhoc way. Similarly used Google based allows users to define attributes for their objects. This annotation methodology can provide subsequent information discovery. More annotation system allows only“untyped” keyword annotation. For this instance a user may annotate a weather report using a tag such as “storm category 3”.

Annotation strategies that use attribute value pairs are generally more expressive, they can contain more data than “untyped “approaches. Many systems though do not have the basic “attribute value” annotation that would make a pay - as –you- go querying feasible. Annotation use” attributes value” pairs require users to be more principled in their annotation efforts. So that user idea in using and applying the annotations process. Regardless of the

possibility that the framework permits users to explain the information with such property estimation sets, the users are frequently unwilling to perform the task. Such difficulties results in very basic annotations that is often limited to simple keywords. Such simple annotations make the analysis and querying of data cumbersome. Users are often limited to plain keyword searches and access to very basic annotation fields, such as "creation time" and "size of document". That annotations process using CADS (collaborative adaptive data sharing platform), which is use the " annotate-as-you-create" infrastructure that provides fielded data annotation .a key Contribution of our system is the direct use of the query workload to direct the annotation process in addition to examining the content of the document. Alternative technique probing algorithm with Bayesian approach, which identifies the attribute based on querying workload and text frequency, content of the previous text annotation such as content value. This method has been implemented in data sets that provide data annotation and prioritizes the values and analysis. That the show a better performance while comparing with other methods because probability theory provides a principled foundation for such reasoning under uncertainty.

II. RELATED WORK

A. **information extraction:**

A lot of organized data is covered in unstructured content. Data extractions frameworks concentrates organized relations from the archives and empower SQL-like in queries over unstructured content .Information extraction frameworks are imperfect and their output has defective precision and recall (i.e., contains spurious tuples and misses efficient tuples). An extraction framework has a set of parameters that can be utilized as handles to tune the framework to be either precision or recall arranged. Furthermore, the decision of document transformed by the extraction framework can influence the nature of the concentrated relationship. So for, assessing the output nature of a data extraction task has been a fanciful technique, built mostly with respect to different things. In this paper, how to utilize Receiver Operating Characteristic (ROC) curves to estimate the extraction quality in a measurably powerful manner and demonstrates to utilize ROC analysis' to choose the extraction parameters in a principled way. Besides, systematic models that reveal how different document recovery systems influence the nature of the concentrated relation.[3].

Information Extraction is identified with this effort mainly in the setting of recommendations of attributes. Data extraction procedures have indicated great comes about on Web inputs, there are three types of data extraction on the web. The Text Runner framework manages the crude characteristic dialect message, the Web Tables framework concentrates on HTML- tables, and the profound web surfacing system concentrates on backend databases. Content Runner expends content from a Web scrawl and emits n-ary tuples. It work up to expectations by first linguistically parsing every regular dialect sentence in a creep, then utilizing the results to get a few hopefuls tuple extractions. Recovering social databases from the raw HTML tables comprises of two steps. To start with, Web Tables attempts to channel out all the non-social tables. Second, for all the tables that we accept to be social, Web Tables attempts to recover metadata for each. This methodology is, basically an information joining arrangement that is to make vertical web indexes for particular areas. In this methodology we could make a middle person structure for the area close by and semantic mappings between individual information sources and the arbiter form.[4].

B. **collaborative annotation:**

There are many systems that use collaborative annotation of object focused around users made labels to explain new questions. Labels are users made marks for substances. Past examination on

label suggestion framework concentrates on enhancing its precision or on guiding the procedure, however overlooking the proficiency issues. In this paper they proposed a highly automated framework for real time tag recommendation. The tagged preparing document are created as triplets of (words, docs, labels), and are represented to in two bipartite diagrams, which are separated into groups by Spectral Recursive Embedding (SRE). Tag in every topical cluster is ranked by the novel ranking algorithm. A two-way Poisson Mixture Model (PMM) is proposed to model the document distribution into the mixture components inside each one bunch and total words into word groups all the while. Another document is separated by the mixture display that is focused around its probabilities so the tag is recommended as indicated by their ranks.[6].

Tag recommendation is centered around recommendation valuable tag to a user who is annotation a Web asset. A similar examination issue is the recommendation of extra tag to somewhat annotated asset, which may be depended on upon either customized or aggregate information. This paper introduces a customized tag suggestion framework that finds and executes summed up association rules, i.e., tag relationships holding at different levels of reflection, to recognize extra applicable tag to recommend. The utilization of summed up guidelines comparably enhances the viability of conventional rules based frameworks in adapting to meager tag accumulations, on the grounds that connections covered up at the level of individual tags may be in any case made sense of at larger amounts of abstraction. A low level tag affiliation that is found from aggregate information may be exploited to specialize state association which is found in the user particular connection. [1] .in recent years labeling the procedure of including key words (tags) to object has ended up exceptionally mainstream intends to comment different web assets, for example, site page bookmarks , academic publications, and multimedia objects . The tag- gives significant meaningful description of the items, and allows the user to organized and content there substance. Taking into account this investigation, they present and check label proposal methods to backing the client in the photograph annotation task by recommending a set of tags that can be added to the picture. The aftereffects of the exact assessment demonstrates that we can adequately propose relevant tags for a mixture of pictures with different levels of thoroughness of unique tagging.[7].

C. **form based query:**

Structures based question interfaces are broadly used to get to databases. The design of a structures based interface is often an essential important at present sending of a database. Each structure in such an interface is fit for communicating just an extremely restricted scope of queries. Jayapandian expands the capacity of a structures based interface to help queries that a users may ask, while considering both the number from structures and the complexity of any one structure. Given a database diagram and content they introduced a programmed method to create a good set of structures that fulfill the above expected information. A careful analysis of genuine or expected query workloads is helpful in design the interface, these question sets are now and again inaccessible or hard to get preceding the database actually being deployed.[8]. A typical feedback of database frameworks is that it is difficult to give or compose query for users who are uncomfortable with a formal query language. To solve this issue, structure based interfaces and catchphrase query have been proposed, while both have preferences, they likewise have constraints. The procedure is to take input as a focused on database and after that create and document a set of query structures disconnected from the net. At query time, a user with a question that is to be addressed issues standard keyword search queries, however as instead to returning tuples, the system returns structures

that are like the query. The user might then form an organized query taking after any of these structures and submit it again to the system for confirming. [5]. In this the system naturally chooses which address in the study are the most important for setting the query .once the attribute are identified in the document we can then utilize the usher to model the conditions crosswise over properties and minimizes the quantity of queries to be asked.[2]

D. **Data space system:**

Michael Franklin proposes information spaces and their supportive systems as another scope for information management. The creator proposes the design and advancement of Data Space Support Platforms (Dssps) as a key thing for the information management field. DSSP offers a pack of interrelated management and ensures that helps designers to concentrate on the focused on difficulties of their applications, as instead to repeating difficulties included in managing reliably and productively with huge amounts of interrelated. Combined information. Dssps are skilled to free application designers from needing to constantly re implement essential information management usefulness when managing unpredictable, different and, interrelated information sources, which is like that of traditional DBMSs.. Dissimilar to a DBMS, a DSSP does not have a complete control over the information in the information space. Rather, a DSSP allow the information to be managed by the member system, however gives another set of management over the total of the system.[11]. An essential test to large scale information coordination is creating similar equivalences between components from different information sources that are identified with the same real element or idea. Data spaces utilizes a pay as you go methodology which are mechanized instruments, for example, pattern matching and reference compromise give starting correspondences, termed competitor matches, and after that user criticism is utilized to affirm these matches. The route to this methodology is to focus in what request to rank client input for affirming competitor matches. in this we utilize the estimation of perfect data for matching in this we make an information space D as a mix of triples of the structure objects, attributes, value.[9].

III. PROBLEM DEFINITION

In the existing period many annotation system permits users to share and annotate the document in an adhoc way. Likewise much annotation system allows just “untyped” key word annotation. Annotation that utilization attributes requires users to be more principled in their annotation efforts. They should to know the pattern and field type to utilize additionally they should to know when to utilize such type of fields. Such type of challenges brings about an extremely fundamental annotation that often users simple keywords. Such annotation makes analysis and questioning of database very cumbersome.

Additionally one issue in annotation focused around attributes is that many systems have a large number of attributes names for single attributes for instance city and area they may refer to the same value in different database. Such kind of constraints makes analysis and searching of database poor.

IV. OBJECTIVES

As the amount and many-sided quality of organized information increments in a variety of application, there is a need to give a brought together get to these heterogeneous information source for instance if 1% of the archive contains significant data then it is going to be unnecessarily expensive to ask anyone to assess all the document to identify such data . It respects target and process just promising document with high probability of containing significant information. The lot of research around there is carried out but there are number of issues in existing frameworks. So the goals to be recovered in future may be, to annotation the document focused around the attributes qualities for those search that are

available in the document. This will help in quick and exact seeking of report So there is an idea of document annotation which highlights the important content of the archive. We explore this idea by annotating the document based on attributes value, around property estimation that is available in the document. With help of this we will have the capacity to comment the document focused around the attribute value that is present in the document . It will likewise help for quick and exact seeking of the important document.

V. CONCLUSION

In nowadays so many organizations generate and share textual description of their products, services, action etc. It contains for most amount of structured information and which remains worried about unstructured information. If information extraction structural relation by using algorithms they are often more cost and inaccurate. When working top of a text it does not contains structural information. An alternative approach to the generation of the structured metadata by identifying document that is likely to contain information of interest. This data is going to be valuable for questioning the information base. Approach relies on the idea that humans are more likely to add the necessary metadata during creation time. In this firstly those attribute value will be choose that have continuous occurrence .Thus utilizing the attribute value can improve the annotation process and increase the utility of document , by making it more simpler for fast and accurate searching of the document.

VI. ACKNOWLEDGMENT:

I take this opportunity to thank you Mr. **K. Bhaskar Naik** Assistant Professor in Sree Vidhyanikethan Engineering College, Tirupati. for their valuable guidance and for providing all the necessary support to accomplish this research work.

REFERENCES

[1] D. Yin, Z. Xue, L. Hong, and B. D. Davison, "***A probabilistic model for personalized tag prediction,"*** in ACM SIGKDD, 2010.

[2] K. Chen, H. Chen, N. Conway, J. M. Hellerstein, and T. S. Parikh,"***Usher: Improving data quality with dynamic forms***," in ICDE, 2010.

[3] Jain and P. G. Ipeirotis, ***"A quality-aware optimizer for information extraction,"*** ACM Transactions on Database Systems, 2009.

[4] M. J. Camarilla, J. Madhavan, and A. Halevy, ***"Web-scale extraction of structured data,"*** SIGMOD Rec., vol. 37, pp. 55–6 1, March 2009.

[5] E. Chu, A. Baid, X. Chai, A. Doan, and J. Naughton, ***"Combining keyword search and forms for ad hoc querying of databases,"*** in SIGMOD, 2009.

[6] Y. Song, Z. Zhuang, H. Li, Q. Zhao, J. Li, W.-C. Lee, and C. L. Giles, ***"Real-time automatic tag recommendation,"*** in Proceedings of the 31st annual international ACM SIGIR conference on Research and development in information retrieval, ser. SIGIR '08. New York, NY, USA: ACM, 2008, pp. 515–522.

[7] B. Sigurbj ¨ornsson and R. van Zwol, ***"Flickr tag recommendation based on collective knowledge,"*** in proceeding of the 17th international conference on World Wide Web, ser. WWW '08. New York, NY, USA: ACM, 2008, pp. 327–336.

[8] M. Jayapandian and H. V. Jagadish, ***"Automated creation of a forms-based database query interface,"*** Proc. VLDB Endow., vol. 1, pp. 695–709, August 2008.

[9] S. R. Jeffery, M. J. Franklin, and A. Y. Halevy, ***"Pay-as-you-go user feedback for data space systems,"*** in ACM SIGMOD, 2008.

[10] Nandi and H. V. Jagadish, ***"Assisted querying using instant response interfaces,"*** in ACM SIGMOD, 2007

[11] M. Franklin, A. Halevy, and D. Maier, ***"From databases to dataspaces: a new abstraction for information management,"*** SIGMOD Rec., vol. 34, pp. 27–33, December 2005.

SPECKLE NOISE REDUCTION IN SYNTHETIC APERTURE RADAR IMAGE USING MULTI-LAYER PERCEPTRON

[1]K. Amitab, [2]D. Kandar, [3]A.K. Maji.
[1,2,3]Department of Information Technology
North Eastern Hill University, Shillong, Meghalaya, INDIA.
[1]khamitab@gmail.com, [2]kdebdatta@gmail.com.

Abstract: **Synthetic Aperture Radar (SAR) produce images in all-weather condition, day and night. Interference, Clutter, noise in channel degrades the quality of the image and causes serious difficulty in analyzing the images. Speckle is multiplicative noise mainly caused by interference of signal. Artificial Neural Network (ANN) have the capability of learning and is gaining popularity in SAR image processing. Multi-Layer Perceptron (MLP) is a feed forward artificial neural network model that consists of an input layer, several hidden layers, and an output layer. In the Matlab simulation work Authors added speckle noise to the target image and applied MLP for speckle noise reduction in SAR images. Authors found that speckle noise in SAR images can be reduced by using MLP.**

Key words: SAR Image, Speckle, MLP, Noise Filtering, ANN.

I. INTRODUCTION

SAR produces high resolution two dimensional images of mapped areas [1], it is mounted on moving platform such as aircraft or spacecraft. A SAR works by illuminating the scanned surface with a beam of coherent electromagnetic radiation in a side-looking direction, the returned echo form the illuminated are collected by SAR receiver and processed to reconstruct the image of the surface. Reconstruction of image from continuously collected returned echo is two dimensional problems; echo signal of a point target is spread in range and azimuth.

Range is the direction perpendicular to flight path of the aircraft. By measuring the time difference between the transmitted pulse and received echo, the range of the reflecting object can be determined. Range resolution is the ability to separate two object points in the range direction. Mathematically range resolution can be defined as in (1)

$$\textit{Range Resolution} = \frac{c\tau}{2} \qquad (1)$$

Where τ is the pulse width and c is the speed of light. From (1) it can be observed that smaller value of τ will give high (fine) resolution. However decreasing the value of τ will also reduce Signal to Noise Ratio (SNR). To solve this problem SAR uses pulse compression techniques in which the transmitted pulse are linearly frequency modulated.

Azimuth is the direction parallel to the flight path of the aircraft. To obtain high azimuth resolution, a large antenna is needed to focus the transmitted and received echo into a sharp pencil like beam. The sharpness of the beam defines the azimuth resolution.

$$\textit{Azimuth resolution} = \frac{R\lambda}{L} \qquad (2)$$

Where R is slant range, λ is the wave length of the transmitted signal and L is the length of the antenna. SAR utilizes the flight path of the platform to simulate an extremely large antenna.

The collected returned echo is processed to reconstruct the image of the scanned surface. The most commonly used algorithm is the Range Doppler Processing algorithm. It consists of Range Compression, Azimuth Fast

Fourier transform, Range Cell Migration Correction and Azimuth Compression

SAR works in all-weather condition, day and night. The application of SAR techniques includes satellite remote sensing of land and sea, target imaging for military purposes, geo-science and climate change research, environmental monitoring and planetary exploration.

Speckle is a granular noise and inherently exists in all types of coherent imagery such as Radar image, acoustic, and laser illuminated imagery. It degrades the quality of the image and causes serious difficulty in analyzing the images. Speckle noise is multiplicative noise mainly caused by interference of signal.

II. SPECKLE NOISE REDUCTION TECHNIQUES

Many speckle noise reduction techniques have been presented previously. This includes Lee filter [2], Median filter [3], Frost filter [4], Kuan filter [5] Enhanced Lee filters [6] and Enhanced Frost filters [6]. Generally all this filters move a kernel over each pixel in the image and replace the central pixel by a value which is mathematically computed from the pixel values under this kernel. The kernel slides along the image one pixel at a time. Morphological filters [7] probe an image with a structuring element or template, the structuring element is positioned at all possible locations in the image and compared with the corresponding neighborhood of pixels to reduce the noise locally. Wavelet filters are also extensively used for speckle noise reduction, it decompose a signal using wavelet transform and analyses the noise separately at each wavelet scale.

Artificial Neural Network is gaining importance in speckle noise reduction. ANN have the ability to learn from previous experience and uses this knowledge to improve the result, using ANN for reduction of noise produces better results compared to conventional statistical techniques [8]. Research paper [9-13] uses ANN for reducing speckle noise.

III. MULTI-LAYER PERCEPTRON (MLP)

An MLP is a network of simple neurons called as perceptron. MLP is a feed forward artificial neural network model that consists of an input layer, several hidden layers, and an output layer. MLPs are widely used for pattern classification, recognition, prediction and approximation [14]. Research paper [15] comparatively evaluated the performance of traditional filters such as mean and median, and MLP networks experimental result shows that overall efficiency of MLP networks is better.

A. Architecture of MLP

MLP is a nonlinear function that maps input vector via several hidden layers to output vector. Structure of a neuron is shown in Fig. 1.

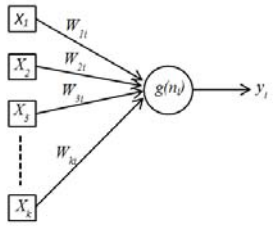


Figure 1: A perceptron of MLP network.

All input x_j is multiplied by the corresponding scalar weight w_{ji} to form the product $w_{ji}x_j$, and bias θ_i is added to form n_i in (3). n_i is given as input to the transfer function g. The output y_i is shown in (4).

$$n_i = \sum_{j=1}^{K} w_{ji} x_j + \theta_i \tag{3}$$

$$y_i = g\left(\sum_{j=1}^{K} w_{ji} x_j + \theta_i \right) \tag{4}$$

The commonly used transfer functions for multi-layer network [16] are Log-sigmoid, Tan-Sigmoid and Linear Transfer Function.

Log-sigmoid function generates outputs between 0 and 1 as the neuron's net input goes from negative to positive infinity. The mathematical expression of Log-sigmoid is shown in (5)

$$logsig(n) = \frac{1}{1+e^{-n}} \tag{5}$$

Tan-Sigmoid is mathematically equivalent to hyperbolic tangent (6)

$$tansig(n) = \frac{2}{1+e^{-2n}} - 1 \qquad (6)$$

Linear Transfer Function gives same output as the input, (7) shows the relation between input and output.

$$purelin(n) = n \qquad (7)$$

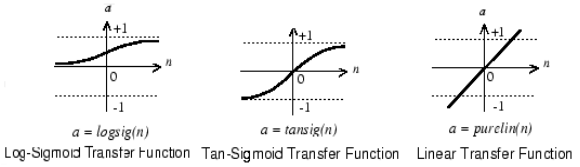


Figure 2: Transfer functions

The architecture of MLP [17] which has an input layer with ***k*** input, one hidden layer with three neurons and an output layer with two neurons is shown in Fig. 3.

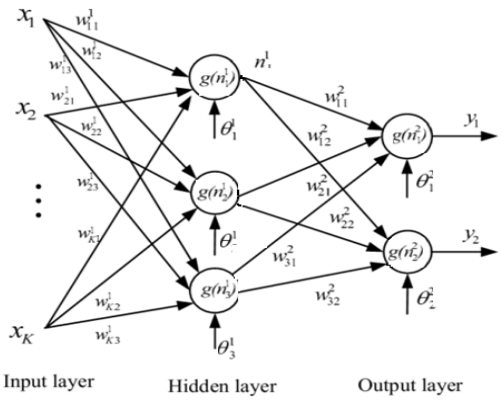


Figure 3: Architecture of MLP network

The output of the MLP network y_i, for i=1,2 of can be defined as

$$y_i = g\left(\sum_{j=1}^{3} w_{ji}^2 g\left(\sum_{k=1}^{K} w_{kj}^1 x_k + \theta_j^1\right) + \theta_j^2\right) \qquad (8)$$

B. Training the MLP

Learning is one of the main advantages of using an artificial neural network. Learning takes place during training phase. The goal of the training process is to find the set of weight $w_{ij}(n)$ that will cause the output from the neural network to match target values as closely as possible. The most commonly used algorithm for adjusting weights during the training phase is back-propagation. In back propagation initially the network contains random weights and for a given training input it is likely to produce incorrect output. The errors for all input patterns are propagated backwards, from the output layer towards the input layer. And the errors are minimized by adjusting the weights to get the desired outputs.

Gradient descent with momentum back propagation, Resilient back propagation and Levenberg-Marquardt back propagation are commonly used algorithm for training MLP. Gradient descent with momentum back propagation updates weight and bias values according to gradient descent with momentum, back propagation is used to calculate derivatives of performance with respect to the weight and bias variables, and each variable is adjusted according to gradient descent with momentum. Resilient back propagation takes only the sign of the partial derivative over all patterns and acts independently on each weight, the magnitude of the derivative have no effect on the weight update. The size of the weight change is determined by the learning process. Levenberg-Marquardt back propagation algorithm updates weight and bias values according to Levenberg-Marquardt optimization technique; it takes less time however require more memory than other algorithms.

IV. IMPLEMENTATION AND RESULT

MLP is implemented in MATLAB and ALOS-PALSAR [18] image is used for testing. Implementation process can be divided into three phases namely designing the MLP network, training and testing. The designed architecture of the MLP network using neural network toolbox [16] is shown in Fig. 4, it consists of an input layer with a node and takes a single input, two hidden layer; the first layer has nine neurons and second layer has single neuron and an output layer with single node. We have used all the possible combination of Log-sigmoid, Tan-Sigmoid and Linear transfer function in hidden layer and comparatively evaluated the performance in terms of Peak Signal to Noise Ratio (PSNR).

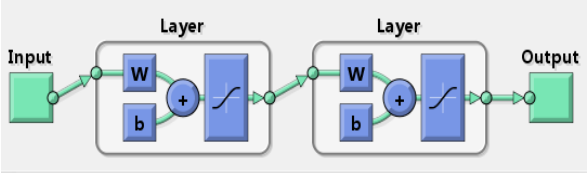


Figure 4: Architecture of Designed MLP

The parameters associated with the training algorithm are defined as Maximum epochs=600, Error goal = 0.0, Maximum validation failures=5, learning rate to 0.001 and Momentum constant=0.9.

The input image to the training algorithm is shown in Fig. 5 and the target image is shown in Fig. 6. Fig. 5 is the effect of speckle noise in Fig. 6. The multiplicative speckle noise is created by using (9)

$$J = I + n * I \qquad (9)$$

Where is ***J*** is the noisy image, ***I*** is the original image, ***n*** is uniformly distributed random noise with mean 0 and variance ***v***, the value for ***v*** is taken as 0.04.

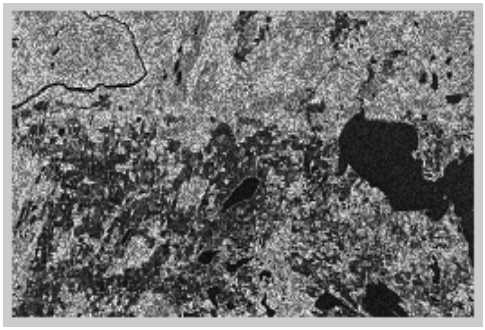


Figure 5: Speckle noise effected image

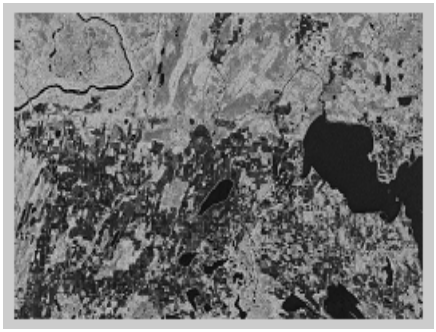


Figure 6: Target image

The same training parameters are used for all the training algorithms. To evaluate the performance we have used the image in Fig. 5 as the test image. The test result in decibel is presented in Table 1. Fig. 7, Fig. 8 and Fig. 9 are the samples of denoised images using Levenberg-Marquardt, Resilient and Gradient descent with momentum back propagation training algorithm respectively.

Transfer Functions		PSNR by using Levenberg-Marquardt, Resilient and Levenberg-Marquardt training algorithm		
Layer 1	Layer 2	Gradient descent with momentum back propagation	Resilient	Levenberg-Marquardt
Log-sigmoid	Log-sigmoid	54.7989	70.7548	70.7799
Log-sigmoid	Tan-Sigmoid	59.8017	70.7470	70.7800
Log-sigmoid	Linear	62.1224	70.7381	70.7800
Tan-Sigmoid	Log-sigmoid	59.3987	70.7230	70.7799
Tan-Sigmoid	Tan-Sigmoid	63.5685	70.7266	70.7800
Tan-Sigmoid	Linear	65.5659	70.6755	70.7800
Linear	Log-sigmoid	58.5352	68.6869	68.6869
Linear	Tan-Sigmoid	66.8746	69.8703	69.8703
Linear	Linear	69.0680	69.0722	69.0722

Table 1: Simulation results of designed MLP network

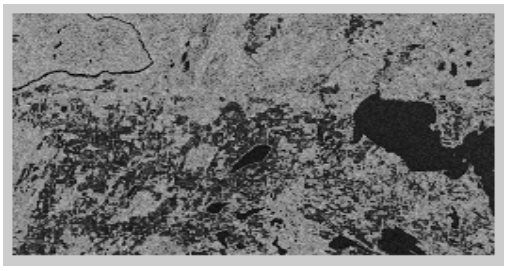


Figure 7: Denoised image using Levenberg-Marquardt training algorithm

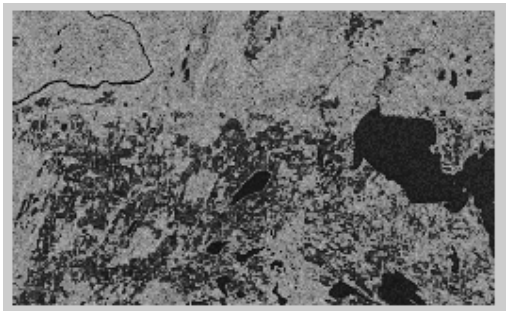


Figure 8: Denoised image using Resilient training algorithm

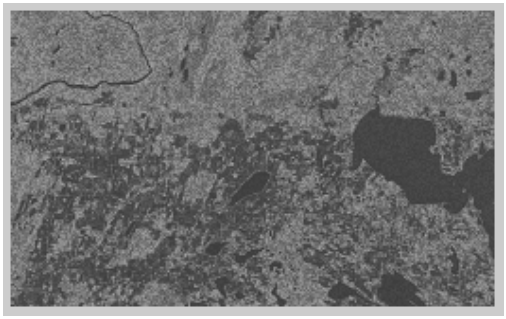


Figure 9: Denoised image using Gradient descent with momentum back propagation

V. CONCLUSION

Due to unavailability of field experimental data, Authors involve in offline SAR image processing. The designed MLP network trained using Levenberg-Marquardt gives better result among the chosen training algorithm. Though the simulation result is acceptable, however performance analysis is required after adding clutter and other impairments. In future work, performance of SAR using MLP is to be compared with other Soft Computing tools. Authors are also planning to implement radial basis function network for reducing speckle noise and comparatively evaluate the performance with MLP.

REFERENCES

[1] Tomiyasu K.," Tutorial review of synthetic-aperture radar (SAR) with applications to imaging of the ocean surface", Proceedings of the IEEE, VOL. 66, NO. 5, 1978.

[2] J. S. Lee, "Speckle suppression and analysis for synthetic aperture radar," Optical Engineering, vol. 25 no 5, pp. 656-643, 1986.

[3] I. Pitas & A.N. Venetsanopoulos," Nonlinear digital filters", Kluwer Academic Publishers, 1990

[4] Frost, Victor S, Stiles, Josephine Abbott, Shanmugan, K.S., Holtzman, J., "A Model for Radar Images and Its Application to Adaptive Digital Filtering of Multiplicative Noise," Pattern Analysis and Machine Intelligence, IEEE Transactions on , vol.PAMI-4, no.2, pp.157,166, March 1982

[5] Kuan, Darwin T., Sawchuk, A.A., Strand, Timothy C., Chavel, P., "Adaptive Noise Smoothing Filter for Images with Signal-Dependent Noise," Pattern Analysis and Machine Intelligence, IEEE Transactions on , vol.PAMI-7, no.2, pp.165,177, March 1985

[6] Lopes A., Touzi R.,Nezry E., "Adaptive speckle filters and scene heterogeneity," Geoscience and Remote Sensing, IEEE Transactions on , vol.28, no.6, pp.992,1000, Nov 1990

[7] Mashaly A.S., AbdElkawy E.E.F., Mahmoud T.A." Speckle noise reduction in SAR images using adaptive morphological filter" International Conference on Intelligent Systems Design and Applications (ISDA), 2010 .

[8] Sander Ali Khowaja, Syed ZafiSherhanSah and Muhammad UsmanMemon, "Noise Reduction Technique for images using Radial Basis Function Neural Networks", Mehran University Research Journal of Engineering & Technology, Volume 33, No.3, July 2014.

[9] Saikia T., Sarma K.K., "Multilevel-DWT based image de-noising using feed forward artificial neural network," Signal Processing and Integrated Networks (SPIN), 2014 International Conference on , vol., no., pp.791,794, 20-21 Feb. 2014

[10] Hyunkyung Park, Nishimura T., "Reduced Speckle noise on Medical Ultrasound Images Using Cellular Neural Network," Engineering in Medicine and Biology Society, 2007. EMBS 2007. 29th Annual International Conference of the IEEE , vol., no., pp.2138,2141, 22-26 Aug. 2007

[11] Blacknell D., Oliver C.J., Warner M., "Speckle reduction of SAR images using neural networks," Image Processing and its Applications, 1995., Fifth International

Conference on , vol., no., pp.647,651, 4-6 Jul 1995

[12] White R.G., Oliver C., "Change detection in SAR imaginery," Radar Conference, 1990., Record of the IEEE 1990 International , vol., no., pp.217,222, 7-10 May 1990

[13] Long P.D., Pham Thuong Cat, "Real-time speckle reducing by Cellular Neural Network," Information, Communications and Signal Processing, 2009.ICICS 2009. 7th International Conference on, vol., no., pp.1,4, 8-10 Dec. 2009

[14] T. Santhanam, S. Radhika, "Applicability of BPN and MLP Neural Networks for Classification of Noises Present in Different Image Formats", International Journal of Computer Applications, 2011.

[15] Raquel E. Patino-Escarcina, Jose Alfredo Ferreira Costa," An Evaluation of MLP Neural Network Efficiency for Image Filtering" Seventh International Conference on Intelligent Systems Design and Applications

[16] Mark Hudson Beale, Martin T. Hagan and Howard B. Demuth, "Neural Network Toolbox™User's Guide", MathWorks, 2014.

[17] Heikki N. Koivo, "NEURAL NETWORKS: Basics using MATLAB Neural Network Toolbox ", 2008

[18] ORNL DAAC, " Alos-palsar image", Available: http://webmap.ornl.gov/wcsdown/dataset.jsp?ds_id=993