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Sinhgad Institutes

S. No. 44/1, Vadgaon (Budruk), Off Sinhgad Road, Pune - 411041.
• Tel : +9120-24354938, 24100295/293 • Tele Fax : 020-24354938 • Email : principal.skncoe@sinhgad.edu • Website : www.sinhgad.edu

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B. E., M. E. (Computer Engg.), Ph. D.
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Date: 11/04/2022

To,
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Subject: Proofs of Metric No. 3.3.2

Reference: Metric No. 3.3.2 Number of research papers per teachers in the Journals notified on UGC website during the last five years

Dear sir/Madam,

Number of research papers per teachers in the Journals notified on UGC website during the last five years is as follows:

Year	2020-21	2019-20	2018-19	2017-18	2016-17
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Smt. Kashibai Navale
College of Engineering
Vadgaon(Bk.), Pune - 41.

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Criterion No.:3.3.2

Number of research papers per teachers in the Journals notified on UGC website during the last five years

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Thanking You,

(Dr. A.V.Deshpande)

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Smt. Kashibai Navale
College of Engineering
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Generic Communication Framework for Internet of Things

Amol Dande[1], S. K. Pathan[2]

[1]Smt. Kashibai Navale College of Engineering, Pune, Maharashtra, India

[2]Professor, Smt. Kashibai Navale College of Engineering, Pune, Maharashtra, India

Abstract: *Internet of Things the name explains about itself ,internet is network of network where heterogeneous machine are connected to share the information among different clients. Things are the sensors connected to this network. Network layer and physical layer wrapped together with specific application layer to form IoT, which becomes domain specific .There are various framewarks exists which are dependent on specific domain, if new domain comes, ultimately there is need to create new framework. In this paper we proposed generic communication framework which is common platform for all the domains , where IoT can be used and existing framework can be reused. It is beneficial to analyze data efficiently and future predictian.*

Keywords: Internet of Things, IoT solutions, email communication, data storage and analysis, machine to machine communication, cloud structure for IoT.

1. Introduction

IoT network infrastructure consists of multiple devices (sensors) are connected using communication protocols. IoT is n/w of n/w anything can be accessed from anywhere via various application programming interface. In IoT there is a continuity to development, future scope can be esti mated by a mixture of variety of technology path and various IT concepts which consist of CC, Hadoop, Robot and other different fields. The concept is came from ubiquitous computing , so these ideas lap in few component can be service infrastructure ,technical, visualization, ability of sys- tem to work with other system, self-decision, actual innovators can see great the vision of complementary instead against separate fields. The inference of concept IoT can be globally defined as the completeness of presence things, an IoT area of world may be connected to object everywhere on the planet. As like as computer network and the ubiquitous computing works as per the human body, such as human neurons are capable for taking the decision simultaneously likewise this way or path can be used in IoT for higher utilization and fast decision making. Devices deeply embedded in public and private places will recognize us and adapt to our requirements for comfort, safety, streamlined commerce, entertainment, education, resource conservation, operational efficiency and personal well-being.", according to Intel's report "Rise of the Embedded Internet [1].Four companies are emerging as IoT leaders: Intel in the semiconductor space, IBM and Microsoft in the platform/analytic s space and Cisco in the connectivity.In addition, designate one author as the "corresponding author". This is the author to whom proofs of the paper will be sent. Proofs are sent to the corresponding author only [2].

2. Related work

There exist various [3] applieation under dif- ferent domains in Internet of Things. Internet of things is application driven which tends to new innovation, most common domains are Smart wear, Transportation, Home-appliances, information of environment, and human Care. And some of the challenges are in the sys- tem of one technology get communicates with other technology made system architecture , Privacy and Security preserving, smart physical object(things), realistic and flexible. Al- most all the applications are domain specifics. One of the applications designed to human safety.

A. Industries towards the IoT

IoT is described as the broad idea behind these buzzwords is that a whole constellation of inanimate objects is being designed with built-in wireless connectivity, so that they can be monitored, controlled and linked over the Internet via a mobile app. [4] The types of objects span a wide range of categories, from wearables to light bulbs to home appliances (like the coffee maker, washing machine, and Even your car) really, anything. [5]IoT is also being applied to vertical markets like the medical and health-eare industry and to transportation systems. At this point, the easier question might be who isn't working on an IoT product.[6] Big names like Samsung, LG, Apple, Google, Lowe's and Philips are all working on connected devices, as are many smaller companies and start-ups.[7] Research group Gartner predicts that 4.9 billion connected deviees will be in use this year, and the number will reach 25 billion by 2020.

B. IoT Controllers and hardware's:

There are various micro controllers and development boards are available to implementing the IoT. Some of the controllers list is given below.

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Deduplication and Decentralized Access Control in Cloud with Efficient Public Auditing Mechanism

Sohail A. Khan[1], Dr. Shafi K. Pathan[2]

[1,2]Savitribai Phule Pune University, Smt. Kashibai Navale College of Engineering, Pune, India

Abstract: *Cloud computing is a very important area which Permits client to remotely store their data into the cloud and enjoy the on-interest excellent applications and services. However in cloud computing, since the data is put away anyplace over the globe, the client organization has less control over the stored data. So here, security and privacy are very important things. The user should to validate himself / herself before beginning any transaction, and user privacy is also important so that the cloud or other user in cloud do not know the identity of user who stored the data. This is an access control system for data store away in cloud that gives anonymous authentication. In this scheme, the cloud confirms the user without knowing the users identity before storing data in the cloud by using ABS (Attributes Based Signature). The proposed scheme uses ABE (Attribute-Based Encryption) in which the attributes are match and according to matching attribute the various access control (Read, Write) are provide to user. Also for Integrity checking trusted outsider security service provider is used who does not store any data at its end, and it's only confined to providing security service. Thus, enabling public auditability for cloud storage is of discriminating significance so that client can resort to a third-party auditor (TPA) to check the integrity of outsourced data and be effortless. In Proposed system the task of Key distribution is done in a decentralized way, for this more than one KDC are used who shares the same databases. The scheme not only verifies the integrity of data but also performs De-duplication of files. Moreover, this authentication and access control scheme is decentralized and robust, unlike other access control schemes designed for clouds which are centralized. The Experimental result show that the proposed system is more efficient in terms of data storage and security, and also it reduces the computation overhead of user by making the use of TPA.*

Keywords: Cloud Computing, Key Distribution Center (KDC), Attribute Based Encryption (ABE), Third Party Auditor (TPA), Integrity Checking, De-duplication checking, Access Control

1. Introduction

Cloud computing is the conveyance of registering services over the Internet. Cloud services allow individuals and organizations to use both software and hardware that are managed by third parties at remote locations. In Today's era because of the advances in network technology and an increase in the need for computing resources have prompted numerous organizations to outsource their storage and computing needs. This new economic and computing model is generally referred to as cloud computing and incorporates various sorts of services, for example, infrastructure as a service (IaaS), where a customer makes utilization of an service providers computing, storage infrastructure; platform as a service (PaaS), where a client influences the providers resources to run custom applications; lastly software as a service (SaaS), where clients use software that is run on the providers infrastructure.

It is important thing to protect the security of data and privacy of user. Cloud should guarantee that the user attempting to access data and services are authorized users. Authentication of user can be achieved utilizing different public key cryptographie techniques. User should guarantee that the cloud is not altering with their data and computational results. It is also be important to hide the user's identity for security reasons. For example, while putting away medical records, the cloud should not to have the capacity of getting the records of a specific patient. User should also guarantee that the cloud is ready to perform computations on the data without knowing the data values. One approach to hide the data from the cloud, but carry on computation on the data, is by the utilization of homomorphic encryption methods [7]. User sends messages encrypted using homomorphic encryption technique to cloud, while the cloud without knowing the actual data performs computations on these encrypted messages and gives back outcomes to the user.

Consider now the following situation. Patients store their personal medical records in the cloud. Different users can get access to various data fields. Here the same data fields may be accessed by a specific group of people which are authorized. For example the patient's medical history and drug organization can be accessed to by doctors and nurses, but not by hospital management staff.

In online social networking , generally owners are members of the networking site, they keep their personal details, music ,recordings, pictures, videos in the cloud and different individuals can view them depending upon their access rights. A member can post a message or transfer a photo whenever, which will be visible only to the friends and selected groups that she belongs to, but not available to the rest. It is important to also protect privacy of these data from the cloud. Giving access rights to some authorized users and preventing the other user from getting an access to that data, is called access control. One approach to achieve this is to put a list of all valid users in cloud who can access the data, this called as user based access control. In cloud computing, such records can be much long and frequently dynamic, which will make taking care of such records to a great degree troublesome. Every time the list must be verified whether the user is valid. This outcomes in a tremendous computation and storage costs. Another approach is to encrypt data is by using public keys of valid users, so that only they are able to decrypt data using their secret keys. However the same data

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Head
Department of Computer Engineering
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Volume 146 – No.5,

Clustering Embedded with Context Awareness using Evolutionary Approach

Sanjeevani Dhaneshwar
Department of Computer Engineering,
mt. Kashibai Navale College of Engineering,
Vadgaon Budruk, Pune, India

Manisha R. Patil
Department of Computer Engineerin
Smt. Kashibai Navale College of Engine
Vadgaon Budruk, Pune, India

Smt. Kashibai Navale College of Engineering * Pune-41.

Head
Department of Computer Engineering
SKNCOE, Pune 411041

ABSTRACT

The research presented in this paper explores the embedding of context awareness into a data mining method called clustering. Adding context to traditional data mining methods has been known to improve results of information retrieval systems. The approach used for this task is that of Multi Objective Evolutionary Algorithms. Evolutionary algorithms imitate the biological process of natural selection, also known as survival of the fittest, to solve computational problems. It is a heuristic method that finds approximate solutions. The solutions are generally optimized with respect to some system objective. However, many practical problems require optimization in more than one and possibly conflicting objectives. Multi Objective Evolutionary Algorithms (MOEA) are used for this purpose.

General Terms

Data Mining, Clustering, Context Awareness

Keywords

Multi Objective Optimization, Evolutionary Algorithms, Data Mining, Clustering, Context Awareness

1. INTRODUCTION

With the explosion of data produced by organizations and individuals, large repositories of raw data have been created. Interesting patterns can be drawn from this raw data to find

operation in. The object producing data ' ' to be in a context. Adding context aware da processes has been extensively use impr accuracy. Adomavicius et al. (2011) describe the context as a frame for a given object. This fram elements or factors that influence the object and th that it performs [1].

For example, the choice of a dress bought by a w depend on the occasion that she is buying it for. influencing her choice in this case is the occasion she will be wearing it. The question asked is 'why being bought?' Some other questions that may be 'what', 'where', 'how', 'when', 'who' and so translate into contextual factors like location, time day of the week, month, purpose of purchase, etc.

2.2 Evolutionary Algorithms

There have been numerous instances wherein ce computation problems have been solved by inspir nature. This is called as bio mimicry. A prominent neural networks that are modelled after the work human brain. Another example is evolutionary a They are modelled after Darwin's theory of Survi Fittest.

The generic algorithm follows these basic steps: [2]

1. Randomly generate a population

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Context Similar Diversification of Keyword Search Results using Different Approaches

M. Arkadi P.B.Mali · Published 2016 · Computer Science

To gain knowledge one of the easiest and nearest solution nowadays is search your problem on internet. User needs solution in just no time. Basic solution to this is searching process. Searching can be done through keyword hunt. If user fires a query using multiple keywords or sentence it becomes quietly easy to get result which is contextually similar to fired query. But when search query is a single word, system has more chances of getting ambivalent or vague search results while considering context similarity scenario. Paper considers single keyword search and results into accurate outcome of related candidate queries. For that paper suggests four different approaches which refer to left and right context which leads to calculate occurrence of keywords, namely baseline solution, anchor pruning approach, naive based mapping approach and advanced filtering approach. System moderately adds complexity to dataset and concludes for better results like time, accuracy and efficiency. Collapse

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Privacy Preserving Record Linkage using LSH Blocking Approach and Secure Multiparty Computation with Set Intersection Technique

Kirti Satpute, P. Mali · Published 2016 · Computer Science

the need of creating this paper is to introduce a basic overview of Locality-Delicate Hashing which is base blocking methodology for saving the security of record linkage. For record pairs which sense the anonymous transmission, LSH framework is implemented. For L-fold Redundant Blocking System which is used for separating record sets that sensed an anonymization transmission, the Locality-Sensitive Hashing technique is act as a base. In this scenario we have demonstrate, how the method is... Expand

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Review on Secure Proof of Retrievability

[1] **Saurabhee Wandhekar, [2] Aradhana Deshmukh**

[1] Dept. of computer Engineering,Savitribai phule pune university, SKNCOE.

[2] Prof. at Department of computer Engineering, SKNCOE

Abstract - Moving user data on cloud provides convenience and avoids the complexity and hardware management for the user. However, the cloud concept brings many challenges which influence the system on various factors such as usability, security, reliability, scalability and overall system performance. User who is storing the data on cloud server has to check the integrity of the data which becomes an overhead every time. This task is outsourced to another public auditor. These parties may not be trustworthy. To mitigate this possibility and to alleviate the integrity checking and computation overhead we proposed a system. Proposed system does the integrity checking and preserves the privacy of the data from the Third Party Auditor.

Keywords - *Cloud Storage, Integrity, Proof of Retrievability [POR], Public Auditing.*

1. Introduction

Cloud computing is a next generation architecture of IT enterprises possess advantages like on-demand self-service, reliable and flexible network with increasing bandwidth, rapid resource elasticity, and usage-based pricing. The cheaper and powerful processors with the software as a service (SaaS) computing architecture are

verification schemes in which data in ver can be done by anyone on the behalf of the data Problem of the Private verification schemes is t owner gets excessively overloaded with this task case of public verification schemes user is alleviat this task. In private verification task there is ch crash the user's computing devices due to verification calculations, so there is high chance th will accept the public verification. All current ver schemes do not consider that cloud provides operations on the data stored on the cloud. G. Ate al. [1]onsiders this issue also and proposes efficien integrity verification scheme.

2. Background

Cloud Storage- It is most important feature i computing. It is model of the storage in which stored in logical pools, physical storage is sp multiple servers and all hardware part is provided l owner party as a service. Service providers are res for on demand accessibility, integrity and securit data. Most of the organizations choose cloud st

Smt. Kashibai Navale College of Engineering Pune-41.
Head Department of Computer Engineering SKNCOE, Pune 411041

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Software Defined Networking with Floodlight Controller

Vidya B. Harkal
S. K. N. College of Engineering,
Pune – 411046

A. A.Deshmukh
S. K. N .College of Engineering,
Pune – 411046

ABSTRACT
Software defined networking (SDN) is combine approach of connection oriented technologies and routing overlay technology presenting new open and programmable network. Decoupling control and data plane from network devices and bring control plane in logically centralized SDN controller which can be then act as network operating system.

This paper is to present an OpenFlow controller – Floodlight Controller. The Floodlight Controller realizes a set of common functionalities to control and inquire an OpenFlow network, while applications on top of it realize different features to solve different user needs over the network. Floodlight consists of controller modules that implement core network services a software defined network would expose to applications, and application modules that implement solutions for different purposes.

Keywords
Software defined network, floodlight controller

1. INTRODUCTION

1.1. Software Defined Networking
This is an era of internet which highly dependent on network for performance. In this, infrastructure has main two components such as simple, vendor neutral & future proof hardware and flexible software. These things are considered as properties of ideal network [1], but exception is legacy network which does not satisfy any of the above goals. In legacy infrastructure decision making functionality is available inside the device for that control plane & data plane work together and make complex and hard to network manager. Software defined networking is programmatic operator network interface, which helps to address a wide verity of operator requirements without changing any of the lower level requirements of the network [2]

Benefits of Software Defined Networking

- Programmability
- Openness
- Centralized control
- Abstraction & Virtualization
- Rapid Innovation

1.2. Software Defined Networking (SDN) Architecture
Most of the networking device has control and data plane working on same device. Only control available to network administrator is from the network management plane, which is used to operate and configure each node separately. The static nature of current network devices do not allow detailed control plane configuration because of this drawback SDN comes into the picture. It provides open user controlled management of the forwarding hardware of a network element. Network hardware devices keep their switching fabric and handover their intelligence to the controller .SDN decouple control and data plane and brings control plane logically centralized, This network operation system is known as software defined networking controller which helps to control ,change ,manage network bebaviour dynamically through software interference[3].

Fig. 1 demonstrates the different layers and components of SDN architecture.

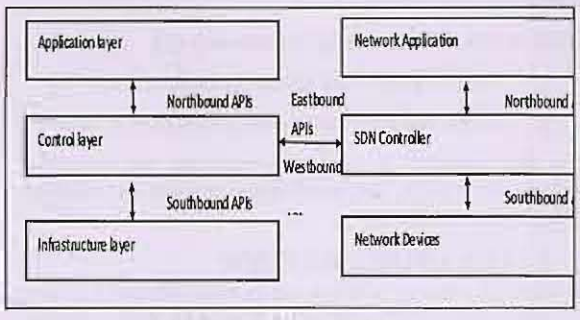

Fig.1 Architecture of SDN

As shown in Fig.1 SDN architecture has below mentioned layers -

- **Infrastructure layer**

This layer includes network devices such as routers, switches, middle boxes, firewall etc. Flow based forwardiug carried out through these network devices.

- **Control layer**

Network operating system is a part of Control layer which control low level infrastructure resources which are logically centralized controller. This layer present abstract view over infrastructure layer which enabled administrator to apply custom polices over lower layer of SDN controller which act as brain of network.

SDN controller broadly divided into two categories:

1. Open source single instance controller
2. Closed source distributed controller

- **Application layer**

This layer act as platform on top of the various network applieations. This layer provides services managed by applications such as adaptive routing, network monitoring, security management, network virtualization etc.

- **Interfaces**

SDN architecture consist of different interfaces such as

1. Northbound interfaces

Smt. Kashibai Navale College of Engineering Pune-41.
Head
Department of Computer Engineering
SKNCOE, Pune 411041

The northbound application programming interface (APIs) is Interface between the software module of controller platform layer and application layer is northbound interface, it includes

RESTfull APIs, adboc APIs, NVP NBAPI, SDMN API.

2. Southbound interfaces

The southbound application programming interface is interface between control layer and infrastructure layer it includes openflow, OVSDB, L2, L3 agent

3. Eastbound – Westbound Interface

This controller used for multi controller based architecture eastbound westbound interface where it used to communieate between controllers.

1.3. Wireless SDN

Wi-Fi network have several unique properties over the wired network. SDN was first applied to wired enviromnent and now wireless SDN is new opportunity for research. In SDWN architecture wireless termination point [WTPs] refer to physical devices coincide with Access point [APs] form infrastrueture layer .WTPs communicate with remote SDWN controller through secure channel.

SDWN architecture has two differeut models [4]:

1. Centralized wireless network [centralized SDWN]
2. Distributed wireless network [Distributed SDWN]

Main functionalities in wireless environment arc managing wireless access point, user verification, mobility and handoff management, security etc.

2. LITERATURE REVIEW

SDN has long history it introduced in mid-1990 and still new approaches and improvements are going on for making it open and programmable. There are many open controller nsed to improve SDN performance and provide seeurity to SDN. Nick feamster et.al[5] all in thcir paper explained timeline history of SDN in three scction activc network (mid 1990-2000), control data separation (2001-2007), open flow and network operating system (2007-2010). Shah et all explained in [6]the detailed architecture four open flow controller namely NOX, Becan, Maestro and floodlight, they provided detailed evolution of thesc 4 controller, results of this evolution used as a key guideline for architecture to improve existing or new arehiteeture plane . Porras et.al. [7] focused on security issue of SDN by explaining security enhanced-version of floodlight, this is known as SE-floodlight with security enforcement kernel. Wallner et.al. [8] addressed issues likc quality of serviees of SDN, what is importance of QoS in SDN and how to managed QoS services through SDN. They provide solution as Qucue based classification in OVS. Riggio et.al.[9] proposed programming abstract for wireless SDN it includes diffcrent types of abstractions like Light Virtual Access Point (LVAP) abstraction, Resource Pool abstraction, Channel Quality and Interference Map abstraction, Port abstraetion etc. Below table (Tablc No. 1) shows some of the open source controller available which used in SDN

Table 1. Open Source SDN Controllers [16]

Controller	Creat ed by	OpenFlow version	Description
NOX	Nicira	1.0, 1.3	Mulüthreaded, asynchronous, event based programmable model by Nieira .its first controller .
POX	Nicira	1.0	Python based modular controller .
Beacon	Stanfo rd univer sity	1.0.1	Multithreaded event based , eross platform java bas ed controller
Maestro	Rice univer sity	1.0	High performance using multithreaded java based controller
Floodlight	Big Switc h Netwo rks	1.0	Java based Modular architecture
Floodlight-plus	Big Switc h Netwo rks	1.3	New version of floodlight for supporting OF 1.3
Ryu	NTT Labs	1.4	Component based, pythou based controller
Open Daylight	Linux Found ation	1.0 , 1.3	Modular java based

3. SYSTEM MODEL AND ITS DESIGN GOALS

3.1. System Model

Fig. 2 demonstrates the system model, which consists of 3 components' such as Application layer of SDN, SDN Controller and Infrastructure layer.

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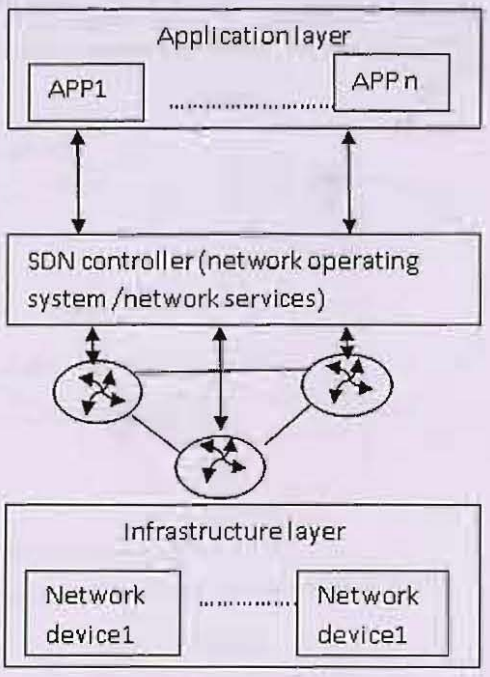


Fig. 2 System Model

SDN Controller in nothing but the control layer of the architecture which work as a centralized controller. This controller allows infrastructure admin to apply custom policies over the control layer in short controller is act as a brain of a network.

3.2. Design Goals

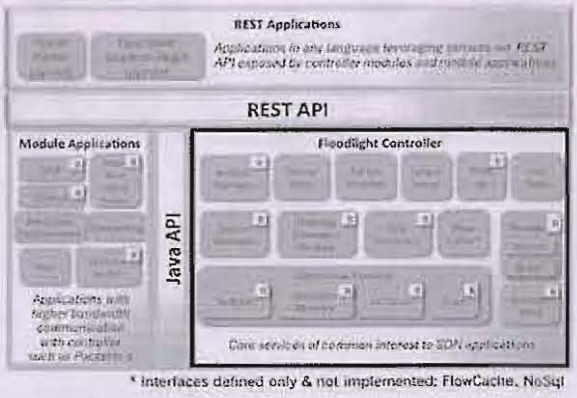
This proposed SDN controller service should achieve below mentioned design objectives:

- High availability - Implementing high availability by providing cluster of controllers.
- Reliability - Reliability of SDN controller relies on active-standby mode by controller node, secure connection between controller and switch nodes, multi-controllers based on openflow.
- Scalability - Scalability of SDN controller relies on node upgrading without service interruption and unique node upgrade in the distribute systems without any influence on the whole system.
- Improve overall performance of SDN

4. PROPOSED SYSTEM

Proposed system is consisting of implementing floodlight controller in SDN to improve its performance by overcoming the current gaps it has. Floodlight has a syne module, which is designed to allow for multiple floodlight instances to work collaboratively and share/sync state between each other. It isn't integrated into the controller core though but the ISyncService module is missing which helps to share information between controllers in a cluster in order to maintain state between the controllers. ISyncService is a Floodlight service provided by the sync module for implementing high availability amongst a cluster of Floodlight controllers. The idea is that module can become IStoreClients and IStoreListeners in order to notify or be notified upon a state change of the controller cluster. Having a robust and well-tested sync module would add a lot of value to Floodlight.

Floodlight control is the baek bone of this system; the Floodlight Open SDN Controller is an enterprise-class, Apache-licensed, Java-based OpenFlow Controller. It is supported by a community of developers including a number of engineers from Big Switch Networks. Fig. 3 demonstrates the 'modular architecture' is used to describe the architecture of Floodlight Controller.



* Interfaces defined only & not implemented: FlowCache, NoSql

Fig. 3 Architecture of Floodlight Controller [8]

4.1 System Architecture

OFSwitchManager is a Floodlight module designed to manage all the OpenFlow switches connected to the Floodlight controller. It can be used to get references to and interact with switches such as send OFMessages like OFFlowMods and OFPacketOuts. Modules can leverage the OFSwitchManager by requesting a reference to the IOFSwitchService.

Services Provided -

- IOFSwitchService

Service Dependencies –

- IFloodlightProviderService
- IDebugEventServiee
- IDebugCounterService
- ISyneService

Fig. 4 shows the system architecture of the proposed system which has clusters of controllers which helps to aehieve high availability, for this new service ISyneServiceis introduced.

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Pune-41.
Head
Department of Computer Engineering
SKNCOE, Pune 411041

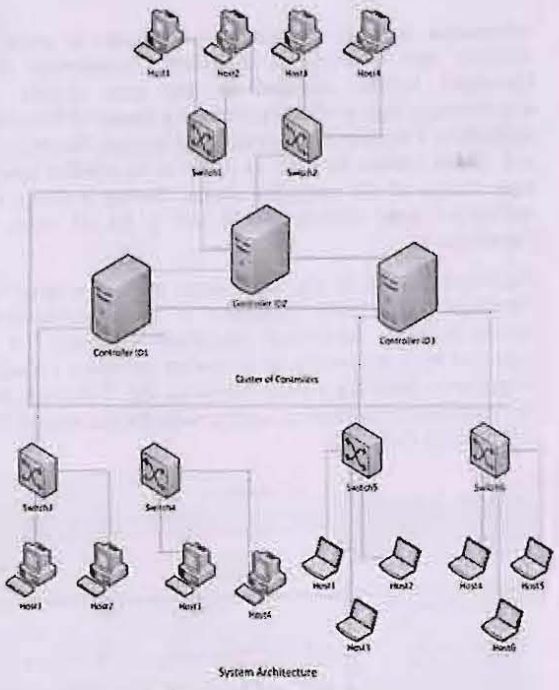

Fig. 4 System Architecture

- ISyncService

ISyncService is a Floodlight service provided by the sync module for implementing high availability amongst a cluster of Floodlight controllers. This is a module designed to maintain a database that is effectively mirrored across all participating controllers.

ISyncService is implemented as a singleton module that maintains the sync state for a given controller. Each controller will have a separate ISyncService module that communicates with other controllers' ISyncService modules.

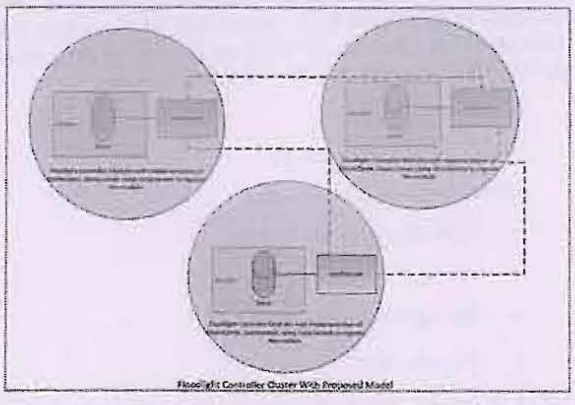

Fig.5 Positioning of 1SyncService

4.2 Mathematical Model

SDN-based network there are flow level and packet level services .where packet consider as basic unit of services for packet level based system and flow between controller and switch as basie unit for flow level based system.

Considering both packet-lcvel and flow-level arrival processes in the network implies unique arrival and service characteristics and requirements. [13]

Packet enter in system goes to controller at least ones. For two node in system (controller and switch or controller -controller) forwarding queue of the type M/Gl/1and feedback queue of delay loss type M/Gl/1 – S can be consider for both type of system. Bases on that performance measure can be calculated. [14]

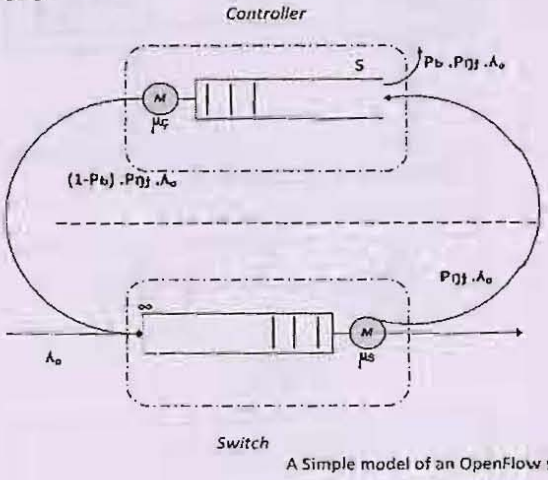

Fig. 5 A Simple model of an OpenFlow switch[14]

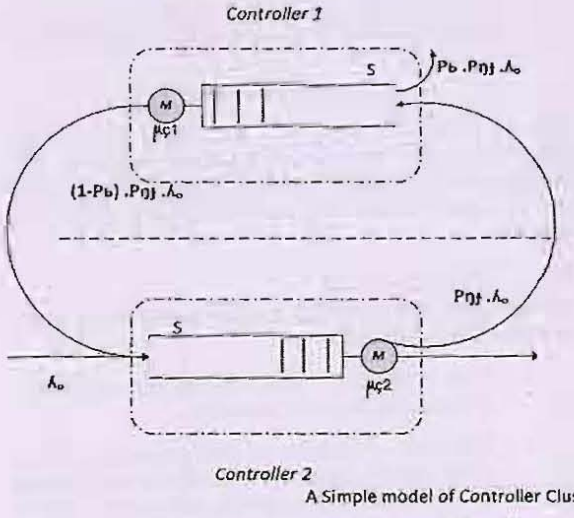

Fig. 6 A Simple model of controller cluster[14]

5. CONCLUSIONS AND FUTURE SCOPE

Software Defined Networking provides a fast, cross-hardware, and above all, inexpensive option for implementing network management solutions. This approach of using floodlight demonstrates the potential of SDN; however, Floodlight also required critical new features before is truly useful in a production environment. So the proposed system overcomes drawbaeks of Floodlight such as very limited configuratiou management and lacks a high availability mechanism. Also if controller fails it ean quickly paralyze the entire network. New service introduced provides funetionality to floodlight to make it easy to take first steps and develop some expertise in SDNs to overcome its challenges.

This implementation can be modified so that it can re-usc by existing or modules implemented in future to able to sync there data in cluster based topology of floodlight controllers

Head
Department of Computer Engineering
SKNCOE
vale College of Engineering
Pune-41.

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Implementation of M2M Communication Protocol for IoT Based Email System

Swatee D. Sonwane, V. V. Kimbahune

Abstract: The vision of internet of thing (IoT) is to collect and exchange data between the networks of physical objects, devices, vehicles, etc. This collected data from different devices and processed information from different source will control physical objects. To interact with the real world, these devices must work together with speeds, scales, and capabilities. To exchange and collect data from physical objects, there is a need of communication protocol. Hence this paper aims to utilize existing standard protocols to sustain smart IoT applications. This paper proposed an advance email system in which communication will be possible in both ways like, human to device and device to device. The tremendous amount of data which is generated by smart IoT devices (sensors) will be stored and processed within the cloud.

Keywords: IoT, Machine to Machine M2M, Communication Protocol, Cloud, Email

Edition: Volume 5 Issue 6, June 2016,

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Performance Analysis for Optimizing Hadoop MapReduce Execution

Samiksha Misal, P. S Desai

Abstract: The Apache Hadoop data changing writing computer programs is doused in an intricate situation made out of gigantic machine bunches, limitless data sets, and a couple taking care of vocations. Managing a Hadoop situation is time escalated, toilsome and obliges expert customers. Likewise, nonappearance of learning may include misconfigurations adulterating the gathering execution. To address misconfiguration issues we propose an answer completed on top of Hadoop. The goal is showing a tuning toward oneself segment for Hadoop businesses on Big Data circumstances. Late years have witness the improvement of distributed computing and the huge information period, which raises difficulties to conventional choice tree calculations. In the first place, as the measure of dataset turns out to be to a great degree huge, the procedure of building a choice tree can be very tedious. Second, on the grounds that the information can't fit in memory any all the more, some calculation must be moved to the outer stockpiling and hence builds the I/O cost. To this end, we propose to execute a normal choice tree calculation, C4.5, utilizing MapReduce programming model.

Keywords: MapReduce, Hadoop, Self-tuning, Optimization, Decision tree

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Journal of Multidisciplinary Engineering Science and Technology (JMEST)
ISSN: 2458-9403
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Secure Classification Of Encrypted Cloud Storage By Using SVM

Ashwini Sarode
Department of Computer Engineering
SKN College of Engineering
Pune, India

Mrs. Saudagar Barde
Department of Computer Engineering
SKN College of Engineering
Pune, India

***Abstract*—with the efficient development and popularity of cloud service providers, huge amount of data is available. This data should be mine. This mine data can be used for various kind of real time and other applications including medicine, scientific research, banking etc. There is a various data mining approaches are available to mine the data available on cloud servers. Among the data mining approaches, classification is very important and challenging task. A classifier is used to define the suitable class for each text document based on the input algorithm used for classification. In past decades, various classification schemes have been proposed. But these schemes are not efficiently applicable for encrypted data, mean they are not able to classify the encrypted data store on cloud servers. The data store on cloud is encrypted, because most of the users store their data on cloud in encrypted format to preserve the security and privacy. In this paper, we have proposed a classification approach to tackle this kind of issue. A SVM classifier is implemented to classify the encrypted data stored at cloud servers and also we remove two disadvantages of SVM by calculating reachability and cover ability on encrypted data to magnify the data. it makes them useful for various applications also maintained the security of user query and their data access patterns. Experimental evaluation of the system prove that the classification of encrypted data is more accurate and efficient with SVM classifier than the KNN classifier. The proposed protocol secures the encrypted data, assure the client's query and hides the data access patterns. Proposed algorithm is memory efficient as well as time efficient due to every process regarding data is done on the cloud.**

***Keywords*—Cloud computing, data mining, classification, encrypted cloud storage, security and privacy of encrypted data, SVM, reachability and cover ability.**

I. INTRODUCTION

Today's digital system allows a user's to store and retrieve their data. In fact user can store their data on remote servers and perform various operations on that data. These remote servers are managed by third party people, this is known as a cloud service providers in cloud computing area. Formally cloud computing is defined as, a type of computing based on Internet-based that allows a sharing of processing resources and data on demand. Computing resources includes, networks, servers, storage, applications and services). Cloud system are cost effective, flexible and reducing the administration overhead of various organizations also provide the various operations over data stored in remote servers.

Cloud storage online space where you can store your data or keep backup of files, through cloud service providers by selecting some data storage package. At this point, cloud storage is physical storage including, hard drives or sub flash devices etc. With this storage system, security and reliability is become a challenging issues. It is very important to keep data secure and original. Data should not be modified. The confidential data store at cloud might be leak or modified by third party unauthorized entities like hackers. To keep security of data over cloud, various techniques are available such as,

- Encryption: It is the technique, used to hide the original information using various encryption algorithm.
- Authentication: In this technique, every valid user has its own user name and password.
- Authorization: In this technique, only valid authenticated users can be able to access the cloud storage data.

In this paper, to maintain the security of data stored on cloud storage, we have focused on the encryption technique. In this technique, the users can encrypt their data before storing on cloud. Various encryption schemes are available with some advantages and disadvantages. Encryption schemes includes, AES, ECC, RSA, RC4 etc.

In our proposed system, we have used Paillier cryptosystem, to encrypt the data file, user queries to server and their responses to query. It will provide more security than other encryption algorithms. This is the holomorphic and probabilistic public key encryption. A security is based

Smt. Kashibai Navale College of Engineering Pune-41.
Head
Department of Computer Engineering
SKNCOE, Pune 411041

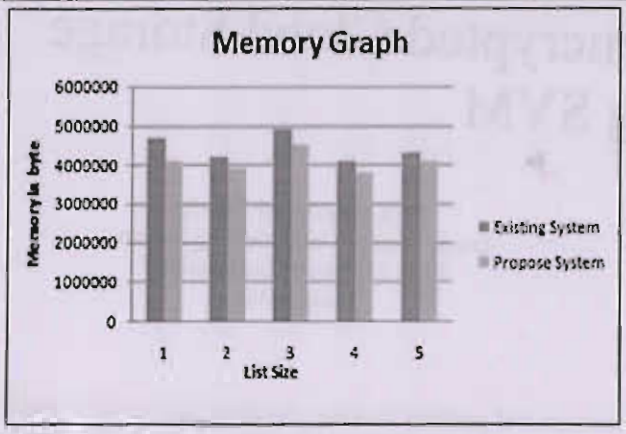

Fig. 4. Memory Comparison between Existing and Propose System

V. CONCLUSION

Various privacy preserving classification techniques have been proposed from many years. But these techniques are not efficiently classified the data stored on cloud server. Because the data stored on cloud servers are in encrypted format. To overcome this issue, a new system is proposed which makes use of SVM classifier for classification purpose. This system also provide the security and confidentiality to user's data and their requested queries and also hide the data access patterns. The performance of system is evaluated by using car dataset. Also system performance is compared with KNN classifier. Experimental results prove that the classification on encrypted data on cloud is better in terms of time, memory and accuracy, with SVM rather than KNN classifier.

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Head
Department of Computer Engineering
SKNCOE, Pune 411041

16-17 Journal

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Monitor Student's Presence in Classroom

[1] Sneha Ramhari Suryavanshi, [2] Lata J. Sankpal

[1] Computer Department of Engineering,
Sinhgad Academy of Engg., Kondhwa-Pisoli road
Pune, India

[2] Computer Department of Engineering,
Sinhgad Academy of Engg., Kondhwa-Pisoli road
Pune, India

Abstract - The real time face detection and recognition is now a days a subject of interest in various daily applications like crowd identification, video conference ,security measure, image analysis etc. This topic has brought attention of researchers because the human face is a dynamic object and has a high degree of variability in its appearance, which make face detection a difficult problem in computer vision. Many technique are being proposed, ranging from simple edge based algorithm to composite high level approaches utilizing advanced pattern recognition methods. The algorithms presented in this paper are Viola-Jones algorithm(Haar Cascade Classifier) and PCA(classified as either feature based and image based) and are discussed in terms of technical approach and performance. The objective of this paper is to find out away to monitor student's presence in classroom using EmguCV(Computer vision Library and wrapper class of OpenCV) and send important notification to parents to keep track of their child from remote location.

Keywords – **EmguCV, Camera, Face Detection, Face Recognition System, PCA Eigen Faces.**

1. Introduction

Today, we see an incremental growth in education percentage compared to the last decade because of awareness within folks and significant benefits of proper education for self and carrier development. The admissions of students are increasing day by day in schools and colleges which in turn increasing no. of students in the classroom. And, teachers/professors are finding difficulty to keep track of presence of all the students in the classroom that takes substantial time to take attendance as well. Therefore, to get rid of this, all are seeking for various alternatives of which 'Online Attendance' is an alternative.

In many institutions, Colleges and organization the attendance is very important criteria for students and organization Employees. The previous method in which manually taking and maintains the attendance records was very inconvenient work for teacher/faculty. Traditionally, students present or absent are taken manually by using attendance sheet given by the faculty members in class, which is a time consuming task. Moreover, it is very difficult event to verify one by one student in a big classroom whether the authenticated students are actually present or not. The ability to compute the attendance percentage becomes a major task as manual computation produces errors, and also wastes a lot of time. If an automatic detect and recognize system is developed for college, it eliminates the need for sheet of paper and personnel for the keeping of student records. Identifying students early on who show signs of absenteeism is a predicator of warning signs of students dropping out. Even though truancy is a major issue in middle school and high school, perhaps students should be identified and monitored early on in elementary school.

Educators need to continue to find innovative ways to bridge the gap between home and school to communicate with parents the need for a strong partnership so students can find success. Students need to know that coming to school on time, everyday is important. Educators, when faced with schools that have attendance problems may need to venture out beyond the wall of the school, into the community to involve families and work together. An automatic attendance management system using biometrics would provide the needed solution. The project – Monitor Student's Presence in Classroom will have a smart and real time attendance application that monitor and detect the exact presence of a student in classroom. This desktop camera authenticate student after

Smt. Kashibai Navale College of Engineering * Pune-41.
Head
Department of Computer Engineering
SKNCOE, Pune 411041

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16-17 Jour

Web Search and Recommendation-based on User Interest for PWS

[1]Arun R. Desai, [2]Mr. Pankaj Chandre
[1]P.G. Student, [2]Assistant Professor
[1]Department of Computer Networks,
[1]Flora Institute of Technology, Pune, India

Abstract - **Numerous personalization approaches have been investigated but it is still unclear whether personalization is reliably effective on dissimilar queries for different users, and under different search contexts. Personalized web search (PWS) has established its effectiveness in increasing the quality of several search services on the web. This paper proposes a personalized web search (PWS) framework known as User customizable Privacy-preserving Search (UPS) that can adaptively specify profiles by queries while regarding user quantified privacy requirements. The system goals at striking a balance among two predictive metrics that estimate the utility of personalization as well as the privacy risk of exposing the generalized profile. The greedy algorithm namely GreedyIL is presented for runtime generalization. Additionally, paper provides an online web age prediction mechanism for deciding whether personalizing a query is helpful. Additionally, this paper proposes a Personalized Web page Recommendation model (PWR) through collaborative filtering and a topic-aware Markov model. Topic-aware Markov model is used to widely applied to learn users' navigation behaviors for predicting the next step while surfing the Web.**

IndexTerms - **Privacy preservation, personalized web search, recommendation, profile privacy risk, user profile.**

I. INTRODUCTION

Personalization has been an active research area in the last some years and construction of user profile is an important component of any personalization scheme. Explicit customization has been generally used to personalize the look and content of several web sites, personalized search [11] methodologies focus on indirectly building and developing user profiles. Corporations that make available marketing data report that search engines are used progressively as referrals to web sites, compared to direct navigation and web links. As search engines make a larger role in commercial applieations, the desire to inerease their effectiveness grows. However, search engines are affected by difficulties such as ambiguity and outcomes ordered by web site popularity rather than interests of user.

Though various information retrieval methods (for instance, web search engines applications and digital library systems) have been effectively installed, the present retrieval systems are far from optimal. A key deficiency of present retrieval schemes is that they usually lack of user modeling and are not adaptive to individual users. This characteristic non-optimality is seen openly in the subsequent two cases: (1) Different users can use the identical query (e.g., "Java") to search for dissimilar information (for example, the Java island located in Indonesia or the Java programming language), however existing IR methods return the identical results for these users. Without considering the actual user, it is difficult to know which sense "Java" refers to in a query. (2) A user's data needs can change over time. The similar user can use "Java" sometimes to mean the Java Island in Indonesia and some other times to mean the programming language. It would be impossible to recognize the correct sense without recognizing the search context.

So as to optimize retrieval accuracy, there is need to model the user suitably and personalize seareh according to every individual user. The main objective of user modeling for information retrieval is to accurately model a user's information requirement, which is, inappropriately, a very problematic task. Indeed, it is hard for a user to exactly define what his/her information necessity is.

The web search engine has become the maximum important portal for normal people observing for valuable information on the web. Though, users might experience failure when search engines return irrelevant results that do not meet their real meanings. Such irrelevance is mostly due to the enormous contexts of users and backgrounds, in addition to the ambiguity of texts. PWS is a common group of search methods aim to provide improved search results that are personalized for needs of individual user. As the outcome, nser information has to be collected and examined to understand the user purpose behind the delivered query.

The way out to PWS can usually be characterized into two categories, viz. click-log-based approaches and profile-based ones. The click-log based approaches are straightforward they just impose bias to clicked pages in the history of user's query. Though this approach has been established to perform consistently as well as considerably well [1], it can simply work on repeated queries from the identical user, which is a strong drawback restricting its applicability. In contrast, profile-based approaches improve the search knowledge with problematical user-interest models created from user profiling methods. Profile-based approaches can be possibly effective for majority kinds of queries, but are described to be unstable under some conditions [1]. Though there are pros as well as cons for both types of PWS methods, the profile-based PWS has established extra effectiveness in improving the quality of web search with increasing usage of personal and behavior data to profile its users,

Smt. Kashibai Navale College of Engineering Pune 41
Head
Department of Computer Engineering
SKNCOE, Pune 411041

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Enhanced Approach for Secure Communication over Decentralize Opportunistic Network

[1]Ajay B. Kapase, [2]Mr. Pankaj Chandre
[1]P.G. Student, [2]Assistant Professor
[1]Department of Computer Networks,
[1]Flora Institute of Technology, Pune, India

Abstract **- Soldiers communicate with one other using wireless sensor devices which are carried by them. The soldiers need these wireless sensor devices to access the sensitive/confidential information. In this case decentralizes disruption tolerant network techniques are becoming the effective way to command consistently by abusing remote storage nodes. Ciphertext-Policy Attribute-Based Encryption is a competent solution such as cryptographic for the initial control issues. Still, the difficulty of relating CP-ABE in decentralized Disruption-tolerant Networks (DTNs) presents some security and protection challenges respecting the quality denial, key escrow, and in addition attribute coordination issued from changed powers. This paper proposes a protected data recovery approach utilizing Ciphertext-Policy Attribute-Based Eneryption used for DTNs where numerous key authorities deal by means of their attributes freely. The framework turns out to he more secure by applying ABE and various characteristic encryption confirmations**

IndexTerms **- disruption-tolerant network; identity-base encryption; attribute-based encryption; Ciphertext-policy attribute-based encryption.**

I. INTRODUCTION

In numerous military network situations, contacts of wireless devices carried by soldiers are also briefly disconneeted by jamming, environmental reasons, and mobility, particularly when the soldiers work in threatening situations. Disruption-tolerant network (DTN) technologies are getting successful solutions that enable nodes to communicate with one another in these dangerous networking environments. Ordinarily, once there is no limit to end association between a source and a destination pair, the messages from the source hub might need to go to inside of the middle of the intermediate hubs for an impressive amount of time until the association would be eventually built up.

In some application scenarios, there are some 'storage nodes' (which is also mobile or static) within the network wherever helpful knowledge is held on or replicated so other regular mobile nodes (such as users) will access the necessary data quickly and efficiently. . A demand in some security-critical applications is to design an access system to protect the confidential knowledge stored within the storage nodes or the secret messages text moved from end to end the network.

Modern distributed data systems need flexible models of access control that go past optional, compulsory and role-based access control. Recently projected attribute-based models, define access control strategies supported environment, the completely different requester attributes, or the information object. Another one is the current trend of service-based data systems and storage outsourcing need increased protection of knowledge together with that cryptographically enforced access management strategies. The thought of Attribute-Based encryption (ABE) fulfills the same needs. It provides an elegant approach of encrypting knowledge specified the encryptor already defines the set of attribute that needs to pass by the decryptor so as to decrypt that particular encrypted cipher-text. Since Sahai and Waters [1] projected the fundamental ABE theme, many additional advanced schemes are developed, like most notably Ciphertext-Policy ABE schemes (CP-ABE). In these schemes, a generated ciphertext is related to an access policy and also the secret key of user is related to a collection of attributes. Only the holder of secret key (i.e. owner) will decrypt the given ciphertext only if the attributes that are related to his secret key completely satisfy the access poliey related to the ciphertext.

CP-ABE could be a public-key cryptography primitive that was projected to resolve the precise issue of fine-grained access control on shared information in one-to-many communications. In CP-ABE, every user gets assigned a collection of attributes that are embedded in the authorized user's private key. A public key component is already defined for every authorized user. When the message or file is encrypted, the encryptor encrypts the private message on set of attributes by selecting an access structure via encrypting with the equivalent user's public key components. When the users set of attributes satisfy the ciphertext access control then and then only users are able to decrypt that ciphertext of message. The ciphertext sizes and public key in CP-ABE are simply linear to the quantity of attributes and also the quality of the access arrangement. This arrangement is not depend on the set of users in system. Moreover, CP-ABE is unaffected by collusion attacks from unauthorized users of these good properties create CP-ABE very appropriate for fine-grained knowledge access control on untrusted storage.

The problem of using the ABE to DTNs still produces many privacy and security challenges. As a result, of most of the users might modify their associated attributes at some point (for example, moving their area), or many personal keys can be negotiated, key revocation (or modification) for each attribute is important for secure and protected systems development. Though, this drawback becomes harder, particularly in ABE [12], [13] systems, therefore of each attribute is possibly shared by various users.

Smt. Kashibai Navale College of Engineering, Pune-41.
Head
Department of Computer Engineering
SKNCOE, Pune 411041

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Relay Selection in Multihop Wireless Network

[1] Shraddha Patil, [2]Pankaj Chandre
[1]PG Scholar, [2]Assistant Professor
[1]Dept. of Computer Engineering, Flora Institute of Technology, Pune, India

Abstract - **We will consider the two important aspects of the OR. First Candidate node selection and second Prioritization of the selected nodes in the candidate set. In proposed work we consider the Leftover energy of the nodes as well as the security parameter of the node by adding a security value to each node at time of deployment of the nodes. We use the secure value and the leftover energy of the node for the candidate selection and the prioritization of the selected relays. Lastly compare proposed system with existing system to demonstrate the results.**

Index Terms - **OR, WSN, ExOR protocol, Opportunistic routing, Trustworthiness, Leftover Energy.**

I. INTRODUCTION

Traditional wireless sensor networks were considered as point to point connected nodes by neglecting the broadcast nature of wireless network. Currently opportunistic routing has attracted lot of attention from the researchers in the area of networking. In OR major concern is the candidate selection at the runtime to forward the packet to the destination. Many of the OR protocol has concentrated on the research in the relay selection and neglected the security parameter during selection. Existing work proposed the relay node selection algorithm based on the Leftover energy of the node. Wireless sensor network (WSN) are everywhere nowadays. In WSNs, thousands of physically embedded sensor nodes are distributed and more modern networks and they used in most applications, it is not possible to change battery each and every time whenever it degrade its value. Energy efficiency for transmitting data, the existing energy-efficient routing protocols are used to find the minimal energy path between a source and a destination that means a sink to achieve optimal energy consumption [3]–[5].

II. RELATED WORK

ETX is used by ExOR [1] extremely opportunistic algorithm to select a candidate forwarder set. It can provide better performances over traditional routing protocols [5]. But there are still some problems in ExOR. After a transmission, all the nodes in the candidate set have to wait for the forwarding of the nodes with higher priority in order. It is not an efficient way to do the spatial reuse. Moreover multicast is not implemented.

MORE [2] randomly mixes packets before forwarding them. This action of forwarding of packets randomness ensures the routers that overhear the same transmission will not forward the same packets. In other words, MORE introduces network coding to OR. MORE support both unicast and multicast. Previously we are using MORE to forward an elected packet to choose relay node. Using ETX in MORE is not suitable because MORE is a versatile scheme, unlike ExOR which is an unfair scheme to use the nodes based on their priorities. It does not need ETX to select candidate nodes with priorities, and treat them based on the different priorities. Moreover, it does not introduce error control and rate control schemes.

III. PROPOSED SYSTEM

A. Structure

In proposed system we will implement the candidate selection using Leftover energy of the nodes and the trust value assigned / calculated by the nodes in the network. We have kept the existing system of Leftover energy based candidate selection. In our proposed work our aim is to achieve the better results for candidate selection with the improved packet delivery ratio and minimum end to end delay. It consists of main phases:

TBEER selection scheme
Phase-2 or Leftover energy of nodes
Phase-3 or Trustworthiness of nodes
Phase-4 or Candidate selection
Phase-5 or Prioritization of Relays

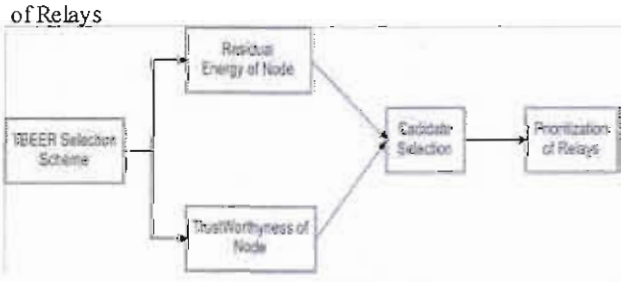

Fig1. Architectural Block Diagram

Smt. Kashibai Navale College of Engineering Pune-41
Head
Department of Computer Engineering
SKNCOE, Pune 411041

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Scalable and Secure Sharing of Personal Health Records in Web Using Attribute-Based Encryption

[1]Reshma S. Sapakal,[2]Pankaj R. Chandre
[1] Student ME(Computer),[2]Prof. ME(Computer)
[1]Department of Computer Engineering
[1]Flora Institute of Technology, Khopi, Pune, India

Abstract– **Traditional paper-based health records may result in wastage of paper. Now days internet bas grown very rapidly. There are more advances in medical and information technology. So using benefits of both traditional health record cau be transfer to electronics health record (EHR) and allow medical people to do their activities in nnmerous ways. Existiug centralized Personal Health Record (PHR) systems has efficiency and security problems. To overcome this problem Personal Health Records are outsourced to third party semi trusted data servers over the web to provide distribnted environment. However there is major risk of privacy of personal health information exposed to third party server and to unauthorized users. To assure privacy and security one efficient way is to encrypt PHR before outsourcing it to the internet. There are other issues like scalable key management, efficient user revocation and fine grained access. To achieve scalable and fine-grained access Attribute-Based Encryption is used to encrypt PHR. PHR system is consider as multiple owner, multiple user system. For reducing key management complexity, users are divide into multiple user domains like public and personal. While providing high degree of privacy proposed system shows security, scalability and efficiency from its result analysis.**

IndexTerms– **Electronic Health Record, Personal Health Record, Attribute Based Encryption, Third party Servers, Privacy and Security**

I. INTRODUCTION

In field of communication, communication is fastest growing area. Using advantage of it allow user to achieve "any time, anything and anywhere" access to required medical information. The traditional paper-based health records generate an extensive paper waste. So there is great interest of moving from paper-based health records to electronic health records (EHRs). With the growth of information and medical teehnology, health records are transformed from traditional paper records to electronic medical records which are widely used. It leads to the development of a new exchange system of medical information which was named PHRs[1]. PHRs is a new patient-centric health information system. For storing information conveniently and efficiently, medical information is outsourced the third-party semi trusted servers over the internet. So PHR systems are widely deployed and hence improve people's daily life compared with traditional paper-based systems for its interesting advantages like high efficiency, better accuracy, and broader availability.

According to a recent report [4], there are more than 77% patients and 70% physicians who want to get involved with PHR systems. The Health Insurance Portability and Accountability Act (HIPAA) has been established for years to regulate PHR related operations [5]. In patients' sensitive Personal Health Information (PHI) contains highly-private information like social security number, address, and date of birth, all of which can be easily used by attackers for malpractice [6], [7]. Several medical records theft and stolen incidents [8] have been reported recently where attackers steal and publish patient health information to a third party over the Internet. According to a recent survey [9], researchers estimate the economic impact of medical identity theft in the United States at 41.3 billion dollars per annum. More than 78% of participants in [10] worry about the leakage and misuse of their personal information and health condition, so that they fear to use of PHR systems.

For providing privacy and security to the health information, information is encrypted before outsourcing it over internet. Basieally, the PHR owner i.e. patient herself should decide how to encrypt her PHR and to allow which set of users will access the information. A PHR will be available to the users who are given the corresponding decryption key, while remain confidential to the rest of users. Furthermore, the patient shall always retain the right to not only grant, but also revoke access privileges when they feel it is necessary [11].

Traditional public key encryption PKE[1] is not useful here as it has disadvantages like key management complexity, fine-grained access, and scalability. To overcome these problems Attribute Based Encryption (ABE)[2] is good solution. Chase and Chow[3] proposed a MA-ABE solution referred to as CC MA-ABE program. Generally, PHR service allows a user to create, manage, and control her personal health data in one place through the web, which has made the storage, retrieval, and sharing of the medical information more efficient. As PHR is multi owner system that encrypts their PHR according to their own way. Here each user obtains keys from every owner whose PHR she wants to read would limit the accessibility since patients are not always online. An alternative is to use a central authority (CA) to do the key management on behalf of all PHR owners.

Smt. Kashibai Navale College of Engineering Pune-41.
Head
Department of Computer Engineering
SKNCOE, Pune 411041

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16-17 Jour

Malware Detection In Mobile Through Analysis of Application Network Behavior By Web Application

[1]Himgouri P. Barge,[2]Pankaj R. Chandre
[1] Student ME(Computer),[2]Prof. ME(Computer)
[1]Department of Computer Engineering
[1]Flora Institute of Technology, Khopi, Pune, India

Abstract– **This system detects the mobile malware by analyzing suspicious network activities through the traffic analysis. In our system, the detection algorithms which we are using are works as modules inside the Open Flow controller, and the security rules can be imposed in real time. Here, we are using new behavior-based anomaly detection system which is used for identifying meaningful deviations in a mobile application's network behavior. Here, we are trying to detect a new type of mobile malware with self-updating capabilities. This kind of malware neither identified by using the standard signatures approach nor applying static or dynamic analysis methods. The detection is completely based on the application's network traffic patterns only. Here we are using Semi-supervised machine-learning techniques for learning the normal behavioral patterns.**

IndexTerms– **Android Mobile Malware, Network Traffic, Machine learning, Smart-Phones Security.**

I. INTRODUCTION

Now a days there is momentous growth in the popularity of smart phones and the number of available mobile applications, the amount of malware that damage users or compromise their privacy has also increased[1][2]. Smart phones are most widely used in every aspect of our life including personal, official, political, social and educational. That's why, smart phones are used not only for making calls, but also making important business decisions in professional life, internet services such as online shopping, online ticket booking, online social network etc. Large numbers of apps are available for various mobile operating systems to these services. Net banking is one of the most increasing areas where mobile devices (i. e. banking app.) are widely used now days.

Keeping mobile secure is important task, so secure the mobile devices from malicious files and applications. There can be three properties of security based data security:

1. Confidentiality is nothing but preventing the data from unauthorized users. The data which is stored in mobile device should not be used by anyone else without mobile user.
2. Integrity means prevention of modification of information or data by unauthorized user.
3. Availability is nothing but preventing unauthorized access of information. Mobile's applications and its services must be available to the authorized mobile user at any time.

Use of smart phones for sensitive and important services like net banking is increasing state so mobile security is most important. Mobile security is very challenging task because the malicious applications are increasing every day. So basic understanding about various viruses and malwares for mobile user is very important.

Malware is a software program or mobile application which exhibits malicious behavior [3][4]. This is a general term used to refer to number of intrusive applications and are characterized into virus, bonnets, worm, Spyware, Adware, Root kit as well as Trojan horse based on their behavior of affecting the mobile device. Malwares are intentionally used by black hat hackers for accessing the personal data and sensitive information of a mobile device. They also uses the malwares to collect the sensitive or important data of a corporate or government websites.

A virus is a program that destroys the personal data as well as applications of mobile device. Viruses have the characteristics of self-modification, encryption which makes its detection very difficult to an antivirus application. A bonnet is very bad threat to the information society at present. It can control Internet Relay Chat (IRC) or can also send spam emails. Bonnets are used to steal the data from a computer such as different login IDs, application serial number, and financial information such as credit cards number etc. worms are the stand alone software applications that may runs without a host and can have the capacity to self –replicate and propagate around in the network. Worms can also used by the bonnets for controlling the computers connected to internet which are used by spam sender for sending junk emails. The worm is risk-free because it does not perform any malicious activity but because of the continuous searching for another Bluetooth device, the battery life will reduces. A spyware is a software program that collects person and organization information and can also send the information to another entity without the permission of user. Key logger is Spyware software which is used to remember the key struck on a keyboard. It remembers all key interactions without the permission of user. Hackers use this software to obtain passwords and usernames of a computer. Trojan horse is a category of Spyware that can arrive at a computer system via online games, internet driven applications.

It can provide the access of computer which is targeted to a hacker that can use the machine as a part of bonnet, can steal the sensitive data, it can also download any malicious files, and it can upload any file into target machine. It can also

Head
Department of Computer Engineering
SKNCOE, Pune 411041

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Department of Computer Engineering SKNCOE Pune 411041

Head

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Real Time Hand Gesture Recognition System Using Webcam for Convenient HCI

#1Abhishek Bhavarthi, #2Sayali Dhanrale, #3Bhavna Mahalle, #4Ashwini Kalane,
#5Prof. V.V. Dakhode

#1bhavarthi.abhishek@gmail.com,
#2 sailydhanrale14@gmail.com,
#3 bhavnamahalle01@gmail.com,
#4 ashukalane@gmail.com

#1234Department of Computer Engineering,
#5Assistant Professor, Department of Computer Engineering

Smt Kashibai Navale College of engineering,
Pune 411041, India.

ABSTRACT

With the large use of computers, Human computer Interaction has become an important part of our daily life. Gesture recognition enables humans to communicate with the machine and interact without auy peripheral device like mouse, keyboard etc. Compared to many existing interfaces, hand gestures have the advantages of being easy to use and intuitive. Gestures are used widely for different applications on different domains. This includes human-robot interaction, sign language recognition, interaetive games etc. The essential aim of building hand gesture recognition system is to create an interaction between human and computer where the recognized gestures can be used for controlling a computer. With the help of this technique one can pose a hand gesture in the vision range Of a computer and desired action is performed by the system. Simple web camera is used for computer vision, which helps in monitoring gesture presentation.

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Index Terms: Human Computer Interaction (HCI)

I. INTRODUCTION

In HCI there is communication between humans and machine without need of any physical contact with the device and this can be achieved by eliminating peripheral devices like mouse, keyboard. In this project there is interaction between humans and computer as we are giving input to computer through gestures. Much system uses sensors for recognition of gestures. But there is limit on distance and also they are costly. MPU 6050 sensor is used in mobile. But its range is only up to 0.2 m to 0.5 m, so there is limit on distance in sensors. But we can increase distance using webcam. It is easily available and price is also low as compared to sensors. So we decided to use webcam instead of sensors.

II. MOTIVATION

Sensors cover limited distance and also they are costly. So here we decided to use webcam instead OS sensors so that it will overcome disadvantages of sensors.

Design a real time hand gesture recognition system using webcam instead of sensors increasing efficiency between human and computer interaction over a long distance. The essential aim of building hand gesture recognition system is to create effective and Convent an interaction between human and computer where the recognized gestures can be used for controlling a computer.

III. LITERATURE SURVEY

In paper [1] presents the design and implementation of a system of accelcrometer-based hand gesture recognition. This system will be embedded within a modern remote control to improve human-machine interaction in the context of digital TV of Argentina. Models such as the multilayer perceptron (MLP) and the support vector machine (SVM) are types of artificial neural networks (ANNs) that attempt to reproduce the problem-solving process of the brain. The drawback of

Smt Kashibai Navale College of Engineering Pune-41.
Head
Department of Computer Engineering
SKNCOE, Pune 411041

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Information Fusion towards Multi-sensor Data using Cognitive Computing Approach

[1] Parikshit N Mahalle, [2] Saudagar S Barde, [3] Poonam N Railkar, [4] Pankaj R Chandre

[1,2,3,4] Department of Computer Engineering, Savitribai Phule Pune University,
Smt. KashibaiNavale College of Engineering,
Pune, Maharashtra, India

Abstract - As Internet of things and allied applications are spreading their facets at faster rate, use of sensors is increasing rapidly. Every sensor produce big amount of data which needs processing, reliable delivery. There are many use cases where information is to be sensed from multiple sensory resources and fused together. An objective of information fusion from multiple sources is to interpret single parameter for effective decision making. In the sequel, this paper presents an overview of information fusion and its mathematical model. Next part of the paper presents motivation and challenges in information fusion for different uses of Internet of Things. Comprehensive literature survey and evaluation of the literature survey is also preseuted in order to compare existing potential works with respect to performance parameters like reliability, scalability, computational time etc. The proposed data science approach using cognitive computing is also presented and discussed in detail. Experimental results of information fusion for one sensor and three sensors are also presented which produces significant contribution towards information fusion. Results show that there is marginal difference in the access time to sense information from one sensor and multiple sensors. Finally, paper also presents challenges and future outlook.

Keywords - *Data fusion, Information fusion, Multi-sensor.*

1. Introduction

The integration of data and knowledge from several sources is known as data fusion [1]. Data fusion methods are used extensively for target tracking, automated identification of targets, remote sensing, battlefield surveillance, condition monitoring of weapons, soldiers and many more [2]. Techniques to combine or fuse data are drawn from a diverse set of more traditional disciplines, including digital signal processing, statistical estimation, control theory, artificial intelligence, and classic numerical methods etc. [2]. Multiple observations if correctly fused and associated then the combination of two or more sensors provides a better determination of location that could not be possible if sensors are used independently [3]. Figure 1 show data fusion of radar and FLIR sensors. In smart environments, there are locations equipped with variety of multiple sensors and often these sensors serve distinct purposes and respective data is processed by separate systems and set of algorithms. Consider the use case smart building where occupancy or temperature sensors are used for lighting or heating efficiency can be useful to the security system or vice versa. Recent standard such ZigBee make it possible to receive and aggregate data from multiple sensors; however integrated information processing with diverse set of sensor data is a big challenge [4]. The fundamental problem in remote sensing and GIS application is the way the collected information is processed. In the sequel, information fusion is concerned with how this multi-sensor data can be processed to increase the relevance of this big data. Aim of this project is to design and develop lightweight and reliable information fusion method with knowledge ecosystem.

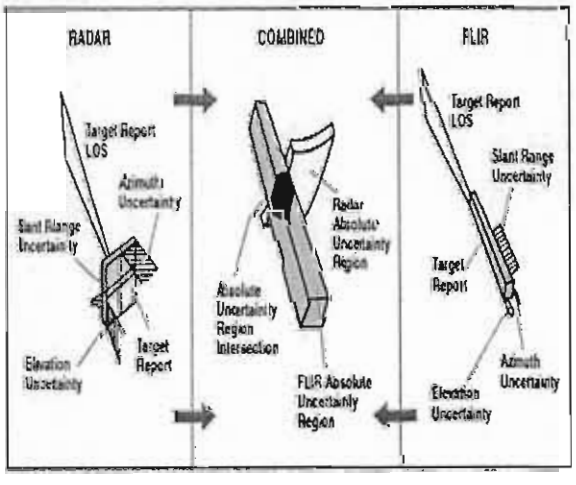

Fig. 1.Schematic Representation of Data Fusion of Two Sensors (RADAR and FLIR) [5]

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INTERNATIONAL JOURNAL ON EMERGING TRENDS IN TECHNOLOGY

Distributed Access Control and Authorization (DACA) for Internet of Things

Parikshit N. Mahalle[1], Sandesh Mahamure[2], Poonam N. Railkar[3] Pankaj R. Chandre[4]

aalborg.pnm@gmail.com [1], s.mahamure@gmail.com, poonamrailkar@gmail.com [3] pankajchandrc30@gmail.com
Department of Computer Engineering[1, 2, 3, 4]
Smt. Kashibai Navale College of Engineering, Pune, India[1, 2, 3, 4]

***Abstract*—**In the 21st century, devices surrounding us are increasing at faster rate and these devices are providing contextual and adaptive services to all the stake holders. This paradigm of communication computing which is distributed in nature is referred as Internet of Things (IoT). Equally, time is also the crucial factor for any business use cases. To run a successful business the resource and time need to be efficiently managed. Now the atomization in all the fields of engineering helps to save time as well as money. IoT communication helps to reduce time but now we reach one step ahead of this traditional communication. This IoT needs to be intelligent and can be viewed as an intelligent device to device communication network in which devices are connected via the Internet. Security in IoT in terms of access control and authorization is very important. Controlling access to information is usually done by defining access control model, which decides who is allowed and who is not. In the sequel, this paper presents proposed Distributed Access Control and Authorization (DACA) model for IoT. This paper also gives idea about challenges and issues faced for implementation of DACA. Relational calculus based mathematical model for DACA is also presented and discussed in the next part of this paper. Implementation of DACA shows that the local device access time and remote device access time requires nearly same amount of time which significant contribution of this paper. This finding proves that the proposed DACA model is most suited for the IoT.

Keywords*— *Access Control, Automization, DORA, IOT, M2M.

I. INTRODUCTION

In the 21st century, time is the crucial factor for any business. To run a successful business the resource and time need to be efficiently managed. Now the atomization in all the fields of engineering helps to save time as well as money. Machine to Machine (M2M) communication helps to reduce time but now we reach one step ahead of this traditional communication. This M2M needs to be intelligent. IoT can be viewed as an intelligent device to device communication network in which devices are connected via the internet. In a simple way, IoT can be viewed as extensions to existing network in which devices are added to the network.

The figure 1, gives mapping TCP/IP suite to respective layered objectives with respect to IoT. The motivation of application layer is to provide communication channel for devices. It also provides service and device discovery framework for the applications. The Transport and internet layer has the same motivation i.e. peer to peer networking but these layers gives service at different level and finally media access provided by link layer. This stack gives idea about functioning of each TCP/IP layer.

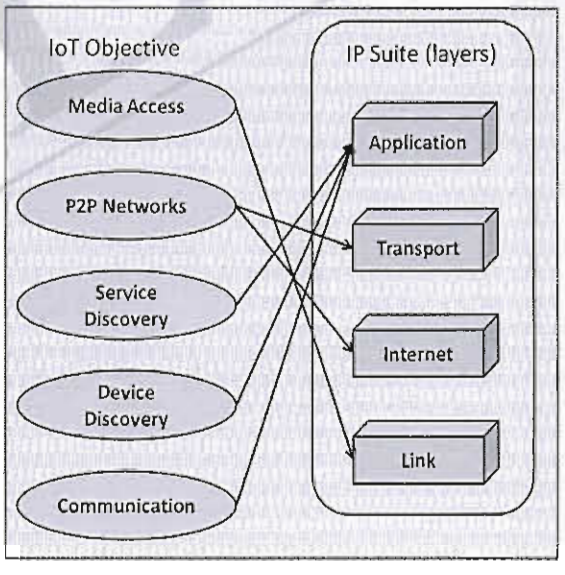

Fig. 1. Layerwise objective for IoT

The intelligent network helps for good decision making and efficient prediction making. This term was coined by Aston Kevin in 1991. Most of the people confused between embedded system and IoT. IoT is a bigger picture of embedded system. IoT is the convergence of various technologies and domains as well like Hadoop, Bigdata, business intelligence, image processing and so on. Now IoT becomes key factor in various domains like finance,

Smt. Kashibai Navale College of Engineering Pune-41.
Head
Department of Computer Engineering
SKNCOE, Pune 411041

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Rising Issues in VANET Communication and Security: A State of Art Survey

Sachin P. Godse
Research Scholar: Department of Computer Engineering
Smt. Kashibai Navale College of Engineering, SPPU, Pune, India

Parikshit N. Mahalle
Professor: Department of Computer Engineering
Smt. Kashibai Navale College of Engineering, SPPU, Pune,India

Sanjeev J. Wagh
Professor: Department of Information Technology
Government College of Engineering Karad

***Abstract*—VANET (Vehicular Adhoc Network) has made an evolution in the transportation hi-tech system in most of the developed countries. VANET plays an important role in an intelligent transportation system (ITS). This paper gives an overall survey on the research in VANET security and communication. It also gives parameters considered by the previous researchers. After the survey, it considered the authentication and message forwarding issues required more research. Authentication is first line of security in VANET; it avoids attacks made by the malicious nodes. Previous research has come up with some Cryptographic, Trust based, Id based, and Group signature based authentication schemes. Speed of authentication and privacy preservation are the important parameters in VANET authentication. This paper presented the AECC (Adaptive Elliptic Curve Cryptography), and EECC (Enhanced Elliptic Curve Cryptography) schemes to improve the speed and security of authentication. In AECC, the key size is adaptive, i.e. different sizes of keys are generated during the key generation phase. Three ranges are specified for key sizes: small, large, and medium. In EECC, added an extra parameter during the transmission of information from, the vehicle to the RSU for key generation. This additional parameter gives the information about the vehicle ID, and the location of the vehicle to the RSU and the other vehicle. Under the communication issue of VANET, the paper gives priority based message forwarding for improving the message forwarding scheme. It handles emergency situations more effectively.**

Keywords*—*Vehicular Adhoc Network (VANET); Adaptive Elliptic Curve Cryptography (AECC); Enhanced Elliptic Curve Cryptography (EECC); authentication; message forwarding

I. Introduction

The VANET becomes a milestone in an intelligent transportation system. It helps to automate the traffic monitoring system more efficiently. In VANETs nodes, there is nothing, but vehicles and the RSU (Road Side Unit), which communicate with each other. RSU's are deployed on the roads, and help to maintain the communication when the vehicles are not in the coverage of each other. There are different issues in VANET. Due to an open medium of VANET, the outside nodes can easily, access the network. Security is a major challenge in VANET. Malicious nodes can carry different attacks to misguide the driver. Communication is the heart of all networks; in VANET, the nodes are moving fast so, there is the need of a faster and smart communication mechanism, to handle emergency situations [11]. In this paper, Section 1 gives an introduction of VANET, communication. Section 2 gives a detailed literature survey of the authentication and communication issues in VANET. Section 3 gives an analysis about the research parameter considered by the previous researchers, and the area for new research. Section 4 gives the objectives and solutions for the same.

A. VANET Architecture

The VANET architecture is shown in Fig. 1. It shows the scenario of the vehicular adhoc network, and the different ways of communication in VANET. There are three ways of communication, namely, V2V (Vehicle to Vehicle), V2I (Vehicle to Infrastructure), and I2V (Infrastructure to Vehicle) [1].

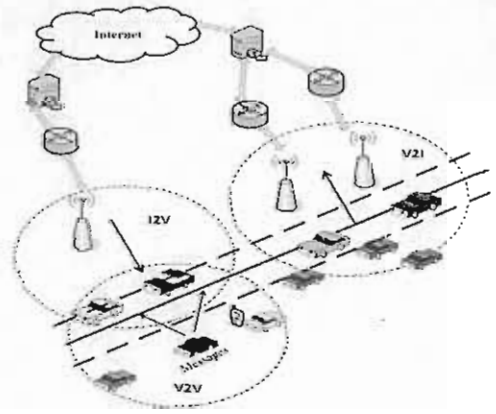

Fig. 1. VANET architecture [1].

B. Communication in VANET

1) **Wireless Access in Vehicular Environment (WAVE)**: Lots of efforts have been made to design the new standards for the services and the interfaces for VANET. These standards form the basis for a wide range of applications in the vehicular network environments. A set of standardized services and interfaces defined under WAVE is shown in Fig. 2. These services and interfaces cooperatively enable a secure V2V and V2R communications in a rapidly changing communications environment where communications and transactions need to be completed in a short time frame.

Smt. Kashibai Navale College of Engineering Pune-41.
www.ijacsa.thesai.org
Head
Department of Computer Engineering
SKNCOE, Pune-411041

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SMART CITY EMERGENCY SERVICES RESPONSE SYSTEM

[1] Rachana A Satao, 2 Malati Jadhav, [3] Madhu Jagdale, [4] Jatin Bhore
[1] Computer DEPARTMENT: SKNCOE, [2] Computer DEPARTMENT: SKNCOE, [3] Computer DEPARTMENT: SKNCOE, [4] Computer DEPARTMENT: SKNCOE

ABSTRACT: Traffic overcrowding has become a biggest problem in this technical era. There are many reasons for this traffic overcrowding. Among all, one of the reason is rapid growth of the population. Resulting in increase of the vehicles on road. The increase in the number of personal and commercial vehicles also causes traffic overcrowding. This creates a problem for the ambulance to reach the hospital in minimum time. Due to the rapid growth of technology and engineering field the life of the mankind has got automated. Automation is the process of monitoring the cars through centralize server to serve the purpose of the human. All cars are connected to the internet and sends run time data to the centralize server. This paper is based on the cars communication with cloud to save the human life at critical situation. This paper is to notify the cars which are on the route of the ambulance, so that in run time cars could respond to the arrival of the ambulance. According to the positioning of the ambulance cars can give way to the passing ambulance. Thus this paper will act as a life saver.

1. INTRODUCTION

With the increase of road networks and vehicles, traffic congestion has become an enormous problem in all mega-cities in the world. During rush hours, it is very common for an emergency vehicle to be stuck in long vehicle queue for several hours. Traffic congestion has huge impact on public health and national economies. However, traffic congestion can be disastrous following a catastrophic event by disrupting the rescue and recovery operation and delaying the transportation of emergency deliveries. A good management strategy in post disaster scenario requires notifying all the vehicles on the way of the emergency vehicle so they can move aside and give way to the emergency vehicles.

"A world where physical objects are seamlessly integrated into the information network, and where physical objects can become active participants in business processes. Services are available to interact with these 'smart objects' over the Internet, query, and change their state and any information associated with them." Currently the Internet of Things (IoT) is focused on architectures, protocols, and networking for the logical interconnection of different things, infrastructure deployment, and creation of value-added services. The majority of the IoT products, services, and platforms are supported by cloud-computing platforms. With the IoT being a multidisciplinary ecosystem, it is now being utilized in connection with scenarios demanding real-time data processing and

Head
Department of Computer Engineering
SKNCOE, Pune 411041

Kashibai Navale College of Engineering
Pune-41.

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Predictive Analysis of Premier League Using Machine Learning

Siddhesh Sathe[1], Darshan Kasat[2], Neha Kulkarni[3], Prof. Rachana Satao[4]

B.E. Students, Dept. of Computer Engineering, Smt. Kashibai Navale College of Engineering, Pune, India[123]

Assistant Professor, Dept. of Computer Engineering, Smt. Kashibai Navale College of Engineering, Pune, India[4]

ABSTRACT: Machine Learning allows us to gain insigbt into data using which we aim to cover feature extraction for premier league football predictive analysis and perform machine learning to gain insight. The system will be performing our analysis based on our featured dataset and implement multiple classification algorithms such as support vector machine, random forest and naïve bayes.

KEYWORDS: Machine Learning, Data Mining, Classification Algorithm, Feature Extraction, Support Vector Machines, Random Forest, Naïve Bayes.

I. INTRODUCTION

There are 2.3 billion football fans worldwide and 1.2 billion fans of premier league with every match being broadcasted in around 730 million homes [1] premier league is undoubtedly the most followed football league. Sports analytics have been successfully applied to baseball and basketball however there is a need to find out if machine learning can provide insights into the game adored by billions. We will cover existing solutions in terms of feature selection, models and analyse our results. Our system will classify each season which starts in May and ends in August next year in which each team plays 38 matches from which 19 are played on home field and 19 on away field.

II. LITERATURE SURVEY

Many attempts have been undertaken to uncover patterns based on data of previous seasons, player performance and match statistics. CS229 Final Project from autumn 2013 by Timmaraju et al. [2] used match stats such as corner kicks and shots of previous matches achieving accuracy of 60% but rather limited scope of parameters for broader classification of data.

Research done by Ben Ulmer and Matthew Fernandez of Stanford University [3] used game day data and current team performance achieving error rates of linear classifier (.48), Random Forest (.50), and SVM (.50).

Nivard van Wijk [4] uses the betting concept predicting winner by proposing two models prediction i.e. toto model and score model. This paper aimed to explain the prediction system mathematically using methods and formulas specified in the article. They obtained accuracy of 53% on their model.

Work of Rue et al. [5], used a Bayesian linear model to predict outcome. They used a time-dependent model taking into account the relative strength of attack and defense of each team.

Joseph et al[6] used Bayesian Nets to predict the results of Tottenham Hotspur over the period of 1995-1997. As it relied upon trends from a specific time is was not extendable to later seasons, and they report vast variations in accuracy, ranging between 38% and 59%

The paper on using FIFA game data by Leonardo Cotta et al [7] which compared and contrasted between the Brazilian and German National teams in 2014 and FC Barcelona's distinguished style in the 2012/13 season. This gave us a new direction to pursue our research leveraging the data of previous seasons with that from Fifa.

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Abandoned Object Detection via Temporal Consistency Modelling And Back-Tracing Verification for Visual Surveillance

Vishal Malpure[1],Onkar Patil[2], Priyanka Raut[3], Niranjan Pimpalwadkar[4], Prof.V.S.Deshmukh[5], Prof. Vedashree Gokhale[6]

BE Students,Department of computer engineering, Smt.Kashibai Navale College of Engineering, Savitribai Phule Pune University, Pune, India

Asst.Professor,Department of computer engineering, Smt.Kashibai Navale College of Engineering, Savitribai Phule Pune University, Pune, India

Asst. Professor, Department of computer engineering, Smt.Kashibai Navale College of Engineering, Savitribai Phule Pune University, Pune, India

ABSTRACT: Security of public places is a considerably burning issue. Day by day the issues of mass killing due to bomb explosions are increasing. These bombs are mostly disguised in bags, luggage, etc. The common strategy of sleeper cell is to leave bags or belongings in public area. The security in charge cannot be always vigilant over Camera's footage, hence if an automation is given to Camera itself; that will lessen the chances of such risk. For that the proposed system is processing the video with the image processing using OpenCV on .NET platform. If a person is dropping off some bag or any such suspicious thing and leaving it running away, the system will catch this activity and if such bag is immobile for certain time span decided by analyzer, then it will give notification to authority as abandon object using Image processing.

I. INTRODUCTION

Currently,the proposed system is designed in such a way that it accepts the video input given by the remote operator.It does not support thc real time application i.e the real time video captured by the cctv camera footage.

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Survey: Secure data storage in the cloud with Decentralized Access Control

Sohail A. Khan[1] & Dr. Shafi K. Pathan[2]
[1,2] Savitribai Phule Pune University, Smt. Kashibai Navale College of Engineering, Pune, India

Abstract-- *Cloud computing is a rising computing paradigm in which resources of the computing infrastructure are provided as services through the Internet. Cloud computing is the delivery of multiple computing services through the Internet. Cloud computing provide various services such as software, applications and information over the cloud on demand. Cloud has ability to provide dynamically scalable access for users, and the ability to share resources over the Internet. Cloud checks the authentication of the user without knowing the users identity. The main aim of system is secure data storage on clouds. A basic solution is to encrypt data files, and then upload the encrypted data into the cloud to preserve data privacy. This paper presents a survey of existing techniques with the novelties highlighting the need of intelligent sharing and validating technique for storing files on the cloud. This paper is motivated by arising need to provide high quality of security for the user with validation by using third party authority. In proposed system we add third party authority with decentralized access management theme to validate integrity of the files stores on cloud.*

Keywords-- *Cloud storage, access control, authentication, attribute-based encryption.*

Introduction

Recently cloud computing is gaining a lot of attention in the field of academic and industrial worlds. Cloud computing is one of the greatest platform which provides storage of data in very lower cost and available for all time over the internet. Cloud computing is also known as Internet-based computing, where by shared resources, software and information are offered to computers and devices on demand. Main objective of Cloud computing is to deliver multiple computing resources through the Internet. Cloud computing mainly arise attention in the field of hardware virtualization, Web administrations, dispersed computing, utility computing and framework automation. Now a day instead of keeping data on our own hard drive or updating applications, people use a service over the Internet, at another location, to store your information or use its applications. One of the most primary services presented by cloud providers is data storage.

Cloud computing composed of many hardware and software resources are provided to users and made available on the Internet which are managed by third-party services. Data owners or providers can remotely store their data in the cloud to take benefit from on-demand high-quality applications and services from a shared pool of configurable computing resources. Preserving Identity privacy is one of the most significant problems for the wide deployment of cloud computing. The new data storage paradigm brings about many challenging design issues which influence on the security and performance of the overall system. One of the biggest concerns with cloud data storage is that of data integrity verification at untrusted servers. The system consists of various members such as group of user, third party authority (TPA), and key distribution center (KDC) and cloud server, Trustee.

Group of users: Number of user such as managers, employee's tec.
Third party authority (TPA): main objective of third party authority to verify the integrity of the data stored in the cloud.
Key distribution center (KDC): main objective of Key distribution center to generate and distribute keys to users.
Cloud server: To provide data storage service and has significant storage space and computation resources.
Trustee: it is used to generate the token based on user request.

Related Work

In [2], author proposed a flexible distributed storage integrity auditing mechanism to achieve the integration of storage correctness insurance and data error localization. The identification of misbehaving server is performed by using the proposed technique. Proposed scheme is an effective and flexible with explicit dynamic data supports which includes block update, deletes, and append by utilizing the homomorphism token and distributed erasure-coded data.

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Head
Department of Computer Engineering
SKNCOE, Pune 411041

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A Survey on Predicting Suitable Crops for Cultivation Using IoT

Shridhar Mhaiskar[1], Chinmay Patil[2], Piyush Wadhai[3], Aniket Patil[4], Vaishali Deshmukh[5]

B. E Students, Dept. of Computer Engineering, Smt. Kashibai Navale College of Engineering, Pune, India[1234]

Asst. Professor, Department of Computer Engineering, Smt. Kashibai Navale College of Engineering, Pune, India[5]

ABSTRACT: The Internet of Thing (IoT) is playing a vital role in everyday life of human being. It is being used in almost every domain. The aim of the system is to predict a crop which can be cultivated in order to give maximum yield after harvesting. In order to get maximum yield it is very necessary that the crop which is going to be cultivated have suitable climatic and soil conditions. The proposed system works on two domains, IoT and Machine Learning. The system predicts the values of moisture, temperature and Ph value from the historical data which is generated by respective sensors. Crop production depends on various factors which includes biological characteristics, environmental conditions, soil attributes. Applying appropriate data mining techniques on data collected from sensor devices will be used for the recommendation of the suitable crops for cultivation.

KEYWORDS: IoT, Machine learning, prediction, K means, ARIMA Model, KNN algorithm, Precision agriculture, Raspberry pi3, sensors.

I. INTRODUCTION

Preeision agriculture is an upcoming field which provides an alternative for traditional crop selection techniques. Traditional crop selection method mostly relies on farmer's crop instincts and intuition's. Combining IoT and data mining with traditional method would increase the efficiency of erop selection and thus will improve the efficiency of selecting crop.

Agriculture plays a vital role in Indian economy. [1] Agriculture is considered as a primary means of livelihood for about 58% of the rural India. The green revolution which introduced various high yielding seeds and fertilizers undoubtedly leaded to increase in crop productivity. However, for the past 20 years scientific contribution in fields of agriculture is low compared to the technological inventions in services and manufacturing industries. [2] Agriculture is now currently 15% of GDP as per Government of India Statistics.

Indian farmers still follow the traditional way for selecting crops for cultivation which was passed onto them by their ancestors. There is no proper guidanee available to assist them for cultivating appropriate type of crop using modern technologies. Thus using various data mining techniques, the proposed system provides the end user with a variety of crops suitable for cultivation. It is a Cross domain system which uses IoT for collecting temperature value, moisture value and Ph value from different sensors further uses data mining algorithms such as k-means clustering and KNN to predict the type of crop which is appropriate for the given conditions.

II. LITERATURE SURVEY

[3] Proposes three recommendation system based on past data. Since efficiency of random forest algorithm is higher than naïve bayes and ID3, it uses random forest algorithm to predict appropriate crop based on current NPK value of soil. However random forest algorithm doesn't deal with large number of categories in categorical variable. Another crop rotation recommendation system is described in this paper which uses FP tree. Paper also provides recommendation for appropriate fertilizers using sufficiency method. However this method would put additional pressure on soil to match its fertility with required conditions thus degrading the soil condition.

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Smt Kashibai Navale College of Engineering Pune-41.

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Department of Computer Engineering
SKNCOE, Pune 411041

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New Avenues in opinion mining: Considering Dual Sentiment Analysis

Authors

Pankaj R Chandre[1], Rohan Raj[2], Himanshu Raj[3]

Dept. of Computer Engineering, Smt. Kashibai Navale College of Engineering, Pune, India

Email Id - rhimanshu99@gmail.com, rohanraj9931111104@gmail.com

ABSTRACT

In the modern world, due to advancement and outreach of technology, ease of access to any kind of product or service is growing immensely. Subjective attitude (i.e. Sentiment) ranging from that of products, news, movies to that of social networking mediums is being given for each and every product now-a-days. The market now, not only values the expert opinion but the reviews of masses have taken an equal importance as they are the one using the products and services. For the betterment of products, the input must be understood and the data must be analyzed by proper Machine Learning techniques along with Natural Language Processing in order to draw the conclusions and comprehending the overall situation. The topic-based text classification based on the Bag-of-Words model has some fundamental inadequacies, although various algorithms and classifiers (like naïve Bayes, support vector machines) are already analyzing sentiments and giving categorical feedback as a generic output. Polarity shift problem restricts the performance of these existing models. To address this problem for sentiment classification, Dual sentiment analysis (DSA) has been expanded from a 2 facet classification to a 3 facet classification which considers neutral reviews from the dataset as well for better accuracy and understanding. For each training and test review, a novel data expansion technique is being proposed that will use opposite class labels of positive and negative sentiments in one to one correspondence for a dual training and dual prediction algorithm. A corpus method based pseudo-antonym dictionary has also been proposed to remove the single language (English) based restriction and to maintain domain consistency as it will be pairing up words on the basis of sentiment strength.

Keywords- *Natural Language Processing, Bag-of-Words, Machine Learning, Dual Sentiment Analysis, Opinion mining, Naïve Bayes, Support Vector Machines, Dataset, Polarity shift, Corpus Method*

I. INTRODUCTION

Natural language processing, text analysis and computational linguistics are used to identify and extract subjective information in source materials. This is nothing but Sentiment analysis which is widely applied to reviews and social media for a variety of applications, ranging from marketing to customer service. Analyzers are used for polarity identification. Analyzers are of two types, manual (domain oriented) and automatic (generalized oriented). We used domain oriented in our methodology. In manual analyzer, predefined data set exists in which similar/ related term have to be fed and then the result occurs. Sentiment analysis is used to classify polarity and the sentiment analyzer is used to define polarity opinion expressed is (+) ve, (-) ve or (=) neutral [1]. A model called dual sentiment analysis (DSA) addresses this problem of polarity for sentiment classification. We first propose a novel data expansion technique by creating a sentiment reversed review for both, training and test review.

On this basis, we propose a dual training algorithm to make use of original and reversed training reviews in pairs for learning a sentiment classifier, and a dual prediction algorithm to classify the test reviews by considering two sides of one review. Sentiment analysis is to extract the opinion of the user from the text

Smt. Kashibai Navale College of Engineering Pune-41.

Head
Department of Computer Engineering
SKNCOE, Pune 411041

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Rubix Cube Solver

Pankaj R. Chandre[1] Atul Raut[2] Riya[3] Shweta Terkar[4] Jaswin Shah[5]
[1,2,3,4]Department of Computer Engineering
[1,2,3,4]SKNCOE, Vadgaon(Bk), Pune, Maharashtra, India

Abstract— The reason to develop an application, which would be able to generate steps for solving the Rubix cube, as it is known to be a very famous puzzle solving game among the current generation. This application will help them to develop and improve their problem solving skills. This application will scan the current Rubix Cube state and help the user solve the Rubix Cube by generating the steps to solve it. This application would use the most famous method to solve cube. The reason for choosing the most famous method to solve the cube is that most of the starter Rubix cube solvers start with this method, so the user will be familiar with the steps used in this application. Although instead of using only the basic method, this will include some advanced methods and develop a Hybrid Algorithm using David Singmaster Method and Jessica Fridrich Method.

Key words: Hybrid Algorithm, Image Capturing, Solving Program, Scrambled Cube

I. INTRODUCTION

The Rubik's Cube is a 3-D combination puzzle invented in 1974 by Hungarian sculptor and professor of architecture Ern Rubik. Since then its immense success has led to it becoming the world's most successful toy in history with nearly 350 million units being sold worldwide. Despite the relatively simple concept, the cube has over 43 Quintillion (43,252,003,274,489,856,000) different combinations of scrambling. Nevertheless the legal arrangement of the Rubik Cube can be solved in 20 moves or fewer, with the use of a variety of algorithms and this is called Gods Number. The most important part of solving a Rubik's Cube is understanding how it works. When looking at a Rubik's Cube, there are six sides, each containing nine pieces. There are three types of pieces in a Rubix Cube, Center piece, Edge Piece and Corner Piece. There are 6 center pieces, 12 edge pieces and 8 corner pieces in the Rubix cube. Each center piece has single color, edge pieces have two colors and corner pieces have three colors. The six colors of the Rubix cube are red, green, blue, yellow, white and orange. Red center piece is always opposite to orange, white is always opposite to yellow and green is always opposite to blue. The sides can be rotated in many ways, but regardless of what is done to the cube (unless taken apart) the center pieces don't move with respect to each other. Therefore, when the cube is being solved, the central pieces cannot move position. The target state for the Rubix cube is the state or configuration of the Rubix cube in which all the faces of the Rubix cube have the same color i.e. the edge pieces and corner pieces of each face have the color matching with the center piece on each face of the Rubix cube.

II. LITERATURE SURVEY

Sr. No	Title of paper	Technologies Used	Drawbacks
1	An Evolutionary Approach for Solving the Rubik's Cube Incorporating Exact Methods.	Thistlethwaite, Kociemba and Rokicki	These algorithms are very fast and very efficient for machine to solve the rubikx cube but difficult for human to understand and memorize.
2	Autonomous Rubik's Cube Solver Using Image Processing.	OpenCV (Open Source Computer Vision), Dev C++, Kociemba's algorithm	Kociemba's algorithm is efficient for computers to find steps to solve cube but difficult for humans to learn.
3	Rubix Cube Localization, Face Detection, and Interactive Solving.	k-means, SLIC (Simple Linear Iterative Clustering), Convolutional neural network, Koceimba's algorithm	CNN have high computational cost. If you don't have a good GPU they are quite slow to train. They also need a lot of training data. Assignment of pixels to their corresponding k-means centroids is an expensive process.
4	Intelligent Rubik's Cube Solver.	Jessica Friedrich method (CFOP)	Used very complex components to design robot which solves rubix cube. Also designing robot to solve cube would be costly. Because the restriction of machine set design, the robot can only do to turn-over of push action.

Table 1: Literature Survey

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A Study of Traffic Aware Partition and Aggregation in MapReduce for Big Data Applications

Shweta Hegade ,Prof. Raghib Nasri

ME Student, Dept. of Computer Engg., SKNCOE, Savitribai Phule Pune University, Pune, Maharashtra, India

ABSTRACT: MapReduce programming framework process large amount of data by taking advantage of parallel Map and Reduce tasks. Computationally MapReduce has two phases called Map and Reduce. In actual implementation, it has another phase called Shuffle where data transfer takes place. Conventionally Shuffle phase use Hash function to partition data which is inefficient in handling Traffic leading to a bottleneck. Improving the performance of network traffic inshuffle phase is important to improve the performance of MapReduce. The goal of minimization of network traffic is achieved by using partition and aggregation. The proposed scheme is designed to minimize network traffic cost in MapReduce. The problem of aggregator placement is considered, where each aggregator can reduce combined traffic from multiple map tasks.A decomposition-based distributed algorithm is proposed to deal with the large-scale optimization problem for big data applications. Also, an online algorithm is designed to dynamically adjust data partition and aggregation.

KEYWORDS: MapReduce, Hadoop, HDFS, Aggregator, Distributed System, Scheduling.

I. INTRODUCTION

Big Data bas emerged as a widely recognized trend, attracting attentions from government, industry and academia. Generally speaking, Big Data concerns large-volume, complex, growing data sets with multiple, autonomous sources. The major challenge for the Big Data applications is to process the large volumes of data and extract useful information for future actions. MapReduce has appeared as the very popular calculating framework for big data processing appropriate to its simple programming model and automatic parallel execution. MapReduce and Hadoop have been used by many big companies, such as Yahoo!, Google and Facebook, fordifferent big data applications.

In MapReduce [1][2], computation is viewed as consisting of two phases, called `map' and `reduce' respectively. In the map phase, data is reorganized in such a manner that the desired computation can then be achieved by uniformly applying one algorithm on small portions of the data. The second phase in MapReduce is called the reduce phase. As each of these two phases can achieve massive parallelism, MapReduce systems can exploit the large amount of computing power by huge scale clusters. When understanding the performance of MapReduce systems, it is convenient to view a MapReduce job as consisting of three phases rather than two phases. The additional phase, which is considered between the map phase and the reduce phase, is a data transfer phase called the `shuffle' phase. In the shuffle phase, the output of the map phase is recombined and then transferred to the compute nodes that are scheduled to perform corresponding reduce operations. The performance of MapReduce systems clearlydepends heavily on the scheduling of tasks belonging to thesethree phases.

Even though many efforts have been made to improve theperformance of MapReduce jobs, they show blind eye to thenetwork traffic generated in the shuffle phase, which plays acrucial role in performance enhancement. In traditional way, ahash function is used to partition intermediate data amongreduce tasks, which, however, is not traffic-efficient because we don't consider network topology and data size associated with each key. In this paper, by designing a novel intermediate data partition scheme we reduce network traffic cost for a MapReduce job.

Configuring the job, submitting it, controlling its execution, and querying the state is allowed to user by Hadoop. Each and every job consists of independent tasks, and all the tasks need to have a system slot to run. All scheduling and

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Department of Computer Engineering
Pune 411041

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A Survey of Network Layer Attacks in MANET Using Sequence Diagram

Medini Desai, Prof. S. A. Nagtilak

Department of Information Technology, Smt. Kashibai Navale College of Engineering, Pune, India

Department of Information Technology, Smt. Kashibai Navale College of Engineering, Pune, India

ABSTRACT: MANET is a collection of the autonomous node. Mobility, dynamic topology, and self-organization of nodes are the features of MANET. Due to these intrinsic features, MANET is more vulnerable to security attack than the traditional wired network.

Security Prevention implemented for the traditional network is not suitable for MANET. To develop more secure and effective intrusion detection system, one must aware of possible security attack.

Due to dynamic topology and multi-hop routing technique, the network layer of MANET prone to many attacks. In this paper, well-known network layer security attacks are modeled using a sequential diagram approach of Unified Modeling Language (UML).

KEYWORDS: MANET, UML, Sequence Diagram, Network Layer Attack.

I. INTRODUCTION

MANET is the collection of autonomous nodes which are mobile innature and communicate with each other using multi- hop technique. The main purpose of MANET is to provide communication in some situations where the services offered by both wired networks and WLAN are unavailable. MANETs are mainly useful for military and other applications such as emergency rescues. Security in MANET is more complex mainly due to its intrinsic features like mobile nodes, limited physical security, changing topology, scalability and lack of centralized management. A MANET is more prone to many different security attacks at all layers of communication, and these attacks can launch a lot of in consistencies in the network. To develop good intrusion detection and prevention system, it is essential to understand the behavior of the attacks [7]. MANET based on open network architecture it allows a peer to peer connectivity between nodes [6]. Network layer plays a central part in the operation of MANET where it is responsible for determining and maintaining network routes, delivery of packet from source to destination. Coo perative nature of network layer protocols makes network layer vulnerable to many different attacks such as Blackhole, wormhole, sleep attacks, sibyl attack, etc. These attacks introduce significant delays in the network, congestion and performance degradation.

Understanding the behavior of network layer attacks is important to develop secure mechanisms for MANET. The aim of this paper is to understand and model the behavior of network layer attacks using UML sequence diagram.

II. RELATED WORK

Classification of Attacks in MANETS

Mobile Ad hoc networks are vulnerable to various attacks not only from outside but also from within the network itself. Ad hoc network are mainly subjected to two different levels of attacks [12]. The first level of attack occurs on the basic mechanisms of the ad hoc network such as routing. Whereas the second level of attacks tries to damage the security mechanisms employed in the network. The attacks in MANETs are divided into two major types [9].

- **Internal Attacks**

Internal attacks are directly leads to the attacks on nodes presents in network and links interface between them. This type of attacks may broadcast wrong type of routing information to other nodes. Internal attacks are sometimes more difficult to handle as compare to external attacks, because internal attacks occurs due more trusted nodes. The wrong

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routing information generated by compromised nodes or malicious nodes are difficult to identify. This can be due to the compromised nodes are able to generate the valid signature using their private keys.

- **External Attacks**

These types of attacks try to cause congestion in the network, denial of services (DoS), and advertising wrong routing information etc. External attacks prevent the network from normal communication and producing additional overhead to the network. External attacks can classify into two categories [10]:

  - **Passive Attacks**

MANETs are more susceptible to passive attacks. A passive attack does not alter the data transmitted within the network. But it includes the unauthorized "listening" to the network traffic or accumulates data from it. Passive attacker does not disrupt the operation of a routing protocol but attempts to discover the important information from routed traffic. Detection of such type of attacks is difficult since the operation of network itself doesn't get affected. In order to overcome this type of attacks powerful encryption algorithms are used to encrypt the data being transmitted.

  - **Active Attacks**

Active attacks are very severe attacks on the network that prevent message flow between the nodes. However active attacks can be internal or external. Active external attacks can be carried out by outside sources that do not belong to the network. Internal attacks are from malicious nodes which are part of the network, internal attacks are more severe and hard to detect than external attacks. These attacks generate unauthorized access to network that helps the attacker to make changes such as modification of packets, DoS, congestion etc. The active attacks are generally launched by compromised nodes or malicious nodes. Malicious nodes change the routing information by advertising itself as having shortest path to the destination.

ACTIVE ATTACKS ARE CLASSIFIED INTO FOUR GROUPS:

i. **Dropping Attacks**: Compromised nodes or selfish nodes can drop all packets that are not destined for them. Dropping attacks can prevent end-to-end communications between nodes, if the dropping node is at a critical point. Most of routing protocol has no mechanism to detect whether data packets have been forwarded or not.

ii. **Modification Attacks**: Sinkhole attacks are the example of modification attacks. These attacks modify packets and disrupt the overall communication between network nodes. In sinkhole attack, the compromised node advertises itself in such a way that it has shortest path to the destination. Malicious node than capture important routing information and uses it for further attacks such as dropping and selective forwarding attacks.

iii. **Fabrication Attacks**: In fabrication attack, the attacker send fake message to the neighbouring nodes without receiving any related message. The attacker can also sends fake route reply message in response to related legitimate route request messages [8].

iv. **Timing Attacks**: In this type of attacks, attackers attract other nodes by advertising itself as a node closer to the actual node. Rushing attacks and hello flood attacks uses this technique [11].

III. ANALYSIS OF NETWORK LAYER ATTACK

A. *BLACK HOLE ATTACK*

Blackhole Attack comes under a Denial of Service attack (Dos) which can perform by single compromised node or set of compromised nodes. Blackhole attack abuses the nature of reactive routing protocol, and it works in two phases in the first phase Compromised node advertises itself as having the short and fresh route to the destination and drops the receiving packets without forwarding them further. The detailed procedure is as follows below in Fig.1

1) An attacker compromises a malicious node 3 and initiates for Blackholeattack
2) Source node1 detects an event to establish a route to destination node5.
3) Source node1 broadcast route request.
4) Legitimate node 2 receives and broadcast the same request.
   (Source node1 → legitimate node2 → legitimate node4 → destination node5)
5) Malicious node directly replies to source node with a high destination sequence number.
6) Source node select route via malicious node.

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7) Source node sends data packet. (Sourcenode1→ Maliciousnode2)
8) Malicious node2 refuses to transfer data packet.(Source node1→ malicious node2----DROP)

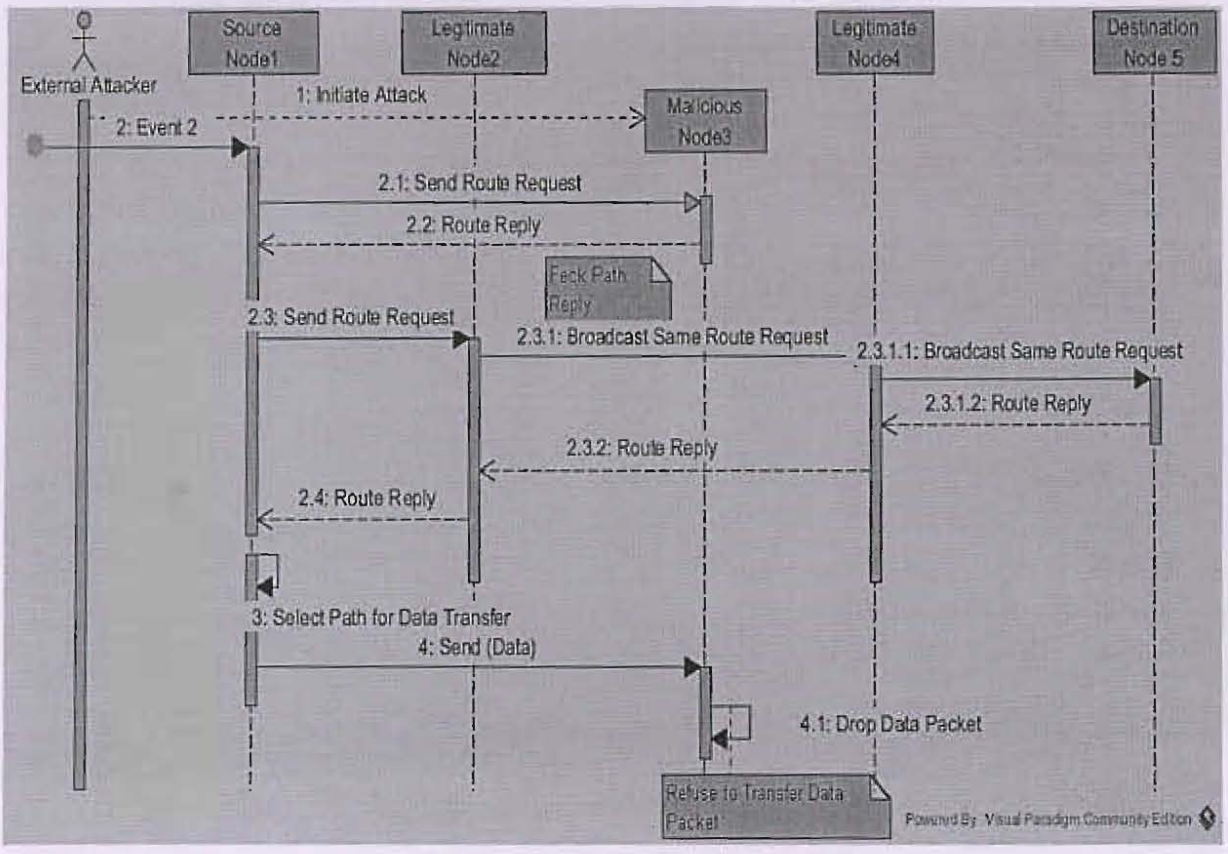

Fig.1UML Sequence Diagram for Black Hole Attack

B. *GRAY HOLE ATTACK*

Gray Hole is a special type of Blackhole attack. In which malicious node switches its state back and forth authentic to malicious [1].Recognition of GrayHole attack is harder because, in contrast to Black Hole attacks where all packets drop, a Gray Hole attack drops only a subset of the packets and is thus more difficult to detect. Also, the attacker may drop the packets arbitrarily or according to any distribution. In a multi-hop network, it is difficult to distinguish a random packet drops caused by a Gray Hole attack from those eaused by congestion.
A Gray Hole node may reveal its malicious behavior in several ways:-
(i) It can drop packets with specific probability coming from certain nodes while forwarding packets from other nodes correctly.
(ii) It can drop packets only for predefined time duration but may switch back to normal routing behavior later.
(iii) It can combine the latter two scenarios

The detailed procedure is as follows below in Fig.2

1) An attacker compromises a malicious node 3 and initiates for gray hole attack
2) Source node1 detects an event to establish a route to destination node5.
3) Source node1 broadcast route request to search for destination node5.
4) Malicious node3 receives and broadcast same request.
5) (source node1→ malicious Node3→ legitimate node4→ destination node5)

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6) Source node select route via malicious node and send data packet.
7) The malicious node receives data packet then check for the particular condition if condition satisfies then forward the data packet to next hop (legitimate node4) Else drop the received data packet.

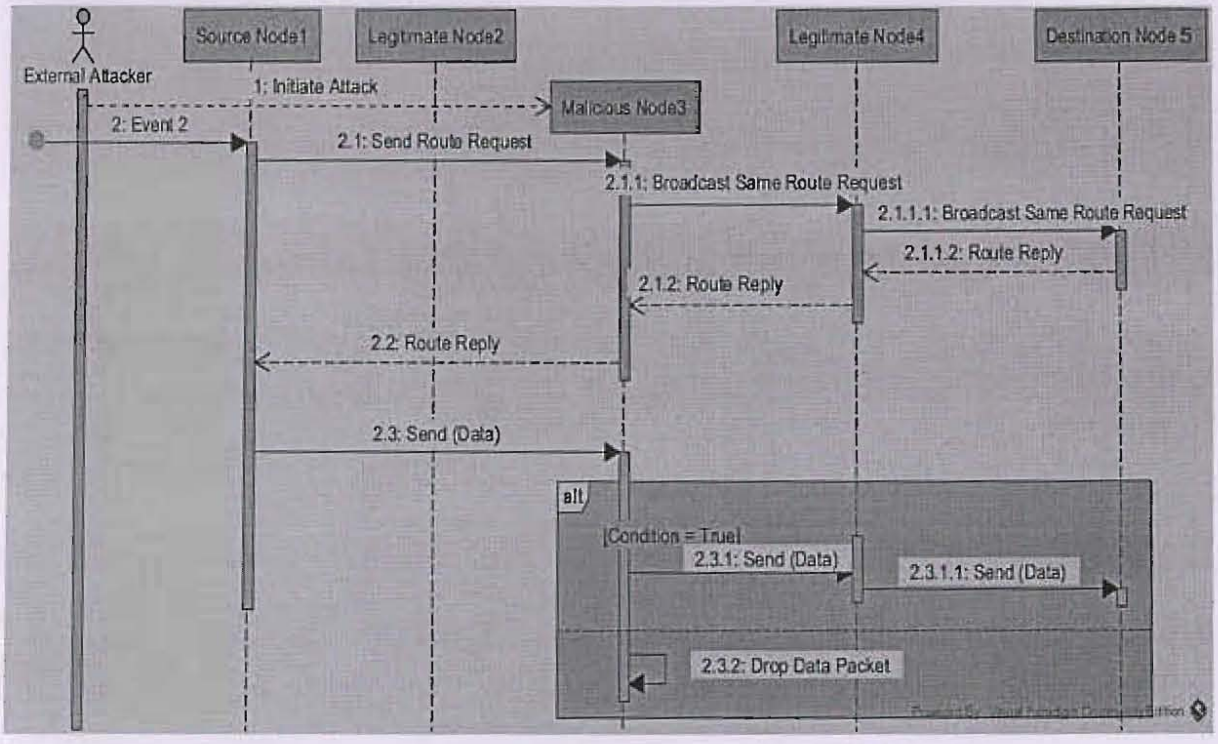

Fig.2 UML Sequence Diagram for Gray Hole Attack

C. *WORM HOLE ATTACK*

Two or more malicious nodes launch a wormhole attack using a private channel called tunnel, between them. At one end of the tunnel, a compromised node captures a control packet and sends it to another colluding node at the other end through a private channel, which rebroadcasts the packet locally. The attack normally works in two phases. In the first phase, the wormhole nodes get themselves involved in several routes. In the second phase, these malieious nodes start exploiting the packets they receive. These nodes can disrupt the network functionality in a number of ways. Wormhole nodes can drop, modify, or send data to a third party for malicious purposes.

The detailed proeedure is as follows below in Fig.3

1) An attacker compromises a malicious node 2 and malicious node4.Create a tunnel between them.
2) Source node1 generates an event, send data packet to destination node5.
3) Malicious node2 receives a data packet from its neighbor node and then forwards that packet trough tunnel to malicious node4.
4) Malicious node4 replays data packet.
5) (source node1→ malicious Node2→ malicious node4→ malicious gateway)

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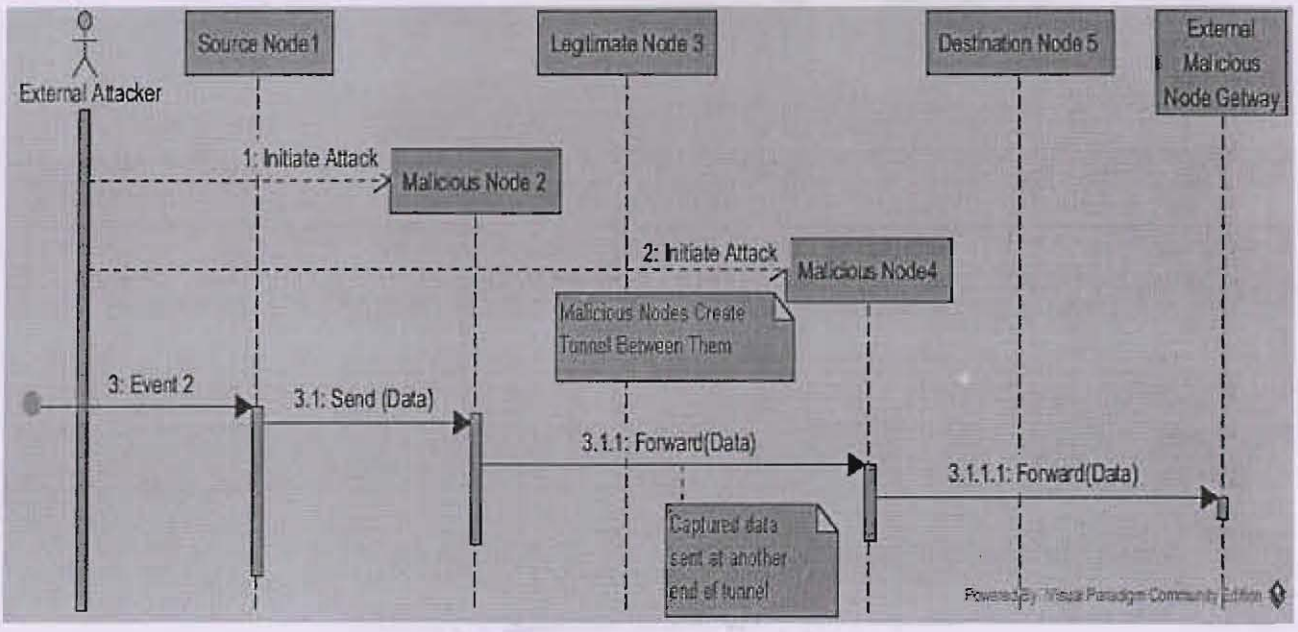

Fig.3UML Sequence Diagram for WormHole Attack

D. *SYBIL ATTACK*

In Sybil attack, attacker compromise authentieation property of MANET. Sybil attacker may produce bogus identities of a number of additional nodes. In this, a malicious node pretends itself as an enormous number of nodes instead of a single node. The additional identities that the node obtains are called Sybil nodes. A Sybil node may formulate a new identity for itself, or it steals an identity of the authentic node.

The detailed procedure is as follows below in Fig.4

1) An attacker compromises a malicious node3 and initiates for Sybil attack.
2) Malicious node3 send a hello message with different identities to its neighbors.
3) Malicious node may generate fake identities or steal from legitimate node
4) Legitimate nodesnode1, node2 and node3 listen and update their routing table. In this attack authenticity requirement of MENT is spoiled.

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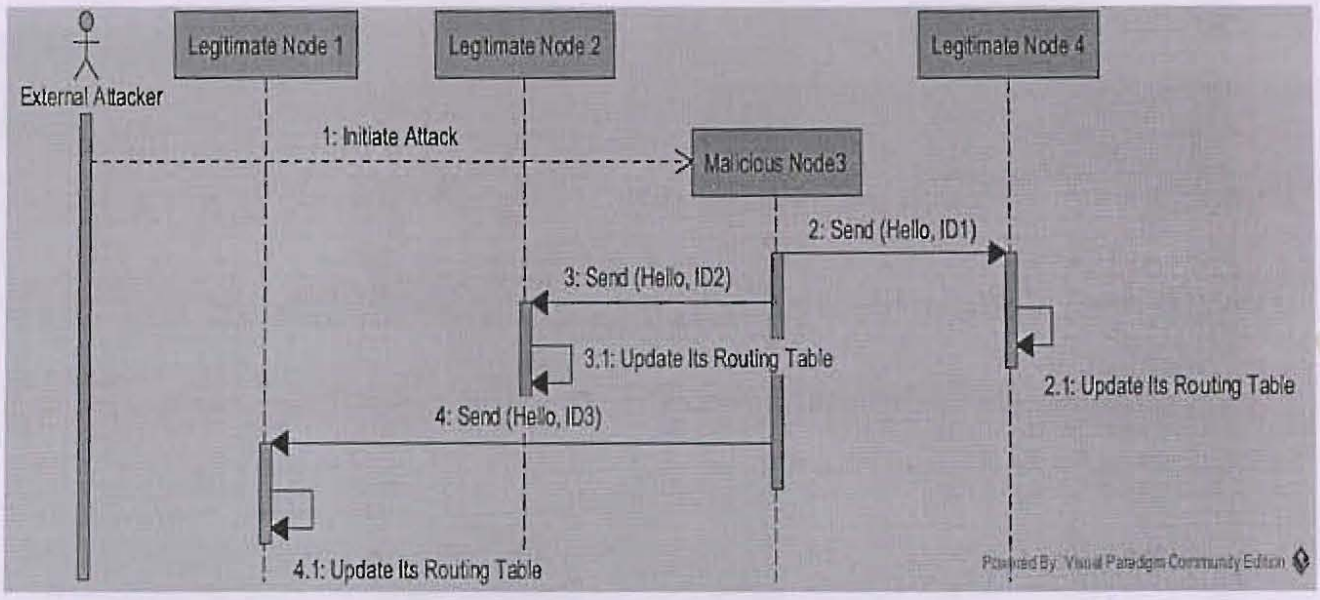

Fig.4 UML Sequence Diagram for Sybil Attack

E. *JELLYFISH ATTACK*

Jellyfish attack is a sort of passive attack. In Jellyfish attack attacker purposely produces a delay in transmission and reception of data packets in the network. As a result, themessage cannot reach the destination within the hard deadline. This attack is difficult to detect. Sometimes messages are recorded or stored at the compromised node. Jellyfish attack further classified into three subcategories Jellyfish recorder attack, Jellyfish periodic dropping attack and Jellyfish Delay variance attack [3].
The detailed procedure is as follows below in Fig. 5

1) An attacker compromises a malicious node3 and initiates for jelly fish attack
   Source node1 detects an event to forward data to node2 that is on the routing path.
   (Source node1→ legitimate node 2 → malicious Node3→ legitimate node4→destination node3)
2) Malicious node3 receives data from node2 and generates delay before transmitting data to next hop node.
   (Source node1→ node2→ malicious Node3-----→ node 4→ destination node

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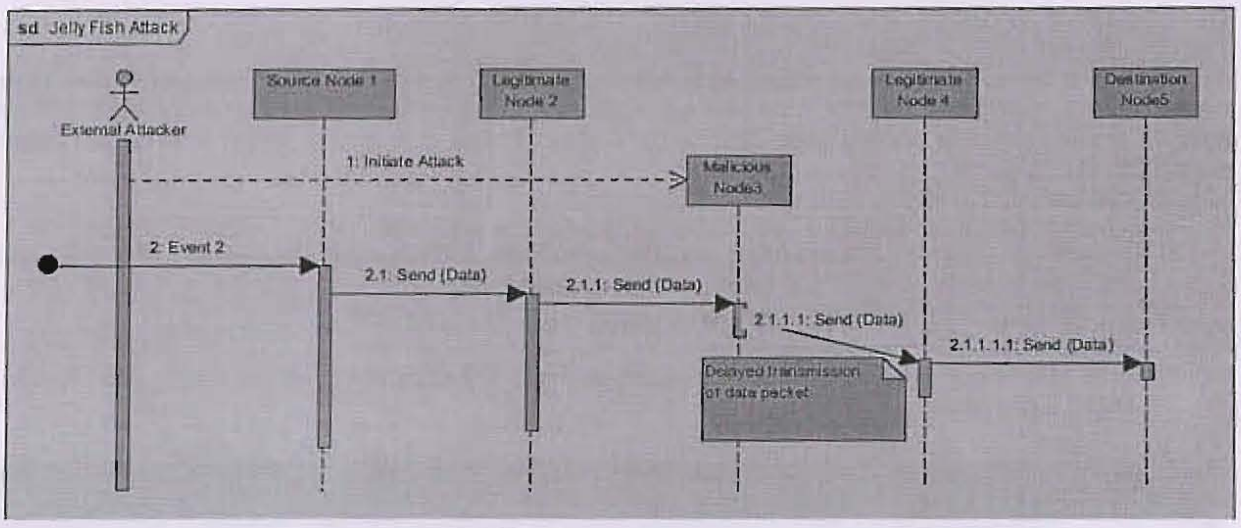

Fig.5 UML Sequence Diagram for Jelly Fish Attack

F. *SLEEP DEPRIVATION ATTACK*

Sleep deprivation (SD) is also known as resource consumption attack. The aim of an intruder here is to drain off limited resources in the MANET nodes by constantly making them busy in processing unnecessary packets [1].Sleep deprivation attacks can be launched by flooding unnecessary routing packets to the targeted node. For example, attacker broadcasts a large number of RREQ messages in route discovery phase.So all other legitimate nodes receive them and end up reducing their battery power while processing the received RREQs.
The detailed procedure is as follows below in Fig.6

1) An attacker compromises a malicious node3 and initiates for Sleep Deprivation attack.
2) Malicious node3 send a route request to legitimate node2 and legitimate node4, which are in its range.
3) Node2 and Node4 broadcast the same request.
4) Malicious node continuously repeats step 2and3.

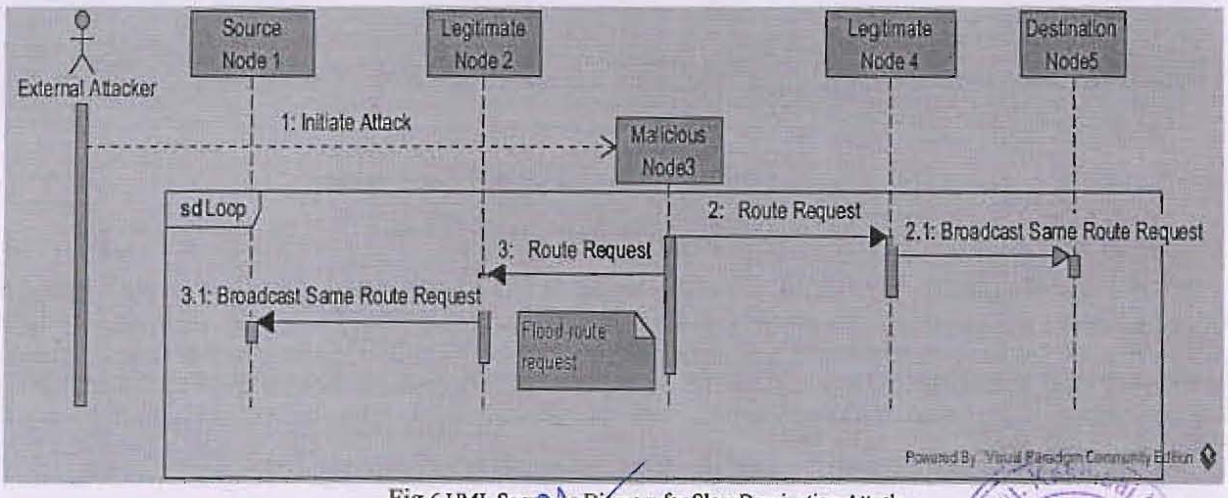

Fig.6 UML Sequence Diagram for SleepDeprivation Attack

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G. *BYZANTINE ATTACK*

In this attack, the aim of the intruder is to disturb the network service and degrade the performance of the network. A compromised node works alone, or a group of compromised nodes work together and perform activities such as creating loops in routing path, packets forwarding through non-optimal paths, or dropping packets selectively [4].

The detailed procedure is as follows below in Fig.7

1) Anattackercompromisesamaliciousnode3andinitiatesforByzantineattack.
2) Sourcenode1detects an event to forward data to node2 that is on the routing path.(Source node1→legitimate node2→ malicious Node3→ legitimate node4→ destination node5)
3) On receiving data from the node,two malicious node alter the routing path. Creates loop (node3→ node2→nodes1)
4) Node 2 forwards the received data from node3 to node1 according to the altered routing path. Repeat steps2 thru step3.

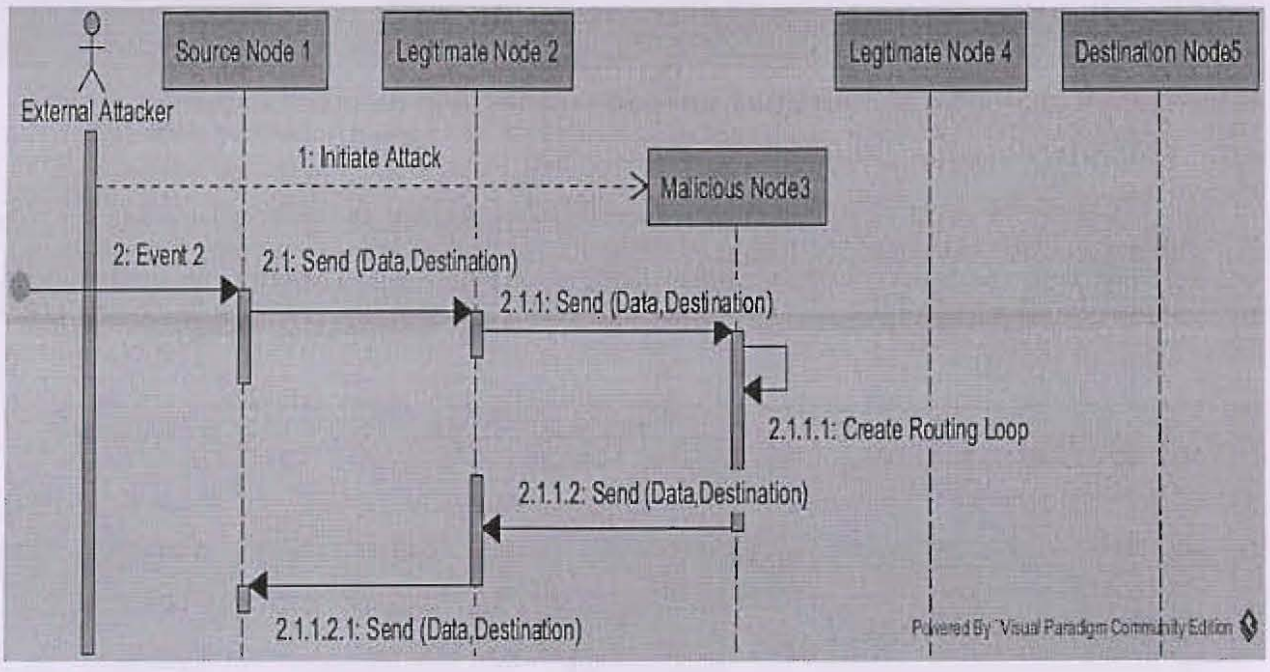

Fig.7 UML Sequence Diagram for Byzantine Attack

IV. CONCLUSION AND FUTURE WORK

MANET used for military operation, or in a rescue operation like a flood, earthquake, etc. The main requirement of these applications is security. Due to intrinsic features of Ad-hoc network, MANET is more prone to security threat like a Blackhole, gray hole, sleep deprivation, wormhole attack. To protect MANET from an intruder, security attacks must be well studied to find countermeasures. In this paper, well-known network layer security attacks are modelled using a sequential diagram. This work provides a better understanding of attacks; it helps the developer to build more secure MANET.

From the so far discussion, it is clear that MANETs are an easy host for several types of attacks. A black hole is one of the renowned securities attacks in MANET in which attacker abuse the weakness of Reactive Routing Protocol. Compromised node advertises itself as having the short and fresh route to the destination and drops the receiving packets.

As a future work, designing a Black Hole detection and prevention system that effectively detects and prevents the Black Hole attack in any environment while keeping the minimum overhead will be the focus.

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Performance Evaluation of Different Distance Measures Used in Color Iris Authentication

A. S. Narote, L. M. Waghmare

S.G.G.S. Institute of Engineering and Technology,
Nanded, India

Abstract

This paper proposes performance evaluation of different distance measures used in color iris authentication. The color iris segmentation is carried out using histogram and circular Hough transform. The color iris features are extracted using histogram method. Different distance measures are used for iris authentication. The experimental evaluation shows that Euclidean and Manhattan distance are computationally efficient as compared to other distances. The proposed method gives very promising results which achieves classification accuracy of 92.1%. Equal error rate of 0.005 and 0.072 for Euclidean and Manhattan distance for HSV model and 0.09 and 0.098 for RGB model respectively.

Keywords: *Biometrics , authentication, feature extraction, Euclidean distance.*

I. INTRODUCTION

Biometric traits [1], such as recognizing one's iris, fingerprint, face, retina, etc. helps in person authentication and identification. This authentication or identification of an individual is based on his/her behavioral or physiological characteristics. Biometric traits, has the capability to distinguish between an authorized person and an impostor. As biometric characteristics of different traits such as fingerprints, face, iris, ear, voice, palm print, hand geometry, etc., are unique and distinctive, they are used for authentication and identification. Biometric traits offer different degrees of reliability and performance. Biometric systems have gradually become an accepted means for person identification and verification. In biometric authentication/identification system, person to be authenticated needs to be physically present at the point of identification.

Iris recognition [2, 3] is widely accepted as one of the most reliable biometric technique. The iris patterns are very complex which contains many distinctive features such as radial furrows, concentric furrows, zigzag collarette, crypts, freckles, rings and corona [3,4]. In the last two decades, there is significant progress of use of iris recognition [4–7]. Compared with some other biometrics, iris has various advantageous factors such as greater speed, simplicity, and accuracy. Literature reveals that the irises of identical twins are different and also right and left irises of an individual are different. The properties of iris makes it as one of the most secure biometrics for identification and authentication. Iris recognition is widely accepted as one of the best biometrics recognition methods [3], in the world because of its stability, uniqueness and non-invasiveness.

A generic iris recognition system [3] consists of image acquisition, iris segmentation, feature extraction, matching and recognition. For recognition /authentication of a person, the eye image is captured using infrared (IR) camera. While acquiring the eye image, eyes are illuminated using infrared light. The acquired image of the eye contains data, derived from the surrounding eye region along with iris. Therefore, initially the iris is localized in the segmentation module from the acquired image. The size of the individual iris goes on changing with respect to changes in illumination, also the size of iris each individual is different. In order to avoid inconsistency in the size of the iris, it is normalized. In the featurc extraction module, features are extracted from the normalized iris. This feature is encoded and then matched with the other template.

The limitations of this IR based iris authentication system is that the color information is lost and special IR cameras are required for acquiring iris images. This paper proposes a new method for iris extraction and also color histogram based approach is used for iris authentication. The color histogram information is directly adopted as features. Color histogram has simple mathematical analysis which reduces complex mathematical computations. The computational complexity of the feature extraction process is much lower than other filtering based approaches. This proposed method can be implemented effectively on embedded platforms.

The rest of this paper is organized as the following. Section II and Section III presents the developed method for iris extraction and feature extraction technique using color histogram. Section IV describes the matching process of the proposed approach. Experiments and results are elaborated in Section V. The last section is a conclusion of our work

II. IRIS PREPROCESSING

Iris patterns are unique for a person which remains stable throughout the life [2,4]. The iris image of a person is acquired at different instant of time. During this instant the external environments are not same, i.e. the distance between the camera and eyes, tilting of head, eye

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movements and pupil dilation. All these factors need to be considered while feature extraetion. Therefore prior, to feature extraction iris image need to be preprocessed.

Iris segmentation plays an vital role in the performance of iris identification system. Several segmentation techniques have been proposed in the literature. The most two popular techniques used for iris segmentation are integro-differential operator [2] and the Hough transform [4] respectively. The first stage of iris segmentation is to find out pupil boundary and then the limbus boundary. The UBIRIS [8], iris database consist of color images. The color eye image consist of RGB colors which is used for iris segmentation. The red channel (plane) of this color eye image is used for iris segmentation, which reduce the processing time required for conversion into gray level format. The pupil boundary and its radius are extracted using the histogram method [9]. The limbus boundary and its radius are detected using integro-differential operator [2]. The circular Hough transform is based on voting scheme which is tolerant to noise. To detect the limbus boundary of noisy iris images from UBIRIS database the circular Hough transform is selected for limbus boundary detection. In circular Hough transform the voting process is carried out in a parameter space. A circular Hough space is given in equation 1 as

$$H(x_c, y_c, r) = \sum_{i=1}^{n} h(x_i, y_i, x_c, y_c, r) \qquad (1)$$

where r is radius, (x_c, y_c) are circle center, (x_i, y_i) is an edge point and (x_o, y_o, r) are location. $H(x_c, y_c, r)$ is an accumulator array. The maximum value of the accumulator is selected as the parameter for the largest circular boundary. This parameter gives the limbus center and radius value. Using pupil radius, limbus radius and center values, pupil boundary and limbus boundary are mapped on color iris as shown in Figure 1.



Figure 1. Segmeneted iris image

The segmented image consists of the original eye image on which pupil boundary and limbus boundary is mapped. The pixels inside the pupil boundary are not useful, which are considered as noise and similarly the portion outside limbus boundary are not useful which are also considered as noise. This noise from the segmented image is to be removed and only iris image is to be preserved. Here the pixels outside the limbus boundary and the pixels inside the pupil boundary are replaced with white pixels. The sample extracted iris image from segmented images are shown in Figure 2. The size of extracted iris image is different for every image.



Figure 2. Extracted iris image

There is pupil constriction and dilation due to illumination conditions, environmental, physiological factors, the distance between the camera and iris image, etc. This iris deformation will affect the overall performance during matching. In order to compensate this elastic deformation iris image is normalized. Normalization method transforms a localized iris texture from Cartesian to polar coordinates. The majority of the iris recognition algorithm uses rubber sheet model suggested by Daugman [2] for normalization. In this color iris authentication system normalization step is eliminated.

III. Iris Feature Extraction Using Histogram Of Color Models

The first method of iris recognition was proposed by Daugman [2] which uses 2-D Gabor filter for feature extraction using IR images. Laplacian of Gaussian (LoG) filter was used by Wildes for feature extraction. In the literature, it has been observed that various filter bank techniques have been suggested by authors for iris feature extraction. An alternative to IR images based iris recognition is to use color information of iris for iris recognition. Krichen [10] used wavelet packets for iris identification using color iris images. Hugo [8] created a noisy iris database UBIRIS were gray scale images were used for experimentation. Boyce et. al. [11] used multispectral iris images for segmentation and recognition. Here RGB images are converted into Lab color space, for feature extraction 2D Gabor filters and radial feature vectors are used. Monaco [12] used color space analysis for iris recognition in which Gabor filters are used for feature extraction from each band. For color iris recognition and indexing Gabor filter and other filter bank techniques have been used. This filter banks provide excellent accuracy, but their design is complex and are computationally expensive.

The infrared iris image is a gray scale image were as color iris images consists of three channel data. The color image data is acquired from three sensors, i.e. red, green and blue. The RGB image is used for segmentation. Prior to feature extraction the segmented RGB image is to be converted to the desired different color space. A color space is a model used for representing color values in intensity. There are a number of color spaces available, from this a particular color space is selected depending upon the application. The RGB color model is the most popular model used for processing digital images. The RGB color space, describes colors by three components: red, green and blue. The disadvantage of RGB model is

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that gets effected due to intensity variations. The other color space models are transformed from the RGB model using linear and nonlinear transformation matrix such as YUV, YIQ, HSV, HIS, etc.

The HSV color model is a popular model for computer graphics. The hue of an image refers to a pure color. The hue ranges from $0 - 360^0$ where each value corresponds to one color. The saturation and value ranges from 0 to 1 where saturation is the intensity of the color and value is the measurement of brightness of color. Unlike other color models HSV is not device independent. HSV is popular due to its similarity with the way human perceive color.

Different color models have been used for iris recognition. Boyce et. al. [11] uses CIE Lab color space, Monaco [12] uses RGB, CIE lab, HSV, CMYK, YebCrSun [13], Al-Quanieer [14] , Tan [15] and Sibai [16] used RGB color models for preprocessing. RGB and nine different color models, i.e. YUV, YIQ, HSV, HIS, HSL, Lab, Luv, LCH and YCbCr are used for transforming segmented RGB iris image into different spaces. Based on experimentation five color models HSI, HSV, YIQ, Lab and RGB model are finally selected. Using this color model RGB extracted iris images are transformed into different color spaces. From this transformed image features are extracted.

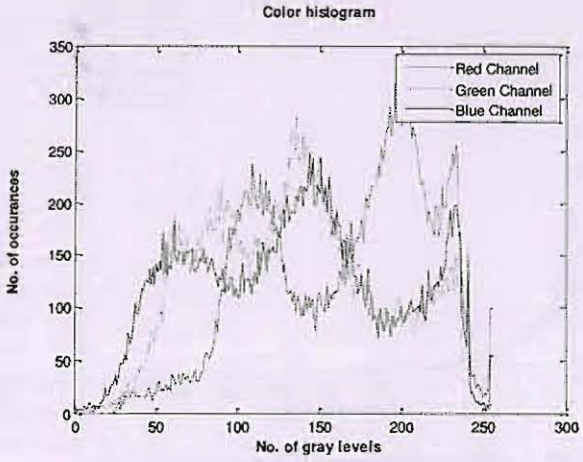

Figure 3. Color histogram of eye image

Color histogram is a standard method of extracting features from a color image. As color iris images are considered, the color histogram is used for feature extraetion. The Color histogram of an image is rotation, translation, and scale invariant [17]. The color histogram is the probability distribution of color pixels in an RGB image defined as

$$H_{(R,G,B)} = \text{Probability}(N_{R,G,B}) \qquad (2)$$

This probability function is a color histogram $H_{R,G,B}$ where H_R, H_G and H_B represents the frequency of occurrences of red, green and blue channels respectively. For color images, the histogram is fragmented into three histograms of the three channels as H_R, H_G and H_B as shown in Fig. 3.

IV. MATCHING

Once the features are extracted, then these features are used for matching. As the features extracted from iris are independent from other channels, their respective levels are considered as feature vectors. There are various distances available to compare the similarity between two irises using this pdfs. For measuring the similarity distances Euclidean distance and Manhattan are used.

The Euclidean distance (ED) and Manhattan distance (MHD) is commonly used for similarity measurement due to its efficiency, effectiveness and less time for computation. The ED compares the similarity between two feature vectors of iris image by estimating the square root of the sum of the squared absolute differences as given in equation 3. The value of p is taken as 2 in Euclidean distance.

$$\text{Euclidean Distance } ED_{(a,b)} = \sqrt{\sum_{i=1}^{d}(a_i - b_i)^p} \qquad (3)$$

Manhattan Distance (MHD) also called as city block distance measures the similarity between two iris image by taking the sum of the absolute values of the differences between the two feature vectors as shown in equation 4

$$\text{ManhattanDistance } MHD_{(a,b)} = \sum_{i=1}^{d}|a_i - b_i| \qquad (4)$$

The Minkowski distance (MinkD) compares the similarity between two feature vectors of iris image by estimating the square root of the sum of the squared absolute differences as given in equation 5. The value of p is taken as 3 in Minkowski distance.

$$\text{Minkowski Dist. } M_{ink}D_{(a,b)} = \sqrt{\sum_{i=1}^{d}(a_i - b_i)^p} \qquad (5)$$

Similarly the cosine distance and histogram intersection is given in equation 6 and 7 respectively.

$$\text{Cosine Dist. } CosineD_{(a,b)} = \frac{\sum_{i=1}^{d} a_i b_i}{\sqrt{\sum_{i=1}^{d} a_i^2}\sqrt{\sum_{i=1}^{d} b_i^2}} \qquad (6)$$

$$\text{Histogram Inters. } HistI_{(a,b)} = \frac{\sum_{i=1}^{N-1}\min(a_i b_i)}{\min(|a||b|)} \qquad (7)$$

Experiments are carried out using above distances. The computational complexity is different for different distance measures. This is computed based on number of multiplication, addition and subtraction. For a feature vector of size d. Euclidean distance requires d subtractions for ai − bi, d squares of the previous, d − 1 further additions and one square root at the end. Similarly Manhattan distance requires d subtractions for ai − bi, d − 1 addition. The comparison of the above distances based on time is shown in table I. The time required for

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comparing two iris image is 0.000025 and 0.000021 secs using Manhattan and Euclidean distance. Experiment are carried out using distances shown in table I.

TABLE I. TIME REQUIRED ROR COMPARING SIMILARITY FOR TWO IRIS IMAGES

Distance Metrics	Time in secs.
Euclidean distance	0.000025
Minkowski distance	0.00025
Spearman	0.000654
Cosine	0.000741
Manhattan	0.000021
Chi Square Statistics	0.000484
Histogram Intersection	0.000348

The performance of the system can be improved if fusion is carried at the matching score level [18, 19]. The fusion, at matching score is performed using a sum rule, max rule, min rule and produet rule. The matching score of all the three channels is fused.

V. RESULTS

To evaluate the performance of the proposed distance method UBIRIS database is used. In this section set of experiments are conducted to evaluate the performance of the proposed method and summarize the results. The performance is evaluated in two stages: first based on segmentation, color transformation, feature extraction and pattern matching and second based on authentication mode. For authentication mode the performance is measured in terms of genuine accept rate (GAR), false match rate(FMR), false non match rate (FNMR) and equal error rate(EER). The experiments are conducted on a COREi5 system with 4 GB RAM and MATLAB 2014A environment.

5.1 Iris Database

The performance of the proposed algorithm is evaluated on the UBIRIS database [8]. The images from the database have been captured from 241 persons with 5 images for each user in first session resulting in total 1205 images with image resolution of 200 x 150 . In a second session images are captured from 132 persons. The color images are acquired in visible light spectrum. The important characteristic of this database is that it incorporates several noise such as poor illumination, contrast, reflection, focus and occlusion in the iris images. Performance of segmentation method is tested on session one images in percentage using histogram and integro-differential operator (IDO) and histogram and circular Hough transform (CHT). The segmentation accuracy achieved using combination of histogram and circular Hough transform is 91.86%.

5.2 Performance evaluation using different color models

Experiments are carried out using five color models HSI, HSV, YIQ, Lab and RGB model. Table II presents the EER for individual channel of HSV, HSI, YUV, YIQ and Lab color model. In order to improve the performance of color models, the data is fused at score level. This score level fusion improves the EER. Fig. 4 and 5 shows the DET curves for best five color models. Based on these DET curves the EER is estimated. The EER obtained from these five color models is listed in Table II.

TABLE II. TIME REQUIRED ROR COMPARING SIMILARITY FOR TWO IRIS IMAGES

Color Models	EER	
	MHD	*ED*
HSV	0.05	0.072
YIQ	0.07	0.079
HSI	0.088	0.102
Lab	0.22	0.227
RGB	0.09	0.098

VI. CONCLUSIONS

The paper presented the performance evaluation of different distance measures used in color iris authentication. The iris features are extracted using color

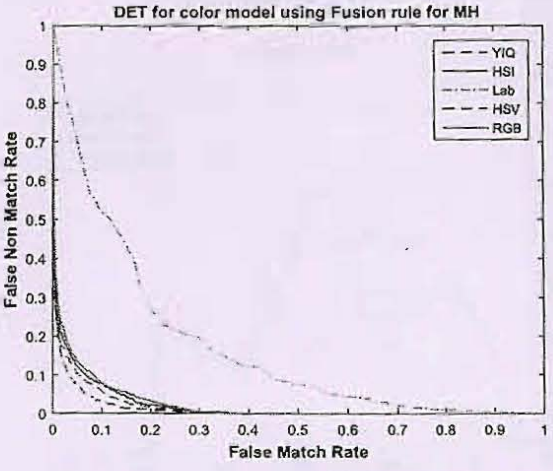

Figure 4. DET curves for various color models using MHD

histogram. This method of color histograms deals with different image sizes, colors, eyelashes, eyelids and illuminations. The experimental results reveal that HSV and YIQ color spaces are powerful as compared to RGB, YUV, HIS, HSL, Lab and YCbCr color spaces for iris authentication. Experimental results demonstrate that Manhattan and Euclidean distance are computationally efficient than all other distances. The performance of the method using the HSV color model is very simple, effective, efficient and faster. Based on the results presented above HSV model is an optimal color model suitable for color iris authentication. The proposed method using Euclidean and Manhattan distance achieves EER of 0.072 and 0.05 respectively. The execution time required for iris authentication is less as compared with earlier algorithms.

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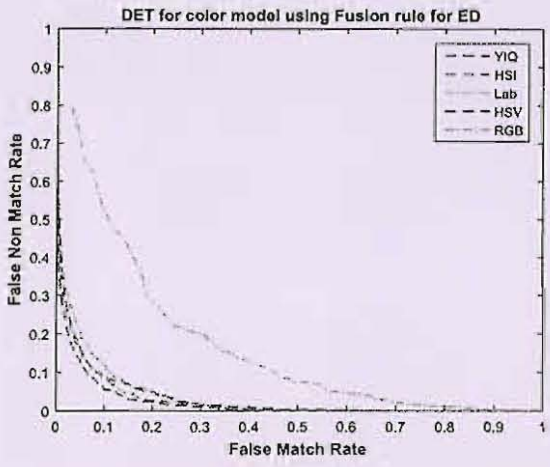

Figure 5. DET curves for various color models using ED

Experimental results suggest that the combination of HSV channels, its histogram and matching score fusion using weighted sum rule is more promising. The accuracy of the proposed system can further be improved by developing new models for feature extraction which are more efficient in terms of accuracy and EER.

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Face Recognition and Tracking in Videos

Swapnil Vitthal Tathe*,[1], Abhilasha Sandipan Narote [2], Sandipan Pralhad Narote[3]

[1] *Department of Electronics & Telecommunication, Sinhgad College of Engineering, Pune, India*

[2]*Department of Information Technology, SKN College of Engineering, Pune, India*

[3]*Department of Electronics & Telecommunication, Government Residence Women Polytechnic, Tasgaon, India*

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ABSTRACT

Advancement in computer vision technology and availability of video capturing devices such as surveillance cameras has evoked new video processing applications. The research in video face recognition is mostly biased towards law enforcement applications. Applications involves human recognition based on face and iris, human computer interaction, behavior analysis, video surveillance etc. This paper presents face tracking framework that is capable of face detection using Haar fea-tures, recognition using Gabor feature extraction, matching using correlation score and tracking using Kalman filter. The method has good recognition rate for real-life videos and robust performance to changes due to illumination, environmental factors, scale, pose and orientations.

1 Introduction

In recent years, there has been rapid growth in research and development of video sensors and analyzing technologies. Cameras are vital part of security systems used to acquire information from environment. It includes video, audio, thermal, vibration and other sensors for civilian and military applications. The intelligent video acquisition system is a convergence technology including detecting and tracking objects, analyzing their movements and responding to them.

Face recognition system is used to automatically identify a person from an image or a video source. The recognition task is performed by obtaining facial features from an image of the subject's face. The main objective of video-based face recognition and tracking is to identify a video face-track of unknown individuals. It identifies the facial features by extracting features from image of subjects face and analyzing the relative position, size, shape etc. These obtained features are utilized to search corresponding matching features in other images or subsequent frames.

The face recognition system can be divided into three main parts:detection, representation and classification. The face detection from video is challenging task as it needs compensation to distortions arising from motion. The most popular algorithm for last decade is Viola Jones algorithm based on cascaded Haar feature detector [1]. Due to its high computational speed and robustness it is widely used to detect face in still images as well as video frames. Skin color of human being has limited range of chrominance that can be modeled to represent skin color pixels [2]. To overcome the limitation of complex background with skin color like objects it detects feature like shape and appearance to validate face detection [3]. The representation stage extracts distinct and discriminative features that represents face texture and appearance for face classification. The feature extraction stage is an important as the final matching decision is biased to the quality of features. Recognition stage consists of generating reference template by averaging multiple faces and matching with the detected faces. Eigenface method is simple and popular method widely used in this field [4]. Other methods like LBP [5], LDA [6], Gabor Filter [7], etc. Neural Network is efficient method used for classification [8]. It requires large training samples suitable for face recognition in images. The computation time of recognition system depends on the size of feature vector and number of database images. The state-of-art methods are mostly used for still image face recognition. Research is in progress to develop robust methods for face recognition in real-time.

This paper is an extension of work originally presented in IEEE Annual India Conference [9]. The system proposed here is intended to detect and identify the person. The first stage captures the video segments. Pre-processing algorithms like histogram

*Swapnil Vitthal Tathe, Sinhgad College of Engineering, Pune, India & swapniltathe7@gmail.com

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equalization are employed to remove the unwanted artifacts present in the image [10]. The second stage detects faces in complex backgrounds using Viola-Jones [1] face detector. Next stage is representation of face features using Gabor filter [11] that inculcates directional features. The Gabor features are compared with the database images using correlation coefficients [12]. The later stage tracks the detected face in subsequent frames. Tracking utilizes popularly used Kalman filter [13] that makes use of statistical analysis to predict the location of face. The proposed system identify a person in high security premises to restrict the movements of unauthorized person.

The paper is organized as follows: Section 2 presents state-of-art technologies of the field. Section 3 describes methodologies used. Section 4 presents Results and Section 5 gives Conclusions.

2 Related Work

Recognition of individuals is of high importance for various reasons. The real-time algorithms has hard limitations to overcome as any delay in processing may result in loss of important information. Facial features are used for describing individuals as it has unique nature i.e. no two persons can have same faces. The facial features commonly used in many of the studies are skin color [14], spatio-temporal [15], geometry[16] and texture pattern [17]. Face detection algorithms are computationally intensive, which makes it is difficult to perform face detection task in real-time. As human face changes with factors like facial expression, mustache, beard, glasses, size, lightening conditions and orientation, detection algorithms must be adaptive and robust[18].

The simplest approach to detect faces is to find skin pixels present in frames and then apply geometrical analysis to locate exact position of face. The conventional images or frames in videos are modeled with *RGB* color space. Skin pixel values for normalized *RGB* plane are - r plane pixel values are in the range 0.36 to 0.456 and g values in the range 0.28 to 0.363. The second model in representing images is *HSV* color space. In *HSV* model pixel is classified as skin pixel if it has values $0 \leq H \leq 50$ and $0.20 \leq S \leq 0.68$ [19]. The third model in color representation is YC_bC_r color space. Skin color pixel has C_r value around 100 and C_b value around 150 [20]. Dhivakar et al. [21] used YC_bC_r space for skin pixel detection and Viola-Jones [1] method to verify correct detection.Skin color based method is sensitive to illumination variation and fails if background contains skin color like objects.

The other complex methods used for face detection are based on geometry and texture pattern that uses depth features to detect face. Face detection using edge maps and skin color segmentation is presented in [22]. Mehta et al. [6] proposed LPA and LBP methods to extract textural features with LDA dimensionality reduction and SVM classification. Lai et al. [23] used logarithmic difference edge maps to overcome illumination variation with face verification ahility of 95% true positive rate. Contour based face detection is proposed in [24]. Xiao et al. [25] used eigen faces for face detection using texture and shape information in bi view face recognition system. Viola and Jones [1] proposed haar feature based real-time method for face detection. Many researchers popularly used haar face detection with adaboost classification [8] in face detection.

Face recognition systems are popular in biometric authentication as they do not require the user intervention. Face recognition systems can be classified as sub-class of pattern recognition systems. Eigenfaces and Fisher faces were proposed in the early 1990s by Turk et al. [26]. Bayesian face recognition has better performance compared to eigenfaces [27]. Rawlinson et al. [28] presents eigen and fisher face for face recognition. Feature based methods are robust to illumination and pose variations. SIFT and SURF has robust performance in unconstrained scenarios [29]. Gangwar et al. [30] introduced Local Gabor Rank Pattern method that uses both magnitude and phase response of filters to recognize face. Neural Network is most popular tool of recent days that is used for classification which has outperformed many methods [31]. Meshgini et al. [7] proposed a method with combination of Gabor wavelets for feature extraction and support vector machine for classification. Recognition methods are time consuming as it requires accumulates training and testing phases.

Tracking is of prime importance to monitor activities of individuals in various environments [32]. The location of object in next frame is predicted based on location of object in current or preceding frames. More details for tracking methods can be found in [33]. Elafi et al [34] proposed an approach that can detect and track multiple moving objects automatically without any learning phase or prior knowledge about the size, nature or initial position. Gyorgy et al. [35] proposed Extended Kalman filter for non linear systems. Kumar et al. [36] extracted moving objects using background subtraction and applied Kalman filter for successive tracking. The other popular tracker is mean shift that employs mean shift analysis to identify a target candidate region, which has most similar appearance to target model in terms of intensity distribution. Adaptive mean shift (Camshift) algorithm is popular OpenCV algorithm for tracking [37]. In [38] combined mean shift and kalman filter is used for tracking. Particle filter tracker uses probabilistic approach to estimate position of object in next frame. The particle filter searches for histogram that best matches with reference [39]. Tracking using sparse representation [40] is gaining momentum for fast and accurate tracking.

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3 Methodology

Automatic face detection is the very first step in many applications like face recognition, face retrieval, face tracking, surveillance, HCI, etc. Face is vital part of human being representing most information about the individual. Developing a representation model is difficult because face is complex, multi-dimensional visual stimuli. General architecture of proposed system is shown in Figure 1.



Figure 1: Human detection and tracking system

3.1 Haar Face Detection

This method is most popular method for face detection in real-time applications. Most of mobile platform uses the technique to locate faces in camera applications. Viola and Jones [1] proposed real-time AdaBoost algorithm for classification of rectangular features. The detection technique is based on the idea of the wavelet template that defines the shape of an object in terms of a subset of wavelet coefficients. The different Haar features shown in Figure 2 are used to analyze the intensity variation patterns of face regions. For example the eye region appears darker than the surrounding region that can be modeled using two rectangle feature (black part corresponding to eye region and white part corresponding to surrounding region). Combination of four, six, eight and more features is used in practical face detection to make detection robust. For a given random variable X, the variance value of X is as follows:

$$Var(X) = E(X^2) - \mu^2 \quad (1)$$

where $E(X^2)$ is expected value of squared of X and μ is expected value of X.

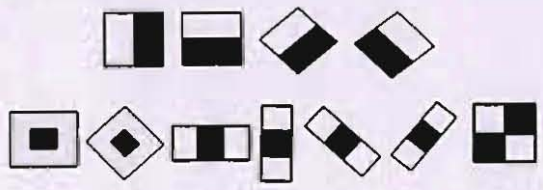

Figure 2: Haar features

Feature value is computed by subtracting the sum of variance of black region from sum of variance of white regions. To increase the computation speed, feature values can be computed using integral image [41]. Each feature is classified by a Cascaded Haar feature classifier. The Haar feature classifier multiplies the weight of each rectangle by its area and results are added together. The cascaded structure helps to speed up the detection process by eliminating non-face regions at every stage of cascade. Figure 3 shows face detection results from a video stream capture using webcam.



Figure 3: Face detection using Haar Features

Haar based method is capable of detecting multiple faces in near real-time and robust to illumination variations.

3.2 Gabor Filter

Feature extraction is one of the most important steps in designing a pattern recognition system. The features must have features have a small within class variation and strong discriminating ability among classes. Gabor filters have band pass performance that emphasizes features in face region that are analogous to scale and orientation of filter. The characteristics of Gabor filters are appropriate for texture representation and discrimination [7]. This method is robust to face pose and illumination changes.

The Gabor filter extracts face features from gray-level images. A two-dimensional Gabor filter is a Gaussian kernel function modulated by a complex sinusoidal plane wave represented as Equation 2.

$$\Psi_{\omega,\theta}(x,y) = \frac{1}{2\pi\sigma^2} exp\left(-\frac{x^2+y^2}{2\sigma^2}\right) exp(j\omega x') \quad (2)$$

$$x' = xcos\theta + ysin\theta, y = -xsin\theta + ycos\theta \quad (3)$$

where (x, y) is the pixel position in the spatial domain, x is the central angular frequency of the complex sinusoidal plane wave, h is the anti-clockwise rotation(orientation) of the Gabor function, r represents the sharpness of the Gaussian function along both x and y directions and $\sigma \approx \frac{\pi}{\omega}$.

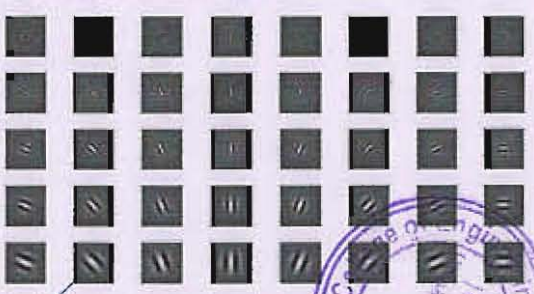

Figure 4: Gabor filters at 5 scales and 8 orientations

To extract useful features from an face image a set of Gabor filters with five frequencies (scales) and eight

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orientations is used. Figure 4 shows the Gabor filter bank. The scale and orientation values are obtained using Equations 4 and 5.

$$\omega_u = \frac{\pi}{2} \times \sqrt{2}^u, u = 0,1,\ldots,4 \quad (4)$$

$$\theta_v = \frac{\pi}{8} \times v, v = 0,1,\ldots,7 \quad (5)$$

The Gabor representation of a face image $I(x,y)$ is obtained as:

$$G_{u,v}(x,y) = I(x,y) * \Psi_{\omega_u,\theta_v}(x,y) \quad (6)$$

where $G_{u,v}(x,y)$ denotes the two-dimensional convolution result corresponding to the Gabor filter at scale u and orientation v. This process can speed-up with the use of frequency domain transformation. Figure 6 and 7 shows the convolution results of a face image shown in Figure 5) with Gabor filters.



Figure 5: Face Image



Figure 6: Magnitude of Face

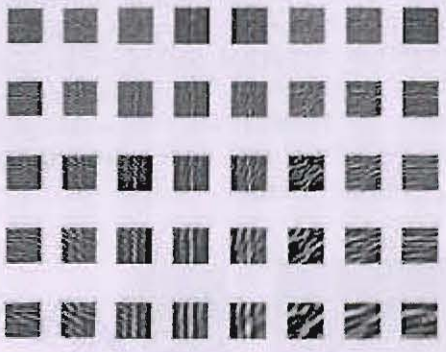

Figure 7: Real Part of Face

Each image $I(x,y)$ is represented as set of Gabor wavelet coefficients $G_{u,v}(x,y)|u = 0,1,\ldots,4; v = 0,1,\ldots,7$. The magnitude $G_{u,v}(x,y)$ is normalized to zero mean and unit variance and represented as a vector $z_{u,v}$ given by Equation 7 [7].

$$z = \left[(z_{0,0})^T (z_{0,1})^T \ldots (z_{4,7})^T\right]^T \quad (7)$$

Gabor based recognition is robust to pose and illumination variations with additional overhead of processing time and complexity.

3.3 Correlation Score Matching

Matching is a search algorithm that compares the features from query image to the database images to find best match. The comparison is done using correlation coefficients [32] between the Gabor features of detected face and the images present in database. Prior to matching stage all images in database are applied with Gabor filter for efficient feature matching. The 2D images are represented by 1D feature vector that speeds up the matching process. The correlation score is computed as :

$$Score = \sum_{i=1}^{m} f_q(i).f_{db}(-i) \quad (8)$$

where m is size of feature vector, f_q represents query feature vector and f_{db} represents database feature vector. The query image best matches with the database image that results into high correlation score.

3.4 Kalman Filter Tracking

Tracking objects in video sequences is one of the most important tasks in computer vision. The approach is to search target within a region centered on last position of the object. The important facts that should be taken care for effective tracking are: speed of moving object, frame rate of video and search region. These factors are dependent on each other, higher frame rate is used to get hold of faster moving target which on other hand requires faster processing. Tracking is defined as localization and association of features across series of frames. The two major components of tracking system are object representation and data association. The first component describes object and second utilizes the information for tracking.

The location of face from face detection stage is used as apriori estimate or sometimes called as initialization for tracking. Based on this location Kalman filter estimates and updates the prediction behavior of this stage. Initialization is an important stage for the tracker.

Kalman filter predicts the next time state vector based on the movement information in the previous stages. Kalman filter equations are categorized as - time update equations and measurement update equations. The time update equations projects forward the current state and error covariance estimates to obtain the apriori estimates for the next time step. The measurement update equations are the feedback i.e. it incorporates a new measurement into the a priori estimate to obtain an improved aposteriori estimate. The time update equations are predictor equations, while the measurement update equations are

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corrector equations. The process for Kalman filter estimation and update is given in Algorithm 1.

Algorithm 1 Kalman Filter

1: Initial Estimates for $\hat{X}_{k-1}$ and P_{k-1}
2: Time Update

- Project the state

$$\hat{X}_k^- = A\hat{X}_{k-1} + Bw_k$$

- Project the error covariance

$$P_k^- = AP_{k-1}A^T + Q$$

3: Measurement Update

- Compute Kalman gain

$$K_k = \frac{P_k^- H^T}{HP_k^- H^T + R}$$

- Update estimate with measurement Z_k

$$\hat{X}_k = \hat{X}_k^- + K_k(z_k - H\hat{X}_k^-)$$

- Update error covariance

$$P_k = (1 - K_k H)P_k^-$$

The state equation is

$$X_k = AX_{k-1} + Bw_k \quad (9)$$

The measurement model is

$$Z_k = HX_k + v_k \quad (10)$$

A and B are the system parameters and are matrix in the multi-model system, H is a parameter in a measure system, which is matrix in the multi-measurement system. w_k and v_k represents the process and measurement noise respectively.

The state vector $X_k = [x_k y_k x'_k y'_k]^T$, x_k, y_k are the object center in the x, y-axis location, x'_k, y'_k are the x, y axis speed. $Z_k = [x_{ck} y_{ck}]^T$ is the observation vector. P_k^- is apriori estimate error covariance and P_k is aposteriori estimate error covariance.

The search for object is carried in a region selected based on the estimated observation matrix Z_k. It fails if image is not properly illuminated. Kalman filter overcomes problem of Kanade-Lucas-Tomasi(KLT) [42]. It can track multiple objects with variations in pose and occlusion. The drawback is that it cannot handle rapid changes in motion of target.

Table 1: Result Comparison

Video	Frames	Face Det.	True Recog.		False Recog.	
			Eigen	Gabor	Eigen	Gabor
1	237	71	47	37	24	34
2	329	99	97	31	2	68
3	257	223	52	98	171	125
4	339	225	65	138	160	87
5	448	305	225	7	80	298
6	438	283	127	4	156	279
7	353	176	140	96	36	187
8	404	274	242	195	32	88
9	198	191	101	2	90	189
10	248	206	46	19	160	187
11	78	78	21	65	57	13
12	128	124	36	74	88	50
13	324	252	122	224	130	28
14	353	250	112	216	138	36
15	258	176	107	82	69	94
16	328	191	125	95	66	96
17	346	238	65	108	173	130
18	426	392	148	289	244	103
19	318	302	144	48	158	344
20	388	257	146	16	111	376

4 Results

The algorithms are applied on video sequences obtained from NRC-IIT Facial Video Database and our own videos recorded with webcam. Table 1 gives the comparison of proposed method with eigen face method. The values presented in table are the number of frames with true result. Table 2 gives summary of results obtained on the videos. Haar face detector used has robust performance for frontal faces. It cannot handle larger pose variations. Face detection fails if the face is very small in size compared to size of frame and in random pose changes. The second part of algorithm is face recognition that makes use of gabor filters. Gabor filter has robust performance in pose and illumination variations. Once person is recognized Kalman filter keeps track of movements the face in subsequent frames. Kalman filter has good tracking performance in partial occlusions but fails in case of sudden movements. Recognition result is shown in Figure 8. The values in table shows the playback time in sections for videos under test with face detection and recognition stage.



Figure 8: Face Recognition Results

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Table 2: Results for Tracking

Sample Video	No. of Frames	Face Detect. (Time (sec))	Face Recog. (Time (sec))
1	237	15.5880	54.5289
2	329	20.9837	52.9032
3	257	16.4133	41.3256
4	339	21.4623	86.5154
5	448	31.4490	63.3743
6	438	30.2323	65.4514
7	353	25.3845	56.76
8	404	28.7957	113.2256
9	198	13.7490	31.8384
10	248	16.5841	39.8784
11	78	5.4555	5.97056
12	128	8.6597	20.5824
13	324	22.5488	59.4159
14	353	24.4202	66.3573
15	258	17.0961	41.4864
16	328	20.7186	52.7424
17	346	22.1367	55.6368
18	426	28.5429	68.5008
19	318	20.9056	51.1344
20	388	25.4525	35.1624

5 Conclusions

The proposed system detects the facial features of human being and verify identity of a person. Haar based face detection is popular and efficient face detection algorithm for real-time applications. Haar based face detector has high accuracy in frontal face detection. Recognition performance depends on the type of images in database. Larger the database more is recognition time. Gabor face recognition is better than many other methods as it compares features at different scale and orientations. Disadvantage of recognition stage is that comparison of large number of features requires more time for recognition that affects real-time performance. Reducing feature set reduces recognition time but affects accuracy of system. Kalman filter gives good performance in complex environment. Future directions can be optimizing algorithms to minimize processing time and achieve real-time performance.

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Sinhgad Vasale College of Engineering
Vadgaon (Bk.), Pune - 411 041

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Efficient retinal vessel detection using line detectors with morphological operations

Sarika B. Patil[a,*], Abbhilasha S. Narote[b] and Sandipann P. Narote[c]
[a]*Department of Electronics and Telecommunication, Sinhgad College of Engineering, Savitribai Phule Pune University, Pune, Maharashtra, India*
[b]*Department of Information Technology, S.K.N. College of Engineering, Savitribai Phule Pune University, Pune, Maharashtra, India*
[c]*Department of Electronics and Telecommunication, M.E.S College of Engineering, Savitribai Phule Pune University, Pune, Maharashtra, India*

Abstract. Digital fundus photography plays a major role in the diagnosis of different retinal pathologies like hypertension, diabetic retinopathy and Glaucoma. To identify abnormal components on the retina, retinal features should be detected accurately. Retinal vessel structure is one of the important landmarks of the retina. So precise detection of retinal vessel structure is imperative. This paper presents a simple, robust retinal vessel extraction approach based on the line detectors and morphological operations. As vessel detection is basically a problem of a line detection, the green channel retinal image is applied to morphological opening using a line as structuring element. The resultant image is again applied with the line detectors and thresholded using Otsu's thresholding. The proposed algorithm overcomes the fundamental issues of scale and orientation avoiding the need of multiple thresholds with improved values of performance measure as compared to the state of the art techniques. The proposed algorithm is applied on 3 standard databases-HRF (healthy and Diabetic), DIARETDB1 and DRIVE. Area under the ROC curve (AUC) of 97% was achieved with 91% Sensitivity and 97% Specificity for DRIVE dataset. The proposed algorithm achieved an Accuracy of 97%, Sensitivity of 85 % and Specificity of 97% for HRF database. On DIARETDB1 database too observed very good results.

Keywords: DIARETDB1, DRIVE, HRF database, fundus image, retinopathy, vessel detection

1. Introduction

Retinopathies related to diseases such as diabetes and cardiovascular diseases have an ever increasing importance as a cause of blindness and visual loss [1]. Current statistics show, 39 million people are blind and 246 million have low vision worldwide. Timely diagnosis of eye diseases can prevent blindness [1, 2]. The global Vision 2020 initiative has an effect to prevent blindness, particularly from ocular infeetions. Researeh indicates that at least 90% of these new cases could be avoided if there were proper and automatic screening and monitoring of the eyes. Abnormal features of the retina can be identified in-time with the aid of fundus photography through innovative image processing algorithms. Advanced medical therapies save a person from blindness [3].

Automated examination of retinal images plays a significant role in the diagnosis and analysis of different retinal pathologies like hypertensive, diabetic pathology and Glaucoma. Currently, a timely eye check-up appears to be the best method with nearly worldwide coverage of the people at risk [1].

*Corresponding author. Sarika B. Patil, Department of Electronics and Telecommunication, Sinhgad College of Engineering, Savitribai Phule Pune University, Pune, Maharashtra, India. Tel.: +91 020 24354705; Fax: +91 020 24357243; E-mail: sbpatil.scoe@sinhgad.edu.

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Early detection of abnormal features, which are not often directly visible by clinical investigation, has the potential to reduce the global burden of diabetes and cardiovascular disease. Engineering tools such as digital image processing combined with innovative machine learning to allow identification and automated classification of features, lesions, and vascular changes in fundus images of the retina [2, 3].

A significant number of lesions have been found on the retina due to diabetics (progressive disease). The evolution of disease takes place from mild Non Proliferative Diabetic Retinopathy (NPDR) to Severe Proliferative Diabetic Retinopathy (PDR) [3]. Usually, first and the most common sign is microaneurysms or small haemorrhages – tiny capillary dilations. As the disease progresses, retinal capillaries start leaking fluid forming exudates – lipid deposits that appear as bright yellow/white lesions in the photograph. If the leakage is located around most acute vision, i.e. macula, it leads to sight threatening macular edema [1, 2]. Proliferative diabetic retinopathy (PDR) develops from obstructed capillaries which cause micro infarcts called soft exudates. This PDR stage quickly turns into Severe PDR where extensive lack of oxygen causes formation of small and fragile vessels either near the optic disc or in the retinal periphery. These newly developed vessels are disposed to bleed, resulting in neovascularisation, pre-retinal haemorrhages, fibrosis and ultimately detachment of the retina resulting in blindness [1].

In order to recognise the abnormalities like Microaneurysms, haemorrhages and exudates, the normal retinal landmarks namely blood vessels, optic disc and macula need to be detected accurately. Optic disc and macula detections are achieved with a greater accuracy in the earlier mentioned literature. Retinal blood vessels are combinations of arteries and veins, originating from the optic nerve towards the retina. These vessels normally possess maximum light reflectance on the centreline that seems more significant on arteries than veins and the oxygenated blood supply to arteries makes them brighter than veins [3]. In general, the methods of the literature for vessel detection try to extract the features like position, grey level profiles of vessels, linearity and steady variation in intensity lengthwise.

The vessels are connected in the retina, forming a binary tree like structure. Blood vessel detection suffers from many issues such as methods based on matched filters, suffer from the problems of scale and orientation [5, 10, 15]. Accurate detection and extraction of blood vessel structure is still a challenging task as most of the methods mentioned in the literature fail to detect vessels in the presence of lesions producing false positives and reduced value of sensitivity, which lowers overall accuracy [7]. Thin vessel detection is another major problem faced by many of state of the art methods. In general, methods using edge detectors fail to recognize correct and false edges. Branching, bifurcation, and crossover in vascular structure can further complicate the profile model. Central Vessel reflex, variations in intensity profiles and low contrast images along with background noise increases the problems in most of the blood vessel detection algorithms [4].

This paper proposes an innovative, simple and robust method for retinal vessel extraction. The use of morphological opening and line detectors helps in enhancing all line paths of vessels equally avoiding the need of multiple thresholds and helping to extract thin vessels. It also overcomes the fundamental issues of scaling and orientation as it is working on multiple origins and size of images equally. The vessel extraction achieved by this method produces precise results even in the presence of lesions at an initial stage of Diabetic Retinopathy.

2. Related work

Blood vessel detection techniques can be broadly classified into four categories – matched filters, edge detectors, morphological operators and pattern recognition techniques. Chaudhari et al. [5] addressed the problem of detecting retinal blood vessels by approximating Grey level profile of a cross section of retinal blood vessel by a Gaussian shaped curve and applying the concept of matched filter detection to detect piecewise linear segment of blood vessels giving an accuracy of 0.8733. Joes Staal et al. [6] presented a ridge based vessel segmentation methodology from colour images of the retina on DRIVE and STARE database given an accuracy of 0.9442, 0.9516. An innovative spatially weighted fuzzy c-means (SWFCM) clustering algorithm for vessel detection with accuracy of 0.8911 on DRIVE presented by Giri Babu Kande et al. [7].

A Radius based Clustering Algorithm (RACAL) using distance based principle to map the distributions of the image pixels, is proposed by Salem et al. [8]. Yang et al. [9] presented an automatic hybrid method including the combination of mathematical morphology and a fuzzy clustering algorithm. Zhang et al. [10] generalized the classical matched filter and

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extended with a first-order derivative of the Gaussian (MF-FDOG) on DRIVE and STARE database and given 0.7120, 0.9724 and 0.9382 as sensitivity, specificity and accuracy. Diego Marín et al. [11] invented a method using a neural network (NN) scheme for pixel classification. A new system is proposed by Keith A. Goatman et al. [12] for detection of New Vessels on the Optic Disc.

Delibasis et al. [13] presented an automatic parametric model-based tracking algorithm for vessel segmentation and diameter estimation. Akram et al. [14] proposed retinal vessel extraction using multilayered thresholding based technique producing an Accuracy of 0.9469. Fraza et al. [15] reported an automated method using a unique combination of techniques for vessel centre line detection and morphological bit plane slicing, methodology is evaluated on DRIVE and STARE databases, producing an average accuracy of 0.9430,sensitivity 0.7152 and specificity 0.9768, but method is dependent upon vessel centre line reflex and scale and orientation problem.

Montoro et al. [16] focused on studying the appearance of the retinal vascular network in different colour spaces like RGB and HSV to extract the most distinct vessel features and classify the retinal vascular network as arteries and veins. Chakraborti et al. [17] proposed a novel self-adaptive matched filter for retinal blood vessel detection, a synergistic mixture of the vesselness filter with high sensitivity and the matched filter with high specificity is obtained using orientation histogram. Shuangling Wang et al. [18] presented a retinal blood vessel segmentation algorithm based on feature and ensemble learning given sensitivity 0.8173, specificity 0.9733 and accuracy of 0.9767. Temitope Mapayi et al. [19] proposed a local adaptive thresholding technique depending on grey level co-occurrence matrix.

3. Proposed vessel segmentation method

The proposed blood vessel segmentation method is an approach based on the combination of morphological analysis with line detectors. Since vessels and lesions are morphologically different. Morphological opening is done using line as SE which will enhance line segments and suppress lesion part of the retina. The results of it will be further enhanced using line detectors and Morphological opening giving additional advantage. Then the resultant image is thresholded using Otsu's thresholding followed by morphological cleaning. Experimental results have shown that proposed methodology achieved a high value of sensitivity even in the presence of lesions and it is free from the problems of scale and orientation.

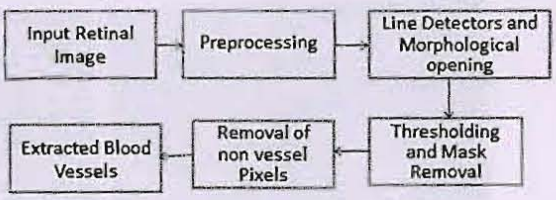

Fig. 1. Block diagram of proposed system.

3.1. Pre-processing

In pre-processing section the input retinal image is first converted into green channel as blood vessels are clearly seen into green channel as shown in Fig. 2(b). The retinal fundus image from specified database is given as an input image as shown in Fig. 2(a).

3.1.1. Image smoothing

Morphological opening helps to smooth out bright lesions and optic disc. Morphological opening operation with SE as a 'disk' of radius 5 using the following Equation (1).

$$\phi_f^{(sB)} = \max[\min f(x+b)] \tag{1}$$

Here f is pre-processed color image and b $\in$ SB, Where SB is structuring element of size 'S'. This gives smooth regions for dark lesions, but it need contrast enhancement [20].

3.1.2. Contrast Limited Adaptive Histogram Equalization

Contrast Limited Adaptive Histogram Equalization works on small sub sections in an image called 'tiles'. Each tile's contrast is enhanced by specifying 'distribution'. Here we have preferred use of flat histogram distribution.

The equation of CLAHE is given by,

$$g = 255\frac{[\phi_w(\phi_f) - \phi_w(\phi_f \min)]}{[\phi_w(\phi_f \max) - \phi_w(\phi_f \min)]} \tag{2}$$

Where ϕ_w is sigmoid function and given by,

$$\phi_w(\phi_f) = \left[1 + \exp\left(\frac{m_w - f}{\sigma_w}\right)^{-1}\right] \tag{3}$$

ϕ_f max and ϕ_f min are the maximum and minimum intensity values of morphologically processed

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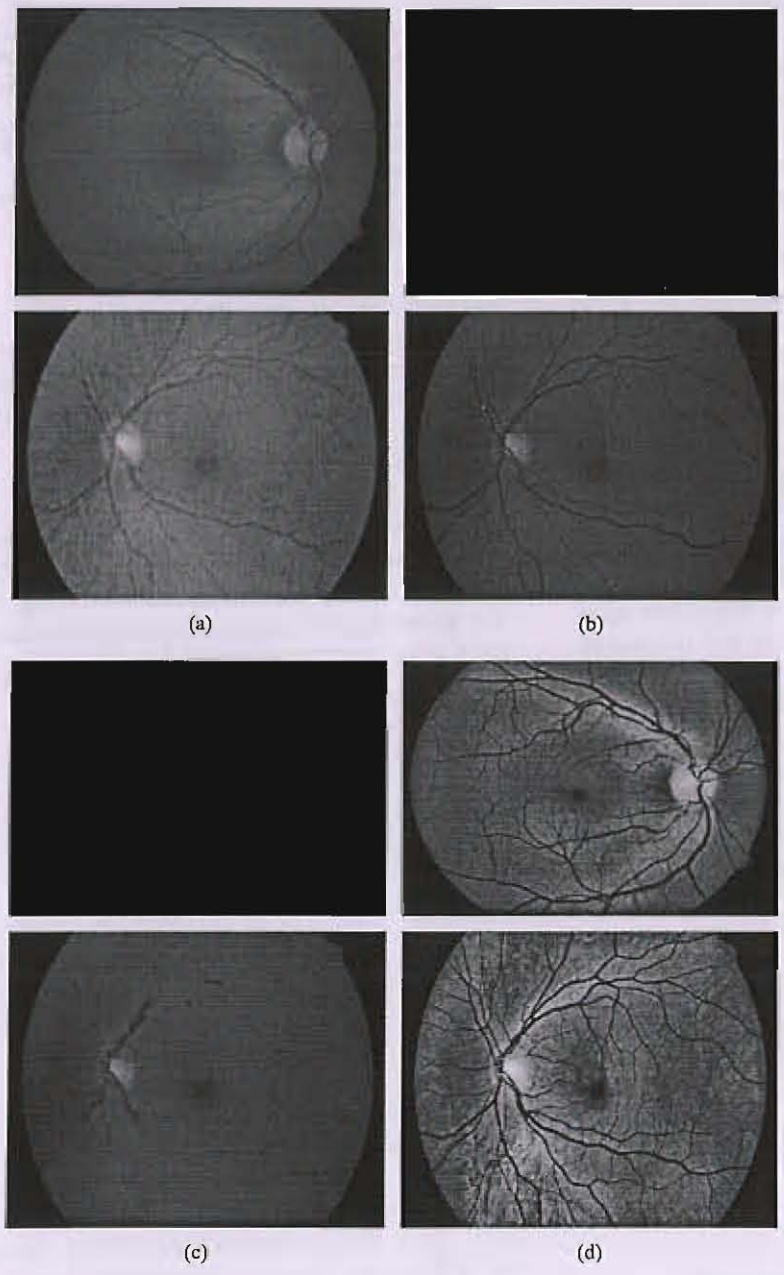

Fig. 2. Preprocessing on Diaretdb1 and HRF Database (a) Input fundus image (b) Green channel image (c) Image after Morphological opening to smooth bright lesions (d) Image after applying CLAHE.

smooth green channel image respectively. m_w and σ_w are the mean and variance of intensity values within the window [20].

Morphological opening is applied on extracted green channel image in order to smooth out bright objects like white lesions and optic disc. The resultant image is shown in Fig. 2(c). But this image is an image with poor contrast so it is applied with the contrast enhancement technique i.e. CLAHE. Output of it is shown in Fig. 2(d). where contrast between blood vessels, background, and other lesions are enhanced.

3.2. *Vessel boost and segmentation*

3.2.1. *Vessel boost*

The demand for improvement in appearance of a vessel pattern arises due to lack of contrast which typically causes problem for thin vessels. Directional

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-1	-1	-1
2	2	2
-1	-1	-1

Horizontal

-1	-1	2
-1	2	-1
2	-1	-1

-450

-1	2	-1
-1	2	-1
-1	2	-1

Vertical

-1	2	-1
-1	2	-1
-1	2	-1

-450

Fig. 3. Orientation masks in 4 directions.

matched [5] and Gabor filters [14] are preferred for this drive, but we have preferred the use of morphological opening to enhance the vascular pattern and thin vessels. The morphological open operation is erosion followed by dilation, using the same structuring element for both operations. We have used 'line' as a structuring element to enhance blood vessels since vessel segmentation is basically a problem of the line detection.

$$X_B = (X\ \theta\ B) + B \tag{4}$$

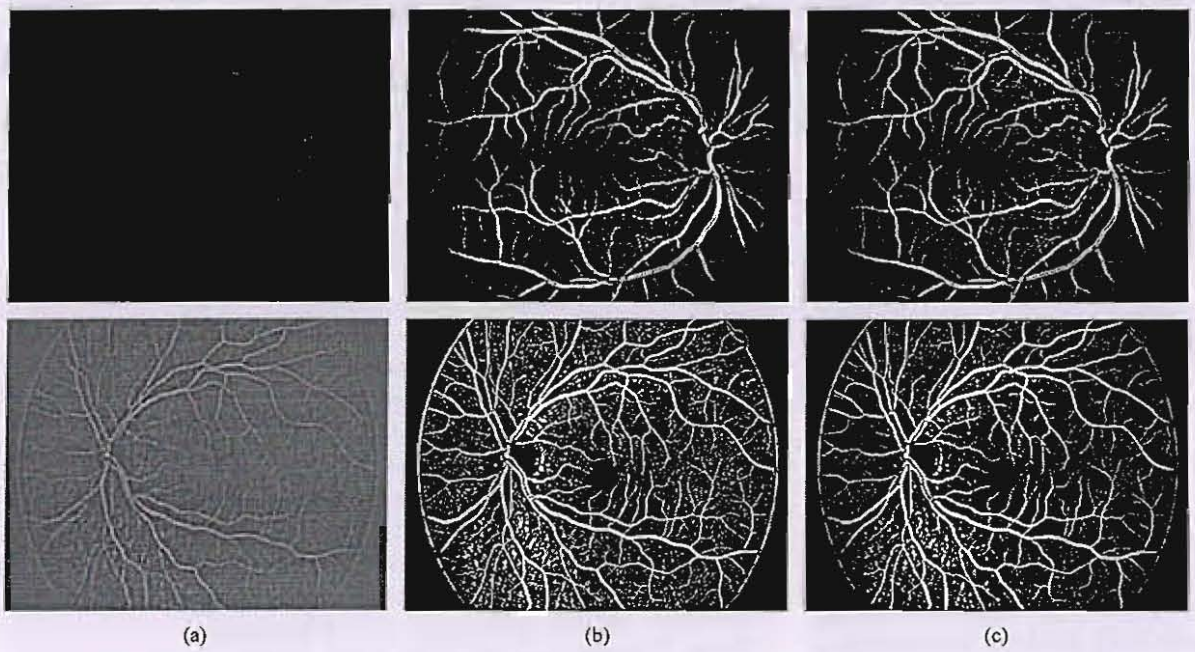
Assuming the object X and the structuring element B, X is first eroded and further dilated by B. We need to fix the lengths of the line based on the selected database. Here we have kept the length of line from 2 to 5. Image opening is made in 45°, 90°, 135°, 180° and maximum of the response is found out from all directions in order to enhance vessels and subdue other components in the image.

3.2.2. *Line detectors*

The image obtained after considering the maximum response of opening operation is convolved with average filter. The average filter is applied on each pixel in image to smooth an image, which takes the average around neighboring pixels. The background image with homogenized background is obtained by subtracting response of average filter from the contrast enhanced image. The resultant image is then convolved with line detectors in 4 directions, i.e. horizontal, vertical, +45° and –45°. The masks for convolution are as shown in Fig. 3 below.

By performing a convolution operation, maximum of them is obtained. An inverted and resultant of line detector image results are added together to increase the brightness. Again, applying SE as a line of size 2 to 5 in all directions, i.e. 45°, 90°, 135°, 180° image is opened in all directions and maximum from all directions is found out as shown in Fig. 4(a).

The choices of morphological opening followed by the line detectors benefits in enhancement of the vessel structure as vessels are basically lines in nature. The vessels in dark region are present with less intensity which might not get reflected after thresholding.



(a) (b) (c)

Fig. 4. Vessel enhancement and Segmentation on Diaretdb1 and HRF Database (a) Image inversion (b) Result after line detectors and enhanced brigbtness (c) Image after thresholding.

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Vadgaon, (Bk.), Pune - 411 041

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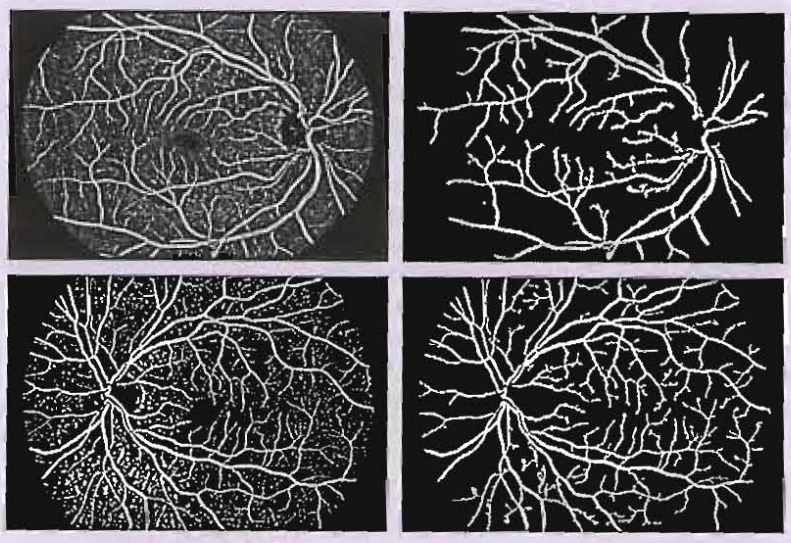
Vadgaon(Bk.)
Pune-41



(a) (b)

Fig. 5. Blood vessel extraction results on Diaretdb1 and HRF Database (a) Image after removal of mask (b) Extracted blood vessels.

So all vessel pixels of resultant image are further enhanced by multiplying a suitable factor with an image. Thus enhancing all vessels pixels equally and avoiding the need of multiple thresholds. The resultant image is then applied with Otsu's thresholding. The output image is as shown in Fig. 4(c).

3.2.3. Blood vessel extraction

The output image is logically ANDed with mask image from database in order to remove mask as shown in Fig. 5(a). The thresholded image still consists of noise as well non-vessel pixels, they are removed by using morphological 'clean' operation. Thus avoiding the need of further post processing algorithms for vessel extraction. The clear blood vessel extracted image as shown in Fig. 5(b).

4. Results

The Proposed algorithm is applied on standard databases such as DRIVE, HRF (Healthy and Diabetic) and DIARETDB1. The results for DRIVE and HRF databases are compared with ground truth images provided along with the dataset.

4.1. Materials

IMAGERET–Proposed algorithm's performance is observed on publically available DIARETDB 1 database from IMAGERET project. Out of 89 colour fundus photograph's 84 images are having signs of at least mild NPDR and all experts involved in annotation agreed that 4 images do not have any signs of DR. The images were acquired at the Kuopio University Hospital. The digital fundus camera with a FOV of 50 degrees was used to take images [22].

DRIVE – To evaluate the performance of the proposed vessel segmentation technique DRIVE database is used. The fundus images for the DRIVE database were acquired from a diabetic retinopathy screening drive in the Netherland. The database contains 400 images, people affected due to diabetics between the age group 25–90 were involved in the screening process. 40 images are arbitrarily chosen, no signs of DR are present in 33 images whereas 7 of them are showing mild DR signs. Each of the images is compressed with JPEG standard with a pixel resolution of 786 × 584 and 8 bits per pixel [23].

Chosen 40 images are divided into two sets – training and testing, containing 20 images in each. The test dataset is provided with two manual segmentations; one treated as ground truth and another one is used to compare results with computer generated data. A single vascular structure is provided for the images from training dataset. This dataset is specialized in vessel segmentation and makes two sets of images available, one for training and one for testing purposes [23].

HRF – The database is provided by the Pattern Recognition Lab, the Department of Ophthalmology, Germany and the Brno University of Technology, Brno. This database has been made available to support relative studies on automatic segmentation algorithms on retinal fundus images. The images

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Table 1
Evaluation Parameters used to test performance of algorithm

Parameters	Description
Sensitivity/TPR	TP/ vessel pixels
Specificity	TN/TN+FP
Accuracy	(TP+TN)/(TP+TN+FP+FN)
FPR	FP/Total non-vessel pixels

are having resolution of 3504 × 2336 captured with Canon EOS 20D. The public database contains 15 images of, healthy retina, retina affected due to diabetic retinopathy, and of the glaucoma patients each. The segmented vascular structure is provided as a gold standard for each image of database, along with the masks with defined FOV. The group of specialists in the analysis of retinal images and expert doctors from ophthalmology clinics participated in generating the ground truths [24].

4.2. Evaluation parameters

TP is the value of True Positive pixels means vessel pixels present in both ground truth as well as segmented image. TN is the value of True Negative pixels i.e. pixels absent in both cases. FP is False Positive –pixels which are absent in ground truth, but present in segmented image and FN False Negative – the pixels present in the ground truth image but absent in segmented image. The parameter TPR should approach to unity, whereas the parameters FPR should be ideally zero. Sensitivity replicates the capability of an algorithm to detect the true vessel pixels. Specificity shows the capability to detect number of pixels which do not belong to vessel, expressed as 1–False Positive Rate.

Evaluation Parameters are as indicated in the following Table 1.

4.3. Vessel segmentation results

Table 2 summarizes vessel segmentation results of the proposed algorithm on DRIVE, HRF Diabetic and HRF Healthy databases. The results are compatible with the methods mentioned in earlier literature. The results are also observed great on 89 images from

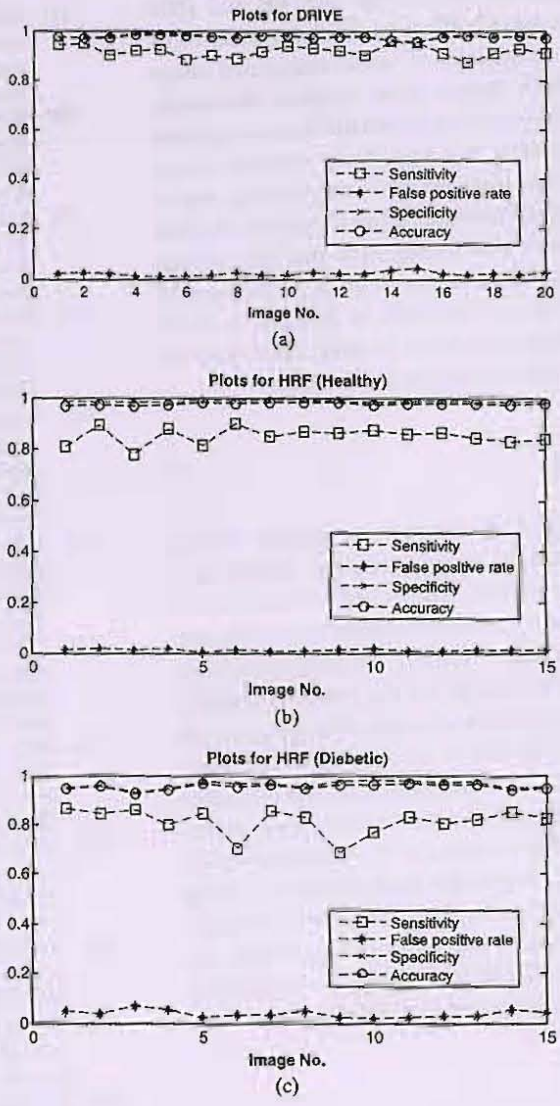

Fig. 6. Comparison of Evaluation Parameters for (a) DRIVE (b) HRF (Healthy) (c) HRF(Diabetic) Databases.

Table 2
Results of vessel segmentation for the proposed algorithm

Method	Database	Sensitivity	Specificity	Accuracy	False Positive Rate
Chaudhuri et al. [4]	DRIVE	–	–	0.8773	–
Zhang et al. [10]	DRIVE	0.7120	0.9724	0. 9382	–
S Wang et al. [18]	DRIVE	0.8173	0.9733	0.9767	–
Odstricilik et al. [21]	HRF	0.7741	0.9669	0.9494	–
Proposed Method	DRIVE	0.9168	0.9771	0.9735	0.0212
	HRF Healthy	0.8512	0.9867	0.9768	0.0120
	HRF Diabetic	0.8130	0.9630	0.9535	0.0369

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Diaretdb1 database. Results on DRIVE and HRF (both Diabetic and Healthy) database are obtained by pixel to pixel comparison of vessel segmented image and ground truth images from database document. Experimental results have shown the values of parameters like Accuracy and Specificity obtained using the proposed algorithm are similar to the other methods mentioned in literature rather it exceeds in some cases. It is worth mentioning here that the average value for sensitivity is improved greatly as compared to the state of the art methods in addition to it the value of specificity is greater in most cases than the other reported methodologies in literature.

5. Conclusions

The proposed work found very suitable for the extraction of blood vessel structure which is a major retinal landmark. The retinal vasculature is obtained using simple morphological operations and line detectors together avoiding the need of multiple thresholds. The advantage for the practical application is that the algorithm works on retinal images from multiple origins and can be used by different operators working with different equipment. It is important to point out that the parameters used for segmentation are invariant. The robustness with fast implementation and simplicity makes this work suitable for being implemented into a complete automated retinopathy screening process. The proposed algorithm has achieved a high value of sensitivity as compared to most of the earlier proposed methodologies.

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Energy Efficient Encryption Scheme for Vehicular Ad Hoc Network

Pooja Mundhe
Dept. of Information Technology
Sinhgad Technical Education Society's SKNCOE,
Pune, India
E-mail: poooh.m99@gmail.com

Prof. V. S. Khandekar
Dept. of Information Technology
Sinhgad Technical Education Society's SKNCOE,
Pune, India
E-mail: varsha.khandekar@gmail.com

***Abstract*—Vehicular ad hoc networks are part of Mobile ad hoc network. They are self-distributed and organized. The main purpose of the VANET is to provide comfort and safety application such as information about fuel station, whether condition, parking, road block, and emergency warning, etc. Energy saving is an important issue in VANET. Energy consumption can be reduced with the help of the network coding with less transmissions. Transmission is not the only source of energy consumptiou there are many more like encryption and decryption. P-coding is a light-weight security mechanism, which saves the energy in the process of eneryption/decryption of data. With the efficient permutation encryption, this method provides security against eavesdropping attack. The permutation encryption makes an attacker difficult to locate the coding vector.**

Keywords- Energy Saving, Light-Weight Encryption, Network Coding, Vehicular Ad Hoc Network.

I. INTRODUCTION

Vehicular ad hoc network is now becoming interesting research topic in the area of wireless communication. Vehicles in the particular range form a network to communicate with each other without the need for a base station. VANET provide comfort and safety applications such as lane changing, traffic sign violation, weather information, road condition, location of restaurants or fuel station, parking and interactive communication such as internet access [2]. For providing these services, energy is required. Thus, energy saving is an important issue in vehicular ad hoc network. There are several energy efficient schemes used to overcome this problem [3], [4] and [5].

Many researchers show that network coding can reduce energy consumption in VANET with less transmission [6]. Network coding can be defined as coding performed at a node in a network, where coding means casual mapping from inputs to outputs. Idea behind it is to mix and forward data to output links [7]. A node in the network encodes the packet with the network coding and then forwards it to another node. Network coding requires less energy for this process of encoding. Figure 1clarify the use of network coding in ad hoc network. Suppose there are six nodes forming hexagon and transmission range of each node reaches to its right and left neighbor. As shown in figure. 1(1) each message would require four transmissions without network coding. When network coding is used as shown in (figure. 1(2), 1(4), 1(4),) a total number of nine transmissions are needed for three messages, i.e., three transmissions per message. It would save ¼ energy without considering energy required for the process of encryption and decryption.

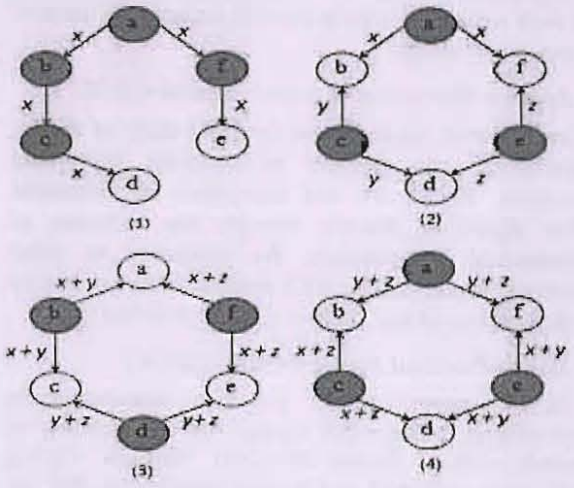

Figure 1: Use of network coding for transmission. Shaded nodes are those involved in transmission [1].

Encryption and decryption performed at each node for providing security also consumes more energy in VANET. For example, data eommunieated between vehicles in battlefield or a police van should keep confidential during transmission [8]. But the encryption schemes previously used for providing security not work efficiently.

In [9], a Motorola's "DragonBall" embedded microprocessor consume near about 13.9 µJ to send a bit. It consumes 7.9 µJ when symmetric-key encryption algorithm is used for encryption per bit. Intrinsic security is provided by network coding based on which encryption scheme can be designed. In [10], it proposes that coding vector can be encrypted by using Homomorphism Encryption function (HEF), due to whieh network coding can be performed directly on coding vectors. This scheme has too much computation or space overhead; therefore they are not suitable for VANET.

In this paper, a new encryption scheme is designed which provide security in energy efficient manner. P-coding randomly permutes both message content and coding vector due to which eavesdropper cannot locate coding vector without knowing permutation since cannot reveal useful information [1].

There are different types of attacks and threats possible on VANET [8] such as Denial of Service, fabrication attack, alteration attack, message suppression attack and reply attack described here.

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Smt. Kashibai Navale College of Engineering
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The remaining of this paper is organized as follows. Section II describes the related work along with the literature review. Section III introduces proposed work along with the system architecture. Section IV concludes the paper.

II. RELATED WORK

A. *Rivest Shamir Adleman Algorithm (RSA)*

In [14] paper, author proposes Vehicular Public Key Infrastructure (VPKI) to monitor malicious activities in the network. Certificate authority is used to bind the public key with respective user identities. RSA public key algorithm is used for security and authentication. The work mainly focuses to provide security for location privacy preservation.

B. *Advance Encryption Standard Algorithm(AES)*

In [9] paper, author gives the brief study of energy consumption characteristic of different eneryption algorithms. Encryption and decryption in symmetric cipher algorithm process through the sequence of mathematical computation. As compared to other symmetric key algorithm AES require minimum energy for the purpose of key setup and encryption/decryption.

C. *Secure Practical Network Coding(SPOC)*

In [7] paper, author proposes low-complexity eryptographic scheme that explore intrinsic security of network coding. Secure Practical Network Coding SPOC uses unlocked and locked coefficients that are added and concatenated to the packet header each time whenever a new packet is generated. These unloeked and locked coefficients are enerypted with keys and are used for encoding and decoding. Due to use of SPOC number of operations for encryption is greatly reduced.

D. *Homomorphism Encryption Function(HEF)*

In [15] paper, author focuses on reducing privacy threat in multi-hop wireless network. Homomorphism Encryption Funetion (HEF) performs linear random combination on incoming packets and gives resultant packets. HEF perform encryption on GEVs to keep it confidential.

E. *Authenticated Routing for Ad Hoc Network(ARAN)*

In [13] paper, author briefly discusses the ARAN protoeol. This protocol uses public key cryptography and a certificate server and also prevents from spoofing attack. Author discusses the security challenges and issues in VANET and their solutions. ARAN is one of them solution that is based on the AODV protocol. It uses timestamp for the route freshness. This scheme requires all nodes must keep the routing table for all another node.

F. *Network Coding (NC)*

In [16] paper, author proposes efficient use of network coding for handling content distribution and enhancing the performance. In VANET, network coding can efficiently handle mobility and random crrors. In VANET, eontent distribution is a challenge due to dynamics of network and high mobility. There are some resource constraints that have a light impact on encoding and storage operations performed by network coding.

TABLE 1: LITERATURE SURVEY

Sr. no.	Existing Method	Advantages	Disadvantages
1.	RSA	1) Increased security and convenience. 2) Provide the digital signature that cannot be repudiated.	1) Slower than the secret key method. 2) Can be vulnerable to impersonation if hacked. 3) Consumes more energy for the key generation, verification and signing operation.
2.	AES	1) AES is more secure as compare to 3DES. 2) AES is less susceptible to cryptanalysis. -AES is faster.	1) AES in counter mode is challenging to implement.
3.	SPOC	1) Use locked and unlocked coefficient. 2) Achieve confidentiality	1) Incurs more computation overhead. 2) Do not provide privacy against flow tracing.
4.	HEF	1) Privacy against flow tracing and traffic analysis. 2) Homomorphism allows recoding	1) computation overhead 2) Incurs more energy consumption.
5.	ARAN	1) Prevent from spoofing 2) Provide message integrity, non-repudiation and authentication.	1) Each node maintains the routing table for each node. 2) Computation overhead and delay.
6.	Network coding	1) Network coding in VANET can efficiently handle mobility and increases throughput.	1) Performance issue if no. of generations is more. 2) Vulnerable to eavesdropping attack.
7.	VPKI	1) Prevents from DOS, replay attack, message suppression attack	1) Causes overhead due to group signature. 2) Network is not stable so cannot form a stable group.

G. *Vehicular public key infrastructure*

In [8] paper, author focuses on security issues and challenges of VANET. Author suggests use of VPKI in which each node have both public and private key. When a node sends a message, it is signed by its private key and also adds certificate authorities (CAs) Certificate.

In existing papers, researchers use methods and schemes to provide security. But these schemes requires

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Navale College of Engineering
Pune - 411 041

large amount of energy and therefore computation overhead occurs. Hence here an energy efficient light-weight security scheme is proposed to solve these problems.

III. PROPOSED WORK

This paper proposes a security scheme that helps to reduce the eavesdropping attack effieiently. Due to use of permutation encryption it is difficult to adversary to recover the original packet. The lightweight encryption scheme used here requires less time for the process of encryption and decryption. The time is reduced therefore energy required for these processes greatly reduced. The proposed architecture is based on the following parts.

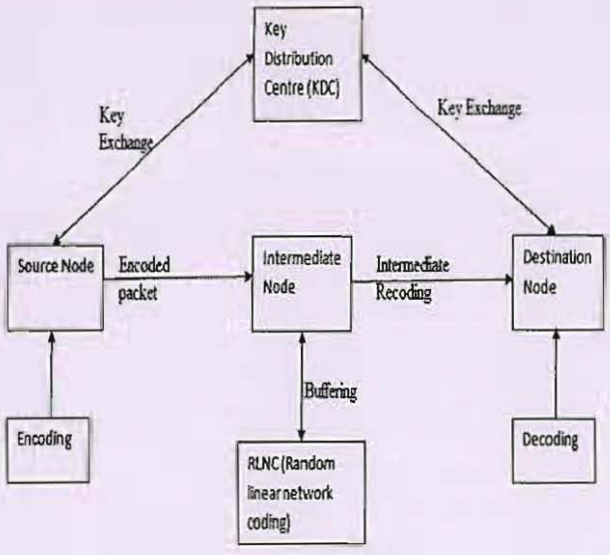

Figure 2: System diagram

The proposed system assumes that both the communicating parties must share a symmetric key by means of a key distribution centre.

This P-coding scheme initially consists of three stages as follows: source encoding, intermediate recoding and sink decoding[12].

A. *Source encoding*

Source encoding tries to encode the data comes from different nodes in order to transmit it more efficiently. Let the source node has sequence of message to send. Source prepends the local encoding vector (LEV) to these messages and then forwards these messages to the intermediate node.

B. *Intermediate recoding*

In this stage, permutation encryption function helps to rearrange the corresponding Global Encoding Vector (GEV) and symbols of the message. The key used for encryption is kept secret from the intermediate node.

C. *Sink Decoding*

On receiving the message from a source node, receiver decrypts the message by performing permutation decryption on it. Once the independent messages are collected, sink prepares the matrix representation of them. Finally, by applying Gaussian elimination original message can be reeover.

Following steps are used for providing security and saving energy in VANET

- A key distribution center is used for sharing keys, and both communicating parties use the same key.
- Source enerypts the data with permutation encryption and appends a global encoding vector (GEV) to the packet and then forwards it to the intermediate node.
- Intermediate node forwards the packet to outgoing links with some modifications according to the P-coding.
- Sink node on receiving all the packets decrypts the packet with permutation decryption.
- Finally, to recover the original packet Gaussian elimination is performed.

IV. MATHEMATICAL MODEL

- Consider a VANET of N nodes,
  G= (V, E), where, V= {v1 ,....., vn} and E= {e1,....., en}
- Assume a node v ε V where,
  (-v)= Links terminating at v.
  (+v)= Links originated from v.
- Here, a link has capacity of carrying one packet per unit i.e. y (e).
- When a source wants to send series of packet $X= [x_1,.....,x_i]$ to a set of sink T where, $T \subseteq V$ then source computes y(e) as[1],
  $y(e)= \sum_{e\in(-v)} \beta(e)y(e)$
  where, $\beta(e)$ is a Local Encoding Vector(LEV)
- Global Encoding Vector can be appended to message as[1],
  $y(e) = \sum_{i=1}^{t} g_i(e)x_i = g(e)x$
  $Y = GX$
- Source encrypts packet with permutation encryption[1],
  $C[y(e)] = \sum_{e\in(-v)} \beta(e)C[y(e)]$
- Intermediate node forward packet to sink node with simple recoding with no extra efforts.
- Sink node will decrypt the packet as[1],
  $D\{c[y(e)]\}= E^{-1}\{E[y(e)]\} = y(e)$
- Thus source packets simply recover by applying Gaussian elimination,
  $X = G^{-1}(Y)$.

V. CONCLUSION

In this work, a light-weight eneryption scheme is used for providing security in energy efficient way. This scheme is based on the network coding. In previous work, author shows that network coding can

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be used to reduce the energy consumption by fewer transmissions. Here P-coding is used with network coding to reduce the energy consumption as well as to provide security in VANET. This scheme requires less energy for the process of encryption and decryption operation.

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Vadgaon, (Bk.), Pune - 411 041

Opinion Mining of Live Comments from Website using Fuzzy Logic and NLP

Pooja C. Sangvikar[1] Prof. V.S. Khandekar[2]
[1,2]Department of Information Technology
[1,2]Smt. Kashibai Navale College of Engineering Pune, India.

Abstract— For many Natural Language Processing tasks, Opinion Mining of text content is important. In recent years, Social Media plays important role for expressing and sharing of any valuable or important information in terms of text, SMSs, mails, reviews or comments, etc. Existing studies of Opinion Mining tend to extract less features and also used static datasets i.e. publicly available datasets. So the proposed system gives a heuristic approach for Dynamic Comment Classification. The approach focuses on crawling of web pages by entering seed URL and then parsing of web pages is done. After getting user and their comments, preprocessing of comments is done. Various features are extracted like term weight, Noun Identification, Thematic words, Bag of words, etc. Then by applying Fuzzy Logic and IF-THEN rules, comment classification is done: positive and negative. Evaluation is done by the evaluation parameters like Precision, recall and F-measure.

Key words: Web Crawler, Data Preprocessing, Feature Extraction, Fuzzy Logic

I. INTRODUCTION

Opinion Mining is language processing task that uses a computational approach to identify opinionated content and classify it as positive, negative or neutral [1]. The unstructured data on the Web often carries expression of opinions of users in the form of reviews, blogs, comments, etc. Opinion Mining attempts to identify the expressions of opinion and mood of writers. Most of the current Opinion Mining research is focused on business and e-commerce applications, such as review of products and movie reviews. Few researches have tried to understand opinions in the social and geopolitical context.

But it becomes more difficult for web users to find valuable or important information in such a huge repository when the quantity of evaluative texts expands, so sentiment classification becomes important. Sentiment classification has been applied to many areas. It is used to annotate the sentiment content in text, categorize opinions in product reviews, etc. Some of other terms used in previous papers are sentiment analysis, opinion extraction and affect analysis. Sentiment classification has become an overlapping research issue in multiple research areas, such as Data Mining (DM), Machine Learning (ML), and so on [3].

Sentiment analysis is an area of research that is closely related to text analytics, natural language processing (NLP), computational linguistics (CL), and information retrieval (IR). The general aim of sentiment analysis is to determine/extract the opinion contained within a piece of text. There has been an increase in popularity for sentiment analysis in recent years, mainly due to the many practical applications it supports. For example: tracking opinions in online forums, blogs and social networks; helping companies and organizations find customer opinions of commercial products or services; and helping individuals decide on which product to buy or which movie to watch. Sentiment classification has increasingly gained attraction in recent years. It aims to divide text into different emotional polarities, such as positive, negative and neutral. Major approaches for sentiment classification fall into two categories: lexicon based methods and machine learning based methods. The performance of lexicon based methods strongly relies on sentiment lexicon [2]. As it is costly to build sentiment lexicons manually, most previous work has focused on the automatic or semi- automatic construction of sentiment lexicons. For machine learning based methods, sentiment classification is often treated as a traditional text categorization problem, and it's important to extract useful textual features for machine learning algorithms [3].

The remainder of this paper is organized as follows: Section II describes literature survey or related work on Sentiment Analysis. Section III includes overview of proposed system. Section IV describes the Results and Discussion. Section V gives Conclusion and Future Work.

II. RELATED WORK

Sentiment Analysis has been done using a different techniques or methods. Some works extract the meaning of the text, document, sentence or phrase level while others obtain connections between users to assign sentiment polarity for sentiment analysis. Many different approaches to solve sentiment analysis have been developed by researchers from information retrieval, most of which in this field use bag of words representations. In particular, Opinion Mining of tweets has been done using approaches based on text, which is lexicon based classifiers, also by combining Natural Language Processing and Machine Learning techniques. A lot of research has been done in this field by researchers and scholars all around the world.

Text Mining and Sentiment Analysis have received a great attention due to abundance of opinion data that exists in social networks such as Facebook, twitter, etc. Here author Akaichi (2013) in [4] focused on mining of Facebook status updates. For this, they constructed sentiment lexicon based on interjections, acronyms and emoticons. There are five main steps are followed: raw data collection, lexicon developments, feature extraction, training model for text polarity creation and machine learning method application. To evaluate the performance of sentiment classification, accuracy is calculated on different feature sets.

Stopword removing is one of the frequently used step in preprocessing. Stopwords are periodically occurring words that rarely carry any information and orientation. Ghag and Shah (2015) in [5] the effect of stopword removal on various sentiment classification models was analyzed. Sentiment Classification model were analyzed using movie review dataset. Classifiers focuses on proportional presence count distribution and proportional frequency count

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distribution where as traditional approaches such as delta TFIDF and alternative term weighting techniques.

Cai and Spangler (2008) in [6] focused on techniques that detect the topics that are highly correlated with positive and negative opinions. By coupling this technique with Sentiment classification, sentiment score is calculated. For topic detection, Point-wise mutual information and term frequency distribution method is used.

A dependency Tree based Sentence-level Sentiment classification approaeh is presented by Li (2011) in [7]. Here flat features (Bag-of-words) is captured as well as structured featurcs from dependeney tree of a scntiments. Author introduced a convolution tree kernel based approach to the sentence level Sentiment elassification. This approach achieved improvement for implicit Sentiment Classification. To identify the polarity SVM classifier is used. An approach which adopts empirical learning to implement the Sentiment Classification technology and used a distance based predictive model to bind computational efficiency and modularity proposed by Bisio (2013) in [8].

Li (2013) [9] performed Sentiment Classification with full consideration of polarity shifting phenomenon. Firstly, extraction of some detection rules for detection of polarity shifting of sentimental words from polarity shifted words in testing data, detection rules are applied. Lastly, term counting based classifier is designed by using polarity shifted words.

Lin (2015) [10] proposed a personality based Sentiment Classification method to capture more useful but not widely used sentiment words. To utilize both personality related and commonly used textual features, they adopt an ensemble learning strategy. Allocation of tweets is done to different groups according to personality traits of users for each group, Random Forests is trained separately.

Liu (2011) in [11] presented a Novel Approaeh for News Video Story Sentiment Analysis. In this, two challenges are addressed: new video story Sentiment Classification and ranking. Graph based approach is used to classify the news stories into sentiment classes. To add news videos into sentiment space, a multimodal approach is used and to rank the videos in each class visual representation scores is adopted. For sentiment representation, sentiment class analysis is done based on PageRank algorithm and affinity propagation clustering.

Mouthami (2013) in [12] proposed a New algorithm called Sentiment Classification algorithm with POS tags is used to improve classification accuracy on Movie Reviews Dataset. It approximately classifies the Sentiment using Bag of Words. Su (2012) in [13] explained a Semi-supervisecl learning method based on multi-view learning. Idea of approval is to generate multiple views by accomplishing both feature partition and language translation strategies and after that to perforin multi-view learning for Semi-Supervised Sentiment Classifieation standard co-training algorithm is applied. To generate different views two strategies are used: Feature Partition which splits whole and other strategy is language translation which translates original text into another language.

III. PROPOSED METHODOLOGY

A. Overview

The proposed method of Opinion Mining of live comments from websites using fuzzy logic and NLP is described efficiently according to the steps which are depicted in the Fig.1.The following steps are used for comment classification.

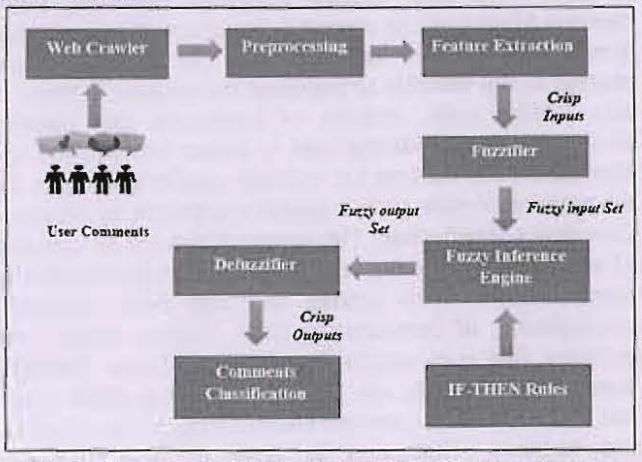

Fig. 1: Overview of Fuzzy based Classification System

B. Algorithm

The input to algorithm is seed URL which is T_n= {x | x ϵ Ti, where i=1, 2, 3 ...n} to receive the comments from websites. The output generated by the proposed algorithm is elassification of comments into positive and negative.

C. Data Preprocessing

1) Read input data (I) with the help of web crawler Where I= $T_{i...n}$ i.e. different URL for extracting comments.
2) Colleet the contents of web pages and parse that web page by using efficient parser Remove special symbols like #, &, @, etc.
3) Remove all the stop words from comments like is, are, but, etc.
4) Convert the words into stem form i.e. studied to study, where ied is replaced with y. Output is the preprocessed string (R_s). Repeat these steps for each comment.

D. Feature Extraction

1) Get the vector from keyword database and ealculate the repeated words in the comment. Calculate term weight (C_t) for each repeated word by following equation (1).

$$C_t = Tf_i * Isf_i \quad \text{(1)}$$

Where,
Tf_i = term frequency of each repeated word.
Isf_i = inverse sentence frequency of word.

$$Tf_i = \frac{nj}{\sum nk}$$

Where,
n_j = the number of occurrences of the term j
n_k = the number of occurrences of all terms in the comment.

$$Isf_i = \log \frac{N}{ni}$$

Where,
N = Total number of comments.
n_i = number of comments in which word i arises.

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Now, divide string (R_s) into words and store in a vector V. Identify the duplicate words in the vector and remove them. For each word check for its occurrence in Dictionary and calculate the score (Pn).

Next step is thematic words (Tw) identification. It can be calculated as the proportion of the number of thematic words that arise in the text over the maximum summary of thematic words in the text.

Bag words, here database is maintained for good words and negative words. If the words from comments are matched with these database words, then calculate the scores (Gw) and (Bw) for that comment. Repeat these steps for each comment.

E. Fuzzy Classification

In order to implement comment classification based on fuzzy logic, first, the features extracted in the feature extraction step are used as input to the fuzzifier. Triangular membership functions and fuzzy logic is used to summarize the document.

The input triangular membership function for each feature is divided into five fuzzy sets which are composed of unimportant values low (L) and very low (VL), average values (medium (M)) and important values high (H) and very high (VH). Fuzzy crisp values are created as shown below as example:

Very Low (Vl) - 0.0 To 0.2
Low (L) - 0.2 To 0.4
Medium (M) - 0.4 To 0.6
High (H) - 0.6 To 0.8
Very High (Vh) - 0.8 To 1.0

In inference engine the most important part is the definition of fuzzy IF-THEN rules. The important sentences are extracted from these rules according to features criteria. Sample of IF-THEN rules shows as the following rule.

IF (Term weight is H) and (No Proper Noun is VH) and (No Thematic Word is H)
THEN (Comment is Important)
IF (Term weight is VL) and (No Proper Noun is M) and (No Thematic Word is L)
THEN (Comment is Unimportant)

Likewise, the last step in fuzzy logic system is the defuzzfication. The output membership function which is used to convert the fuzzy results from the inference engine into a crisp output for the final score of each sentence. Then after defuzzification, the classification of comments is done.

IV. Results and Discussion

The Fuzzy based comment classification system uses customer reviews about some restaurants effectively. A review is a subjective text containing a sequence of words describing opinions of reviewer regarding a specific food, services, etc. Review text may contain complete sentences, short comments, or both. Restaurants reviews are collected from websites like Woodland, Orchid, Sapana and Mathura hotels from pune. The fuzzy based comment classification system is compared with the aspeet based classification using frequent item set mining [15].

In the context of classification, True Positives (TP), True Negatives (TN), False Negatives (FN) and False Positives (FP) are used to compare the class labels assigned to documents by a classifier with the classes the items actually belong to.

True positive means, which are truly classified as the positive terms. True positives (TP), the classifier correctly labeled as belonging to the positive class.

False positive (FP) means which were not labeled by the classifier as belonging to the positive class but should have been.

True Negative (TN) is that the classifier correctly labeled as belonging to the negative class. True Negative means, which are truly classified as the Negative terms.

False Negative (FN), which is nothing but example which was not labeled by the classifier as belonging to the negative class but should have been. Evaluation measures like precision, recall, F-measure can easily be calculated from these four variables.

1) Precision: Precision and recall are two widely used metrics for evaluating performance in text mining. Precision is used to measure exactness. Precision is the number of examples correctly labeled as positive divided on the total number that are classified as positive. This is shown in the following formula.

$$\text{Precision: } \frac{TP}{TP+FN}$$

2) Recall: Recall is a measure of completeness. while recall is the number of examples correctly labeled as positive divided on the total number of examples that truly are positive. This is shown in the following formula.

$$\text{Recall: } \frac{TP}{TP+FP}$$

3) F-Measure: F-Measure is the harmonic mean of precision and reeall. This gives a score that is a balance between preeision and recall. F-Measure combines them into one score for easier usage.

$$F = \frac{2 \times precision \times recall}{precision + recall}$$

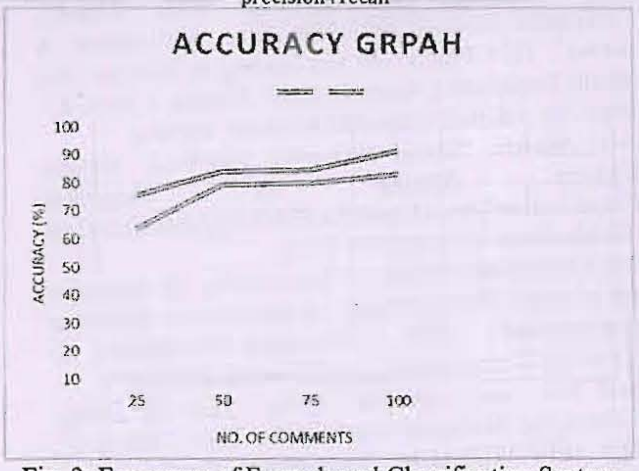

Fig. 2: F-measure of Fuzzy based Classification System

The experiments are performed on web pages containing comments in the range of 25,50,75,100 and F-measure is ealculated for each web pages as shown in Fig.2.

The system [15] implements aspect extraction using frequent item set mining in customer product reviews and gives the precision 75%, recall 85.71% and F-measure 80.36%. The fuzzy based Comments classification system gives better results than the aspect based opinion Mining such as precision 84.18%, F-measure 82.08% as shown in Fig.3.

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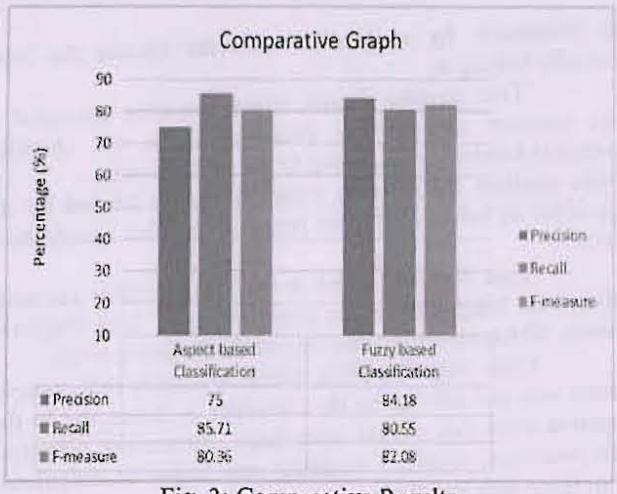

Fig. 3: Comparative Results

V. Conclusion and Future Scope

The proposed system gives heuristic and general approach named Opinion Mining of live comments from the website using Fuzzy Logic and NLP. Here the focus is on comments which are used for classification and experiments are performed on some web pages. The accuracy aehieved by the proposed system with the help of evaluation parameters like Preeision, Reeall and F-measure are 84.18%, 80.55% and 82.08%. Here, proposed system uses HTTP protocol based websites for implementation. In future, HTTPs protocol based sites (Yahoo, Twitter, etc.) can be taken into consideration by taking authorization as these are secured sites and also by combining Fuzzy based classifier with other classification techniques, accuracy can be achieved.

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Residential Electricity Demand Forecasting using Data Mining

Student Ms. Seema Kore[1], Prof. V. S. Khandekar[2]

Department of Information Technology, Smt.Kashibai Navale College of Engineering, Savitribai Phule Pune University, Pune, India

Abstract *—In this paper, the proposed system is designed which predicts the electricity demand. Data mining techniques are used such as data cleaning, data smoothing to get the data required for prediction.The Artificial Neural Network (ANN) plays a great role in forecasting the electricity consumption. The existing methodology used to find the electricity consumption and demand prediction for household used ANN, data mining and data preprocessing. The context features like weather, temperature, humidity and public holiday are used as input for the prediction system. Along with context features seasonwise electricity consumption forecasting to achieve improved accuracy is done using proposed system which is based on Support Vector Regression (SVR) and Linear Regression (LR). LR and SVR gives better accuracy than the existing system. LR produces the MAPE value of 0.59% and SVR produces MAPE value of 0.11%. The RMSE (Root Mean Squared Error) performance metrics is used to evaluate the system performance. The RMSE value for LR is 0.73 and for SVR it is 0.34.*

Keywords — *Predictive modeling, Data mining, Artificial Neural Network, Context Features, Support Vector Regression, Linear Regression*

I. Introduction

Electricity is correlated with the economic growth of the country. It provides working flow for the industries all over the world. The shortage of electricity leads normal economic growth. Electricity is the day-to-day need of the people. Electricity could not be invented as it is a natural phenomenon. It has great importance in our life as it illuminates houses, switch on the televisions, helps in cooking food, reduces work load with the help of many electric appliances. Electricity comes from photo voltaic energy, non renewable fuels, hydroelectric energy, nuclear energy, wind energy. Energy is the reliable source to supply electricity which is pollution free. For no pollution, we can simply go for NAP i.e., North American Power. It offers a gas which is called "cleangas", that don't cause pollution. They also provide a product called "greenelectric". They also carry out the generation of uncontaminated energy from renewable sources.

The electricity forecasting is done using articficial neural networks, data mining techniques, regression amalysis and many more. In this paper regression methods such as Linear Regression and Support Vector Regression is used with data mining techniques.

In this paper, the techniques of data mining are used to calculate the electricity demand. For this we need to know what is data mining ?

A. Data Mining Definition

Basically data mining is also known as knowledge discovery. Data mining is extracting data from large databases and transform it into understandable structure for further use. Data mining is the analysis step of the "knowledge discovery in databases" process or KDD. Data mining is defined in various forms. Some of these definitions are listed below:

• Data mining or knowledge discovery in databases, as it is also known, is the non-trivial extraction of implicit, previously unknown and potentially useful information from the data. This encompasses a number of technical approaches such as clustering, data summarization, classification, finding dependency networks, analyzing changes and detecting anomalies.

• Data mining is the search for the relationships and global patterns that exist in large databases but are hidden among vast amounts of data, such as the relationship between patient data and their medical diagnosis. This relationship represent valuable knowledge about the database and the objects in the database, if the database is the faithful mirror of the real world registered by the database.

B. Linear Regression(LR)

Linear Regression depicts the relation between the dependent variable and explanatory variable (independent variable). LR is used to predict the value y i.e., independent variable from the value of x i.e., dependent variable . It describes a straight line which minimizes squared deviations of observed values of y from those on the regression line.

Equation for Simple Linear Regression:

$$Y = a + bX \quad - (1)$$

Where, Y= dependent variable
X= independent variable
a= intercept of line
b= slope of line

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the equation can also be written in different form as:

$$y = \alpha + \beta x + \varepsilon \quad -(2)$$

where
α, β are model parameters;
ε is the unpredictable random disturbance term

C. Support Vector Regression(SVR)

Support Vector Machine (SVM) is supervised learning model with associated learning algorithms that analyse data used for classification and regression analysis. SVR is similar to the SVM but a margin of tolerance is set in SVR. But the main idea is same i.e., to minimize the error. There is a function called SMOReg which used for SVR in weka tool. LibSVM performs same as SMOReg so it can be used for calculating SVR. LibSVM is the library for SVM algorithms.

II. LITERATURE SURVEY

There are various approaches used to predict the electricity demand. Various data mining techniques have been used for forecasting electricity demand. The work done for prediction of electricity is discussed below:

A. Forecasting Electricity using Neural Networks

In [2], the value prediction method is implemented with artificial neural network. The meteorological factors such as temperature, humidity, rainfall, public holidays, etc are considered. The two methods for load forecasting are categorized as models and methods. Time series and regression analysis contribute as models and methods belong to computational and artificial intelligence. Regression based models are used because regression methods are easy to implement. Time series are the oldest methods used for load forecasting. To improve the load forecasting the approach can be explored to predict the agricultural electricity consumption.

In [3], a technique for calculating hourly electricity prices for wholesale electricity market in Ontario, Canada using feed forward neural network combined with data mining is proposed. For training the neural network 135 days are selelcted. The forecasting is done for nine days from different seasons. The similar prices days are used for each hour from a set of 90 days. The proposed method predicts the accurate electricity consumption from low to medium price.

In [4], an idea is put forth of forecasting model on hourly basis for large commercial office buildings based on radial basis function neural network (RBFNN) which uses weather and historical load data. It is beneficial because it does not require any trial and error procedures. The data required consists only the weather and electric power consumption.

In [5], electricity prediction using artificial neural network of China is discussed. The goal of his study is to provide accurate estimation model of electricity demand. The multilayer perceptron ANN model i.e., Artificial Neural Network with error back-propagation algorithm is used. This algorithm is used to estimate the electricity demand.

In [6], a new method regression tree and Normalized Radial Basis Function Network i.e., NRBFN for electricity price forecasting is introduced. If-then rules are used to classify the input data. The combination of ANN and regression reduced the maximum errors for forecasting electricity prices.

B. Other Approaches

[7] has used data mining techniques to predict the electricity consumption in Iran- Mazandaran province. The regression model is used for the prediction. The prediction variables used are temperature, moisture and electricity consumption price. The research aimed at predicting recent years electricity consumption and prediction of future consumption.

[8] has described the idea of short term load forecasting using SVM (Support Vector Machine) based on clustering. In this the available past data is clustered for forecasting the next day load. All the similar patterns of the day are considered for training the SVM. Also the threshold between the daily average loads of all the input training patterns and input testing patterns are used. The results of both with clustering and without clustering are put forth and form the different cluster patterns for different threshold values. This method avoids heavy computation.

[9] has presented an approach of data mining techniques for long term electricity forecasting in Egyptian Electrical Network. The knowledge discovery steps are implemented. Preprocessing is used to find the missing values, odd values, outliers and normalize data. Eleven different cases are tested with actual data collected from different sites. Comparison is done between these different cases.

In [10], a method using clustering and silhouette algorithm for simple building electric power prediction model with local weather forecast information is proposed. A data mining technique called K-means clustering algorithm is selected. Cluster analysis and Correlation analysis are performed to find energy usage patterns. Cluster analysis silhouette index indicate that the season and

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the day type time parameters are important factors to classify the total electric power usage. Correlation analysis show the energy facility working patterns are strongly related to local weather conditions. The developed model can be used to replace a wattmeter to a computer
application. The model ean be also applied for optimal control problems in smart grid.

In [11], an automatic method of explanatory variable selection using additive model is presented. There are thousands of time series which need to be studied so some automatic method is required. This approach tells how to correct the middle term errors for short term load forecasting. EDF portfolio consumption is considered as load demand at aggregate level and GEFCom2012 (Global Electricity Forecasting competition 2012) is considered at loaeal application. This methodology combines nonlinear regression and variable selection procedure. This approach simplifies the analysis. But the disadvantage is that it breaks the longitudinal aspects of the observed data.

[12] introduces a new data fusion algorithm for electricity forecasting. A single forecast engine is not enough to capture all the patterns of price signal. Therefore, artificial neural network, adaptive neuro-fuzzy inference system, autoregressive moving average are selected as forecast engine. The new data fusion algorithm i.e., modified ordered weight average (modified OWA) is proposed to combine the three forecast engines. The proposed method provides more accurate results than the primary agents i.e., engines. The system can yield even more accurate results if the primary agents provide accurate forecasts at the initial stage.

In [13], an integrated method of price and load is presented. Through this methodology consumer can make electricity usage according to the price. At the initial stage price and load are treated separately. In second stage, price and load interaction is done by considering input from initial stage. The adaptive wavelet neural network (AWNN) is used which forecasts the 24 hour electricity for the next day. The ARIMA and GARCH models are used. The system forecasts on price or load and does not require the information of the forecast day. But weather conditions, power changes may affect the performance of the system. Feature selection can be added to the system to improve the performance in the future.

III. PROPOSED METHODOLOGY

In the proposed system the efforts are made to enhance the accuracy and performance of the system.

A. Algorithm for Forecasting Electricity Consumption

1. Let U be the set of Users U={u1,u2,u3.....un} for each u in U. Where, u=household user.

2. Collect previous M consumption records {f1,f2....fM} Where, M=consumption record.

3. Now, Calculate mean electricity consumption using formula giver below

Mean electricity consumption = $\sum_{k=0}^{m} Fk / m$

Where, m=no. of previous records of energy consumption

Fk=energy consumed at kth instances

4. The calculating the linear regression(LR)

$$y= \alpha + \beta x + \varepsilon$$

5. Calculating the support vector regression(SVR)

$$f(x,\omega)=\sum_{j=1}^{m} \omega_j g_j(x) + b$$

7. Output demand electricity improve accuracy result.

B. Algorithm for SVR

The jar files of weka are imported in java .i.c., weka.jar. Interfacing of weka with cclipse is done. The working of the SVR algorithm in java will be the same as in weka tool. The algorithm is as follows:

1. Choose the LibSVM button under the functions group.
2. Click on name of the algorithm to view the configuration
3. Click on start button to start the algorithm
4. On the result sereen the output of SVR is displayed.

C. System Architecture

The work flow of the eleetricity forecasting system is represented diagrammatically in the Fig 1 given below:



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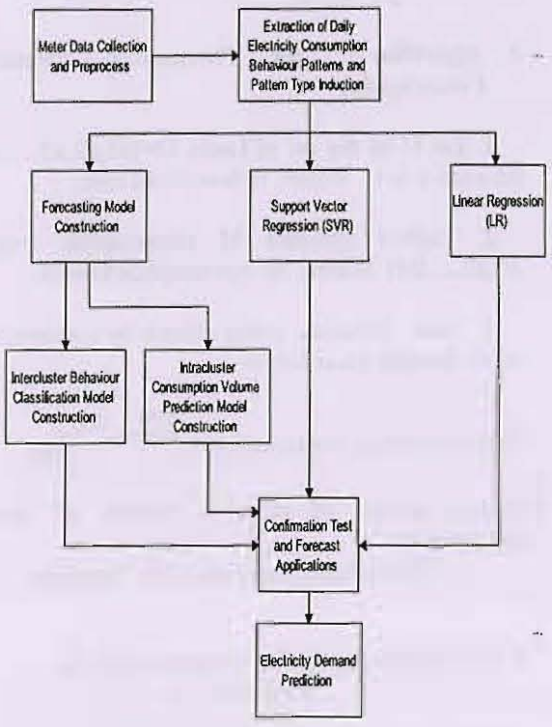

Fig 1: Proposed System Architecture for Electricity Consumption Forecasting

Step by step working of the proposed system is explained as follows:

1.Meter data collection and preprocess: In figure 2, the very first step is to collect the individual meter data for an adequate time period. The time series were composed of conseeutive data points. The daily time series is sorted because noisy and missing data is unavoidable during meter data transmission.

2. Extraction of daily electricity consumption behavior pattern and pattern type induction: At this stage daily electricity consumption behavior pattern is found. Data smoothing and data granulation is done. Data smoothing fetehes the data by removing the noisy data. In data granulation, the data is divided into finite granular intervals to reduce the resolution.

3. Forecasting model construction: Two classification models are constructed at this stage:

i. InterclusterBehaviour Classification Model Construction This model takes the day-dependent context feature as input. The behavior class label treated as the output. Each cluster is treated as a behavior class and days in the same class exhibit similar electricity consumption patterns.

ii. Intracluster Consumption Volume Prediction Model Construction The minute-dependent context feature is the input for this model. also the historical load data is also the input. The output is the electricity consumption volume. Back propagation neural network is applied to construct the estimation function of a time point electricity consumption volume using minute-dependent context features and historical load data for each of the cluster.

4. SVR and LR Methodology:

Support Vector Regression: Support Vector Machine can also be used as a regression method, maintaining all the main features that characterize the algorithm (maximal margin). The Support Vector Regression (SVR) uses the same principles as the SVM for classification, with only a few minor differences. First of all, because output is a real number it becomes very difficult to predict the information at hand, which has infinite possibilities. In the case of regression, a margin of tolerance (epsilon) is set in approximation to the SVM which would have already requested from the problem. In SVR, the input x is first mapped onto a m-dimensional feature space using some fixed (nonlinear) mapping and then a linear model is constructed. SVR is calculated as follows:

$$f(x,\omega)=\sum_{j=1}^{m} \omega_j g_j(x) + b \quad - (3)$$

where $g_j(x)$, j=1,2,.....m is the set of non linear transformations and b is the bias term.

Linear Regression: It is the simplest form of regression that just contains predictor and prediction. The relationship between the two can be mapped on a two dimensional space and the records plotted for the prediction values along the Y axis and the predietor values along the X axis. The simple linear regression model then could be viewed as the line that minimized the error rate between the actual prediction values and the point on the line.

$$Y= a + bX \quad - \text{(from 1)}$$

Where, Y= dependent variable
X= independent variable
a= intercept of line
b= slope of line

In Fig 1, by using the forecasting model, LR and SVR method the daily basis demand of the predicated electricity is calculated. The results using the foreeasting model i.e., inetrcluster classification model and intracluster volume consumption model and SVR, LR are compared. The assumption is that the forecasting using SVR and LR will improve accuracy as behavior patterns are also analysed at this stage.

5. Confirmation test and Forecast application: At this stage, confirmation test of electricity consumption forecasting demand at a specific time point in a specific day is done. The intercluster behavior classification model and intracluster consumption volume prediction model is applied. If the results are not proper the context features and

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construction model are checked. If the results are correct forecasting applications are initiated.

D. Error Calculation

To compare the results of existing system and proposed system error is calculated. MAPE (Mean Absolute Percentage Error) is calculated and one additional error which is modification to the proposed system i.e., RMSE (Root Mean Squared Error) value is calculated. Error calculation for regression is as follows:

Error calculation for LR:

$$MAPE = \frac{1}{N}\sum_{i=1}^{N}\left|\frac{yi-\bar{y}i}{yi}\right| \times 100 \quad - (4)$$

Where, y_i= actual meter reading

$\bar{y}i$= predicted value

MAPE= 0.59%

$$RMSE = \sqrt{\frac{\sum_{i=1}^{n}(yi-yi)^2}{n}} \quad - (5)$$

Where, n=total no.of readings

RMSE= 0.73

Error calculation for SVR:

$$MAPE = \frac{1}{N}\sum_{i=1}^{N}\left|\frac{yi-\bar{y}i}{yi}\right| \times 100$$

$= 0.11\%$

$$RMSE = \sqrt{\frac{\sum_{i=1}^{n}(yi-yi)^2}{n}}$$

$= 0.34$

IV. RESULT AND DISCUSSION

The existing system produced an error i.e., MAPE value of 3.23%. From the error calculation section it is clear that the proposed system for electricity consumption forecasting for household gives less error. The MAPE error for LR is 0.59% and RMSE value is 0.73. the MAPE error for SVR is 0.11% and RMSE value is 0.34. Error calculation shows that electricity demand prediction is more accurate than the existing system. Ultimately the improved accuracy improves the performance of the forecasting system.

In Fig 2 the prediction for LR methodology is shown . The meter reading is plotted on X-axis and the prediction is plotted on Y-axis.

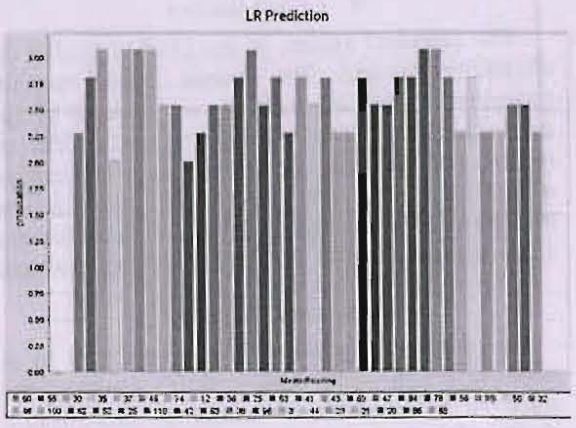

Fig 2: Graph for LR prediction

In Fig 3, the graph for prediction through SVR methodology is plotted. Here also, the X-axis indicates meter reading and the Y-axis indicates the prediction.

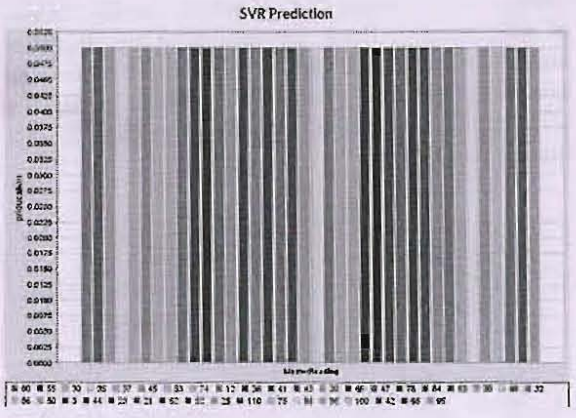

Fig 3: Graph for SVR prediction

In Fig 4, the comparison between the SVR and LR methodology is shown. The graph indicates that the prediction done with SVR is less than the LR. So from the graph it is clear that the SVR methodology yields better results. And hence, the accuracy of prediction is improved.

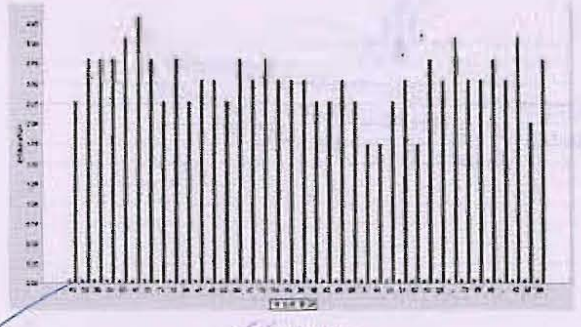

Fig 4: Graph of SVR vs LR

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V. Conclusions

The proposed system is designed to predict the electricity demand. The system shows that the consumer's behaviour patterns are affected by the external factors. The proposed system works on behavioural patterns of electricity consumption using SVR and LR. The SVR and LR are implemented using weka tool which classifies and clusters the data. SVR and LR. The error produced by the SVR and LR methodology is much less as compared to the existing methodology. The MAPE value for SVR is 0.11% and RMSE value is 0.34. For LR the MAPE value is 0.59% and RMSE value is 0.73. The error calculation shows that the proposed system provides improved accuracy as well as the improved performance. The regression methods used prove that the regression yields better results.

Acknowledgment

For everything achieved, the credit goes to all those who had really helped us to complete this work successfully. We are extremely thankful to P. G. Coordinator Prof. N.P. Kulkarni and Prof. V. S. Khandekar project guide for guidance and review of this paper. I am very much grateful to our Project coordinator Dr. L. V. Patil for providing all the facilities. I would also indebted to Dr. K. R. Borole, Vice-Principal Smt. Kashibai Navale College of Engineering, Pune for providing the facilities needed for completion of the dissertation and necessary guidance. I would also indebted to Dr. A. V. Deshpande, Principal Smt. Kashibai Navale College of Engineering, Pune for providing the facilities needed for completion of the dissertation and necessary guidance. I would also like to thanks the all faculty members of "SKN College Of Engineering".

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Survey on Techniques for Keyword Aware Service Recommendation

Article *in* International Journal of Innovative Research in Computer and Communication Engineering · November 2016

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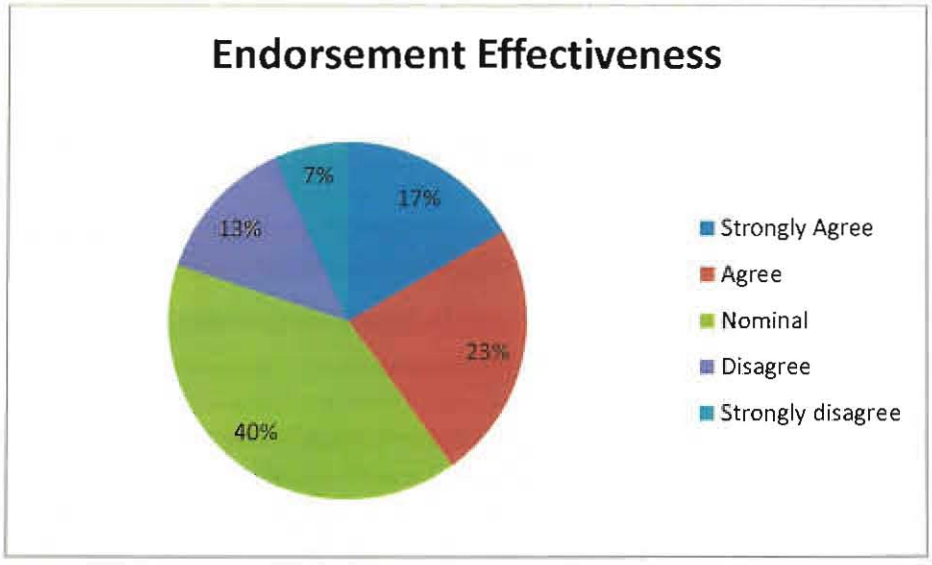
5. Do you get attracted to buy a product /brand endorsed by a celebrity?

A) Strongly Agree B) Agree
C) Nominal D) Disagree E) Strongly Disagree

Scale	No. of respondent	Percentage (%)	Valid percentage (%)
Strongly Agree	5	16.66	16.66
Agree	7	23.33	23.33
Nominal	12	40	40
Disagree	4	13.33	13.33
Strongly disagree	2	6.67	6.67
Total	30	100	100



Interpretation

From the above graph, it can be interpreted that 40% of people are nominal about celebrity endorsement effectiveness while only 7% people are strongly disagree that celebrity attracts me to buy a product.

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Vol. 4, Issue 11, November 2016

Survey on Techniques for Keyword Aware Service Recommendation

Sneha G. Potdar, Prof. Nitin S. More

Student of (M.E.), Dept. of I.T., SKN College of Engineering, Pune, India

Assistant Professor, Dept. of I.T., SKN College of Engineering, Pune, India

ABSTRACT: Service recommender systems have been made clear as of great value instruments for making ready right recommendations to users. In the last ten years stage, the amount of persons getting goods from store, services and connected knowledge has grown quickly, giving in the great sized facts observations hard question for public organization recommender systems. As an outcome of that, old and wise public organization recommender systems often have pain of from scalability and inefficiency problems when processing or observing such great-scale facts. In addition, most of having existence public organization recommender systems present the same ratings and putting in line of services to different users without giving thought to as different users' desires, and therefore fails to meet users' made for a person needed things. Here KASR implemented on Hadoop to improve its scalability in the big data environment and Map-reduce parallel processing using distributed computing with cf algorithm. The sentimental analysis is helping to improve accuracy on the users' preferences. By using various parameters with sentimental analysis the recommendation system will help to improve its performance on live data.

KEYWORDS: Hadoop; CF algorithm; big data; Recommendation System; Keyword- Aware Service; Distributed Computing; Sentimental Analysis; Map-Reduce

I. INTRODUCTION

A. BACKGROUND

Big data is the great sized growth and availability of the data, this data can structured, unstructured and semi-structured data. In today's life, the growth of the data is increasing because of internet. Big data refers the data set which beyond the capacity of current technology. Increasing data may require more accurate analyses, this may lead to more confident decision making and better decision can result greater operational efficiency, reduced risk and cost reductions. It is the management challenge for the IT companies. For that challenge provisioning the hardware and software solutions is one of the big challenges.

The online service providing application, there Big Data tendency poses heavy impacts on service recommender systems. The growing no of alternative service recommendation system in which users' preference has become important issue. The service recommendation system have been shown the valuable tools for providing appropriate recommendation to the user and helps the users with services overload.

B. MOTIVATION

The companies capture large scale information about providers, customers and the operations making on that information. The rapid growth of services, customers and online services has facing critical challenges of service recommendation. Most existing service recommendation system such as Hotel Reservation System and the Restaurant guides presented the rating of the services to the new user same recommendation as per the past ratings. They didn't considering different preferences without considering the requirements of the new user.

Motivated by these observations, in this paper 1) KASR: The Keyword Aware Service Recommendation method based on the User Based Collaborative Filtering (CF) Algorithm. 2) In Keyword Aware Service Recommendation (KASR), keyword of previous users extracted from their reviews to give the better preferences. Depends upon various recommendation methods the keyword can be extracted for making the ratings.

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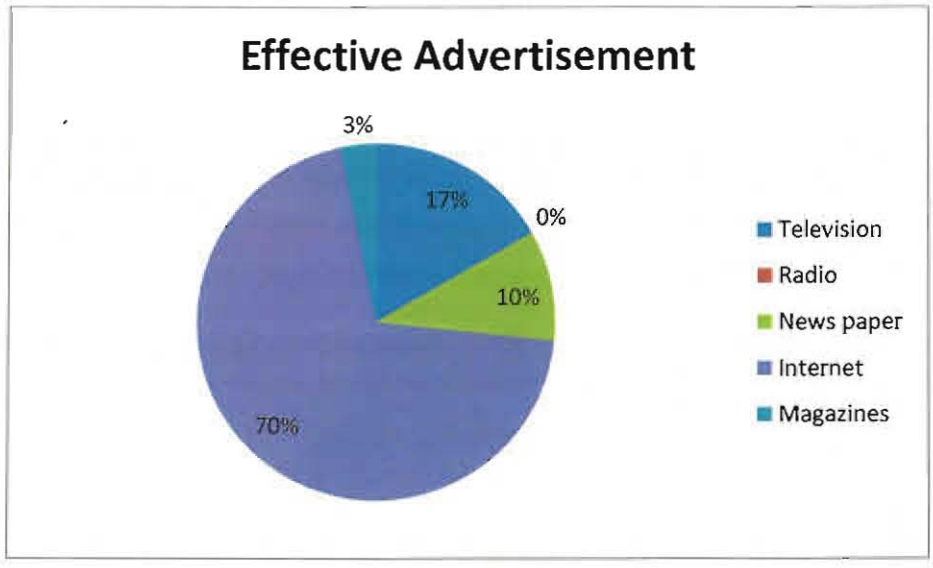
4. What means of advertisement persuades you the most to purchase a product?

A) Television B) Radio
C) Newspaper D) Internet E) Magazines

Sources of Advertisements	No. of respondent	Percentage (%)	Valid percentage (%)
Television	5	16.66	16.66
Radio	0	0	0
News paper	3	10	10
Internet	21	70	70
Magazines	1	3.33	3.33
Total	30	100	100



Interpretation

From the above graph, most 70% people persuades that's in today's scenario internet has been the effective source of advertisement and most of the people using internet 3 to 5 hour a day so they get the chance to be aware of celebrity endorsements while radio doesn't have impact on people now days.

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a) Approximate Similarity Computation

Here comparing the similarity and diversity of sample sets, jaccard coefficients, is applied in the approximate similarity computation.

b) Exact Similarity Computation

A cosine based approach is applied in the exact similarity computation and it is similar as vector space model in information retrieval.

Step 3: Computing Sentimental Analysis

In Similarity computation it considered the previous and active user's prefcrences for computing appropriate recommendation, like wise in sentimental analysis it categorise the positive and negative reviews of the previous users. Because of sentimental analysis the system works in more efficient way. In proposed system by using various parameters like systems speed, efficiency, scalability, accuracy etc will be computing on live data for better recommendation performance.

Step 4: Generate Recommendation by Calculating Personalized Ratings

The recommendation would be generated to the user by calculating similarity of the active user and previous user. Finally a personalized service recommendation list will be presented to the user and the service(s) with the highest rating(s) will be recommended to him/her.

IV. ACKNOWLEDGEMENT

I hereby take this opportunity to express my heartfelt gratitude towards the people whose help was very useful for completion of my research work on the topic of "Survey on Techniques for Keyword Aware Service Recommendation". It is my privilege to express sincerest regards to the project guide Prof. N. S. More, for his valuable guidance. I deeply express my sincere thanks to our all faculty members of "SKNCOE,Pune" for their support.

V. CONCLUSION AND FUTURE WORK

As per the literature survey and intensive analysis it has been found that the service recommendation system works accurately on the basis of sentimental analysis. It helps to compute negative and positive reviews of the previous user. By using few parameters here we can improve efficiency of the recommendation system and this motivates the researcher for further research that how to deal with the live data for recommendation.

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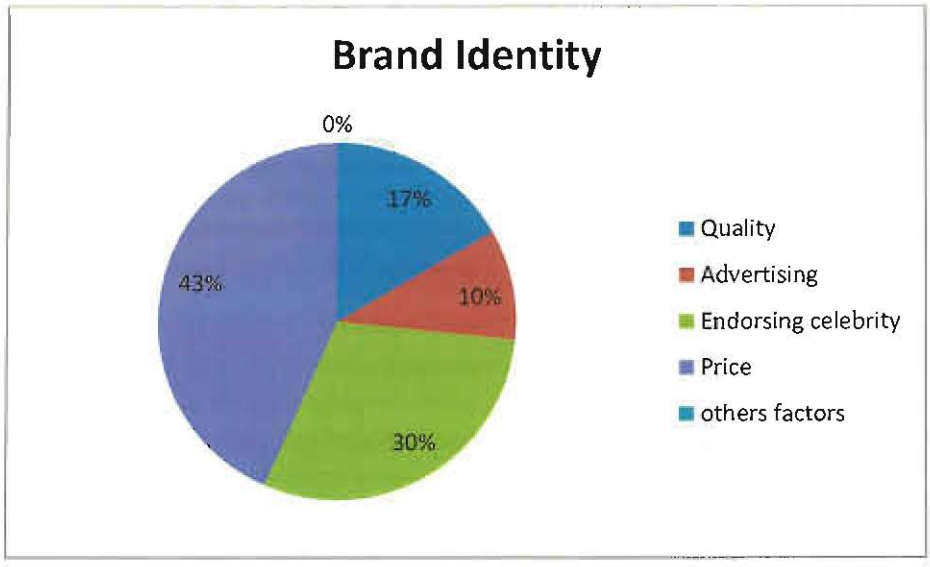
3. What makes you notice a brand?

A) Quality B) Advertising
C) Endorsing celebrity D) Price E)others factors

Significance	No. of respondent	Percentage (%)	Valid percentage (%)
Quality	5	16.66	16.66
Advertising	3	10	10
Endorsing celebrity	9	30	30
Price	13	43.33	43.33
others factors	0	0	0
Total	30	100	100



Interpretation

From the above pie graph, it can be interpreted that 42% of people gets affected towards the product because of price of the product while least 10% of people notice a brand through the advertisements.

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Indoor Localization and Tracking using Wi-Fi Access Points

Dubal Omkar [#1], Prof. S. S. Koul [*2]

Department of Information Technology, Smt. Kashibai Navale college of Eng. Pune-41, India.

Abstract *Location finding by using wireless technology is one of the emerging and important technologies of wireless sensor networks. GPS can be utilized for outdoor areas only it cannot be used for tracking the user inside the building. The main motivation of this paper is to implement the system which can locate and track the user inside the building. Indoor locations include buildings like an airport, huge malls, supermarkets, universities and large infrastructures. The significant problem that this system solves is of tracking the user inside the building. The accurate indoor location can be found out by using the Received Signal Strength Indication (RSSI). The additional hardware is not required for RSSI, and moreover, it is easy to understand. The RSS (Received Signal Strength) values are calculated with the help of WiFi Access points and the mobile device. The system should provide the exact location of the user and also track the user. This paper presents a system that helps in finding out the exact location and tracking of the mobile device in the indoor environment. It can also be used to navigate the user to a required destination using the navigation function.*

Keywords — *Received Signal Strength, Global Positioning System, Indoor Localization, WiFi.*

I. Introduction

GPS is the most efficient technique used for tracking, but it can be utilized only for outdoor locations. When people need the indoor localization or tracking, GPS is not at all useful. GPS can be used only for outdoor areas and not for indoors. Indoor locations include buildings like supermarkets, big malls, parking, universities, and various other infrastructures with the wide area. In these regions, the accuracy of the GPS location is substantially reduced. When GPS is used for indoor localization, the map shown by GPS is not much correct. But for the indoor localization, it requires the higher accuracy, so GPS is not compatible for indoor tracking, also when the GPS is used in the mobile device the amount of battery consumption is quite more as compared to other applications.

Indoor tracking can be very useful in large buildings such as airports, shopping malls, and enterprises during emergencies. Indoor localization provides vital services for mobile and general applications such as advertisement of a product or promotion of new shops in the shopping mall. It can also be very helpful for navigation during an emergency rescue. Now days, mobile phones have become the most important information interface between users and environments, motivating extensive research on localization based on smartphones.

In recent few years, localization of indoor things such as pedestrian or rooms or exit doors in a building has become an exact requirement for which a variety of technologies have been introduced to obtain the good accuracy. The challenge is in developing the map based on floor plans of interiors, selecting the useful indoor positioning technology and various efficient algorithms and developing the proper indoor positioning devices for the buildings. The existing systems that deal with indoor localization services mostly use different wireless technologies like Wi-Fi, RFID Tags, Bluetooth, signals of cellular towers and ZigBee. Existing indoor localization systems can be divided into three types based on the structure of service areas. The three types of systems which can do indoor localization are 2D (two dimensional) service areas, 3D (three dimensional) service areas, and large building.

The remaining paper is arranged as follows: Section II gives an overview of related work already done on indoor localization systems, section III includes the proposed system, Section IV includes mathematical model section V includes results and discussion, and Section VI consists of conclusion and future scope.

II. Related Work

Various systems have been developed for indoor localization. Some of critical systems that are developed are discussed below.

A WaP

The paper [1] "WaP: Indoor Localization and Tracking Using WiFi-Assisted Particle Filter," is discussed below. The authors of this paper are F. Hong, Y. Zhang, Z. Zhang, M. Wei, Y. Feng, and Z. Guo., it was published in 39th Annual IEEE Conference on Local Computer Networks, 2014. Dead Reckoning is the tracking system which determines the current position of a thing by using the knowledge and information from the previously known location. It can also be useful to predict the future locations, by analyzing the current position.

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Indoor tracking can be done by using DR technology along with the help of some other techniques. Working with DR can be classified into two methods [1].

1] The First method uses the accelerometer and magnetometer which help in analyzing reference direction towards the gravity. The accumulation of orientation error is avoided which is one of the advantages of this method. The limitation of this system is that the additional errors will be produced due to incomplete separation of gravity signals from linear acceleration imposed on phones.

2] The second method is to use the sensors with the gyroscope, which are less noisy and error free. They are also not affected by the external interface. But they cannot measure the angular position, instead of that, they can only measure angular velocity because of which only relative movement of the phone can be known with the help of gyroscope readings [1].The heading direction can be efficiently found out by merging these two techniques. The raw values as received from accelerometer, magnetometer, and gyroscope are given as inputs to the filter and output is an estimate of azimuth, pitch, and the roll of the phone in the global home.

B. Magicol

The authors Y. chaoShu, C. Bo, GuobinShen, C. Zhao, L. Li, and F. Zhao in the paper [2] "Magicol: Indoor Localization Using Pervasive Magnetic Field and Opportunistic WiFi Sensing" described the techniques for indoor tracking. It was published in IEEE Journal on selected areas in communications, vol. 33, no. 7, July 2015. Magicol is the system which uses the magnetic field for indoor tracking and localization. It is beneficial for Smartphone users. Fig 1 shows the architecture of Magicol. This system uses the device called as magnetometer which is present in almost all Smartphone. It does not require the additional setup of hardware. Magicol is very efficient as it uses the magnetic sensing that consumes a tiny amount of energy and also it can be utilized for all indoor environments. Recognizing that the indoor geomagnetic field anomalies are ubiquitous, location specific and temporally stable, Magicol forces the locally disturbed magnetic signals as location-specific signatures [2].

During the implementation of to it comes across three main challenges which are discussed below:

1] Magnetic signal as not much distinguishable. In Magicol system collects the user motion to form a set of multiple observations and it is called as the vector. This vector is then compared with predetermined Magnetic Signal Map (M-Map). M-Map is the offline map that is already created and stored in the database. The user may walk randomly in any direction or can stop or start to walk at any point. To handle such complexity the vectorization is out on per-step basis.

2] Secondly Magicol is not dependent on WiFi or access points. It can work in infrastructure which is not supported by WiFi or any other access points.

3] The another important challenge in Radio Frequency indoor localization system is that the database of indoor may need to eonstruct in advance. This is the major challenge and has been studied recently here they proposed a complaint walk (CW) based solution for a site survey. In this system, the person who is doing survey needs to walk along the pre-determined path. The mobile device analyzes and collects sensor readings and magnetic signals which surveyor is walking. Then the real walking traces are compared with survey path through dynamic programming and form the tracking path [2].

C. The Horus

The authors M. Youssef and A. Agrawala in their paper, [3] "The Horus WLAN location determination system" which was published in Proceedings of 3rd ACM MobiSys described the Horus system for indoor localization. It was released in Horus is a Radio Frequency based indoor location determination system. Current working of Horus is done in the context of 802.11 wireless LAN's. Horus uses the Received Signal Strength (RSS) technology. The components of HORUS are shown in Fig 2. In this technology the signal strength, this measured to find the location. WLAN location determination system consists of two types: client based and infrastructure based. Horus works primarily into two phases, offline phase, and online phases [3].

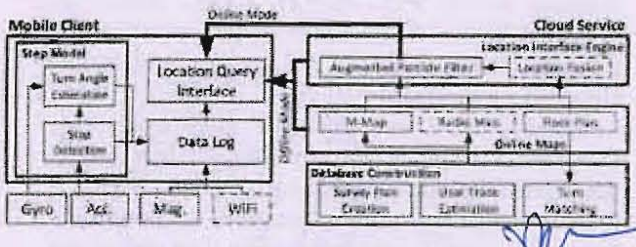

Fig 1: Magicol Architecture [2].

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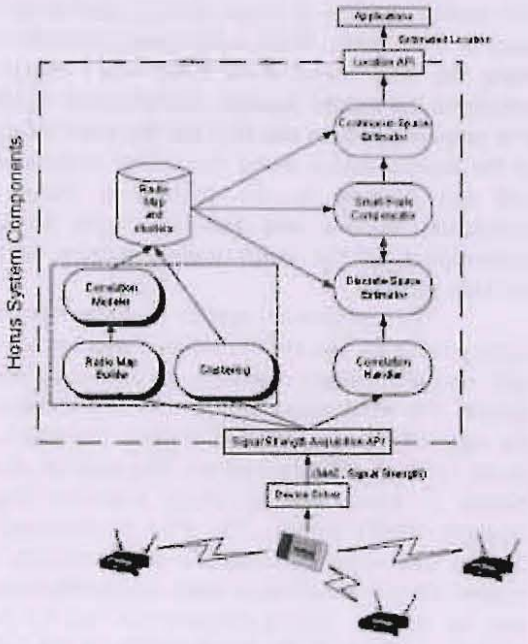

Fig 2: Components of HORUS [3].

1] Offline phase: - In the offline phase, initially the construction of radio map is done. Clustering of radio map locations and preprocessing of the Received Signal Strength model is performed.

2] Online phase: - In online phase, the actual tracking is carried out. Here the user location is found out by using the Received Signal Strength from each access point and radio map, which is constructed in offline phase [3].

Horus is the system that lies in the category in which multiple possible outcomes occurs. It is designed to satisfy the two primary goals: first is high accuracy and second are low computational requirements. Horus system analyzes the various causes of the wireless channel and helps in solving them to achieve high efficiency.

D. MADT

The paper [4] named Energy-Efficient Indoor Localization of Smart Hand-Held Devices Using Bluetooth is described below. The authors of this article are YU GU and FUJI REN, and it was published in Department of Information Science and Intelligent Systems, University of Tokushima, Tokushima, Japan, 2015. MADT i.e. Motion Assisted Device tracking, is a unique and efficient algorithm which is used for quick localization of target devices. It does not require any additional labor survey of the site and also it does not need any access point. MADT uses the fundamental rules of RSSI and the environmental factor such as direction and distance instead of signal entries from access points. This helps to guide the user to move gradually towards the direction of the target [4].

MADT can be combined with either Bluetooth or WiFi to form a complete system for indoor tracking. But the challenge is to find out, which of these two technologies are efficient for use along with MADT. After comparing both Bluetooth and WiFi regarding various attributes, the obtained result shows that Bluetooth will be more efficient than WiFi for MADT [4][5].

The basic idea of MADT is to set the target device as the signal emitting source which sends the signals and gradually draws the user in its direction. The movement of user shows the particular pattern which supports the rules derived in the empirical study. It uses two main rules: Rule 1 – It decides whether target in close range or not.

Rule 2 – To find the direction of search i.e. target. The pseudo code for MADT is divided into four parts [4].

1] Selecting the start point: - Choose the starting point of the search area manually.

2] Calculate the RSSI reading: - Place the receiver facing towards all four directions and calculate the distances.

3] Choose the search Direction: - Identify the correct quadrant by considering the gained RSSI values from step 2.

4] Identify whether the target is closer or user or not.

E. RFID

The authors P. Bahl and V. N. Padmanabhan in the paper [5] "RADAR: An In-building RF-based User Location and Tracking System" which was published in Proceedings of 9th IEEE INFOCOM. RFID is a means of loading and gaining back the data through an electromagnetic transmission to an RF compatible integrated circuit. It is now being seen as a means of enhancing data handling processes. A RFID system has various important components which include RFID readers, RFID tags, and the communication between them. The RFID reader can read the data emitted from RFID tags. RFID readers and tags use a defined RF and protocol to transmit and receive data. RFID tags are of two types, as either passive or active. Passive RFID tags can work without need of the battery [5]. The traditional barcode technology is replaced by RFID. Moreover, RFID tags are much lighter in weight and smaller in volume, and are less expensive than active tags. The RF signal transmitted to RFID is reflected from a reader and add information by modulating the reflected signal [5]. The only drawback of RFID is that its range is very limited. The typical reading range is 1–2 m, and the cost of the readers is relatively high. Active RFID tags include the small transceivers. These transceivers can actively transmit their ID or any other additional data in reply to a request. Frequency ranges used are almost similar to the passive RFID case except for the low-frequency and high-frequency ranges.

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F. Fingerprinting

The authors N. Kothari, B. Kannan, Evan. Glasgow and, and M. Dias in the paper [6] "Robust Indoor Localization on a Commercial Smart Phone," which was published in the International Workshop on Cooperative Robots and Sensor Networks, 2014 have described the technique of fingerprinting. Fingerprinting also was known as mapping or scene analysis is the approach that is used for tracking which is based on geometrical measurements. This system shows the basic idea of fingerprinting is to build a database with features of the seenario at reference locations and then apply regression techniques to mateh the measurement and infer current position. It eonsists of access point's database to store results and fingerprints. Fingerprinting can be elassified mainly into types as follows [6].

1] Offline training phase:

The scenario is surveyed at known locations, and the features of the environment at each site are then recorded into a database. These features are referred to as fingerprints and could be RSS, magnetometer measurements, or any other type of data that is position-dependent. For instance, when RSS is considered for fingerprinting, the database is composed of the coordinates of the training location, and the RSS of the nearby AP's measured at this place.

2] Online phase:

Online phase is also known as operating phase, as in this stage actual tracking is carried out. This phase needs offline phase as the prerequisite. This step includes the process where the mobile node navigates from one point to other while sensing the same type of fingerprints that were recorded in the database. The results that are obtained are then used to perform matching with the content of the database and provide a correct position of the mobile device which is handled by the user.

III. Proposed System

Indoor localization requires the higher accuracy. GPS cannot be used for tracking inside the building, so to find out the accurate location for indoor environment system use the RSSI-based trilateral localization algorithm. This algorithm is the low cost, and the algorithm does not require any additional hardware support. The algorithm is also easy to understand. The battery consumption by this technique is quite low as compared to the battery consumption of the GPS. Due to these reasons, this algorithm has become the important factor for localization algorithm in the wireless sensor networks.

Due to increase in development of the wireless sensor networks and the smart devices, the use and amount of WiFi access points are also increasing. The mobile devices in users hand is used to detect three or more public WIFI access points position and using the RSS values from these WIFI routers it calculates the current location of the mobile device. The proposed system can find out the exact location of the mobile device under the indoor environment and can traverse to the destination using the navigation function and also can enable the less consumption of the smart mobile battery for the tracking purpose.

The proposed system architecture has shown in Fig 3. The system has one web application and one applieation running on the smartphone mobile. The smartphone mobile user first downloads the map of the indoor environment for which he wants to enable the navigation. The position of the person is found out by using Received Signal Strength (RSS) values. The RSS is measured in decibel microvolts per meter (dB-microvolts/m). The system takes the assistance from the mobile sensors also for the low battery eonsumption and the more accurate location of the smart mobile in the indoor area.

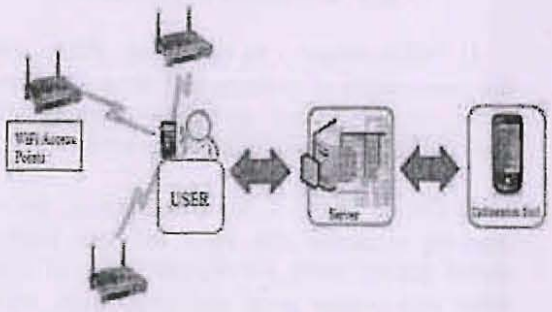

Fig 3: Proposed System Architecture.

In the environment developer can't guess the user behavior, the user might be at one position, or he can take turns, or the speed variation, all these behavior can be pointed out using the accelerometer and the orientation sensors. These sensors send the location samples to the server, and those are plotted on the map, and the trajectory is achieved. The mobile sensors and the WiFi routers can be utilized for the indoor localization because of their high accuracy and less consumption of the battery.

The mobile device has the number of the sensors embedded within it, but for this system, it uses the accelerometer and the Gyroseope. It calculates the distance value to plot the mobile device location and to check the movements of the user. To test the speed and the path changes, system takes the sensor values. The Magnetometer helps in analyzing reference direction towards the gravity. WiFi access points are used for identifying the user client location by using the RSSI algorithm. In the indoor location with each WIFI routers, there are some characteristics. The system will be using the strength that is the level and the frequency for the calculation of the distance of the mobile from the

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WIFI routers, but as the system is dealing with the accurate location finding and also less consumption of the battery, it takes the assistance from the mobile sensors.

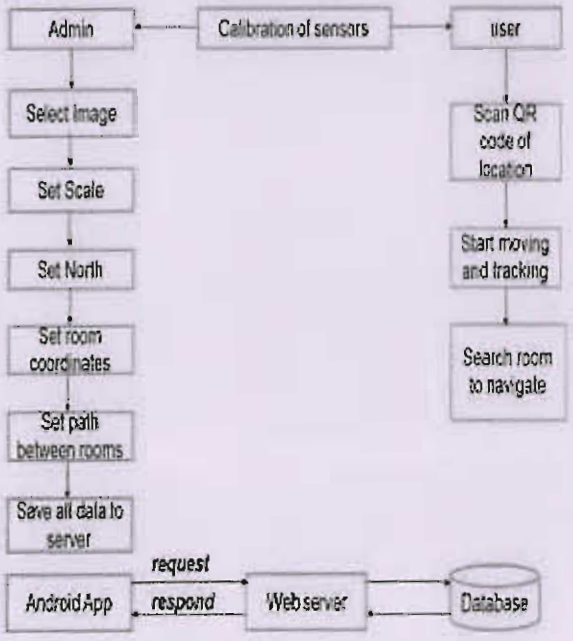

Fig 4: Block Diagram of Proposed System.

The flow of system architecture diagram of the indoor tracking system is explained in Fig 4. The system mainly consists of two actors, one is the admin, and other is the user. Initially, the admin selects the image of room in which the user is going to track owns location. In second step admin needs to set the scale and north direction. He has to adjust the room coordinates according to X and Y co-ordinates. Admin then sets the path between different places present in map. The user tracks his location and movements with the help this route. After building this M-Map admin has to save all this data on the server. The user, on the other hand, has to scan the QR code of location where he is standing. Once he selects the site, he has to download the M-Map of that site from the server. Once the map is downloaded, user can track and locate his location on the map with the help of his mobile device.

IV. Mathematical Model

S= {S, s, X, Y, T, f_{main}, DD, NDD, f_{friend}, memory shared, CPU_{count}}

- **S (system)**:- Is our proposed system which includes following tuple.
- **s (initial state at time T)** :-GUI of wireless indoor tracking. The GUI provides space to enter a query input for the user.
- **X (input to system)**: - Input Query. The user has to first enter the query. The query may be ambiguous or not. The query also represents what user wants to search.
- **Y (output of the system)**: - List of URLs with Snippets. The user has to enter a query into wireless indoor tracking then wireless indoor tracking generates a result which contains relevant and irrelevant URL's and their snippets.
- **T (No. of steps to be performed)**:- 6. These are the total number of steps required to process a query and generates results.
- **f_{main}(main algorithm)** : - It contains Process P. Process P contains Input, Output and subordinates functions. It shows how the query will be processed into different modules and how the results are generated.
- **DD (deterministic data)**: - It contains Database data. Here we have considered Rooms information, floors information, route information i.e. Database which contains a number of rooms information. Such as routes uploaded by admin will be shown to users when requested as a result.
- **NDD (non-deterministic data)**: - No. of input queries. In our system, user can enter numbers of queries so that we cannot judge how many queries the user enters into the single session. Hence, Number of Input queries are our NDD.
- **f_{friend}**: - WC and IE. In our system, WC and IE are the friend functions of the main functions. Since we will be using both the functions, both are included in the f_{friend} function. WC is Web Crawler which is a bot, and IE is Information Extraction which is used for extracting information on the browser.
- **Memory shared**: - The database will store information like the list of receivers, registration details, and numbers of receivers. Since it is the only memory shared in our system, we have included it in the memory shared.
- **CPU_{count}**: - 2. In our system, we require I CPU for server and minimum 1 CPU for the client. Hence, CPU_{count} is 2.

Subordinate functions:

Identify the processes as P.

S= {I, O, P....}
P= {SM, SR}

Where,

- SM is floor site.
- SR is site route.
- P processes.

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SM= {U, MAX, SC}
Where,

- U= x, y co-ordinates for rooms
- MAX = {1, 2, 3, … , n}
- SC site created with number of rooms.

SR= {SC, Triangulation Algorithm, Info}
Where,

- SC is input which contains rooms and path information

Triangulation algorithm is used to calculate user's current x, y co-ordinates from the current physical location over site map on the phone.

V. Result and Discussion

The experiment was done to check the accuracy for indoor location. The table 1 showed the results of actual distance and calculated distance between the mobile device and AP, and also the difference between them. The table 2 consists of the gained signal strength at the particular distance. The Received Signal Strength (RSS) is calculated in dBm (decibel-milliwatts). The results were obtained from the single access point.

TABLE 1: RESULT ANALYSIS TABLE.

Sr No	AP Number	Actual Distance	Calculated Distance	Difference
1	1	7	5	2
2	2	10	12	-2
3	3	15	13	2
4	4	4	4.5	-0.5
5	5	6	8	-2
6	6	7	6	1
7	7	20	17	3
8	8	16	15	1
9	9	18	19	-1

The results of the first table were obtaincd from nine access points from different floors. The values of actual distance and calculated distance between mobile user and access points are measured and compared. The comparison does not show the major difference between the actual and calculated distances. The actual distance is measured physically, by using measuring equipment's, while the calculated distance is measured by the system. The application is developed which shows this calculated distance. Results are shown in the following table, and its graphical representation is also shown in Fig 5.

The graph shows the comparison of actual and calculated distance. The difference between actual and calculated distance is very low. The X axis in the graph represents the access point number, and the Y axis represents the distance in meters. The blue line in the graph represents the actual distance, and red line represents the calculated distance.

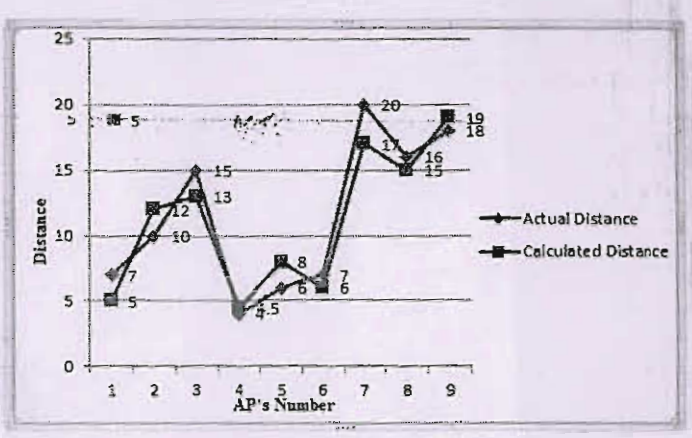

Fig 5: Calculated distance versus Actual distance.

The graph shows the comparison of actual and calculated distance. The difference between actual and calculated distance is very low. The X axis in the graph represents the access point number, and the Y axis represents the distance in meters. The blue line in the graph represents the actual distance and red line represents the calculated distance.

TABLE 2: RSS AT PARTICULAR DISTANCE

Sr. No	Distance (m)	RSS (dBm)
1	1.5	-53
2	5	-60
3	9	-70
4	14	-79
5	25	-86

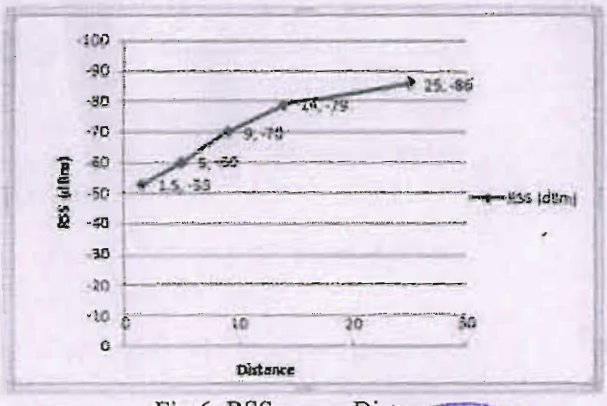

Fig 6: RSS verses Distance

Table 2 shows the distance and amount of RSS at that distance. The distance is calculated in meters whereas the RSS is calculated in dBm (decibel-milliwatts). The graph of distance verses RSS is

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shown in fig 6. The x-axis shows the distance in meters and y-axis shows the RSS in dBm.

VI. Conclusions and Future Work

The system mainly introduces a new tracking system that relies on Wi-Fi and mobile device. The main aim is not only to make the best utilization of the existing infrastructure available in an organization but make the deployment of the system most commercially viable by using technologies that are already available to the consumers.

In the future, the system can be integrated with the outdoor tracking and positioning to form the complete system which will help the user to enable the tracking for both indoor and outdoor locations. An indoor system for user and device tracking for security reasons can also be the future scope of the system.

Acknowledgment

The authors would like to thank the publishers, researchers for making their resources available and teachers for their guidance. We would also thank the college authority for providing the required infrastructure and support. Finally, we would like to extend heartfelt gratitude to friends and family members.

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A REVIEW: AUTONOMOUS AGRIBOT FOR SMART FARMING

[1]ASHISH LALWANI, [2]MRUNMAI BHIDE, [3]S. K. SHAH

[1,2]PG Student, [3]HOD PG Department,
Skncoe, Vadgoan, Maharashtra, India

Abstract— Increasing population requires the food production to be increased which requires better cultivation in the form of proper utilization of seeds and fertilizers with minimum labor work. The main objective of autonomous agribot is efficient utilization of resources and to reduce labor work. It can perform various tasks like soil testing, sowing of seeds, spraying of fertilizers and harvesting of fruits. It can measure the NPK content of soil using colour testing of chemical solution using fiber optic and dispense the required amount of fertilizers which is necessary or less in soil. It can dig a hole in soil by drilling mechanisms and plants seed and cover hole by soil again. It can spray the pesticides using spraying mechanisms. All above operations are performed by using ARDUINO controller which is master and others are lilypad which are slaves performs specific operation. By using image processing and robotic arm the agribot will detect fruits on tree and cut the fruit and dump it on basket, all this harvesting work can be done by using Raspberry pi.

Keywords— Agribot, ARDUINO controller, Raspberry pi, NPK testing, sowing of seeds, pesticides spraying, Harvesting.

I. INTRODUCTION

The main motive for developing Agricultural Automation Technology is the decreasing labour force, a phenomenon common in the developed world. The reasons are the need for improved food quality. Robotics and artificial intelligence achievements offer solutions in precision agriculture to processes related to seeding, harvesting, weed control, grove supervision, chemical applications, etc. to improve productivity and efficiency. In the current generation most of the countries do not have sufficient skilled man power in agricultural sector and it affects the growth of developing countries. So it's necessary to automate the sector to overcome this problem. In India there are 70% people dependent on agriculture. Robotics is the branch of technology that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing. The design of a rover will often incorporate agricultural efforts, though it may not look much like a human being or function in a human like manner. These types of intelligent systems having robust and feasible model with a number of integrated functionalities is the demand of future in every field of technology, for the betterment of the society.

The application of agricultural machinery in precision agriculture has experienced an increase in investment and research due to the use of robotics applications in the machinery design and task executions. Precision autonomous farming is the operation, guidance, and control of autonomous machines to carry out agricultural tasks. It motivates agricultural robotics. It is expected that, in the near future, autonomous vehicles will be at the heart of all precision agriculture applications. The goal of agricultural robotics is more than just the application of robotics technologies to agriculture. Currently, most of the automatic agricultural vehicles used for weed detection, agrochemical dispersal, terrain levelling, irrigation, etc. are manned. An autonomous performance of such vehicles will allow for the continuous supervision of the field, since information regarding the environment can be autonomously acquired, and the vehicle can then performs its task accordingly.

Agriculture was the key development in the rise of human civilization. A remarkable change in agricultural practices has occurred over the past century in response to new technologies, and the development of world agricultural markets. This also has led to technological improvements in agricultural techniques. Robotics is the branch of technology that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback. The design of a rover will often incorporate agricultural efforts, though it may not look much like a human being or function in a human like manner [1].

Agribot is a robot designed for agricultural purposes. In the 21st century the trends of development on automation and intelligence of agricultural machinery is increasing. All kinds of agricultural robots have been researched and developed to implement a number of agricultural products in many countries. This Bot can performs basic elementary functions like harvesting, planting and spray the pesticides. The application of agricultural machinery in precision agriculture has experienced an increase in investment and research due to the use of robotics applications in the machinery design and task executions. Precision autonomous farming is the operation, guidance, and control of autonomous machines to carry out agricultural tasks. It motivates agricultural robotics. The goal of agricultural robotics is more than just the application of robotics technologies to agriculture. Currently, most of the automatic agricultural vehicles used for weed detection, agrochemical dispersal, terrain levelling, irrigation, etc.

A. *Comparison between Present sowing techniques and sowing with Agribot System*

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Table 1: Comparison of sowing techniques.

Sr. No.	Parameters	Manual	Tractor	Digging and sowing using Agribot
1.	Man Power	More	Moderate	Less
2.	Time Required	More	More	Less
3.	Digging and sowing technique	Manually	Manually	Automatically
4.	Adjustable seed distance	No	No	Yes
5.	Seed Wastage	Moderate	More	Less
6.	Energy needed	High	Very High	Less
7.	Pollution	No	More	No
8.	Alarm and display	No	No	Yes

Table1. Shows that the manual sowing method requires more man power and time than the sowing with tractor but still it is more than sowing with agribot. Also using agribot we can change the distance between the two plants and the wastage of seed is also less.

B. ***Limitations of Manual Farming***

If farming is done manually then a lot of human efforts are required and then also the required quality work is not possible. Also there is wastage of seeds and fertilizers due to improper use of it. Also the harvesting part is very difficult manually because it may happen that the fruits are cut before their maturity level of it because grading of fruit is done manually. Manual harvesting method is slow and also very costly.

C. ***Agribot design challenges***

Today agricultural robots can be classified into several groups: harvesting or picking, planting, weeding, pest control, or maintenance. The goal is of creating "robot farms" where all of the work will be done by machines. The main obstacle to this kind of robot farm is that farms are a part of nature and nature is not uniform. It is not like the robots that work in factories building cars. Factories are built around the job at hand, whereas, farms are not. Robots on farms have to operate in harmony with nature. Robots in factories don't have to deal with uneven terrain or changing conditions. So following are some challenges in designing agribot [3].

1. It is difficult to drop only one seed at a time, so control the flow of seed tank is difficult task to plant only one seed.
2. Difficult to design seeding mechanisms with plough in the farm and cover it with soil again.
3. Difficult to design spraying mechanisms, while spraying the pesticides it is necessary to control the flow of air and pesticides from the nozzle, otherwise only the air or pesticides will be out from the nozzle and proper spraying is not done.
4. While harvesting the fruit on tree, the fruit will be detected by using 2D camera we get only X-Y direction but it is difficult to get Z direction which is distance of fruit on tree from robot.

The review is organized as follows: the model of agribot system is presented; related problems, design challenges are discussed in Section I. Related work is presented in section II. In section III proposed methodology is presented. In section IV, conclusion and set of remarks presented at the end of the brief.

II. RELATED WORK

Different methods that are used to implement agribot is presented below.

The robot which performs operation like soil, moisture testing, seeding, spraying pesticides, removes compost from the field is presented in [1], which also performs obstacles avoidance operation and metal detection in the path. The robot is controlled using cell phone using DTMF technique. Because of using DTMF technique it overcomes the range or distance problem of using Bluetooth or RF module which having limited working range.

Agribot integrated system which uses Wi-Fi to communicate between two robots is presented in [2], which perform activities like seeding, weeding, spraying of fertilizers and insecticides. It is controlled using Arduino Atmega2560 controller and powerful Raspberry pi minicomputer to control and monitor working of robot. It has hexapod body which can move in any direction as per required. It has ultrasonic proximity sensor to avoid the obstacles in the path, and underbody sensor system to detect that seed is planted or not. It can dig a hole in soil plant seed in it n cover the hole again with soil and necessary pre emergence fertilizers applies on it, and move on along with communicating with other robot near to it using Wi-Fi.

Command based self-guided digging and seed sowing rover, a sensor guided rover for digging, precise seed positioning and sowing has been proposed to reduce the human effort and also to increase the yield is presented in [3]. The rover's navigation is performed by remote guiding devices fortified with the positioning system. It uses Arduino Atmega2560 controller and ultrasonic radar sensor for obstacle avoidance. It is controlled using wireless module that can be control by PC/ TAB/ Mobile. It gives acknowledgement massage of seed tank empty or full to the farmer.

The agribot which perform only two operation is presented in [4], in that it performs operation like digging hole in field that is ploughing in the field and then planting a seed at a regular interval and cover the plough area with soil. To drop the seed stepper motor is used and to dig a hole spike wheel is used. The Psoc

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controller from cypress is used to control all the operation.

The robot performing soil moisture test, Ph measurements, seeding and fertilizing using Arduino328 is presented in [5], live streaming to see the operation of robot the camera is mounted on robot, by live streaming it is possible to control the direction of it instead of making it path follower or line follower. The robot is controlled by remote which is connected through internet using Raspberry pi.

Up to this point only seeding and fertilizing techniques are discussed now we see about harvesting techniques. Motivation for the research is to decrease harvesting cost and increase the value of their product to the consumer. Conventional harvesting method is highly labor intensive and inefficient in terms of both economy and time. Machine harvesting systems are a partial solution to overcome these issues by removing fruits from the trees efficiently thus to reduce the harvesting cost to about 35-45% of total production cost.

An agribot which is unmanned aerial vehicle (UAV's), high speed image processing algorithms and machine vision techniques is presented in [7]. The techniques that have used in this paper reinforce the possibility of transforming agricultural scenario to modernity within given resources. It is basically a quadcopter empowered with vision for detecting mangoes on tree and cutting ancillaries. It could hover around the trees, detect the ripe mangoes, cut and collect them.

The approach has been applied for targeting fruits for robotic fruit harvesting. Efficient locating the fruit on tree is one of the major requirements for any harvesting system is presented in [9]. The fruit detection using improved multiple features based algorithm. Improved multiple features refers to an image processing algorithm that trained for efficient feature extraction.

III. PROPOSED METHODOLOGY

Proposed system requires IR sensors, Image processing, robotic arm and controller as main blocks for the design. Selection of Controller will be done on the basis of number required memory size, number of analog and digital input/output pins. Hence for system design controllers like ATMEL 8051, PIC and Arduino will be considered.

Depending upon number of peripheral used and memory size required for system design, system will be design using Arduino microcontroller as main control unit due to following design issues.

1. In ATMEL 8051 there is no provision of inbuilt ADC and if system demands ADC interface for any problem, there is a need to interface ADC externally. Due to which extra cost will increase.
2. In case of ARM processor, there is a provision for on chip ADC interface. As system demands limited number of resources, there will be the possibility of wasting number of unused resources.
3. Arduino has 54 digital input/output pins, 16 analog input pins.
4. It is possible to connect lily pads which are atmega328 controller to the arduino.
5. Cost is also an important aspect to consider for design.

Hence due to above mentioned points system will have to be implemented by using Arduino controller.

A. Proposed Block Diagram

Farming using agribot is major task to achieve. Proposed system will be totally based on it. Agribot deals more strongly with proper execution of task like human being. It also proper utilizes the resources available like seeds, fertilizers, there should be less wastage of things and complete the task in as minimum time as possible.

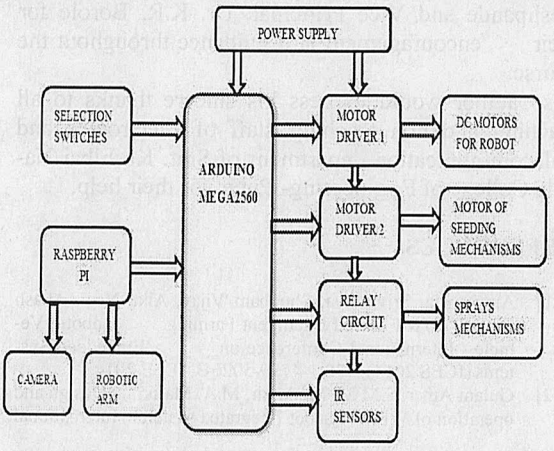

Fig. 1. Proposed system block diagram.

As shown in the Figure 1, a manual switches are used to control the robot action like for NPK measurement of soil, seeding, fertilizer spray, harvesting of on tree fruit. When the power supply is turned on the robot will be in idle mode it performs nothing till any one manual switch is pressed. As soon as the switch is-press the robot will perform the dedicated task-provided in the program. After the robot start performing the task at same time it can detect obstacles in the path of the robot using IR sensors. If any obstacle comes in the path then the robot will try to avoid that obstacle by changing the path but at the same time it continuously monitors any other obstacles in the path. The robot will follow only the dedicated path if there is no obstacle in the path.

CONCLUSIONS

This robotics agricultural machine is designed to facilitate the farmers to ease their work and increase the productivity with its multitasking working features such as automatic seeding system, automatic pest control unit, automatic compost spraying etc.

Smt. Kashibai Navale College of Engineering Pune-41.
Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

By developing this robotic vehicle with its multi-tasking agricultural features, it overcomes the difficulty of farmers in farming their land in every season no matter what is the weather that day. Considering all the situations, the robot integrated with different sub modules can be used for redemption and agricultural purposes worldwide especially countries like India where agriculture provides the principal means of livelihood for the major Indian population.

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★★★

Head
Dept. of Electronics &
Telecommunication Engineering
Smt. Kashibai Navale College
of Engineering, Pune - 411 041

Smt. Kashibai Navale College of Engineering ★ Pune-41.

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SVM Classifier Based Grape Leaf Disease Detection

Pranjali B. Padol
Dept. of Electronics & Telecommunication
STE'S, Smt. Kashibai Navale College of Engineering
Pune, India
pranjali.padol@gmail.com

Prof. Anjali A. Yadav
Dept. of Electronics & Telecommunication
STE'S, Smt. Kashibai Navale College of Engineering
Pune, India
aayadav.skncoe@sinhgad.edu

Abstract— **Grape constitutes one of the most widely grown fruit crops in the India. Productivity of grape decreases due to infections caused by various types of diseases on its fruit, stem and leaf. Leaf diseases are mainly caused by bacteria, fungi, virus etc. Diseases are a major factor limiting fruit production and diseases are often difficult to control. Without accurate disease diagnosis, proper control actions cannot be used at the appropriate time. Image Processing is one of the widely used technique is adopted for the plant leaf diseases detection and classification. This paper is intended to aid in the detection and classification leaf diseases of grape using SVM classification technique. First the diseased region is found using segmentation by K-means clustering, then both color and texture features are extracted. Finally classification technique is used to detect the type of leaf disease. The proposed system can successfully detect and classify the examined disease with accuracy of 88.89%.**

Keywords— Image Processing, Leaf diseases detection, K-means clustering, feature extraction, SVM Classification.

I. INTRODUCTION

In India grape productivity is highest in the world and there is scope to raise it further. Grape export from India is about 53,910 tonnes valued at 48,505 (1000US$) that makes a share of nearly 1.54% of total export of grapes in world. Near about 70% of population depends on agriculture. Grapes are an important fruit crop in India. Due to disease on grape plant there is loss of about 10-30 % of crop. Therefore there is a need to identify the diseases at the beginning and suggest solutions to the farmers so that maximum harms can be avoided so as to increase the yield.

Farmers generally use naked eye observation to judge the diseases. But sometimes this may be an inaccurate way. Many times farmer needs to call the experts for detecting the diseases which is also time consuming in large farms [3].

The grape suffers from enormous loss due to the leaf diseases like: Powdery mildew, Downy mildew and anthracnose etc [1]. The disease on plant is on their leaves, fruits and on stem of plant. In an agriculture field, an early detection of leaf diseases is the major challenge.

Using digital image processing techniques, number of applications has found in different fields such as industrial inspection, medical imaging, remote sensing, and agricultural processing etc.

For analysis in various agricultural applications, digital image processing techniques have been established as an effective way such as plant recognition, soil quality estimation, and crop yield estimation etc. in the field of agriculture. One of the applications of digital image processing techniques in agriculture is to detect plant disease.

The disease types are classified into bacterial, viral, fungal etc. on plant. In India the fungal diseases for grape leaf found are Downy Mildew, Powdery Mildew and Anthracnose. The proposed work focused on recognition and classification of fungal disease like Downy Mildew and Powdery Mildew using image processing. This work describes that how we can do the automatic detection of grape leaf diseases. The given system provides automatic, fast, accurate and less expensive method to detect and classify the grape leaf diseases.

II. LITERATURE SURVEY

Lots of researches have been done on the use of digital image processing for detection of plant leaf diseases in agricultural applications. Visual recognition of diseases on leaves is less accurate and it requires more experienced knowledge.

The automated plant disease detection provides advantages in an agricultural area hence it is an important research topic.

In [4] authors have proposed detection and classification of grape leaf diseases using Neural Networks (NN). In this system, grape leaf image is taken as input. Thresholding is deployed to mask green pixels. An anisotropic diffusion is used to remove noise. Then by using K-means clustering grape leaf disease segmentation is done. Using Neural Networks the diseased part is recognized.

In [5] authors provided color transform based approach to detect disease spot on plant leaf. In this paper a comparison of the effect different types of color space in the process of disease spot detection given. All color models (CIELAB, HSI and YCbCr) are compared and finally „A" component for CIELAB color model is used. Median filter is used for image smoothing. Finally by using Otsu method on color component, threshold can be calculated.

In [6] authors provided fast and accurate diagnosis and classification of plant diseases. In this method K-means clustering is used for segmentation and NN is used as a classification using some texture feature set.

Smt. Kashibai Navale College of Engineering Pune-41.

Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College
of Engineering, Pune - 411 041

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In [8] authors given the different types of diseases in rice leaf. In preprocessing techniques segmentation of leaf disease detection has been discussed. Using histogram plot the classification of normal and diseased leaf is done. Both shape and color features are extracted. Using PCA method shape features are extracted and using color based grid moments the color features are extracted.

All these mentioned methods uses either texture, shape or color features for feature extraction.

Also in NN classifier, it is hard to know how many neurons and can be done for small dataset only.

III. SYSTEM DESIGN

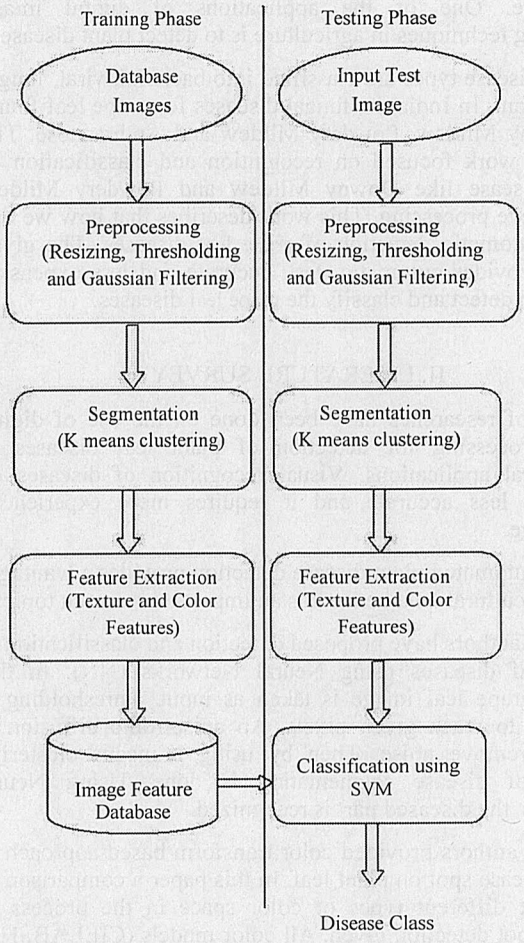


Fig. 1. System Block Diagram

A. Image Acquisition

In this step the sample images are collected, which are required to train the system. Grape leaf images are taken by using digital camera and are used for both training and testing the system. The standard jpg format is used to store these images. In this study, images are collected from different regions like Pune, Nasik. Few of the images have been taken from internet. Collected images include the leaves infected by Powdery Mildew and Downy Mildew.

B. Preprocessing

The image preprocessing is done on gathered images for improving the image quality. It removes the background noise as well as to suppress the undesired distortion. In this image is first resized to size 300x300 and then thresholding is done to get all green color component. Gaussian filtering is carried out to remove noise in the image.

C. Segmentation

In image segmentation the separation of the given image into homogenous regions with respect to certain features is done. Clustering is a method by which the large sets of data are grouped into clusters of smaller sets or segments of similar data.

In present work, K-means clustering is used to for segmenting an image into three groups as shown in Fig. 4. The clusters contain diseased part of leaf. Before clustering 'a' component is extracted from L*a*b space [5].

Properties of K-Means Algorithm and K-Means Algorithm Process [10] are given as below:

1) Properties of K-Means Algorithm

a) There is K number of clusters always.

b) There is minimum one item in each of the given cluster.

c) The clusters never overlap with each other.

d) Each member of single cluster is nearer to its cluster than any other cluster.

2) The Process of K-Means Algorithm

a) First divide the dataset into K number of clusters and assign the data points randomly to the clusters.

b) Then for each data point, calculate the Euclidean distance, from the data point to every cluster.

The Euclidean distance is the straight-line distance between two pixels and is given as follows:

$$\text{Euclidean Distance} = \sqrt{((x1 - x2)^2 + (y1 - y2)^2)} \quad (1)$$

Smt. Kashibai Navale College of Engineering Pune-41.
Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

Where (x1, y1) & (x2, y2) are nothing but two pixel points (or two data points).

c) If the data point is closest to its own cluster then leave it where it is.

d) Shift it into the nearby cluster, if the data point is not closest to its own cluster.

e) Repeat all steps until an entire pass through all the data points.

f) Now the clusters become stable and the process of clustering will stop.

D. Feature extraction

The feature extraction is used to extract the information that can be used to find out the significance of the given sample. The main types of features are shape, color and texture, which are mostly used in image processing technique.

For Downy Mildew color features and for Powdery Mildew texture features are need to be used. Hence in this system color and texture features both are extracted to get better accuracy.

Following steps are used to calculate the color features for a given image [8]

1) First conversion of RGB image into HSV color spaces is done.

2) An image is subdivided into 3X3 blocks uniformly.

3) The mean color (H/S/V) for each of the nine blocks is calculated by using following formula.

$$x' = \frac{1}{N} x_i \qquad (2)$$

Where x_i is the pixel intensity and N is the total number of pixels.

Here mean is considered as one of the feature.

4) For each block the variance is calculated by using below formula.

$$\text{Variance} = \frac{1}{N} \sum_{i=1}^{N} (x_i - x')^2 \qquad (3)$$

The computed variance has the ability of measuring the variability.

5) The skewness for each block of (H/S/V) is calculated.

$$\text{Skewness} = \frac{\frac{1}{N} \sum_{i=1}^{N} (x_i - x')^3}{\left(\frac{1}{N} \sum_{i=1}^{N} (x_i - x')^2 \right)^{\frac{3}{2}}} \qquad (4)$$

The skewness is used to judge the image surface. Each block will have 3+3+3=9 color features.

The 9 texture features-contrast, uniformity, maximum probability, homogeneity, diagonal variance, difference variance, entropy, inverse difference, and nine color features are used.

TABLE I. MATHEMATICAL FORMULAS FOR TEXTURE FEATURES [7]

We first need to combine the texture and color (9+9=18) features for classification, before we use SVM to train the classifier.

No.	Feature	Formula
1	Contrast	$\Sigma_i \Sigma_j \lvert i-j \rvert^2 p(i, j, d, \theta)$
2	Uniformity (Energy)	$\Sigma_i \Sigma_j p(i, j, d, \theta)^2$
3	Maximum probability	$\text{Max}_{ij}\, p(i, j, d, \theta)$
4	Homogeneity	$\Sigma_i \Sigma_j p(i, j, d, \theta)/(1 + \lvert i-j \rvert)$
5	Inverse difference moment of order 2	$\Sigma_i \Sigma_j 1/(1 + (i-j)^2)\, p(i, j, d, \theta)$
6	Difference variation	Variance of $\Sigma_i \Sigma_j \lvert i-j \rvert p(i, j, d, \theta)$
7	Diagonal variance	Variance of $p(i, j, d, \theta)$
8	Entropy	$\Sigma_i \Sigma_j p(i, j, d, \theta) \log (p(i, j, d, \theta))$
9	Correlation	$\sum_{i,j} \frac{(i-\mu_1)(j-\mu_1) p(i, j)}{\sigma_i \sigma_j}$

E. Classification

The classification technique is used to detect the type of leaf disease. Classification deals with associating a given input pattern with one of the distinct class. In the given system a Linear Support Vector Machine (LSVM) is used for classification of leaf disease.

Smt. Kashibai Navale College of Engineering Pune-41.
Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

SVM is a binary classifier which uses a hyper plane called the decision boundary between two classes. This hyper plane tries to divide, one class containing the target training vector which is labeled as +1, and the other class containing the training vectors which is labeled as −1.

Using this labeled training vectors, SVM optimizer finds an hyper plane that will then maximizes the margin of separation among the two classes as shown in Fig. 2.

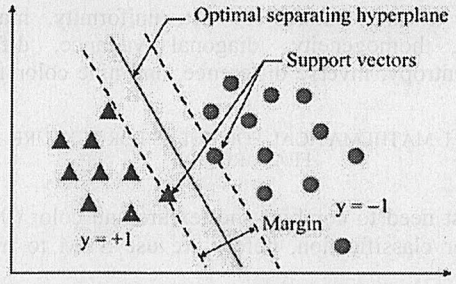


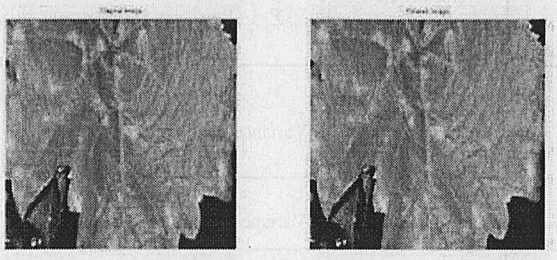
Fig. 2. SVM in Linearly Separable Condition [9]

IV. RESULTS AND DISCUSIONS

Classification involves two stages, training and testing using any classifier. In training phase, classifier is trained using feature values and its respective target values. This trained classifier is then used to classify test images.

In this work total 137 grape leaf images (containing both initial stage as well as final stage images) are used out of which 75 images are Downy leaf images and 62 are Powderly leaf images. For training phase 60 Downy and 50 Powderly images are used and 15 Downy and 12 Powderly are used for testing.

First step is thresholding and filtering. Fig. 3 shows original image and filtered image.



(a) (b)

Fig. 3. (a) Original Image (b) Filtered Image.

Then filtered image is segmented into 3 clusters using K-means clustering. Fig. 4 shows 3 clusters formed using K-means clustering.

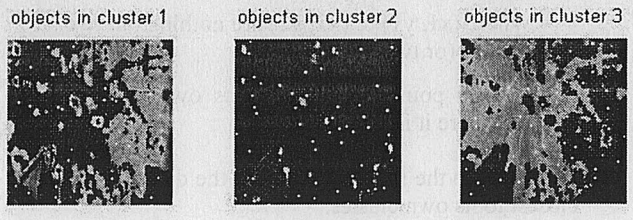


Fig. 4. Segmentation using K-means Clustering.

The texture and color features of all three segmented images are extracted.

In this work nine texture features and nine color features are calculated for all three segmented parts of single leaf image. Hence total number of feature values for single leaf image becomes (9+9)*3=54. These feature values, collectively called as feature vector, is given to trained SVM classifier which classifies the input leaf image into two classes Downy and Powderly, depending upon its feature values.

Image shown in Fig. 3 is Downy leaf image so SVM classifies it into Downy class and this result is presented into a message box as shown in Fig. 5.

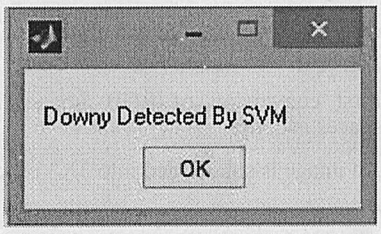


Fig. 5. Classification Result Presented by a Message Box.

The overall performance of SVM classifier is summarized into Table II. It can be seen from the Table II that SVM perform extremely good with Downy class of grape leaves but gives considerably poor performance with Powderly class.

TABLE II. CLASSIFICATION RESULTS OF SVM

Dataset	Total test samples	Correctly Classified	% Accuracy
Downy	15	14	93.33%
Powderly	12	10	83.33%
Combined	27	24	**88.89%**

$$\text{Accuracy (\%)} = \frac{\text{Correctly Recognized Images}}{\text{Total Number of Test Images}} * 100 \quad (5)$$

Navale College of Engineering Pune-41.
Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

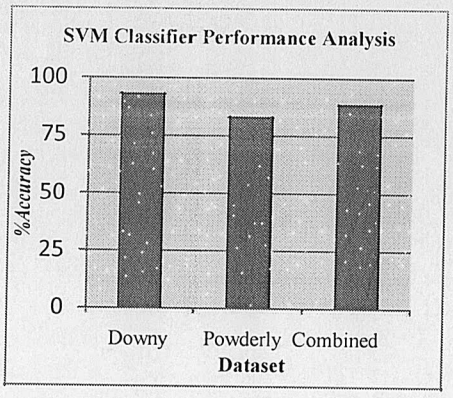


Fig. 6. SVM Performance Analysis.

Table III shows comparative study of this system with previous system.

TABLE III. COMPARATIVE ANALYSIS

Parameters	Previous System, S. S. Sannakki et al. [4]	This System
Classifier Used	NN	SVM
Total Samples	33	137
Features Used	9 (Texture)	18 (9 Texture & 9 Color)
% Accuracy	100%	88.89%

V. CONCLUSIONS AND FUTURE WORK

The given system uses resizing, thresholding and Gaussian filtering for image preprocessing. To segment the leaf area, the K-means clustering technique is used for segmentation of image then feature extraction is done using both texture as well as color features. Then finally SVM classification technique is used to detect the type of leaf disease. In the experiment two classes of grape leaves were considered namely, Downy Mildew and Powdery Mildew. The given system gives **88.89%** average accuracy for both Downey and Powderly grape leaf disease.

Future expansion of this work will be focused on following points:

1) To develop combinations of more algorithms by using fusion classification technique, so as to improve the detection rate of the classification process.

2) On the basis of detection of disease the proper mixture of fungicides will be provided to the grape farmer for further use in their farms.

3) To design an automated system with the help of embedded system so that this fungicide mixture will be automatically sprayed using spraying mechanism.

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Smt. Kashibai Navale College of Engineering Pune-41.

Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

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A Review: Liver Cancer Detection Algorithm

Abhijeet Patil[1], Prof. Mrs. V. S. Kulkarni[2]

M.E. Student, SKNCOE Vadgaon (Bk) Pune, Maharashtra, India[1]

Assistant Professor, SKNCOE Vadgaon (Bk) Pune, Maharashtra, India[2]

Abstract: The liver is the largest internal organ in the human body. It performs a multiplicity of life sustaining functions and fundamentally affects every physiological process in the body. The liver is the second organ most normally involved by metastatic disease, being liver cancer one of the prominent causes of death worldwide. The early detection and diagnosis of liver tumor is consequential for the detection of liver tumor. Medical image processing is used as a non-invasive method to detect tumors. Many techniques have been developed for the detection of liver tumor utilizing the aberrant lesion size and shape. This paper reviews many different liver tumor detection algorithms and methodologies utilized for liver tumor diagnosis. The novel methodology for the detection and diagnosis of liver tumor is additionally proposed in this paper for the detection and diagnosis of liver tumor.

Keywords: liver tumor segmentation, CT image, computed tomography.

I. INTRODUCTION

Liver cancer is one of the major death factor in the world and also known as hepatic cancer; it is a cancer which starts in the liver, and not from another organ which ultimately travels to the liver. In other words, there may be cancers which start from somewhere else and end up in the liver - those are not (primary) liver cancers. Cancers that originate in the liver are known as primary liver cancers. Liver cancer comprises of malignant hepatic tumors (growths) in or on the liver. The most common type of liver cancer is hepatocellular carcinoma (or hepatoma or HCC), and it tends to affect males more than females. Early detection and accurate presentation of liver cancer is a significant issue in practical radiology. Liver lesions refer to those abnormal tissue cell that are found in the liver. Liver lesions are a wound or injury in the tissue areas of the body due to harm caused by a wound or disease. These lesions can be identified in a CT scan by a difference in pixel intensity from other regions of the liver. For proper clinical treatment, manual segmentation of this CT scan is difficult and excessively time consuming task. [1] Alternatively, automatic segmentation is very challenging task, due to numerous issues, including liver stretch over 150 slices in a CT image, poor intensity contrast between lesions and other nearby similar tissues and indefinite form of the lesions.

Segmentation of liver tumors is a significant prerequisite task afore any medical intervention. A precise and perfect examination of the lesions/tumors allows for accurate staging and evaluation of the available therapies that can be provided to the patient. Over an interval of time it track the progress of the therapy as well as it can help in deciding the best treatment approach. Also, tumor segmentation plays a vital role in the development of 3D surgical tools that can help and guide the surgeon for the complete removal of the tumor rendering the patient free of the underlying disease.
Accurate and early detection of the tumor is very important for the diagnosis and treatment of the disease.

Since CT is one the most commonly used imaging modalities in the diagnosis of liver tumors, segmentation and calculation of volume becomes essential. Various automatic/semiautomatic techniques for liver tumor segmentation have been developed based on strategies which include Bayesian approaches, entropy based segmentations, level set techniques, multi-level thresholds, and region growing techniques.
So, we have studied different methodologies to detect cancer as well as proposed a new, less computational complex, robust comparatively accurate methodology of cancer diagnosis.

CT SCAN IMAGE

A computerized axial tomography scan (CT scan) is an x-ray method that combines several x-ray images with the aid of a computer to produce cross-sectional views and three-dimensional images of the interior organs and structures of the body. A CT scan is used to define normal and abnormal structures in the body and/or assist in procedures by helping to precisely guide the placement of instruments or treatments.

It is a medical imaging method that employs tomography. Tomography is the method of producing a two-dimensional image of a slice or section through a 3-dimensional object (a tomogram). CT scans of the abdomen are extremely helpful in defining body organ anatomy, including visualizing the liver, gallbladder, pancreas, spleen, aorta, kidneys.

To verify the existence of tumors, infection, abnormal anatomy, or changes of the body from trauma, CT scans in this area are used. The CT image is sufficient for analysis for this proposed method. Moreover MRI Scan is very costly and the tissues can't able to view clearly. But the CT is not so costly but also the tissues can be clearly visible in CT scan.

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II. EARLIER WORK

M V Sudhamani, G T Raju proposed that Segmentation of CT liver images helps to analyse the occurrence of hepatic tumor and classify the tumor from images. Here, to examine the neighbouring pixels of initial seed points and determine whether the pixel neighbours should be added to the region or not they used region growing technique. The procedure is iterative and seed point is selected interactively in the suspected region. The watershed segmentation method is used to segment the contour, which is generated by the region growing. The texture features for segmented region are extracted through Grey Level Co-occurrence Matrix (GLCM). These features are used to classify the tumor as benign or malignant using Support Vector Machine (SVM) approach. In this paper, a semi-Automated system has been presented which is robust, allows radiologist and surgeons to have easy and convenient access to organ measurements and visualization. Experimental results shows that liver segmentation errors are reduced significantly and all tumors are segmented from liver and are classified as benign or malignant. [2]

In segmentation module, the selection of ROI from the suspicious region is done using region growing algorithm. The region growing is a region-based image segmentation method. Here, the human expert intervention is needed to select the seed point of the suspected region. For this purpose, the CT image has to be pop up from the location where it is stored and then seed pixel has to be selected by using plus mark curser with clicking one time on the suspected area of the image.

L. Ali, A. Hussain, J. Li, U. Zakir, X. Yan, A. Shah, U. Sudhakar research objective is to grow a robust and intelligent clinical decision support framework for disease management of cancer based on legacy Ultrasound (US) image data collected through numerous stages of liver cancer. The proposed intelligent CDS framework will automate real-time image enhancement, segmentation, disease classification and progression in order to enable efficient diagnosis of cancer patients at early stages. The CDS framework is motivated by the human interpretation of US images from the image acquisition stage to cancer progression prediction.

Specifically, the proposed framework is composed of a number of stages where images are first acquired from an imaging source and pre-processed before running through an image enhancement algorithm. The detection of cancer and its segmentation is considered as the second stage in which different image segmentation techniques are utilized to partition and extract objects from the enhanced image. The third stage involves disease classification of segmented objects, in which the meanings of an investigated object are matched with the disease dictionary defined by physicians and radiologists. In the final stage, cancer progression, an array of US images is used to evaluate and predict the future stages of the disease. For experiment purposes, we applied the framework and classifiers to liver cancer dataset for 200 patients. Class distributions are 120 benign and 80 malignant in this dataset. [3] Classifiers performance is measured by introducing WEKA Explorer where several classifiers such as Bayesian Logistic regression, Multi-Layer Perception, KNN, J48graft and SVM classifier were tested on LESH features. SVM produced 95.29% accuracy results and performed better among the machine learning algorithms tested.

Yu Masuda, Amir Hossein Foruzan, Tomoko Tateyama and Yen Wei Chen proposes a new method to detect liver tumors in CT images automatically. The proposed method is composed of two steps. In the first step, tumor candidates are extracted by EM/MPM algorithm; which is used to cluster liver tissue. To cluster a dataset, EM/MPM algorithm exploits both intensity of voxels and labels of the neighbouring voxels. It increases the accuracy of detection, with respect to other probabilistic approaches. In the second step, false positive candidates are filtered by using shape information. They use tumor shape information to reduce the false positive regions. As tumors have usually a sphere-like shape, we just need to check the circularity of the candidate regions in each slice to reject false positive. In proposed method they also reject those candidate tumors that their centroids are near the liver boundary. Quantitative evaluation of our method shows that it can decrease false positive rate successfully without decreasing true positive rate, compared with other conventional methods. [4]

Pedro Rodrigues, Jaime Fonseca and João L. Vilaça proposed an interactive algorithm for liver tumour segmentation was developed, allowing the user to quickly paint the object of interest in the image using an intelligent paintbrush. This technique was based on an image partitioning into homogeneous primitives regions by applying a pseudo-watershed algorithm on an image gradient magnitude. Outcome of this initial segmentation was the input of an efficient region merging process to find the best image partitioning, based on the minimum description length principle. The algorithm was evaluated on Computed Tomography (CT) and Magnetic Resonance (MR) data using the dice similarity coefficient (DSC) as a statistical validation metric. This led to a DCS mean scores of 87% and 84% on the CT and MR studies, respectively. [5]

A semi-automatic algorithm was presented providing a powerful technique allowing liver tumour segmentations in CT and MR images. The segmentation was reduced by selecting all primitives regions belonging to the anatomical target, instead of having to considerer all pixels. It decreased the total number of decisions, time-consumption and user dependence and increases the segmentations efficiency and robustness. It also has a high sensitivity detecting tumor boundaries located near other anatomical structures, identifying weak edges, robustness against image noise, and being able to segment hyper dense and hypo dense metastasis with different size and shape.

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III. METHODOLOGY

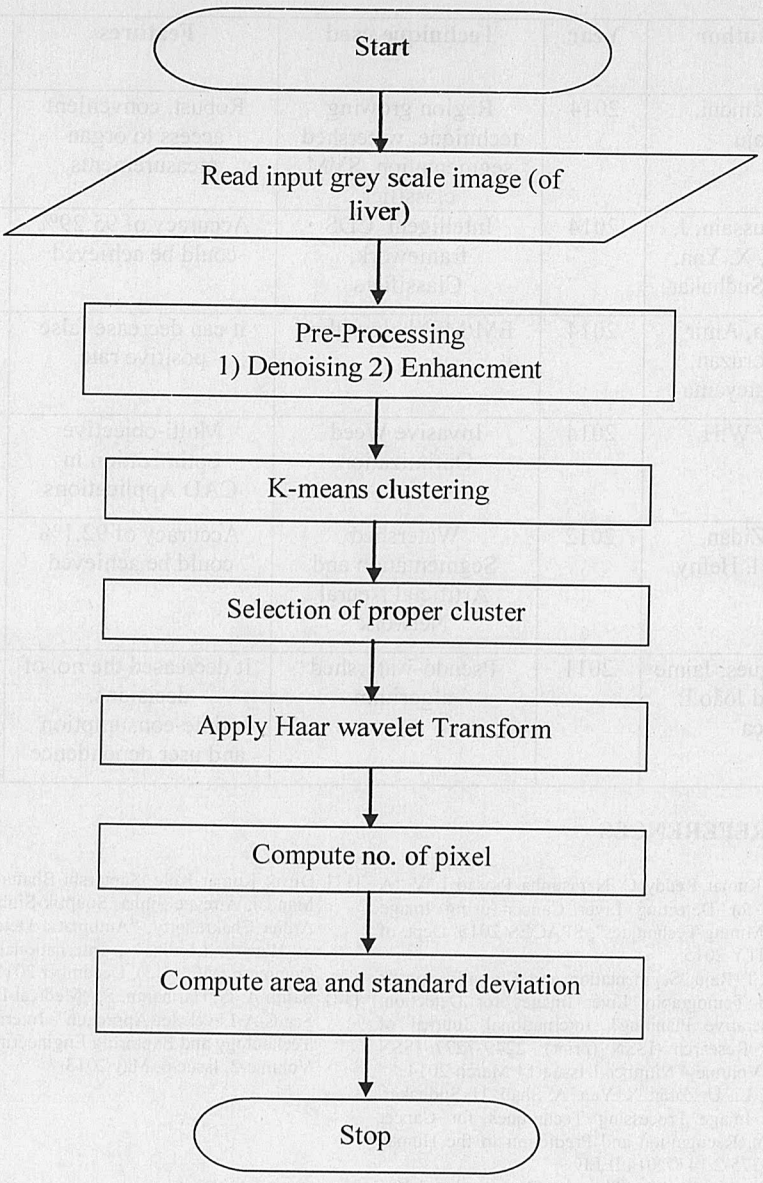

Fig. 1 flowchart of methodology

Now, as the cancer cell is considered to be the region of interest segmenting the liver alone from the abdominal CT image is difficult due to the fact that the image includes other organs like kidney, spleen, pancreas etc. very close to the liver. In order to amass only the liver part and analyse the cancer cell the experimentation makes use of image segmentation using K-means clustering. Now the clustered image that shows the excerpts of cancer cell which is additionally used for detection procedure. So as to analyse if the given image is a cancer cell or not. The feature is extracted by picking the region of interest, and for these images the threshold range is to be fixed. As the area of the affected part is to be calculated, the number of pixels has to be determined which is done using MATLAB software. [1]

IV. CONCLUSION

This contributes by providing a computer aided diagnostic system for the diagnosis of the liver cancer using the images framed through the CT scan of certain patients. This diagnostic application makes use of MATLAB software for processing of the image, by making use of Haar wavelet transformed and clustering techniques.

The whole analysis is based on the selection of cluster and threshold values and the images are justifying by checking if the threshold falls within the same range estimated for each image. The experimentation gave an accuracy of about 80% besides being less time complex, reducing the computational complexity for the purpose of detection.

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Table 1 Comparison of various methodology

Sr. no.	Name of author	Year	Technique used	Features	Limitations
1.	M V Sudhamani, G T Raju	2014	Region growing technique, watershed segmentation, SVM classifier	Robust, convenient access to organ measurements	Human expert intervention is needed, complex
2.	L. Ali, A. Hussain, J. Li, U. Zakir, X. Yan, A. Shah, U. Sudhakar	2014	Intelligent CDS framework, Classifiers	Accuracy of 95.29% could be achieved	Very complex, Different classifiers used
3.	Yu Masuda, Amir Hossein Foruzan, Tomoko Tateyama	2014	EM/MPM algorithm	it can decrease false positive rate	Complex, Only considers sphere like structure
4.	El-Masry W.H	2014	Invasive Weed Optimization	Multi-objective optimization in CAD Applications	Computational time is high
5.	Abdalla Zidan, N. Ghalli, H. Hefny	2012	Watershed Segmentation and Artificial Neural Network	Accuracy of 92.1% could be achieved	The use of Ant Colony is Ignored
6.	Pedro Rodrigues, Jaime Fonseca and João L. Vilaça	2011	Pseudo-watershed algorithm	It decreased the no. of decisions, time-consumption and user dependence	A semi-automatic algorithm, Has low accuracy

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A Review: Haptic Glove in Medical Training

Purvi S. Patel[1], Prof. Dr. A.D. Kumbhar[2]

PG Student, Dept of Electronics and Telecommunication Engineering, STES'S,

Smt. Kashibai Navale College of Engineering[1]

Dept of Electronics and Telecommunication Engineering, STES'S, Smt. Kashibai Navale College of Engineering[2]

Abstract: Pointing at actualization of direct and instinctive collaboration between human and robot, we are developing an interface system for a mobile robot to communicate with the user via hand gestures. Autonomous and semi-autonomous mobile robots are often equipped with sophisticated sensors designed to provide the system with a model of its surrounding environment. The paper describes widely used haptic technology in a form of glove. The invention of force and touch feedback has raised their realism to virtual world. The glove is designed to feel and interact with virtual environment. The mobile is designed along with the glove to explore the virtual world. The developed haptic glove provide force feedback to the fingers of users and accordingly it will interact with the mobile robot. So, basically the device should be light in weight and wireless actuator system; so that it can easily fit on the bare hand of the user and the user can freely make a hand movements without feeling restricted. The primary goal of this project is to achieve such a mobile robot which is controlled by wireless system i.e glove by recognizing hand gestures which is based on haptic technology.

Keywords: Exoskeleton, haptic interface, Force Feedback, mobile robot, telesurgery.

I. INTRODUCTION

Haptic technology can be defined as generation of touch sensation through tactile feedback. This tactile sensation can be in the form of appied force, motion vibration. Every haptic device consists tactile sensors which are used to measure the force applied by the user. Generally motors or actuators are used to achieve haptic sensation through vibration. Haptic enables user to experience a realistic environment, with users feeling the action of the application being accessed. Haptic perception relies on sensory signals arising from haptic interaction with a real or virtual environment. They can be used in many areas of application; like telesurgery, medical training, gaming, rehabilitation etc.

Haptic feedback is divided into two modalities-Force and touch feedback. Touch feedback is needed to gain the information about virtual object like temperature, size, distance etc. Force feedback opposes the user's motion, and is intended to convey information on virtual object hardness, weight, and inertia. Haptic feedback increases the simulation realism and the application domain of virtual environments. For example, it is hard to imagine how a surgical simulator could be useful without haptics.

The Haptic Glove is a wearable device that simulates tactile sensations of virtual objects. Past many years, different haptic devices with multiple fingers were implemented. These devices are further divided into two categories-Grounded haptic devices and Exoskeleton haptic devices. Ground-based haptic devices provide the capability of adding force feedback to virtual environments; however, the physical workspace of such devices is very limited due to the fixed base. Exoskeleton type haptic devices are mainly shaped like a glove to fit into the back of the hand. Since the shape of the device is just like a human hand, the operator can manipulate it instictively.

We created a glove that provides tactile feedback of virtual objects. When activated, it provides real feedback about the tactile sensation of holding a virtual object. There are indeed certain reasons behind using haptic technology. One main reason is that a haptic system with a real force-feedback is capable of delivering a maximum force that matches the human hand output force. The system contains some challenges related to the given haptic design. These challenges are listed below-

1) Size and Weight- The proposed design has to be small in size and light in weight; So that it can easily fit on the bare hand of the user;
2) Flexibility of mechanism-to give sufficient ability without constraining any hand motions;
3) Dynamic range- to be flexible enough to be used in sensitive activities and large force situation.

The other main challenge includes, The hand gestures should be unrestricted so that user can make desire hand movements.

II. RELATED WORK

The given glove system provides a real feel of grasping applicable to all segments of the finger, and also fulfills the requirements of size, weight and flexibility mentioned in the introduction. An Arduino board is used .Servo motors and accelerator is mounted on the glove. PCBs are used to maintain the weight of the glove design. The mechanical motion is converted into the electrical motion using potentiometer. The potentiometer produces these electrical pulses which are on the way for the arduino board. Now this board processes on these signals received from the potentiometer and convert those signals into the digital form and sends to the servomotors. This motor reacts as per the pulses and hand motion of the user. It can

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be summerized as the microcontroller interfaces these components described above.

III. PROPOSED METHODOLOGY

The system involves control interface and glove skeleton. The inverse kinematics is applied to measure the finger's position. The control unit plays main role into this system. It will calculate the velocity commands and transmit it to the mobile robot to control it. When the mobile robot receives the command, it controls the speed of the two wheels accordingly.

A. Proposed Block Diagram

The proposed system consists the haptic glove and mobile robot. The microcontroller is used to read force sensor data and to communicate with the robot. Different force sensors are used here to feel the virtual object. Flex sensors are embedded on the fingertips of the user's glove. Meanwhile, the obstacles distance information collected by ultrasonic sensors is converted by the mobile robot in the form of a virtual force and sends it back to the haptic glove, which generates force feedback to the user to represent the robot's proximity to obstacles. Position sensors are used to determine the distance information, which can be helpful in mapping. Hand gestures are extensively used in the literature for control of mobile robots. Glove mechanism can be measured through the hand gestures of the user and then it is converted into the command form and transmitted to the mobile robot in the form of velocity commands. Communication between the robot and the glove can be established via wireless module called XBee (1-mW transmission power at 2.4 GHz provides 30-m working range indoors). The adoption of such RF module makes the glove portable, wireless and compatible.

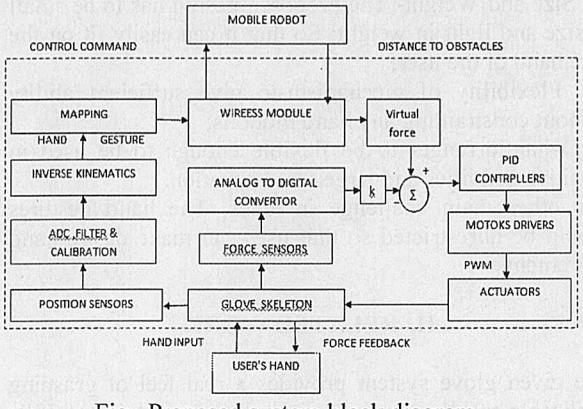

Fig. Proposed system block diagram.

When the glove is in active state,force feedback can be felt by the users on the fingers.When the robot is getting close to any object or moving fast;The user will feel large force feedback.

IV.CONCLUSION

The paper is all about haptic technology used to implement the glove. A sensor based haptic glove is designed along with mobile robot. And the robot is controlled through the hand gestures making by users. The main objective of this paper is to introducing such a haptic technology which might be useful to induce desire movements. The proposed device is light in weight and wireless as per required. Future work contains certain opportunities. There are areas of improvement, which needs to be considered. Firsty, Designing such a method which allow user to interact with virtual world which consists comparatively larger workspace. Other furtherance includes todetermine the method how to avoid object collision. This needs to be consider. In order to meet this requirement, we should use on board sensors on the mobile robot to detect limits and to modify the velocity commands received accordingly.

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Smt. Kashibai Navale College of Engineering Pune-41
Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

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Strategy of Intelligent System for Recognizing Surgically Modified faces

Pratik N. Mohod [1], Anjali A. Yadav [2]

PG Student, Dept. of EXTC, SITS'S Smt. Kashibai Navale College of Engg., Vadgao (BK), Pune, Maharashtra. India

Assistant Professor, Dept. of EXTC, SITS'S Smt. Kashibai Navale College of Engg., Vadgao (BK), Pune, Maharashtra. India

ABSTRACT: Plastic surgery face recognition is important for any security and biometrics application. There are number of technique available for recognition of plastic surgery faces. Person face gives detail information about age, gender, expression. Now days plastic surgery popularity is increased. Basically, plastic surgery procedure introduces skin texture variations between images of the same person (intraface) thereby making recognition more difficult than in normal scenario. Since the shape of significant face features such as eyes, nose, eyebrow and mouth remains unchanged even after plastic surgery. Intelligent system is one of system in facial detection algorithm that raised challenges in detection. In this research, a multimodal approach (PCA & LBP algorithm) is proposed to match face images before and after plastic surgery. The algorithm first generates non-disjoint face granules at multiple levels of granularity. In this system raspberry pi model is used which faster operation performance as compare to other. Memory requirement is also less, difference in before and after face image is shown in LBP histogram. Raspberry pi model 2 has been used for exploration of algorithm.

KEYWORDS: Feature extraction, Raspberry pi2 model, Face Recognition, Feature Extraction.

I. INTRODUCTION

As increasing popularity of plastic surgery, interest for different look has rising consistency. As observed by report in 2010, there is increase of more than 9 % in plastic surgery operations [1]. Plastic surgery procedure is benefit for patient suffering from several kind of disorders caused due to different accident. These procedures give the facial features and skin texture there by providing a substance over in the appearance of face. Matching of post surgery images with pre surgery images become difficult task for automatic face recognition system. The face recognition under certain conditions results in faces, which are termed the unconstrained faces [2].operations.

Face recognition after plastic surgery can lead to rejection of genuine users or acceptance of impostors. While face recognition is a well studied problem in which several approaches have been proposed to address the challenges of illumination, pose, expression, and disguise, the use of plastic surgery introduces a new challenge to designing future face recognition systems. From past two decades face recognition has been an active research area. The much attention given to face recognition within the research and commercial community can be associated with its real-world application potentials in areas such as forensics, surveillance, and home land security [3]. Among the most challenging tasks for face recognition in these application scenarios is the development of robust face recognition systems.

II. LITERATURE SURVEY

Mayank Vatsa advancement and affordable is top to the popularity of plastic surgery procedures. Facial plastic surgery can be reconstructive to correct facial feature or cosmetic to improve the appearance [2]. Both corrective as well as cosmetic surgeries alter the original facial information to a large extent thereby posing a great challenge for face recognition algorithms. 1) Preparing a face database of 900 individuals for plastic surgery, and 2) providing an analytical and experimental underpinning of the effect of plastic surgery on face recognition algorithms.

Rajesh Kumar Gupta proposed the Principal Component Analysis (PCA) which decomposes a face image into a small set of characteristic feature images called eigenfaces and recognition is performed by projecting a new face onto a low dimensional linear "face space" defined by the eigenfaces, followed by computing the distance between the resultant

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position in the face space and those of known face classes [4]. The objective of the Principal Component Analysis (PCA) is to take the total variation on the training set of faces and to represent this variation with just some little variables. When we are working with great amounts of images, reduction of space dimension is very important. PCA intends to reduce the dimension of a group or space so that the new base describes the typical model of the group. The image space is highly redundant when it describes faces. This happens because each pixel in a face is highly correlated to the others pixels. The objective of PCA is to reduce the dimension of the work space.

Di Huang Local binary pattern (LBP) is a nonparametric descriptor, which efficiently summarizes the local structures of images. In particular for facial image analysis, including tasks as diverse as face detection, face recognition, facial expression analysis, and demographic classification.[5]represents a comprehensive survey of LBP methodology, including several more recent variations.

III. PROPOSED ALGORITHM

Face recognition after plastic surgery can lead to rejection of genuine users or acceptance of impostors. While face recognition is a well studied problem in which several approaches have been proposed to address the challenges of illumination, pose, expression, and disguise, the use of plastic surgery introduces a new challenge to designing future face recognition systems. From past two decades face recognition has been an active research area. The much attention given to face recognition within the research and commercial community can be associated with its real-world application potentials in areas such as forensics, surveillance, and home land security [3]. Among the most challenging tasks for face recognition in these application scenarios is the development of robust face recognition systems.

A. *Source of data collection:*

The Data required for face recognition across plastic surgery is collected from IIT-D plastic surgery database online which contain pre-surgery and post-surgery images of face. As part of research work, they are forming this face database comprising pre and post-surgery images. The face database enables researches in developing, testing and publishing human recognition algorithm. Image Analysis and Biometrics (IAB) lab at Indraprashtha Institute of Information Technology, Delhi (IIT-D) holds the copyrights for the image collected and source of distribution of IIT-D plastic surgery face database.

B. *Preprocessing:*

In pre-processing, first background is remove and obtained particular region from the face images. i.e. strip, overlapping, non-overlapping and lips region of face images [1]. In this first normalization of face images done and then pre-processing is performed on the normalized image.

C. *Local Binary Pattern:*

In the basic local binary pattern operator, introduced by Ojala , was based on the assuming that texture has locally two complementary aspects, a pattern and its strength. In that work, the LBP was proposed as a two-level version of the texture unit to describe the local binary patterns [1]. The original version of the local binary pattern operator works in a 3×3 pixel block of an image.

Local binary pattern (LBP) is a non-arithmetic algorithm, which mostly use for detection of the local structures of images. LBP features are in gray scale and rotation invariant texture operator. These features are more widely used for expression recognition. LBP features are also applied for face recognition task. LBP feature extraction is faster than any other feature extraction method and it provides good performance make this most researched features. The local binary pattern operator is an image operator which converts an image into an array or array for describing small-scale appearance of the image. These labels or their operations, most commonly the histogram, are then used for further image analysis. The most widely used versions of the operator are designed for monochrome still images but it has been extended also for color (multi channel) images as well as videos and volumetric data [1], [3].

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D. *Principal Component Analysis:*

In face recognition PCA has been mostly used. Suppose we have an image and wish to compare this with a set of date base image to find the best match [1]. Each pixel can be considered a variable thus we have a very high dimensional problem which can be solved by PCA. PCA is usually used in dimension, eigenvectors and lots of numbers it reduced the dimension of data using PCA. In face recognition PCA has been extensively used [2]. The objective of the Principal Component Analysis (PCA) is to gives the total variation on the training set of faces and to represent this variation with some variables. When we are working with more amounts of images, reduction of space dimension is very important. PCA intends to reduce the dimension of a group or space so that the new base describes the confident model of the group

The image space is mostly redundant when it describes faces. This happens because each pixel in a face is mostly correlated to the others pixels. The maximum number of principal components is the number of variables in the original space. This concludes that some principal components can be rejecting because they only have a small quantity of data, considering that the larger quantity of information is contained in the other principal components. Practically, the eigenvectors of the matrix of these vectors would important variation amongst the face images. The eigenfaces are the principal components of the original face images, obtained by the variation of PCA, forming the face space from these images. So any new face can be expressed as linear combination of this Eigen face [1].

E. *Periocular Biometrics:*

There is no database available with periocular region images. Only way to fetch this is using available face image. Periocular biometrics is performed in three different ways such as Non-overlapping, overlapping and Strip Using four significant points in eye region all this three different types of periocular regions are obtained. Strip is area below forehead and above nose considered whole region together. This strip region is cropped using outmost corner points of both the eyes. By bisecting strip into left and right region and then Overlapping periocular is obtained.

Non-overlapping regions are cropped from the two corner points of each eye separately. Lips regions are obtained using two corner points. LBP features from periocular and lips region are used in this work PCA is used for LBP feature dimension reduction and in turn helps in increasing the recognition rate

IV. System Model

In the proposed system, we are introducing advanced smart system technology using raspberry pi. It is a plastic surgical face detection technique in which skin structure are selected among cooperating better reception of smart system

These methods can increase the recognition accuracy to almost sufficient level. However, it is difficult to improve the accuracy more as surgery can alter the facial features (e.g. LBP) which are used for training. In smart system, local binary pattern algorithm use to detect hole region and local eye region to achieve better match and accuracy ratio. However, the working of smart system is different than earlier reorganization techniques. First, the raspberry pi is used to operate all the performing operations working speed of execution is more aster than other like MATLAB. On changing face he/her can change personal identity which is unrecognizable. Conceder in result traditional face detection method is not suitable which decrease accuracy of system. In ratio in accuracy range from 30% to 60% is depend on recognition technique.

In the fig.1, input image is take in consideration on performance of both algorithm PCA and LBP feature get extracted. Pre-processing operations are not meant to increase image information content they are meant to extract the useful information and suppress the undesired distortion or enhances some image features relevant for further processing and analysis task. In face recognition PCA has been extensively used primarily, for reducing the number of variables. Suppose we have an image and wish to compare this with a set of date base image to find the best match. PCA is usually referred to in tandem with Eigen values, eigenvectors and lots of numbers. Dimension is reduced the dimension of data using PCA.

Data sets contain different varieties of plastic surgery such as noise surgery, eyelid surgery, skin peeling. It is difficult to reorganization of undergone plastic surgery and recognizes them. LBP methodology developed recently with more variation for improved more variation in applications. The variations are increment of discriminative capability. Enhancement of robustness, selection of neighborhood, these are latest variation in LBP.

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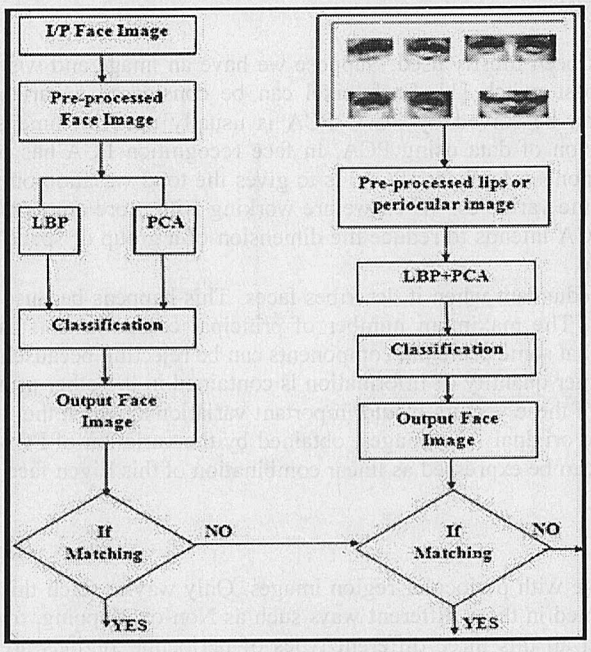

Fig. 1. Working frame algorithm

For evaluating the performance of proposed system, we analyze system based simulations using raspberry pi2 terminal window software. In simulation, assume a scenario in which reorganization rate using raspberry pi is high. Also, we use camera structure in future which focuses multiple faces recognition in the environment. We consider only offline recognition because of availability of plastic surgery persons. In simulation, we show histogram graph which means that variation in faces.

A. *Euclidian Distance:*

Euclidian distance is used to better match of image. Minimum distance is better match of input image. It can be calculated using a distance formula. The position of a point in a Euclidean n-space is a Euclidean vector. So, p and q are Euclidean vectors, starting from the origin of the space, and their tips indicate two points. The Euclidean norm, or Euclidean length, or magnitude of a vector measures the length of the vector.

A vector can be described as a directed line segment from the origin of the Euclidean space (vector tail), to a point in that space (vector tip). If we consider that its length is actually the distance from its tail to its tip, it becomes clear that the Euclidean norm of a vector is just a special case of Euclidean distance: the Euclidean distance between its tail and its tip. In a three-dimensional space (n=3), this is an arrow from p to q, which can be also regarded as the position of q relative to p. It may be also called a displacement vector if p and q represent two positions of the same point at two successive instants of time.

B. *Canberra Distance:*

The Canberra distance is a numerical measure of the distance between pairs of points in a vector space, introduced in 1966[1] and refined in 1967[2] by G. N. Lance and W. T. Williams. It is a weighted version of L_1 (Manhattan) distance.[3] The Canberra distance has been used as a metric for comparing ranked lists[3] and for intrusion detection in computer security.[4]

The Canberra metric is similar to the Manhattan distance (which itself is a special form of the Minkowski distance). The distinction is that the absolute difference between the variables of the two objects is divided by the sum of the absolute variable values prior to summing. The generalised equation is given in the form.

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$$d^{CAD}(i,j) = \sum_{k=0}^{n-1} \frac{|y_{i,k} - y_{j,k}|}{|y_{i,k}| + |y_{j,k}|}$$

This is a slightly modified form compared to the original form given by Lance & Williams (1966) and was suggested by Adkins (reference in Lance & Williams 1967). In the equation dCAD is the Canberra distance between the two objects i and j, k is the index of a variable and n is the total number of variables y.[3]

V. PERFORMANCE EVALUATION

In recognition we use the updated version of raspberry pi2 which has high working speed and enough RAM memory and storage memory. Working algorithm is in python language which helps to reliable changes in smart system. Online detection is one of feature of system which also use in future.



Fig. 2. Recognized face portion

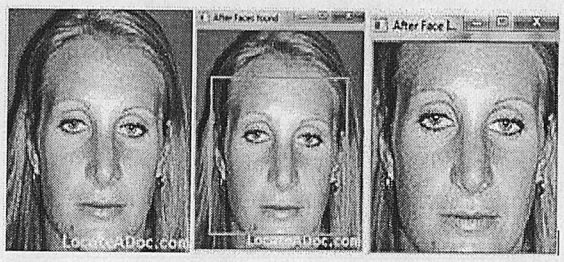

Fig. 3. 1) Surgery face 2) detect face 3) LBP histogram image

In fig.4 rhinoplasty surgical face is used for recognition performanceof proposed system, second image is gray scale image which use for further process. After applying LPB, histogram image is found. Histogram image is use for matching purpose of pre and post surgery faces.

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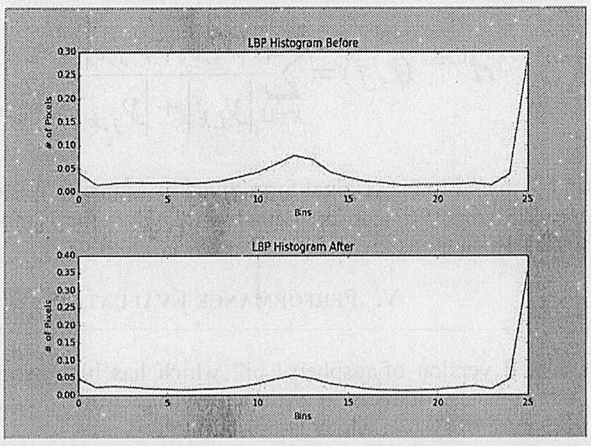

Fig. 4. Rhiniplasty nose surgery LBP histogram

In fig.5 rhinoplasty surgical faces graph is detected, its observed value of graph shows variations of face before and after plastic surgery faces. Pixel values of image are used for detection, variation on faces changes position of pixel which we can observe in LBP histogram graph.



Fig. 5. 1) Scar repair image 2) detect face 3) LBP histogram image

In fig.6 scar surgical faces are used, different surgical images are used for matching purpose. Second image is surgical face detection portion image. And third is its histogram, used for observation of matching.

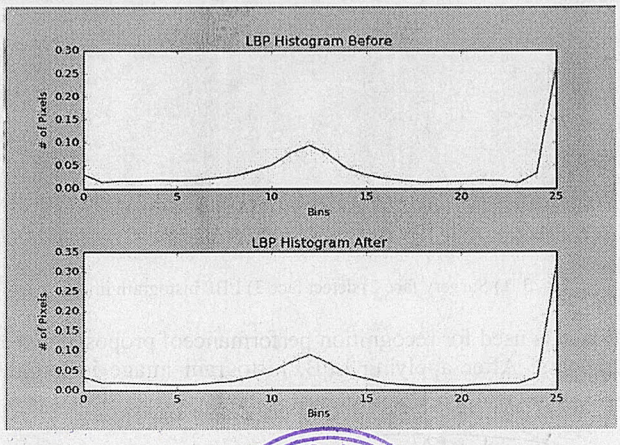

Fig. 6. Scar nose repair LBP histogram

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In fig.7 scar surgical faces graph is detected, its observed value of graph shows variations of face before and after plastic surgery faces. Pixel values of image are used for detection, variation on faces changes position of pixel which we can observe in LBP histogram graph.

Test Image	Euclidian Distance Accuracy	Canberra Distance Accuracy	Total Images
Number of true positive identification	72%	80%	50
Number of false negative identification	28%	20%	50

Fig. 7 Accuracy Table

VI. Conclusion and Future Work

In this paper, an overview of face recognition using intelligent system is discussed with the help of certain existing technology. This paper also reviewed existing methods and provides some conclusion based on it. By overcoming the time consumption and complex operations in the existing technology, methods proposed appropriate face can be recognize after plastic surgery and before surgical faces, system will also be detect other parameters of faces. Small industries can use this system for the security purpose especially in investigation area by using advanced technology of face detection matching method and algorithm this system will provide better accurate result. Above result gives the matching performance of system, we getting to match 50% to 60% of faces using smart system. Histogram graph of different images are different and it vary according to face parameter. Thus system will be used for the security of human health. System will have advantage that it helps to both investigation team and normal person as well advance security in sensitive areas laboratory. Also this paper shows that raspberry pi2 is better device use to perform algorithm in the image in face recognition by comparing certain strength and weakness of both the system.

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BIOGRAPHY

Pratik N. Mohod is a Post Graduate student in the Electronics Telecommunication Department, Smt. KashibaiNavale College of Engineering Pune. He received Bachelor of Engineering degree in 2013 from SGBAU University, Amravati, MS, India. His research interests are Image Processing.

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A Review: Image Interpolation by Low-Rank Matrix and Bilinear Method

Nitish Kumar[1], Prof. N. M. Wagdarikar[2]

PG student, Signal Processing (E&TC), SKN COE, Pune, India[1]

Assistant Professor, E&TC, SKN COE, Pune, India[2]

Abstract: Image interpolation occurs in all digital photos at some stage. It happens anytime you resize or remap your image. Many researchers are working on improving image resolutions with different algorithms. When a low-resolution image is down sampled from the corresponding high-resolution image without blurring, the reconstruction becomes an image interpolation problem. Hence, this is a way to define the linear relationship among side by pixels to reconstruct a high-resolution image from a low-resolution image. In low rank matrix completion and recovery, a process for performing single-image super resolution is initiated by formulating the reconstruction as the recovery of a low-rank matrix. Besides that this method can be utilized to process noisy data. In this paper, we have studied and reviewed different interpolation methods.

Keywords: super-resolution, Image interpolation, low-rank matrix recovery, reconstruction augmented Lagrange multiplier

I.INTRODUCTION

Researchers are working on enhancing image resolutions with distinctive algorithms. These approaches are supposed towards achieving optimized level of resolution without damaging original image. Recently, many interpolation algorithms have appeared for SISR, which includes the classical bilinear, bicubic interpolation and edge-guided interpolation methods. Although nearly no traditional interpolation methods can completely accommodate correlations in image edge pixels, and consequently those methods can also bring about a few ringing artifacts and blurring at the edge of the reconstructed HR image. Therefore, because the linear correlations are fixed and predefined in these techniques, they cannot sufficiently model the textures in natural images. In our project we proposed a new method to solve the SISR problem based on the recently developed technique of low-rank matrix completion, which determines the order of the linear model adaptively and implicitly. The linear relationship among neighboring pixels was determined implicitly and adaptively by exploring the low-rank properties of the augmented matrix. The low rank of the augmented matrix is due to the local structural similarity of the images. In other words, the centre pixels can be sufficiently represented by the 8-connected neighboring pixels or a subset of the 8-connected neighboring pixels. However, due to the presence of noise and random perturbations, some entries in the augmented matrix are corrupted. We therefore investigate the SISR problem under this condition by using the recently developed low-rank matrix recovery theory. When a low-resolution image is down sampled from the corresponding high-resolution image without blurring, i.e., the blurring kernel is the Dirac delta function, the reconstruction becomes an image interpolation problem. Hence, this is a way to define the linear relationship among side by pixels to reconstruct a high-resolution image from a low-resolution image. This project seeks an efficient method to determine the local order of the linear model .based on theory of low-rank matrix completion and recovery, a process for performing single-image super resolution is initiated by formulating the reconstruction as the recovery of a low-rank matrix. Besides that the proposed method can be utilized to process noisy data and random perturbations effectively.

II.LITERATURE SURVEY

Interpolation is a method of constructing new data points within the range of a discrete set of known data points. Interpolation is the process of determining the values of a function at positions lying between its samples. It achieves this process by fitting a continuous function through the discrete input samples. This permits input values to be evaluated at arbitrary positions in the input, not just those defined at the sample points. While sampling generates an infinite bandwidth signal from one that is band-limited, interpolation plays an opposite role: it reduces the bandwidth of a signal by applying a low-pass filter to the discrete signal. That is, interpolation reconstructs the signal lost in the sampling process by smoothing the data samples with an interpolation function.

A. Interpolation through low rank matrix

Feilong Cao, Miaomiao Cai. [1], proposed an efficient method to decide the local order of the linear model implicitly. According to the theory of low-rank matrix completion and recovery, a method for performing single-image super resolution is proposed by formulating the reconstruction as the recovery of a low-rank matrix, which can be solved by the augmented Lagrange multiplier

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method. Similarly, the proposed approach can be used to deal with noisy data and random perturbations robustly. The proposed technique aims to explore the local linear relationship among neighboring pixels. The proposed approach can implicitly determine the most efficient order of the linear model. Low rank matrix is concerned with missing pixels around the central pixel due to random noise. The center pixels can be sufficiently represented by the 8-connected neighboring pixels or a subset of the 8-connected neighboring pixels. However, due to the presence of noise and random perturbations, some entries in the augmented matrix are corrupted. In this low matrix we are interpolating the missing pixels with central pixel.

Low-rank matrix recovery theory is a new signal processing method which was proposed in the framework of compressed sensing theory. Here, the SISR problem is recast as that of recovering and completing a low-rank augmented matrix (MCR) in the presence of random perturbations and noise .This problem can be expressed as a rank minimization problem, which can be solved by the augmented Lagrange multiplier method (ALM). Let Y be an input LR image which is a down sampled version of the HR image by a down sampling factor, and let X be the HR image to be estimated from Y. Let $x_i \in X$ and $y_i \in Y$ denote the pixels of X and Y respectively. The neighbors of x_i in X and y_i in Y can be written as x_{ti} and y_{ti} respectively, where t = 1, 2, . . 8. Then, for the pixels in the LR image Y, $y_i \in Y$ implies $y_i \in X$. One can also write an HR pixel $x_i$as y_i when it is in the LR image.

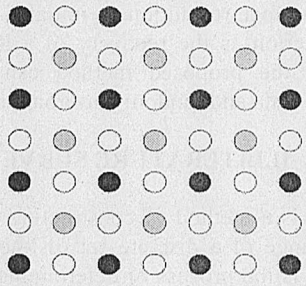

Fig.1 Low resolution image pixels

The solid dots are the LR image pixels, the shaded dots are the missing pixels to be estimated in the first phase, and the empty dots are the missing pixels to be estimated in the second phase. This method involves interpolating the missing pixels in X in two phases. A schematic diagram of the proposed method is shown in Fig.1, in which there are three kinds of pixels: solid dots, shaded dots, and empty dots. The solid dots are the known LR pixels, and the shaded and empty dots are the missing pixels. To provide enough information to estimate the missing pixels, interpolation is done in two phases. In the first phase, the bilinear interpolation method is first used to obtain initial estimates of the empty dots. Then the solid dots and the empty dots are combined to recover the shaded dots using low-rank matrix recovery theory. In the second phase, the final values of the empty dots are revised using low-rank matrix recovery theory. The relationship among neighboring pixels is an important piece of information for estimating missing pixels. The concept of 8-connected neighbors of pixels is illustrated in Fig. 2. This concept also illustrates that the spatial configuration of known and missing pixels is involved in the two phases. For a missing pixel $x_i \in X$, some of its 8-connected neighbors are known LR pixels. In contrast, for a pixel $x_i \in Y$, some of its 8-connected neighbors are missing pixels in X. A local window W is defined as an n × n image patch, and for each $x_i \in W$, it can be sufficiently expressed by the linear combination of its 8-connected neighboring pixels x_i^t (t = 1, 2, . . . ,8), namely

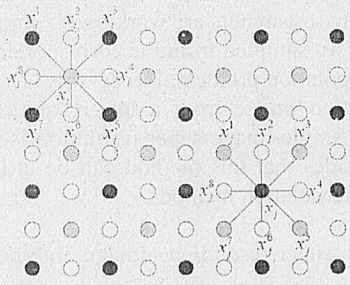

Fig.2 connected neighbours of pixels

$$x_i = \sum_{t=1}^{8} x_i^t \alpha_t, \quad x_i \in W, \qquad (1)$$

Where α_i(i = 1, 2, . . . , 8) are the linear representation coefficients.

The system architecture for low rank matrix completion and recovery is shown in Fig. 3. Input image is taken from database of 50 images. Pre-processing of an image includes resizing of an image. The basic condition for any image processing algorithm is that images must be of same size for processing purpose. Hence in order to process out any image with respective algorithm we resize the image. The size can be fixed like (256*256).

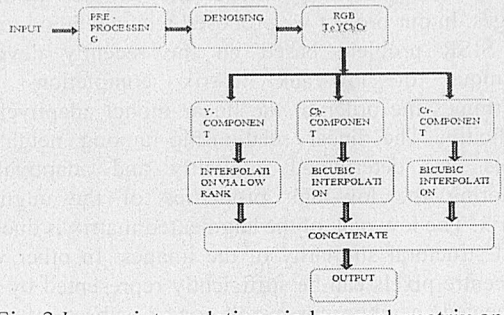

Fig. 3 Image interpolation via low rank matrix and recovery

Image de noising is an important image processing task, both as a process itself, and as a component in other processes. Many ways to de noise an image or a set of data exists. The main property of a good image denoising model is that it will remove noise while preserving edges. Median filter is used here which does the work of smoothening of image. A color image must first be transformed from RGB color space to YCbCr color space.

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The proposed method will be applied to the Y channel only. As for the color channels (Cb, Cr), the bicubic interpolation method is used to up-sample them. In the Y channel, the proposed low-rank matrix recovery method is used. Low matrix is concerned with missing pixels around the central pixel due to random noise. The center pixels can be sufficiently represented by the 8-connected neighboring pixels or a subset of the 8-connected neighboring pixels. However, due to the presence of noise and random perturbations, some entries in the augmented matrix are corrupted. In this low matrix we are interpolating the missing pixels with central pixel

B. Bilinear interpolation method

H. Kim., S. Park [8], proposed Bilinear Interpolation which determines the grey level value from the weighted average of the four closest pixels to the specified input coordinates, and assigns that value to the output coordinates. First, two linear interpolations are performed in one direction (horizontally) and then one more linear interpolation is performed in the perpendicular direction (vertically). For one-dimension Linear Interpolation, the number of grid points needed to evaluate the interpolation function is two. For Bilinear Interpolation (linear interpolation in two dimensions), the number of grid points needed to evaluate the interpolation function is four.

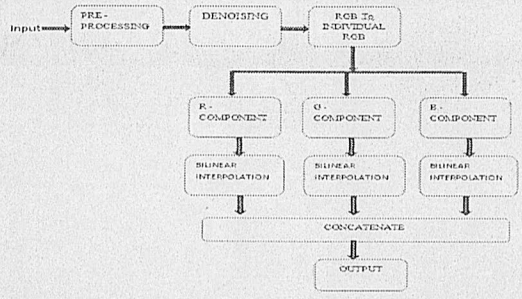

Fig. 4 Image interpolation by Bilinear Interpolation

The system architecture for bilinear interpolation is shown in Fig. 4. In this method interpolation method is applied to RGB component of image separately.

C. Cubic Convolution interpolation method

Robert G. Keys [3] proposed Cubic convolution a one-dimensional interpolation function is derived in this paper. A separable extension of this algorithm to two dimensions is applied to image data. The cubic convolution interpolation function is derived from a set of conditions imposed on the interpolation kernel. The cubic convolution interpolation kernel is composed of piecewise cubic polynomials defined on the unit subintervals between - 2 and +2 .The kernel is required to be symmetric, continuous, and have a continuous first derivative. It is further required for the interpolation kernel to be zero for all nonzero integers and one when its argument is zero. This condition has an important computational significance-namely, that the interpolation coefficients become simply the sampled data points. Finally, the cubic convolution interpolation function must agree with the Taylor series expansion of the function being interpolated for as many terms as possible. The interpolation kernel derived from these conditions is unique and results in a third-order approximation.

D. Super Resolution

Emmanuel J. Candes [4] explains the recovery of a superposition of point sources from noisy band limited data. In the fewest possible words, they only have information about the spectrum of an object in the low-frequency band $[-f_{lo}, f_{lo}]$and seek to obtain a higher resolution estimate by extrapolating the spectrum up to a frequency $f_{hi} > f_{lo}$. They show that as long as the sources are separated by $2/f_{lo}$, solving a simple convex program produces a stable estimate in the sense that the approximation error between the higher-resolution reconstruction and the truth is proportional to the noise level times the square of the super-resolution factor (SRF) $f_{hi} > f_{lo}$.

III.CONCLUSION

In this paper, single image super resolution method of interpolation aims to explore the local linear relationship among neighboring pixels is proposed. By considering the low-rank property of the augmented matrix, the super-resolution problem has been reformulated as the recovery of a low-rank matrix from missing and corrupted observations, which can be solved efficiently using the ALM method.The proposed low rank matrix method is compared with other interpolation methods.

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Smt. Kashibai Navale College of Engineering Pune-41
Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College
of Engineering, Pune - 411 041

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Screen Content Images Quality Assessment (Subjective and Objective Test)

Sachin C. Jadhav[1], Prof. N. M. Wagdarikar[1]

Dept of Electronics and Telecommunication, STES'S SKNCOE, Vadgaon, Pune, India[1]

Abstract: Quality assessment is important for digital visual signal in the field of image and video processing. Screen content images are used in multi-device communication applications. Process evaluation, implementation, and optimization quality assessment becomes important. Screen content images (SCIs) shows different statistical properties in textual and pictorial regions, and the human visual system (HVS) also behaves differently while viewing the textual and pictorial regions in terms of the extent of visual field. Quality assessment of distorted screen content images subjectively and objectively with the help of screen image quality assessment database (SIQAD). The subjective quality scores shows, which part of the image (text or picture) have greater quality to that of overall visual quality. The single stimulus methodology is used to obtain three kinds of subjective scores i.e. the entire, textual, and pictorial regions, respectively. Analyzing the subjective data, we recommend a weighting strategy for correlation among these three subjective scores. An objective metric is used to measure the visual quality of distorted screen content images by considering visual difference of text and picture regions. The proposed quality assessment method gives better predicts to the perceptual quality of screen images, also leads to an effective way to optimization screen content coding schemes.

Keywords: Screen content image, image segmentation, quality assessment, subjective and objective quality assessment.

I. INTRODUCTION

SCREEN Content Images (SCIs) which is mixture of computer generated texts, picture and graphics content. With the quick development of internet technology such as screen sharing, information sharing between computer and mobile phones, remote computing system, cloud computing and gaming, product advertisement, etc. Quality of the images is more important into the multi-client communication system. Visual content on the screen is typically provide in the form of screen content images, SCIs determines interactivity performance and determines experience of the remote system. Screen content images are used test quality on-line, in-service monitoring visual/multimedia and system benchmarking. SCIs need to be compress efficiently for rapid sharing. Number of compression techniques has been used to compress SCIs. HEVC screen content coding encoder is used for the optimization of the screen content images.

Computer generated screen images are featured by sharp edges and thin/thick lines with few colors, whether natural images usually have smoother edges, thicker lines and more colors. While capturing the screen content images by mobile phones they get blurred, changes in contrast, having poor color depth that depends on the configuration of the system. Blockings and quantization noises are usually appeared on encoded screen content images. For the evaluation of visual quality of processed SCIs PSNR can be adopted, which is not consistent with human visual perception. The available IQA methods for natural image quality assessment can be applicable are still an open question. For the quality assessment of SCIs both subjective and objective metrics is significant to evaluate. An immensely colossal-scale Screen Image Quality Assessment Database (SIQAD) is constructed for the subjective test, in which three subjective quality scores are obtained respectively for the entire, textual and pictorial regions of each test image. According to the analysis of subjective data, we propose an incipient scheme, SCI Perceptual Quality Assessment (SPQA), to objectively evaluate the visual quality of distorted SCIs. The SPQA consists of an objective metric and a weighting strategy. The objective metric is designed to evaluate the visual quality of textual and pictorial regions separately.

II. RELATED PREVIOUS WORK

During the last decades Natural Image Quality Assessment (NIQA) has been studied immensely. Subjective testing strategies have been used to construct several image quality assessment databases, based on which various Full Reference (FR) IQA methods, such as FSIM, SSIM and VIF have been described to objectively evaluate the quality of distorted natural images. Except from this, many Reduced Reference (RR) IQA and No Reference (NR) IQA metrics are reported. Because of increase in requirements of digitization of typewritten and historical documents, DIQA attracted special attention in research community. The efficacy of the DIQA methods is conclusively evaluated by the Optical Character Recognition (OCR) precision calculated by the OCR software rather than human visual judgement. The topic Screen Content Image Quality Assessment (SCIQA) remains competitively not been explored.

Based on thorough analysis of subjective data a specific metric is proposed to objectively evaluate the visual

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quality of SCIs. There are many distortion types seems on screen images are applied to generate distorted images. Gaussian Noise (GN) is associated in image acquisition and added in most existing image quality databases. Motion Blur (MB) and Gaussian Blur (GB) also commonly exist in practical applications. Contrast Change (CC) is also an important factor affecting particularly of the HVS. Different settings of brightness and contrast of screens will result in different visual experiences of viewers. Three commonly used compression algorithms are used to encode the reference SCIs: JPEG, JPEG2000 and Layer Segmentation Coding (LSC). The textual layer is encoded by using the Basic Colors and Index Map (BCIM) method whether the pictorial layer is encoded by the JPEG algorithm [7].

III. SUBJECTIVE QUALITY ASSESSMENT OF SCIS

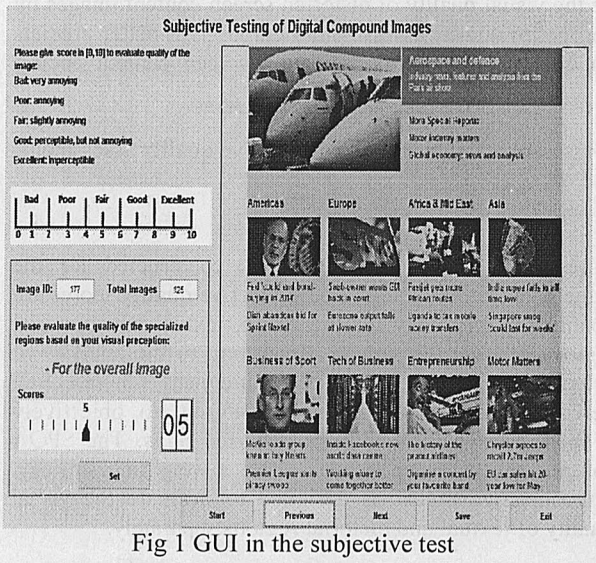

Fig 1 GUI in the subjective test

A. Methodology: (Subjective Test)

Subjective testing methodologies of image quality assessment have been suggested by ITU (International Telecommunications Union), which includes Single Stimulus (SS), Double Stimulus (DS) and Pared Comparison. Fig.1 shows GUI for the subjective test of the distorted screen images quality assessment. In this, the human subject is asked to give score from 0 to 10 (0 is the poor and 10 is excellent) on the image quality predicated on his/her vision competency. The single stimulus methodology utilizes viewing experience of subjects is proximately to that there is no access to reference images. In this test, which part of the image textual part or pictorial part provides more to the overall visual quality? Hence, the human subject have to give scores to test each image on the database with three scores, corresponds to textual, pictorial, and entire regions, respectively. In this testing methodology we generate a random permutation of 1000 images, which are divided into different batches. Each batch contains 125 images. To finish all the judgement of one batch each subject requires approximately one hour. We have to use more than two subject to give scores the each batches for getting better result.

B. Analysis of Subjective Scores: DMOS Value

All distortion types at different distortion levels, these images are re-evaluated by subjects. A linear mapping function is also learned to convert Z scores to Difference Mean Opinion Score (DMOS) values. We normalize the DMOS values to a commonly used scale (i.e., 0-100). We repeat this procedure to the three groups of subjective scores for entire, textual and pictorial regions, respectively. The consistency can be quantified by the confidence interval derived from the number and standard deviation of scores for each image. With a probability of 95% confidence level, the difference between the computed DMOS value and the "true" quality value is smaller than the 95% confidence interval. Fig.2, which gives the reliability of the subjective scores for approximating the visual quality of distorted images [6].

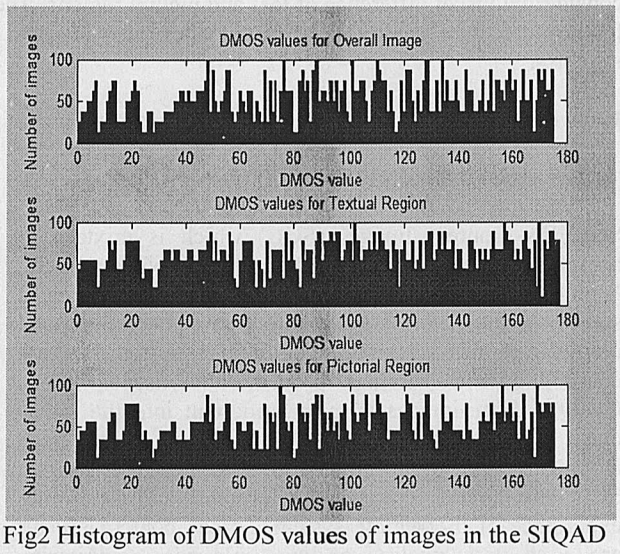

Fig2 Histogram of DMOS values of images in the SIQAD

C. Analysis of Different Regions: (QT, QP and QE)

We get three subjective scores for each test image from subjective testing of images: QT, QP and QE, corresponding to the quality of the textual, pictorial and entire regions, respectively. The subjective scores given having one problem would like to express which part contributes more to the overall visual quality of SCIs, textual or pictorial part? Because of that we analyze the overall correlation of these three quality scores in terms of Root Mean Squared Error (RMSE), Pearson Linear Correlation Coefficient (PLCC), and Spearman rank-order correlation coefficient (SROCC).

We can know that which component/part magnetizes more attention when viewing distorted SCIs through in-depth investigation of their correlation, an efficacious way for integrating textual and pictorial components can be deduced. The correlations for each distortion types Correlations for each distortion type are calculated to estimate human visual perception to different distortion types. The correlation results are reported in Table I.

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TABLE-I CORRELATION ANALYSIS OF THE OBTAINED QUALITY SCORES FOR THE ENTIRE IMAGES, TEXTUAL AND PICTORIAL REGIONS

	QE and QT			QE and QP		
Distortions	PLCC	SROCC	RMSE	PLCC	SROCC	RMSE
GN	0.6088	0.6236	1.4639	0.8549	0.9129	0.9258
GB	0.9312	0.9167	1.4639	0.9429	0.9718	0.6547
MB	0.8844	0.8767	2.3905	0.8054	0.8767	2.0354
CC	0.8756	0.7926	2.1381	0.7601	0.5661	1.9272
JPEG	0.7961	0.6670	2.7255	0.8555	0.8300	1.0690
JPEG2000	0.4714	0.4677	1.6475	0.5629	0.4734	1.5119
LSC	1.0000	1.0000	1.0000	0.7593	0.7071	0.5774
Overall	0.8264	0.7692	1.8921	0.7951	0.7259	1.3416

IV. OBJECTIVE QUALITY ASSESSMENT OF SCIS

The block diagram of the proposed SPQA scheme is shown in Fig.3. Reference SCI X and its distorted version Y are firstly segmented into textual and pictorial layers using image segmentation method. The above proposed objective metric is used to evaluate the quality of the textual and pictorial layers separately. Weighting strategy which derived from the correlation analysis of subjective scores to integrate the two quality scores Q_t and Q_p to the final visual quality score Q of the distorted SCI [7].

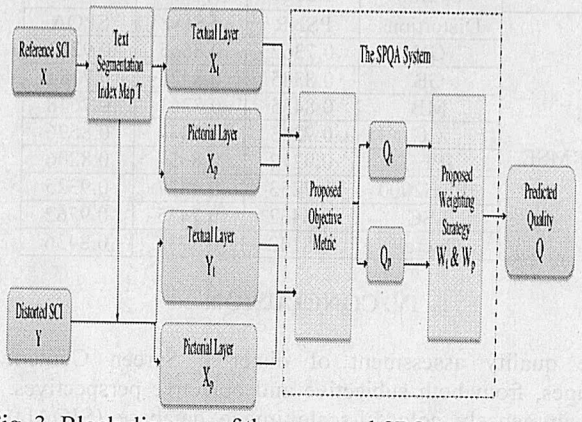

Fig. 3. Block diagram of the proposed SPQA scheme. The SPQA scheme contains two algorithms highlighted in the figure.

A. Quality Evaluation of Textual and Pictorial Regions

The HVS pertains to image luminance, contrast and sharpness. They changes with various image distortions. Hence, they have been widely investigated in the FR NIQA. In SSIM, the product of three components of homogeneous attribute between the reference patch x and its distorted version y is computed to estimate the image local quality:

$$SSIM(x,y) = [l(x,y)]^{\alpha}.[c(x,y)]^{\beta}.[s(x,y)]^{\gamma} \quad (1)$$

Where l(x, y), c(x, y) and s(x, y) are luminance, contrast and structural similarity; α, β and γ are positive constants used to adjust the relative importance of these three components. α = β = γ = 1 is adopted in SSIM and most of its variations. The proposed weighting strategy is used to combine the luminance and gradient similarity as shown in equation below:

$$q = (1 - W) \times g(x, y) + W \times e(x, y) \quad (2)$$

Where q is the quality score of the distorted image y; e(x, y) and g(x, y) are luminance and gradient similarity. W = 0.1 × g(x, y) is used as weighting value to highlight the contribution of the gradient similarity to the final quality.

The luminance homogeneous attribute of textual regions is adaptively integrated to the sharpness homogeneous attribute, while only sharpness homogeneous attribute is considered for pictorial regions. For one SCI X and its distorted version Y, given its text segmentation index map T, their textual layers (X_t, Y_t) and pictorial layers (X_p, Y_p) are calculated by

$X_t = X \cdot T$, $X_p = X \cdot (1 - T)$, $Y_t = Y \cdot T$ and $Y_p = Y \cdot (1-T)$
The luminance similarity map S_l (X_t, Y_t) between the textual layers X_t and Y_t is calculated as follows:

$$S_l(x_t, y_t) = \frac{2.\mu_{xt}.\mu_{yt}.+c_1}{\mu_{xt}^2+\mu_{yt}^2+c_1} \quad (3)$$

Where μ_{xt} and μ_{yt} are the mean values for each pixel in the textual layers X_t and Y_t. C1 is a parameter to evade instability when denominator is proximate to zero. The filters capture the local variations of images at four directions, including horizontal and vertical directions [3]. The quality map for the pictorial part Qp_map is quantified by the sharpness homogeneous attribute between pictorial regions.

$$Qp_{map} = S_s^p(X_p, Y_p) \quad (4)$$

The quality map for the textual part Qt _map can be calculated by integrating the luminance and sharpness homogeneous attribute maps as follows:

$$Q_{t_{map}} = [Sl(X_t, Y_t)]^{\alpha}.[S_s^t(X_t, Y_t)]^{\beta} \quad (5)$$

Where α > 0 and β > 0 parameters used to adjust the effect of the two components. By setting β = 1 to simplify structural difference of both textual and pictorial regions. When the textual layers are processed α is used to adjust effect of the luminance component. When intensity change is small, the effect of the luminance similarity to the visual quality should be reduced; when the change is large, the effect of the luminance similarity should be enhanced.

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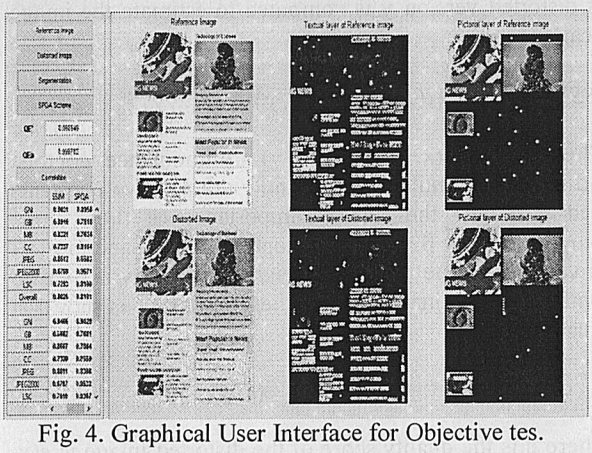

Fig. 4. Graphical User Interface for Objective tes.

B. Proposed Weighting Strategy in SPQA scheme

Based on area ratio and position of texts, size of characters, content of pictures, etc. many factors affecting human perception. Image activity measure (IAM) is adopted to calculate the weights of images. Image activity values reflect the variation of image content, which can be habituated to differentiate images. Based on the activity measure and segmentation algorithm proposed in [5], a novel model to compute two weights Wt and Wp that can measure the effect of textual and pictorial regions to the quality of the entire image. One reference SCI and its text segmentation index map T in which textual pixels are marked by one and pictorial pixels by zero, calculates the activity index map A of the corresponding distorted SCI [5]. The activity maps $A_t = A \times T$ and $A_p = A \times (1 - T)$ of the textual and pictorial regions can be calculated. In the HVS, a Gaussian mask G is used to weight activity values. Based on the weighted activity map, values of W_t and W_p for the textual and pictorial parts are calculated by equation (6) and (7):

$$W_t = \frac{\sum_{i=1}^{m}\sum_{j=1}^{n}(A.T.G)_{i,j}}{\sum_{i=1}^{m}\sum_{j=1}^{n}(T)_{i,j}} \qquad (6)$$

And

$$W_p = \frac{\sum_{i=1}^{m}\sum_{j=1}^{n}(A.(1-T).G)_{i,j}}{\sum_{i=1}^{m}\sum_{j=1}^{n}(1-T)_{i,j}} \qquad (7)$$

where m and n represent the dimensions of the images. The quality scores of the textual and pictorial regions are calculated as the mean values of the corresponding regions based on the calculated quality maps of textual layer Q_t _map and pictorial layer Q_p_map,

$$Q_t = \frac{Q^t\_map\ .T}{\sum_{i=1}^{m}\sum_{j=1}^{n}(T)} \qquad (8)$$

$$Q_p = \frac{Q^t\_map\ .(1-T)}{\sum_{i=1}^{m}\sum_{j=1}^{n}(1-T)} \qquad (9)$$

Where m and n denote the dimension of the reference SCI. And finally quality score Q of the distorted image is computed as:

$$Q = W_t * Q_{t+} W_p * Q_p \qquad (10)$$

V. EXPERIMENTAL RESULTS AND ANALYSIS

By applying the weighting strategy to subjective data obtain the three sets of subjective scores for entire, textual and pictorial regions in SCIs, it is plausible to verify the proposed weighting strategy on the substructure of subjective scores. A quality score QE' of an entire SCI is prognosticated on the quality scores of textual and pictorial regions, i.e., QT and QP. The QE' is computed as follows:

$$QE' = W_t * QT + W_p * QP \qquad (11)$$

The predicted quality scores QEa is the mean of quality scores of textual and pictorial regions:

$$QEa = 0.5 * QT + 0.5 * QP \qquad (12)$$

	Distortions	PSNR	SSIM	SPQA
PLCC	GN	0.8990	0.9031	0.8958
	GB	0.8515	0.8919	0.7518
	MB	0.8643	0.8321	0.7634
	CC	0.6862	0.7337	0.8184
	JPEG	0.8910	0.8512	0.6583
	JPEG2000	0.7146	0.6769	0.9671
	LSC	0.7948	0.7293	0.8160
	Overall	0.8145	0.8026	0.8101
	Distortions	PSNR	SSIM	SPQA
SROCC	GN	0.7962	0.8466	0.9029
	GB	0.8646	0.8662	0.7681
	MB	0.8545	0.8607	0.7864
	CC	0.7412	0.7320	0.8659
	JPEG	0.9114	0.8811	0.8308
	JPEG2000	0.7360	0.6767	0.9532
	LSC	0.8228	0.7610	0.9367
	Overall	0.8181	0.8035	0.8634
	Distortions	PSNR	SSIM	SPQA
RMSE	GN	0.7362	0.8665	0.9213
	GB	0.8345	0.8425	0.7184
	MB	0.8435	0.8261	0.7648
	CC	0.7243	0.7432	0.8596
	JPEG	0.9212	0.8654	0.8206
	JPEG2000	0.7253	0.6877	0.9325
	LSC	0.8432	0.7435	0.9762
	Overall	0.8142	0.8231	0.8436

IV. CONCLUSION

The quality assessment of distorted Screen Content Images, from both subjective and objective perspectives. An immensely colossal-scale image database (SIQAD) helps to explore the subjective quality evaluation of SCIs. DMOS values of images obtained via subjective test, and their reliability is verified. The three subjective scores for textual, pictorial and entire regions are predicted using proposed methodology. Thus we find that textual regions contribute more to the quality of the entire image in most of the distortion cases. With the weighting strategy, an emerging objective quality metric is constructed to discretely assess the visual quality of textual and pictorial regions.

Smt. Kashibai Navale College Pune-41

Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

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Performance Evaluation of Bit Error Rate for Conventional and Wavelet Based OFDM

Makarand N. Patil[1], Prof. S. S. Savkare[2], Prof. S. B. Shinde[3]

Department of Electronics and Telecommunication, JSPM Narhe Technical Campus, Pune, India [1, 2, 3]

Abstract: The paper represents performance evaluation of Bit Error Rate (BER) for conventional (DFT) and wavelet (DWT) based orthogonal frequency division multiplexing (OFDM) with various modulation techniques. There are different modulation schemes such as Binary Phase Shit Keying (BPSK) and Quadrature Phase Shift Keying (QPSK). The performance in between these modulation techniques is evaluated and analyzed to obtain lowest possible Bit Error Rate (BER) to be transmitted. Simulation is performed on the software named MATLAB.

Keywords: Bit Error Rate, Discrete Fourier transform, Discrete Wavelet Transform, Orthogonal frequency division multiplexing.

I. INTRODUCTION

The higher data speed requirement is increasing in exponential manner, due to easy availability of smart phones [5], with inexpensive cost and social websites. Continuous improvement in wireless data rate is in demand. Long Term Evolution-Advanced (LTE-A) is the ultimate solution for wireless broadband services. LTE-Advanced commonly known as 4G wireless networks and it is an evolution of a LTE Rel-8. IMT-Advanced (International Mobile Telecommunication-Advanced) is related to a family of mobile wireless technologies, known as 4G.

OFDM is one of the prime method which enable non-seen sight of wireless [2] services makes it possible to extend wireless access method over wide-areas. It is nothing but deviation of the Frequency Division Multiplexing scheme which have frequency channel divided into multiple smaller sub channels. Sub-channelization in FDM requiring provision of guard bands between two sub-channels to avoid interference between them. OFDM [4] divides bandwidth of frequency in narrow orthogonal sub-parts called subcarriers. A sub-channel is the combination of these sub-carriers numbers. The sub-carriers comprise data carriers and pilot carriers along with a DC. The data carriers are utilized to transmit data and pilot carriers are used for sensing purpose. Subcarriers are usually modulated with Quadrature Amplitude Modulation or Phase Shift Keying. (PSK) .Every user is provided with a number of sub-channels, each of them is composed of a number of sub-carriers. Data of the user is carried parallel on every sub-carrier with a low rate. The combination of the parallel sub-carriers at the destination provide for higher data rates. Since the sub-carriers transmit data at a low rate and thus higher symbol time it is durable to the effects of multipath, so this makes more suitable for wide-area non-line of Sight wireless access and also, use of orthogonal sub-carriers which is overlapped without guard bands make it more capable than FDM scheme. OFDM resembles CDMA in which it is a spread-spectrum expertise in which energy generated at a particular bandwidth is spread across the wide bandwidth which makes it more durable to intrusion and "jamming".
Multiple Input Multiple Output (MIMO) is one of the popular Advanced Antenna Technologies which is used in LTE [5] and Ultra Mobile broadband (UMB).One of the attractive features of MIMO is its good throughput. The transmitter and receiver have multiple antennas in MIMO giving multiple flavours based on the number of antennas present on both sides. The input idea is that a transmitter sends multiple flows over the multiple transmit antennas 9 of 15 and each transmitted flow goes through different paths to reach every receiver antenna. The different paths taken by the same flow to reach multiple receivers allow cancelling errors by using advanced signal processing techniques.

On the same frequency MIMO obtains spatial multiplexing to differentiate among various symbols. Thus MIMO is beneficial in obtaining higher spectral efficiency. The DWT-COIFLET OFDM has to fulfil the ortho-normal basis and for OFDM the best restoration properties to be considered. For different wavelet families the BER concert comparison is done with the conventional FFT-OFDM method for an AWGN. The results prove that the DWT-OFDM method operates at its finest concert with variety of wavelets. Results also show that DWT-OFDM is advanced than that of the FFT-OFDM [7] with regards to the bit error rate (BER) concert in AWGN channel.

II. OFDM SYSTEM DESIGN

It is well known that occupied bandwidth is of course directly related to data rate to be transmitted. But it needs to verify the minimum bandwidth required to be taken in order to get sufficient diversity and avoid the loss off all the frequency selective fading signals. On the other side much bandwidth means much transmitting power. Optimal bandwidth calculation is done by channel simulations and field test trials. For the Digital Audio Broadcasting

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(DAB), the bandwidth of value 1.5 MHz is a good compromise for the type of propagation conditions that apply. We have observed that the greater the carriers number, the greater the symbol period on each carrier and so less equalization is required and the greater is the diversity offered by the system. In case of differential modulation, the channel does not change too much during one symbol period. This is not the case when the receiver is moving due to the Doppler Effect as well as short term fading. Here number of carriers will reduce the moving speed. This one is another trade off of OFDM excellent opportunities for quick execution in parallel hardware

III.CONVENTIONAL OFDM SYSTEMS

For conventional OFDM system, an orthogonal basis function set is comprised of DFT sinusoids. In DFT the transform correlates the input signal with that of each sinusoidal basis function [4], here orthogonal basis functions are the subcarriers used in OFDM technique. At the receiver side the signals are combined to obtain the information transmitted. Orthogonal Frequency Division Multiplexing (OFDM) is a technique of multicarrier modulation in which the spectrum of the subcarriers overlap with each other. The spacing in frequency among them is selected in such a manner that orthogonality is obtained among the subcarriers. The basic OFDM system block diagram is shown in Figure 1.

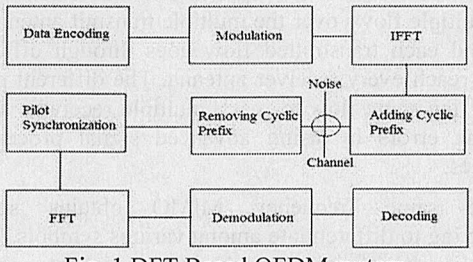

Fig. 1 DFT Based OFDM system

IV. WAVELET BASED OFDM SYSTEM

Wavelet transform have the ability to completely replace the DFT in OFDM. Wavelet transform is a tool for analysis of the signal in time as well as frequency domain. It is a multi resolution analysis mechanism where input signal is decomposed into various frequency components for the performance evaluation with particular resolution matching to scale.

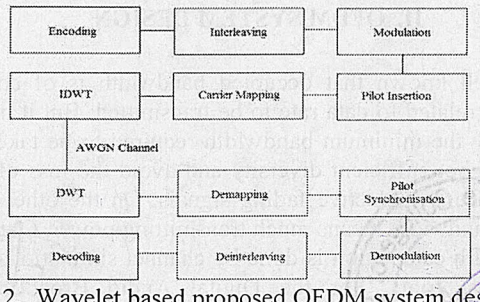

Fig. 2. Wavelet based proposed OFDM system design

Figure 2 describes that in proposed model we are using IDWT and DWT at the place of IDFT and DFT. Rayleigh channel is implemented for transmission and cyclic prefixing is not used. Here first of all conventional encoding is performed followed by interleaving after that data is converted into the decimal form and modulation is done next.

After modulation the insertion of pilot and sub carrier mapping is done then comes the IDWT of the data, which provides the orthogonality to subcarriers effectively. IDWT will convert time domain signal to the frequency domain. After passing through the channel on the signal DWT will be done and then pilot synchronization where the inserted pilots at the transmitter are removed then the demodulation is performed. Demodulated data is converted to binary form and the de-interleaved and decoded to obtain the original data which is transmitted.

V. BER PERFORMANCE EVALUATION

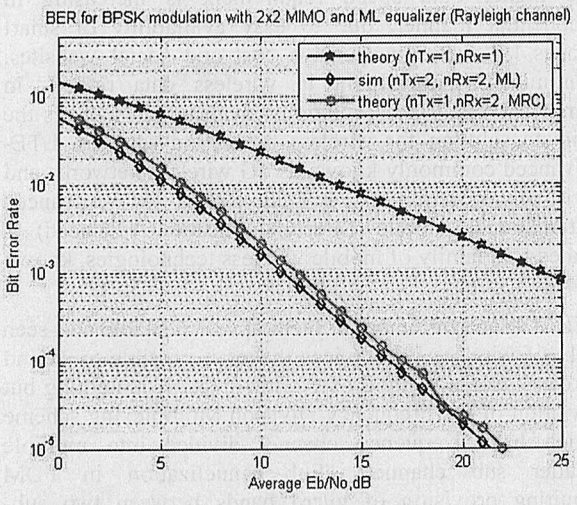

Fig. 3.BER Evaluation for DFT based OFDM using BPSK

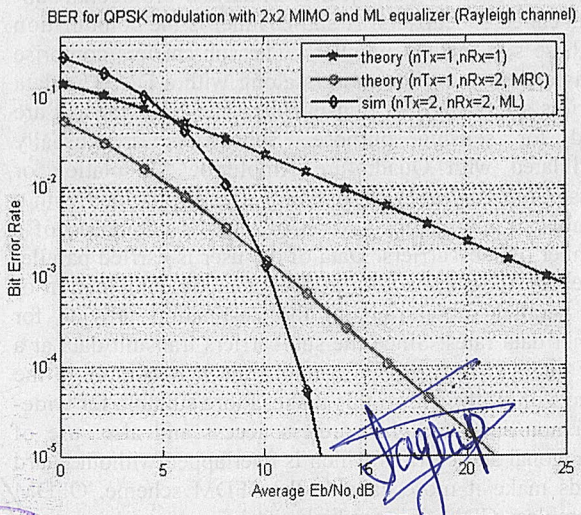

Fig. 4. BER Evaluation for DFT based OFDM using QPSK

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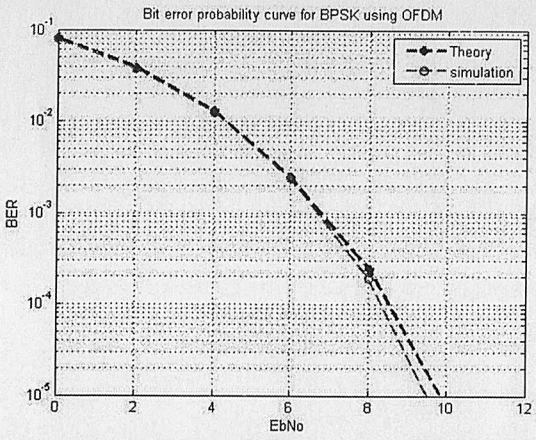

Fig.5. BER Evaluation of DWT Based OFDM using BPSK

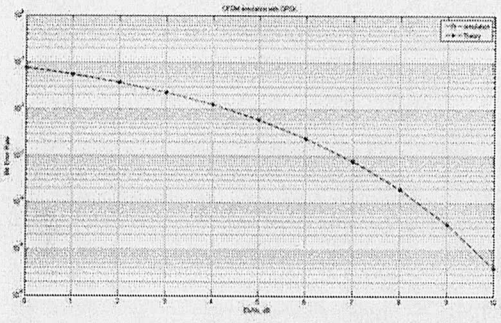

Fig.6. BER Evaluation of DWT Based OFDM using QPSK

Simulations have been done in MATLAB. For performance evaluation of DFT based OFDM and DWT based OFDM different modulation schemes are opted such as BPSK and QPSK.

VI. CONCLUSION

In this paper we have evaluated the performance of wavelet based OFDM system and DFT based OFDM system. From the performance analysis we have observed that the BER performance graph curves obtained from DFT based OFDM and DWT based OFDM using various modulation techniques. We conclude that the BER curves obtained from wavelet based OFDM are better than that of DFT based OFDM.

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Performance Evaluation of Bit Error Rate for Conventional and Wavelet Based OFDM

Makarand N. Patil[1], Prof. S. S. Savkare[2], Prof. S. B. Shinde[3]

Department of Electronics and Telecommunication, JSPM Narhe Technical Campus, Pune, India [1, 2, 3]

Abstract: The paper represents performance evaluation of Bit Error Rate (BER) for conventional (DFT) and wavelet (DWT) based orthogonal frequency division multiplexing (OFDM) with various modulation techniques. There are different modulation schemes such as Binary Phase Shit Keying (BPSK) and Quadrature Phase Shift Keying (QPSK). The performance in between these modulation techniques is evaluated and analyzed to obtain lowest possible Bit Error Rate (BER) to be transmitted. Simulation is performed on the software named MATLAB.

Keywords: Bit Error Rate, Discrete Fourier transform, Discrete Wavelet Transform, Orthogonal frequency division multiplexing.

I. INTRODUCTION

The higher data speed requirement is increasing in exponential manner, due to easy availability of smart phones [5], with inexpensive cost and social websites. Continuous improvement in wireless data rate is in demand. Long Term Evolution-Advanced (LTE-A) is the ultimate solution for wireless broadband services. LTE-Advanced commonly known as 4G wireless networks and it is an evolution of a LTE Rel-8. IMT-Advanced (International Mobile Telecommunication-Advanced) is related to a family of mobile wireless technologies, known as 4G.

OFDM is one of the prime method which enable non-seen sight of wireless [2] services makes it possible to extend wireless access method over wide-areas. It is nothing but deviation of the Frequency Division Multiplexing scheme which have frequency channel divided into multiple smaller sub channels. Sub-channelization in FDM requiring provision of guard bands between two sub-channels to avoid interference between them. OFDM [4] divides bandwidth of frequency in narrow orthogonal sub-parts called subcarriers. A sub-channel is the combination of these sub-carriers numbers. The sub-carriers comprise data carriers and pilot carriers along with a DC. The data carriers are utilized to transmit data and pilot carriers are used for sensing purpose. Subcarriers are usually modulated with Quadrature Amplitude Modulation or Phase Shift Keying. (PSK) .Every user is provided with a number of sub-channels, each of them is composed of a number of sub-carriers. Data of the user is carried parallel on every sub-carrier with a low rate. The combination of the parallel sub-carriers at the destination provide for higher data rates. Since the sub-carriers transmit data at a low rate and thus higher symbol time it is durable to the effects of multipath, so this makes more suitable for wide-area non-line of Sight wireless access and also, use of orthogonal sub-carriers which is overlapped without guard bands make it more capable than FDM scheme. OFDM resembles CDMA in which it is a spread spectrum expertise in which energy generated at a particular bandwidth is spread across the wide bandwidth which makes it more durable to intrusion and "jamming".
Multiple Input Multiple Output (MIMO) is one of the popular Advanced Antenna Technologies which is used in LTE [5] and Ultra Mobile broadband (UMB).One of the attractive features of MIMO is its good throughput. The transmitter and receiver have multiple antennas in MIMO giving multiple flavours based on the number of antennas present on both sides. The input idea is that a transmitter sends multiple flows over the multiple transmit antennas 9 of 15 and each transmitted flow goes through different paths to reach every receiver antenna. The different paths taken by the same flow to reach multiple receivers allow cancelling errors by using advanced signal processing techniques.

On the same frequency MIMO obtains spatial multiplexing to differentiate among various symbols. Thus MIMO is beneficial in obtaining higher spectral efficiency. The DWT-COIFLET OFDM has to fulfil the ortho-normal basis and for OFDM the best restoration properties to be considered. For different wavelet families the BER concert comparison is done with the conventional FFT-OFDM method for an AWGN. The results prove that the DWT-OFDM method operates at its finest concert with variety of wavelets. Results also show that DWT-OFDM is advanced than that of the FFT-OFDM [7] with regards to the bit error rate (BER) concert in AWGN channel.

II. OFDM SYSTEM DESIGN

It is well known that occupied bandwidth is of course directly related to data rate to be transmitted. But it needs to verify the minimum bandwidth required to be taken in order to get sufficient diversity and avoid the loss off all the frequency selective fading signals. On the other side much bandwidth means much transmitting power. Optimal bandwidth calculation is done by channel simulations and field test trials. For the Digital Audio Broadcasting

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(DAB), the bandwidth of value 1.5 MHz is a good compromise for the type of propagation conditions that apply. We have observed that the greater the carriers number, the greater the symbol period on each carrier and so less equalization is required and the greater is the diversity offered by the system. In case of differential modulation, the channel does not change too much during one symbol period. This is not the case when the receiver is moving due to the Doppler Effect as well as short term fading. Here number of carriers will reduce the moving speed. This one is another trade off of OFDM excellent opportunities for quick execution in parallel hardware

III. CONVENTIONAL OFDM SYSTEMS

For conventional OFDM system, an orthogonal basis function set is comprised of DFT sinusoids. In DFT the transform correlates the input signal with that of each sinusoidal basis function [4], here orthogonal basis functions are the subcarriers used in OFDM technique. At the receiver side the signals are combined to obtain the information transmitted. Orthogonal Frequency Division Multiplexing (OFDM) is a technique of multicarrier modulation in which the spectrum of the subcarriers overlap with each other. The spacing in frequency among them is selected in such a manner that orthogonality is obtained among the subcarriers. The basic OFDM system block diagram is shown in Figure 1.

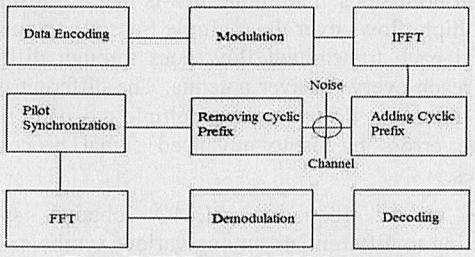

Fig. 1 DFT Based OFDM system

IV. WAVELET BASED OFDM SYSTEM

Wavelet transform have the ability to completely replace the DFT in OFDM. Wavelet transform is a tool for analysis of the signal in time as well as frequency domain. It is a multi resolution analysis mechanism where input signal is decomposed into various frequency components for the performance evaluation with particular resolution matching to scale.

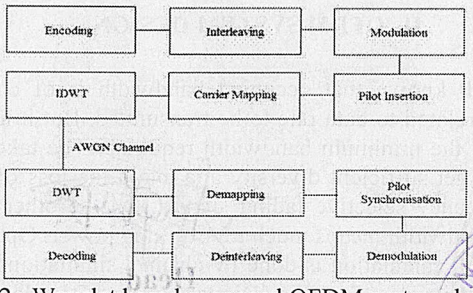

Fig. 2. Wavelet based proposed OFDM system design

Figure 2 describes that in proposed model we are using IDWT and DWT at the place of IDFT and DFT. Rayleigh channel is implemented for transmission and cyclic prefixing is not used. Here first of all conventional encoding is performed followed by interleaving after that data is converted into the decimal form and modulation is done next.

After modulation the insertion of pilot and sub carrier mapping is done then comes the IDWT of the data, which provides the orthogonality to subcarriers effectively. IDWT will convert time domain signal to the frequency domain. After passing through the channel on the signal DWT will be done and then pilot synchronization where the inserted pilots at the transmitter are removed then the demodulation is performed. Demodulated data is converted to binary form and the de-interleaved and decoded to obtain the original data which is transmitted.

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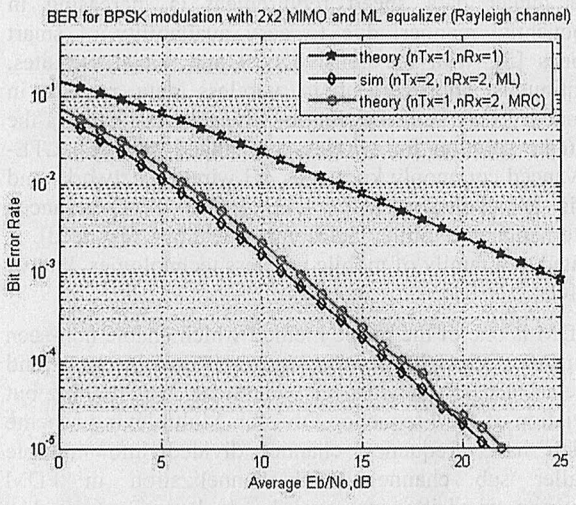

Fig. 3.BER Evaluation for DFT based OFDM using BPSK

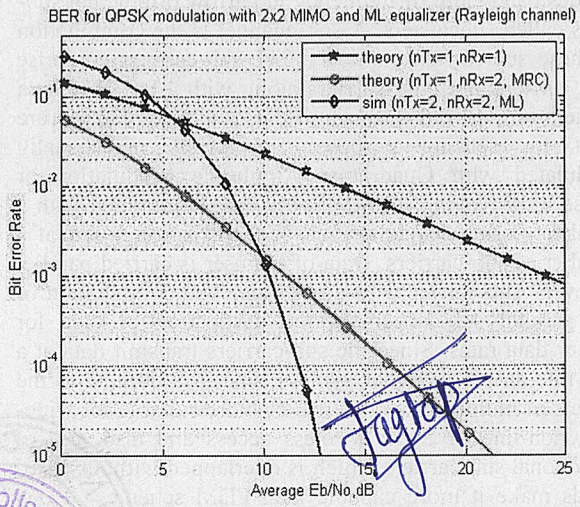

Fig. 4. BER Evaluation for DFT based OFDM using QPSK

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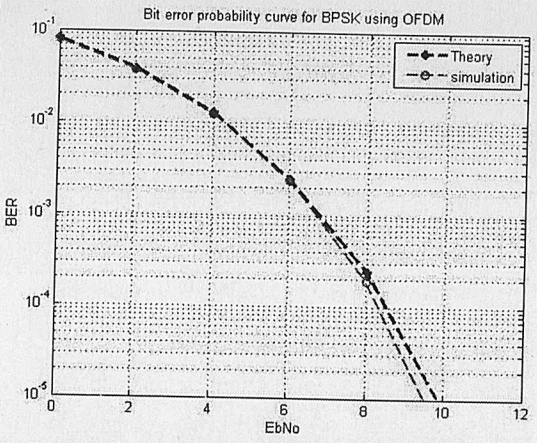

Fig.5. BER Evaluation of DWT Based OFDM using BPSK

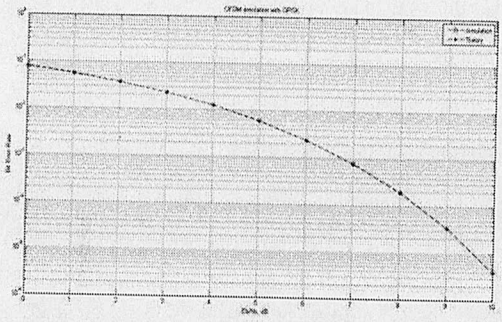

Fig.6. BER Evaluation of DWT Based OFDM using QPSK

Simulations have been done in MATLAB. For performance evaluation of DFT based OFDM and DWT based OFDM different modulation schemes are opted such as BPSK and QPSK.

VI. CONCLUSION

In this paper we have evaluated the performance of wavelet based OFDM system and DFT based OFDM system. From the performance analysis we have observed that the BER performance graph curves obtained from DFT based OFDM and DWT based OFDM using various modulation techniques. We conclude that the BER curves obtained from wavelet based OFDM are better than that of DFT based OFDM.

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Static Hand Gesture Recognition Using SOM-Hebb Classifier

Richa V. Vedpathak[1], Mrs. S.A. Shirsat[2]

M.E. Electronics Student, E&TC, SCOE, Pune, India [1]

Assistant Professor, E&TC, SCOE, Pune, India [2]

Abstract: Gestures are physical actions made by human to convey feelings or expressions to others. Hand gestures are basically classified as static and dynamic. It is used as sign language for deaf and dumb, controller less video gaming, Smart TV, video surveillance, human robot interaction, biometrics, virtual and augmented real time applications. This proposed work focuses on static hand gesture recognition system using hybrid network consisting of SOM (Self-organizing map) and Hebb classifier. SOM classifier is a single layer feedforward neural network. It uses Hebbian learning algorithm to in its association to help in identifying categories. Mapping is done by SOM method and network training is obtained by Hebbian learning algorithm. The performance of this proposed work is simulated using MATLAB and evaluated in terms of recognition accuracy. The obtained accuracy of the system is 91.11%.

Keywords: Euclidean distance, Fourier descriptor, Hebb, Self-organizing maps (SOM), Skin color Segmentation.

I. INTRODUCTION

Gestures are kind of action or movement performed by human beings for conveying message. Hand gestures are the main way of communication for deaf and dumb people. Because of lack of understanding interpreters are used. In today's advanced world this problem is nearly removed and many applications are there for deaf and dumb people. Hand gestures are mostly used in real time application namely 3-D gaming, robot control and video surveillance. Hand gestures are many two types static based (posture based i.e. without any movement) and dynamic based which include movement of hand for a particular period of time. One can used single handed signs or both handed sign [1].Hand gestures contain a different approach that is various types of input taking styles which are basically gloved based and vision based [2]. Glove based include data glove (hardware based, sensors embedded on the glove) and colored glove it includes the different color patches used on a single glove or either single and two or more colors [3]. Another includes the vision based it consists of the input taken of bare hands. It needs a good quality camera (Kinect etc).It is further divided into appearance based and 3D based approach [2][3]. The proposed work is based on static hand gesture using SOM- Hebb neural classifier [1]. The whole process consists of image acquisition (capture RGB image), pre-processing of image (skin color segmentation and vertical and horizontal projections), feature extraction (calculating magnitude spectra using FDT (Fourier Descriptor Transform)), classification (by using SOM-Hebb classifier) for feature vector and accordingly recognize the desired hand sign.

This paper is organized as follows: the Section II demonstrates the work related to hand gesture recognition. In the Section III the methodology is studied. Section IV is about the experimental results and the section V is followed by conclusion.

II. RELATED WORK

Hand gesture recognition technology is very well known research topic in image, video processing and real time applications. Much research work has been carried on it.

A novel FPGA implementation of hand sign recognition system with SOM–Hebb classifier proposed by Hiroomi Hikawa and Keishi Kaida [1] shows the hand sign recognition of American Sign Language (ASL) using SOM –Hebb hybrid classifier. The recognition system based on the video processing and is implemented by using FPGA. Adithya V., Vinod P. R., Usha Gopalakrishnan [4] presented a method on Artificial Neural Network (ANN) based method for ISL Recognition. This method uses the Fourier Descriptor for feature extraction, statistical features in terms of central moments (variance, skewness and kurtosis) and classification by using ANN. In [5] Sweta Shiwani, Neeraj Shukla, Abhishek Kumar showed comparison between unsupervised feature learning method like Softmax classifier(Auto- Encoder) with the SOM (Self-Organizing Map Algorithm) classifier algorithm. The SOM shows better result as compared with Softmax algorithm. In [6] Hsien-I Liny, Ming-Hsiang Hsu, Wei-Kai Chen proposed a method on human hand gesture recognition using a convolution neural network. the vision based gesture recognition is done using CNN (Convolution Neural Network).By using CNN the images are easier to recognize, while due to light intensity problem gesture seriously affect recognition. In [7] Yuan Yao and Yun Fu presented the gesture recognition is done on the basis of contour model using Kinect sensor (RGB –D sensor). It is able overcome the problem of illumination. It cannot handle the segmentation of long arm or body and has limited accuracy. Deepika Tewari, Sanjay Kumar Srivastava [8] proposed the visual static hand gestures recognition using KSOFM (Kohonen Self Organizing Maps) using ISL(Indian Sign Language) along with

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discrete cosine transform (DCT) for feature extraction. In [9] Hiroomi Hikawa, Seito Yamazaki, Tatsuya Ando, Seiji Miyoshi, Yutaka Maeda compared Range Check (RC) classifier and hybrid network of SOM –Hebb network. The efficiency of hybrid network is much better than RC classifier. [10] The similar classifier i.e. hybrid network (SOM - Hebb) is used for recognizing Japanese sign language of 41 signs. It contains 22 dimensional vectors including 100 neurons to have high recognition performance.

III. HAND GESTURE ALGORITHM

The main purpose of this system is to recognize the gesture/sign and enhance recognition accuracy. The hand sign used in this work is ASL (American Sign Language) which has been taken from the Massey University. The flow of methodology consists of following processes:

A. Pre-processing.
B. Feature Extraction.
C. Classification.

The hand gesture system block diagram is shown in the Figure 1. A colored image i.e. RGB format image is taken from a camera or reference dataset of hand sign. The image contains equal pixels i.e. S x S values i.e. of equal height and width. The input image is converted to binary image using Skin color segmentation by YCbCr color space. The pre-processing is further done on binary image of I(x, y) which contains binary pixel values .The brightest pixel values are count in two ways horizontally and vertically to get a vector of size of image height and width in form of projection. These projection values are differentiated based on height (horizontal projection) i.e. $H_P(y)$ and based on width (vertical projection) i.e. $V_P(x)$. The final stage of pre-processing is using two Fourier transform coefficients i.e. Fourier Descriptor for computing or calculating the magnitude spectrum H (n) and V (n) of $H_P(y)$ and $V_P(x)$. Both of these are used as feature vector of the input image.

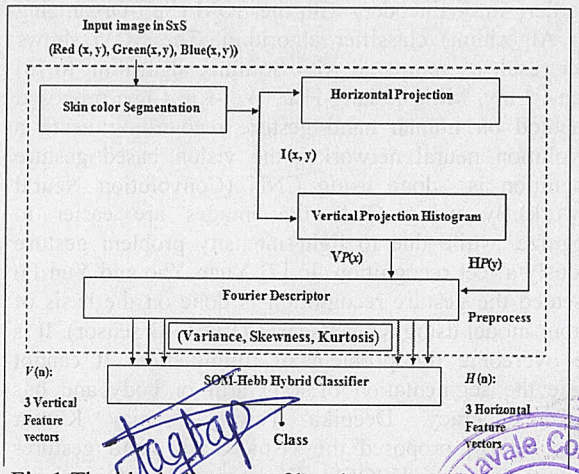

Fig 1 The block diagram of hand gesture recognition system

The feature of (D = 6) dimension (i.e. 3 feature vectors in terms of higher order moments i.e. variance, skewness, kurtosis) is fed to the SOM – Hebb classifier network that classifies the G class of gesture and identifies the hand sign.

A. Pre-Processing

The preprocessing is prior stage of gesture recognition system. It includes image capture (Image aquistion), then converting into gray scale or binary image In this paper skin color segmentation, horizontal and vertical projection is used for reducing the dimesions. These values are used to convert into magnitude spectra using fourier descriptor. The Figure 2 describes the numerical dataset of ASL (American sign language) consisting of 0 to 9 numbers.

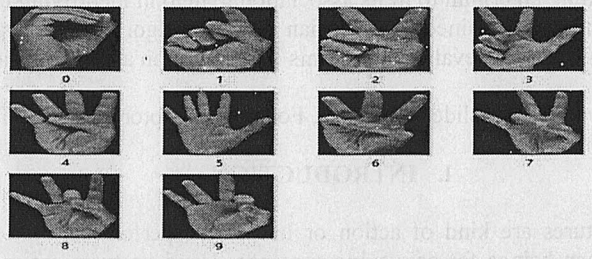

Fig 2. The Massey University hand sign dataset consisting of numbers 0 to 9 [11].

• Skin color segmentation:

In the process of skin color segmentation in the input image it is first converted to YCbCr color space. YCbCr separates RGB into luminance and chrominance components where Y is the luminance component and Cb, Cr are the chrominance components [4]. RGB values are converted into YCbCr color space using the weighted sum of RGB. Using thresholding condition the output of hand segmentation is obtained. If the Y, Cb and Cr values of a pixel are within a specific range of skin color, the pixel value is set such that pixel would be white otherwise black. Thus a pixel is described as belonging to skin if it satisfies the following relation:

$$75 < Cb < 135 \text{ and } 130 < Cr < 180 \text{ and } Y > 10. \quad (1)$$

The output of this color segmentation is binary image in terms white for skin color and black for black background of color image [4]. The resultant binary image may contain noise, that why median filtering is used to remove the noise.

• Horizontal and vertical projections:

The horizontal and vertical projection histograms of I (x, y), are calculated in the preprocessing as a sub module. The projection is defined as an operation that maps a binary image into a 1-D array called a histogram. The histogram value is the sum of pixel values along a particular direction (horizontal and vertical) according to is width and height. Horizontal projection histogram H_P (y) and vertical projection histogram V_P (x) are defined by:

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$$H_P(y) = \sum_{x=0}^{S-1} I(x,y) \quad (2)$$

$$V_H(x) = \sum_{y=0}^{S-1} I(x,y) \quad (3)$$

B. Feature Extraction

The main purpose of the feature extraction is to reduce the original dataset by measuring features in terms of shape that differentiates on input pattern. The features extracted are transformed in feature vectors. Fourier coefficient i.e Fourier shape descriptor is used as shape transform. Also the statistically normalized feature vectors are used in terms of central moment.

• Fourier Descriptor

The Fourier transform is used to convert the H_P (y) and V_P (x) projections into the magnitude spectral value i.e. H (y) and V(x). Fourier Descriptor (FD) is obtained by applying Fourier transforms to a magnitude spectrum. The feature extracted (in terms of shape) is a 1D function in general. Normalized Fourier transformed coefficients are called Fourier Descriptor for the shape. Fourier descriptors of the row (horizontal) and column (Vertical) projection vectors are calculated. These descriptors represent the handshape in the frequency domain. Fourier descriptors have strong discrimination power, they remove the noise sensitivity present in the shape representation of image [4].Fourier descriptors are information preserving and they can be easily normalized. For the two vectors X (t) and Y (t), where t=0, 1, 2... S-1 the discrete Fourier transforms are used is given by,

$$Hn = \frac{1}{S} \sum_{t=0}^{S-1} X(t) \cdot e^{-\frac{j2\pi nt}{S}} \quad (4)$$

$$Vn = \frac{1}{S} \sum_{t=0}^{S-1} Y(t) \cdot e^{-\frac{j2\pi nt}{S}} \quad (5)$$

where n= 0,1,2….. S-1 for both X and Y. S is the size of X and Y. Hn and Vn are the vertical or horizontal Fourier descriptors of the shape. The feature values are formed from the Fourier descriptors of the horizontal and vertical projection vectors by taking only the magnitude of the Fourier coefficients and ignoring the phase information. Normalization of feature vector is carried out to remove the unwanted information and store the main information. The feature values are normalized by dividing the magnitude values of all the Fourier coefficients by the magnitude value of the first coefficient which is called the dc component.

$$Hnm = Hn / Hn(1) \quad (6)$$

$$Vnm = Vn / Vn(1) \quad (7)$$

where, Hnm and Vnm are the magnitude values or spectra of the horizontal and vertical projections.

• Statistical Feature Vectors(Central Moments)

The feature vector is formed of six feature values which are the second, third and fourth central moments of the normalized Fourier coefficients of the horizontal and vertical projection vectors for each gestures. Central moments are a set of values which contains the probability distribution properties. The higher order central moments are only related to the spread and shape of the probability distribution, other than location. So they are preferred to ordinary moments for describing the probability distribution.

The six statistical features namely variance, skewness, kurtosis of both horizontal and vertical projections are extracted.

A. Variance

Variance is a measure of the scattered data in a sample. It is also a good descriptor of the probability distribution of a random variable. It describes the spread of the numbers from the mean value. The μ_2 represents the second order moment. In equation (9) shown below μ is the mean, X_i is the sample value of random variable where, i= 1,2….,N. N is the finite set of data values of the random variables.

$$\mu_2 = \frac{1}{N} \sum_{i=1}^{N} (X_i - \mu)^2 \quad (8)$$

B. Skewness

The histogram can be divided at the center into two identical halves, wherein each half is not a mirror image of the other, is called as skewness. Skewness is the measure of a single value which indicates the degree and direction of asymmetry. The μ_3 represents the third order moment.

$$\mu_3 = \frac{1}{N} \sum_{i=1}^{N} (X_i - \mu)^3 \quad (9)$$

C. Kurtosis

Kurtosis is a parameter that describes the shape and is a measure of the "peakedness" of a random variable's probability distribution. It contains the characteristics of the distribution of a real-valued random variable same as that of skewness. The μ_4 represents the fourth order moment.

$$\mu_4 = \frac{1}{N} \sum_{i=1}^{N} (X_i - \mu)^4 \quad (10)$$

C. Classification.

It is the last phase of the gesture recignition system.After this step the input gesture is recognized in terms of the numerals. The classifier used in this paper is combination of SOM- Hebb Classifier. Along with SOM-Hebb classifier, the Euclidean distance for increasing accuracy.

• SOM – Hebb Classifier

The statistical DFT based normalized six feature vectors are given as input to the SOM-Hebb (Hybrid Network).Each vector of the element ξ_i is fed to the classifier network. SOM is an unsupervised single feedforward neural network which is trained Hebbian learning algorithm. A winner neuron is determined from the vectors of neuron and its neighbourhood neurons are updated. The Hebb network identifies the category from winner neuron in terms of class. Classifier takes the D - dimensional vectors from pre-processing and classifies them into H classes (where 'H' is hand sign class, here D= 6 feature vectors). Fig. 3 shows the schematic block diagram of the SOM-Hebb Classifier.

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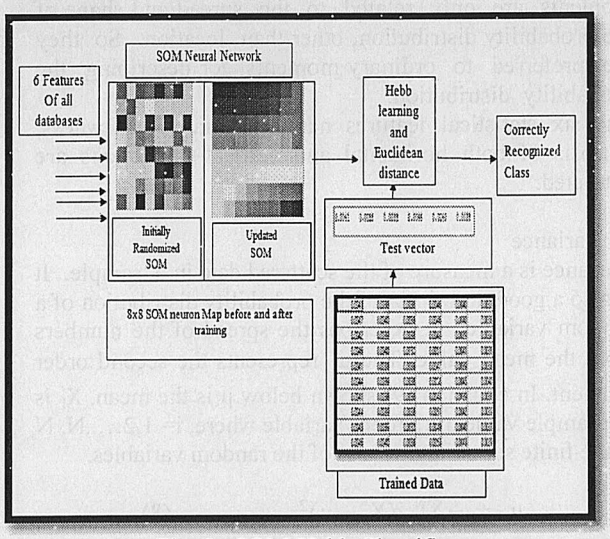

Fig. 3. SOM-Hebb Classifier

SOM - Hebb neural network algorithm:

Step 1: Take the statistical feature vector as input to the SOM neural network.

Step 2: SOM consist of learning (SOM map trained with training vectors) and recall phase (mapping or testing done by using trained map).

Step 3: The input weight vector are initially randomly generated (training data) each of which contains a D-dimensional vector $\underset{w_i}{\rightarrow}$ called the weight vector

$$\underset{w_i}{\rightarrow} = \{wi0, wi1, \ldots, wiD-1\} \in \Re^D. \quad (11)$$

Step 4: In learning process the input vectors, x ∈ D, are given to the map in multiple iterations (epoch). For each input vector, the distances to all weight vectors are calculated.

$$x = \{x0, x1 \ldots xD-1\} \in D. \quad (12)$$

Step 5: Learning rate of epoch (initial and current) is computed. The variance of the gaussian (Neighbourhood) function is computed for current epoch.

Step 6: The neuron having the weight vector closest to the input vector is searched and is called a winning neuron. The weight vectors of the winning neuron and its neighbourhood neurons are updated to be closer to the input vector.

$$w_i(t+1) = w_i(t) + hc_i \cdot d_i \quad (13)$$

where, t is a sampling index.

Step 7: Compute the Euclidean distance between the training vector and each neuron in the SOM map. Find the best match unit (BMU) and transform it into 2D map to find row and column of winner. The winner neuron is calculated using Euclidean or Manhattan distances. The winner neuron is given by,

$$H = \arg \min_i \{\| \underset{x}{\rightarrow} - \underset{wi}{\rightarrow} \|\} \quad (14)$$

The Manhattan distance d_i is given by

$$d_i = \sum_{j=0}^{D-1} |x\,j - wi\,j| \quad (15)$$

Step 8: Find the association matrix and generate a gaussian function centered on the location of the BMU. Determine neighbouring neurons and determine the size of it.

$$h_{ci} = \alpha(t) \exp\left(-\frac{\| \underset{r_c}{\rightarrow} - \underset{r_i}{\rightarrow} \|}{2\sigma^2(t)}\right) \quad (16)$$

where , $r_c \in \Re^2$ and $r_i \in \Re^2$ correspond to the location vectors of the winner neuron-c and neuron-i .

Step 9: For SOM weights updation, the BMU neurons are put back to the SOM map.

Step 10: The SOM map obtained is used for mapping from neurons to cluster in winner find module. The mapping is done by hebb i.e association map. It again determines the count of how many times the neurons are interconnected to the cluster.

Step 11: The SOM map and the trained feature data (teaching) are used for comparison and once again Euclidean distance is calculated to find the winner class by computing the activation map (trained SOM map) and the testing vector.

Step 12: The Hebb synchronizes better with strong simultaneous correlation between cluster and teaching data.

Step 13: On giving testing vector as input the same class vector is expected.

Step 14: The training and testing is done. If not then go to step 3-13.

• Euclidean and Hamming Distance

The Euclidean distance along with hamming distance is used as a classifier along with SOM- Hebb to increase the recognition accuracy. The Euclidean distance is nothing but the square of difference between two points or two vectors i.e. training and testing vectors.

$$E(i, j) = |(x1 - x2) + (y1 - y2)| \quad (17)$$

E (i,j) is the Euclidean distance vector, where x, y are the two co-ordinates of the vectors i,j, where i,j= 1,2.

The distance vector is calculated in terms of multiplication of multiplier count and the E (i,j).The minimum distance of the Euclidean distance vector is considered as correct class or hand sign position vector.

IV. EXPERIMENTAL RESULTS

The implementation results of the proposed hand sign recognition system is presented in this section. The system was implemented using MATLABR2010a in a machine with Intel(R) Core(TM) i5, 2.40 GHz processor, 64 bit OS system type and 4GB RAM. The 5 signer database is used by the Massey university signers. Total 9 databases of numerals 0 to 9 are taken for training and testing purpose. The results obtained are pre-processing, statistical feature graph, SOM training map, confusion matrix and finally GUI (Graphical User Interface).The pre-processing result of the hand sign '0' showing six images of the colored image, skin color segmented image, the horizontal and vertical projection along with it the magnitude feature vector plot of horizontal and vertical projection as shown in the fig.4. The last two image of

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magnitude spectra are position invariant for the input image and remain same for the one signer but different for other signer.

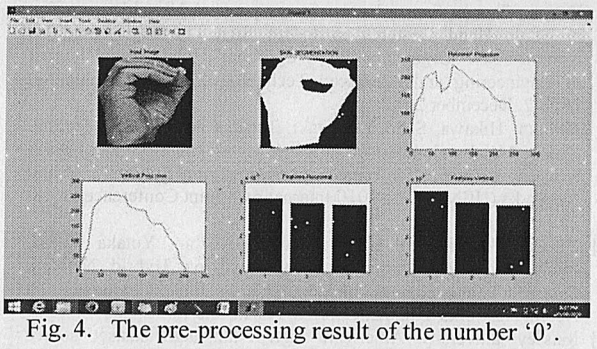

Fig. 4. The pre-processing result of the number '0'.

The three higher order moments are taken as the features of Fourier descriptor which show 6 graphs. Three features each for horizontal and vertical projection. The result shows first three and last graph has greater accuracy and uniform. The first side graph is of variance, next one skewness and last one kurtosis. The fig.5 shows the test graphs of statistical features.

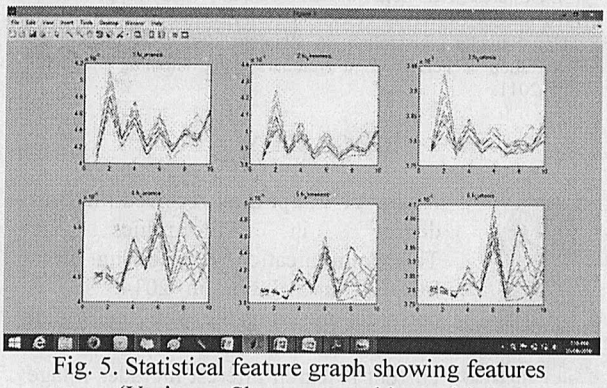

Fig. 5. Statistical feature graph showing features (Variance, Skewness, and kurtosis).

After creation of the feature vectors which are in .mat file format. These feature vectors are converted into the neurons i.e in terms of value and index of the features into 8x8 neuron map. Fig 6 depicts the representation of the SOM map in initial and trained state in terms of the various color blocks.

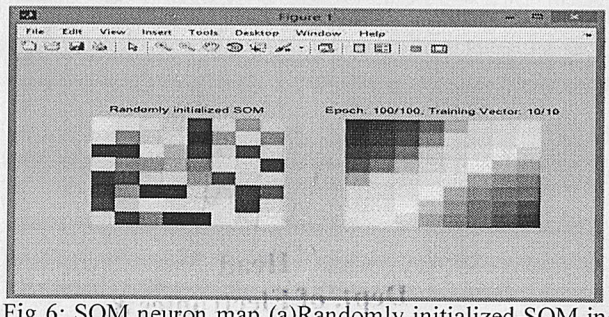

Fig 6: SOM neuron map (a)Randomly initialized SOM in terms of color. (b) Other shows the organized color display that runs for the SOM of 64 clusters and 100 epoch.

After SOM map creation the neuron map formed is grouped into cluster and then using euclidean distance and Hebb we get the desired class of the number.Finally the confusion matrix is plotted interms of computed vs desired gesture expressions. The Fig. 7 shows the plot of confusion matrix.

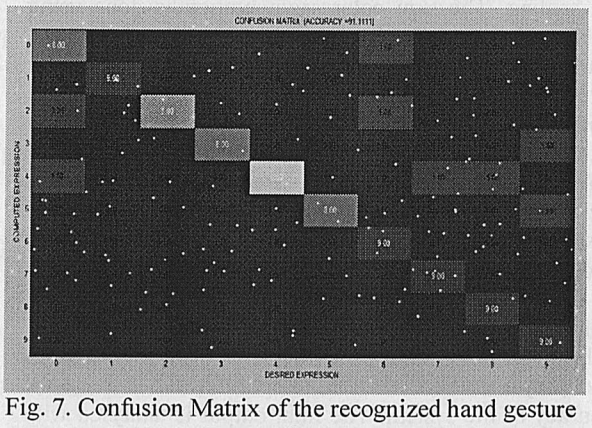

Fig. 7. Confusion Matrix of the recognized hand gesture system

The accuracy is calculated from confusion matrix which is described in Table I.

TABLE I. ACCURACY FROM CONFUSION MATRIX

Total hand sign.	**Recognition accuracy = $\frac{\text{correct gestures}}{\text{Total number of gestures}}$. 100%**		
	Correctly identified	**Incorrect identified images**	**Accuracy**
10 hand sign X 9 dataset = 90	83	7	91.11%

The last step is the implementation of whole system in terms of the panel window for input, output, training and testing. Fig 8. Shows the GUI (Graphical user interface) for the hand sign of number '0'. The output is shown below with the display of the number '0'.

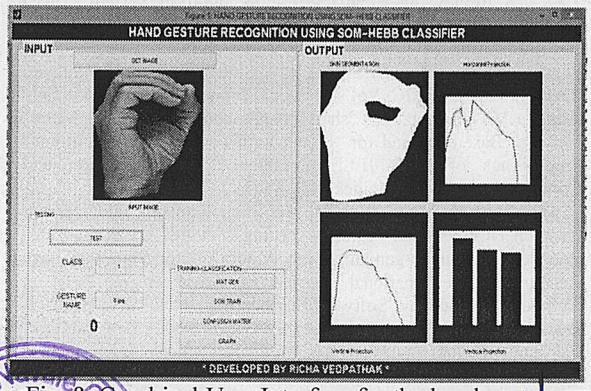

Fig. 8. Graphical User Interface for the hand gesture recognition result of the number "0".

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V. CONCLUSION

The proposed system is based on static hand gesture recognition using SOM-Hebb classifier. The feature vectors obtained remain unchanged irrespective of position of image. It is not completely immune to rotation and scaling. The skin color segmentation is done using YCbCr color space into binary image along with filtering. Fourier descriptor is used for the feature extraction for features in terms of feature vector. The three central moments are used as features which have uniform distribution and helps in enhancing the accuracy. The SOM - Hebb used show proper category based identification. The SOM classifies on the basis neuron and cluster and Hebb with respect to class. The SOM classifier tends to get confused, while Hebb removes the confusion for identification of gesture. The training and testing is performed by both SOM and Hebb along with association with Euclidean distance. The Euclidean distance is used as secondary classifier. It is used to optimize and increase the accuracy of the system. The final output is analysed with the help of confusion matrix for analysing the true and false recognition. The whole system is implemented successfully on MATLAB. The system implemented show the accuracy of 91.11%. In future the system could be implemented using real time model based approach using camera.

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BIOGRAPHY



Richa V. Vedpathak received the B.E. degree in Electronics & Telecommunication engineering from SCOE, Pune, India, in 2014. She is currently pursuing the M.E. in Digital Systems from SCOE Pune, India. Her current research interest includes image processing and neural networks.

Prof. (Mrs.) S. A. Shirsat is currently an assistant professor in SCOE, Pune. Her current research interest is wireless communication and networks.

Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

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A Real Time Image analysis System to Detect Skin Diseases

Pravin S. Ambad[1], Prof. A. S. Shirsat[2]

Dept. of Electronics and Telecommunication, STES's SKNCOE, Vadgaon, Pune, India[1, 2]

Abstract: Skin diseases rate has been increasing for past few decades. One of the risk factor in skin diseases is unprotected exposer to UV radiation, which causes various skin diseases. For early diagnosis of skin cancer, psoriasis and dermatophytosis increases chance for cure significantly. Therefore proposed method used for a real time analysis system, which will detect skin diseases. The image recognition technique where user will able to capture skin images of different mole type or rashes type. System will analyze and process the images, which alert the use to seek medical help urgently. This system will introduce steps for automating the process of skin diseases prevention and detection.

Key words: Enhancement, statistical analysis, Adaboost classifier.

I. INTRODUCTION

A. Background and Motivation

Now a day's people of different age groups are suffering from skin diseases and lesions such as eczema, scalp ringworm, skin fungal, skin cancer of different intensity, diabetic ulcers, psoriasis symptoms etc. The above said diseases strike suddenly without warning and have been one among the major disease that has life risk.

If skin diseases are not treated at earlier stage, then it may lead to complications in the body including spreading of the infection from one individual to the other. The skin diseases can be prevented by investigating the infected region at an early stage. The characteristic of the skin images are diversified, so that it is challenging job to devise an efficient and robust algorithm for automatic detection of the skin disease and its severity. Skin tone and skin color plays an important role in skin disease detection. Colour and coarseness of skin are visually different. Automatic processing of such images for skin analysis requires quantitative discriminator to differentiate the diseases. In this paper we propose Image analysis system to diagnosis multiple skin disease using statistical parameter analysis. Statistical analysis is concerned with analysis of random data. Random data is nothing but random pattern of skin diseases. Though random data has not any mathematical expression still it has some statistical properties. To analyse random data we must analyse statistical properties of it. This type of analysis is done by statistical analysis.

B. Contribution

In this paper we propose Image analysis system to diagnosis multiple skin disease using statistical parameter analysis. Statistical analysis is concerned with analysis of random data. Random data is nothing but random pattern of skin diseases. Though random data has not any mathematical expression still it has some statistical properties. To analyse random data we must analyse statistical properties of it. This type of analysis is done by statistical analysis this system is combo-model which is to be used to diagnosis multiple skin diseases at a time. The target skin diseases are skin cancer, psoriasis and dermatophytosis. The disease diagnosis and classification is based on statistical parameter analysis. Statistical parameters includes: Entropy, Texture index, Standard deviation, Correlation fact Depending on standard range of parameters skin disease is going to be diagnosis as well as classified.

C. Paper Organization

Paper is organized as follows: Section II related work. Section III proposed system named image analysis system to detection of skin diseases. Section IV describes the technique for skin disease images classification. In Section V It shows the results of the classification framework. In Section VI It conclude the paper with future work.

II. RELEATED WORK

Skin image recognition has become one of the attractive and demanding research areas in the past few years. Colour histogram based features are used to analyse and classify the psoriasis infected skin images in order to take the diagnostic measures [3]. On one hand this would be useful for dermatologists to reduce diagnostic errors, while on the other hand it can serve as the initial test bed for patients in rural areas where there is a dearth of good medical professionals. A support Vector Machine with RBF kernel is used for the classification of images. The experimental results gave the encouraging results in an initial attempt for identification of psoriasis infected skin images. Classification of psoriasis skin diseases and their severity will be carried out.

Image processing method is implemented in MATLAB, for skin cancer detection. In this paper, online database of skin cancer images is used for testing the method [4]. Skin images for cancers of different types are obtained from, of these images for BCC (Basal cell carcinoma), SCC (squamous cell carcinoma) and normal or harmless skin

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lesions are collected and database is created for testing purpose Next step in image processing is de-noising using wavelet tool. To remove low frequency or background noise from image, filtering is used. After de-noising the image, median filtering is applied to remove some hair like material from skin image, if present Thresholding is the simplest and most commonly used method of segmentation. This paper considers use of high level feature extraction technique by implementing the 2D-DWT as the processing method neural network tool is used for classification of skin images in different skin diseases. Using the features extracted from image, it is classified either in harmful diseased i.e., BCC (Basel cell carcinoma), SCC (Squamous cell carcinoma), or harmless. Buket D. have worked on real time system for the malignant melanoma prevention and early detection [5]. In this system user is able to analyse captured image. System process the image and shows the notification for medical help. This system shows convincing results and accuracy. Ho Tak Lau. Have worked on an automatic skin cancer classification [6]. Available image is given to the system and it goes through different image processing procedure. Use full information is extracted from the image and then with the help of training and testing system classifies the image. Recognition accuracy of the neural network classifier is 90%

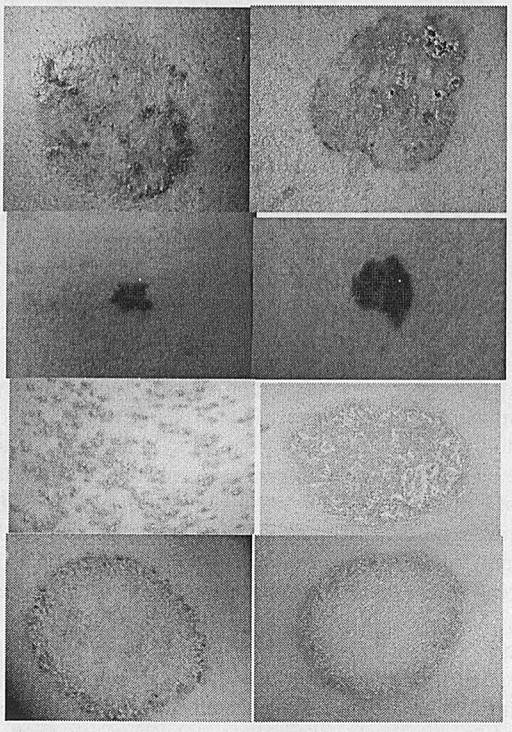

Fig I. Sample Images from Database (melanoma, psoriasis, dermo)

III. PROPOSED SYTEM

In this paper, we propose the Real time system to detect skin diseases. Our system capture image from standard database and put in to the system to inform the user for preventing the risks related to skin diseases. More briefly we present the Image analysis system to detect different skin diseases, where user will able to take images of different moles or skin patches. Our system will analyse and process the image and classifies the image to normal, melanoma, psoriasis or dermo case based extracting the image features.

This database includes images of multiple skin diseases. These images are taken from standard database. Preprocessing of an image includes resizing of an image. Basic condition for any image processing algorithm is that images must be of same size for processing purpose. Hence in order to process out any image with respective algorithm we resize the image. It's necessary to have quality images without any noise to get accurate result. Noisy image may lead your algorithm towards incorrect result. Hence it becomes necessary to de-noise the image. Image de noising is an important image processing task, both as a process itself, and as a component in other processes. There are many ways to de noise an image. The important for good image de noising model is that it will remove noise while preserving edges. Traditionally, linear models have been used. To de-noise the image we can use median filter. Median filter does the work of smoothening of image. The input signal which we get that is RGB image. But for our algorithm we require gray images. Hence using rgb to gray conversion in MATLAB we convert RGB images in to gray images.

Image Enhancement:

To get accurate result in biomedical image processing it is always necessary that biomedical image must be of very good quality. However, practically this is not easy. Due to different reasons obtain low or medium quality images. Hence it becomes necessary to improve their quality. To improve the quality of image using image enhancement algorithm. This algorithm enhances the image by focusing on parameters like contrast, brightness adjustment.

Statistical Analysis:

Statistical analysis of skin image is supposed to give different statistics such as: Entropy Standard deviation Texture factor correlation factor Depending on this parameter first find out there range for individual skin disease. To find out range of these parameters used for standard skin disease image database.

- First we calculate the variance with the help of sample mean

$$\sigma_I^2 = \frac{\sum_{i=l1}^{l2}(I_1(i) - m_i)^2}{l_2 - l_1}$$

- With the help of variance, we calculate the energy of the image I by taking mean square of variance.
- We then calculate the luminance of image with the help of RGB components of image I, we calculate the RGB components of image by taking mean of R,G and B components.

$$L = \sqrt{((0.3 * r^2) + (0.587 * g^2) + (0.114 * b^2))}$$

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- We calculate sample similarity measurement with the help of resized image I2, texture T2, window and luminance L.
- We calculate the standard deviation of image

$$\sigma_i = \sqrt{\sigma_i^2}$$

- We calculate the entropy of the image

$\text{entropy} = -\text{sum}(p.* \log^2(p))$.

With the help of this parameters we correlate the image and classifies as per respected catagries.

IV. IMAGE CLASSIFICATION

In proposed system, we use standard database for the development and testing of proposed system. A framework Proposed system is shown in fig. 3.In this framework we use neural network. At first stage this frame work performs image processing for denoise the image and enhancement the image for statistical analysis. It calculate the entropy, Standard deviation, texture factor to find the range of parameters used in image. We use two leval classifier to get better results. With the help of AdaBoost classifier it correlate the images with deciding the the range of correlation with the help of mean, standard deviation based on intensity classifier classifies biomedical images. The Adaboost classifier is simple to implement and it gives 97.2% classification accuracy.

Table I Comparison of Classifiers

Classifier name	Accuracy %
kNN	95
NB	95.8
SVM	95.5
AB	97.2
OMK	93.7

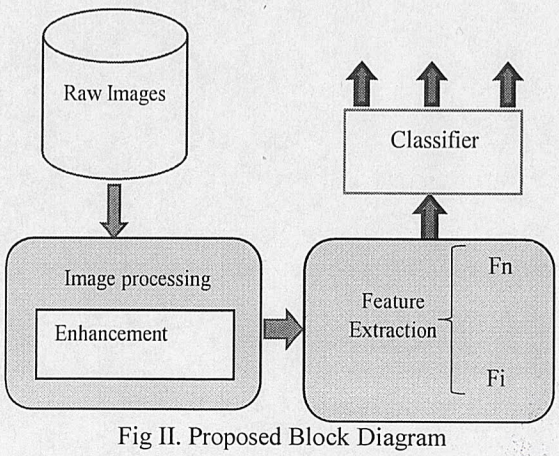

Fig II. Proposed Block Diagram

V. RESULTS

In the proposed framework as result of adaboost classifier, we can classify the normal, psoriasis, dermo and melanoma images with accuracy of 90% or more. Table II shows results for standard deviation. This automated image analysis module where Image processing module classifies under which category the image falls (Psoriasis, Melanoma and Dermatophytosis).

Table II. Results of statistical analysis.

	Luminance	Texture	Standard Deviation	Entropy
Psoriasis	200.1013-225.3665	0.1853-0.2404	9.5709-30.91	5.065-6.7293
Melanoma	192.0704, 100.2521	0.2764, 0.1645	60.6499, 21.1382	7.4575, 5.5998
Dermo	151.4497-196.3330	0.2011-0.2733	11.0351-54.5073	5.4555-7.5061
Normal skin	226.8690-244.7091	0.2235-0.2400	4.0219-19.6765	3.6991-5.6361

VI. CONCLUSION AND FUTURE WORK

In this paper we present Image analysis system for prevention and detection of skin diseases. Using statistical analysis with correlation algorithm we can diagnosis the multiple skin diseases as well as classify skin disease. Different statistical parameters has been studied amongst them are Entropy, Texture index, Correlation factor has been chosen to find out probability of disease. According to further requirement if necessary statistical parameters can be increased. Outcome of this system is supposed to diagnosis the multiple skin diseases as well as it classifies skin diseases. This future work may reduce the processing time of diffusion speed. That makes system faster.

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A Comparison and Study of Tone Mapping Methods for High Dynamic Range Images

Arati N. Joshi[1], Prof S. P. Deshmukh[2]

M.E, E&TC Department, SKNCOE, Vadgoan, Pune, India [1]

Assistant Professor, E&TC Department, SKNCOE, Vadgoan, Pune, India [1]

Abstract: This paper presents comparative study of different Tone mapping method of high dynamic range (HDR) images for image reproduction. The main aim is to provide the mapping between the light emitted by the original scene and display values. The dynamic range of the captured scene is smaller or larger than that of the display device, tone mapping expands or compresses the luminance ratios and adjust the image in such a way that all parts in the image can display and recognise properly. Tone and retrieve the visual impression of light sources placed in the field of view and the quality of resulting image will not reduce. The proposed system developed using Reinhard method. To create HDR and tone mapping the MATLAB functions are used.

Keywords: Tone Mapping, MATLAB Software, High Dynamic Range Images.

I. INTRODUCTION

High Dynamic Range images can be created using sequence of images captured at different exposure times. It is very difficult to capture the full dynamic range images by using the modern digital camera. Combining different low dynamic range (LDR) images with different exposure time the HDR image can be created. In 1997 the algorithm was developed which can create high dynamic range radiance maps. algorithm can store the HDR image in RGBE form [1],[10].



Fig. no. 1: Low Dynamic Range photograph with short, medium and long exposure time

Fig. no. 1 represents three shots taken under different exposure values of the camera. The first one is underexposed image which shows contrast image similarly, the third one is overexposed image which shows brighten image. The medium exposure value image is not able to present all luminary information of image. To overcome from this problem the tone mapping method was invented. From all 3 LDR images the HDR image can be generated using tone mapping method. The block diagram of HDR image processing system is as shown in Fig. no.2 [2], in which 7 blocks are present different functions. The multi exposure digital camera can take N number of images, by adding those images pixel values individually and RGB pixel values can taken separately the HDR image found, by applying tone mapping the HDR images are converted into LDR images, which can be able to display on device. The block diagram shows very simple method of HDR image generation.

HDR images not displayable on device, again convert into LDR image.

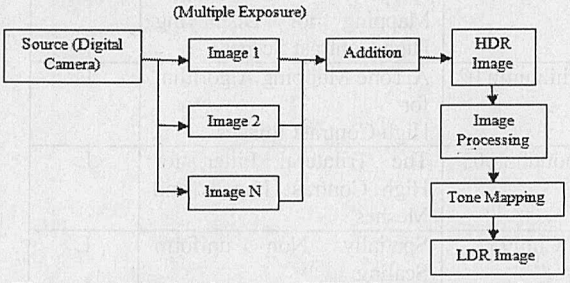

Fig. no. 2: Block Diagram of HDR Image processing system

II. RELATED WORK

Lot of work has been done on the High dynamic range images.

A] Generation of HDR Image

Jinto et al. [4] represents the creation of high dynamic range images using tone mapping and inverse tone mapping, single image with different exposure values that represents multiple low dynamic range images. The exposure value is in increasing order, using this technique the Jinto et al. created a HDR image. Vavilin and Jo [5] generated a HDR by using segmentation method, region wise decomposition of HDR image is taken and for each segmented region the tone mapping is applied, using local mapping the image get reconstructed.

B] Tone Mapping

Tone mapping is the method of finding appropriate image which is able to display the darkest and brightest part of image clearly. While calculating contrast it compresses the darkness range of image. Drago et al. [6] proposed

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luminance vales logarithmic compression of image. Using contrast enhancement and histogram adjustment technique the visualization of image done. Li et al. [7] describes adaptive algorithm to display the high dynamic range image, which presents two compression approaches that are global and local operator. In global operation point to point matching function and in local operation detailed luminance range taken under consideration. Statistical based histogram adjustment technique used for global mapping to convert base layer into LDR image and spatial filter used for local mapping.

C] HDR Image Evaluation

Alvaro and Guillermo [8] defined visualization of HDR images. Cadik et al. [9] evaluated HDR tone mapping methods using perceptual attributes. The identification of relationship between different attributes became essay using perceptual attributes method. Table 1 presents evaluation of different tone mapping methods.

TABLE 1 ABBREVIATIONS OF EVALUATED TONE MAPPING METHODS

Abbreviation	Method description	Global/ Local
Drago03	Adaptive Logarithmic Mapping for Displaying High Contrast Scenes	G
Ashikhmin 02	A Tone Mapping Algorithm for High Contrast Images	L
Choudhury03	The Trilateral Filter for High Contrast Images and Meshes	L
Chiu93	Spatially Non uniform Scaling functions for High Contrast Images	L
Durand02	Fast Bilateral Filtering for the display of HDR Images	L
LCIS99	Low Curvature Image Simplifier	L
Fattal02	Gradient Domain High Dynamic Range Compression	L
Pattanaik02	Adaptive Gain Control for HDR Image Display	L
Tumblin99	Revised Tumblin-Rushmeier Tone Reproduction Operator	G
Schlick94	Quantization Techniques for Visualization of HDR Pictures	L
Reinhard02	Photographic Tone Reproduction for Digital Images	L
Ward94	A contrast-based scale factor for luminance Display	G
Ward97	A Visibility Matching Tone Reproduction Operator for HDR Scenes	G

III. COMPARATIVE PERFORMANCE ANALYSIS OF VARIOUS TONE MAPPING METHODS

Tone mapping method is used to reproduce the image and provides mapping between luminance of original scene to output device display values. The problem with standard displays is that they are unable to display High Dynamic Range images. To solve this problem the tone mapping technique was invented, it can display the maximum luminance image on standard display without compromising quality of image by converting High Dynamic Range image into Low Dynamic Range image.

The classification of tone mapping operators in four classes: global, local, gradient domain and frequency domain operator. Table 2 presents Comparisons of Various Tone Mapping Operators [1]. Following list represents different well known tone mapping methods used in study:

1] Logarithmic (LTM)

The logarithm is used for compressing purpose for values larger than 1, so that by mapping luminance the range compression may be achieved, base of logarithm is adjusted according to each pixel value [1].

2] Modified Logarithmic (MLTM)

For each image channel it adopts a separate luminance function. The modified logarithmic functions may be extended the curve to handle a wider dynamic range images than the simple Operators. For each channel of RGB image the luminance was computed and compressed [1].

3] Exponential (ETM)

A mapping which converts world luminances to display luminances by means of the exponential function is called exponential mapping [1].

4] Modified Exponential (METM)

Similar to modified logarithmic method, the modified exponential function may work. For each channel of RGB image separated luminance mapping is generated [1].

5] Reinhard et al. global operator (RGTM)

Compression of luminance is done by using Reinhard at al. operator. It is a modified technique of exponential operator, the luminance key is variable so due to that the compression of luminance may be controlled [11].

6] Reinhard et al. local operator (RLTM)

Reinhard et al. Local operator works similar as Reinhard global operator, the difference is that a blurring function is applied on High Dynamic Range image before applying tone mapping [11]. For very high-dynamic-range images, local contrast may be preserved better with the local version that implements dodging and burning.

7] Garrett et al.

They used image appearance model, iCAM, to render high dynamic range images for display and to develop a tone map curve [12].

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IV. EVALUATION OF HDR IMAGES

In this work, the combination of HDR generation methods and tone mapping algorithms are taken under consideration. The HDR generation methods are classified in two types namely Linear HDR generation method and Nonlinear HDR generation method. Firstly, different images were captured at different exposure time. Then for generating HDR images two HDR generation methods were applied. After that tone mapping algorithms are used to convert the high dynamic range image to low dynamic range image format so it can be displayed in normal display devices. Finally, the obtained image has been evaluated subjectively and objectively [1].

The implemented methods have been implemented firstly on standard HDR images in order to evaluate the performance of the tone mapping methods. After that, HDR images have been created using the linear and nonlinear LDR combination methods.

A] Tone Mapping for Standard HDR Images

RGTM and RLTM methods achieved the best quality of image by preserving the scene details. ETM shows good visualization with fewer loses in image details. Other techniques have poor images; the logarithmic tone mapping (LTM and MLTM) has very dark image. GTM produced a greyish image while the METM lost details in bright areas.

TABLE 2

Method	Definition	Advantage	Disadvantage	Different Operators
Global Operator	reduce dynamic range of image, treat each pixel independently	computationally efficient, real time, Faster, low complexity	For extremely high dynamic range images it may not always preserve visibility	Miller's operator, Tumblin–Rushmeier's operator, Ward's scale factor, Ferwerda's operator, Ferschin's exponential mapping, Logarithmic mapping, Drago's logarithmic mapping, Reinhard's global photographic operator, Reinhard and Devlin's photoreceptor model, Ward's histogram adjustment, Schlick's uniform rational quantization
Local Operator	Compute an adaptation level individually for each pixel by considering the pixel itself and a set of neighbouring pixels.	More flexible and adaptive	More expensive and resource demanding	Chiu's spatially variant operator, Rahman and Jobson's multiscale retinex, Johnson and Fairchild's iCAM, Ashikhmin's operator, Reinhard's local photographic operator
Frequency Domain Operator	Dynamic range of image is reduced by compressing luminance component with spatial frequency	Used in edge preserving operations	High frequency components within an image cause rapid changes in luminance	Horn's lightness computation, Fattal's gradient domain compression
Gradient Domain Operator	A derivative of image is modified	Adjustment of image is possible	Too much compression has the visual effect of exaggerated small details	Oppenheim's operator, Durand's bilateral filtering

B] Tone Mapping on Images Generating Using Linear HDR Generation methods

Using the linear combination method, the tone mapping algorithms were applied on the generated HDR images. Similar the standard HDR images, Reinhard et al. Methods (RGTM and RLTM) achieved the good quality images followed by the modified exponential method. Garrett et al. has higher quality images than the previous set. MLTM and METM, both achieved low quality because the image is very purplish.

C] Tone Mapping on Images Generated Using Nonlinear HDR Generation Methods

In nonlinear combination method [3], the selected tone mapping algorithms were applied on HDR images. Reinhard et al. methods and the modified exponential tone mapping techniques achieved the highest quality of image. LTM method achieved good quality images compared to the previous sets. MLTM, METM and GTM show very poor quality. The HDR images obtained by the linear production techniques have better quality than the nonlinear technique. The images obtained by the nonlinear technique are very greenish and they lost the details of the bright and dark regions.

V. PROPOSED METHODOLOGY

The proposed system fig. no.3 takes different exposure images from camera by placing the camera in one place and by changing the exposure value, more than 3 images

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are taken, those images are low dynamic range, so they can easily display on device which has very poor clarity. Very bright and very dark areas of LDR images are not recognize properly. MATLAB is used for pre input generation process that is HDR creation.

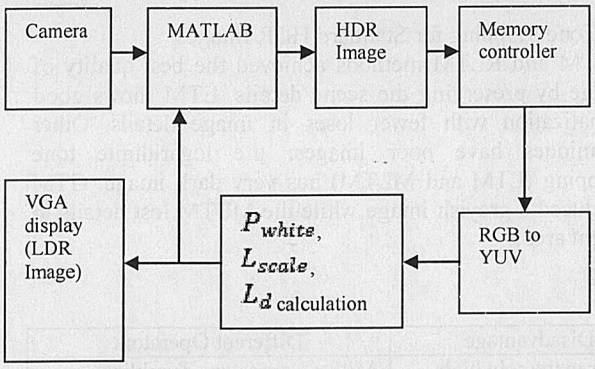

Fig.no.3: Proposed system architecture

The HDR image can't display on device, placed in memory controller block. Where optimization of memory and time required complete the process are measured. Reinhard method is used for tone mapping, the white point, scaled luminance and display luminance are calculated by using tone mapping method.

Algorithm of the System

- Take more than 2 shots under different exposure setting of camera.
- Place images in one folder for applying them as an input
- Create HDR image.
- Get exposure value from each image information.
- Find exposure time.
- Apply tone mapping function to HDR image.
- Tone mapped image display on device.

VI. RESULTS

Fig. no. 4 shows HDR image which is not displayable on device, the HDR images are very high dynamic and most of the display devices is not able to display that image properly. Fig. no. 5 shows the LDR image which has very less dynamic range and easily display on device.

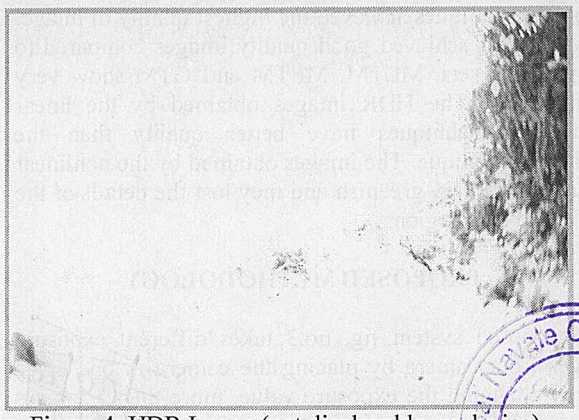

Fig.no.4: HDR Image (not displayable on device)



Fig.no.5: Tone mapped image (displayable on device)

VII. CONCLUSION

This paper presented a subjective evaluation of various tone generation and tone mapping techniques. HDR images are generated from a sequence of differently exposed images using either a linear and nonlinear combination technique. Linear HDR generation produces images with better quality and more visually pleasing than the nonlinear ones. The paper presented the comparative study of various tone mapping methods and shows proposed Reinhard tone mapping method with higher visual quality of image.

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Particle Filter Based Object Tracking in Video

Swati S. Jadhav, Rohita P. Patil

***Abstract*—Object tracking has been emerging as a demanding research area in the domain of video surveillance. The accurate object tracking is achieved by overcoming difficulties caused by object deformation, occlusion and illumination variation. Object tracking using Particle filter algorithm could overcome these challenges so it becomes the recent area of research. The particle filter update the state-space dynamic model using approximation of posterior probability density function. It is achieved using the finite set of weighted samples known as particles. The object tracking process requires huge computation. The design is implemented on FPGA using synthesizable state machine. The states correspond to particle generation, likelihood estimation, resampling and particle update modules of the particle filter algorithm.**

Index Terms—*object tracking, computer vision, Particle filter,occlusion, deformation.*

I. INTRODUCTION

Object tracking has number of application in the domain of video surveillance, video indexing, vehicle navigation,human-computer interface,robot controland object classification. In general object tracking is process to create temporal correspondence among detected objects in consecutive frames. Object tracking process can be divided into number of tasks as Object representation, Feature Selection, Object Detection and Tracking.

A recursive Bayesian filter is statistical process of dynamic state estimation. In particle filtering using the state space approach different object properties are modelled. This results in posterior probability distribution function of the object state vector. Kalman filter and particle filter come under category of Bayesian filter. Kalman filter is best possible estimator for linear state space model where noises of the model are Guassian. Particle filter provides object state estimation even for non-linear state space model with non-Guassian noises. So the particle filter covers wide range of applications.

The particle filter method is based on three main operations: Sampling, Update and Resampling. The probability density function represented approximately as set of random-samples known as particles. The weights are assigned to the particles and get updated as per system dynamics.

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Swati S. Jadhav,Master of Engineeering Student, Dept. of Electronics and Telecommunication,Smt. KashibaiNavale College of Engineering, Vadgaon(BK),Pune,SavitribaiPhule Pune University, India.

RohitaP. Patil, Professor,Dept. of Electronics and Telecommunication,Smt. KashibaiNavale College of Engineering, Vadgaon(BK),Pune,SavitribaiPhule Pune University, India.

The proposed system consider object histogram as tracking feature. The random point are considered initially to prepare templates. These points are nothing but particles. This template is used as reference to update particle values in subsequent frames for tracking the object. The computation is based on likelihood function which is used to predict the location of object. During the process there might be the sample impoverishment problem which can be resolved by resampling algorithm.

This paper is organized as follow; section II describes related work. Section IIIprovides the mathematical analysis of particle filter algorithm. Section VI describes system architecture for object tracking using particle filter. Section V contains the FPGA implementation and simulation results. Section VI ends the paper.

II. RELATED WORK

Resampling is important step of particle filter algorithm as it prevents degeneracy of propagated particles. The resampling methods are reviewed in [1]. Evolutionary computing using genetic operators such as crossover and mutation addresses the problems of particle degeneracy and sample impoverishment [2]. In [3] the distance based histogram is calculated for RGB planes separately with flexibility for selecting object size, type of video sequence and number of particles.The problem of inaccurate tracking due to illumination variation is resolved in [4] with the help of local color entropy feature.

Efficient hardware implementation is achieved in [5] using Multiple Candidate Regeneration (MCR) algorithm; where MCR is recursive process analogous to prediction and update steps of particle filter algorithm.The parallel architecture for weight calculation and histogram computation is proposed in [6]. The design is based oncomputation of Bhattacharya coefficient for Region of Interest to estimate center of the target object.Hardware/software co-design has been proposed in [7].The software part contains computation of weight of particles andis implemented on NIOS-II, while hardware circuit is used for particle update step. Considering constraints on the resources like memory bandwidth and operation cycles a low cost real time object tracking system is achieved using dual cache architecture [8]. The robotic applications for object trackingand its FPGA implementation is proposed by [9]. The application includes construction automation using Bayer image patterns.

The applications of object tracking require real time response. The algorithms should be designed for efficient hardware implementation such that it should not require external memory module and applicable for different image sequences.

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III. PARTICLE FILTER ALGORITHM

Particle filter is a Monte Carlo method used to compute a Bayesian state estimate recursively by updating a posterior pdf of the state of the state at each time t based on available information up to t. The relation betweenobservable state variableY_t, the unobserved or latent variable s_t and noise v_t is given by state transition equation as:

$$s_t = \gamma(s_{t-1}, Y_{t-1}, v_t) \quad (1)$$

The associative transition density of (1) is $f(s_t|s_{t-1}, Y_{t-1})$.The measurement equation is,

$$y_t = \delta(s_{t-1}, Y_{t-1}, u_t) \quad (2)$$

The associative density of (2) is $f(y_t|s_t, Y_{t-1})$ and u_t is measurement error or measurement noise. Consider the initial density$f(s_0)$. The filtering and likelihood evaluation proceed recursively. The steps involved in particle filter algorithm are:

Prediction:

$$f(s_t|Y_{t-1}) = \int f(s_t|s_{t-1}, Y_{t-1}), f(s_{t-1}|Y_{t-1})ds_{t-1} \quad (3)$$

Forecasting:

$$f(y_t|Y_{t-1}) = \int f(y_t|s_{t-1}, Y_{t-1}), f(s_t|Y_{t-1})ds_t \quad (4)$$

The likelihood estimation $\hat{f}(y_t|Y_{t-1})$ is derived from (4) as:

$$f(y_t|s_t^{1,i}, Y_{t-1}) = \frac{1}{\sqrt{(2\pi)\Sigma u}} \exp\frac{(X_t - x_t^{1,i})'\Sigma u(X_t - x_t^{1,i})}{2}$$

Averaging over particles yield the Likelihood function as:

$$\hat{f}(y_t|Y_{t-1}) = \frac{1}{N}\sum_{i=1}^{N} f(y_t|s_t^{1,i}, Y_{t-1}) \quad (5)$$

The posterior weight w_t^i obtained from the prior weight w_{t-1}^i as:

$$w_t^{0,i} = \frac{f(y_t|s_t^{1,i}, Y_{t-1})}{\hat{f}(y_t|Y_{t-1})} \quad (6)$$

Update:

$$f(s_t|Y_t) = \frac{f(y_t, s_t|Y_{t-1})}{f(y_t|Y_{t-1})} = \frac{f(y_t|s_t, Y_{t-1})f(s_t|Y_{t-1})}{f(y_t|Y_{t-1})} \quad (7)$$

The update step is followed by likelihood step and the process repeats. The parameter Σu is standard deviation.

IV. OBJECT TRACKING SYSTEM

The system block diagram of object tracking is shown in Figure 1. The camera is used to input video signal to FPGA board. The video frames are stored in buffer. The resolution of image from video signal and number of particles are considered for furthercomputation.

A. *Particle Generation*

The operation of particle generation is the initialization step. It is applicable for very first frame of the video sequence. The pixels are randomly selected from the image, which is termed as particles. The state space model is built from the location and probable direction of object's motion. More the number of particles more will be accuracy of object detection. But the number of particles are constrained with resources available for computation and time required for computation. For this FPGA implementation total sixteen particles are used. The random generator module is used to generate particles taking resolution into account.

B. Particle Propagation

The particles are propagated according to motion model.It is assumed that if the object is moving towards the right direction then it will be move in right in subsequent frames. Similarly if object is moving towards left direction then it will move in left in subsequent frames.

C. Likelihood Estimation

The likelihood function is used for estimation of new values from the prior data. The likelihood function finds the difference between current positions of object with respect to the reference location. The computation is performed for all the particles and used for updating the particle location.

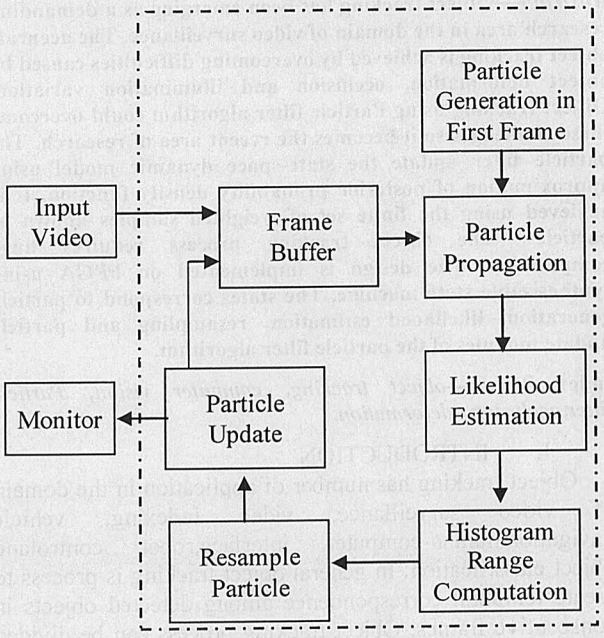

Fig. 1. System block diagram

D. Particle Resampling

The resampling step replace particles with low likelihood by particles with high likelihood. This need to be done since we have finite number of particles. Thus particles with high weights gets replicated to indicate interested area.

E. Histogram Range Computation

The cumulative sum of normalized weights is used to define the range of histogram. The histogram indexing is performed to update the state vector.

F. Particle Update

The particles gets updated through the filtering process. The particles which gets accumulated at the location of object are considered for further computation discarding other particles. Thus the particles with low weight filtered out retaining only significant particles.

V. FPGA IMPLEMENTATION AND SIMULATION RESULTS PARTICLE FILTER ALGORITHM

The state diagram of particle filter is shown in Figure 2.The *state 0* of finite state machine (FSM) corresponds to video frame buffer. The Particle generation create state space matrix representation with respect to 16 randomly generated particles.

$$S = \begin{bmatrix} X_1 X_2 X_3 \ldots X_{14} X_{15} X_{16} \\ Y_1 Y_2 Y_3 \ldots Y_{14} Y_{15} Y_{16} \\ h_1 h_2 h_3 \ldots h_{14} h_{15} h_{16} \\ w_1 w_2 w_3 \ldots w_{14} w_{15} w_{16} \end{bmatrix}$$

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The first and second row of matrix corresponds to location of particles i.e. (x, y) co-ordinates. The third and fourth row of matrix indicates the motion. These particles are initialized for first video frame. In this matrix third and fourth row contains all zero elements that implies steady position of object. This corresponds to *State 1* of FSM.

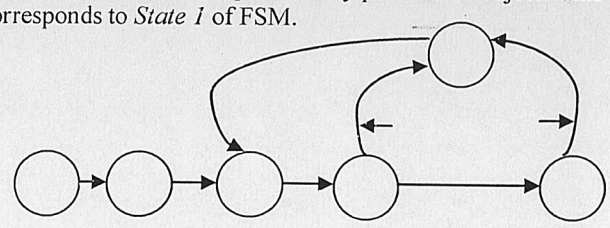

Fig. 2. Finite state Machine for particle filter.

These particles are propagated using random generation algorithm. The co-ordinates of particles are generated as new center around the old center. In this case the third and fourth row contains nonzero elements which indicates dynamic model of the object to be tracked. This process is *state 2* of FSM.

$$X_{new} = X_{old} + w_{old} \pm random$$
$$Y_{new} = Y_{old} + h_{old} \pm random$$
$$h_{new} = h_{old} \pm random$$
$$w_{new} = w_{old} \pm random$$

The random numbers are generated by concatenating the bits of eight bit counter in random manner. The likelihood computation is based on logarithmic function and it is *state 3* of FSM. Here *D* is the difference between the pixel value i.e. red, green and blue components and the reference initialized value.

$$Dist = D' * D$$
$$Dist = R^2 + G^2 + B^2$$

The likelihood function is

$$L(k) = A + B * Dist$$

Where A and B are constant and represented as:

$$A = \log\left(\frac{1}{\sqrt{2\pi}\Sigma u}\right)$$
$$B = -\frac{1}{2 * (\Sigma u)^2}$$

Here Σu indicate the standard deviation. The above computation is performed on all particles and the likelihood value is stored in the form of array in vector *L(K)*.

Particle resampling is performed using cumulative sum algorithm and it is the *state 4* of FSM.

$$w = e^{(L - \max(L))}$$
$$w_{normal} = \frac{w}{\sum_{i=1}^{16} w_i}$$

Perform cumulative sum of vector w_{normal} that corresponds to the range of histogram. The histogram is generated as *state 5*of the FSM. Here the histogram is indexed to create the range vector.

$$T = \left[0, \left(\frac{1}{16}\right), \left(\frac{2}{16}\right), \left(\frac{3}{16}\right), \ldots\ldots, 1\right]$$
$$= [0, 0.0625, 0.125, 0.1875, \ldots, 1]$$

Just for illustration consider the vector of normalized weights as:

$$w_{normal} = [0.05, 0.06, 0.11, 0.19, 0.4, 0.55, \ldots..]$$

Histogram indexing corresponds to above values is represented by *Histo* vector as:

$$Histo = [1,1,2,4,7,9, \ldots..]$$

From above histogram the state vector gets updated as given below:

$$S = \begin{bmatrix} X_1 X_1 X_2 X_4 X_7 X_9 \ldots \\ Y_1 Y_1 Y_2 Y_4 Y_7 Y_9 \ldots \\ h_1 h_1 h_2 h_4 h_7 h_9 \ldots \\ w_1 w_1 w_2 w_4 w_7 w_9 \end{bmatrix}$$

From the above updated state space matrix it is inferred that the object is tracked at location of particles present in matrix. Thus the particles not present in matrix are discarded. This matrix corresponds to location of object and in subsequent frame this matrix is used as reference. The process repeats for all the video frames by retaining the particles with more likelihood. The simulation results of few model are shown below:

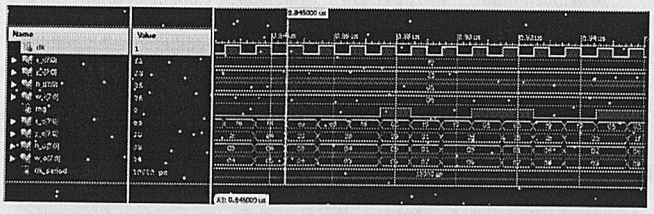

Fig. 3. Experimental results showing result of particle update in modelsim

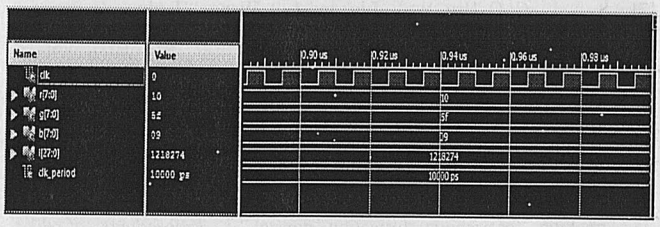

Fig. 4. Experimental results showing result of log likelihood in modelsim

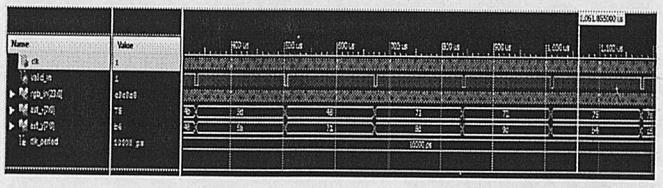

Fig. 5. Experimental results showing result of estimated center position of object in modelsim

The experimental results of particle update and log likelihood module is shown in Fig 3 and Fig 4 respectively. The result is obtained considering some arbitrary values of R, G and B components. The estimated position of object as shown in Fig. 5 is computed for the target object. The estimation is done on the video frames stored as text file.

VI. CONCLUSION

This paper deals with the object tracking method based on particle filter algorithm. For FPGA implementation the algorithm is optimized for utilization of limited hardware resources. This architecture is designed for parallel implementation using controller for executing finite state machine. This framework can be extended for multiple object tracking.

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Head,
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

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Swati S. Jadhav,PGStudent,Elect. & Telecom Department Smt. KashibaiNavale College of Engineering,Vadgaon(BK) Pune, India

Rohita P. Patil, Asst. Professor Elect.& Telecom Department Smt. Kashibai Navale College of Engineering,Vadgaon(BK),Pune, India

Smt. Kashibai Navale College of Engineering ★ Pune-41.

Head
Dept. of Electronics & Telecommunication Engineering
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A REVIEW ON LANE DETECTION AND TRACKING TECHNIQUES

Pravin T. Mandlik
PG Student, Skncoe, Vadgoan ,Maharashtra,India
Prof A.B.Deshmukh
Assistant Professor, Skncoe, Vadgoan, Maharashtra , India

ABSTRACT:

Most of the people die every year in road crashes due to driver's inattention and not following the traffic rules. The Lane detection systems are useful to avoid the accidents and safety is the main purpose of the system. The main goal of these systems is to detect the lane stripes and to warn the driver in case of the vehicle tend to depart from the lane. Many intelligent vehicles transport systems have the lane detection system as an important element while driving. Therefore, Lane detection and tracking is the challenging task in computer vision. In this paper, the different vision based lane detection techniques and algorithms are discussed. The performance of the different lane detection technique is also compared and studied.

INDEX TERMS: Advance Driver Assistance System (ADAS), Hough Transform (HT), Lane detection, Lane Tracking, Lane departure warning.

I. INTRODUCTION:

Now a day's the road accidents have increased to a great extent. Most of the accidents occur due to driver's negligence and carelessness while driving. Advance driver assistance system (ADAS) plays an important role in providing safety to drivers. It helps to automate the car system and increases the driving experiences. The Advance driver assistance system provides a safe system to reduce the road accidents. The system takes an active step like warning the driver or takes a corrective action to avoid an accident during the dangerous situation. The Lane Departure Warning (LDW) is an important module in Advance driver assistance system.

In vision based lane departure system, a camera is placed is placed behind the wind shield of the vehicles and images of the road is captured. The white stripes on the road are interpreted and lanes are identified. Whenever the vehicle goes out of the lane then the warning is given to the driver. In lane departure warning system, the lane detection is the initial step to be taken. There are two classes of approaches used in lane detection: the feature based approach and the model based approach. The features based approach detects the lane in the road images by detecting the low level features such as lane edges or painted lanes etc. This approach requires well painted lines or strong lane edges, otherwise it will fail. This approach may suffer from occlusion or noise. The model based approach use geometric parameters such as assuming the shape of lane can be presented by straight line or curve. This approach is robust against noise and missing data. [1][3]

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Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

II. LANE DETECTION AND TRACKING ALGORITHMS:

In this section the various tracking algorithm for lane detection is discussed. The Table below summarizes and presents the various lane detection and tracking algorithms.

Y. Wang, E. K. Teoh and D. Shen [1] introduced "lane detection and tracking using b-snake". Here lane detection and tracking is proposed without using any cameras parameters. B-Spline can form any arbitrary shape by a set of control points so the B-Snake based lane model is able to describe a wider range of lane structures. By using the knowledge of the perspective parallel lines the problems of detecting both sides of lane markings (or boundaries) have been merged here as the problem of detecting the midline of the lane. For providing a good initial position for the B-Snake, a robust algorithm called CHEVP is proposed. Also to determine the control points of the B-Snake model, a minimum error method by Minimum Mean Square Error (MMSE) is proposed by the overall image forces on two sides of lane. This method is robust against noise, shadows, and illumination variations in the captured road images. It is applicable to the dash and the solid paint line roads also to the marked and the unmarked roads.

M. Aly [2] introduced "A Real time detection of lane markers in urban streets". It is a real time, efficient and robust algorithm in urban streets for detecting lanes. The top view of the road images is generated using the inverse perspective mapping to reduce the perspective effect. Selective Gaussian kernel is used to filter the top view of the road image .Then RANSAC fitting technique is used to detect the lanes. This technique gives good result in all-weather condition but still there are some false positives. The drawback of these techniques is that it does not gives well accurate results for lane detection.

C. Mu and X. Ma [3] introduced "Lane detection based on object segmentation and piecewise fitting". The image captured by the camera is then converted to grey scale using piecewise linear transformation method. The region of interest (ROI) is obtained by the OTSU segmentation method. Then the sobel edges detection is used to detect the lane in the road images. This technique is robust in the presence of noise, shadow, lack of lane painting and changes of illumination conditions.

Parajuli, M. Celenk and H. Riley [4] introduced "Robust lane detection in shadows and low illumination conditions using local gradient features". Here individual frame is extracted from the video and process each frame to detect and track road lane stripes.
Then using vertical gradient of the image the shadow along the road is removed. This technique can locate precise lane marking points on each horizontal and curve stripes. The disadvantage of this technique is that it cannot detect the any high dynamic range portion of the image.

Y.Li, A.Iqbal, and N.R.Gans [5] introduced "Multiple lane boundary detection using a combination of low-level image features". To detect the edges in ROI, Canny edge detector is used. The straight lines are detected from the binary output of Canny edge extractor using

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Hough transform. To eliminate effect of noise local maxima features are searched along the estimated lane boundary. Then RANSAC algorithm is applied to eliminate outliers. The final local maxima features are fit into a straight line. Next Kalman filter is used to track the lanes in remaining frames.

J.Wang, T.Mei, B. Kong, and H.Wei [6] introduced "An approach of lane detection based on Inverse Perspective Mapping". Here uses an overall optimal threshold converting the input image to binary. Inverse perspective mapping is done to avoid the perspective effect. Then K means clustering is performed to partition n samples to k clusters. Considering all the points in a cluster as control points, B-spline fitting is implemented to obtain lane marker.

S. Srivastava, M. Lumb, and R. Singal [7], "Improved lane detection using hybrid median filter and modified Hough transform". The main objective is to integrate lane detection algorithm with improved Hough transform and HMF to improve the results when noise is present in the signal. The main objective is to integrate lane detection algorithm with improved Hough transform and HMF to improve the results when noise is present in the signal. The method developed is working efficiently and gives good results in case when noise is not present in the images.

Bing Yu, Weigong Zhang, and Yingfeng Cai [8] introduced "A lane departure warning system based on machine vision". Firstly the Gaussian filter is used to remove the small noise in the road images. Then the dynamic threshold Value is judged by histogram statistics. And the linear parabolic model fitting is conducted to detect the lane from the road images. The lane departure decision is made on the basis of an angle between lanes and the horizontal axis. In this algorithm less parameters
are needed to detect the lane departure compared to TLC or CCP.

Qing lin, Y. Han and H. Hahn [9] introduced "Real time lane detection based on extended edge linking algorithm". This method is based on Region of interest (ROI). First the region of interest is determined and then sobel operator along with non-local maximum suppression is used to find the edges pixels. After detection of edges, then extended edges linking based on direction edges closing is done. The raster scan is performed to find out the starting point of edge. Then edges tracing is carried out and adding the pixels along the orientation to fill the gaps. The edges with length less than 15 pixels are removed out. Next step is to detect the color of the lane markers using lane hypothesis verification. After that Hough transform is applied to determine the values of θ and ρ.

V. Bottazzi et. al. [10] introduced "Adaptive region of interest based on HSV histogram for lane marks detection". The lane detection method is based on the histogram. Using a prior triangle model a dynamic region of interest is determined. First step is to calculate the histogram of the whole image and the road frame. The illumination changes are found out using the difference between the two images. The lane markers are segmented from the ROI. Lucas Kanade tracking is used to track the lanes.

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C. Guo [11] introduced "lane detection and tracking in challenging environments based on a weighted graph and integrated cues".
First the input image is converted to inverse perspective image and then multiscale lane detection is done on images. Normalized cross correlation is used to find out the similarity of corresponding pixels. Learning algorithm is used to find out whether the lane marking is painted or not. Then weighted graph is constructed by integrating the intensity and the geometry cues.
The weighted graph corresponds to pixels of a lane point. Using particle filter the lane boundary is determined. This algorithm is suitable for curve lanes, splitting and merging lanes.

Y.C. Leng and C. L. Chen [12] introduced "vision base lane departure detection system in urban traffic scenes". The Sobel operator is used to detect the edges. Then Hough transform is used to detect he straight lanes. Lanes sometimes appear to intersect in road images. Then width of the lane differs at the different height of the images. The width lane is between the minimum and the maximum values. The left and right lane boundaries width is determined based on the width of the lane. Then the lane departure can be determined by position of the lane boundary.

H. Jung et. al. [13] introduced "An Efficient lane detection algorithm for lane departure detection". Here the image is partitioned into two rectangular regions. The lane markers appearing diagonal are detected using diagonally directional steerable filter.
Then the left and right lanes are computed. The lane converges at the vanishing point as they in parallel. Then hypothesis is verified of the detected lanes. By determining the distance between the vanishing point and the horizontal line, the lane departure can be determined.

S. Zhou et. al [14] introduced " A novel lane detection based on geometrical model and Gabor filter". This algorithm contains three modules: lane model generation, parameter estimation and matching. The lane model contains the three parameters: lane width, original orientation, lane curvature and the middle line. Finally the lane model is obtained using the lane width. Vanishing point is detected using Gabor texture analysis, to estimate the lane parameters. Then Gaussian model is used to obtain the single vanishing point. The width and the orientation of the lane are estimated after vanishing point is detected. Then the canny edges detector and Hough transform is used to detect the lane boundaries. At last matching algorithm is used to detect the curvature of the road.

H. Tan et. al. [15] introduced "A novel curve lane detection based on improved river flow and RANSAC". First, Inverse perspective mapping is done on the input image. Then the ROI is divided into two regions: near vision field and far vision field. Straight lines are detected using Hough transform from the near vision field. Then improved river flow is method is used in far vision field to extend the point detected in near vision field. The RANSAC algorithm is used to model the detected feature points in hyperbola pair model.

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V. Gaikwad and S. Lokhande [16] introduced "lane departure identification for advance driver assistance". The image captured by the camera is first processed using piecewise linear stretching function. It increases the contrast level of the lane image. The OTSU method is used to select the threshold values. Then 40% ROI is segmented and partition into two parts. The lane identification and tracking is done using the Hough transform. Then the lane departure is determined using the Euclidean distance. This algorithm proves good in detecting straight and curve roads.

Table I: Comparison of Various Lane Detection and Tracking Algorithms

METHODS	PREPROCESSING	DETECTION	TRACKING	ADVANTAGES	DRAWBACKS
Y. Wang et. al. [1]		Canny/Hough Estimation of vanishing points		This algorithm is proposed without using camera parameters	The problem of detecting the mid line of the lane
M. Aly [2]	Inverse perspective mapping, Selective oriented Gaussian filters	Hough transform and RANSAC spline fitting		Comparable results to algorithms using both detection and tracking	In presence of stop lines at cross walks, nearby vehicles detection not proper
C. Mu et. al. [3]	Piecewise linear transformation	Segmentation by OTSU method and threshold selection	Sobel edge detection and lane markers detection by piecewise fitting	Good lane detection during the dim light environment	little false lane detection results because feature based method is usually affected by intensity of image
Parajuli et. al. [4]	Local gradient features	Linear prediction model		This method is to track the road lane markers of various shapes (curved or straight) and locate precise lane marking points on each horizontal and other low illumination conditions.	It gives more false alarms.
Y.Li et. al. [5]	Edges feature extraction and grouping	Kalman filter and Hough transform		Suitable for straight roads	Poor performance in heavy traffic and confusing road textures
J.Wang et. al. [6]	Threshold method (OTSU method)	Inverse perspective mapping		Urban lane detection	Not susceptible to interference effect
S. Srivasta-va et. al. [7]	Hybrid median filter	Edges detection algorithm	Hough transform	Computational complexity of Hough transform is optimum	This method fail to give efficient results when there is any kind of noise in road images.

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Bing Yu et. al. [8]	Gaussian filter	Linear parabolic model		Less parameters are used to detect lane departure than CCP or TLC	Complex roads cannot be detected
Qing lin et. al. [9]	Sobel operator with non maximum suppression	Directional edges gap closing and Hough transform		Adaptive to various road conditions	False lane detection also occurs
V. Bottazzi et. al. [10]	Histogram	Segmentation	Lucas Kanade tracking	Robust in illumination changes	High false positives rate
C. Guo [11]	Cascade lane feature detector	Catmull Rom splines	Particle filter based on weighted graph	Robust in various lightening and weather condition.	
Y.C. Leng and C. L. Chen [12]	Sobel operator	Hough transform		Suitable for urban roads	
H. Jung et.al. [13]	Steerable filter	Haar like feature		Robust in illumination changes	
S. Zhou et. al. [14]	Lane model is obtained using the camera parameters	Gabor filter based lane matching algorithm		Robust in noise and shadows	
H.Tan et. al. [15]	Improved river flow	Hough transform		Suitable for straight and curve road	
V. Gaikwad et.al. [16]	Piecewise stretching function	Hough transform		Suitable for straight and curve road	It cannot denote which lane departure occurs.

III. PERFORMANCE ANALYSIS PARAMETERS USED FOR LANE DETECTIN AND TRACKING:

The performance evaluation of the lane detection and tracking algorithm can be done by determining whether there is a true positives (TP), false positive (FP), true negative (TN) and false negative (FN) after comparing with the ground data set. When the true ground data set is determined by the algorithm then true positive occurs. False positives occur when the lane markers are detected by the algorithm and there is no ground truth exists in the image. False negatives occur when there ground truth exists in the image and the algorithm does not detect it. True negative occurs when there is no ground truth exists in the image and the algorithm is not detecting anything in the image.

The common metrics used for evaluating the performance of the lane detection are precision, recall, accuracy and receiver operating characteristics (ROC) [17][18]. Precision is the fraction of the detected lane stripes to the actual lane stripes. Recall is fraction of the actual lane stripes to the detected lane stripes. Accuracy the measure of the how well the lane stripes are correctly detected compared to other algorithms. The ROC is the curve plot that examines the relation between the true positive rate and the false positive rate.

$$\text{Precision} = TP/(FP+TP) \quad (1)$$

$$\text{Recall} = TP/(TP+FN) \quad (2)$$

$$\text{Accuracy} = (TP+TN)/(TP+TN+FP+FN) \quad (3)$$

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IV.CONCLUSION:

The detailed analysis of various lane detection and tracking algorithm is discussed. Different methods and techniques presented by different authors for the lane detection and tracking during the last decades are presented in the paper. Various performance parameters required to detect the accuracy of the algorithm is discussed in these paper. The lane detection techniques play a significant role in Advance cruise control. The vision based approach is very easy and simple approach for detecting lanes. A lot of advancement has been done in the lane detecting and tracking but still there is a scope of enhancement due to wide variability in the lane environments.

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Hardware–In–Loop Test Bench Based Failure Mode Effects Test Automation

Renuka M. Kulkarni[1], Rohita. P. Patil[2], Chidambar Rao Bhukya[3]

PG Student, Elect. & Telecom. Department , STES's Smt. Kashibai Navale College of Engineering, Pune, India[1]

Asst. Professor, Elect. & Telecom. Department, STES's Smt. Kashibai Navale College of Engineering, Pune, India[2]

Cummins Emission Solutions, Cummins Technologies India Pvt. Ltd., Pune, India[3]

Abstract: The after-treatment system is used to make exhaust gases less hazardous to environment. It consists of set of sensors and actuators. Due to harsh working condition, the system needs to be tested against large number of possible faults. The correct working of set of sensors and actuator is ensured with failure modes effects tests (FMET). The conventional manual FMET is time consuming and prone to manual errors. In order to reduce the testing time and manual errors the Hardware – in – loop (HIL) system is developed and automated. The HIL system uses NI TESTSTAND and NI LabVIEW to automate the conventional FMET process. The system is implemented on engine emulator called Load-box User Interface System (LUIS Bench) and FMET box. The developed Hardware – in – loop system is more accurate and reduces the testing time significantly.

Keywords: After-treatment, Hardware – in – loop system, Failure Modes Effects Tests and LUIS

I. INTRODUCTION

A very high horsepower engines such as 160HP, 60HP, 23Hp are used for heavy duty, medium duty and light duty vehicles. The dominant exhaust gases from these vehicles are Oxides of Nitrogen i.e. NO_X and particulate matters. It is a mixture of extremely small particles and liquid droplets which come out with exhaust gases from the automobile engine. Particulate matter is also known as particle pollution or PM. It is a mixture of extremely small particles and liquid droplets which come out with exhaust gases from the automobile engine.

In high horsepower engines, the particulate matters concentration is reduced within the engine itself making the compromise with increased NO_x. After-treatment system is necessary to control the environmental pollution due to emission of NO_x from this engine. In order to reduce the NO_x, urea solution is sprayed over the exhaust gases with the help of doser which convert NO_x into N_2 and H_2O (water). Urea solution called as diesel exhaust fluid contains 32.5% of urea and 67.5% of distil water. In order to provide the error free dosers the correct testing of the doser is required. The Hardware-in-loop system is developed and automated to reduce the testing time and to improve the testing results.

A. Hardware – in – loop system

The hardware – in – loop (HIL) testing can be used for great range of systems from simple embedded systems such as room temperature controllers to sophisticated embedded systems like the dosing system consisting of large number of sensors and actuators [1].
Figure 1 illustrates the generalized block diagram of HIL testing. The required system is simulated as the HIL system and its operation is controlled through the connected controller. The hardware – in – loop system involves the advantage of the testing of embedded system in cost effective, repeatable and controlled manner. Even when the end system is not ready, the HIL methodology allows development of ECUs. If the vehicle is also ready in that case the HIL system reduces the iteration time. It is found that in automobile industries the testing of ECUs through HIL is easier and efficient than testing on real vehicle.

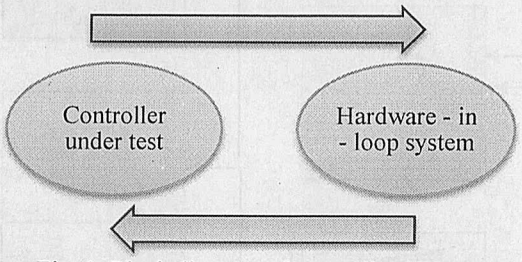

Fig. 1. Block diagram of generalize HIL system

As the probabilities of accident are more in real environment "in-vehicle" testing, the use of HIL, in development and validation of ECUs reduces human risk factor. The combination of virtual prototyping and physical environment can be described as a HIL system.

B. After – treatment system

There are three types of methods developed so far to reduce the hazardous exhaust gases coming out of engine –

- Exhaust Gas Recirculation (EGR)
- Diesel Particulate Filter (DPF)

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- Selective Catalytic Reduction (SCR) technology

Exhaust Gas Recirculation (EGR) method was used as an after-treatment system for exhaust gases reduction in the internal combustion engines [3] It reduces a nitrogen oxide (NO_x) emissions and used in petrol, gasoline and diesel engines. EGR recirculates a portion of an exhaust gas coming out from engine back to the engine cylinders. As the EGR caused combustion chamber temperatures reduces, the amount of NO_x the combustion generates also gets reduced. It reduces the engine efficiency.

Another after-treatment system for automotive is a Diesel Particulate Filter (DPF) with Selective Catalytic Reduction (SCR) technology [2]. It removes over 90% of particulate matter (PM) from the exhaust gases. But it increases the NOx level.

The recent innovation is the SRR i.e. Selective Catalytic reduction system in which the Urea Dosing system is used to reduce the NOx proportion and Particulate matter concentration is reduced in the engine itself.

II. HARDWARE – IN – LOOP SYSTEM DEVELOPMENT

The proposed system is to develop Hardware-in-loop Test Benches for the simulation of sensors and actuators inside DOSER with the help of Load-box User Interface System (LUIS) and its GUI along with the automation of tests using NI TEST STAND. Fig 2 describes the block diagram of the system

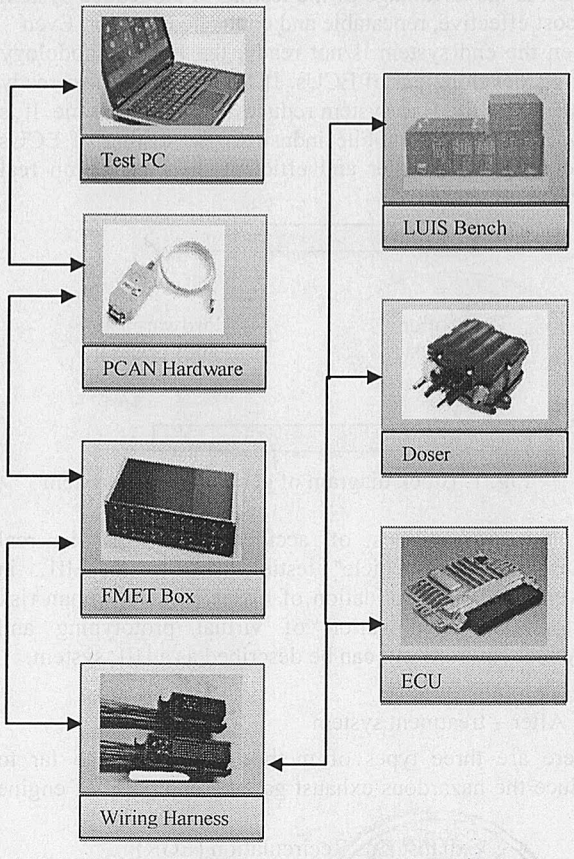

Fig. 2. Block diagram of the system

It consists of Doser, PCAN adapter, ECU, LUIS Bench, FMET box, etc. The sensors and actuators inside the DOSER are controlled through the Electronic Control Unit (ECU). The communication between the ECU and the DOSER unit takes place through the component called PCAN which works on the CAN protocol. The blocks of the Fig. 2 can be elaborated as below –

A. Doser

DOSER is the core part of After-treatment system used as a sprayer to spray urea.. Air-Assisted Urea Dosing System, UA2 is a dosing system that accurately injects a 32.5% solution of urea in water which is also known as Diesel Exhaust Fluid (DEF), into the exhaust stream[4]. The urea mixes with the exhaust gases by utilizing heat from the exhaust and then gets decomposed into ammonia. The ammonia reacts with the SCR catalyst and converts NOx in the exhaust stream into harmless nitrogen and water.

The dosing system consists of various sensors and actuators inside it as shown in Fig. 3. The sensors are temperature sensor, pressure sensor and mixed air pressure sensor. And actuators are bypass valve, metering valve, Air shut off valve and pump motor.

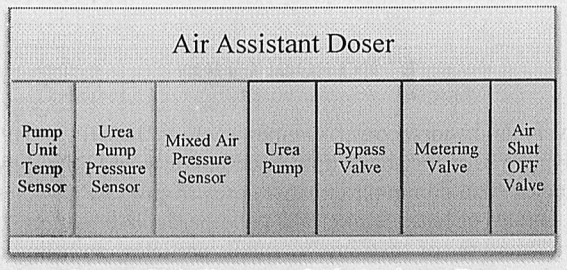

Fig. 3. Block diagram of Air Assistant Doser

B. PCAN Adapter

It is used to make the communication of the ECU, controlling software and DOSER. It works over CAN protocol i.e. J1939 SAE standard for automotive applications. It is a two wire twisted pair protocol. CAN is a multi-master serial bus standard for connecting Electronic Control Units [ECUs]. These ECUs are also known as nodes. The CAN network requires two or more nodes in order to make successful communication. All nodes are connected to each other through a two wire bus. The wires are nominal twisted pair having characteristic impedance of 120Ω.

C. Electronic Control Unit

Electronic Control Unit i.e. ECU is responsible for all the controlling and decision making operations in the system. While testing it detects whether any fault is generated. If the fault is generated, the ECU communicates over the PCAN adapter with the working computer system to show the status of the fault.

D. Load-box User Interface System

The Load Box User Interface System, LUIS, is an engine simulator which is used to facilitate bench top engine control system hardware and software testing[5]. The second generation LUIS system i.e. LUIS Gen2 provides expanded capabilities from the original LUIS.

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Fig. 4 shows the standard picture of LUIS box.The Load-box User Interface System (LUIS) is used to simulate the characteristics of the sensors and actuators inside the DOSER with the help of modules of the LUIS bench such as main module, wave maker module, analog module, resistive load module, switch module.

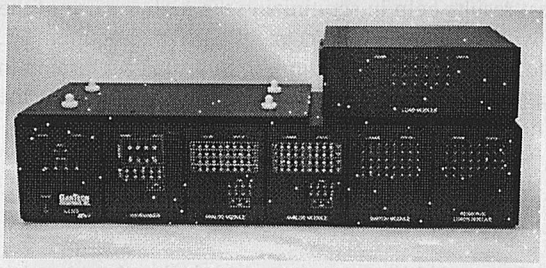

Fig. 4. Load Box User Interface System

E. FMET Box

The FMET box is an electronic relay box. It consists of the electronically operated relays which allow the electrical short and open connection between any two or more pins of the ECU. The relays are operated through the NI teststand software.

III. IMPLEMENTATION AND RESULTS

Fig. 5 shows the complete flow of the system implementation. First step is to understand the conventional set up for the FMET testing and the FMET procedure.

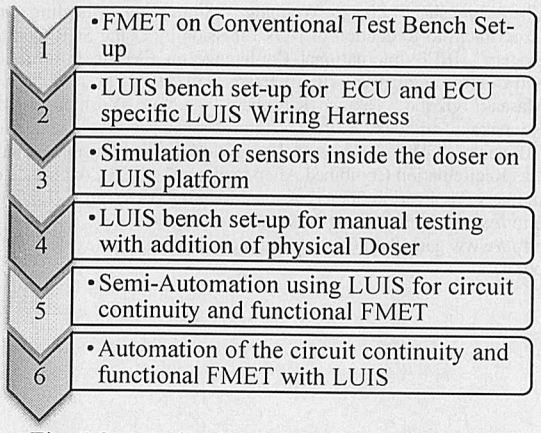

Fig. 5 System implementation flow diagram

The conventional test bench consists of the ECU, Doser, Wiring harness and break out box. The breakout box is just a gateway between the ECU and the Doser. It is used to short or open any pin/s of the ECU or doser. In the second step, the system is set up with LUIS Bench, ECU and ECU specific wiring harness for LUIS Bench. In the third phase the simulation of all the sensors and the required parameters is done on the particular LUIS platform using LUIS GUI. Next step is to add the physical doser in the system because it is required to run the actual doser using LUIS GUI. When the parameter values are changed with the help of simulated sensors, the doser starts operating. This shows the Doser is successfully implemented in the LUIS system.

The next step is to semi automate the system without help of the FMET box. This step is carried out to check whether the implemented system works properly with the NI Teststand sequence. The normal dosing cycle i.e. purge, prime, dose, prime, purge is carried out with the help of NI test sequence and the doser has responded as per the requirement. The PASS result for the normal dosing operation is witnessed with the help of Fig 6(a) and 6(b).

INITIALIZING THE PARAMETERS FOR NORMAL DOSING					
Verify that the parameter H_EPS_n_UserOverride SpeedValue	1200	== 1200	+/- 0	Pass	0
Verify that the parameter H_EPS_s_UserOverrideS peedEnable	1	== 1	+/- 0	Pass	0
Verify that the parameter O_AIM_pc_Urea_TankLv l_Enable	1	== 1	+/- 0	Pass	0
Verify that the parameter O_AIM_trc_Urea_TankT_ Enable	1	== 1	+/- 0	Pass	0
GIVING DOSING COMMANDS					
Verify that the parameter O_USM_flm_DosingCmd _Enbl	1	== 1	+/- 0	Pass	0
Verify that the parameter O_USM_flm_DosingCmd _Val	1	== 1	+/- 0	Pass	0

Fig. 6(a) Normal Dosing – ON

Verify that the parameter O_USM_flm_DosingCmd _Enbl	0	== 0	+/- 0	Pass	0
Verify that the parameter O_USM_flm_DosingCmd _Val	0	== 0	+/- 0	Pass	0
Verify that the parameter H_EPS_s_UserOverrideS peedEnable	0	== 0	+/- 0	Pass	0
Verify that the parameter H_EPS_n_UserOverride SpeedValue	0	== 0	+/- 0	Pass	0
Verify that the parameter O_AIM_pc_Urea_TankLv l_Enable	0	== 0	+/- 0	Pass	0
Verify that the parameter O_AIM_trc_Urea_TankT_ Enable	0	== 0	+/- 0	Pass	0

Fig. 6(b) Normal Dosing – OFF

Then the last phase is complete automation of the system with the help of the electronically controlled FMET Box. This box will turn ON the series of relays so as to short or open the particular pin of the ECU to generate the fault. Again same series of relays is turned OFF to remove the fault. In this manner the complete automation of the failure modes effects tests is implemented.

As a case study temperature sensor shorted to VBATT fault is simulated and removed and the complete test sequence is written in NI Teststand. The algorithm for simulating and removing the Temperature Sensor shorted to VBATT fault is given in Fig. 7. And the PASS results for the fault is witnessed with the help of Fig. 8

The first step is to configure the complete bench set up with the required configuration and calibration file. This is called as total bench configuration. Then next step is to establish the session with the required scripting software tools. Next is initializing the feature test report, monitoring report file.The next is to start the normal dosing, to simulate the fault condition by turning ON the required relay series and to check whether the required fault code is

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activated. If the fault code is activated, it will return value 1 and will update the PASS result in feature test report.After the removal of fault the fault is deactivated returning value 2 and again PASS result is reflected in the feature test report as witnessed in Fig 8.The bar graph for the comparison of time required performing FMET on conventional bench and the automated bench is given in Fig. 9.

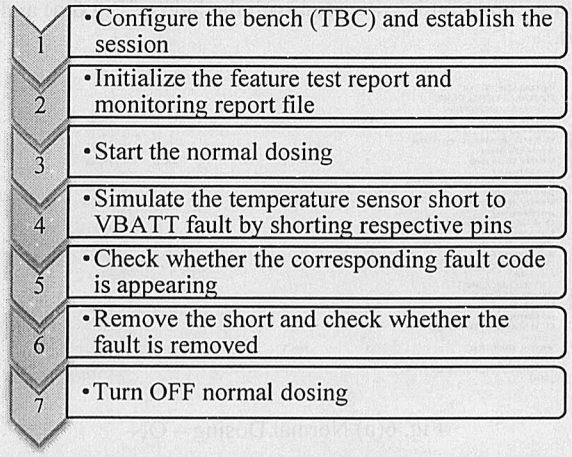

Fig.7. Algorithm for Temperature Sensor Short to VBATT fault

CHECKING FAULT CODE STATUS AFTER MAKING SHORT					
Checking whether Fault Code is appearing	1	==1	+/- 0	Pass	0
CHECKING FAULT CODE STATUS AFTER REMOVING SHORT					
Checking whether Fault Code is appearing	2	==2	+/- 0	Pass	0

Fig. 8 Activation and deactivation of the fault – result

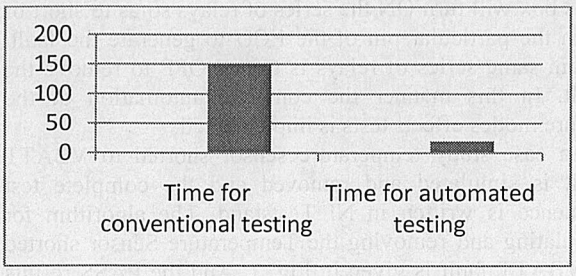

Fig. 9 Comparison between testing time requirements

IV. CONCLUSION

The This paper implements the novel testing-time reduction approach in the hardware – in –loop devoted for the testing of the doser i.e. after treatment system developed for the heavy duty, medium duty or light duty vehicles. The developed HIL automated system articulate the industrial real time emulator. It simulates the required fault condition and removes them according to the testing requirements of the failure modes effects tests. It provides same results as the conventional bench failure modes effects testing in less time.

The test results help in scrutinizing the performance of the doser with various ECUs under tests per the requirement. This automated hardware – in – loop testing performed in the reproducible, controlled and efficient way create the real time environment.

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Embedded System Design for Canal Gate Automation

Shashikumar P. Tale[1], A. R. Khaladkar[2], Mukesh Arora[3], S. K. Shah[4]

PG Student, Dept. of E & TC, STES Smt. Kashibai Navale College of Engineering, Pune, India [1]

Scientist C, Central Water and Power Research Station, Pune, India [2]

Scientist B, Central Water and Power Research Station, Pune, India [3]

HOD PG, Dept. of E & TC, STES Smt. Kashibai Navale College of Engineering, Pune, India[4]

Abstract: The water discharge from the canal depends on the various canal parameters viz. upstream water level, downstream water level, canal dimensions, etc. For the correct water distribution, the upstream and downstream water levels need to be maintained properly. Continuous discharge of water at constant rate is can be achieved by keeping the difference between upstream and downstream water levels constant. The canal gate opening needs to be corrected according to the changes in the upstream water level, desired water discharge, flow rates, etc. The Proportional Integral Derivative (PID) control algorithms are robust and efficient to achieve zero steady state error. Thus in order to maintain the correct the gate position, PID algorithm can be used. A PID algorithm based embedded system is implemented to maintain the upstream water level in the canal at constant desired level. The implemented system maintains the desired upstream water level within the acceptable tolerance limits.

Keywords: Upstream water level, downstream water level, canal dimension, PID algorithm.

I. INTRODUCTION

With the rapid increase in human population and the increasing industrialization the water resources are consumed heavily. Thus the water is becoming a more care resource over the world. As the population is growing and the economy is increasing, the direct fresh water consumption viz. the drinking water, water for washing is increasing dramatically. The indirect water uses like the irrigation water for industry and agriculture is also increasing. Thus, a proper management of water consumption and the available water is very necessary for sustainable development. Hence more accurate and flexible irrigation canal systems are required.

The proposed system automatically maintains the upstream water level to the desired set point for a given flow of water in the canal. Also provides the adaptive measure to control the response of the system for minimizing the system oscillations.

A. Downstream Water Level Control Method

In the downstream control method the canal gate structure is operated to control the downstream water level of the canal pool.When the downstream water level shows the deviation from the desired set point, the information is communicated to the controlling structure at upstream point. The controlling structure then takes corrective action to compensate the downstream error. For the positive error the upstream gate should open and for negative error the canal gate should closed appropriately.

B. Upstream Water Level Control Method

In the upstream control method the situation is exact opposite to that of downstream water level control method. In this, the canal gate structure is operated to control the upstream water level of the canal pool. When the upstream water level shows the deviation from the desired set point, the information is communicated to the controlling structure at downstream point. The controlling structure then takes corrective action to compensate the upstream error. For the positive error the upstream gate should close and for negative error the canal gate should open accordingly.

II. RELATED WORK

The PID algorithm is very robust and effective in control system. It is widely used in closed loop systems where a particular system variable needs to maintain the desired set point value. Some such closed loop systems are discussed below.

A downstream control in canal automation using software approach is discussed in [1]. In this a PID algorithm is developed using the PID controller tool set of LabVIEW software. Also it discusses about the NI MyRIO real time processor having NI LabVIEW and its features for development of canal automation system based on PID algorithm.

An upstream control in canal automation using PI controller is discussed in [2]. PI controllers are the special case of PID controllers in which the D i.e. derivative gain is kept zero. In this paper velocity form of PI logic is presented. A new concept of universal factor is introduced which accounts for the nonlinearity in the water level to gate response. The tuning of PI logic over widely varying flow rates is presented in this paper.

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An adaptive PID algorithm to control the speed of a separately excited DC motor is discussed in [3]. In this paper, a dynamic sliding mode control technique along with the PID algorithm is introduced for DC motor control. Also the improvement in performance by the use of adaptive feature of PID is discussed along with the simulation results.

A DC motor speed control using linear quadratic regulation (LQR) is discussed in [4]. In this paper the linear quadratic regulation (LQR) based tuning of the gains of PID is given. Also, the state weighting matrices method of LQR for finding the set of optimal PID gains is introduced. It is used for second order plus time delay (SOPTD) process utilizing the pole placement techniques.

A self-tuning PID control for permanent magnet synchronous motor (PMSM) is discussed in [5]. An energy-based approach to PMSM control with parameters self-tuning PID control is introduced. The self-tuning PID achieves good speed tracking motion by keeping the system's total energy to the desired value. The port-controlled Hamiltonian structure of PMSM system is presented.

A PID controller designed for position control of DC servo-motor is discussed in [6]. An Integral-Square-Error (ISE) minimization method is introduced which. The formulated ISE is minimized using the Luus-Jaakola (LJ) algorithm. Also, the results of LJ algorithm are compared with the Ziegler-Nichols (ZN) algorithm.

A novel feedback mechanism for the conventional proportional integral controller is discussed in [7]. In this paper current regulation using PI controller which is PID controller with derivative term zero is given. Also an approach to eliminate the steady-state error of the grid current at the fundamental frequency is presented.

There are a number of methods for tuning the PID parameters. The response of the PID algorithm depends on the values of the PID parameters. The response requirements of the different systems differ widely. There is no specific method of parameter tuning which will suite for all the systems. The different tuning methods are discussed in following paper.

The different recent PID parameters tuning methods required for design of PID controller are discussed in [8]. The tuning methods like Ziegler-Nichols (ZNI) method, Kappa-tau tuning, Pole placement, D-partitioning, Nyquist based design, PID tuning using the theory of adaptive interaction, Methods based on cancellation, K-B parameterization, Frequency loop shaping (FLS) method are discussed along with their advantages and disadvantages.

III. CANAL GATE AUTOMATION SYSTEM

The figure 1 shows the block diagram of Canal Gate Automation System which consists of water level sensor, Controller which works on PID algorithm, Motor driver and Shaft encoder. The system is designed around Arduino MEGA 2560 controller board. It runs the PID algorithm, takes water level from HC SR05 sensor and drives the motor through designed h-bridge motor driver. The ultrasonic transceiver modules are used for measuring the upstream and downstream water levels. The upstream water level is of more interest as the canal models use mainly the upstream water level control methods. The ultrasonic signals are the signals with the frequencies above 20 kHz. The human ear has upper audible limit of 20 kHz so cannot hear the ultrasonic sound. The ultrasonic sensor module HC SR05 is used for measuring the water levels.

The ultrasonic module HC SR05 is used for measuring the water level in the canal. The module has four pins viz. VCC, GND, ECHO and TRIGGER. A supply of 5V is sufficient for the normal module working. A high pulse of 10μs is needed to be fed to the TRIGGER pin to start the module functioning. When a trigger pulse is supplied to the module it transmits a burst of 40 kHz ultrasonic sound and makes the ECHO pin high till it receives back the corresponding echo signal. The duration of the high pulse gives the time (T) taken by the burst to traverse the path from module to target and back to module. Thus, the distance (D) of water level from the module can be calculated as:

$$\text{Distance (D)} = \frac{\text{velocity (v) of sound in air}}{0.5 * T}$$

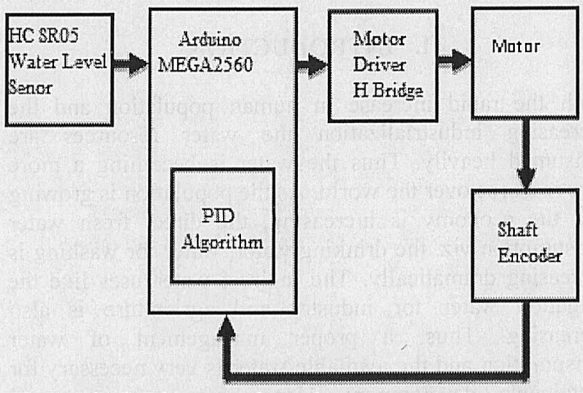

Fig 1: Block Diagram of canal gate automation system

The velocity of sound in dry air is around 343m/s. The actual water level (h) in the canal is computed by subtracting the distance (D) from the depth D_0 of the canal base.

$$\text{Height of Water (h)} = \text{canal depth } (D_0) - \text{Dist (D)}$$

The flowing water produces continuously changing dynamic waves which differ in heights. This creates random fluctuations in determining the water height in canal. The effect harmonics causes deviation from the true value of the water level. This effect can be minimized by taking a number of samples $(S_1, S_2, S_3, \ldots, S_n)$ and finding the mean S_m of their total. It is given by:

$$S_m = \frac{S_1 + S_2 + S_3 + \cdots + S_n}{n}$$

where n is number of samples. The mean value S_m gives the water level close to the true value of the actual water level.

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The PID algorithm is a robust, flexible control algorithm which leads the closed loop system towards the zero steady state error. The response of the PID algorithm depends on the P, I, D coefficients and the error (e) which is the deviation of actual process variable and set point. The upstream water level is the process variable in the proposed system. The PID algorithm program is dumped in the microcontroller. Thus, it acts as the PID controller. The P, I, D and the desired set point are fixed through programming. The controller gets the input from the level sensors. The controller determines the difference between the actual water level and the set point upstream water level. This gives out the amount of error signal. The controller then computes the amount of response required to achieve zero error signal.

A 12V DC motor is used to drive the mechanical gate control structure. The motor shaft drives the geared assembly which reduces the load on motor shaft. The canal gate is attached directly to the geared assembly. The motor draws high current due to loaded condition. The motor is controlled through pulse width modulation (PWM). In order to drive the motor with high current through pulses a motor driver is necessary. The commercially available high current PWM H-Bridge motor drivers ICs are expensive. Thus, a custom high current PWM controlled H-Bridge circuit is designed. It contains 2 PNP and 2 NPN power transistors, 4 base current control registers, 4 freewheeling diodes to pass back electromotive force and heat sinks as pulsating high currents heats up the power transistors.

The gate needs to be driven precisely to produce the correct output deviation. Thus, for the controlled shaft rotations the shaft encoder is attached with the motor shaft. The shaft encoder contains a circular opaque disk with small hole on its perimeter. There are two LEDs and two phototransistors on either side. It tracks the direction and amount of rotations of the motor. The data related to the gate opening is thus tracked using shaft encoder which feeds to the controller.

IV. SYSTEM FLOW

Logic flow of system is as follows and shown in figure 2.

1. Initially the values of P, I and D coefficients are determined and set.
2. The upstream water level is continuously read.
3. The deviation of the upstream water level from the set point is computed.
4. The PID algorithm computes the response as per the error signal value generated because of the difference between the desired water level and actual water level in the canal.
5. The motor is then operated accordingly so that error value tends toward zero.

The shaft encoder data is read continuously for the period of motor movement. The encoder tracks the direction and number of revolutions of motor.

Steps 2 to 5 are repeated till the upstream water level stabilizes in the allowable tolerance limits.

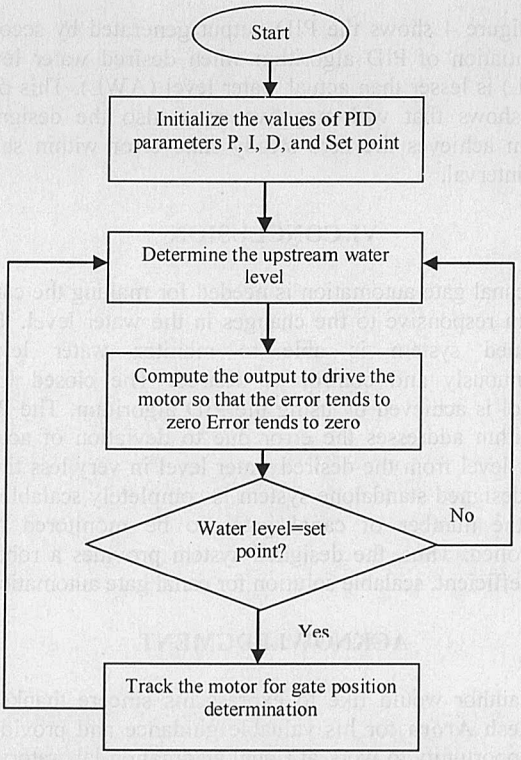

Fig 2: Flow chart of canal automation system

V. RESULTS

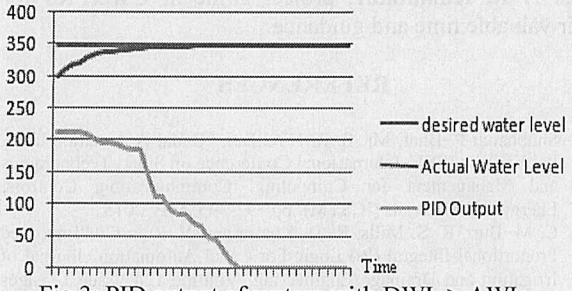

Fig 3: PID output of system with DWL > AWL

The figure 3 shows the PID output generated by first instantiation of PID algorithm when desired water level (DWL) is greater than actual water level (AWL). The above plot clearly shows that with the positive error the designed system achieves the zero steady state error within short time interval. The PID output is a function of the error generated between the two water levels.

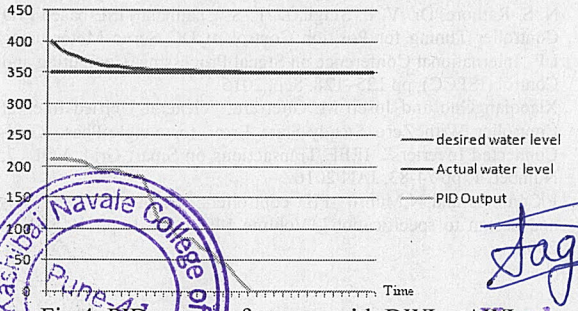

Fig 4: PID output of system with DWL <AWL

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Smt. Kashibai Navale College of Engineering, Pune - 411 041

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The figure 4 shows the PID output generated by second instantiation of PID algorithm when desired water level (DWL) is lesser than actual water level (AWL). This plot also shows that with negative error also the designed system achieves the zero steady state error within short time interval.

VI. CONCLUSION

The canal gate automation is needed for making the canal system responsive to the changes in the water level. The designed system is able to monitor water levels continuously and control as desired. The closed loop control is achieved by using the PID algorithm. The PID algorithm addresses the error due to deviation of actual water level from the desired water level in very less time. The designed standalone system is completely scalable as per the number of canal gates to be monitored and controlled. Thus, the designed system provides a robust, time efficient, scalable solution for canal gate automation.

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A Design Method for Compact Wideband Bandpass Filter for Wireless Applications

Mayur B. Chavan[1], Prof. Rohita P. Patil [2]

PG Student (VLSI & Embedded) SKNCOE, Vadgoan Pune, India [1]

Assistant Professor, E&TC Department, SKNCOE, Vadgoan, Pune, India[2]

Abstract: This paper presents a proposed wideband Bandpass filter (BPF) using multiple mode resonator (MMR).The Bandpass filters are designed for the frequency range of 0.8-2.8 GHz. The brief history of the multiple mode resonators and the evolution of the filter by adding different techniques to enhance the filter performance and also the techniques which are used for miniaturization of the filter size are studied. With the help of this techniques the performance and size have increased and decreased resp. The outputs of various filters are compared with each other for proper analysis of the filter design to study the limitations of the previously proposed techniques. The proposed filter uses the compact structure for Bandpass filter design in ref [5]. The filter is designed and the simulation results of the proposed filter are discussed with respect to its size gain and input return loss.

Index Terms: Bandpass filter (BPF), multiple-mode resonator (MMR, stepped impedance stub load resonator (SISLR, ultra wideband (UWB).

I. INTRODUCTION

SINCE the Federal Communications Committee (FCC) authorized the unlicensed use of the ultra-wideband (UWB) frequency spectrum for short-range and high-speed wireless communication in 2002, tremendous interests in both academic and industrial fields have been attracted to explore various UWB devices, antennas, and systems. To meet the required UWB frequency mask (3.1 to 10.6 GHz), it has been commonly recognized that UWB Bandpass filters (BPFs) with good in-band transmission and out-of-band rejection performances are highly demanded. So far, several prototype UWB filters have been reportedly developed based on varied principles, such as dual-stopband features , composite lowpass-Highpass filter topology , cascaded broad- side-coupled structure and resonance characteristics of Stepped-impedance multiple-mode resonator (MMR).

In a filter with tightened coupling extent via a three-line coupling section originally showed its capacity in realizing a wide passband of 40% to 70%. A wideband passband of 49.3% was achieved in terms of two Stopbands of a filter block with the two tuning stubs on a ring resonator. However, this filter configuration was found theoretically difficult to be directly employed for the design of such a UWB filter with a bandwidth of about 110.0%.UWB passband. A Microstrip ring filter with the dual Stopbands below 3.1 GHz and above 10.6 GHz was constructed to make up the most initial UWB filter. However, this filter in fact has many problematic issues, such as unexpected Passband below 3.1 GHz, narrow lower/upper Stopbands, large size, complexity in configuration, and so on.

It was initially exhibited in that the first two resonant modes of the constituted MMR could be utilized together with the input/output parallel-coupled lines to achieve a 70% wide passband with four transmission poles. The first three resonant modes of an improved MMR were newly constructed to realize five transmission poles with lowered return loss in the whole passband. Then, an improved Microstrip line UWB BPF was presented by forming an alternative MMR with proper loading of three open-ended stubs. The open-ended stubs are introduced at the center of a stepped-impedance resonator to allocate the first two resonant modes more closely with each other. By feeding this resonator with two parallel-coupled lines at two sides, a class of wideband filters with a fractional bandwidth of 60% to 80% was constructed. Open ended stub, placed at center, to a great extent. However, with the use of only a single loaded stub or paired stubs at the central position, these filters have been found to hardly achieve the FCC defined UWB passband with a fractional bandwidth of 110% at 6.85 GHz. Following this work, two identical stubs were in addition introduced at the two symmetrical positions with respect to the central plane. It provided us with an additional degree of freedom to relocate the first four resonant modes within the UWB band while pushing up fifth mode, aiming at achieving sharpened out-of-band rejection skirts and widened upper stopband. All the above mentioned SIR-type UWB BPFs showed good passband performance except the Stopbands suffer the slow increase in attenuation and there were no longer enough degrees of freedom for effective control of resonant frequencies and also suffered from large size. Then the MMR increasing the degree of freedom and miniaturizing the size of the filter were developed in [4], [5].

II. DIFFERENT DESIGN TECHNIQUES FOR DESIGNING UWB BANDPASS FILTER USING MMR

In ref [1], as shown in Fig 1 the initially proposed UWB Bandpass filter using a Microstrip line multiple-mode resonator (MMR) was presented. Here the MMR has been properly modified in configuration so as to reallocate its

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first three resonant modes close to lower-end, center, and upper-end of the targeted UWB passband. Also, the coupling degree of the input/output parallel-coupled line sections is largely raised. At the central frequency of the UWB passband, i.e., 6.85 GHz, the MMR consists of one half-wavelength low-impedance line section in the center and two identical λ/4 high-impedance line sections at the two sides.

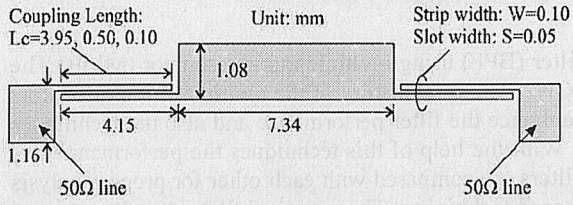

Fig. 1. Schematic of the compact Microstrip-line UWB Bandpass filter

With respect to the configuration, the proposed MMR was categorized as a so-called stepped-impedance resonator (SIR). As a non-uniform transmission line resonator, the SIR was proposed in to enlarge the frequency spacing between the first and second-order resonant modes so as to effectively widen the upper stopband above the dominant passband of a Bandpass filter. Here, all the first three resonant modes are taken into account together and they are applied to make up a wide dominant passband. In this case, the first and third-order resonant frequencies basically determine the lower and upper cutoff frequencies of a wide passband. Further the two additional transmission poles in the λ/4 parallel-coupled lines, a UWB filter can be built up with good insertion and return loss in the entire passband of concern.

Then in ref [2], as shown in Fig 2 the Microstrip line stepped impedance stub loaded MMR was proposed. As discussed in ref [1], the first three resonant modes in the stepped-impedance MMR can be quasi-equally allocated within the concerned UWB passband by adjusting width/length ratios of central-to-side sections. However, this MMR-based filter usually suffers from a high insertion loss of about 2.0 dB in the upper UWB passband and a narrow upper stopband of 11.0 to 14.0 GHz. The former is mainly caused by parasitic radiation from the central part with wide strip conductor at high frequencies, while the latter is due to the 4th resonant mode in this stepped-impedance MMR.

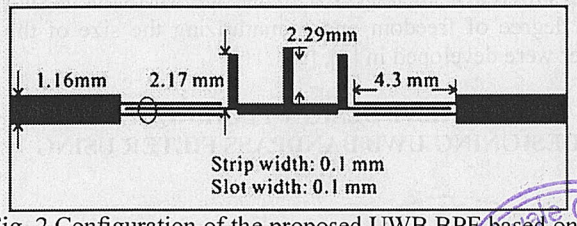

Fig. 2 Configuration of the proposed UWB BPF based on stub-loaded MMR in ref [2].

As shown in Fig.2, the proposed stub-loaded MMR is formed by properly attaching one single open-ended stub in the middle and two identical ones in the two symmetrical positions. The lengths of the central stub and side stubs are indicated by Lc and Ls, respectively. In this way, the first four resonant modes expect to be relocated within the UWB passband while pushing up the fifth mode to make up a wide upper stopband.

Now the novel stepped impedance stub loaded resonator (SISLR) was proposed in ref [3] as shown in Fig 3 to design UWB BPF. The previously mentioned SIR type UWB BPF showed good performance in passband except the Stopbands suffer the slow increase in attenuation and there were no longer enough degree of freedom for effective control of resonant frequencies.

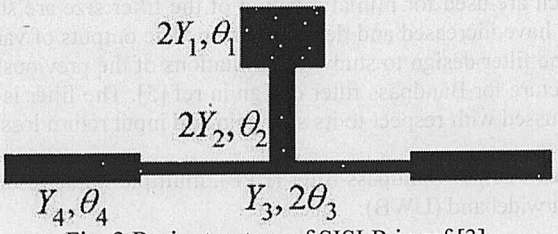

Fig. 3 Basic structure of SISLR in ref [3]

This resonator has more degrees of adjusting freedom to control its resonant frequencies, which results in conveniently relocating the required resonant modes within the UWB band. The basic structure of the proposed SISLR is shown in Fig 3. It consists of a traditional SIR with the characteristic admittance, and electrical lengths and, which is tapped-connected to a stepped-impedance stub (SIS) in the center. The SIS is also made of transmission-line sections of characteristic admittance, and electrical length. Since the SISLR is symmetrical in structure, odd- and even-mode analysis can be adopted to characterize it.

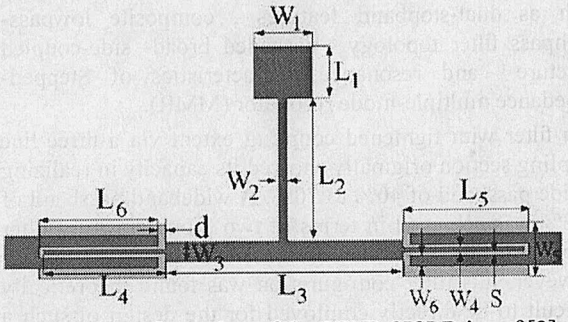

Fig. 3(a): Configuration of the UWB SISLR in ref [3]

Compared with the conventional multi-mode resonator in [1], as shown in Fig 3(a) the filter design had an extra stepped-impedance stub loaded in the center. The performance of the filter was good but was large in size.

Now the filter size miniaturization was the major challenge faced by the design engineers so the Novel UWB Bandpass filter using stub load multiple mode resonator was proposed in ref [4] as shown in Fig 4. The paper had the filter size less as compared to the filter proposed in ref [3]. This filter used a uniform impedance resonator and consisted of the SIS at the center and two

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extra added open stubs at the side of the center stub placed symmetrically around the center. The MMR consists of three open stubs in a uniform impedance resonator, and five modes, including two odd modes and three even modes within the desired band are combined to realize UWB passband.

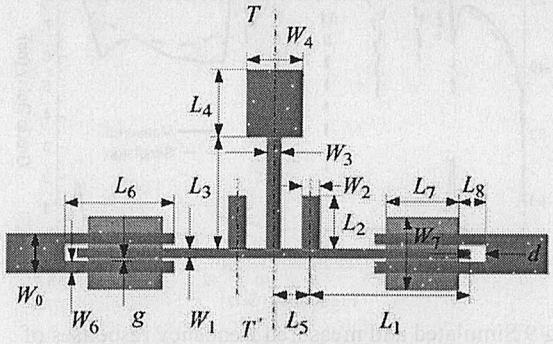

Fig. 4 - Structure of the SISLR in ref [4]

There are five modes, including two odd modes and three even modes within the desired band, and two transmission zeros generated by the stepped-impedance stub are at the lower and upper cutoff frequencies. The two odd modes could be located within the UWB band by properly designing the horizontal uniform-impedance resonator and the two side stubs. Otherwise, the even modes could be flexibly tuned by the stepped-impedance stub while the odd modes are fixed.

In this design method mentioned in ref [5], the size of the filter is further reduced improving the performance of the filter in the passband as well as in stopband.

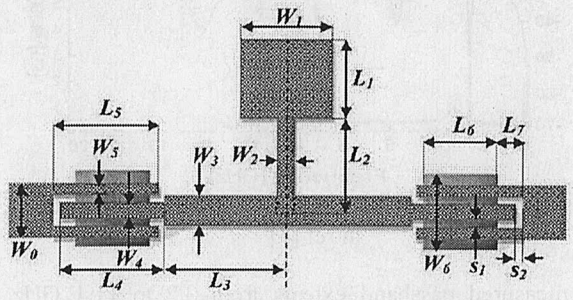

Fig .5 UWB Bandpass filter in ref [5]

The size of the filter is further reduced as shown in Fig 5 compared to the filter designed in ref [4] as shown in Fig 4. Also the technique uses only a single SIS connected at the center of the uniform impedance transmission line and an aperture-backed beneath three inter-digital parallel coupled lines connected at each side of the filter for coupling enhancement. The adopted method leads to a simplified objective function with a minimum number of variables to avoid convergence and implementation problems.

III. COMPARATIVE PERFORMANCE ANALYSIS OF VARIOUS UWB BANDPASS FILTER

In the ref [1], the structure of the filter is shown in the Fig 1 the performance obtained was good as compared to the previously designed filters without MMR. The MMR design had good performance in the passband but slow attenuation in the stop band. The Fig 6 shows the varying effect of the length of parallel coupled line on the gain and the insertion loss varied with frequency. The attenuation obtained is about -30 dB at 1 GHz and less than -30 till 13 GHz from the upper cutoff frequency that is 10.6 GHz

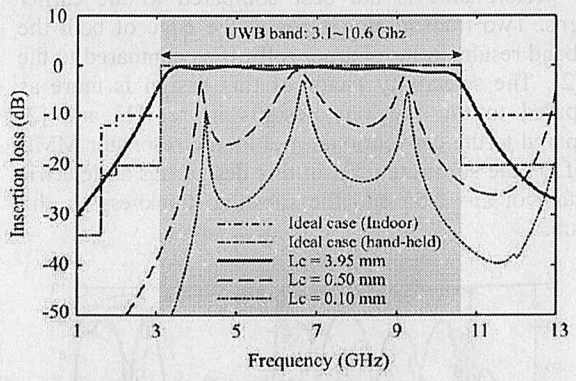

Fig. 6 Insertion loss of the Microstrip-line UWB Bandpass filter with different parallel Coupled line lengths (Lc)

The slope or the roll off of the filter is less so the transition band is more. The filter is fabricated and measured using the substrate dielectric of ε_r=10.8 and height =1.27mm. In the measurement, the lower and higher cutoff frequencies of the fabricated filter are equal to 2.96 GHz and 10.67 GHz. This shows that the relevant fractional bandwidth achieved is about 113%. At the central frequency of 6.85 GHz, the measured insertion loss is found as 0.55 dB. The fabricated and the simulated results are in the good agreement with each other.

The performance of the filter designed in ref [2] is comparatively better as compared to the ref [1]. The filter designed as shown in Fig 2 is fabricated using the substrate RogersRT/Duriod 6010 with the relative permittivity ε_r= 10.8 and the substrate thickness h=1.27. The tool used here for simulation is the Agilent Momentum software and the fabricated filter is measured with universal test fixture and Agilent network analyzer.

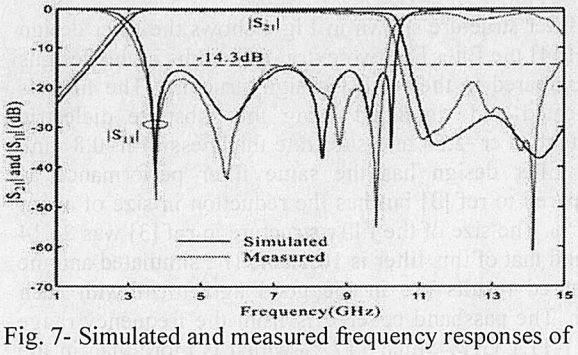

Fig. 7- Simulated and measured frequency responses of the optimized UWB BPF in ref [2]

Compared to the initially designed UWB filter in ref [1] the input return loss is more that is that is -23 dB at 1 GHz where as in ref [1] it is -30 dB. The performance of the filter is increased by increasing the roll off in the upper

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Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

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cutoff frequency i.e. we can observe the attenuation of -35 degree at 11.5GHz in ref[1] the attenuation is -25 dB at 13 GHz. The size of the filter is also reduced in this design to 13.80cm from 15.64cm from design shown in ref [1]. This designed helped to increase the roll-off and also to reduce the size of the filter.

The filter designed in ref [3] as shown in the Fig 3(a) the filter performance is the best compared to the earlier designs. Two transmission zeros at the edge of both the passband results in the sharper roll-off as compared to the ref [2]. The selectivity factor of this design is more as compared to the previous designs in ref [1] and [2] compared to the conventional multimode resonator MMR in ref [1] the substrate used in this design has a dielectric constant of ε_r= 2.55 and the substrate thickness as h= 0.8mm.

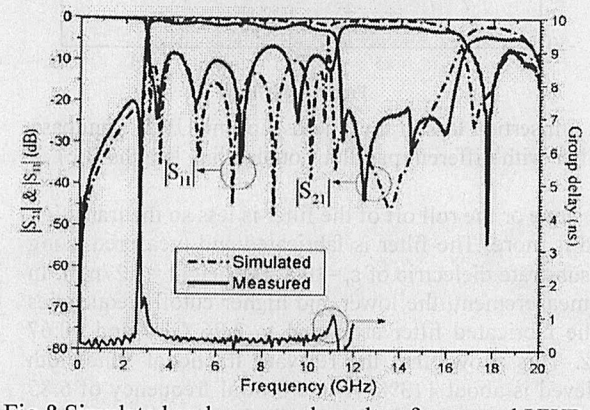

Fig 8 Simulated and measured results of proposed UWB BPF in ref [3]

The measured passband of the measured filter is from 2.90 to 10.90 GHz against the simulated frequency range of passband as 2.92 to 10.72 GHz. The measured return loss is lower than -10 dB for most of the passband of the filter. The major drawback of the design was its large size. The filter designed by this techniques has the best performance compared to the ref [1],[2] but also had the largest size of 24.14 cm as compared with the size of 15.64cm in ref [1] and 13.80 cm in ref [2].

The filter structure shown in Fig 4 shows the filter design of ref [4] the filter has two extra open stubs in the designs as compared to the ref [3] design structure. The filter is fabricated and simulated using the substrate dielectric constant as er=2.55 and substrate thickness of h=0.8 mm. This filter design has the same filter performance as compared to ref [3] but has the reduction in size of about 33.6 %. The size of the filter structure in ref [3] was 24.14 cm and that of this filter is 16.1 cm. The simulated and the measured results are in the good agreement with each other. The passband covered is from the frequency range of 3.1-11.1 GHz which 117 % which is more than in the ref [3] which has fractional bandwidth of 114 %. The measured return loss is less than -10 dB for most part of the passband. The attenuation of the upper stopband is less than -20 dB up-to 17GHz which means the design has an extended stopband as compared to the design results of ref [3]. The selectivity factor of ref [3] is 0.926 and that of this design is 0.921 which means they have the same performance.

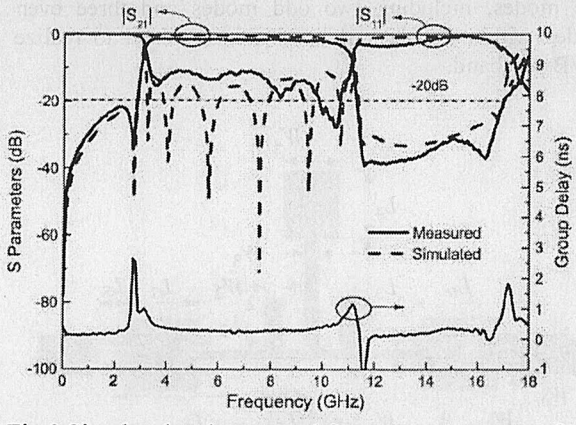

Fig 9 Simulated and measured frequency responses of fabricated UWB BPF.

In ref [5] design structure shown in Fig 5 the filter is simulated using the momentum simulation software and the filter used RT Duriod 5870 substrate having the relative dielectric constant of ε_r=2.33 and substrate height of h= 0.5 mm. The substrates used in the ref [3] and [4] used the substrate having ε_r=2.55 and the substrate height of h= 0.8 mm.

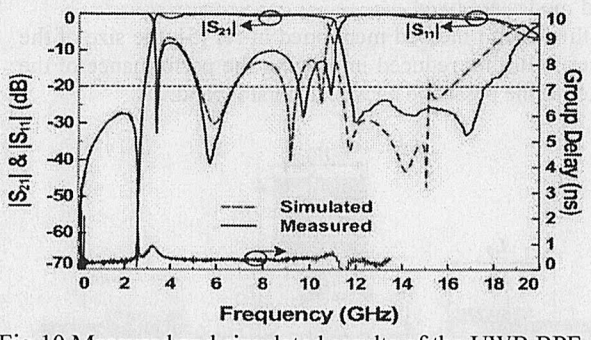

Fig 10 Measured and simulated results of the UWB BPF in ref [5]

The measured passband extents from 3.2 to 11.1 GHz covering a fractional bandwidth of 115 % as compared to 117 % of that of the filter designed in the ref [4]. In addition to good performance of the filter the filter design has the least size amongst all the filter designed earlier. This design has the filter size of 11.72 mm as compared to the filters having size 15.64 mm, 13.80 mm, 24.14 mm and 16 mm in the ref [1], [2], [3] and [4] respectively. The filter has the size reduction of 54.12 % and 27 % compared to the ref [3] and [4]. This design focuses on the compactness and the good performance of the filter.

IV. PROPOSED METHODOLOGY

The proposed design uses the structure of the Bandpass filter designed in ref [5]. The proposed filter is designed for the frequency range of 0.8 GHz to 2.7 GHz. The filter has a good response in the passband of the filter and sharp selectivity after the upper cutoff frequency. The selectivity

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Head
Dept. of Electronics & Telecommunication Engineering
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factor of the filter is 0.9032 as the frequency at -3 dB is obtained as 2.8 GHz and frequency at -30dB is 3.100 GHz.

V.COMPARATIVE ANALYSIS OF FILTERS

TABLE I

Reference	Dielectric	S.F	-3 dB FBW	Size in $\lambda_0 \times \lambda_0$	Size in (mm)
[1]	10.8/1.27	0.642	116 %	0.371× 0.043	15.64
[2]	10.8/1.27	0.594	114 %	0.315×0.061	13.80
[3]	2.55/0.8	0.926	114 %	0.73×0.35	24.14
[4]	2.55/0.8	0.921	117%	0.514×0.312	16.1
[5]	2.33/0.5	0.861	115 %	0.382×0.307	11.72

λ_0 is the free space wavelength at 6.85 GHz. The selectivity factor or skirt factor ref [4] is defined by the ratio

$\Delta f|_{-3dB} / \Delta f|_{-30dB}$ at -3 dB and -30 dB of bandwidth of filter.

The filter size is about 7cm in length and 4 cm in height. The filter is designed using the FR4 material with dielectric constant of er=4.6 and the height of h=1.6 mm. This configuration of the filter is chosen as the filter has to be fabricated in India. The FR4 material of er=4.6 is easily available for fabrication. The minimum spacing between the tracks which can be fabricated in India is 0.2 mm. Hence no length or spacing between the tracks is less than 0.2 mm. The layout of the filter is drawn using ADS layout window and momentum simulation is done to obtain the frequency response of the designed filter.

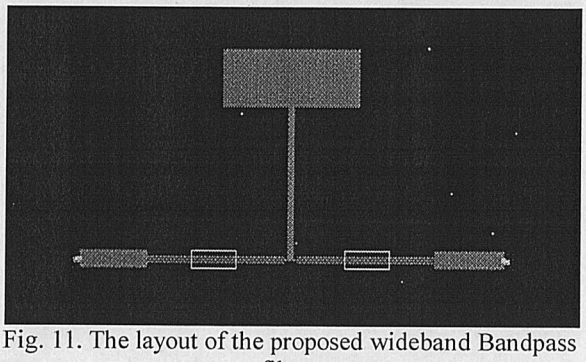

Fig. 11. The layout of the proposed wideband Bandpass filter.

As shown in Fig 11 the filter consist of center stub and a uniform impedance line of $\lambda/4$ at the center frequency of 1.65 GHz. The center stub is connected in the center of the uniform impedance line and the lengths and the widths of center stubs are taken such that the zeros are placed the cutoff frequencies of the filter. The inter-digital coupling is made on both side of the filter to suppress the frequencies after the cutoff frequency and to have a larger stopband. The filter also uses the defective ground structure in which the ground plane is not present below the coupling. The lengths of the defective ground can be obtained by the trial and error method. The defective ground structure minimizes the input return loss of the filter.

The filter gain response shows that the filter has the passband from 0.8 GHz to 2.7 GHz. The filter has an insertion loss of about 0.5dB.

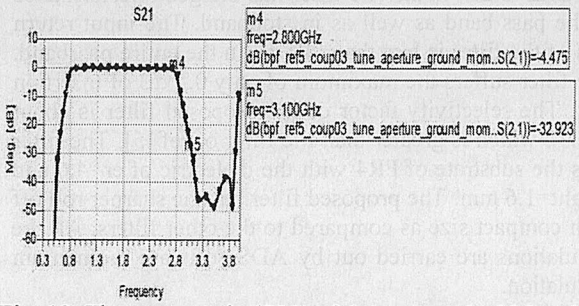

Fig. 12. The output gain (S21) of the proposed wideband Bandpass filter.

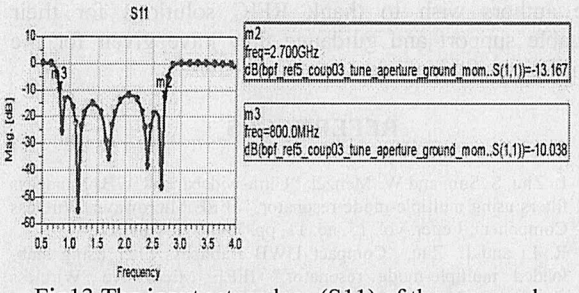

Fig13.The input return loss (S11) of the proposed wideband Bandpass filter.

The Fig 12 and 13 shows the momentum simulation results of the proposed filter has the pass band from 0.8 GHz to 2.7 GHz the S11 as seen in Fig 13 is below -10 dB for the whole passband of concern. The filter suffers from the second harmonics of the filter center frequency. The stopband of the filter is extended up-to 4GHz. The designed filter uses the compact structure proposed in ref [5] hence is compact in size for the proposed frequencies of 0.8 GHz to 2.7 GHz. The size of the filter is only 7 cm as compared to the ref [5]. As the filter is designed for the low frequencies as compared to ref [5] the lengths of the filter are greater. The proposed filter is designed to cover all the wireless applications which work in 800 MHz to 2.7 GHz band of frequencies.

VI. CONCLUSION

The various design structures using the MMR for the design of UWB BPF are discussed in this paper. The comparative analysis of the various structures and their respective outputs are done. The filters from the conventional MMR to the latest MMR developed recently are seen and their comparison table is carried out to study the various advantages and limitations of the design. The paper properly explains about the evolution of the MMR in UWB BPF and its benefits in terms of performance and the size of the filter. The study has revealed that the design developed in the ref [5] is the best design in terms of the performance and size of the filter compared to the various other designs developed earlier. The design has good performance in the passband as well as an extended

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stopband till 18 GHz after the upper cutoff frequency also the filter is very compact i.e. 11.72 cm in size.

The proposed filter is designed to operate at frequencies of 0.8 GHz to 2.7 GHz. The filter has the good performance in the pass band as well as in stopband. The input return loss of the filter is less than -10 dB in the entire passband. The filter suffers the maximum of only 0.5 dB of insertion loss. The selectivity factor of the proposed filter is about 0.9032 which is greater than the filter of ref [5]. The filter uses the substrate of FR4 with the dielectric of er=4.6 and height=1.6 mm. The proposed filter has the sharper roll off with compact size as compared to the other filters. All the simulations are carried out by ADS software momentum simulation.

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Implementation of Video Authentication using Sensor Pattern Noise

Urvi M. Mittal[1], Rohita P. Patil[2]

PG Student, Elect & Telecom Department, SKNCOE, Vadgaon (BK), Pune, India[1]

Asst. Professor, Elect & Telecom Department, SKNCOE, Vadgaon (BK), Pune, India[2]

Abstract: Video evidences play an important role in criminal investigations for obtaining detailed information from their own. To deduce whether the contents of the given video are authentic or exactly similar to the captured one is determined using video authentication technique. Video authentication techniques are used for detecting malicious tampering and preventing various types of forgeries, performed on video data. Pattern noises acquired are treated as the fingerprint of devices which is very useful in for device identification. Image/video source identification is a difficult task on typical embedded devices. The paper provides a hardware or FPGA implementation of Modified filter bank (FB) based orthogonal db2 DWT filter and an image denoising algorithm based on minimum mean square error estimation. Without decrease in authentication accuracy, there is saving in hardware and improvement in clock frequency.

Keywords: Video authentication; Sensor Pattern Noise;DWT; Denoising.

I. INTRODUCTION

The study of digital argumentation is needed for logical and enquiring techniques to spot, gather, study and store information that is kept or encoded, normally to provide correct proof of a particular or regular activity. Manipulation of video sequence in such a way that objects inside the frame area unit inserted or deleted exploitation common malicious video forgery operations. Digital cameras used in flick theaters by raiders to get replica of cheap nature which are later oversubscribed on an illicit business and transported to lower bit-rates for prohibited sharing over the web. This leads to important loss of wealth to the flick trade. To stop illegal repetition drawback and distribution, Video authentication is essential.

A general video authentication system provides the virtue of digital video and justifies about the given video that whether the video has been manipulated or not. For a present video, authentication action begins by means of extraction of frame. Using a distinct video authentication design program, the authentication data is produced exploiting the frame of the video. The obtained authentication information is enciphered and prepacked with the video as a mark or as an option it will be imbedded with the video substantive information as a watermark. The video integrity is certified by deriving new substantiated data for the video presented. The current authentication knowledge which is received after computation is compared with deciphered original substantiated data. If both are equivalent, the video is considered as authentic else it is deliberated as tampered video.The digital watermarking is only applicable once info imbedding structure is accessible and therefore the application standards/protocols are chased. Given this as a limitation it is of little doubt that unwatermarked multimedia can persevere being made and there's a giant range of unwatermarked media gift and hence, digital watermarking is not used for digital investigation.

The most reliable method for detection video forgery like piracy is supply camera identification as a result of it points the device that captures the video. This method informs concerning the association of image with characteristics of camera such as model and complete. Thus, Video authentication using detector pattern noise is the reliable technique because it is exclusive for camera.

The system proposes hardware architecture for video authentication exploiting a pixel-non uniformity noise theme. For image denoising proposal, a modified filter bank (FB) primarily based implementation of the orthogonal db2 DWT is computed. The paper presented involves a 2-D pulse implementation based on array for associate degree image denoising algorithmic program. FPGA is preferred as a result it suggests for fast implementation of projected design and support purposeful similarity.

The paper is formulated as follows: The techniques related to video authentication, related issues are mentioned in section I. Literature review is presented in section II. In section III, proposed system is explained. Conclusion and set of remarks presented at the finish of the transient is delineated in section IV.

II. LITERATURE REVIEW

Different strategies that are used to implement video authentication usingdetector pattern noise are conferred below.

Basic idea used for extraction of noise for associate degree image correlative is inevitable except for unrelated signal it's not inevitable. PNU extraction is done by calculating traditional parametric statistic.

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Calculate the local variance of each and every subband using MAP estimation, and by using Weiner filter obtain the denoised frame F_{dN} as shown in Eq.(1).

$$N = F - F_{dN} \quad (1)$$

Where, N is the extracted noise from frame F.
For proper visual effect, the noise is scaled up 10 times. As, the sensor pattern noise will get through the averaging while remaining noises likely to cancel out. Thus, the sensor pattern noise N can be expressed as:

$$N = \frac{1}{K}\sum_{1}^{K} N_i \quad (2)$$

Where, Ni is the noise derived from the i^{th}frame extraction process and k isthe number of the frames taken into consideration. For identification purpose compute the sensor pattern noise of the video to be processed and identified (N_v) and compare it with the sensor pattern noise derived from the camera (N_c) using the correlation coefficient:

$$corr(N_v, N_c) = \frac{(N_v - \bar{N}_v)(N_c - \bar{N}_c)}{\|N_v - \bar{N}_v\|\|N_c - \bar{N}_c\|} \quad (3)$$

Several measurements like parallelization, selective frame processing and combining wireless finger print were taken to perform source identification in real time situation.
Blocking alters the extraction of sensor pattern noise in manifolds. Firstly, within the blocks the details and pattern noise both are lost. Secondly, the borders of blocking become a strong which will survive extraction & averaging. The correlation coefficient is between 0.1 &0.7 when Nv& Nc have same source. The correlation coefficient is higher when the video extracted (Nv,Nc) is of same bit rate.

The SPN (noise residue) is patterned as an Additive White Gaussian Noise (AWGN) in the extraction process with the help of Wavelet-based denoising filter to cancel out the impact of the contamination in the frequency domain from the image details is proposed.
The noise surplus extracted from an image processed is

$$w_k = I_k - F(I_k) \quad (4)$$

Where, F (I_k) denotes the denoised image.
The camera reference SPN y is computed by averaging the phase component and performing the operation of inverse DFT.

$$y = real\left(IDFT\left(\frac{\sum_{k=0}^{L-1} W_{\emptyset k}}{L}\right)\right) \quad (5)$$

L is the number of images used in extraction process of noise, y is a signal containing white noise. Its circular correlation function is a treated as a delta function.
The noise in a digital image originates from a number of different sources. The noise components that differ from image to image is collectively called shot noise, similarly the noise components that remain approximately the same from image to image is called pattern noise. If the imaging sensor takes a picture of an absolutely evenly lit scene, the digital image resulting will differences between individual pixels. The shot noise consists of a number of components, but is not interesting from a forensic point of view since its random nature makes it unfit for any identification because after extracting large number of frames and adding them the noises cancels out.
Pattern Response non-uniformity noise (PRNU) is a dominating component in sensor pattern noise which is contaminated by various noise introduced during acquisition process at different stages.
A pixel non-uniformity (PNU) noise (P) component which camera contains is present due to the varying pixel's-to-light sensitivity and attributes to the of silicon wafers and imperfections during the process of sensor manufacturing. Thus, PNU noise is a fingerprint of the device and independent of wetness and temperature, making noise as associate degree glorious alternative for video authentication functions. This character of the PNU noise proves that sensors coming from the similar wafer also exhibit different PNU patterns.

III. PROPOSED SYSTEM

The camera inserts a PNU footprint (P) through sensor in the camera into the image or video captured, for authentication purpose. The proposed system block diagram is shown in Fig.1. The extraction step which is proposed contains Forward and Inverse Discrete Wavelet Transform (DWT and IDWT) computation to convert the image to frequency sub-bands, which are then processed individually. For variance estimation of each subband, a maximum likelihood estimate (MLE) is used which is followed by MMSE estimation procedure to obtain denoised frame. The denoised frame obtained after IDWTis subtracted from the frame extracted to get an estimate of the PNU.
The reference PNU Pused for estimation of PNU is not directly available for most cameras; so it is obtained by averaging the past values of P^1 from a great number of past samples.

$$P = \frac{1}{N}\sum_{i=1}^{N} P^1 \quad (6)$$

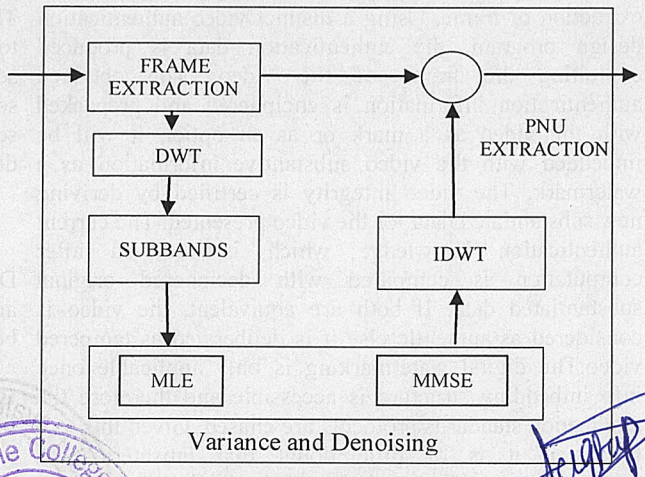

Fig.1Block diagram

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where, P_i^1 is the PNU estimated from the ith frame of camera and N stands for number of samples. As the denoising process, gets rid of all noise and extracts the original image or frame.

Wavelet-domain denoising using MMSE estimation found to be very effective and takes into consideration natural image boundaries, which appears in several denoising algorithms as a component of noise pattern. The denoised frameI ≈ Nobtainedfrom process is subtracted from the extracted frame (EF) to derive an estimate of the PNU.The proposed diagram consists of following blocks:

1)**DWT**:For denoising purpose, the first step is to perform DWT for converting frames into subbands for easy computation. db2 orthogonal wavelet is used for performing DWT and reduces area and computational requirement for hardware implementation. The coefficients are given in Table1.

Table 1 Coefficients of db2 Wavelet Filter

	Lo_D	Hi_D
1	-0.12940952255091	-0.48296291314461
2	0.224143868041857	0.83651630373746
3	0.836516303737465	-0.22414386804185
4	0.482962913144691	-0.12940952255091

The Video is converted into frames in MATLAB. The extracted frame of resolution 256x256 is loaded onto block RAM so as to perform algorithm operation on images. The DWT computation is done using modified filter bank implementation as shown in Fig.2.

Modified Filter bank implementation using db2 wavelet reduces hardware utilization and give almost same accuracy as DWT filter designed using db8 wavelet.

4 different cameras were taken to verify the accuracy of wavelet. The filter coefficients for db2 wavelet filter are expressed as

$$Lo_D(z) = a_1 + a_2 z^{-1} + a_3 z^{-2} + a_4 z^{-3}$$
$$Hi_D(z) = b_1 + b_2 z^{-1} + b_3 z^{-2} + b_4 z^{-3} \qquad (7)$$

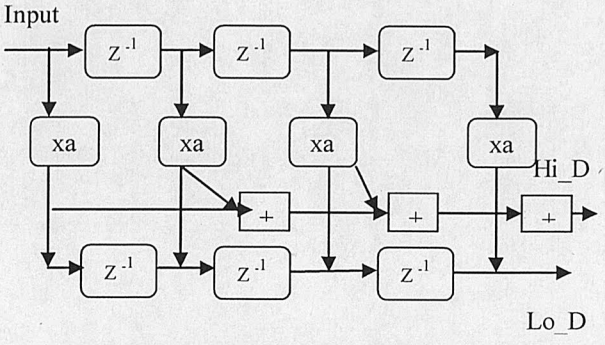

Fig.2 Modified Filter Bank Implementation

Where, a_1, a_2, a_3, a_4 represent low pass filter coefficients and $b_4 = a_1$, $b_3 = -a_2$, $b_2 = a_3$ and $b_1 = -a_4$ are respectively high pass filter coefficients.Fig.3 shows the simulation results of db2 filter. The modifies filter bank implementation uses orthogonal db2 filter coefficients as it requires fewer adders and multipliers than other filter because it reuses the multiplier computation and achieves highest clock frequency.

Table 2 Hardware required for implementation

	'db2' MFB
Adders	6
Multipliers	4

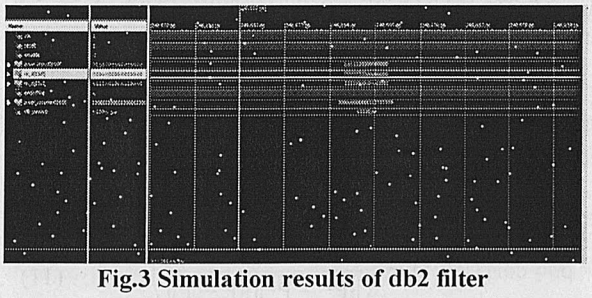

Fig.3 Simulation results of db2 filter

The periodic extension mode of DWT is used, because it produces least wavelet coefficients and increases throughput.Fig.4 shows the 3rd level of DWT of frame computed using db2 filter.

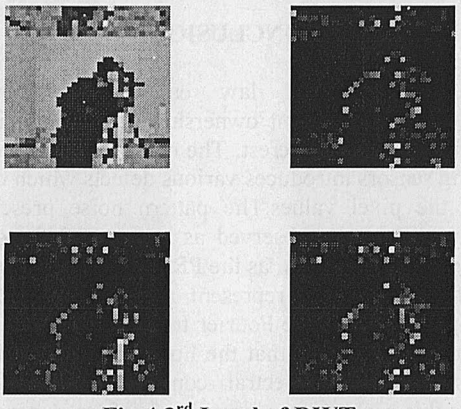

Fig.4 3rd Level of DWT

2) **Variance and Denoising**:Three levels of DWT are taken into consideration and subands except LL3 i.e approximation coefficients of levels are transfered independently for calculation of variance and denoising process. The MLE estimation is calculation of variance by employing of mask size 3 x 3 but the performance of denoising is not affected by this masks as it is used for variance estimation.For each mask variance is calculated as $\hat{\sigma}^2$.

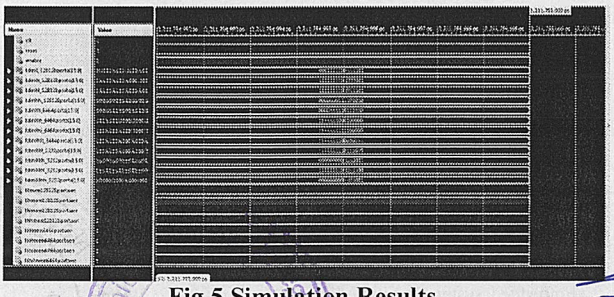

Fig.5 Simulation Results

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After calculation of variance the predictor for a denoised subbands and is expressed by following relation:

$$\overline{S(i,j)} = \frac{S(i,j) \times \widehat{\sigma^2(i,j)}}{\sigma^2(i,j) + \sigma_0^2} \quad (9)$$

The value of $\sigma_0$is taken as 5 for 8-bit pixels.After obtaining denoised subbands as shown in Fig.5,the subbnads are processed with IDWT to obtain denoised image($\bar{I}$).The PNU estimate is computed as subtraction between subband pixel and denoised subband pixel.

$$P^1(i,j) = I(i,j) - \overline{I(i,j)} \quad (10)$$

Where image $\bar{I}$is result of inverse DWT operation on the denoised subbands.

$$\bar{I} = \text{IDWT (all subbands } \bar{S})$$

Compute the correlation between pixels in PNU P and P^1.

$$\rho = \text{corr}(P, P^1) = \left(\frac{(P^1 - \overline{P^1})(P - \bar{P})}{\|P^1 - \overline{P^1}\| \|P - \bar{P}\|} \right) \quad (11)$$

Where $\bar{P}, \overline{P^1}$ denotes mean of the pixel value in P and P^1. The correlation value obtained (ρ) above a pre-calculated threshold identifies successful authentication of the video by identifying proper camera.

IV. CONCLUSION

In video surveillance, law enforcement, forensic investigations, and content ownership the authenticity of video info is of prime interest. The manufacturing process of imaging sensors introduces various defects which create noise in the pixel values.The pattern noise present in digital images can be observed as a non-periodic signal with different interruption, as the PRNU noise is treated as effect of per-pixel. To represent a signal by different frequency components he Fourier transform is useful, but it has a major drawback that the Fourier transform is not able to restrict the spectral components in time.To overcome this problem, the wavelet transform approach is introduced. A system dealing with DWT and IDWT implementation is proposed on FPGA, which results into less number of the hardware requirements of a modified filter bank (FB) depending on the implementation of the DWT using orthogonal db2 filter.

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Guided Filter for Color Image

Ashwini Gadge[1], Dr. S. S. Agrawal[2]

Post graduation student, E & TC, Smt. Kashia Navale College of Engineering, Pune, India [1]

Assistant Professor, E & TC, Smt. Kashia Navale College of Engineering, Pune, India [2]

Abstract: Image Enhancement is one of the most important and difficult techniques in digital image Processing. Image Enhancement is used for improving the quality. Many images like medical images, satellite images and real life photographs suffer from poor contrast and noise. It is necessary to enhance the contrast and remove the noise to increase image quality. Filtering is mostly used for enhancement and smoothing of input image. But in some edge preserving filtering technique gradient distortion and artifacts are observed. To resolve these problem guided filter is used. Guided filter is non-iterative, fast, accurate edge preserving filtering. The guided filter computes the filtering output by considering the content of a guidance image, which can be the input image or another different image. Guided filter uses the color images for implementation because color guidance image can better preserves the edges that are not distinguishable in gray-scale. Guided filter simulation done using MATLAB.

Keywords: FPGA, Guided filter, Image Enhancement, MATLAB

I. INTRODUCTION

Image processing is processing of image using mathematical operation. Input for image processing image, series of image and video. Digital image processing is the use of computer algorithm to perform image processing on digital image. In digital processing pre processing, enhancement, information extraction is done. In processing time many images are affected by random variation in intensity or sometimes environmental parameter affect the images. During transmission images introduces the noise so filtering is used for noise reduction. More specifically, filtering can be applied in many applications such as noise reduction, texture editing, smoothing, enhancement, haze removal, and joint up-sampling. Filtering is the most important image processing techniques used for image feature extraction or enhancement. Filtering is mostly used for enhancing and smoothing the input image.

Image enhancement is used in many applications like forensics, atmospheric sciences, medical images, microbiology. Image enhancement improves the quality of image. Image enhancement involves four parameters likes brightness, contrast, saturation, sharpness. Brightness is can be modified by increasing by gamma. Gamma is a non-linear form of increase in brightness. Contrast is the separation between the dark and bright areas of an image. Saturation is increasing the separation between the shadows. Sharpness is related to edges, the contrast along the edges of a photo.

The enhancement methods are divided into spatial domain and frequency domain method. Spatial domain technique is directly deal with the image pixels. In spatial domain for getting desired output the pixel vales are manipulated. In frequency domain techniques, the image is first transferred s into frequency domain. It means that, the Fourier Transform from the image is computed first. Every one of the enhancement operations are performed for the Fourier transform of the specific image and then reverse Fourier transform is performed to get the concomitant image. The most common benefit of image smoothing is to remove the noise from the image. Different edge preserving image smoothing methods are used for preserving the important features or structures or salient edges in the image, so as to lead the improvement in the visual quality of the image. This is a method for edge preserving smoothing, which is related to the previous methods like bilateral filter and fast bilateral filter for the display of high dynamic range images signal processing approach, edge preserving decompositions, multi-scale image decomposition based on local extreme, histogram based image smoothing, L0 gradient minimization.

Mean filtering is easy to implement. It is used as a method of smoothing images, reducing the amount of intensity variation between one pixel and the next resulting in reducing noise in images. For simulation of guided filter Matlab is used. Matlab is set of numerical analysis and high-performance computing software.

Matlab language provides for matrix arithmetic operators, relational operators, logical operators, conditional operators and assignment operator. Matlab is high level language. It gives simple programming. Matlab is easy to use and flexible. System generator is used for model generation in Matlab.

II. RELATED WORK

In fact, each captured image contains noise. Due to various interferences, noise, the image definition gets bad influence. At the same time, noise making the image blurred. The bad condition was submerged fully. It gives analysis big difficulty. Therefore, people need to suppress unwanted noise to improve image quality. For digital image noise reduction, the basic filtering algorithms are used. It includes mean filtering, median filtering, Gaussian filtering, bilateral filtering. In Gaussian filter is sums all the small values taken and average of those values also these average value is assign to the pixel. The bilateral

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filter is perhaps the simplest and most intuitive one among explicit weighted average filters. It computes the filtering output at each pixel as the average of neighboring pixels, weighted by the Gaussian of both spatial and intensity distance. Bilateral filter is non-linear, edge preserving, noise reducing and smoothing filter. Bilateral filter has some major disadvantages. The bilateral filter suffers from gradient reversal artifact.

Another disadvantage is that it uses histogram based approximation to calculate weights. It has more computational complexity. Non average Filters Edge-preserving filtering can also be achieved by non average filters. The median filter is a well known edge aware operator, and is a special case of local histogram filters. Median filter is very effective in removing salt and pepper or impulsive noise. But median filter having disadvantages like computational complexity, non linear filter.

VLSI architecture design of guided filter is discussed in [1]. In this double integral image architecture proposed for guided filter. Guided filter is implemented using ASIC design. This system reduced gate count and on chip memory. It gives better performance than other filter. In this guided filter can save hardware cost without the loss in quality.

Guided filter is discussed in [2]. In this guided filter is derived from a local linear model, the guided filter computes the filtering output using guidance image, which can be the input image or another different image. It avoids the gradient reversal artifacts that may observe in detail enhancement and HDR compression.

III. SYSTEM ARCHITECTURE

Guided image filter is proposed that performs edge-preserving smoothing on an image, using the content of the second image i.e. the guidance image, in order to influence the filtering. The guidance image can be the image itself, a different version of the image or a completely different image. If the guidance image is same as the input image to be filtered, the structures are the same i.e. an edge in original image is the same as in the guidance image.

Guided image filtering is one of the spatial domain enhancement technique in which the filtering output is locally a linear transform of the guidance image. It takes into account the statistics of a region in the corresponding spatial neighborhood in the guidance image while calculating the value of the output pixel. Guided filter has good edge-preserving smoothing properties and does not suffer from the gradient reversal artifacts that are seen when using bilateral filter.

It can perform better at the pixels near the edge when compared to bilateral filter. The guided filter is also a more generic concept beyond smoothing. By using the guidance image, it makes the filtering output more structured and less smoothed than the input. It can transfer the structures of the guidance image to the filtering output, enabling new filtering applications such as dehazing and guided feathering. Also, guided filter adopts the fast and non-approximation characteristics of linear time algorithm and provides an ideal option for real time applications in case of HD filtering. Hence, it is considered to be one of the fastest edge preserving filters.

Guided filter generally has an O(N) time (in the number of pixels N) exact algorithm for both gray scale and color images, regardless of the kernel size and the range of intensity. O(N) time represents that the time complexity is independent of the window radius(r) and hence arbitrary kernel sizes can be used in the applications.

A. Guided Filter Algorithm

Here we are considering filtering input image as p, guidance image as I, regularization as ε, and filtering output as q.

1. Reading image pixels.
2. Passing them to 5x5/3x3 line buffers. Here, any window size can be chosen. BRAM and slice register usage is increased with large widow size.
3. Getting all window pixels.
4. Applying averaging filter (f_{mean}) on guidance and input image and also finding correlation (corr) as shown below:

$$mean_I = f_{mean}(I)$$
$$mean_p = f_{mean}(p)$$
$$corr_I = f_{mean}(I .* I)$$
$$corr_{Ip} = f_{mean}(I .* p)$$

5. Computing the covariance by using obtained mean and correlation values:

$$cov_{Ip} = corr_{Ip} - mean_I .* mean_p$$

6. Computing the variance

$$var_I = corr_I - mean_I .* mean_I$$

7. Computing the linear coefficients a & b by using obtained covariance, variance, mean values.

$$a = cov_{Ip} ./ (var_I + \epsilon)$$
$$b = mean_p - a .* mean_I$$

8. Computing mean of linear coefficients a and b

$$mean_a = f_{mean}(a)$$
$$mean_b = f_{mean}(b)$$

9. Calculating the filtered image by using the calculated mean values of linear coefficients a and b:

$$q = mean_a .* I + mean_b$$

IV RESULT AND DISCUSSION

Guided filter is fast and accurate filter. Guided Filter gives smoothen image and enhanced image. Guided Filter algorithm is simulated in MATLAB which is shown in Fig.1. Smoothen and enhance image. Guided filter gives the higher quality image.



(a)Input Image (b) Smoothen Image

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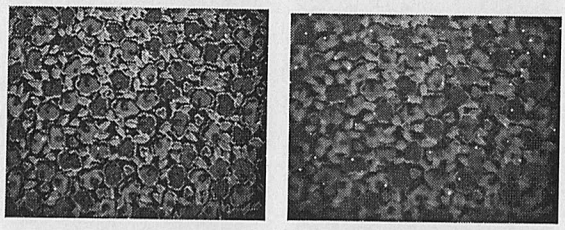
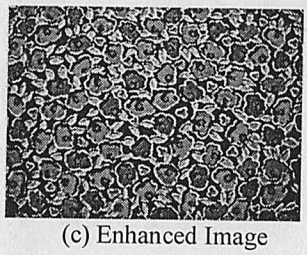
(c)Enhanced Image

Fig.1. Output of Guided filter algorithm in MATLAB (a) Input Image (b) Smoothen Image (c)Enhanced Image



(a)Input Image (b) Smoothen Image



(c) Enhanced Image

Fig.2. Output of Guided filter algorithm in MATLAB (a) Input Image (b) Smoothen Image (c) Enhanced Image

V. CONCLUSION

In this paper, we have presented a novel filter which is widely applicable in computer vision and graphics. Guided filter smooth image and enhance the image and gives the high quality image. Guided filter Algorithm is Simulated in MATLAB. The edge preserving guided filter will be implemented which is based on color images because color guidance image can better preserve the edges that are not distinguishable in gray-scale.

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A Hand Gesture Recognition for Human Computer Interaction

Anuj Kumar[1], Prof. N.M. Wagdarikar[2]

PG Student, Dept. of E&TC, Smt. Kashibai Navle College of Engineering, Pune, India

Assistant Professor, Dept. of E&TC, Smt. Kashibai Navle College of Engineering, Pune, India

ABSTRACT: This paper presents a novel and real time system with an application of sign language recognition via hand gesture recognition. This system includes detecting & tracking of bare a hand in uniform & cluttered background using skin colour detection after RGB image is converted into YCbCr image. In training stage, after extracting the features for every training image using moment invariant method and feature vector is created. This feature vector is taken as input for multiclass artificial neural network classifier. In testing stage, a webcam is used to capture the image and out of seven, first four feature values are used for classification and recognition of hand gestures.

KEYWORDS: sign language recognition; RGB; YCbCr; training; testing, artificial neural network.

I. INTRODUCTION

Human and Computer Interface has become a major portion of our lives because of technology potion into our current way of life. This paper describes the design and execution of a vision-based hand gesture recognition (VHGC) for human computer interaction (HCI) applications and for man optional and augmentative message applications. Hand gestures and even whole body play an important role in human communication. Computer analysis of hand gesture has become an important area in hand gesture recognition.

Gesture recognition is a challenging task, especially hand gesture recognition. Hand Gesture has very high degree of freedom and can move freely in any direction. The shape of the hand is also complicated.

Gesture recognition mostly involves two approach. One is static hand gesture recognition [5] and another is to analyse dynamic hand movements. In this method hand movement is tracked and recognized in real time [1] [4].
Our system is different from the earlier system from the following ways.

- A high accuracy with different hand gestures.
- A low processing power is required because of highly efficient computational operation of artificial neural network.
- Light variation have very trivial effect on our system.
- Real time operation.

This paper presents vision based hand gesture recognition for sign language recognition. The advantage of vision based system is one would not has to use glove for hand segmentation process. Hand segmentation is based on skin colour detection [5] [7]. RGB image is converted into YCbCr image. Y component implies luminance of the image but Cb and Cr imply chrominance of the image.

II. RELATED WORKS

There are normally two types of category for vision based hand gesture recognition. One is three dimensional based hand prototypical and another is two dimensional based mode [2] [3] or it can be said appearance based. The three-dimensional hand gesture recognition technique is captured by Kinect camera which also calculates the depth of the image. Appearance-based model technique extract the features of the image and relate those features with the extracted features computed from the video frames. This is our approach because of its effectiveness.

In [1], Feature extraction through Moment invariant is used for object recognition. While taking image, the gesture variations consists of rotation, scaling and translation and these variations can be avoided using set of features that are invariant to these operations. Moment invariant offers a set of features whose values are independent of these degree of freedom.

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Design of a 2.4 GHz Low Phase Noise CMOS LC VCO for Wireless Applications

Gaurav Haramkar[1], Prof. R.P. Patil[2]

Student, Department of E&TC, SKNCOE, Vadagaon, Pune, India [1]

Assistant Professor, Department of E&TC, SKNCOE, Vadagaon, Pune, India [2]

Abstract: This paper presents the design of a 2.4 GHz CMOS LC voltage controlled oscillator (VCO) in TSMC 130 nm CMOS process. In this paper three different topologies of LC-tank VCO design for low phase noise and low power consumption are studied. Comparison is made between the VCO topologies considering their effect on the parameters such as phase noise, power dissipation, tuning range, tuning sensitivity. The effects of these parameters on the VCO performance are discussed. The proposed design is simulated using ADS Tool and operates from a supply voltage of 1.8 V. After simulating the proposed design the VCO shows a phase noise of -128.68 dBc/Hz at 1 MHz offset frequency from a 2.4 GHz carrier signal. The frequency of the VCO ranges from 2.36 GHz to 2.61 GHz when the control voltage is varried from 0 to 2 V. The FOM is obtained as -183.73 dBc/Hz.

Keywords: VCO, CMOS process, NMOS cross-coupled, LC tank, Phase noise, ADS (Advanced Design System), Figure of Merit.

I. INTRODUCTION

With the tremendous growth of wireless communication technologies there is an increasing need for the bandwidth-efficient, low-power and low-cost transceiver design. The voltage-controlled oscillator (VCO) being an important component in the radio transceiver, its design is an attractive topic for the continued research and still is an active research area. VCO is one of the main building block in the RF communication systems such as Frequency Synthesizer and Phase-Locked Loop (PLL). VCO is an essential element to generate the local oscillation (LO) carrier frequency for up- and down-conversion mixing of the baseband and RF signal in a transceiver.

There are three different topologies for controlled oscillators on the integrated circuits (IC), namely, the ring oscillators, relaxation oscillators and tuned (LC) oscillators [1]. Ring oscillators consist of an odd number of single-ended inverters or an even/odd number of differential inverters with the appropriate connections. Relaxation oscillators alternately charge and discharge a capacitor with a constant current between two threshoid levels. Tuned oscillators contain a passive resonator such as LC tank, transmission line resonator, crystal that serves as the frequency setting element. The relaxation and ring oscillator are very easy to integrate on a monolithic IC and are very compact. Their frequency is controlled by a current or voltage and it is possible to obtain linear frequency tuning characteristics over several orders of magnitude [2]. LC oscillators are difficult to integrate primarily because of the lack of high quality passive inductors in standard IC technologies and because of their large size. However, LC oscillators have a much higher frequency stability and spectral purity since it is set by the passive resonator. Relaxation and ring oscillators are typically very sensitive to noise in the switching thresholds and charging currents. Although the relaxation and ring oscillator can easily achieve wider tuning range, their poor phase noise performance makes them non-suitable for most of the wireless and wireline applications. For higher quality RF transceiver systems, a LC oscillator topology is chosen mainly because of its potential to achieve good phase noise performance, easier implementation, and differential operation than a relaxation or ring oscillator because the bandpass nature of the resonant tank in the LC oscillator provides the lowest phase noise for a given amount of power [3].

The performance metrics such as phase noise, power dissipation, tuning range and tuning sensitivity are most important parameters to consider in the VCO design that determines many of the basic performance characteristics of a transceiver. The VCO to be designed is such that it must be capable of achieving a low power consumption and low phase noise. Noise directly affects the information to be sent and received. The phase noise and power consumption are inversely proportional. That is in order to improve the power consumption performance, the phase noise must be increased and vice-versa. Therefore a trade-off exist in the VCO circuit design between the phase noise and power dissipation. Thus the design of low power and low noise oscillator is significant. Multi-standard transceivers are needed to fulfil the ever increasing demands of the market due to the co-existence of the multiple communication standards. One of the design challenges for the multi-standard transceivers is a wide tuning range VCO that covers the bands of interest while meeting the requirements of each specific standard. The resonant frequency of the tank circuit decides centre frequency for a given topology, although the parasitic capacitances in the circuit causes the downward shift in the centre frequency. Since the inductor use is generally of fixed value, tuning range is provided by varactor and capacitance of the tank circuit. [illegible]

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that can be achieved is limited by the parasitic capacitances of the active devices in the amplifier and of the inductor [4].

The VCO gain (KVCO) also called the tuning sensitivity of the oscillator determines the phase noise in the oscillator [5]. With the large KVCO, the noise coupling to the control node will be amplified and hence the phase noise performance will be degraded. This also makes the VCO very susceptible to the noise because of the AM to FM conversion. A VCO with small KVCO is desirable as it is less susceptible to the noise but it may cause the central frequency of the VCO to shift away from the desired frequency when the VCO suffers from the process and the temperature variations. Therefore, a trade-off exist in the VCO circuit design between the phase noise and tuning range.

This paper is organized as follows. Section II describes the performance metrics of VCO. Different VCO topologies and their comparison is studied in Section III and Section IV. Section V presents the proposed methodology and simulations results of the VCO. Finally, Section IV summarizes and concludes the paper.

II. VCO PERFORMANCE METRICS

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A. Phase Noise

Phase noise gives the measure of the spectral purity of the VCOs output signal. Phase noise is a critical and important parameter in RF wireless design. Phase noise of the VCO can be expressed as [6].

$$L(\Delta f) = 10log\left\{\left[1+\left(\frac{f0}{2\Delta fQ}\right)^{2}\right]\left(1-\frac{fc}{\Delta f}\right)\frac{FkT}{2P_{av}}+\frac{2kTRKvco^{2}}{\Delta f^{2}}\right\} \quad (1)$$

where L{Δf} is the phase noise at the frequency offset Δf from the carrier signal at fo. fo is the carrier signal frequency in Hz. Q is the quality factor of the tank circuit, F is the noise factor. T is the temperature in Kelvin, k is the Boltzmann's constant in J K. R is the equivalent noise resistance of the varactor. Pav is the oscillator output average power, Kvco is the voltage gain of the VCO in Hz/V.

From (1), in the modified Lesson's formula Kvco dominates the phase noise performance, thus by reduction Kvco phase noise performance can be improved. Also it can be observed that the higher the Q-factor of the tank, the lower the noise factor (F), the phase noise performance of can be improved. However, the wide-tuning range design limits the quality factor. By fixing the channel widths of all transistors, the bias current can be increased to lower the phase noise; but this results in increased power consumption.

B. Figure of Merit (FOM)

To compare the performance of the VCO with previously published literature a widely used figure of merit (FOM) parameter [7] can be stated by Eq. (2) as

$$FOM = L\{\Delta f\} - 20\log\left(\frac{fo}{\Delta f}\right) + 10\log\left(\frac{Pdc}{1mW}\right) \quad (2)$$

where the figure of merit in dBc/Hz, Pdc is the power consumption in mW and L{Δf} is the phase noise at the frequency offset Δf from the carrier signal at fo.

III. LC-TANK VCO TOPOLOGIES

Differential cross-coupled topologies are generally preferred since they offer better power supply and substrate noise rejection over single-ended designs. Three different topologies of LC-tank VCOs for low power consumption and low phase noise are studied. The three different structures i) NMOS Cross-coupled ii) PMOS Cross-coupled iii) Complementary NMOS PMOS Cross-coupled are explained in details as follows:

A. NMOS Cross-coupled

In Fig. 1 LC VCO using NMOS Cross-coupled transistors is shown. It consist of cross-coupled NMOS switches, two inductors, a varactor and a NMOS tail current source. The tail current source can be connected to either source or drain; in this structure it is shown to be connected to the source. A LC tank circuit is formed with the inductor and varactor. The transconductance of cross-coupled device gives the negative resistance required for the start-up of oscillations.

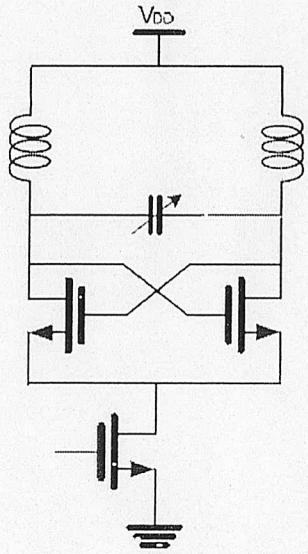

Fig. 1. NMOS Cross-coupled LC VCO

The cross-coupled NMOS structure injects energy to compensate for the losses of the tank and maintain the oscillation as per Barkhausen criterion. The inductor separates the varactor from the supply and the cross coupled NMOS pair and the tail current source separates it from the ground. With the direct connection of inductors to the supply, the oscillator becomes more sensitive to disturbances from the supply. However, due to the tail current source, the LC tank is well guarded against the disturbances caused by the ground. A symmetrical differential pair formed with the implementation of the switching transistors and the tail current source also causes

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Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

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a lower harmonic distortion. The tuning voltage controls capacitance of the varactor. The available headroom enables a maximum tuning range, although the oscillator operates under low voltage condition. If the bulk voltage is tied to the supply voltage, the varactor works from the depletion – to the weak inversion region, where the capacitance tuning voltage characteristic achieves its best linearity. Depending on nonlinear behaviour of the tuning capacitance the varactor also up convertes noise. The quality factor of the inductor and varactor determines the phase noise performance. The phase noise performance is affected additionally by the current source and voltage across the LC tank apart from the quality factor.

B. PMOS Cross-coupled

In Fig. 2 LC VCO using PMOS cross-coupled transistors is shown. The PMOS structure is fully complimentary to NMOS LC VCO (Fig. 1). However, in order to achieve the same transconductance and to provide the same negative resistance; the PMOS transistor is sized about three times larger compared to the NMOS counterpart. This is due to the fact that reduced mobility of holes (μp) in the PMOS transistor as compared to the NMOS. PMOS cross-coupled structure shows a better phase noise performance as the noise factor is lower for PMOS compared to NMOS based VCO structure.

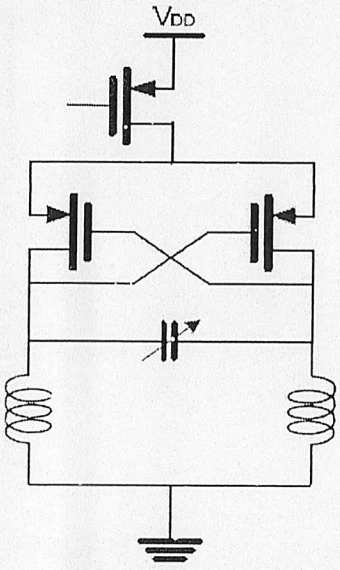

Fig. 2. PMOS Cross-coupled LC VCO

C. Complementary NMOS PMOS Cross-coupled

In Fig. 3 Complementary NMOS PMOS Cross-coupled LC VCO is shown. This structure employs both the NMOS and PMOS cross-coupled pairs. The negative resistance provided is two times larger for the same power consumption as the same bias current flows through both NMOS and PMOS devices. The total negative resistance of NMOS PMOS cross-coupled structure can be expressed as a parallel combination of the NMOS and PMOS negative resistance. Rinn and Rinp , respectively, as:

$$R_{Negative} = Rinn \,||\, Rinp = -\frac{2}{Gmn+Gmp} \quad (3)$$

where Gmn and Gmp are the transconductances of the NMOS and PMOS cross-coupled, respectively.

The amplitude of the voltage across the LC tank is increased in this structure as the NMOS and PMOS transistors are operating in a mutual switching scheme during one half period. Finally due to the presence of both PMOS and NMOS cross-coupled pairs complementary structure exhibits immunity against process variations. This makes it more attractive choice for deep submicron CMOS technologies.

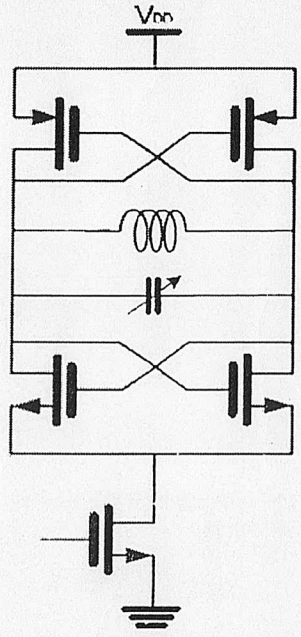

Fig. 3. Complementary Cross-coupled LC VCO

The current mirror is employed in the VCO circuit, since, the transconductance is controlled solely by the size of the device, thereby lacking a flexible approach in establishing control of the transconductance. Therefore, a current mirror is generally adopted to limit the supply current, in order to achieve a desirable control over the negative resistance and evidently, the oscillation amplitude. However, it has been observed that, it may be beneficial to entirely eliminate the tail current source under certain conditions, to achieve better phase noise performance.

For example, under low supply voltage condition, lower than 0.5 V, the tail current source can be eliminated to improve the transconductance and the voltage swing of the cross-coupled PMOS pair. Thus the tail current source aids a designer in achieving a compromise between phase noise performance and power dissipation.

IV. COMPARISON OF VCO TOPOLOGIES

The comparison of the PMOS cross-coupled with NMOS cross-coupled and of PMOS- or NMOS-only cross-coupled with complementary cross-coupled is discussed in detail as follows:

A. PMOS cross-coupled Vs NMOS cross-coupled

PMOS cross-coupled pair has low noise characteristics compared to NMOS. PMOS structure has lower flicker noise of about 10 times smaller than its NMOS counterpart of similar dimensions and thus is more suitable for low phase noise operation than NMOS. Further PMOS

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transistor has lower current density compared to the NMOS transistor, which results in inherent less thermal and flicker noise contribution. However, since the mobility of holes (μp) is lower than mobility of electrons (μn), PMOS devices have to be twice the size of NMOS devices to achieve a similar transconductance performance.

B. PMOS- or NMOS only cross-coupled Vs Complementary cross-coupled

An important difference between the complementary cross-coupled and its NMOS- or PMOS-only cross-coupled is in limiting the differential voltage swing. In NMOS- or PMOS-only versions, the voltage swing is limited only by the bias current, while, in complementary cross-coupled oscillators, the voltage swing is essentially limited by the supply voltage and the bias current. NMOS- or PMOS-only cross-coupled circuits exhibit AC voltage swings that exceed VDD. When designed for the same supply voltage and bias current and when operated in the same current-limited regime, the complementary cross-coupled oscillator shows a better phase noise performance compared to the NMOS- or PMOS-only cross-coupled oscillators. The important drawback of complementary cross-coupled structure is its sensitivity to supply noise.

Due to the higher harmonic distortion the thermal – and flicker – noise will be up converted. Although a complementary cross-coupled topology allows for its higher tank voltage amplitude for a given bias current and LC tank configuration, but at the cost of reduced headroom, increased parasitics, and additional noise sources. Also, the use of more than two active devices other than only the NMOS or PMOS pairs increases the number of noise sources and the parasitics, thereby resulting in harmful effects on the phase noise and frequency performance tuning characteristics.

V. PROPOSED METHODOLOGY

The proposed design uses a NMOS cross-coupled structure for the design of VCO as shown in Fig. 4. The VCO is designed with a centre frequency of 2.4 GHz and covers a wide frequency range from 2.36 GHz to 2.6 GHz. The proposed VCO shows an excellent phase noise performance of -128.68 dBc/Hz at 1 MHz offset frequency from a 2.4 GHz carrier signal. The NMOS cross-coupled topology has been chosen because it shows the higher transconductance per unit area, and hence smaller transistor capacitances will contribute to the total parasitic capacitance of the resonant tank circuit. Also it gives the best overall performance in terms output voltage swing, bias current, phase noise, power dissipation, and total chip area required.

To tune the output frequency of the VCO, a varactor circuit implemented with the help of four transistors structure as shown in Fig. 4, is applied to vary the capacitance. The varactors are implemented with the help of MOSFETs by shorting its drain and source terminals and applying voltage between its gate and the short terminal. The VCO can be made oscillating more easily by increasing the fingers of MOSFETs but this will lead to

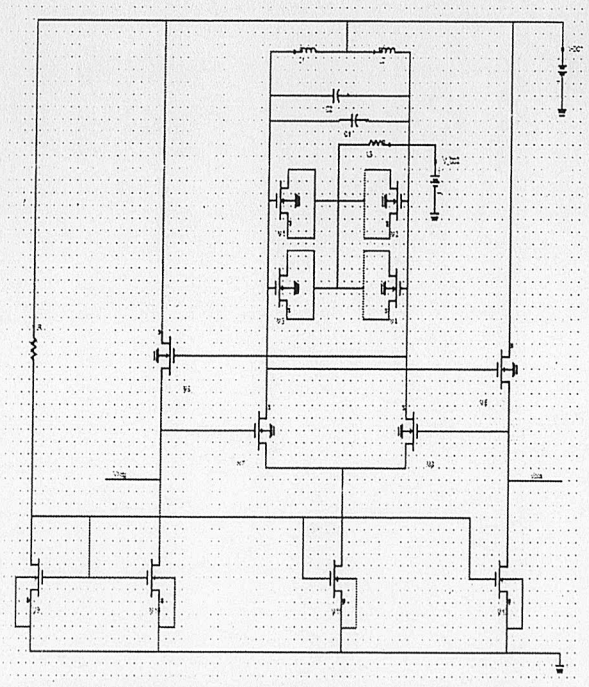

Fig4 Schematic of NMOS Cross-coupled VCO

bigger parasitic capacitance. The fixed capacitance, a varactor capacitance provided by four transistor structure and the parasitic capacitance gives the total capacitance of the circuit. To make sure a wide output frequency range, the tuning range of varactors Cmax/Cmin should be as large as possible. The effect of adding a fixed capacitance in parallel with the LC tank is such that it adjusts the resonance frequency of the tank circuit and lowers the gain of the varactor. The proposed VCO is designed using the TSMC 130nm CMOS process and simulations are carried out using the ADS Tool produced by the Agilent Technologies Inc. The simulated phase noise performance of the VCO is shown in Fig. 5. It can be seen that the VCO has a phase noise of -128.68 dBc/Hz at 1 MHz offset frequency from a 2.4 GHz carrier signal. The total DC power consumption of the VCO is about 18mW. As the KVCO is relatively high, the phase noise performance can be further improved without sacrificing the tuning range, by reducing the gain of the varactors which reduces the KVCO.

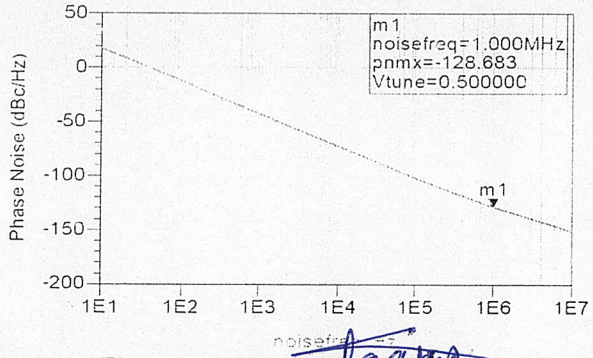

Fig. 5. Phase Noise at 1MHz offset

When the control voltage changes from 0 to 2 V, the frequency of VCO varies from 2.36 GHz to 2.61 GHz, which corresponds to tuning range of 250 MHz. Thus the

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Head
Dept. of Electronics & Telecommunication Engineering
Smt. Kashibai Navale College of Engineering, Pune - 411 041

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VCO gain KVCO, can be calculated as 125 MHz/V. The tuning range of the VCO is shown Fig. 6.

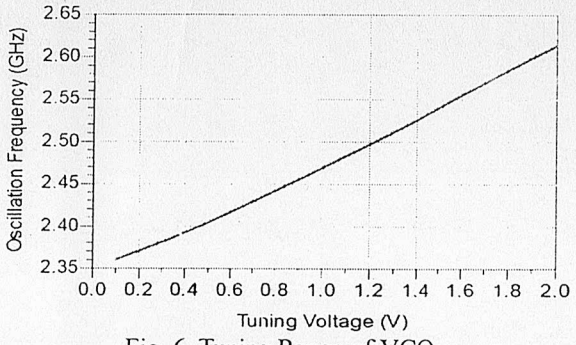

Fig. 6. Tuning Range of VCO

The circuit generates stable periodic oscillations with harmonic index as shown in Fig.7. Harmonic balance simulation simulates the circuit multiple input frequencies and calculates the steady state response of the circuit.

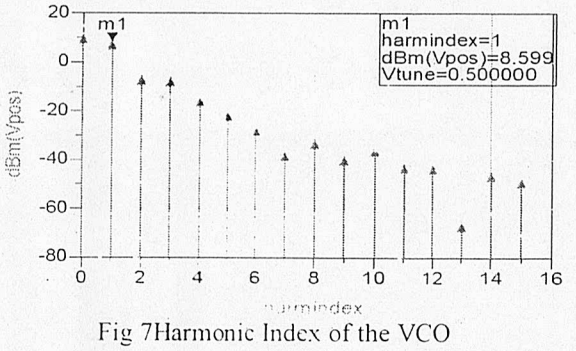

Fig 7Harmonic Index of the VCO

The FOM of the VCO is calculated to be -183.73 dBc/Hz at the centre frequency of 2.4 GHz according to the Eq. (2). The proposed VCO gives a power dissipation of 18mW and operates from a supply voltage of 1.8 V.

TABLE I gives a brief description of the performance comparison of the proposed VCO with the previously published works. It can be determined from TABLE I that our proposed design shows superior performance when compared with previous works.

TABLE I. PERFORMANCE COMPARISON OF VCO WITH PREVIOUS WORKS

Parameters	This work	[7]	[8]	[9]
Technology (nm)	130	180	180	250
Supply Voltage (V)	1.8	1.8	0.25-0.5	2.5
Power Dissipation (mW)	18	3.1	2.82	15
Tuning Range (MHz)	250	330	260	390
Frequency (GHz)	2.4	2.4	2.29	2.4
Phase Noise (dBc/Hz)	-128.63 @1M	-126.1 @1M	-118.9 @1M	-115.7 @600K
FOM (dBc/Hz)	-183.73	-188.8	-181.6	-175.98

VI. CONCLUSION

The design of a 2.4 GHz LC voltage controlled oscillator based on NMOS cross-coupled structure which is implemented using TSMC 130nm CMOS technology is presented. The main parameters such as phase noise, power dissipation, tuning range and tuning sensitivity and their effects on the VCO performance are discussed. The paper explains in detail the three different topologies of LC-tank VCO design for low power consumption and low phase noise. Comparison between the VCO topologies considering their effect on the performance parameters is done. The VCO simulations and design of the layout are carried out using ADS Tool. The VCO shows a frequency tuning range of the VCO is from 2.36 GHz to 2.61 GHz when the control voltage changes from 0 to 2 V which corresponds to a 10%. The simulated phase noise of -128.68 dBc/Hz at 1 MHz offset frequency from a 2.4 GHz carrier signal. The figure of merit value is calculated to be -183.73 dBc/Hz. This design finds its applications in RF wireless communication applications because it offers low power, high performance (low phase noise), wide tuning range and small size (low cost).

ACKNOWLEDGMENT

The author would like to express his sincere thanks to project guide **Prof. Mrs. R.P. Patil** for her valuable references, co-operation and support throughout the project work. The authors would like to acknowledge the RFIC solutions for the valuable guidance and assistance they have given for the accomplishment of this work.

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Review on Leaf Spring Type Suspension System

Prasanna D. Dhumal[1], Mayur S. Jadhav[2], Rushabh S. Tawar[3], Sameer A. Agrawal[4]

U.G. Student, Department of Mechanical Engineering, Smt. Kashibai Navale College of Engineering, Maharashtra, India[1,2,3]

Assistant Professor, Department of Mechanical Engineering, Smt. Kashibai Navale College of Engineering, Maharashtra, India[4]

ABSTRACT: Today suspension system is an integral part of the automotive functioning. This review observes the key areas of designing the suspension system from the aspect of durability, failure analysis and some novel methodology adopted for quick and effective design. Low cost and high reliability of the leaf springs makes them suitable for commercial vehicles even today. Fatigue analysis of the springs to the increased load and its failure at certain cycles is an assessment of the current design process. Along with vertical static loads, a number of loads are analysed and taken into consideration.

KEYWORDS: Leaf Spring, Fatigue, Suspension system.

I. INTRODUCTION

With the advent in modern technology a wide variety of suspension systems are now used in vehicles, although majority of heavy vehicles utilize leaf springs as their suspension sub-system due to a wide merit base such as low cost, easy maintenance and high load carrying capabilities. Leaf springs are an assembly of various components like leaves stacked together, center bolt, U-bolt. Main leaf has eyes at both ends for the ease of mounting. There are various types of eyes such as Berlin, Upturned, Downturned, Military-Wrapper type etc. which are used based upon the loads it encounters and manufacturing feasibility. Vehicle suspension system is classified into three types i.e. passive, semi-active and active suspensions, which depends on working feature to enhance vehicle safety, ride comfort and overall performance. Springs absorb the static and dynamic loads within yield point thus providing proper handling and comfort. The energy is stored as strain energy and hence the strain energy of material becomes an important aspect in the design of springs. Nowadays CAE tools have found a broad base of application in automobile industries. Their use has even made the reduction of costs in product development while developing the safety, comfort, and durability of vehicles. The predictive features of these tools have made verification of design very simple and have improved reliability on digital devices using simulation instead of practical prototype testing. Dampers along with the basic suspension system are also a very critical part of design and need to be incorporated. The paper also shows that while designing the suspension system fatigue life and loading must be exercised as fracture analysis is the backbone of designing.

II. BACKGROUND

The suspension system smoothes out the ride and keeps the car in control. It enables the constant contact of the tire with the road so that a good stability to the vehicle and better ride handling is achieved. The suspension system enhances the comfort of passengers by reduction in the shocks due to complex forces acting on the axle. Commercial and heavy duty vehicles perform satisfactorily with leaf springs as the suspension system. The elasticity and interleaf friction aid in absorbing the shocks on road. The leaf springs are curved in profile (these are often called elliptical springs); the curvature helps the spring to absorb impact. The frequency at which the leaf spring responds is different

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for types of vehicles and has a range of values.

III. LITERATURE REVIEW

M. Malikoutsakis et. al. [1]The paper is a brief optimized procedure for a commercial suspension system for high performance usually adopted by the vendors. The paper mainly focuses on leaf spring suspension subsystem for the front axle as shown in Fig.1. and the whole design procedure is explained. It covers key areas of design such as problem statement, procedure, material selection right up to testing by professional drivers on a test track. Fatigue analysis was also carried out establishing the consequences of various materials on the fatigue life of the leaf springs. Loads encountered while straight driving and braking were found to be the most critical on which the situation was primarily based. A novel method called durability test was used to have an overview of the failure of the front arm. This was to ensure to have pre-knowledge of when the arm fails as its failure can cause the driver to lose control of the vehicle. Miner's damage accumulation rule was used along with the S-N curves and a sensitivity factor to gain damage plateau. Although the paper focuses mostly on a mono leaf spring for a huge load a multi-leaf spring would be more desirable.

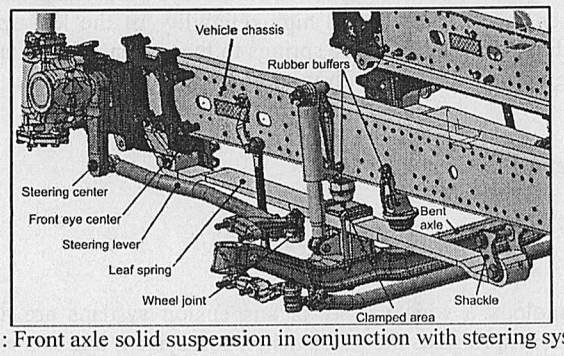

Fig.1: Front axle solid suspension in conjunction with steering system

Gerhard Fischer et. al. [2] This paper mainly focuses the various loads that are encountered by the leaf springs during their life-cycles like vertical, lateral, longitudinal loads and the loads during acceleration and braking as shown in Fig.2. Fatigue testing of leaf springs generally involves sinusoidal loading and uniaxial loading. The loads encountered in practical applications are way beyond simple vertical loads. This paper describes the fulfilment of a setup that tests the spring under multi-axial loads, thus simulating real life loads for knowing fatigue life and also briefly shows the process that was carried and its results verified with the traditional method. The setup involved used of hydraulic actuators for loading and strain gauges for the instrumentation of the parameters of the test. The same setup is applied for testing other vehicles that involve different kinematic conditions and thus save the development time and cost. Apart from loading other factors of failure like ineffective shot peening, coating, tolerances are also recognized. In addition, various failures of the leaf spring are shown through diagrams. This procedure can be readily adapted to for the testing of leaf springs from a set of vendors and thus reducing the risks involved.

Smt. Kashibai Navale College of Engineering Pune-41.

Assistant Professor & Head
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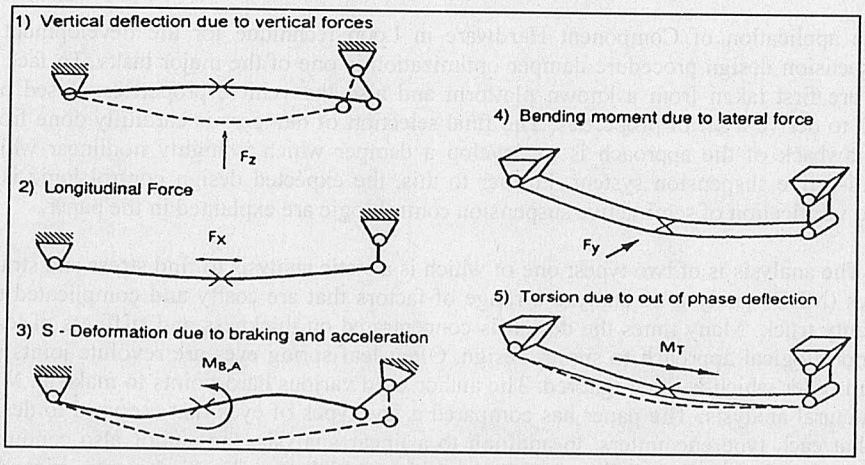

Fig.2: Loads on Leaf Spring

N. S. Mendhe et al[3] The literature observes the vehicle suspension system for study of static and fatigue characteristics of leaf spring, leaf spring optimization, leaf spring design for heavy axle loads etc. This paper includes the comparison of leaf spring performed by finite element method. In this several attempts to perform the optimization of the factors of two different grades of steels. According to the literature, the leaf springs are held in tension, compression, bending, torsion and shear; hence they are prone to fatigue failure. The primary load being vertical load, they are also subjected to F_s(side load), F_t (longitudinal load), T_t (twisting torque) and T_w (wind up torque) as shown in Fig.3. Failure at the eye end is evaluated in the paper for which the modeling of the spring is done in PRO-E and analyzed in ANSYS12.0V Workbench. Stiffness, deformation, stress, safety factor, area, moment of inertia, width, thickness, length of leaves and number of leaves are the most crucial factors while carrying out analysis. From all these factors stiffness and developed stress are the most influencing parameters. In this testing of the spring is carried out for optimization of a number of leaves.

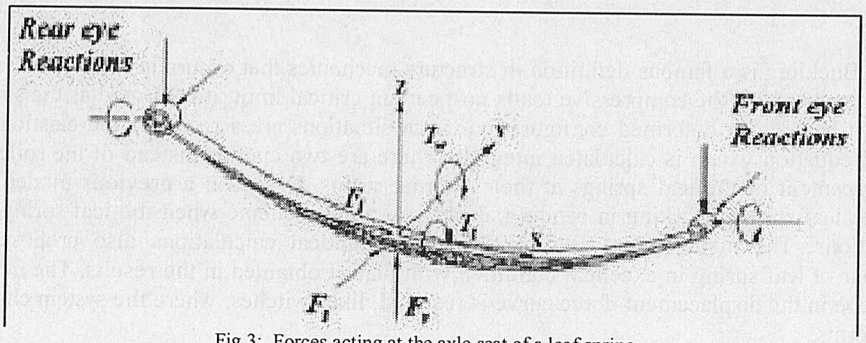

Fig.3: Forces acting at the axle seat of a leaf spring.
F_v: vertical load, F_s side load, F_t: longitudinal load, T_t: twisting torque, T_w: wind up torque.

Medha Santosh Jambhale et. al. [4] This paper states the procedure to make semi-active suspension control system. The simulation model used is the VDYNA vehicle model duly verified with information used to produce a semi-active suspension with PID controller. In this type of suspension system, MR (Magneto-Rheological) damper is used and the control logic is verified with the use of software in loop (SIL) technique and further with component hardware in loop (cHIL) technique. The research of active/ semi-active suspension has applied needs and helps in achieving an optimum level of ride handling which helps us to infer the safety and comfort riding. In both techniques, there is use of road profile (digitally) which is analyzed in the situations of ride handling characteristics of the suspension. For SIL technique model, MR damper is used. To speed up the vehicle development process various tools are used. This is an

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effort to display the application of Component Hardware in Loop technique for the development of semi-active suspension. In a suspension design procedure damper optimization is one of the major tasks. To face the most cases, dampers properties are first taken from a known platform and also the vehicle properties. Based on this selection simulation is carried to derive a set of properties. The final selection of dampers is carefully done from vehicle level experiments. The drawback of the approach is to develop a damper which is highly nonlinear which urges to the development of semi-active suspension system. Further to this, the expected design control logic is necessary. The design, research, and verification of semi-active suspension control logic are explained in the paper.

Y.S. Kong et. al. [5] The analysis is of two types; one of which is a static analysis to find stress and strain while other is multi-body dynamics (MBD) analysis to analyze a range of factors that are costly and complicated to test for a leaf spring for a heavy-duty truck. Many times the design is concentrated on thickness and stiffness of leaf spring but the paper presented a more logical approach to spring design. Often leaf spring eyes are revolute joints which encounter bearing stress of high order which is often ignored. The author used various hard-points to make an MBD model and a CAD model for structural analysis. The paper has compared a few types of eyes that are used to design a leaf spring and all the forces that each type encounters. In addition to a linear analysis, the author also conducted a non-linear analysis for the phase of rubber touch to fully compress as rubber exhibits non-linear characteristics. A maximum load of that the spring encounters is when the truck encounters a pothole and can cause the leaf to enter the plastic state. Thus in the paper, the author optimizes the eye design for vertical, longitudinal and shear loads exploring a new failure possibility.

V.R.Baviskar et.al. [6] The leaf spring (master leaf) is subjected to static analysis with a provision of support which is provided at the center of the leaf. The paper consists of various ways to reduce stress concentration at the eye section and the other parts of the leaf spring by increasing the cross-section area which ultimately results in increased strength. It deals with the findings of fatigue life from stress approach model, since the main failure to which leaf springs are subjected is fatigue failure. The post literature review shows that the leaf springs are subjected to various forces and they are attached to the axle, which provides reaction forces. In this paper, for analysis purpose the leaf spring is modeled in CATIA VSR5 19 and to validate the safety of design, the analysis is done in ANSYS 14 software. It is concluded from the above-mentioned procedure whether the modeled leaf spring is satisfying the required condition or not.

A. Donoso et. al. [7] Buckling is a famous definition in structure mechanics that occurs in long elastic structures on the cost of compressive loads. After the compressive loads post certain critical limit, it is termed as the structure buckling, and after buckling, it becomes a deformed configuration. Such situations are a result of the elasticity in a nonlinear ordinary differential equation which is calculated integrals. There are two clamps instead of the rollers that constrain the horizontal displacement of the leaf springs at their external reams. Based on a previous model of an adjustable stiffness spring, with leaf springs working in bending, developed a new scheme when the leaf springs are working in post-buckling situations. The numerical results are from mathematical calculations also proposed to model the mechanical behaviour of leaf spring in excellent condition with that of obtained in the results. The new device is used where a negative slope in the displacement–force curve is required, like switches, where the system changes its position from two separate forms.

C.K. Clarke and G.E. Borowski [8] The paper consist of discussion about the evaluation of failure of rear leaf spring that occurs in sports utility vehicle while in an accident sequence. The presentation of this failure is expressed in the form of residual strength estimates and analysis of fracture surface. There are two possibilities pointed during an accident for failure: first during the initiation of the accident sequence the marks are observed in the roadway and also at the termination of sequence a rock strike is observed. During evaluation of leaf spring fracture, it is observed that half of the spring is cracked before the accident. It is evident due to rust and chemical contamination which is observed to the point where a failure occurs. This also subjected to secondary a crack which is observed at the plane. This shows that there is the presence of segregation and weakness in the leaf spring. The stress calculation gives the yielded residual-strength level which is observed before the cracking in the spring. This condition is expected during the travel over a

Assistant Professor & Head
Dept. of Mechanical Engg.
Smt. Kashibai Navale College
of Engineering, Pune - 41.

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rough road. Thus it is evident that the spring rupture takes place prior to the accident because of various reasons which are mentioned above and location of the rupture point placed at accident sequence, because of stresses which occur at that point. Thus, the fracture occurred is placed at the sequence of the accident.

Stylianos Karditsas et. al. [9] This paper mainly focusses on the parabolic leaf spring. The idea discussed was the comparative trajectory of the steering knuckle for various deflections to the trajectory of leaf spring. As shown in the Fig.4. both trajectories should be as near as possible to avoid effects like bump steer. The validation is by FEM models to verify the stress distribution. It also compares the eye type and the eccentricity on the arm rate at various designed conditions although they do not have a significant effect on the stress encountered. The procedure for carrying out analysis presented a solid background for future FEM prototypes for different vehicles incorporating the same system for different loads. The paper crucially connects two sub-systems like steering and suspension and validates the design by Finite Element Model.

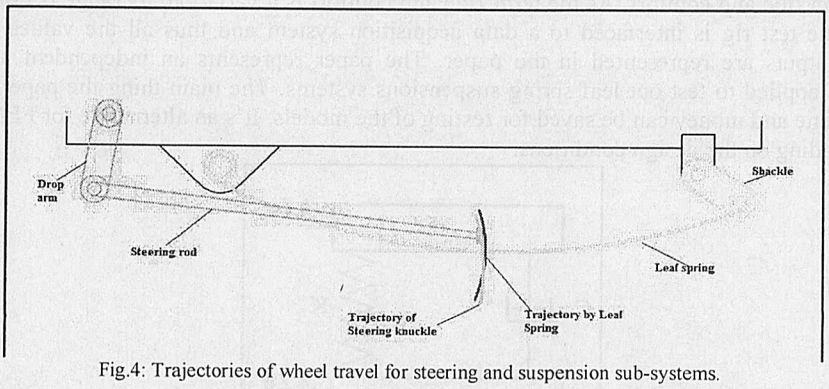

Fig.4: Trajectories of wheel travel for steering and suspension sub-systems.

Bruno Geoffroy Scuracchio et. al. [10] The main function of shot peening is to induce stresses at the part's surface, thus encouraging its fatigue life, which is recognized for several years. In automotive springs, the shot peening process of manufacturing is an important part of the production. In depth study of the process of shot peening is required. The study of stresses in fatigue tests on a series of samples that are subject to various peening. Among the studied processes, the use of 0.8 mm diameter steel shot which is followed by a secondary peening with 0.3 mm diameter steel shot that leads to best performance, regarding fatigue life. X-ray diffraction investigation shows that new assessment is comprised of compressive stress served at a depth of 0.02 mm below the surface, indirectly inspires fatigue crack. Stresses by shot peening in bigger depths have no consequences on the sample's fatigue life.

Dipendra Kumar Roy et. al. [11] The current situation deals with the mathematical analysis of deflection of cantilever beams for material properties with a vertical load suspended at the free end. In free end displacement, there is a fluctuation of stress, strain and the bending moment of the beam having fluctuating material properties with length obtained by the method of minimization of total potential energy. The numerical formulation is based on a variation principle using assumed mode method. The displacement functions are an arbitrary linear combination of functions, developed through equilibrium equation. The solution of the displacement problem is achieved using MATLAB simulation. It is observed due to displacements and the reductions of beam length are largely affected by variables in elasticity. The current situation is verified and results have been published. The inspiration of materials for various types distribution is shown for different types of loading.

Vinkel Arora et.al. [12] The literature had done a comparison of leaf springs made up of two different materials in order to validate the results. This work is done on leaf spring of front end of a commercial vehicle. The paper carries out design by using CAD software and analysis of leaf spring with considering the various design considerations and loading conditions. Since CAE tools are capable of controlling product cost and time, they are used in automobile industry. It results in improved safety, comfort, and durability of the vehicle. The accuracy of the CAE tools isincreased

Smt. Kashibai Navale College of Engineering, Pune - 41.

Assistant Professor & Head
Dept. of Mechanical Engg.
Smt. Kashibai Navale College
of Engineering, Pune - 41.

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to such a level that most of the correction is done with the help of computer simulation over prototype testing. Though CAE is preferred over conventional method still physical testing is done. Since CAE tools are not distinctive to show accurate variables are complex assemblies. Hence validation of the CAE results is important. The paper consist model of leaf spring is made up of material which is different than the widely used material, for which modeling is done in CATIA and analysis is performed using ANSYS. This is carried out under different load conditions of deflection and stresses. For validation, the results of experiments and CAE are compared.

Anirban C. Mitra et. al. [13]This paper describes a special application of mechatronic test systems. A test rig model as shown in Fig.5. was developed to test a quarter of a car for its suspension. Ride and comfort is a big term that incorporates various factors like camber, toe, tire pressure, the stiffness of spring road conditions etc. It's very hard to test out all the conditions, but with the test rig that is developed by the author, many of the dynamics of the car can be evaluated for optimum ride and comfort. As the term ride and comfort is a variation, its range is established where the values should lie. The test rig is interfaced to a data acquisition system and thus all the values are recorded on a processor and the outputs are represented in the paper. The paper represents an independent suspension system, although the same is applied to test out leaf spring suspensions systems. The main thing the paper reflected was that through interfacing time and money can be saved for testing of the models. It's an alternative for FEM models or rather complimentary depending on the design conditions.

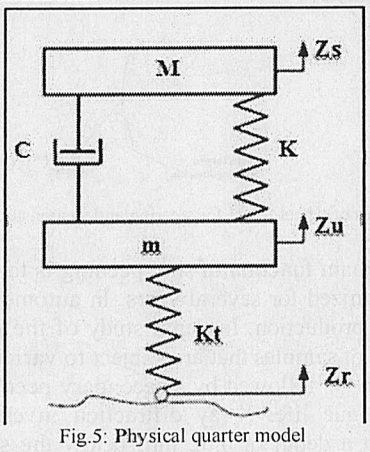

Fig.5: Physical quarter model

Basaran Ozmen et. al. [14]The paper aims to find out fatigue life under the increasing amplitude loading. It states that the fluctuating amplitude loading tests are exercised because none of the cumulative damage hypothesis can decide the fatigue life for loadings. Thus, these parameters are necessities to have real damage approximately with Gassner-lines, the rule of the spectrum distortion with the size L_S are added up and calculations are found from this value by using experimental results. The paper presents testing and simulation for longer life of leaf springs based on measured loads. This study displays a complete production process with the help and guidance of testing and simulation works to build a durability assessment analysis of leaf springs based on rapid fatigue life testing with the help of increased amplitude loading.

Priyanka Kothari, Amit Patel [15] the paper consists of a general study on design, analysis and fabrication of leaf spring. Leaf springs are used in the suspension system of commercial vehicles and they are the oldest component of the suspension system. The leaf spring type suspension system is used to reduce shocks and support the vertical load. The literature shows a growing interest in replacement of steel leaf spring with another material which is having much higher strength than steel and also it should be light in weight. Such kind of material also possesses very high fatigue resistance. The vehicle is significantly affected by its suspension system which accounts for ride comfort and stability of vehicle etc. The leaf springs are prone to a large number of fluctuating stress cycle which causes its failure by fatigue. A lot of research is done on leaf springs in order to increase its fatigue resistance. For literature, the most effective

Smt. Kashibai Navale College of Engineering Pune-41

Assistant Professor & Head
Dept. of Mechanical Engg.
Smt. Kashibai Navale College
of Engineering, Pune - 41.

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solution to this problem is a change of material of spring. The newly developed fiberglass material possesses all required characteristics when it is evaluated against the steel leaf spring. To prove that the author reviews few papers which are consist of the use of alternative materials and effects of this on the performance of leaf spring.

Ishwar Patil et. al. [16] Ride handling and comfort are very important features that inspire the vehicle characteristics. The suspension systems of the vehicle are dependent on these parameters. A semi-active damping system is an element in which the dissipation law can be modelled. The system is cost effective, has light weight and low energy consumption, and is used in passenger vehicles of the future. There is sensible control; the semi-active systems provide complete performance between active systems and passive systems. Various schemes of semi-active dampers are cited in the paper. The initial is the semi-active "on-off" system, in which hard and soft damping coefficients are applied depending on the product of body velocity and damper velocity. Time response analysis is checked out in Simulink and display of results for a better understanding of various semi-active control models for a vehicle is carried out.

IV. CONCLUSION

This study concludes various areas of leaf spring suspension design and analysis. It gives a scope that its design, durability, and fatigue can be studied in more depth. The fatigue life can be increased significantly by the change of materials, which calls for the use of composite leaf spring. The material change gives way to reduced weight which gives lesser stress values in overall consideration. There is a display of the analysis of every literature and all of them share the same view of studying this component in a very different approach. A number of softwares are used nowadays for testing the suspension systems thus reducing costs. Key areas of design were highlighted which ought to be focused upon while designing a suspension system.

V. ACKNOWLEDGEMENT

We respect and thank Mr. S. A. Agrawal for giving us an opportunity to do the project work on "Review on Leaf Spring type Suspension System". It was his support and guidance which made us complete the paper on time. We are extremely grateful to him for providing his support and guidance in spite of his busy schedule. His extra effort in checking our review on a weekly basis helped to keep me on track and finish my work on time.

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Smt. Kashibai Navale College of Engineering Pune

Assistant Professor & Head
Dept. of Mechanical Engg.
Smt. Kashibai Navale College
of Engineering, Pune - 41.

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Smt. Kashibai Navale College of Engineering Pune-41.

Assistant Professor & Head
Dept. of Mechanical Engg.
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ANALYSIS, FABRICATION AND TESTING OF VERTICAL AXIS WIND TURBINE

Rohan Khutade[1] Kuldeep More[2] YashdeepPadey[3] Yash Pate[4] Prof. T.S Sargar[5]
[1,2,3,4,5] Department of Mechanicalengineering
[1,2,3,4,5] Smt. Kashibai Navale College of Engineering, Vadgaon
rohankhutade@gmail.com

Abstract— **Wind energy is an indirect form of solar energy since wind is introduced chiefly by the uneven heating of the earth's crust by the sun. The conversion of this wind energy into electrical energy can reduce the power deficit to large extent. Vertical axis wind turbines (VAWTs), which may be as efficient as current horizontal axis systems, might be practical, simpler and significantly cheaper to build maintain than horizontal axis wind turbines (HAWTs). In this project we attempt to design and fabricate a Savonius Vertical Axis Wind Turbine.**

Keyword- **Savonius; Overlap Ratio; VAWT; CFD**

I. NOMENCLATURE

P= Power to be generated
C_P= Power coefficient
ρ= Density of air
A= Swept area
V= Wind velocity
D= Diameter of rotor
H= Height of rotor
C_L= Coefficient of lift
C_D= Coefficient of drag
F_L= Lift force
F_D= Drag force
F= Resultant force

II. INTRODUCTION

Carbon dioxide (CO_2) being the main culprit for global climate changes, the world is focusing on development and installation of wind energy farms. It is estimated that global wind power capacity is 74 GW and India has 2000 MW out of the total 45000 MW. India ranks fourth in the world with regard to the total wind power installation. So, wind turbines can be the best option for one of the renewable source of energy. As horizontal wind turbines are currently present though they require large infrastructure. So vertical axis wind turbine can be a better option for small power generation. In these paper we have discussed about savonius VAWT.

A. Types of VAWT:

1) Darrius wind turbine
2) Savonious wind turbine
   i) Semi circular blade
   ii) Semi elliptical blade

B. Advantages of VAWT over HAWT:

1) VAWT is simple to design and fabricate.
2) It is drag driven turbine.
3) It is wind direction independent turbine so that it is not necessary to mount turbine in front of wind direction.
4) It is small as compared to HAWT.

C. Disadvantages:

1) VAWT has low efficiency.
2) Due to its vertical shaft; mounting of alternator and gearbox may become a problem.
3) HAWT generates high power and has high capacity.

III. DESIGN THEORY

The Vane type rotor of S-shaped cross section is predominantly drag based, but also uses a certain amount of aerodynamic lift. Drag based vertical axis wind turbines have relatively higher starting torque and less rotational speed than their lift based counterparts. Furthermore, their power output to weight ratio is also less.

The power to be generated is assumed as 15 Watts.

$P=0.5*C_P*\rho*A*V^3$

Here wind velocity is assumed as 7 m/s and density of air is 1.223 kg/m^3.

Therefore swept area comes out to be 0.240 m/s.

So A= D*H

Here blade shape is taken as semi elliptical profile because semi elliptical profile has more concave area as compared to semi circular blade profile. So air will remain in contact with blade for more time and so less force required for rotation of blade.

Therefore Height of blade = 595 mm
Semi- Major axis of blade = 139 mm
Semi- Minor axis of blade =111 mm

Following are chosen design parameters for the fabrication of turbine:

1) Tip speed ratio: It is defined as ratio of tangential speed of tip of the blade to wind velocity. It is taken as 0.8.
2) Overlap ratio: It is ratio of overlap between two blades to the diameter of rotor. It is taken as 0.2.



Assistant Professor & Head
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of Engineering, Pune - 41.

3) Aspect Ratio: It is the ratio of height of blade to the radius of rotor. It is taken as 2.5. [1]

IV. ANALYSIS OF SAVONIUS WIND TURBINE

CFD analysis gives the detailed information about air flow over turbine blade and also gives the information about lift and drag coefficients. So from that we can calculate lift and drag force for turbine with the help of them. From that we can also get resultant force which is assumed to be point force acting at center of blade. So from that we will get required torque. [2]

Here CFD analysis is done on elliptical blade of dimensions mentioned in above design of turbine. For analysis wind speed is taken as 5.5 m/s.

From results of CFD analysis it is clear that VAWT is drag driven turbine as coefficient of drag is greater than coefficient of lift. But effect of lift force is also present in small percentage in savonius VAWT.

From graphs obtained from CFD analysis
We get $C_D = 2.7$
$C_L = 0.2$

Therefore drag force obtained is
$F_D = 0.5 * \rho * A * V^2 * C_D$
$= 0.5 * 1.223 * 0.238 * 5.5^2 * 2.7$
$= 11.88$ N

$F_L = 0.5 * \rho * A * V^2 * C_L$
$= 0.5 * 1.223 * 0.238 * 5.5^2 * 0.2$
$= 0.88$ N

Resultant force obtained is
$F = (F_D^2 + F_L^2)^{1/2} = 11.91$ N.

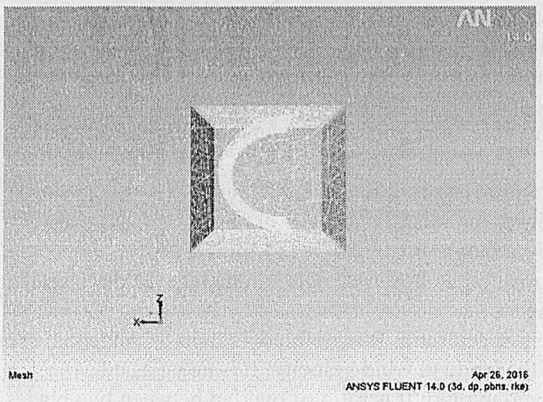

Fig. 1. Meshed profile of blade

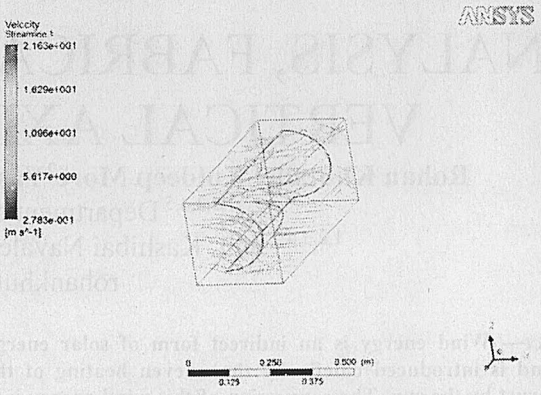

Fig. 2. Air flow on blade profile

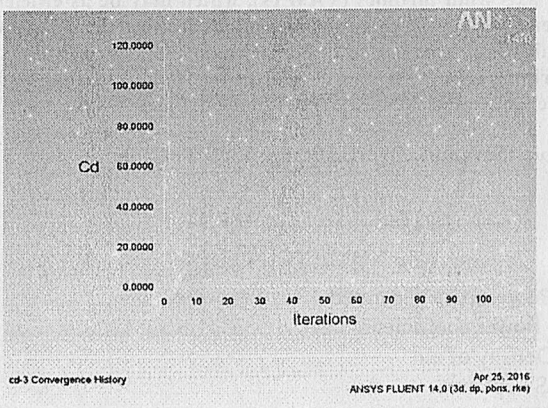

Fig. 3. Graph of C_D Vs. No. of iterations

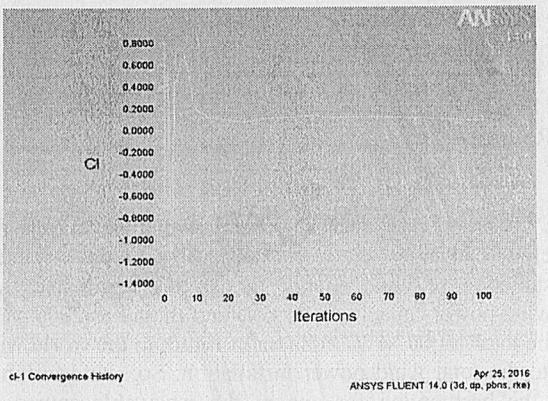

Fig. 4. Graph of C_L Vs. No. of iterations

V. FABRICATION OF SAVONIUS VAWT

In this project we have manufactured 3 bladed semi elliptical profile savonius VAWT. PVC pipes as used as a structure for turbine. Alternator is coupled to turbine with the help of coupling. Wooden planks are used as a supporting structure for bearings. We have used material for blades as aluminium and also material for shaft is aluminum as it has less density.

Smt. Kashibai Navale College of Engineering Pune-41.
Assistant Professor & Head
Dept. of Mechanical Engg.
Smt. Kashibai Navale College
of Engineering, Pune - 41.

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Review of Battery Charging Topologies for Electric Vehicles

VRUSHALI KULKARNI

Abstract: In the event that PHEV became more available and the number of PHEV on the road increases, certain issues will be needed for addressing. One vital issue is the method of charging these vehicles and that if today's grid can sustain the increased demand due increased PHEVs. Although these vehicles pose a large liability to the grid, if executed properly, they can actually become larger asset. The grid can benefit greatly from having reserves that can store and/ or release energy at the appropriate times. Enabling PHEV to fulfill this niche will require a bi-directional interface between the grid and every vehicle. This bi-directional charger must have the ability to charge a PHEV's battery pack while producing minimum current harmonics and also have the ability to return energy back to the grid. This paper reviews the various topologies used for battery chargers plug-in electric vehicles and hybrid Vehicles. Although commercial EV is still to be equipped with integrated charger, various topologies have been proposed for integration. Therefore, there is need for Classification. This paper gives an overview of topologies based on functionality of their integrated Components. Charger systems are mainly classified into off-board and on-board types with unidirectional or bidirectional power flow. Unidirectional charging eases interconnection issues and eases hardware requirements. Bidirectional charging helps in battery energy injection back to the grid. Typical on-board chargers restrict power because of constraints like weight, space, and cost. However, they can be integrated with the electric drive to avoid these problems. If charging infrastructure is available ithelps to reduce on-board energy storage requirements and costs. On-board charger systems can be inductive or conductive. An off-board charger can be designed for higher charging rate and is quite less constrained by size and weight. Level 1, Level 2, and Level 3 power levels have been discussed. Future aspects such as roadbed charging are also presented.

Keywords: Plug-In Hybrid Electric Vehicles (PHEV), Infrastructure Working Council(IWC), Society of Automotive Engineers (SAE).

I. INTRODUCTION

There is growing interest in electric vehicles (EV) and plug-in hybrid electric vehicles (PHEV) technologies because of their reduced fuel usage and greenhouse emissions. PHEV has the advantage of a long driving range since fuel provides secondary resource. Connections with the electric power grid allow opportunities such as ancillary services, tracking the output of renewable energy sources, reactive power support, and load balance. For the purpose of this paper, plug-in vehicle will be lumped together with EV. In the US, an official domestic goal of putting almost one million EV on the road by 2016 has been established, and public policies to encourage electrification has been implemented by government at all levels. Several organizations, such as Society of Automotive Engineers (SAE), IEEE, and the Infrastructure Working Council (IWC), are preparing standards and codes w.r.t the utility/customer interface. Electrical vehicles have yet togain wide acceptance. Three important barriers include the complications of chargers, high cost and cycle life of batteries, and the lack of charging infrastructure. Another drawback is that the battery chargers can produce harmful harmonic effects on electric utility distribution system, although chargers with active rectifier front end can mitigate the impact. Most EV charging can happen at home overnight in a garage where the EV can be plugged into convenient outlet for Level 1 (slow) charging. Level 2 charging is usually described as the primary method for both private and public facilities and requires a 240 V outlet. A future development focuses Level 2; semifast charging provides huge power and can be implemented in most environments. Mostly single phase solutions are used for Level 1 and 2. Level 3 and dc fast charging are used for commercial and public applications, operations like a filling station, and three-phase solutions normally applied. Stations for public use usually use Level 2 or3 chargers installed in parking lots, shopping centers, hotels, reststops, theaters, restaurants, etc.

EV battery chargers are classified as on-board and off-board with unidirectional or bidirectional power flow. Unidirectional charging is a first step because it limits hardware requirements, simplifies interconnection issues, and reduces battery degradation. A bidirectional charging system charges from the grid, inject battery energy back to the grid, and gives power stabilization with adequate power conversion. Typical on-board charger limit high power because of weight, space, and cost constraints. They can be integrated with electric drives to avoid these problems. On-board charger systems can be inductive or conductive. Conductive charging systems use direct contact between

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Head
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SKNCOE

Smt. Kashibai Navale College of Engineering Vadgaon (Bk.) Pune-41.

connector and the charge inlet. An inductive charger transfer power magnetically. This type of charger has been used for Levels 1 and 2 and may be stationary or moving. An off-board battery charger has less constrain of size and weight. Many different electronic circuits can complete this task, but they follow the same general circuit topology shown in Fig.1. This paper reviews the current status and implementation of EVs battery chargers, their power levels, and charging infrastructure.

II. BATTERY CHARGERS FOR PLUG-IN ELECTRIC AND HYBRID VEHICLES

Battery charger plays a critical role in the development of EV. A battery charger should be efficient and reliable, with high power density, low cost, and weight and low volume. Its operation depends on control, components and switching strategies. Charger control algorithms are implemented via microcontrollers, analog controllers, digital signal processors, and specific integrated circuits depending upon the cost, rating, and types of converters. An EV charger must ensure that the utility current draws low distortion to minimize power quality impact and at higher power factor to maximize the real power available from a utility outlet. SAE-J2894,IEEE- 1547, IEC1000-3-2, and the U.S. National Electric Code (NEC) 690 standards limit the dc current injection into the grid and allowable harmonic, and EV chargers are usually designed to comply. Modern EVs battery chargers contain boost converters for active power factor correction (PFC). The design in uses a dedicated diode bridge to rectify the ac input voltage to dc voltage, which is followed by the boost section. The bridgeless boost Power factor correction topology avoids the need of rectifier input bridge and yet maintains this boost topology. The converter helps to solve the problems like heat management in the input rectifier diode bridge inherent to the conventional boost Power Factor Correction, but at the same time increases electromagnetic interference (EMI). Interleaving has been proposed so as to reduce inductor size and battery charging current ripple; a unidirectional configuration presented is illustrated in Fig. 1. It consists of two boost converters connected in parallel operating180◦ out of phase.

The interleaved boost converter also has the advantage of paralleled semiconductors. With ripple can collation at the output, it helps to reduce stress on output capacitors. However, as that of the boost, this topology should provide heat management for the input bridge rectifier; hence, it is limited to power levels up to approximately 3.5 kW. A bridge-less interleaved topology has been proposed for power levels above 3.5 kW in multilevel converters can reduce switching frequency, size, and stress on devices and are suitable for Level 3 Electric Vehicle chargers. They allow for less expensive and smaller filter. The added complexity and additional components increases the cost and required control circuitry. Currently, most PEVs use single-phase on-board chargers to recharge their battery and many circuit configurations are reported in this literature. These topologies of single-phase unidirectional multilevel chargers are suitable, and are common multilevel charger topology for low-power Level 1 and 2 charging. Three-phase bidirectional multilevel converter is recommended for high power Level 3 charger system. These converters provides high level of power quality at input mains with reduced THD, reduced EMI noise and ripple-free regulated dc output voltage insensitive to supply and load disturbances, high power factor and boost. Three-level bidirectional dc–dc converter has been investigated for charge station application. These converters are characterized by low switch voltage stress and are used in smaller energy-storage devices such as capacitors and inductors. Various schemes and topologies have been reported for both three-phase chargers and single- phase. These chargers can use full-bridge or half-bridge topologies.

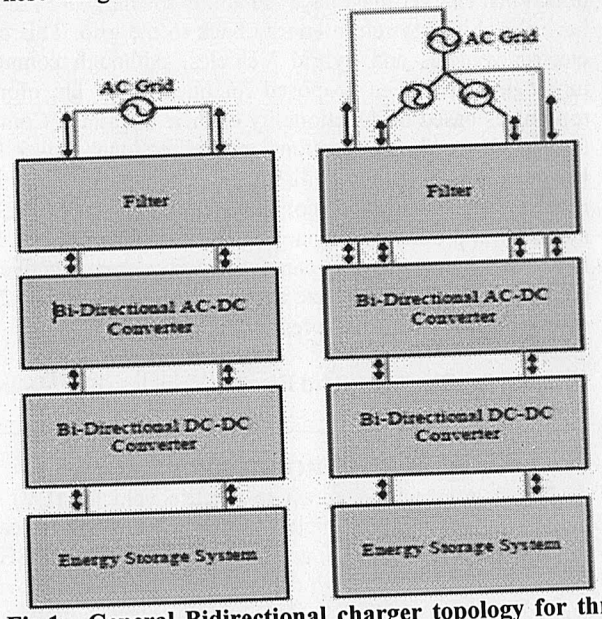

Fig.1. General Bidirectional charger topology for three phase systems (right) and single phase (left).

A. Half-Bridge PWM AC-DC Converter

On the other side, when the single phase charger is running in (battery discharging mode, the transistors are switched on and off by PWM controllers. To avoid fault current, T1 and T2 cannot be switched on at the same time. With the assumption that C1 and C2 are identical, T1 and T2 can be switched on and off to get either VDC-DC/2 or -VDC-DC/2 across R1, L1 and also the AC source. A PWM controller varies as these two voltages are applied so that after being filtered by L1 andR1, the voltage delivered to the AC source is of acceptable sinusoidal form. The three-phase, half-bridge converter (Fig.2) has three inductors, two capacitors, three resistors and six switches with internal diodes. The principle of operation is the same for the three-phase version as it is for the single-phase. During the battery charging mode, each AC source charges C1 when it gives a positive voltage and it charges C2 when it gives a negative voltage. The resultant voltage across the DC-DC converter is almost same as that of single-phase version (peak-to-peak voltage of one source), except the fact that, the charging capacitor receives a larger charging current, hence faster battery charging is possible. If the input current is three

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times, thrice the output current is possible, resulting in three times the maximum battery charging rate.

When the three-phase charger is working in battery discharge mode, the bi-directional AC-DC converter behaves as three independent single-phase circuits working at the same time.T4 and T1, , T3 and T6, T2 and T5each work together to deliver either VDC-DC/2 or -VDC-DC/2 against each respective set of one resistor, one inductor, and one AC source. Just like the single-phase version, a PWM controls every transistor so the right combination of the two voltages is applied across the resistor, inductor, and the AC source to result in a clean sinusoidal output voltage across the AC source. Benefit of the half-bridge topology is that it's simple to design. This requires fewer components, which means less cost of manufacturing. However, this topology exhibits increased component stresses, which may require transistors to be connected in parallel series to handle the high current or/and voltage. Unless filtered properly, the half-bridge converter produces very harmonic currents which could be detrimental to the grid. The conventional passive filter suited to remove the harmonic current would require bulky components. Though the low number of components makes the cost look less on paper, implementing this circuit at high power levels could require additional costs.

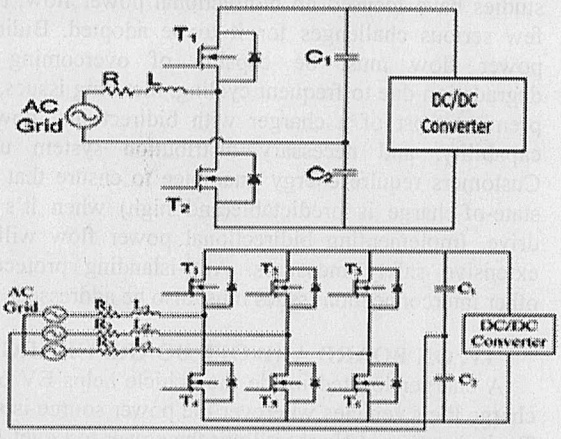

Fig.2. Half phase PWM bidirectional AC-DC converter depicted in single phase (top) and three phase (bottom) .

B. Full-Bridge PWM AC-DC Converter

The single-phase version of full-bridge Pulse Width Modulation AC-DC converters (Fig. 3) consists of one resistor, one capacitor, one inductor, and four switches with internal diodes. Just like the half-bridge circuit, the switches remain open when the battery charges and the internal diodes rectify the current. When the AC source delivers positive voltage, C1 is connected in parallel with the AC source through the internal diodes of T4 and T1. During the time when the AC source supplies a negative voltage, the internal diodes of T3 and T2 conduct to allow C1 to once again be connected in parallel with the AC source, but in reversed configuration. In this way, the DC-DC converter acquires a DC input voltage almost equal to the amplitudes of the AC source. For active rectification, the transistors are switched on when the diodes are forward biased. When the single-phase, full-bridge circuit works in battery discharge mode, T4 and T1 or T2 and T3 can be turned on to apply VDC-DC or -VDC-DC respectively across the AC source. Of course, switching T1 and T2 or T4 and T3 on at the same time would produce zero volts. Through PWM control of each transistor, the correct switching pattern can be implemented. When this combination of VDC-DC, -VDC-DC, and zero volt pulses is applied, the resistor and inductor smooth out the signal to resemble the desired AC sine wave.

The three-phase, full-bridge converter circuit (Fig. 3) has three inductors, one capacitor, three-resistors, and eight switches that each have internal diodes. Once again, the three phase version of the circuit functions more or less like three separate single phase circuits that share the same DC-DC converter and capacitor. Having three-phase instead of one does not result in any change in the supplied voltage to the DC-DC converter under no load, but the three- phase circuit can support larger load. In other words, the maximum rate of charging is increased. Similar to the half-bridge converter, the full-bridge rectifier can produce harmonic currents if not properly filtered. Also, power factor issues may need to be addressed. It is interesting to note that the half-bridge circuit outputs a voltage of ± VDC-DC/2, while the full-bridge can output a voltage of VDC-DC. This could play a significant role in the choice of DC-DC converter, since the VDC-DC must be twice as high with the half-bridge. In other words, for a given input voltage into the DC-DC converter, the output voltage must be twice as high when using the half-bridge AC-DC converter.

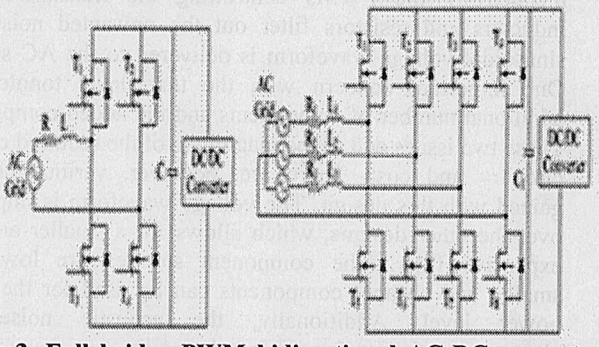

Fig.3. Full bridge PWM bidirectional AC-DC converter depicted in single phase (left) and three phase (right).

C. Three-Level PWM AC-DC Converter

The most complicated and final bi-directional AC-DC converters presented here is the three-level PWM converter. It combines the functionality of the half bridge and the full-bridge PWM with added complexity. The single-phase three-level PWM (Fig. 4) circuit operates just like the full-bridge rectifier in battery charging mode. When the AC source delivers a positive voltage, the internal diodes of T1, T3, and T6 turn on. When the AC source delivers a negative voltage then the internal diodes of T2,T4 and T5 conduct. At the time of active rectification, the switches are turned on in such a pattern to apply various voltage levels (as detailed in the next paragraph). Both passive and active methods charge the capacitors of C1 and C2 each up to half the amplitude of the

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AC source which applies the amplitude voltage of the AC source across the DC-DC converter. When T1, T6 and T3 or T2, T4, and T5 are switched on, voltage of VDC-DC or -VDC-DC can be applied to the load respectively. When T3 and T6 or T4 and T2 are activated, voltage of VDC-DC/2 or -VDC-DC/2 is applied to the load respectively. Like the full-bridge, zero volts can also be delivered to the load. Like the other types of converters, the three-phase; three-level converter behaves in a same fashion as its single-phase counterpart. Each phase applies a voltage equivalent to the amplitude voltage of the AC source across the DC-DC converters through the rectifier.

The three-phase topologies of the three-level PWM converter require that each AC source receives an independent control signal. But, each of the signals is delivered through the same means as the single-phase circuit. Every column of four transistors in the three-phase version acts like the column of four transistors in the single-phase circuit. The column of two capacitors and two transistors in the three-phase version works such as the right half of the single-phase circuit for all the phases in order to cater to the particular AC source to which it is connected. Each set of one resistor, one inductor, and one AC source receives a combination of ±VDC-DC/2, ±VDC-DC, and zero volts as dictated by the PWMs controlling the transistors. The inductors and resistors filter out the unwanted noise and sinusoidal voltage waveform is delivered to the AC source. One important concern with the three-level topology is additional number of components and the added complexity. These two issues add to the magnitude of the required control circuitry and cost. There are, however, various benefits gained with this design. The voltage waveform is improved over the other designs, which allows for a smaller and less expensive filter. The component stresses are lower, so smaller and cheaper components can be used for the given power level. Additionally, the acoustic noise and electromagnetic interference is reduced.

III. UNIDIRECTIONAL CHARGER

Two types of power flow are possible between electric grid and EVs, as shown in Fig. 6. Electrical Vehicle with unidirectional charger can charge but cannot inject energy into the power grid. This charger typically uses a diode bridge in conjunction with dc–dc converters and a filter. These converters are implemented in a single stage to limit cost, volume, weight, and losses. General unidirectional and bidirectional topology desired. Fig. 6 shows a unidirectional full-bridge series resonant converter for a Level 1 charging system which is similar to that represented in fig. Simplicity of control of unidirectional chargers makes it easy for utility to manage heavily loaded feeders due to multiple EVs. Those with active front end can provide local reactive power (Q) support by means of current phase angle control without discharging battery. With high penetration of EV and active control of charging current, unidirectional charger can meet utility objectives while avoiding cost, safety concerns, and performance associated with bidirectional chargers.

A. Biderctional Charger

A typical bidirectional charger consists of two stages: active power factor and bidirectional dc–dc converters to regulate battery current. These chargers use non isolated or isolated circuit configurations. When operating in charging mode, they should draw a sinusoidal current with defined phase angle to control power and reactive power. In discharging mode, the charger should return current in a same sinusoidal form. A bidirectional charger supports charge from the grid; inject battery energy back to the grid, referred to as vehicle-to-grid (V2G) operating mode, and power stabilization. The topology shown in Fig. 7(a) is a non-isolated bidirectional two-quadrant charger. This circuit consists of two switches, which highly simplifies the control circuitry. However, there are 2 high-current inductors that are bulky and expensive, and that can only buck in one direction and boost in the other. The topology in Fig. 7(b) is an isolated bidirectional dual-active bridge charger. While this circuit provides fast control and high power density, the large number of components can increase the cost. Although many studies have focused on bidirectional power flow, there are few serious challenges for it to be adopted. Bidirectional power flow must be capable of overcoming battery degradation due to frequent cycling, metering issues, and the premium cost of a charger with bidirectional power flow capability, and necessary distribution system upgrades. Customers require energy guarantee to ensure that vehicles state-of-charge is predictable(and high) when it's time to drive. Implementing bidirectional power flow will require extensive safety measures. Anti-islanding protection and other interconnection issues must also be addressed.

IV. ON BOARD AND OFF BOARD CHARGERS

A charger located inside the vehicle helps EV owners to charge their vehicles wherever the power source is available. Typical on-board chargers limit the power to Level 1 because of space, weight, and cost constraints. Resonant circuits can be helpful.

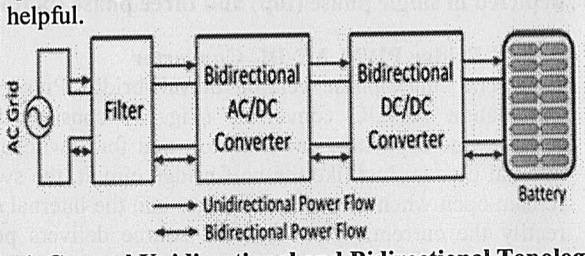

Fig.4. General Unidirectional and Bidirectional Topology.

The on-board unidirectional full-bridge series resonant Level 1 charger shown in Fig. 8 is an example. Considering that typical power electronics ratings in an EV is at least 30 kW, off-board charging involves extra power electronics and the associated extra costs. Other disadvantage includes added clutter in an urban environment and the risk of vandalism.

V. INTEGRATED CHARGERS

To minimize volume, weight and cost integrating the charging function in the electric drive system is proposed. Charger integration was first developed in 1985 and was patented by Rippel and Cocconi in 1990, 1992, and 1994.

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The function can be integrated if traction and charging are not simultaneous. In an integrated charger, motor windings are used as an isolated ac–dc converter or filter inductors. The most important advantage is that the motor drive inverter and the low-cost transformer serve as that low cost high power bidirectional fast charge can be supported with approx. unity power factor.

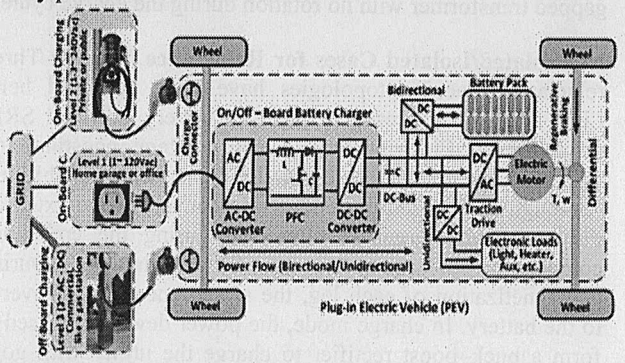

Fig.5. Plug in Electric Vehicle.

Extra hardware and control complexity are challenges to implement in commercial products. A combined battery recharge system and motor drive based on an induction motor is presently used by the Ford Motor Company. A non-isolated integrated charger based on a split-winding ac motor will be used in the automotive industry. A typical integrated charger system is shown in Fig. below

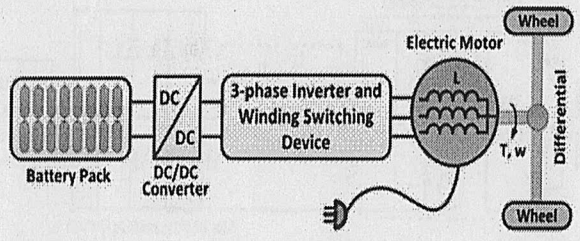

Fig.6.

A. Classifications of Integrated Battery Chargers

Integrated charger topologies may be categorized on the basis of inverter count and motor count. The solution patented by Cocconi and Rippelin 1992 uses two independent inverters with their respective induction motors. Every motor can be controlled by its dedicated inverter. In Tang and Su designed two inverters to drive the main and auxiliary motors, and used them as ac–dc converters for charging, while two three-phase motors were used as inductors for the converters with their neutral points connected to the grid. In, this topology is used for plug-in hybrids. The first machine plays a role in delivering regenerative energy to the battery by supplementing the driving force as a traction motor. The second machine charges the battery or starts up the engine. In the charging mode, both motors and inverters operate as ac–dc boost converters. Disadvantages of this charger are the large number of extra components (three contactors, twelve power switches, and two motors) and control complexity. A two-motor/two-inverter integrated charger is discussed in and shown in Fig. 9(a).

Rippel and Cocconi also proposed one induction motor with a double set of stator windings comprising two motor halves. The operational principle is the same as that of two-motor and two-converter configuration. Cost is saved and weight is less than in conventional chargers, but still the arrangement requires twelve power switches, three contactors, and the special double winding machine.

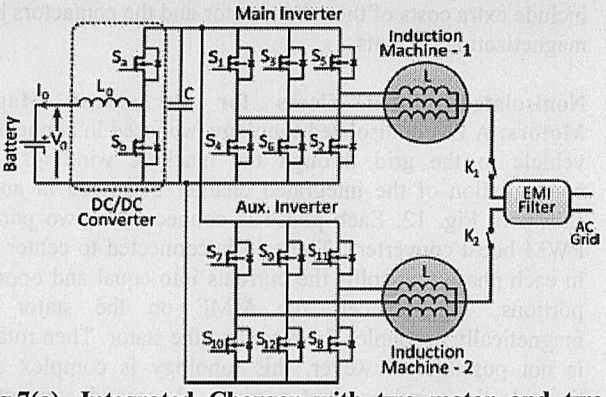

Fig.7(a). Integrated Charger with two motor and two inverter.

B. One-Motor with One-Power Converter Topology

With a motor and a power converter, an integrated topology may be classified by motor type: induction, permanent magnet and switched-reluctance motor (SRM) with isolated non isolated circuitry.

Non isolated/Isolated Cases for Induction Motors: Few non isolated cases for induction motors have been reported. Non isolated chargers tend to minimizes weight and size. Two of these cases were proposed by Ripple in 1990, in which each employs three-phase ac motor with inverter in traction mode. In the second, the three-phase motor and inverter together operate as an ac–dc boost converter, and the dc link voltage is lowered to the nominal battery voltage via bidirectional dc-dc converter. This one-motor inverter system is simple to control than other topologies. The third arrangement accesses the motor center tap to use the motor itself, as a coupling inductor. An integral PFC charger has been formed with four three-phase induction motors and their inverters. There is no other extra hardware except a transfer switch. However, this charger is appropriate only for vehicles with four-wheel drive. In fourth topology, three-level dc–dc boost converters are used as a front end for a two-wheeled vehicle. The front end is used as bidirectional converter to boost the dc-link voltage and get regenerative braking in motoring mode. It is rearranged to work as a PWM-PFC charger in charging mode. The fifth example is a non-isolated single-phase integrated battery charger; it has been installed on an electric scooter prototype and it uses the propulsion inverter with an additional LC filter and power rectifier. These are placed nearer to the motor. The on-board dc–dc converters consist of the three-phase inverter switches and motor windings. The induction machine is used as line-frequency step-down isolation transformer in charging mode. A wound-rotor machine is used and the drive is modified to

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act as a three-phase PWM rectifier. Advantages include low harmonic distortion, galvanic isolation, the possibility of bidirectional power flow, and unity factor. Disadvantages include extra costs of the wound rotor and the contactors high magnetization currents.

Nonisolated/Isolated Cases for Permanent Magnet Motors: A PM nonisolated topology proposed in connect the vehicle to the grid through the machine windings. The configuration of the integrated charger discussed in and is shown in Fig. 12. Each phase is connected to two parallel PWM boost converters. The grid is connected to center taps in each phase that splits the currents into equal and opposite portions. This cancels the MMF on the stator and magnetically decouples the rotor and the stator. Then rotation is not possible. However, this topology is complex as it controls three independent currents. A second concept for fast on-board charging is proposed which it uses the PM motor as a filter. The same converter is used both for traction and charging. The structure of this converter is almost same as that of typical three-phase PFC. The topology is composed of a buck–boost dc–dc converter and two three-phase PWM boost converters. A next and similar topology is appliedinto a scooter with an interior permanent magnet (IPM) motor traction drive as shown in Fig. 9(b). For charging purpose, the ac motor drives are operated as three-phase PFC coupled boost rectifier. No extra filtering is needed since the PWM ripple is reduced by means of phase interleaving. However the disadvantages include the need for extra hardware, which includes a capacitor, a single-phase rectifier bridge with a mechanical switch to access the center tap of the motor, and an EMI filter.

A PM-assisted synchronous reluctance machine is designed with a special winding configuration. It is four-pole machine with three-phase windings in traction mode. Each phase winding is divided in two equivalent parts which are shifted symmetrically around the stator periphery during charging mode. Basically, two three phase windings are shifted 30 electrical degrees, function during charging. The main idea is to introduce a multi terminal generator/motor set, to perform as a motor in traction mode and as an isolated generator and transformer during charging mode. The traction inverter acts as rectifier for charging. The device consists of two sets of three-phase windings, and the connections of winding can be reconfigured from traction mode to charging mode with the relay. A contactor is used to connect the grid-side windings to the grid, as shown in Fig. 10. This charger acts as isolated high-power bidirectional fast charger with unity power factor. Even single-phase solution is possible. Due to possible machine rotation in charging mode, a clutch is needed to disconnect the motor from the mechanical systems. An induction machine can be used with same working principles as of SPM machine. But in this case the motor will not rotate at the synchronous (Ns) speed. If the machine is kept in standstill that is the magnetization current is high due to the air gaps and this may limit system efficiency. Other option is to use an extra winding on one phase of the stator to help transformer operation for a single-phase ac supply. In such case, the stator will have asymmetric windings, and the motor acts as stationary gapped transformer with no rotation during the charge cycle.

Nonisolated/Isolated Cases for Reluctance Motors: Three reluctance machine topologies have been proposed here. Liaw and Chang present a compact battery powered SRM drive for an Electric Vehicle with voltage boosting and onboard power factor correction charging capabilities. Although the boost front-end dc–dc converters are external; the on-board charger is formed by using the embedded components of converter and SRM windings. During demagnetization of each leg, the stored energy is recovered to the battery. In charge mode, the power devices are used to form a buck–boost rectifier to charge the utility with good power quality. Barnes and Pollock used SRM phase windings as a transformer for charging, but without active PFC control. Hagh binet al. used an extra winding on one phase of stator to support transformer operation of single-phase ac supply with an SRM. The rotor position will align automatically, to maximum inductance over the first few cycles for charge mode. The extra winding adjusts the voltage level according to converter requirements.

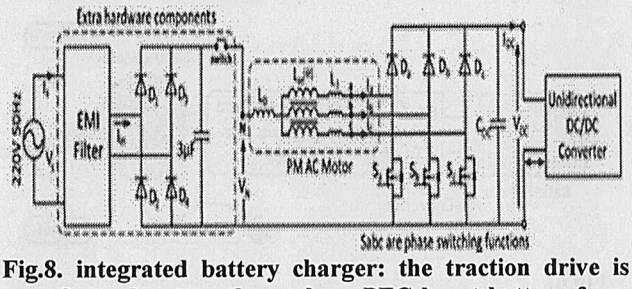

Fig.8. integrated battery charger: the traction drive is transformed onto a three phase PFC boost battery for a scooter.

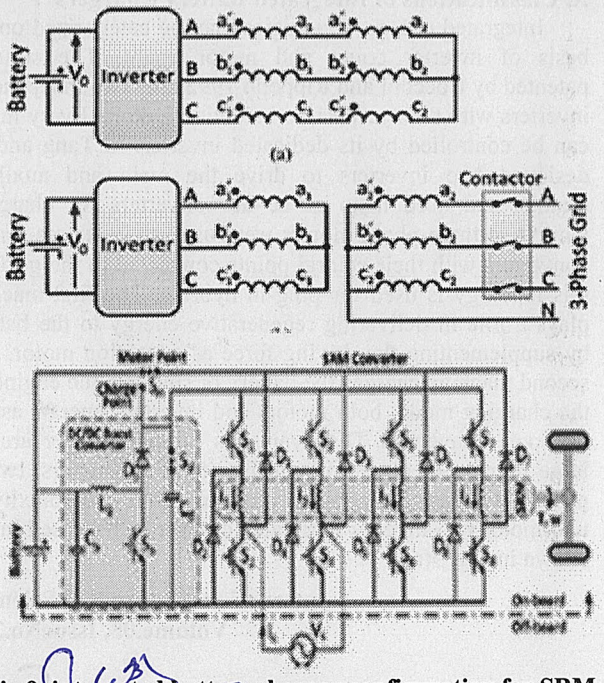

Fig.9. integrated battery charger configuration for SRM.

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Configurations that include a long wire loop sectional loops and spaced loops have been presented in the literature. The spaced-loop geometry improves the overall system efficiency, coupling coefficient and while minimizing the magnetization current, supply voltage ratings, and stray fields. Challenges of roadbed charging include high power ratings, high supply-voltage requirements, loop losses, poor coupling, and high magnetization current due to loose coupling, lateral misalignment, the large air gap, and stray field coupling.

A 1.5-kW H-shaped-core transformer suited for Electric Vehicle IPT is proposed in. This Method has used a bogie on tractor inductive devices installed in pavement. With the use of slim primary ferrite core bars, efficiency can be increased, but cost must be considered when magnetic components are built into the primary track. For increasing power efficiency, a sectional track IPT system for moving vehicles are proposed and studied in. Better efficiency has been reported for inductive charger in stationary applications. Sallan et al. showed a design process to select the parameters of coreless inductively coupled power transfer device with a large airgap that delivers high power efficiently. A polarized coupler, double-D-quadrature (DDQ) is introduced and optimized. The DDQ produces twice the height of flux-path of a circular pad along a single-sided flux path. It has the potential to support cost-effective inductively coupled power transfer device designs. Thrima with an and Madawala described a novel contactless power interface, which is based on IPT technology and suitable for bidirectional power transfer between a dc bus and multiple electric or hybrid vehicles. The proposed bidirectional contactless power-transfer concept can be used in applications such as V2G systems to charge and discharge electric or hybrid vehicles to the power grid.

VII. CONCLUSION

The paper reviewed the current status and implementation of battery chargers, infrastructure for Electric Vehicles and charging power levels. Battery performance depends not only on design of the batteries and types, but also on charging infrastructure and charger characteristics. Battery infrastructure and charging power levels are categorized into following three types: Level 1, 2, and3. Charger system is categorized into on-board and off-board and types with bidirectional and unidirectional power flow. Uni directional charging simplifies interconnection issues, limits hardware requirements, and tends to lower battery degradation. Bidirectional charging helps battery to injected energy back to the grid. Typical on-board chargers restrict power to meet space, weight, and cost constraints. Using the electric drive system as an ntegrated charger, there is a possibility of avoiding these problems. The most important advantage of integrated chargers is that high-power (Levels 2 and 3), it also supports low-cost bidirectional fast charging with unity power factor. The presence of a charging infrastructure reduces on-board requirements and energy storage costs. On-board charger systems can be inductive or conductive. Inductive charging has the long-termpromise of helping active roadbed systems. These are being studied by several groups. Various infrastructure configurations and charger power levels were compared and presented based on the amount of power, charging time and location, cost, equipment necessary, suitability, and other factors. Success of EV depends on standardization of requirements and infrastructure decisions, smart and efficient chargers, and enhanced battery technologies.

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