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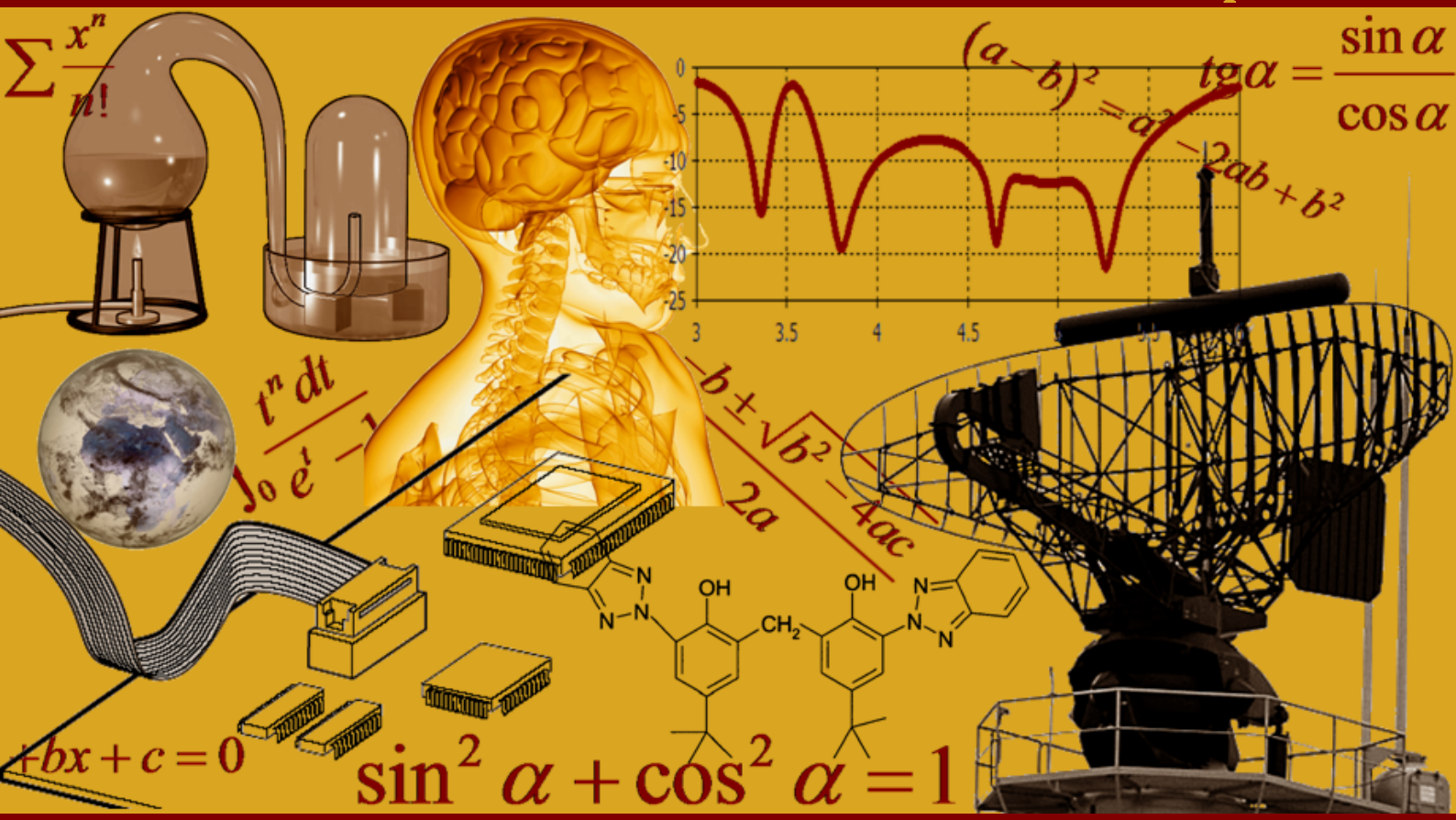

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VMFT: VIRTUAL MACHINE FAULT TOLERANCE IN CLOUD COMPUTING

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ABSTRACT: Cloud computing is the on demand based computing. It is used for storing, retrieving and processing the data with the help of internet connection at anywhere at any time. Today, many real time applications can be remotely processed on cloud environment. It provides many services such as resource pooling, wide range of network access, rapid elasticity etc. However, fault tolerance in cloud computing is the challenging problem nowadays and the detection and recovery of fault are the key issue. In order to reduce the impact of the fault, many fault tolerance techniques have been designed. In this paper, we have proposed the Virtual machine fault tolerance (VMFT). In this technique, the machine tolerates the fault based on the reliability of the virtual machine. It achieves high reliability, availability and reduces the service time. When the application is computed on the virtual machine, the VM which gives correct logical output within the time is considered as best VM among all the virtual machine and then that VM is taken for further processing of an application. With the help of a cloud sim tool the proposed VMFT technique is implemented.

KEYWORDS: Fault tolerance; Virtualisation; VM; Cloud computing; cloudsim tool; Reliability; Availability.

1 INTRODUCTION

Cloud computing plays a major role in the business and IT industry. Today, every one access the cloud with the help of internet connection at anywhere at any time. It offers many benefits such as storing, processing and retrieving the data remotely. It mainly provides three services such as Saas, Pass, Iaas. The Software as a Service (SAAS) provides services such that a single application runs on cloud infrastructure it provides multiple services to various kinds of end users [1]. The Platform as a service (PAAS) provides services such that the user can able to develop, deploy, debug and monitor the execution of the application by using resources with the proper software environment. The platform consists of both hardware and software infrastructure. The users develop and deploy the application with the help of software tools and programming languages provided by the cloud service provide [1].The Infrastructure as a service (IAAS) provides services such as storage and computing capabilities. Various resources such as servers, storage system, Data centre space, Network equipment's are shared among many users to handle and balance the workload [1].With the help of IAAS many users runs their application remotely on the cloud. When running their application, there may be a chance for fault. The fault may arise due to hardware failure, Virtual Machine failure, Network congestion, application or unavailability of resources. So there is an increased requirement for fault tolerance.

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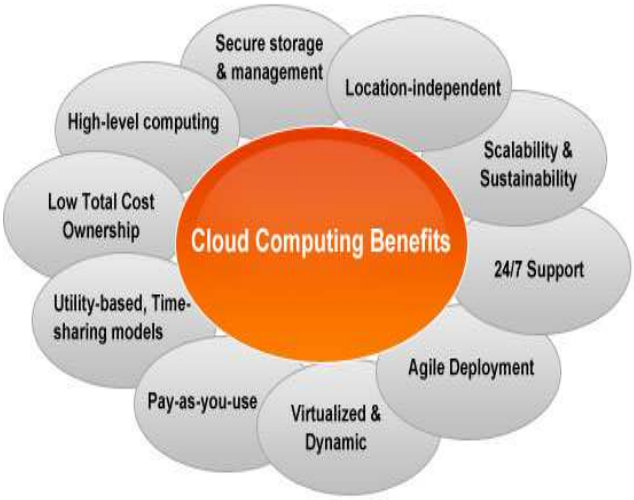

Fig. 1. Cloud computing benefits

2 RELATED WORK

Fault tolerance is essential in cloud computing to achieve reliability and availability, so that services can be delivered without any delay and wastage of resources and energy. It is the one in which the system continues to operate satisfactorily even in the presence of faults. It is the quick replacement and repairing of faulty nodes in case of failure [1][2].There are many fault tolerance techniques are available in cloud computing, but still this is under a research due to increased number of users and the need of "on demand services". The main purpose of Fault tolerance techniques is to provide the robustness and dependability for cloud computing nodes [2].Depending on the policies and procedures, the fault tolerance can be divided in to two categories: [3]

- *Proactive Fault Tolerance*
- *Reactive Fault Tolerance*

2.1 PROACTIVE FAULT TOLERANCE

The proactive fault tolerance policy is used to predict the failure in advance and replace the failed components with other working components. It is to avoid the time taken to replace the failed components [4].

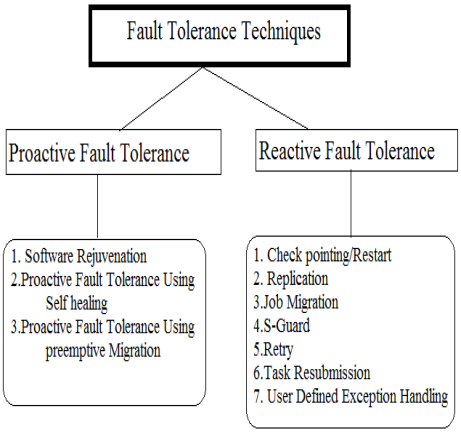

Fig.2.Types of Fault tolerance techniques

2.1.1 SOFTWARE REJUVENATION

It is the system which undergoes for periodic reboot. It restarts the system with clean state and started in fresh state [5].

2.1.2 PROACTIVE FAULT TOLERANCE USING SELF-HEALING

In this technique the divide and conquer method is applied for better performance. The large tasks are divided and distributed in to smaller subtask. Different instances of an application executes on different virtual machine, if a failure occurs when executing the application it automatically controls the failure [6].

2.1.3 PROACTIVE FAULT TOLERANCE USING PRE-EMPTIVE MIGRATION

The running applications are constantly monitored, observed and analysed by using a feedback loop control mechanism [5][6].

2.2 REACTIVE FAULT TOLERANCE

The Reactive Fault Tolerance policy is used to scale down the fault that are already occurred in the cloud environment .After the fault occurs, it takes the remedial measures. It is an on demand fault tolerance and makes the system more robust.[10]

2.2.1 CHECK POINTING /RESTART

It is done in task level for real time and large application. After making every change in the system a periodic check pointing is done [4].When a task execution fails, rather than started from the beginning it is restarted from the recently checked point [8].

2.2.2 REPLICATION

Replication means copying .The several replicas of the tasks are created and run on different resources for successful execution and to get the desired outcome. The tools such as HA-Proxy, Hadoop and AmazonEc2 are used for implementing the replication [4][7].

2.2.3 JOB MIGRATION

Due to certain reason a particular machine fails in the execution and cannot be executed further, in that situation a job is migrated to another working machine by using HA-Proxy

S-GUARD

It is based on roll back recovery. It is less turbulent to normal stream processing. It is implemented by using HADOOP, Amazon EC2.[10]

2.2.4 RETRY

The task is resubmitted again on the same cloud resources. It is the simplest task level technique.

2.2.5 TASK RESUBMISSION

Due to high network traffic and heavy work load a task may fail to execute, whenever a failed task is detected it is either resubmitted to the same or different cloud resources [7].

2.2.6 USER DEFINED EXCEPTION HANDLING

It is predefined by the user whenever the fault is detected [6].

2.2.7 RESCUE WORK FLOW

This technique allows the flow of application execution to persist until it will not be able to proceed without rectifying the fault [6][9].

2.2.8 TIMING CHECK

This technique a watch dog timer is used to check whether the application executes within the time or it exceeds the time. Depending up on the execution the further fault tolerance action takes place [10].

2.2.9 SAFETY – BAG CHECK

Blocking of commands takes place when the system does not met the safety properties [14].

3 PROPOSED MODEL (VMFT)

This scheme is proposed to handle the fault tolerance, particularly in the virtual machine. It is based on proactive fault tolerance. Today, many applications are stored on cloud for computing with the help of Virtual machine. If any fault occurs during execution of an application in the cloud the proposed VMFT technique takes the following action. The user does not know how to tolerate the fault and how the processing is done remotely on a cloud. This technique is mainly focused to provide high reliability and availability of resources in the cloud environment. The VMFT technique is mainly focused to tolerate the VM's fault based on its reliability. Depending up on the need of the user they send their request to the cloud service provider.

CLOUD SERVICE PROVIDER (CSP)

The cloud service provider provides services such as SAAS, IAAS and PAAS to the end user based on their demand. The IAAS provides services such as OS, Virtual disk space, Hardware, security, Virtual Data centre, Network components and storage. The provider sends the application to the physical machine. The physical machine sends the real time application to the hypervisor in order to speed up the execution of the user request.

HYPERVISOR OR VIRTUAL MACHINE MONITOR (VMM)

With the help of Hypervisor or virtual machine monitor (VMM) a single physical machine can scale in to multiple virtual machine (VM).

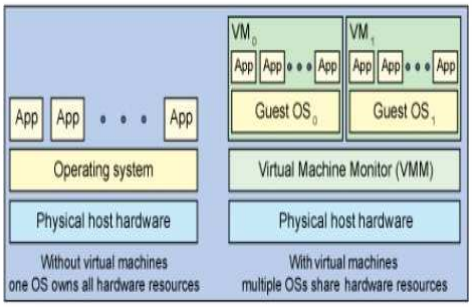

Fig. 3. Physical machine with VM and without VM

The above diagram shows that the machine with VM and without VM. The VM is the emulation of a physical machine. The Virtual machine is the one which have all the configuration as like the real physical machine such as OS ,Hardware, architecture, software, CPU, storage etc. Multiple Virtual machines can be created and they are isolated from each other to perform an application execution in a single physical host. It does all the functionality as host machine.

TIME MONITOR(TM)

The Time monitor monitors all the applications running in the guest OS (Virtual Machine). The VM is continuously observed and analysed. The VM which gives correct logical output on time is given to the reliability assessor.

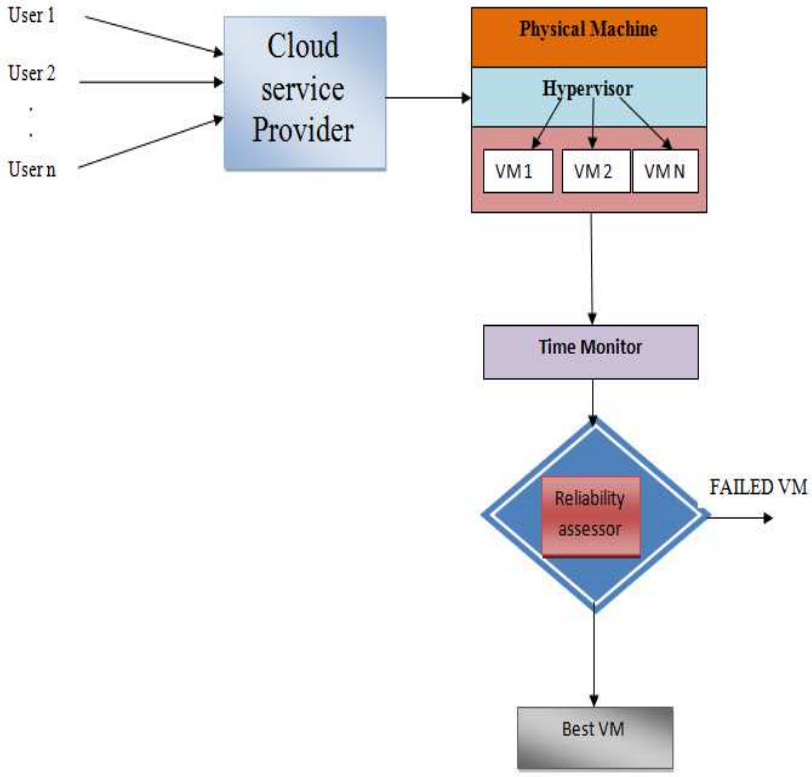

Fig. 4. Architecture of VMFT

RELIABILITY ASSESSOR (RA)

Each virtual machine's reliability is assessed by the reliability assessor. The reliability is measured based on the time taken by the Virtual machine to execute the application. Initially, all the virtual machines reliability is considered as 100%. For each and every computing cycle the reliability varies according to the performance of the VM. The Virtual machine is observed and analysed to check the reliability. Here, we took 10 computing or clock cycle. For each clock cycle the virtual machine performs multiple instruction execution per second, depending up on the processors speed. For e.g.- An i5 processor speed is 1.80 GHz. In One gigahertz a processor can able to perform a billion – 1,000,000,000 – operations per second. For each computing cycle the reliability of the Virtual machine either increases or decreases based on the time taken it to produce the result. The VMFT technique also hasa maximum and minimum reliability level. If the VM does not achieve the minimum level then that virtual machine is removed and the new virtual machine is added instead of the removed Virtual machine. The reliability is increased, if the virtual machine reaches the maximum reliability level and it gives correct output on time. The best reliable virtual machine is the one which gives result on time and it achieves the maximum reliability. That VM is taken for further processing of an application. The system tolerates the fault based on the reliability of the computing nodes (VM). Based on the analysis the comparison is done among all the virtual machine.

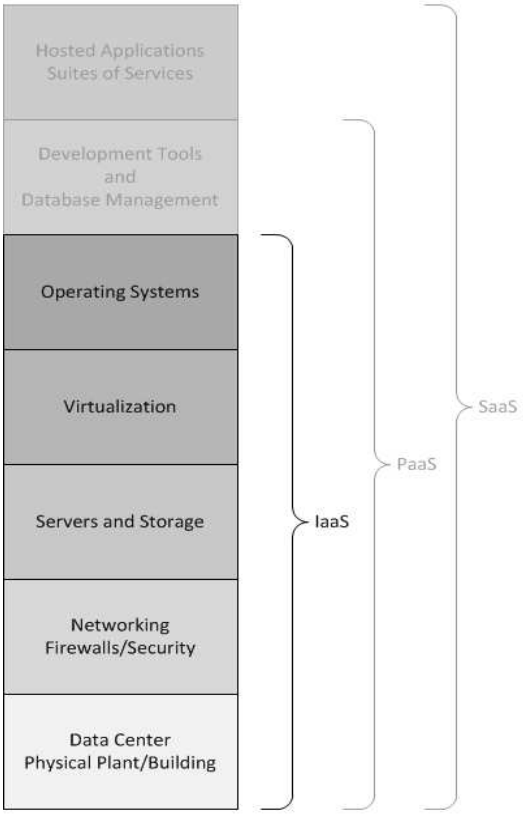

Fig. 5. Services of Saas, Paas, Iaas

OVERALL VMFT PROCESS WORK FLOW AND ALGORITHM FOR RELIABILITY ASSESSOR

Step 1: Setting up the cloud environment by Eclipse IDE.

Step 2: Virtual machine and application are created.

Step 3: Initially all the application is given to the virtual machine at a time for processing

Step 4: Node represents the virtual machine..

Step 5:VM1 represents the first Virtual machine, VM2 represents the second Virtual machine and the VM n represents the n^{th} virtual machine.

Step 6: The time monitor(TM) checks all the virtual machine execution.

Step 7: The machine which gives correct result on time is given to the reliability assessor.

Step 8: Set success Reliability factor =1, Minimum reliability = 0.4, Maximum reliability >=1

Step 9: If the nodes reliability greater than the maximum reliability level, then the nodes reliability increases.

Step 10: If the node reliability lesser than the minimum reliability level, then the nodes reliability decreases.

Step 11: The virtual machine which have the highest reliability factor is consider as best VM.

Step 12: Then the Best VM is taken for executing the application and it is more reliable.

4 SIMULATION AND RESULT

The VMFT technique is implemented in Cloud sim tool. It provides infrastructure and services for modelling and simulation of cloud environment. By using cloud sim we can simulate data centre, virtual machine, cloudlet, application starting time and application ending time, VM status as resembles in the real cloud. It is totally written in java. The cloud sim

package is imported in Eclipse IDE or Net beans IDE. Here all the VM starts their execution at a time .The VM which produces correct output is consider as reliable best VM. Then that VM is considered for further processing of the application.

MODULES

Module 1: Creating Eclipse IDE.

Eclipse is the open source IDE so we can download it from the link [12].

Module 2: Import the cloud sim package in to Eclipse IDE

Cloud sim is an open source where we can create our VM, Data center, Broker, cloud let. It can be downloaded from the link [13] and then Open Eclipse IDE. Then File-->New --> Java Project. Then the cloud sim package is imported in to the Eclipse IDE.

Module 3: Virtual Machine and application are created in cloud sim.

Cloud sim is written in java. So, with the help of default classes we can create the Virtual machine and Data centre. Here three virtual machines are created.

```
// to create the Data centre
Datacenter datacenter0 = createDatacenter
("Datacenter_0");
// to create the virtual machine
Vmvm = new Vm(vmid, brokerId, mips, pesNumber, ram, bw, size, vmm, new CloudletSchedulerTimeShared());
```

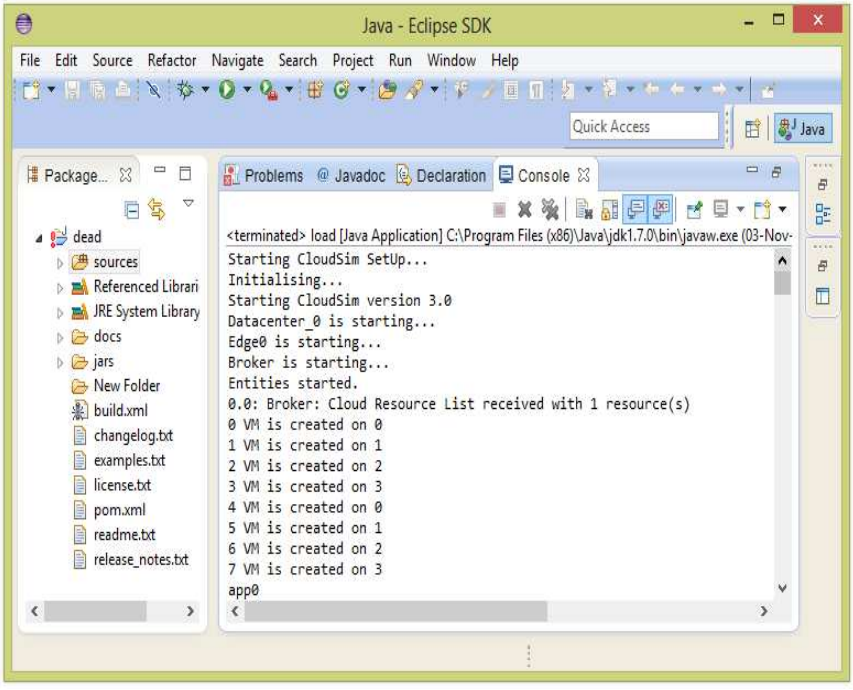

Fig. 6. Virtual machine and application are created.

Module 4: Application execution takes place in the cloud sim

```
Starting CloudSim...
Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Broker is starting...
Entities started.
0.0: Broker: Cloud Resource List received with 1 resource(s)
0.0: Broker: Trying to Create VM #0 in Datacenter_0
0.1: Broker: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker: Sending cloudlet 0 to VM #0
400.1: Broker: Cloudlet 0 received
400.1: Broker: All Cloudlets executed. Finishing...
400.1: Broker: Destroying VM #0
Broker is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.

========== OUTPUT ==========
Cloudlet ID    STATUS    Data center ID    VM ID    Time    Start Time    Finish Time
    0        SUCCESS        2            0        400        0.1        400.1
CloudSim finished!
```

Fig. 7. cloudlet id, data centre, Time, VM id, Start time and End time of an application.

Module 5: Based on the computing cycle and the reliability factor we can assess the single nodes reliability.

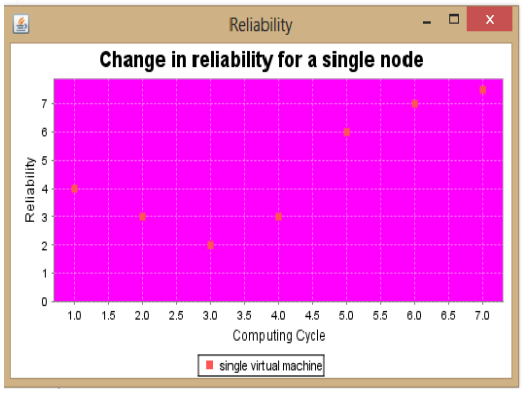

Fig 8 Singles nodes reliability.

Module 6: Reliability comparison of multiple (i.e 3)VM.

Based on the time taken to execute the task the reliability is assessed

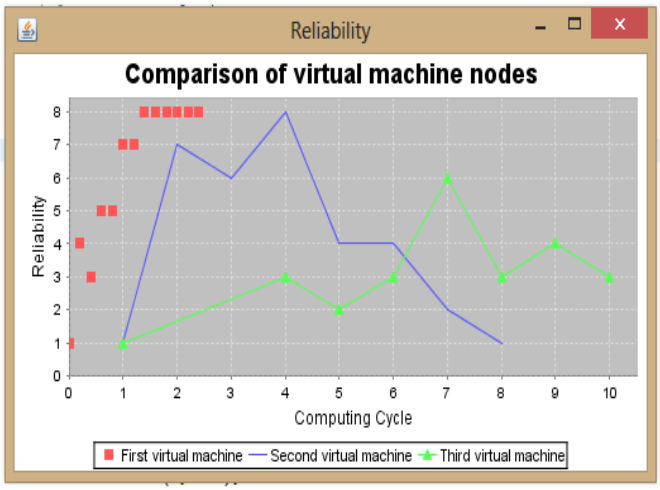

Fig.9. Comparison of three virtual machine reliability.

5 CONCLUSION

Fault tolerance is the major concern in all aspect of business and IT industry. Many safety critical applications are computed on cloud environment for processing it. Because of the scalable virtualized environment the cloud computing provides services to the end user. The Proposed VMFT technique tolerates the fault based on the reliability of the computing nodes. It provides high reliability and availability of resources to the end user. The Virtual machine fault can be tolerated by the VMFT technique. With the help of cloud sim simulator the VMFT technique is implemented. The applications are created and executed in clouds sim. And the reliability of a single node (Virtual Machine)is assessed based on the time it to execute the application. The node which gives the result on time is taken as reliable VM. And the comparison of multiple VM is done. Based on the comparison the best reliable VM among all the three is first Virtual machine which is marked in red colour.

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ANMAC-Based Energy Development for Wireless Sensor Networks Incorporated With Mobile Cloud Computing

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ABSTRACT: Aiming at providing mobile users with the WSN data gathered by the powerful cloud computing exploiting the advantages of evolving mobile cloud computing with respect to wireless sensor networks. Current scenario presented with the below limitations.1. The specific data mobile users request usually depends on the current locations of mobile users 2. Most sensors are usually equipped with non-rechargeable batteries with limited energy. Planned Angle based Medium Access Control (ANMAC) protocol that avoids each issue through medium access tables in the nodes that keep track of the locations of the destination nodes in addition as all act neighbours. During this paper, elaborated performance analysis of ANMAC considering totally different topologies and traffic eventualities, and we show that SDMA cannot be totally exploited while not a smart computer hardware. Proposed ANMAC with Location based programming (ANMAC-LS) and compare its performance with alternative sensible antenna approaches and omni 802.11 MAC. Tend to prove the potency of location based programming in wireless networks with sensible antennas, and that we conjointly show the consequences of antenna orientation on turnout, mistreatment realistic antenna patterns and ANMAC protocol.

KEYWORDS: Wireless Sensor Networks, Mobile cloud computing, ANMAC, CLSS.

1 INTRODUCTION

Wireless sensor network are one of the category belongs to ad-hoc networks. Sensor network are also composed of nodes. Actually the node has a specific name that is “Sensor” because these nodes are equipped with smart sensors. A sensor node is a device that converts a sensed characteristic like temperature, vibrations, pressure into a form recognize by the users. In wireless sensor network data are requested depending upon certain physical quantity. So, wireless sensor network is data centric. A sensor consists of a transducer, an embedded processor, small memory unit and a wireless transceiver and all these devices run on the power supplied by an attached battery. The following steps can be taken to save energy caused by communication in wireless sensor networks.

- To schedule the state of the nodes (i.e. transmitting, receiving, idle or sleep).
- Changing the transmission range between the sensing nodes.
- Using efficient routing and data collecting methods.
- Avoiding the handling of unwanted data as in the case of overhearing.

In WSNs the only source of life for the nodes is the battery. Communicating with other nodes or sensing activities consumes a lot of energy in processing the data and transmitting the collected data to the sink. In many cases (e.g. surveillance applications), it is undesirable to replace the batteries that are depleted or drained of energy. Many researchers are therefore trying to find power-aware protocols for wireless sensor networks in order to overcome such energy efficiency problems as those stated above.

WIRELESS SENSOR NETWORK MODEL

Unlike their ancestor ad-hoc networks, WSNs are resource limited, they are deployed densely, they are prone to failures, the number of nodes in WSNs is several orders higher than that of ad hoc networks, WSN network topology is constantly changing, WSNs use broadcast communication mediums and finally sensor nodes don't have a global identification tags. The major components of a typical sensor network are:

SENSOR FIELD

A sensor field can be considered as the area in which the nodes are placed.

SENSOR NODES

Sensors nodes are the heart of the network. They are in charge of collecting data and routing this information back to a sink.

SINK

A sink is a sensor node with the specific task of receiving, processing and storing data from the other sensor nodes. They serve to reduce the total number of messages that need to be sent, hence reducing the overall energy requirements of the network. Sinks are also known as data aggregation points.

TASK MANAGER

The task manager also known as base station is a centralized point of control within the network, which extracts information from the network and disseminates control information back into the network. It also serves as a gateway to other networks, a powerful data processing and storage centre and an access point for a human interface. The base station is either a laptop or a workstation.

Data is streamed to these workstations either via the internet, wireless channels, satellite etc. So, hundreds to several thousand nodes are deployed throughout a sensor field to create a wireless multi-hop network. Nodes can use wireless communication media such as infrared, radio, optical media or Bluetooth for their communications. The transmission range of the nodes varies according to the communication protocol is used.

MOBILE CLOUD COMPUTING

The development of mobile cloud computing has become an important research field in mobile-oriented world, providing new supplements, consumption, and delivery models for IT services. As reported by ABI Research, more than 240 million business customers will be leveraging cloud computing services through mobile devices by 2015, driving revenues of $5.2 billion. In mobile cloud computing, mobile users can access computation results, resources, applications, and services that are stored, implemented, and deployed in cloud computing environments by using mobile devices through an insecure wireless local area network (WLAN) or 3G/4G telecommunication networks. When a user intends to access a mobile cloud computing service, he/she activates the service through a Web browser or a cloud service application (i.e., App) installed on his/her mobile device. The Web browser or the cloud service application will then mutually authenticate both the cloud service provider and the user. After authentication, the user can access the resources and available services from the cloud service provider.

In the early days of computing technology, when computers took up the space of an entire room, many 'dumb' terminals, or clients, would be connected to a main computer. Many clients could utilize the computational power and storage of the mainframe at the same time. As transistors and CPUs came into play, shrinking personal computers, it became more feasible for a user to purchase their own computer.

However, today, mobile devices are becoming smaller and smaller and we are seeing that there is either a physical or economic limit to the amount of storage and processing power that can fit into these devices. It seems that the original model of client-mainframe computing may be a good answer for this situation. However, we can now utilize existing wireless networks to connect mobile devices to servers in massive datacentres, rather than hardwiring all clients to a server. This idea

of connecting to unseen data may be where the term “cloud” came from, since it seems that the extra power is coming out of nowhere.

Companies are only just beginning to investigate the possibilities of the cloud and provide cloud services for business and personal use. There is much potential in utilizing the resources of the cloud, most of which has not been researched yet. Client machines can become much more powerful by connecting to these cloud datacentres, but what are the options of doing so? Furthermore, integrating mobile devices with the cloud could prove even more advantageous. As these devices become smaller and smaller, consumers are conversely demanding more functionality and features. Bridging the gap between high-end servers and mobile devices could solve the computing problem, though research is needed to identity the advantages and limitations.

Mobile devices, such as smart phones, PDAs and net books, continue to grow in popularity. However, cell phones are no longer considered to be simple communication devices. Today most mobile devices incorporate various functions, such as music players or games. A shortcoming of mobile devices is their limited computing capabilities due to portability and cost issues. Bridging the gap between high- end servers and mobile devices could solve the computing problem and is an important research focus of distributed computing.

2 RELATED WORK

W. Wang, K. Lee, and D. Murray [19], proposed a framework to integrate WSNs and CC is shown. Particularly, a lightweight component model and a dynamic proxy-based approach are combined to connect the sensors with the cloud.

Recently, integration of MCC with WSNs has been proposed in several research works [9], [10], [11], [12], [13], [14], [15], [16], [17]. This trend is induced by the advantages of incorporating the powerful data storage and data processing abilities of MCC as well as the ubiquitous data sensing and data gathering capabilities of WSNs for mobile users. Particularly, the key idea of such integrations is to utilize the powerful cloud to store and process the sensory data collected by WSNs.

MCC applications are often utilized in a location specific way [23], [25]. For example, the online work schedule application might be useful when the mobile user is on the way to work, but not when the mobile user is in a restaurant in the even- ing. Similarly, the traffic news application may be accessed by the mobile user to obtain the traffic information of a certain region before the mobile user actually gets there, while it is unlikely that the mobile user will always pay attention to the traffic news regardless of his or her current location. Also, thinking about a tourism navigation application which guides the mobile user to walk directly to the specific sightseeing place, such an application might be favourable when the mobile user is in fact in or near the tourism area.

Most sensors are usually equipped with non-rechargeable batteries with limited energy [26], [27]. If the sensor nodes continuously transmit the collected data to the cloud, the energy of these sensor nodes will be depleted quickly and the life-time of the WSN will be short.

The performance of smart antenna systems is limited because of the increased hidden terminal problem and deafness of nodes. [04] The proposed Angular MAC (ANMAC) protocol that avoids both problems through medium access tables in the nodes that keep track of the locations of the destination nodes as well as all communicating neighbours.

3 MOBILE USER LOCATION LIST

MOBILE USER LOCATION HISTORY LIST

To achieve the location list L of mobile user u, the location history of u is extracted by the cloud c based on the StarTrack service. Specifically, StarTrack is a mobile client application and it periodically captures the user’s current location (e.g., with GPS) and relays the location information to the StarTrack server which runs as a service in the cloud c. Further, the StarTrack server processes these location data and decomposes them into various tracks (i.e., discrete representations of trips taken by the mobile user). The points of these tracks are operational and retrievable through a high-level application programming interface and they make up the location history list named as Lh.

MOBILE USER PREDICATION LOCATION LIST

To obtain the mobile user predication location list Lp, we utilize the following method that is similar with the Place Transition Graph utilized. The key idea is that the future locations of the mobile user would be associated with the frequently visited locations of the mobile user, thus it is likely that the future track of the mobile user will be constituted by these

frequently visited locations. For instance, if a mobile user goes to restaurant A and gym B from office C very often, it is obvious that the mobile user will go to gym B from restaurant A, or go to restaurant A from gym B someday in the future.

Particularly, we compute a frequently visited location list Lf first. This Lf is obtained by iterating over all the retrieved tracks and selecting the end points of the retrieved tracks of the mobile user. Then Lf is updated by further removing the end points of the tracks that only appear once. With that, an adjacency matrix in which the numbers of rows and columns correspond to the number of the elements in the updated Lf is constructed. Finally, the match of each element in the row and the column except the match with two same points becomes a new track (i.e., the prediction track).

All points without repetition excluding the starting and end points of the prediction tracks constitute the mobile user predication location list Lp. The mobile user location history list Lh and mobile user predication location list Lp constitute the location list L of the mobile user.

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4 ARCHITECTURE AND CLSS ALGORITHM

ARCHITECTURAL DESIGN SPECIFICATION

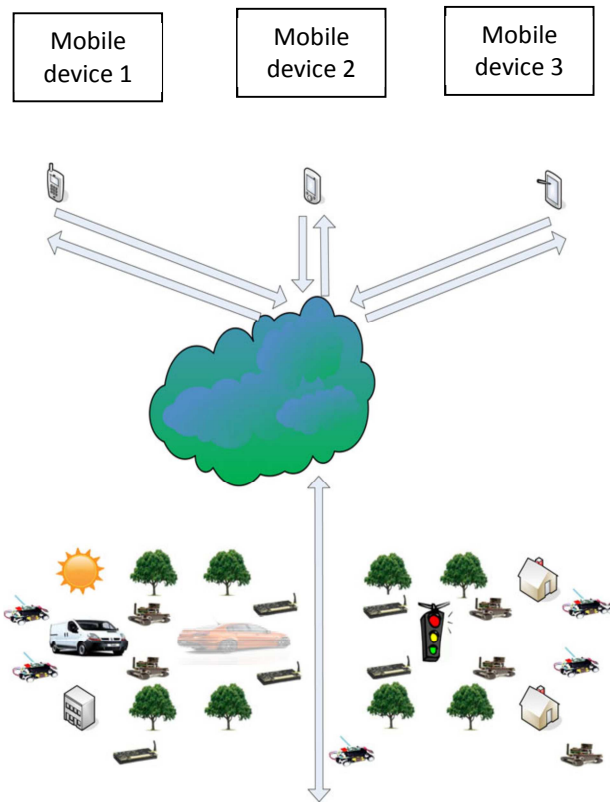

Fig. 1 Example of MCC-WSN integration

Recently, integration of MCC with WSNs has been proposed in several research works. This trend is induced by the advantages of incorporating the powerful data storage and data processing abilities of MCC as well as the ubiquitous data sensing and data gathering capabilities of WSNs for mobile users. Particularly, the key idea of such integrations is to utilize the powerful cloud to store and process the sensory data collected by WSNs. Then any mobile user who wants to access the sensory data can simply issue a data request to the cloud and the sensory data will be returned from the cloud to the mobile user.

Figure shows such an integration example. Various sensor nodes (e.g., static sensors, mobile sensors, video sensors) are deployed to gather weather, traffic, temperature, and house monitoring information. These real-time sensory data are

transmitted from the WSN to the cloud. Mobile users issue data requests asking for these sensory data and in response the cloud sends the sensory data to the mobile users.

For the state of the art, since the data requests of mobile users generally require the cloud to respond in real-time, all current MCC-WSN integration schemes make use of always on (AO) WSNs in which sensor nodes are always working to transmit the sensory data to the cloud, and then center on improving the performance of the integrated WSN or better utilizing the data gathered by the integrated WSN.

For instance, an integration architecture based on CC and WSNs is presented. It assumes that the cloud acts as a virtual sink with many sink points collecting sensing data from sensors. In addition, each sink point is in charge of gathering the sensory data in a zone. Then the cloud stores and processes the collected sensing data in a distributed manner. The main focus of the integration is to improve the packet transmission error rate as well as the number of end-to-end hops of WSNs.

Another framework to integrate WSNs and CC is shown. Particularly, a lightweight component model and a dynamic proxy-based approach are combined to connect the sensors with the cloud. Lightweight component model utilizes the publicly available Loosely Coupled Component Infrastructure (LooCI) middleware for component management and dynamic proxies are added to the LooCI middleware. It aims at enhancing the latency performance as well as the memory of WSNs during CC and WSNs integration.

A framework is proposed to integrate CC and WSNs. In this framework, the deployed WSN is connected to the cloud first. Then the requests of users are served via three service layers (i.e., Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS)) either from an archive collecting sensory data from WSN to data centers, or from a live query which is issued to the corresponding WSN.

CLSS SCHEMES

There are two collaborative location-based sleep scheduling schemes for the integrated WSN and the pseudo codes of these two CLSS schemes (i.e., CLSS1 and CLSS2) in each time epoch TP are shown as follows.

CLSS1

Regarding CLSS1 scheme, cloud c first obtains the current location lu of mobile user u (Step 1 of CLSS1). Then according to whether lu is in the location list L or not, a flag A or Z is sent to base station s by cloud c (Step 2 of CLSS1). Base station s further broadcasts the flags. At last, each sensor node i determines its awake or asleep state according to the flag it receives in each time epoch TP (Steps 3 to 5 of CLSS1).

PSEUDO CODE OF CLSS1 SCHEME

Step 1: Cloud c obtains mobile user u’s current location lu.

Step 2: If lu 2 L, c sends flag A to base station s. Otherwise, c

sends flag Z.

Step 3: s broadcasts flags to sensor nodes.

Step 4: Run Step 5 at each node i.

Step 5: If node i receives flag A, remain awake. Otherwise, go to sleep.

CLSS2

In terms of CLSS2, the first four steps are the same as that of CLSS1. The difference between CLSS2 and CLSS1 lies in Step 5. In Step 5 of CLSS2, when sensor node i receives flag Z, i will be sleep scheduled using the energy-consumption based connected k-neighbourhood (EC-CKN) sleep scheduling scheme [30]. Regarding EC-CKN, the current residual energy rank (i.e., Eranki) of each node i is obtained first (Step 6 of CLSS2) and the subset Ci of i’s currently awake neighbours that have Erank > Eranki is computed (Step 10 of CLSS2). Before a node i can go to sleep in each time epoch TP, the following two conditions should hold: (1) all nodes in Ci are connected by nodes with Erank > Eranki (2) each of its neighbours owns at least k neighbours from Ci (Step 11 of CLSS2).

PSEUDO CODE OF CLSS2 SCHEME

Step 1: Cloud c obtains mobile user u's current location lu.

Step 2: If lu 2 L, c sends flag A to base station s.

Otherwise, c sends s flag Z.

Step 3: s broadcasts flags to sensor nodes.

Step 4: Run Step 5 at each node i.

Step 5: If node i receives flag A, remain awake. Otherwise, run

Steps 6 to Step 12 are the pseudo codes of EC-CKN scheme

Step 6: Get the current residual energy Eranki.

Step 7: Broadcast Eranki and receive the ranks of its currently awake neighbours Ni. Let Ri be the set of these ranks.

Step 8: Broadcast Ri and receive Rj from each j 2 Ni.

Step 9: If jNij < k or jNjj < k for any j 2 Ni, remain awake. Go to Step 12.

Step 10: Compute Ci ¼ fjjj 2 Ni and Erankj > Erankig.

Step 11: Go to sleep if both the following conditions hold.

Remain awake otherwise. Any two nodes in Ci are connected either directly themselves or indirectly through nodes within i's 2-hop neighbourhood that have Erank more than

Eranki. Any node in Ni has at least k neighbours from Ci.

Step 12: Return

5 SYSTEM ARCHITECTURE

ANMAC PROTOCOL

In ANMAC, every station has beams of 90° beam width that covers 360° by four antennas. Stations can monitor the signal level on all beams, and choose the best one. The best beam is defined as the beam over which a station gets a signal with maximum Signal-to-Noise Ratio (SNR). Each station keeps a medium access table (Figure 1), where it stores its best beam number to communicate with a neighbor and the neighbor's best beam number to communicate with itself. The blocking condition for every beam indicates whether that beam is busy or not, so as to avoid deafness and collisions. ANMAC uses modified RTS/CTS messages, namely Angular RTS/CTS to signal the information about the locations of communicating nodes to other stations in the medium, which are used in updating medium access tables in the stations.

The receiver, node B, sends an AN-CTS packet in response to AN-RTS. AN-CTS frame is also sent in all directions to prevent the hidden terminal problem. As node A gets the AN-CTS packet, it finds out that the medium is available for communication, and also selects the best beam, beam with highest signal level, as beam #3. In the AN-CTS packet (Figure 3), the beam number in "transmitter's best beam number" field indicates that this beam was chosen and will be used during data exchange by source node and the beam number in "receiver's best beam number" field indicates that this beam was chosen and will be used during data exchange by destination node. After angular ANRTS/ AN-CTS handshake, node A sends the data over its best beam and node B gets the data packet by its best beam. The directional transmission will reduce the interference and establish a reliable and high quality channel between communicating nodes.

My Address	Neighbor's Address	My Beam	Neighbor's Beam	Blocking			
				Beam 0	Beam 1	Beam 2	Beam 3

Fig. 2 The medium access table

Frame control	Duration	Receiving Address	Transmitting Address	Transmitter Beam Number	FCS

Fig. 3 AN-RTS Frame Format

Frame control	Duration	Receiving Address	Transmitting Address	Receiver's Best Beam Number	Transmitter Beam Number	Transmitter's Best Beam Number	FCS

Fig. 4 AN-CTS Frame format

ANMAC-LS fully exploits the advantage of directional transmission in spatially divided channels, while still avoiding the hidden terminal problem and deafness, and guaranteeing range extension by using only directional antennas. The location-based scheduler utilizes the location information, which is already available through the medium access table of ANMAC protocol.

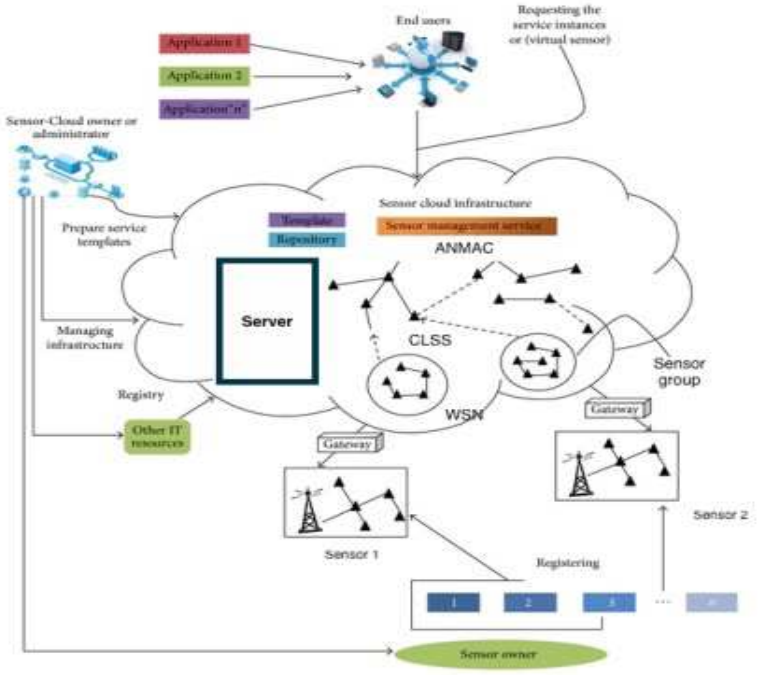

Fig. 5 System Architecture

6 CONCLUSION

Proposed two CLSS schemes (i.e., CLSS1 and CLSS2) with ANMAC for WSNs integrated with MCC. CLSS schemes involve both the WSN and the cloud and then dynamically change the awake or asleep status of the sensor node in the integrated WSN, based on the locations of mobile users. CLSS1 focuses on saving the most energy consumption of the integrated WSN and CLSS2 further pays attention to the scalability and robustness of the integrated WSN. For the integration of MCC and WSNs, both CLSS1 and CLSS2 could prolong the lifetime of the integrated WSN while still satisfying the data requests of mobile users.

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A Novel Double Gate Tunnel FET based Flash Memory

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ABSTRACT: In this paper, a low power double gate TunnelFET (DGTFET) based flash memory cell is designed and its performance is studied through TCAD simulation. A DGTFET is converted into memory cell using floating gates. Its programming, erasing and reading operations are studied in the independently driven double gate (IDDG) mode through transient simulations. Out of the two gates one gate is used for "programming/Erasing" and the other gate is used for controlling the device characteristics dynamically and an application of a DC voltage to this gate reduces the reading delays.

KEYWORDS: Tunnel FET, Flash memory, Double gate, IDDG.

1 INTRODUCTION

Fundamental limitation on the sub-threshold performance is seen in bulk MOSFETs, SOI MOSFETs and FinFETs because of their drift –diffusion carrier transport mechanism. TunnelFETs (TFET) have been introduced to conquer this limitation. Since the charge transport mechanism is different, TFET's sub-threshold slope can be low compared to the conventional drift-diffusion-based devices. The drive current (I_{ON}) achieved by TFETs are low compared to conventional devices hence it has the popularity as the low power devices [1]-[4]. Nowadays, the flash memory technology is developing in a higher rate due to the tremendous growth in the digital consumer applications, such as mobile phones and digital cameras [5]-[6]. To reduce the short channel effects, we are going for multigate structure such as double gate FinFETs, in which the gates can be simultaneously driven or independently driven. Both the gates receive the same gate voltage in the simultaneously driven double gate (SDDG) whereas in the independently driven double gate (IDDG) the gates can be biased individually. In the IDDG devices the threshold voltage of one gate can be modified by varying the voltage on the other gate [7].

TFET based flash memory is a promising structure for ultra-scaled and low power flash memory application as explored in reference [5].TFET based flash memory with high-gate injection efficiency is proposed and experimentally demonstrated in reference [6].

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To the best of our knowledge, low power double gate flash memory in TFET is not realized so far. In this paper, the double gate flash memory is realised in TFET using TCAD simulations. The programming, erasing and reading operations are studied in IDDG mode through transient simulations. IDDG operation is studied in this device to get the dynamic threshold voltage of the device. The parameters, ON current (I_{ON}), OFF current (I_{OFF}) and threshold voltage (V_{TH}) are calculated for programmed and erased states.

Rest of the paper is organized as follows: Simulator models and the device structures are given in section 2. Device characteristics and results are discussed in the Section 3. Conclusions are provided in the final section 4.

2 SIMULATION

Sentaurus TCAD simulator from Synopsys is used to perform all the simulations. This simulator has many modules and the following are used in this study.

- Sentaurus Structure editor (SDE) : To create the device structure , to define doping, to define contacts,and to generate mesh for device simulation
- Sentaurus device simulator (SDEVICE): To perform all DC, AC and noise simulations.
- Inspect and Tecplot: To view the results.

Simulator includes the following models in the device simulation: oldslotboom of band gap model, Masetti of mobility model, nonlocal band-to-band (BTB) tunneling model combined with Shockley–Reed–Hall recombination and drift–diffusion physics [8].

Low power double gate TunnelFET (DGTFET) based flash memory structure is generated from SDE and is shown in Fig.1 with important parameters named. Table 1 gives the dimensions of the device.

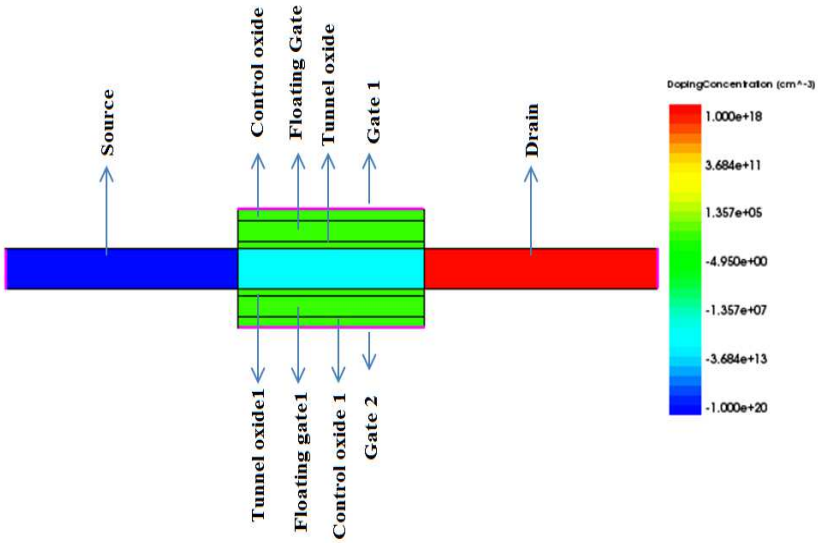

Fig.1 Structure of DGTFET Flash Memory

TABLE1. Device dimensions of DGTFET Flash memory

Parameter name	Value
Gate length	50nm
Width	10nm
Control oxide thickness	3nm
Tunnel oxide thickness	1.8nm
Floating gate thickness	5nm
Source doping (Ns)	$1x10^{20}$atoms/cm^3
Drain doping (Nd)	$1x10^{18}$ atoms/cm^3
Channel doping (Na)	$1x10^{17}$ atoms/cm^3

3 RESULTS AND DISCUSSION

Typical flash memory cell uses a floating gate to store a bit by the presence or absence of a charge. The results discussed in this section includes: the programming, erasing and reading operation for this DGTFET flash memory in IDDG mode. Gate1 voltage of 10V is used for programming, and -16V is used for erasing operations with the drain, source and gate2 are given with zero bias. Gate2 is used for modulating threshold voltages of the device while reading operation. The schematic view for erasing, programming states is shown in Fig. 2(a) and Fig. 2(b) respectively. Figure 3(a) and 3(b) show the space charge for programmed and erased states respectively. It is observed from Fig. 3(a) & 3(b) that the space charge is -1.37992x10^{20}(C/cm^3) for the programming state and is 3.2427x10^{20} (C/cm^3) for erased state.

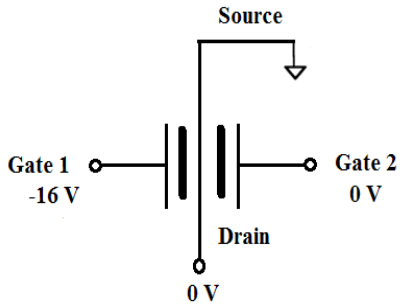

Fig. 2 (a) Schematic view of DGTFET Flash memory for erased state

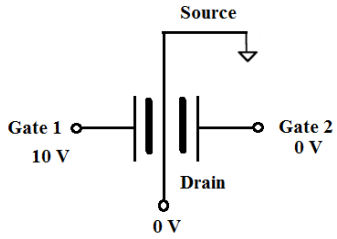

Fig.2 (b) Schematic view of DGTFET Flash memory for programmed state

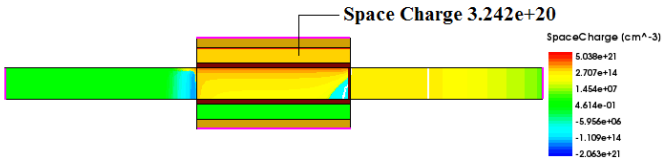

Fig.3 (a) Space charge structure of DGTFET Flash memory for Erased state

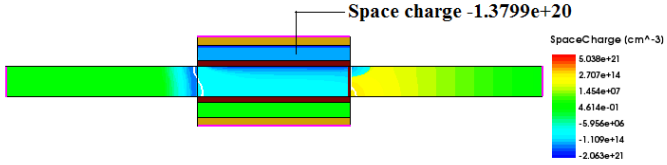

Fig.3 (b) Space charge structure of DGTFET Flash memory for Programming state

IDDG OPERATION

For reading operation, +3.25 V is applied to the gate1 of DGTFET Flash memory with the supply voltage as shown in Fig.4. The gate 2 voltage is varied from 0 to 1V for IDDG mode operation. I_D-V_G characteristics are done for reading operation.

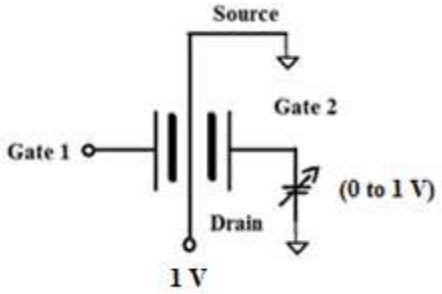

Fig.4 Schematic view of IDDG mode DGTFET Flash memory

Due to the increase in gate1 voltage the barrier in channel region is pushed down and the distance between valence band of Source to conduction band of channel is reduced. Hence the electrons in the valance band tunnel through the barrier into the conduction band of the channel and current starts to flow from source to drain. Figure 5 shows the OFF state band diagram of DGTFET Flash memory with zero bias given at both the gates. Fig 6 shows the ON state band diagram with gate1 voltage applied. It is observed from Fig.5 that there is no tunneling takes place from source to the channel, hence the device is in OFF state. Fig. 6 depicts the tunneling mechanism from the source to channel, hence the current flows from source to drain.

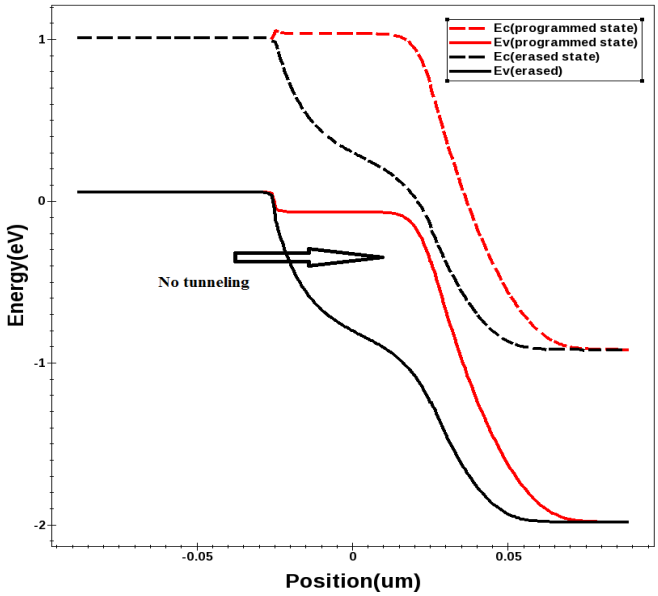

Fig 5 OFF state band diagram of DGTFET Flash memory

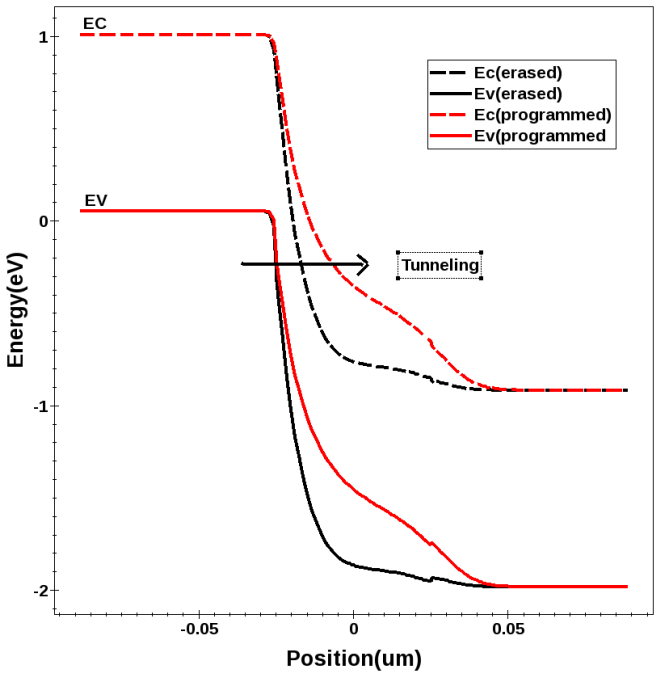

Fig 6 ON state band diagram of DGTFET Flash memory

The ON current (I_{ON}), OFF current (I_{OFF}) and threshold voltage (V_{TH}) are extracted from the I_D-V_G characteristics from Fig.7. As said earlier, the gate1 and gate 2 are biased independently in the IDDG operation. During the reading operation in IDDG mode, desired threshold voltage of the device is achieved. The reduction of threshold voltage will increase the I_{ON} and hence reduce the reading delay for both programming and erasing states.Figure.8 shows the energy band diagram for various gate2 control voltages. It is observed from Fig.8 and Fig.9 that the barrier width between Source to channel is getting reduced when the gate2 control voltage is increased. Hence the threshold voltage and reading delay also changes accordingly as shown in Table 3.

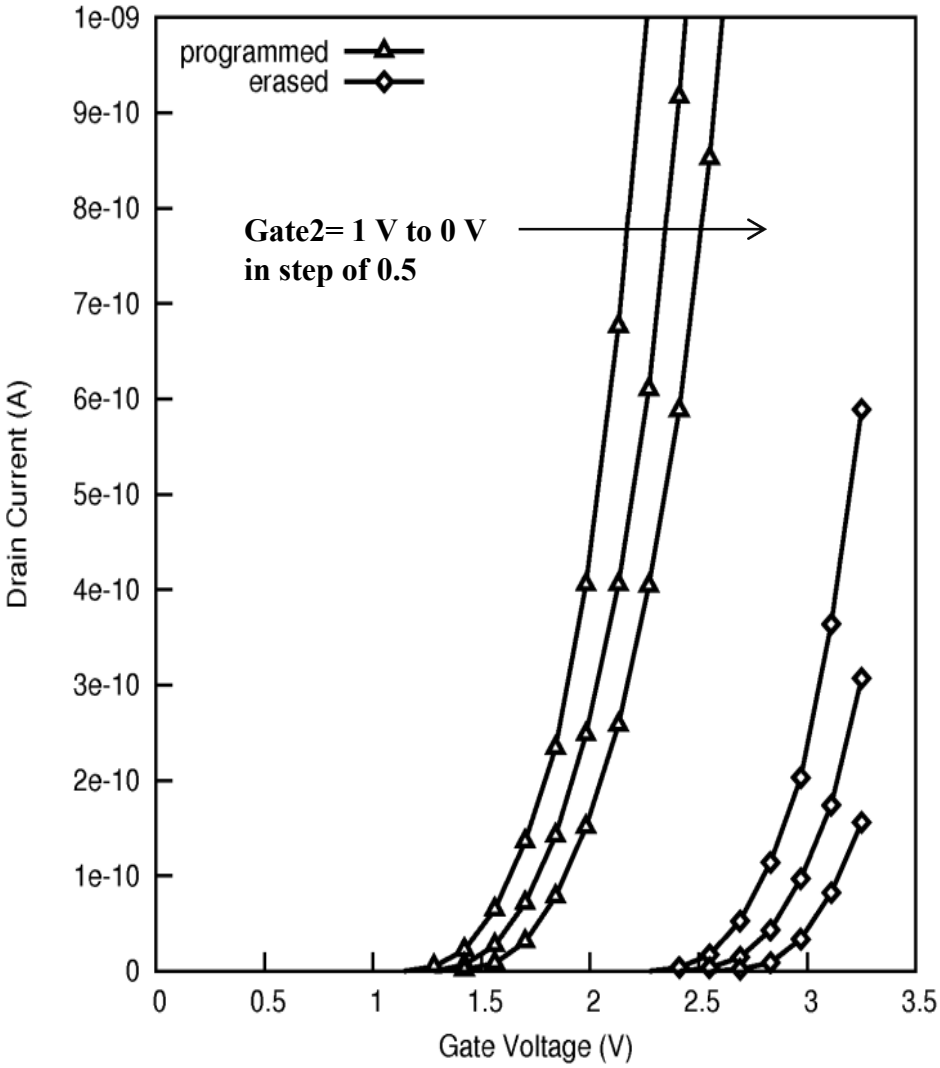

Fig 7 I_D versus V_G for various gate 2 voltages of DGTFET Flash memory.

TABLE.3 Reading Operation

GateVoltage (V)	Reading operation			
	Programmed state		Erased state	
	V_{TH} (V)	Delay(s)	V_{TH} (V)	Delay(s)
0	2.952	3.58e-11	2.543	3.60e-11
0.5	2.926	3.53e-11	2.569	3.56e-11
1	2.882	3.22e-11	2.567	3.48e-11

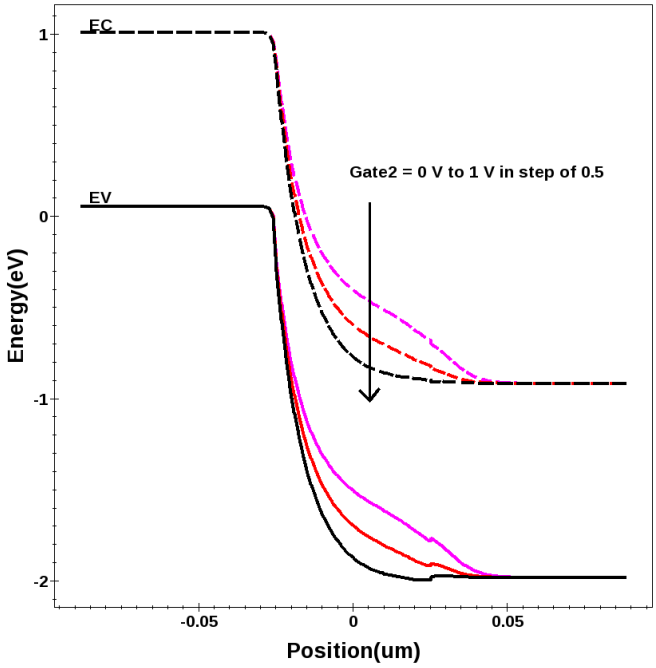

Fig 8.ON state band diagram for programmed state of DGTFET Flash memory

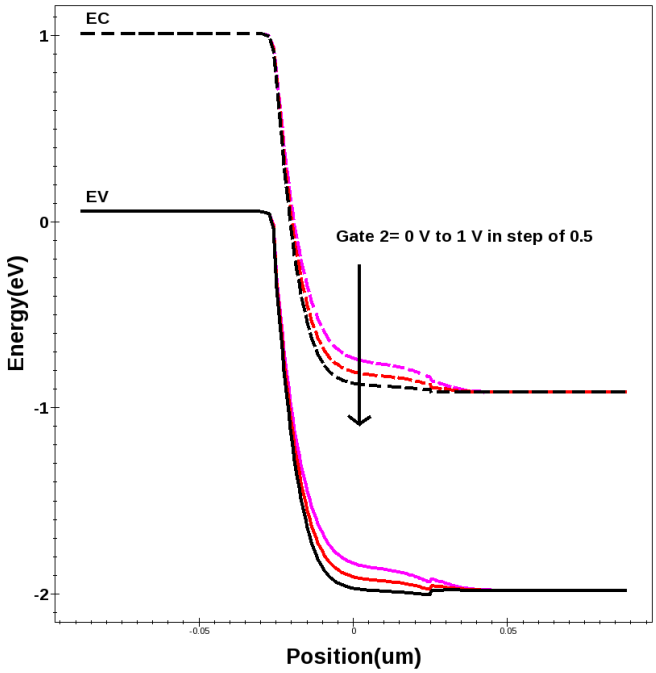

Fig.9 ON state band diagram for Erased state of DGTFET Flash memory

4 CONCLUSION

We have investigated the low power double gate TunnelFET (DGTFET) based flash memory cell through TCAD simulation. DGTFET flash memory's programming, erasing and reading operations were studied in the independently driven double gate (IDDG) mode. The parameters I_{ON}, I_{OFF}, V_{TH} were extracted in the IDDG mode for this device. The desired threshold voltage gate1 was achieved by adjusting the gate2 voltage by which the reading delay in programming and erasing states are reduced.

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Performance & Analysis of Radar Cross Section Estimation of Simple Objects in Time Domain

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ABSTRACT: This paper describes the feasibility and implementation of a time domain facility for Radar Cross Section (RCS) measurements. Main advantages of measuring in the time domain are the high range resolution and the application of direct gating. The limited signal to noise ratio can be a disadvantage. The measurements have been performed with software tool XFDTD using two 2-12 GHz ridged horn antennas and rugby antennas respectively. Because the horns are not designed for transmitting transient signals, an additional system response measurement in combination with a software de convolution algorithm restores the impulse response of the object under test. Further processing separates the object response from clutter contributions. A comparison of the time domain data with calculated and measured frequency domain radar cross sections shows a good agreement. The high range resolution enables the separation of scattering mechanisms (i.e. reaction, single and multiple diffraction. It is concluded that the time domain RCS measurement system is an attractive alternative of its frequency domain equivalent. However, the decision to measure in the time or frequency domain will depend on the specific aim of each experiment.

KEYWORDS: Radar Cross Section (RCS), Perfect Electric Conductor (PEC), De convolution.

INTRODUCTION

This paper describes the feasibility and implementation of a time domain facility for Radar Cross Section (RCS) measurements. RCS measurements have a large number of applications, ranging from model verification to a powerful design tool for ships and aircraft.RCS measurements are usually performed in the frequency domain. The International Research Centre for Telecommunication -transmission and Radar (IRCTR) already operate such frequency domain facilities. Recently IRCTR extended its facilities to perform ultra-short pulse antenna time domain measurements beyond its conventional frequency domain setup [1], [2]. These measurements successfully demonstrated the advantages and potentials of the time domain alternative [3]. Application of the time domain equipment in scattering research could also be very beneficial. Shorter measurement times could reduce the load on scarce measurement facilities and with the high range resolution scattering sources are easily identified. Time domains scattering measurements can also be used to estimate the maximum RCS of an object in a wide range of frequencies (e.g. when performing out-of-band antenna measurements).As described earlier [4,5], only specially designed transient antennas can transmit the ultra short input pulse at their feed. Because these antennas were not available at IRCTR an alternative approach has been taken. Two ridged horn antennas are used to transmit the pulse. The transmitted electromagnetic field does not have an ultra-short pulse shape, but it does contain all the information to reconstruct the impulse response of the object under test from the received signal. For this approach an additional system transfer measurement is necessary to determine the antenna characteristics [6-9]. Summarising, three measurements will be performed to extract the scattering characteristics of the object under test:

1. A system response measurement. The system response measurement determines the transfer function or impulse response of the system as described above.
2. An object measurement. The object measurement determines the total scattered field.
3. A background measurement. The background measurement determines the clutter (empty room scattering contributions and antenna coupling).

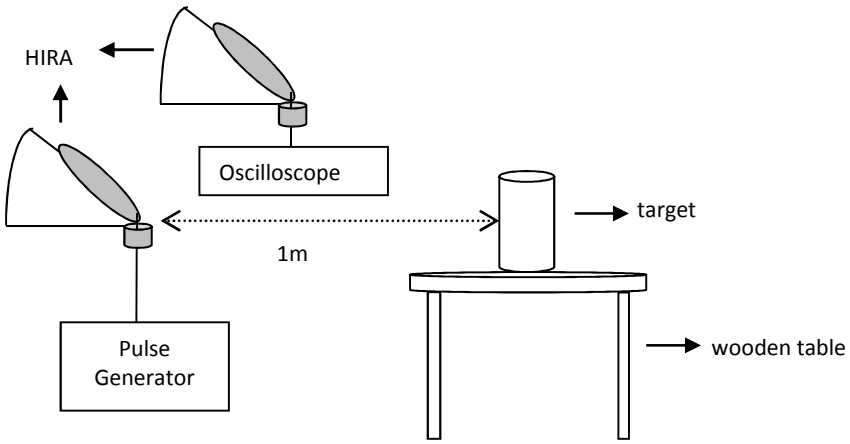

Fig 1 Time Domain Measurement Setup to measure the impulse response of target

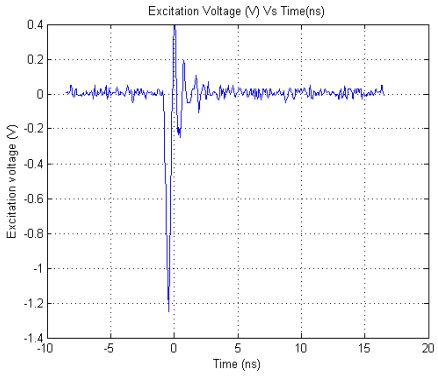

Fig 2 Excitation signal used for time domain measurement

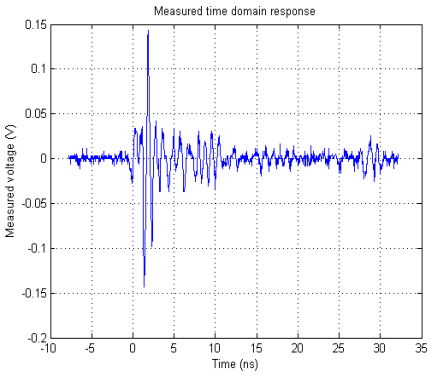

Fig 3 Voltage measured by sensor at distance 1.65m away from HIRA

The setup used in time domain is shown in the fig 1, where the transmitter and receiver antenna is focused on the target. From the fig [2,3] it is evident that the antenna coupling may occur, which has to be removed from the response output from the port 2 later. The antenna also add s some amount of distortion which has to be removed by using filter and deconvolution method. For performing deconvolution, we need three data files,

1. Response of full scene (i.e transmitter, receiver and a target).
2. Output of transmitter alone.
3. Output of receiver alone.

MATHEMATICAL MODEL:

A general system representation is given by

$x(t) \rightarrow h(t) \rightarrow y(t)$ (1)

Where:

x(t) = Input
h(t) = Impulse response of the system
y(t) =Output

Therefore, $y(t) = x(t) * h(t)$ (2)

where '*' represents convolution.

Antenna can be considered as a linear time invariant system. So the output of the antenna is the convolved output of the input and the impulse response of the transmitting antenna. In case of GPR, there will be a transmitting antenna and a receiving antenna.

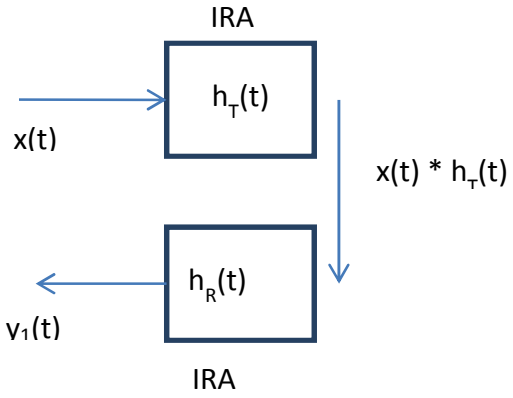

Fig 4 Antenna Configuration without target

So the output of the radar system without any scatterer is modelled [fig 4] as:

$x(t) \rightarrow h_T(t) \rightarrow h_R(t) \rightarrow y(t)$ (3)

Where:
x(t) = Input
$h_T(t)$= Impulse response of transmitting antenna
$h_R(t)$= Impulse response of receiving antenna
y(t) =Output

then,

$y_1(t) = x(t) * h_T(t) * h_R(t)$ (4)

When there is a scatterer in front of the bistatic antenna configuration, there is mutual coupling which is the leakage of the transmitter output directly to the receiver along with the response of scatterer. This coupling gives the early time response and includes no influence from the scatterer, since the response at the receiver is observed before the transmitter output had.

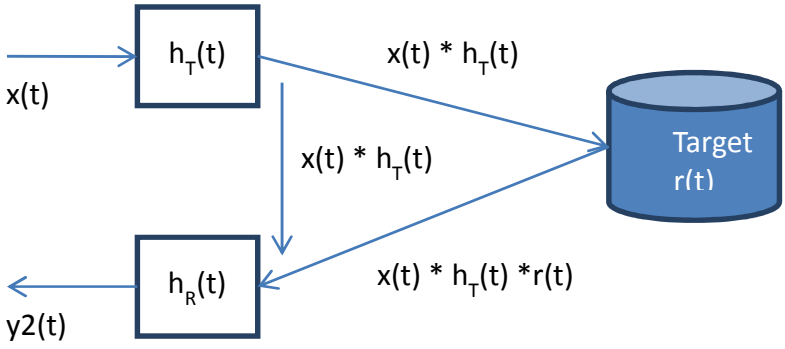

Fig 5 Antenna configuration with target

To simplify [t shown in fig 5] the output is modeled as two components:

$y2(t) = y_E(t) + y_L(t)$ (5)

where, $y_L(t)$ = the late time response,

$y_E(t)$= the early time response.

$y_L(t) = x(t) * h_T(t) * h_S(t) * h_R(t)$ (6)

$y_E(t) = x(t) * h_T(t) * h_R(t)$ (7)

where, $h_S(t)$ = Impulse response of scatterer

The early time response $y_E(t)$ can be captured in a scene where there is no scatterer. This gives the background response. So subtracting the $y_E(t)$ from $y_2(t)$ will give the late time response.

$y_L(t) = y_2(t) - y_E(t)$

$= y_2(t) - y_1(t)$ (8)

With this mathematical model, we first find out the antenna output in time domain. Once the antenna output is found out, we include the scatterer which is the target and find the response of the target. To get the impulse response of target approximately same as that in simulation we go for extended E-pulse approach in which the antenna response with target is first deconvolved with the antenna output and then convolved with the input pulse[10,11].

PROPOSED SYSTEM

The model of time domain measurement is implemented using the XFDTD tool by placing the transmitter and receiver horn antennas as show in the fig 6. The distance between the antenna and the object is about 1m (ideal case). The antennas are focused on the object with a slight angle tilt of 10 degree.

PLACING THE ANTENNAS

The antenna models are pre-loaded from the library files by clicking file -> open and choosing the appropriate file. The antenna is renamed as “Transmitter antenna” and a copy of the same is created. The second antenna is placed few meters away and renamed as “Receiver antenna”.

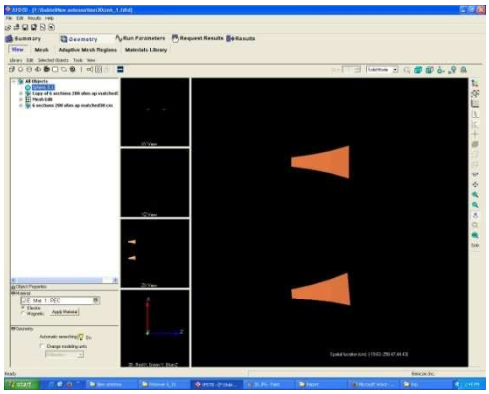

Fig 6 Transmitter and receiver antenna

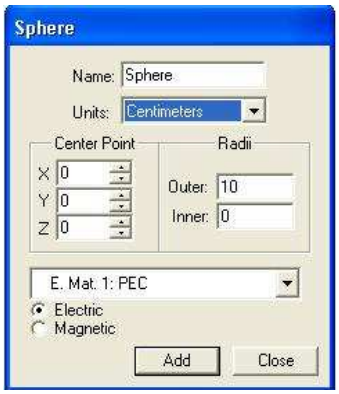

Fig 7 Sphere dialog box

OBJECT PLACEMENT

Now, the Sphere is placed by clicking on the icon sphere on the toolbar. A dialog box appears as shown in the fig 7, select the desired location and radius and click on add button. The sphere is added at the appropriate position as shown in the fig 8.

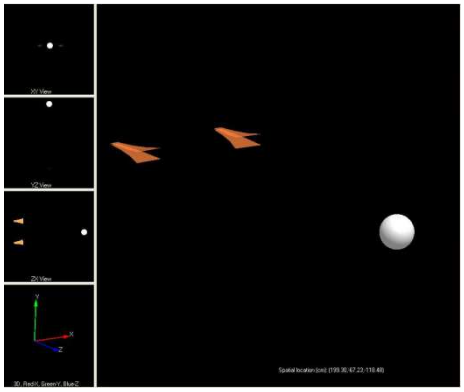

Fig 8 Full Scene of the model

Fig 9 The material panel section of the geometry window

THE MATERIAL PANEL

Once the sphere is placed, select the required material type from material panel which is below the objects panel. By selecting sphere in the hierarchy, and choose a material, in this case choose “Perfect Electric Conductor” (PEC) and then Apply Material button can be pressed to assign the material to the selected geometric object shown in fig 9.

GENERATING MESH

The mesh tab is selected and required number of cells is locked as auto, now generate mesh button is selected. The mesh is created for the geometric model as show in the fig 10. The mesh size should not exceed the ram size as it poses a complexity in calculation process.

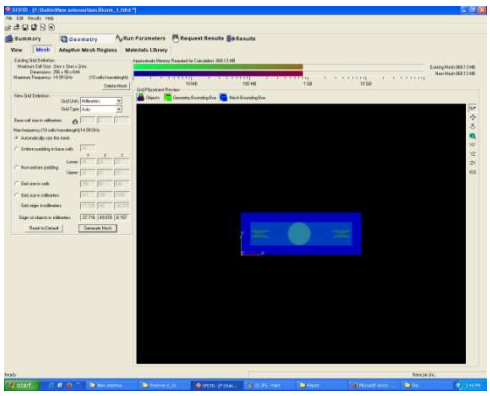

Fig 10 Generating Mesh

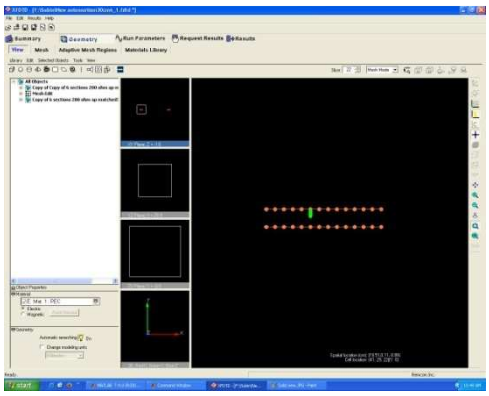

Fig 11 Placing the Component

SOURCE WAVEFORM AND FEED

The source waveform is given as discrete type. Now shift from solid view to mesh view as shown in the fig 11, The voltage feed is given to the transmitter antenna and a normal feed is given to the receiver antenna by following the steps given below,

1. In the mesh view, scroll in and out to select the correct slice to place the feed. Then right click on the exact location select add component to place the component.
2. Now components/ports tab opens, in that field specification select the series voltage. Give the amplitude value as 1 volt and resistance as 50 ohms.
3. Once the parameters are defined correctly, click on add component.
4. Similarly the feed is placed in receiver antenna too, only difference is in field specification choose passive load.

SAVE FAR-ZONE DATA

Under save far-zone data tab in request results, specify the phi and theta angels as 0 and 10 degree. The angles are found using the following formulas, the location of the sphere in the rectangular co-ordinate is used.

SAVE PROJECT AND GEOMETRY

Once all the parameters for stimulation is completed, the project and geometry is saved by selecting File - > save project and File - > save geometry.

RUN CALCULATION

The run calculation button is selected once the above steps are over. The run calculation is under the results tab. The XFDTD tool may take few hours for stimulation based on the size of the mesh. Once the calculations are done, the outputs can be plotted for different parameters.

OBTAINING THE DATA FILES

In the current directory of the project, the data files are created. These files are located using file explorer and are obtained for calculation of RCS. These data files can be directly loaded to the MATLAB code for performing the required tasks.

EXPERIMENTAL RESULTS

To stimulate the antennas alone, the object is now deleted from the full scene and other steps are performed similarly. The transmitter and receiver antenna alone is shown in the fig 12.

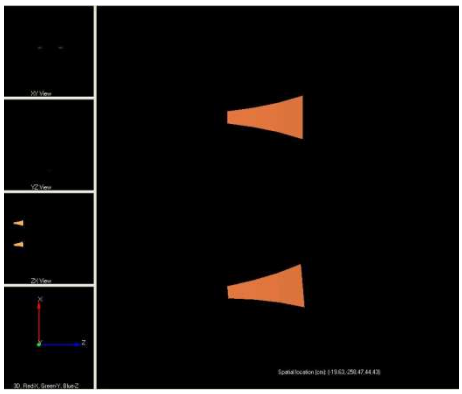

Fig 12 Stimulation of Tx and Rx antenna

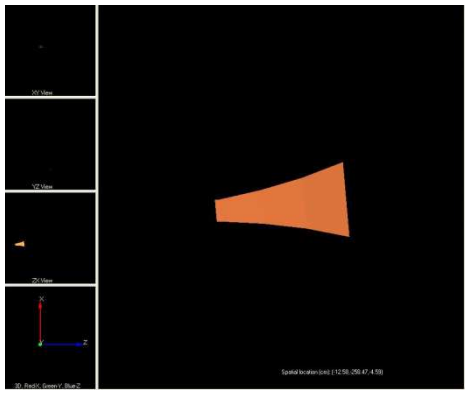

Fig 13Transmitter alone

WITH TRANSMITTER AND RECEIVER ALONE

The mesh is generated for the above geometry and the project is saved. After that run calculations under the results tab is selected. Once the calculations are completed, the data files from the project directory are collected.

TRANSMITTER ALONE

The transmitter antenna alone is stimulated and the results are obtained to find the response of the antenna. So that transfer function of the transmitter antenna alone can be found using deconvolution method shown in fig 13.

RECEIVER ALONE

The receiver antenna alone is stimulated and the results are obtained to find the response of the antenna. So that transfer function of the receiver antenna alone can be found using de convolution method. Here for the receiver antenna, the input cannot be of discrete wave form, so the waveform of the source is given as scattered field plane wave shown in fig 14-21.

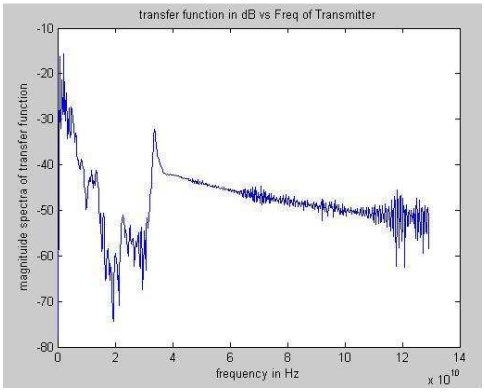

Fig 14 Transfer func. dB Vs Freq of transmitter

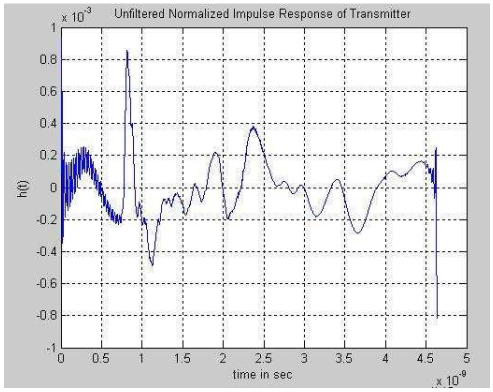

Fig 15 Unfiltered Normalized Impulse response of transmitter

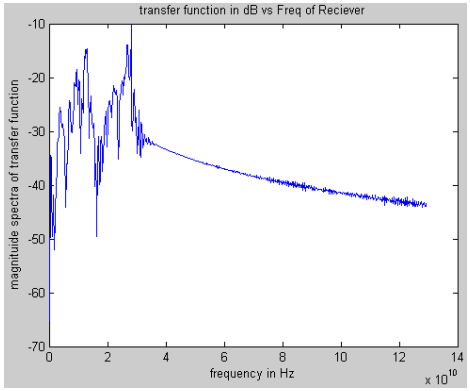

Fig 16 Transfer func. dB Vs Freq of Reciever

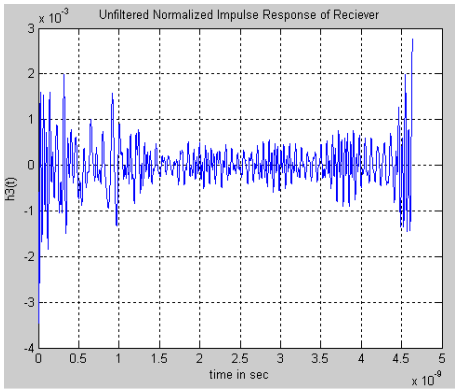

Fig 17 Unfiltered Normalized Impulse response of receiver

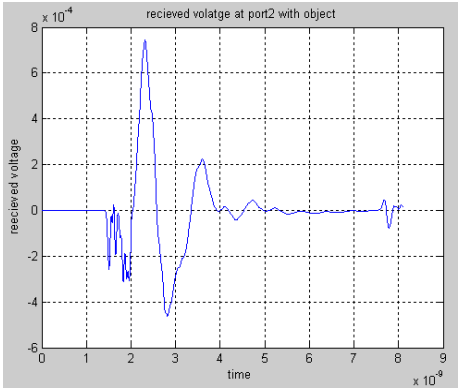

Fig 18 Received Voltage at port 2 with object

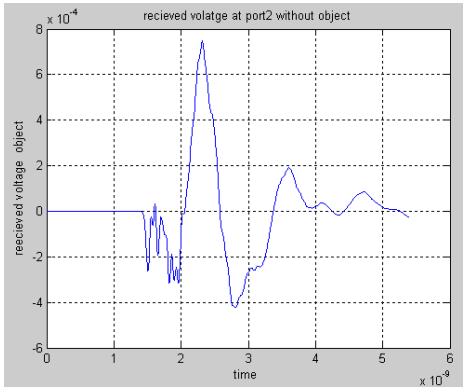

Fig 19 Received voltage at port 2 without object

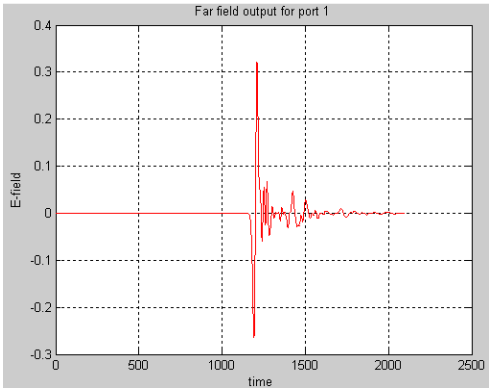

Fig 20 Far field output for port 1

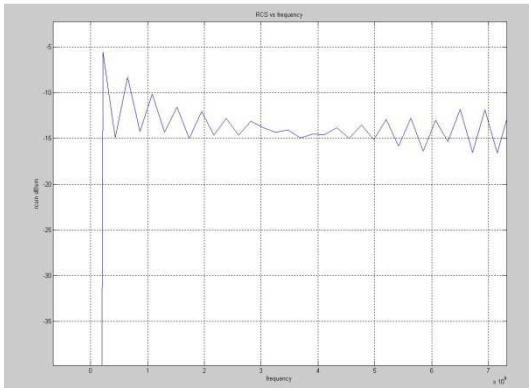

Fig 21 RCS of the sphere obtained

INTERPRETATION AND DISCUSSIONS OF THE RESULTS

COMPARISON OF THE MEASURED AND PREDICTED RCS

The measured RCS is compared with the ideal RCS of the corresponding object. In this case Sphere is used. The ideal output of the sphere is shown in the fig 22. Where the graph is plotted with RCS Vs time shown in fig 21.

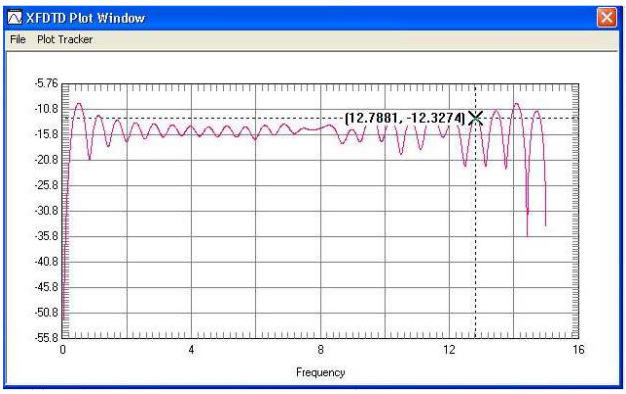

Fig 22 Ideal response (RCS) of a Sphere

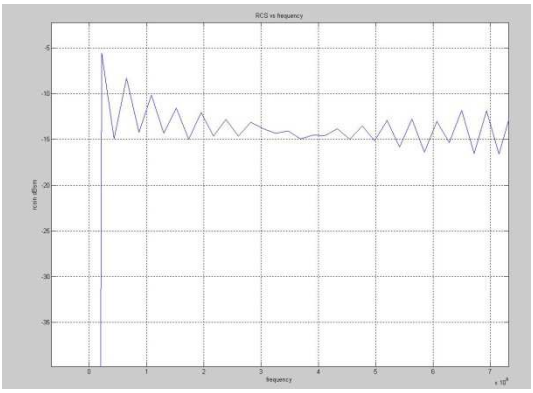

Fig 23 The RCS of sphere obtained from the stimulation tool xfdtd

The output calculated from the measured data from the xfdtd is plotted as shown in the fig 11.3 below; here the amplitude is slightly different due to some distortions caused by the antenna response. On closely examining the above two results of RCS of sphere, we can conclude by saying that RCS can be measured in Time domain unlike frequency domain,

where we need a anechoic chamber for testing. Furthermore the results obtained from the xfdtd tool can be improved in accuracy if the cell size is increased shown in fig 24.

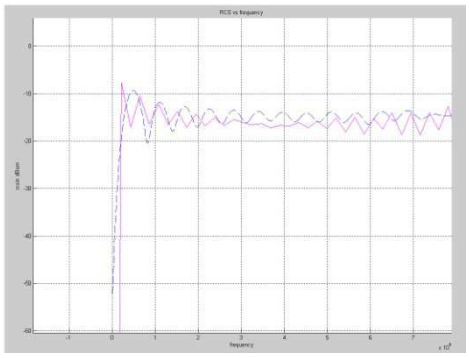

Fig 24 Comparison of Ideal case Sphere response with the obtained result

CONCLUSION

The time domain equipment can be used for high resolution Radar Cross Section measurements. The results are compared to calculated and measured frequency domain results and show a good agreement. Due the unavailability of the high performance system, the result in not exactly matching with the ideal response. If a high resolution system is used we can get the result as same as the ideal one. Instead of the system response measurement also a measurement of a (well known) reference object could provide the antenna response. This would avoid changing the measurement setup, which could be difficult in operational environments. Absolute RCS measurements can be performed by calibration of the measurement system with an exactly known object. This measurement provides a calibration curve which can be used to calibrate the object measurement.

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Implementation of High Speed & Low Power Approach by Designing Multi-Bit Flip-Flops

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ABSTRACT: Power has become a burning issue in modern VLSI design and integrated circuits; the power consumed by clocking gradually takes a dominant part. The proposed system provided a design to reduce the clock tree power by replacing some flip-flops with fewer multi-bit flip-flops, and also reduces the total power consumption. First, it perform a co-ordinate transformation to identify those flip flops that can be merged and also identify their legal regions in a library. Next step is to build a combination table to enumerate possible combinations of flip-flops provided by the library. The last step is to merge flip-flops in a hierarchical way. Besides power reduction, the objective of minimizing the total wire length is also considered. The time complexity of the proposed algorithm is less than the time complexity of the existing algorithm. According to the experimental results, the proposed algorithm significantly reduces the clock power by 27.9% and area reduced by 18.5%. The running time is very short. By using this method the low power consumed IC's can be manufactured using CMOS technologies.

KEYWORDS: Single & Double bit flip flops, Legal Placement Region, Flip flop Merging Power Report.

INTRODUCTION

In electronics, a flip-flop or latch is a circuit that has two stable states and can be used to store state information. A flip-flop is a bistable multivibrator. The circuit can be made to change state by signals applied to one or more control inputs and will have one or two outputs. It is the basic storage element in sequential logic. Flip-flops and latches are a fundamental building block of digital electronics systems used in computers, communications, and many other types of systems. Flip-flops and latches are used as data storage elements. Such data storage can be used for storage of state, and such a circuit is described as sequential logic. When used in a finite-state machine, the output and next state depend not only on its current input, but also on its current state (and hence, previous inputs). It can also be used for counting of pulses, and for synchronizing variably-timed input signals to some reference timing signal Flip-flops can be either simple (transparent or opaque) or clocked (synchronous or edge-triggered); the simple ones are commonly called latches. The word latch is mainly used for storage elements, while clocked devices are described as flip-flops. A latch is level-sensitive, whereas a flip-flop is edge-sensitive. That is, when a latch is enable it becomes transparent, while a flip flop's output only changes on a single type (positive going or negative going) of clock edge. Transparent latches are typically used as I/O ports or in asynchronous systems, or in synchronous two-phase systems.

LITERATURE SURVEY

Assem A. M. Bsoul and Steven J. E. Wilton (2010) had described a technique "An FPGA Architecture Supporting Dynamically Controlled Power Gating", which technique provides a modification to the fabric of an FPGA that enables dynamically-controlled power gating. It provides the total power consumption upto 23%.CorentinDupont et al(2012) had

described a technique "An Energy Aware Framework for Virtual Machine Placement in Cloud Federated Data Centres", which provides a flexible and energy-aware framework for the allocation of virtual machines in a data centre. This method provides 19% reduction in wire length. HoumanHomayouna,et al(2011) had described a technique "On leakage power optimization in clock tree networks for ASICs and general-purpose processors", which provides a post synthesis sleep transistor insertion (PSSTI), a heuristic clustering algorithm for sleep transistor insertion with the objective of total power minimization in a given clock tree. The clock tree leakage power is reduced by 19–32%. Jhen-Hong He, et al(2013) had described a technique "Clock Network Power Saving Using Multi-Bit Flip-Flops in Multiple Voltage Island Design", which provides an effective multi-bit flip-flop merging approach to deal with the clock network power minimization. it reduced the clock power up to 25%.

Mark Po-Hung Lin et al(2011) had introduced a technique "Post-Placement Power Optimization with Multi-Bit Flip-Flops", which describes a technique to reduce not only flip-flop power consumption but also clock tree and wire length. The power consumption obtained by 28%. Michael B. Henry(2011) had introduced a technique "Emerging Power-Gating Techniques for Low Power Digital Circuits", which provides an industry-standard technique, transistors are used to disconnect the power from idle portions of a chip. Present power-gating implementations suffer from limitations, which provides large amount of wasted energy.

Palden Lama et al(2012) had described a technique "Power-Aware Dynamic Placement and Migration in Virtualized GPU Environments", that controls the peak power consumption and improves the energy efficiency of server system. The result of this method is reduced power consumption by 23% and also reduction in power leakage.

Anto Bennet M et al(2015) had described a technique "High-Level Synthesis for Minimum-Area Low-Power Clock Gating", which describes an ILP (integer linear programming) formulation to consider both the clock tree and the clock control logic.. The overall power consumption is provided by this method is 32 Anto Bennet M et al(2015) et al(2012) had introduced a technique "Design Flow for Flip-Flop Grouping in Data-Driven Clock Gating", which describes a practical solution based on the toggling activity correlations of FFs. The data-driven clock gating is integrated into an Electronic Design Automation commercial Back end design flow, achieved power reduction of 15%–20%. Anto Bennet M et al(2014) had described a technique "Data-Width-Driven Power Gating of Integer Arithmetic Circuits", which method include a design that automatically implements coarse grain power-gated arithmetic circuits considering a narrow-width input data mode. This method provides 27% of power reduction. The demand for increased clock frequencies and logic availability (smaller area foot print) makes the problem even more important, leading among others to rapid elevation in power density. This literature survey spokes about the power, area consumption and reduction in wire lengths. Since power consumption is a critical challenge for implementing applications onto reconfigurable hardware. This proposed method provides the reduction in power, area consumption as well as the reduction in delay by merging many single bit flip-flops as a single multi bit flip-flop.

PROPOSED SYSTEM

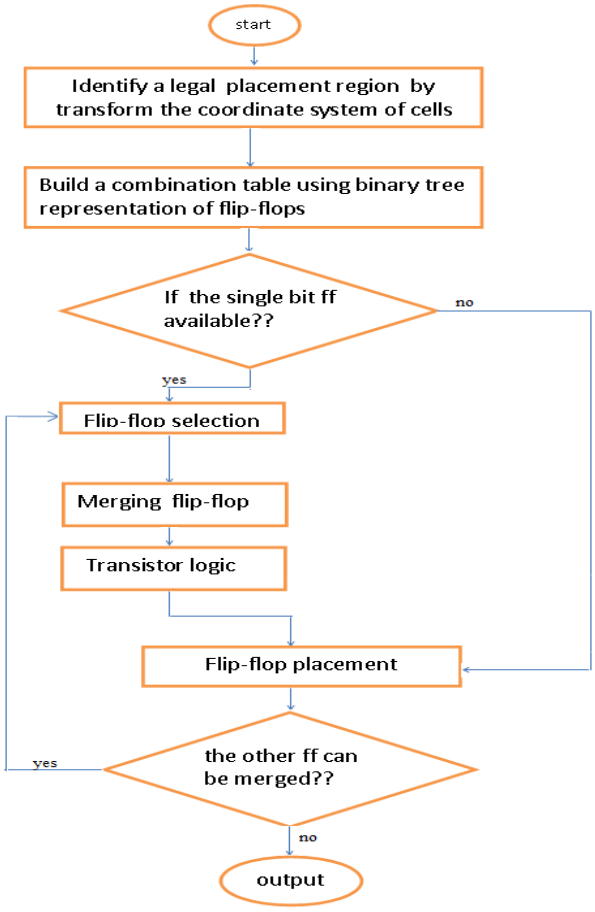


Fig 1 Flip-Flop Merging Flow Diagram

LEGAL PLACEMENT REGION

The shape of a feasible placement region associated with one pin denoted as pi connecting to a flip-flop denoted as fi. Since there may exist several pins connecting to fi,the legal placement region of fiare the overlapping area of several regions. Consider the two pins p1 and p2 connecting to a flip-flop f1, and the feasible placement regions for the two pins are enclosed by dotted lines, which are denoted by Rp(p1) and Rp(p2), respectively shown in fig 2. Thus, the legal placement region R(f1) for f1 is the overlapping part of these regions. However, it is not easy to identify and record feasible placement regions if their shapes are diamond.

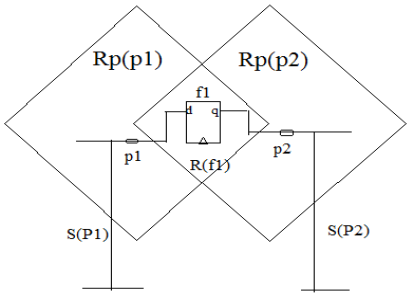


Fig 2. Legal Placement Region

The legal placement regions of flip-flop can be identified by using the following two methods Transformation of coordinate system & Determination of overlapped region.

TRANSFORMATION OF COORDINATE SYSTEM

The equations used to transform coordinate system are shown in eqn(1) and eqn(2). Suppose the location of a point in the original coordinate system is denoted by (x, y). After coordinate transformation, the new coordinate is denoted by (x', y'). In the original transformed equations, each value needs to be divided by the square root of 2, which would induce a longer computation time. Since it need to know the relative locations of flip-flops, such computation are ignored in this method. this method use x'andy' to denote the coordinates of transformed locations

$$x' = x + y \ /\sqrt{2} => x'' = \sqrt{2} * x' = x + y. \quad (1)$$

$$y' = -x + y \ /\sqrt{2} => y'' = \sqrt{2} * y' = -x + y. \quad (2)$$

DETERMINATION OF OVERLAPPED REGION

Then, it can find which flip-flops are mergeable according to whether their feasible regions overlap or not. Since the feasible placement region of each flip-flop can be easily identified after the coordinate transformation, simply use eqn(3) and eqn(4) to determine whether two flip-flops overlap or not.

$$DIS\_X(f1, f2) < 1/2 (W(f1) + W(f2)) \quad (3)$$

$$DIS\_Y (f1, f2) < 1/2(H(f1) + H(f2)) \quad (4)$$

Where,

W(f1) and H(f1) [W(f2) and H(f2)] denote the width and height of R(f1) [R(f2)], respectively, the function DIS_X(f1, f2) and (DIS_Y(f1, f2)) calculates the distance between centers of R(f1) and R(f2) in x& y directions.

BUILD A COMBINATION TABLE

If the system want to replace several flip-flops by a new flip-flop, system have to make sure that the new flip-flop provided by the library L when the feasible regions of these flip-flops overlap. In this paper, the method builds a combination table, which records all possible combinations of flip-flops to get feasible flip-flops before replacements. Thus, it can gradually replace flip-flops according to the order of the combinations of flip-flops in this table. Since only one combination of flip-flops needs to be considered in each time, the search time can be reduced greatly The pseudo code for building a combination table T. by using a binary tree to represent one combination for simplicity. Each node in the tree denotes one type of a flip-flop in L.For each node, the bit width of the corresponding flip-flop equals to the bit width summation of flip-flops denoted by its left and right child ,Let ni denote one combination in T, and b(ni) denote its bit width. In the beginning, initialize a combination ni for each kind of flip-flops in L. Then, in order to represent all combinations by using a binary tree, may add pseudo types, which denote those flip-flops that are not provided by the library . In order to use a binary tree to denote a type inL. If the combination is not included into any other combinations, it is deleted. First initialize two combinations n1 and n2 to represent these two types of flip-flops in the table T Next, the function Insert Pseudo Types performed to check whether the flip-flop types with bit widths between 1 and 4 exist or not. This is shown in algorithm 1.

ALGORITHM 1 BUILD COMBINATION TABLE

```
step1  : T = InitializationCombinationTable(L);
step2  : InsertPseudoType(L);
step3  : SortByBitNumber (L);
step4  : for each niin T do
step5  : InsertChildrens (ni, NULL, NULL);
step6  : index = 0;
step7  : whileindex!= size(T) do
step8  : Range_first= Rndex;
step9  : range_second= size(T);
step10: index = size(T);
```

step11: for each niin T
step12: for j = 1 to range_firstdo TypeVerify(ni, nj, T);
step13: for j = ito range_seconddo TypeVerify(ni, nj, T);
step14: T = DuplicateCombinationDelete(T);
step15: T = UnusedCombinationDelete(T);
InsertPseudoType(L):
step1 : for i= (bmin+1) to (bmax-1)
step2 : if (L does not contain a type whose bit width is equal to i)
step3 : insert a pseudo type typejwith bit width ito L;
InsertChildrens(n, n1, n2):
step1 : n.left_child← n1;
step2 : n.right_child← n2;
TypeVerify(n1, n2, T):
step1 : bsum= b(n1) + b(n2);
step2 : if (L contains a type whose bit width is bsum)
step3 : insert a new combination n whose bit width bsumto T;

FINAL TABLE

By combining two 1-bit flip-flops in the first combination, a new combination n3 can be obtained. Similarly, a new combination n4 (n5) can be easily obtain by combining n1 and n3(two n3's) Finally, n6 is obtained by combining n1 and n4. To speed up this program, n6 is deleted from T rather than n5 because its height is larger. After this procedure, n4 becomes an unused combination since the root of binary tree of n4 corresponds to the pseudo type, type3, in Land it is only included in n6. After deleting n6, n4 is also need to be deleted. The last combination table This shown in table 1. In order to enumerate all possible combinations in the combination table, all the flip-flops whose bit widths range between bmax and bmin and do not exist in Lshould be inserted into L.

Table 1 Combination Table

Combination Table *T*			
n_1	n_2	n_3	n_4
1-bit	4-bit	2-bit	4-bit
		n_1 + n_1	n_3 + n_3

There exist several choices if want to build a binary tree corresponding to a type type j. However, the complete binary tree has the smallest height. Thus, for building a binary tree of a certain combination ni whose type is type j, only the flip-flops whose bit widths are (b(type j)/2) and (b(type j)b(type j)/2) should exist in **L**. which is shown in algorithm 2.

ALGORITHM 2 INSERT PSEUDO TYPES

InsertPseudoType(L):
step1 : for each typejin L do
step2 : Pseudo Type Verify Insertion(typej, L) ;
Pseudo Type Verify Insertion(typej, L):
step1 : if (mod (b(typej) /2) == 0)
step2 : b1 = [b(typej)/2], b2 = [b(typej)/2];
step3 : else
step4 : b1 = [b(typej)/2], b2 = b(typej) – [b(typej)/];

step5 : for i= 1 to 2
step6 : if ((bi >bmin) &&
(L does not contain a type whose bit width is equal to bi))
step7 : insert a pseudo type typejwith bit width bi to L;
step 8 :Pseudo Type Verify Insertion(typej, L);

Insertion recursively checks the existence of flip-flops whose bit widths around b(type j)/2and add them into Lif they do not exist. The function Pseudo Type Verify Insertion, it divides the bit width b(type j) into two parts b(type j)/2 and b(type j)/2, (b(typej)/2 and b(type j), b(type j)/2) if b(type j) is an even (odd) number), and it would insert a pseudo type type j into L if the type is not provided by Land its bit width is larger than the minimum bit width (denoted by bmin) of flip-flops in L (see Lines 5–8 in Pseudo Type Verify Insertion). The same procedure repeats in the new created type. Note that this method works only when the 1-bit type exists in L.For example, assume a library Lonly provides two kinds of flip-flops whose bit widths are 1 and 7. In the new procedure, it first adds two pseudo types of flip-flops whose bit widths are 3 and 4, respectively, for the flip-flop with 7-bit.

MERGE FLIP-FLOPS

Use of the combination table is to combine flip-flops in this subsection. To reduce the complexity, first divide the whole placement region into several sub regions, and use the combination table to replace flip-flops in each sub region. Then, several sub regions are combined into a larger sub region and the flip-flops are replaced again so that those flip-flops in the neighboring sub regions can be replaced further. Finally, those flip-flops with pseudo types are deleted in the last stage because they are not provided by the supported library.Region Partition: To speed up our problem, the whole chip into several sub regions. Replacement of Flip-flops in Each Sub region: Before illustrating this procedure to merge flip-flops, first give an equation to measure the quality if two flip-flops are going to be replaced by a new flip-flop as follows:

$$\text{cost} = \text{routing length} - \alpha \times \text{available area}.$$

Where routing length denotes the total routing length between the new flip-flop and the pins connected to it, and available area represents the available area in the feasible region for placing the new flip-flop.α is a weighting factor The cost function includes the term routing length to replacement that induces shorter wire length. Besides, if the region has larger available space to place a new flip-flop, it implies that it has higher opportunities to combine with other flip-flops in the future and more power reduction. Once the flip-flops cannot be merged to a higher-bit type ignore the available area in the cost function, and hence α is set to 0. Bottom-Up Flow of Sub region Combinations: there may exist some flip-flops in the boundary of each sub region that cannot be replaced by any flip-flop in its sub region. However, these flip-flops may be merged with other flip-flops in neigh boring sub regions. Hence, to reduce power consumption furthermore, it can combine several sub regions to obtain a larger sub region and perform the replacement again in the new sub region again. The procedure repeats until it cannot achieve any replacement in the new sub region. Suppose divide a chip into 16 sub regions in the beginning. After the replacement of flip-flops is finished in each sub region, four sub regions are combined to get a larger Suppose some flip-flops in new sub regions still can be replaced by new flip-flops in other new sub regions, would combine four sub regions to get a larger one and perform their placement in the new sub region again. As the procedure repeats in a higher level, the number of merge able flip-flops gets fewer. However, it would spend much time to get little improvement for power saving. To consider this issue, there exists a trade-off between power saving and time consuming in this program.De-Replace and Replace: Since the pseudo type is an intermediate type, which is used to enumerate all possible combinations in the combination table T, it has to remove the flip-flops belonging to pseudo types. Thus, after the above procedures have been applied, it would perform de-replacement and replacement functions if there exists any flop-flops belonging to a pseudo type. For example, if there still exists a flip-flop, fi, belonging to n3 after replacements it have to de-replace fi into two flip-flops originally belongs to n1. After de-replacing, it do the replacements of flip-flops according to T without consideration of the combinations whose corresponding type is pseudo in L.

POWER EFFICIENCY

The modification of the multi-bit flip-flop is to implement in the transistor logic and here this technique used D_Flipflop basis of transistor operation and it processed depends on both clock and data inputs. This method use the both N-mos and P-mos transistor logic acts the D_Flipflop and whiles during the operation the X-node is the data transferring the next stage and holding the data by using the Delay inverters.

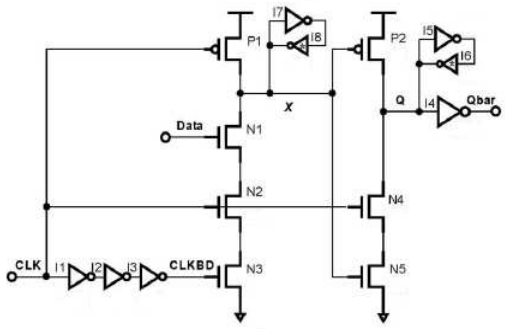


Fig 3 D-Flip-Flop Operation Through Transistor

Fig 3 shows the D-Flip-flop operation through transistor and in/out concept this method using multiple bits so the same concept can be apply for 2-bit operation it was produced the corresponding result and by using the merging method it can able to reduces the power and it was consumed less power shown in table 3.

RESULT AND DISCUSSION

As shown in table 2, the proposed system results of Power and Area are better when compare to the existing method results. The total power consumption for existing method is 68mW and it is reduced as 49mW in the proposed method. The area is reduced from 27(µm)² to 22(um)².

Table 2 Proposed Method Power, Area Comparison

Parameter	Existing method	Proposed method
Power	68mW	49mW
Area	27(µm)²	22(µm)²

Table 3 Single Bit FF Input/output

CLOCK1	CLOCK2	D1	D2	Q1	Q2
0	0	0	0	0	1

SINGLE BIT FLIP-FLOP O/P WAVE FORM

It is a wave form of two single bit flip-flops with two individual clocks shown in fig 4.

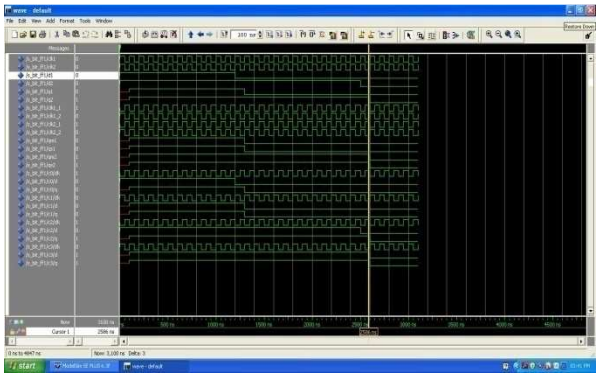


Fig 4 Single Bit Flip-Flop Output Waveform.

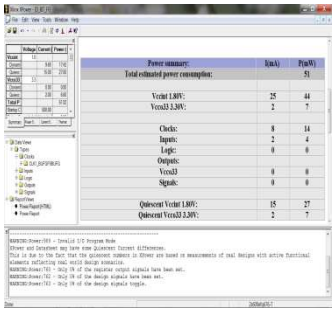


Fig 5 Single Bit Flip-Flop Power Report

SINGLE BIT FLIP-FLOP POWER REPORT

It [Fig 5] shows the total power consumption of two flip-flops at different clock pulses

DOUBLE BIT FLIP-FLOP WAVE FORM

It shows the wave form of double bit flip-flops operated by using a single clock pulse shown in fig 6.

Table 3 MBFF Input/output

CLOCK1	D1	D2	Q1	Q2
0	0	1	0	1

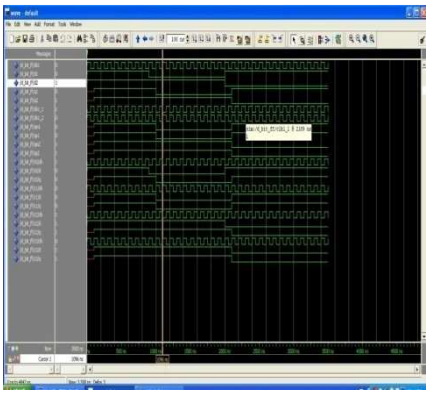


Fig 6 Double Bit Flip-Flop Output Waveform.

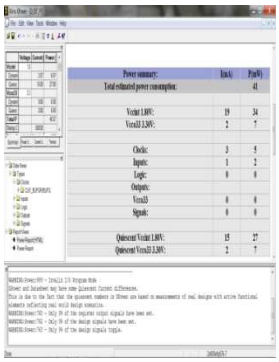


Fig 7Double Bit Flip-Flop Power Report

DOUBLE BIT FLIP-FLOP POWER REPORT

It shows the total power consumption of two flip-flops at same clock pulse shown in fig 7.

COMBINATIONAL TABLE OUTPUT WAVE FORM

It shows the wave form of combinational table operated by using a single clock pulse shown in fig 8.

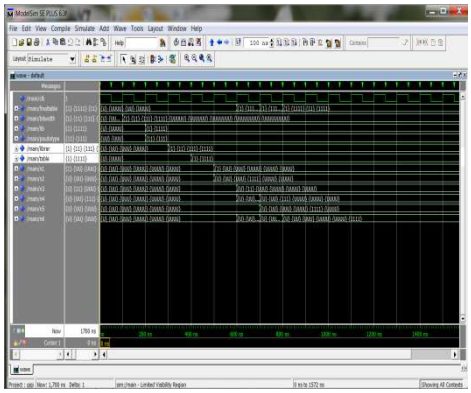
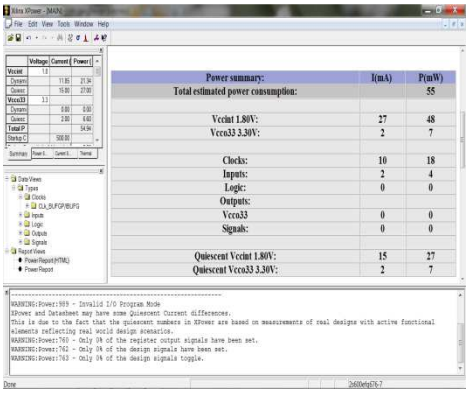


Fig 8.CombinationalTable Output Waveform.



Power summary:	I(mA)	P(mW)
Total estimated power consumption:		55
Vccint 1.80V:	27	48
Vcco33 3.30V:	2	7
Clocks:	10	18
Inputs:	2	4
Logic:	0	0
Outputs:		
Vcco33	0	0
Signals:	0	0
Quiescent Vccint 1.80V:	15	27
Quiescent Vcco33 3.30V:	2	7

Fig 9.Combinational Table Power Report.

COMBINATION TABLE POWER REPORT

It shows the total power consumption of combinational table at one clock pulse.

FLIP-FLOP MERGING WAVEFORM

It shows the wave form of merged flip-flops operated by using a single clock pulse shown in fig 10.

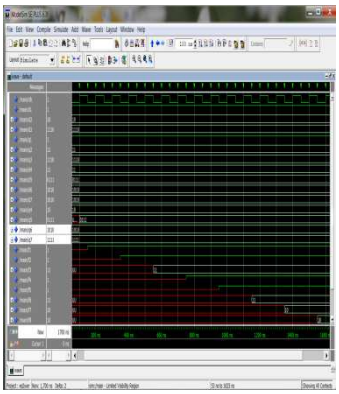
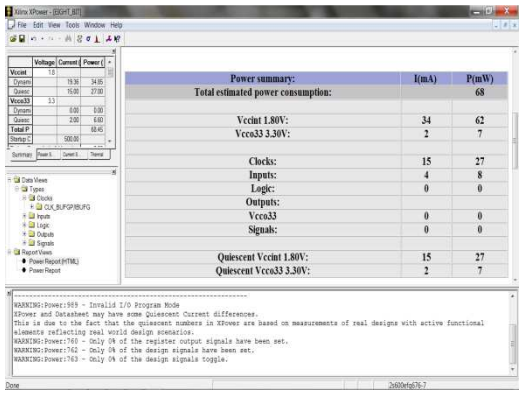


Fig 10 Flip-Flop Merging Output Waveform.



Power summary:	I(mA)	P(mW)
Total estimated power consumption:		68
Vccint 1.80V:	34	62
Vcco33 3.30V:	2	7
Clocks:	15	27
Inputs:	4	8
Logic:	0	0
Outputs:		
Vcco33	0	0
Signals:	0	0
Quiescent Vccint 1.80V:	15	27
Quiescent Vcco33 3.30V:	2	7

Fig 11 Flip-FlopMerging Power Report

FLIP-FLOP MERGING POWER REPORT

It shows the total power consumption of merging at one clock pulse shown in fig 11.

FLIP-FLOP MERGING RTL SCHEMATIC VIEW

It is a RTL SCHEMATIC VIEW of the 8-bit merging flip-flops. It shows the internal connections of the flip-flops shown in fig 12

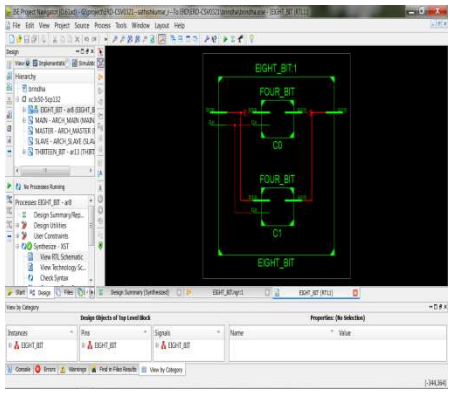


Fig 12Flip-Flop Merging RTL Schematic View Output.

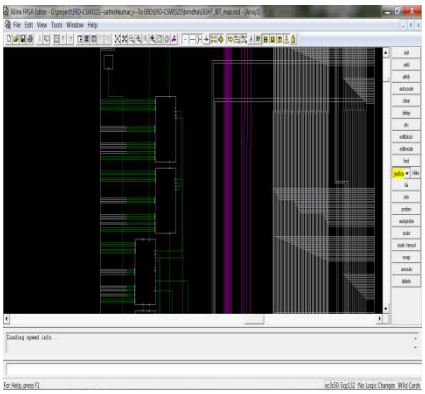


Fig 13Flip-Flop Merging Technological View Output.

FLIP-FLOP MERGING TECHNOLOGICAL VIEW

It is a [13] diagram shows that the internal circuit connections of flip-flop merging method.

FLIP-FLOP MERGING AREA MAPPING

This [14] diagram shows the area mapping of the flip-flops in the circuit by using PLAN AHEAD software.

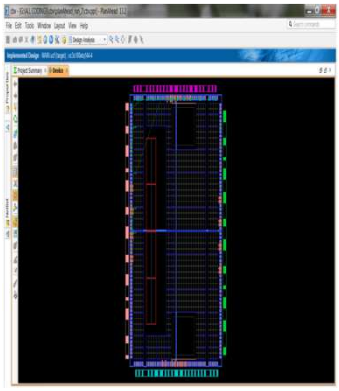


Fig 14 Flip-Flop Merging Area Mapping Output.

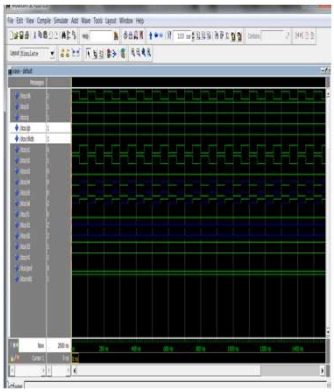


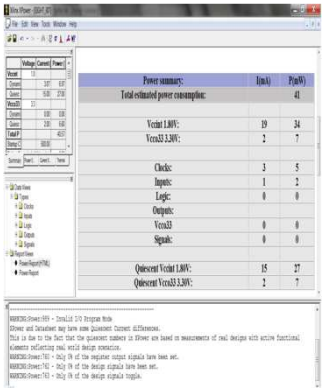
Fig 15 Transistor Logic Output Waveform.

TRANSISTOR LOGIC WAVEFORM

It [15] shows the wave form of transistor logic operated by using a single clock pulse.

TRANSISTOR LOGIC POWER REPORT

It [16] shows the total power consumption of transistor logic at one clock pulse.



Power summary:	I(mA)	P(mW)
Total estimated power consumption:		41
Vccint 1.80V:	19	34
Vcco33 3.30V:	2	7
Clocks:	3	5
Inputs:	1	2
Logic:	0	0
Outputs:		
Vcco33	0	0
Signals:	0	0
Quiescent Vccint 1.80V:	15	27
Quiescent Vcco33 3.30V:	2	7

Fig 16Power Report ForTransistor Logic.

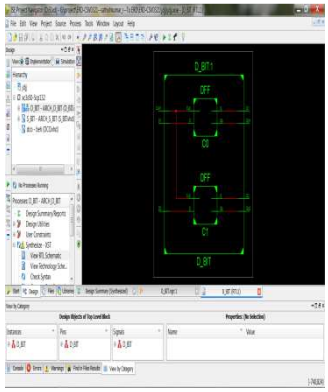


Fig 17 RTL Schematic View Output For Transistor Logic

TRANSISTOR LOGIC RTL SCHEMATIC VIEW

It is a RTL SCHEMATIC VIEW of the merged flip-flop proposed work. It [Fig 17] shows the internal connections of the flip-flops.

TRANSISTOR LOGIC TECHNOLOGICAL VIEW

It is a diagram [18] shows that the internal circuit connections of the transistor logic design.

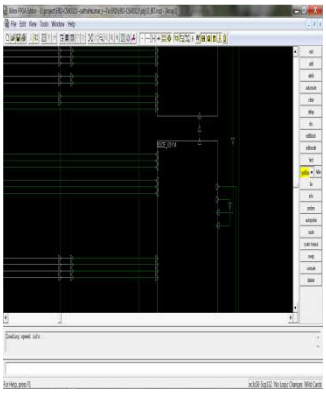


Fig 18 Technological View Output of Transistor Logic

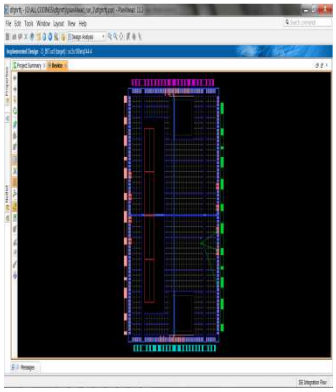


Fig 19 Transistor Logic Area Mapping Output.

TRANSISTOR LOGIC AREA MAPPING

This [19] diagram shows the area mapping of the flip-flops in the circuit by using PLAN AHEAD software.

CONCLUSION

In this proposed system numbers of single bit flip-flops are merged as a multi bit flip-flop for the purpose of power reduction.The procedure of flip-flop replacements is depending on the combination table, which records the relationships among the flip-flop types. The concept of pseudo type is introduced to help to enumerate all possible combinations in the combination table. By the guidelines of replacements from the combination table, the impossible combination of flip-flops is not being considered that decreases execution time. The proposed results achieved power reduction upto 27.9%, area reduction upto 18.5%. The proposed system provides the flip-flop merging concept only by using D type flip-flops. The future work of this project contains merging the other types of flip-flop like T flip-flop, SR flip-flop, JK flip-flop. This merging concept will applied in the transistor logic to obtain high power reduction.

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Degraded Document Image Binarization Using Optical Character Recognition

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ABSTRACT: The proposed OCR algorithm to retrieve the text in the scanned document images. Here the text detection algorithm based on two machine learning classifiers: one allows generating candidate word regions and the other filters out non-text ones. The extract connected components (CCs) in images by using the maximally stable extremal region algorithm. In CC clustering adaboost classifiers are used to determine whether the region contains text or not. Then using binarization method, the gray image is converted into binary image. The binarization outcomes are subject to OCR and the corresponding result is evaluated with respect to character and word accuracy. As more and more text documents are scanned fast and accurate. Additional performance metrics of the percentage rates of broken and missed text, false alarms, background noise, character enlargement and merging. This effectiveness of the proposed method is also confirmed by tests carried on realistic document images. For proposed algorithm MATLAB version 13 software is used.

KEYWORDS: Maximally Stable Extremal Regions(MSER), optical character recognition (OCR).

INTRODUCTION

Document image binarization is an important pre-processing step to document image analysis and recognition. Also, it can be considered as a critical stage in OCR software systems since the result of the subsequent steps is highly dependent on its effectiveness. This is the reason why document image binarization has been a subject of extensive research during the last decades. The contrast enhancement methods, and then at spatial filtering methods that sharpen edges and remove much of the image blur. The image shown in the Fig.1 is the input image given for binarization. (Detector calibration is usually the first step of the image enhancement chain, but this was discussed earlier as part of the sensor modelling.) For simplicity, assume that the images have an eight-bit dynamic range; i.e., there are 28 = 256 possible gray levels, so the gray levels in the image will be in the range 0–255, with zero being black and 255 being white. Colour images have three arrays of numbers typically representing the red, green, and blue images that are combined to give the full spectrum of colours. The image shown in the Fig.2 is the binarization result. Focus on processing single-band images, i.e., black and white images.

Corresponding Author: M. Manimaraboopathy

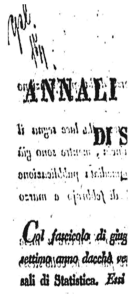


Fig.1 Input image

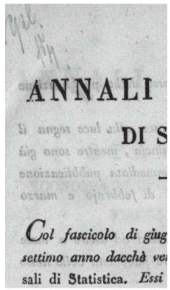


Fig.2 Binarization result

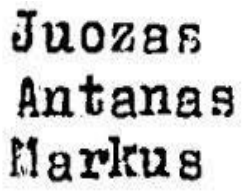


Fig.3 Sample for noise image

The image is divided into segments, denoted by (S), of fixed size. In each segment, the frequency of black pixels is calculated. The selected segments form areas by connecting neighboring segments in respect to their original position in the image. The row-by-row labeling algorithm is used for scanning the document by the window. The parameter k in the formula determines the sensitivity of the detection method. The higher the k, the less segments will be detected. The image shown in the Fig.3 is the sample for noise. Noise area can be having two type foreground and background.In the user was assisted by software to create the ground truth for machine-printed images, by merging and splitting clusters in the character clustering stage, as well as by adding and removing character models to degraded character instances in the character matching stage. The image shown in Fig.4 is the original image. However, the aforementioned procedure can be applied only on machine-printed document without many different font types.

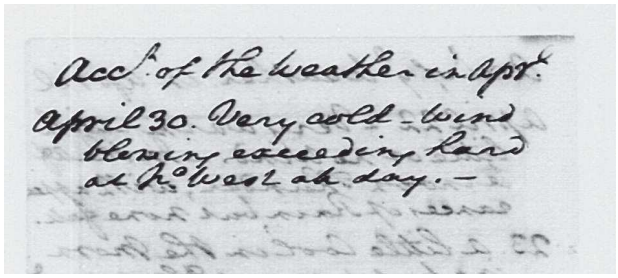


Fig.4 Original image

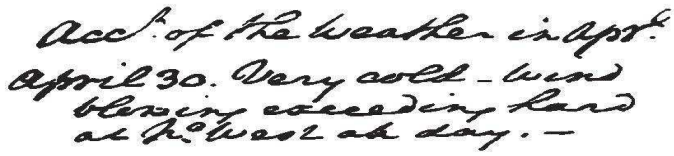


Fig.5 Ground truth

In the proposed methodology, the construction of ground truth plays an important role, since it aids towards the automation of the evaluation procedure. It consists of two distinct stages, namely Skeletonized Ground Truth (SG) stage and Estimated Ground Truth (EG) stage. The image shown in Fig.5 is the ground truth image.Transcript mapping (or text alignment) techniques are used in order to map the correct text information to a segmentation result produced automatically. Usually, these techniques are very useful in order to automatically create benchmarking data sets. The image shown in Fig.6 Sample for skeletonized ground truth image**.**They are mainly based on hidden Markov models (HMMs) and dynamic time warping (DTW) and mainly focus on the alignment of handwritten document images with the corresponding transcription on word level. An efficient transcript mapping technique to ease the construction of document image segmentation ground truth that includes text-image alignment in text line, word and character level.

Fig.6 Sample for skeletonized ground truth image

By concluding this noise in background and foreground can be quantitatively measured by using the garbour filter. Different type of noise can be detected and the ground truth images used for matching the input with grayscale image. Finally the degraded document can be detected.

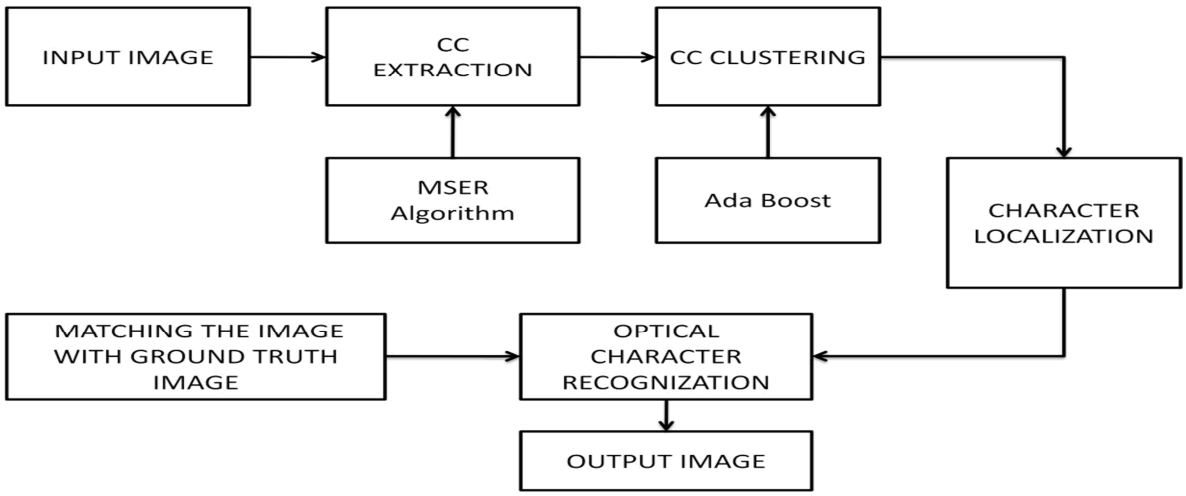
LITERATURE REVIEW

Lamiroy, B. et al., (2011) proposed techniques used here were Fuzzy logic, Self organized neural networks. The process done here was used the image colour values and additional local spatial features extracted in the neighbourhood of the pixels. Both image and local features values feed a kohonen self-organised feature map neural network classifier. An illuminated document easily modified but requires additional spatial information. Low, S.H. and Maxemchuk, N.F. (2010) proposed techniques used here were Bi-modal distribution, Optimization. The process done here was a strongly bi-modal image with smooth regions in both the foreground and background, while allowing for sharp discontinuities at the edges. Then bi-modal and average that measure desired properties in text image but it gives low-resolution image. Moghaddam, R.F. and Cheriet, M. (2010) proposed techniques used here were Sauvola‟s binarization method, Automation and Optimal selection of binarization method. The process done here was tried to compare binarization algorithms by using the precision and recall analysis of the resultant words in the foreground or by evaluating their effect on end-to-end character or word recognition performance in a complete archive document recognition system utilizing OCR. The process provides quality images but this model is not over parameterized. Matsui, E. et al., (2010) proposed techniques used here are adaptive filtering, restoration, scanning. The process done here was that the correction of show through of the printed documents. It offers rate improvement in thresholding and successfully eliminating show through from back side but the efficiency is not much better Anto Bennet, M. et al., (2012) proposed techniques are MLIR where it can find the information that expressed in any language. This paper measuring the effectiveness of MLIR system, this explaining the measures that are regularly used for document retrieval. Here the efficiency to evaluate the performance of the system is not more. Anto Bennet, M. et al., (2015) proposed techniques used here were Binarization algorithm, Hybrid algorithm. The process done here was binarization techniques focus either on finding an appropriate global threshold or adapting a local threshold for each area in order to remove smear, strains, uneven illumination etc. Here, a hybrid approach is presented that first applies a global thresholding technique and then, identifies the image areas that are more likely to still contain noise. The processing is efficient but algorithm used is Anto Bennet, M. et al., (2016) proposed classifying data using Boosting algorithm performs supervised learning which is known as machine learning meta-algorithm. Boosting methods are commonly used to detect objects or persons in videoconference, security system, etc. as an approximation of logistic regression, or enhanced with arithmetical improvements of calculation of weight coefficients. This paper provides a good survey of the literature on mining with rare classes and rare cases using Boosting techniques that shows original approach to classification and its variants. Different evaluation metrics on rarity mining are also discussed in this paper, but error reduction is not efficient.

PROPOSED METHOD

CC-based methods use a bottom-up approach by grouping small components into successively larger components until all regions are identified in the image. A geometrical analysis is needed to merge the text components using the spatial arrangement of the components so as to filter out non-text components and mark the boundaries of the text regions.A CC-based method could segment a character into multiple CCs, especially in the cases of polychrome text strings and low-resolution and noisy video images. Further, the performance of a CC-based method is severely affected by component grouping, such as a projection profile analysis or text line selection. In addition, several threshold values are needed to filter out the non-text components, and these threshold values are dependent on the image/video database.A block-matching algorithm using the mean absolute difference criterion is employed to estimate the motion. Blocks missed during tracking are discarded. Their primary focus is on caption text, such as pre-title sequences, credit titles, and closing sequences, which exhibit a higher contrast with the background. This makes it easy to use the contrast difference between the boundary of the detected components and their background in the filtering stage. Finally, a geometric analysis, including the width, height, and aspect ratio, is used to filter out any non-text components. Based on experiments using 2247 frames, their algorithm extracted 86% to 100% of all the caption text.A binarized character with missing foreground pixels(false negatives) from the contour that do not affect the character topology, compared to a binarized character for which the lack of the same amount of foreground pixels alters the character topology achieves: a) equal performance when the typical measures of Recall or PSNR are used, because of the same amount of false negative pixels, b) better performance when the distance-based measures MPM and DRD are used, because those measures apply lower penalization near the ground truth image.

BLOCK DIAGRAM OF PROPOSED METHOD



CANDIDATE GENERATION

For the generation of candidates, extract CCs in images and partition the extracted CCs into clusters, where the clustering algorithm is based on an adjacency relation classifier. In this section, first CC extraction method shown. Then (i) to build training samples (ii) to train the classifier, and (iii) to use that classifier in our CC clustering method.

MSER ALGORITHM

The core of the vision system are Maximally Stable Extremal Regions, or MSERs, introduced by Matas etc all for gray-scale images and later ex-tended to color as Maximally Stable Color Regions, or MSCR. Details about MSER and MSCR principles are given respectively. The main usage of MSER detection is for wide-baseline image matching mainly because of its covariance and high repeatability. To match two images of the same scene (taken from different viewpoints), MSERs are extracted from both images and then appropriately described using (usually in-variant) descriptor. Because MSER extraction is highly repeatable, the majority of the regions should be detected in both images.

CC EXTRACTION

For any two nodes s and t in a graph, their connected components are either identical or disjoint start BFS from some node s. This gives one component of the graph pick any currently unexplored node *u* start another BFS. This gives another component. Continue in this manner until all nodes are explored undirected graphs: s-t connectivity. Directed graphs: s-t mutual connectivity directed path from s to directed path from t to s.

MUTUAL CONNECTIVITY

If u and v are mutually reachable, and v and w are mutually reachable, then u and w are mutually reachable. If u and v are mutually reachable, and v and w are mutually reachable, then u and w are mutually reachable. To go from u to w, we can go via v. To go from w to u, we can again to via v.

STRONG CONNECTIVITY OF DIGRAPHS

A Directed graph is strongly connected if every two nodes „u and „v are mutually reachable from each other analogous to connectivity in undirected graph. The strong component containing *s* is the mutually reachable from each other. Analogous to connected component containing s in undirected graphs. For any node u in R, u and s are mutually reachable at any two nodes u and v in R are mutually reachable u and s are mutually reachable; s and v are mutually reachable. Hence, u and v are mutually reachable. The image shown in Fig.8 is the original image and text extracted from the original image. For any node u in R, u and s are mutually reachable any two nodes u and v in R are mutually reachable u and s is mutually reachable; s and v

are mutually reachable. Hence, u and v are mutually reachable for any two nodes u and v, the strong components of u and v are either identical or disjoint.

Fig.8 Original image and extraction of text from original image.

Text in images can exhibit many variations with respect to the following properties:

Size: Although the text size can vary a lot, assumptions can be made depending on the application domain.

Alignment: The characters in the caption text appear in clusters and usually lie horizontally, although sometimes they can appear as non-planar texts as a result of special effects. This does not apply to scene text, which can have various perspective distortions. Scene text can be aligned in any direction and can have geometric distortions.

Inter-character distance: characters in a text line have a uniform distance between them.

Color: The characters in a text line tend to have the same or similar colors. This property makes it possible to use a connected component-based approach for text detection. Most of the research reported till date has concentrated on finding text strings of a single color. However, video images and other complex color documents can contain „text strings with more than two colors for effective visualization, i.e., different colors within one word.

Motion: The same characters usually exist in consecutive frames in a video with or without movement. This property is used in text tracking and enhancement. Caption text usually moves in a uniform way: horizontally or vertically. Scene text can have arbitrary motion due to camera or object movement.

Edge: Most caption and scene text is designed to be easily read, thereby resulting in strong edges at the boundaries of text and background.

Compression: Many digital images are recorded, transferred, and processed compressed format.

CC grouping or Clustering

The main aim of CC grouping is to group adjacent characters detected in the previous steps into separated meaningful words and further reject false positives. Based on the observation that characters in the same word usually share some similar properties, such as intensity, size, stroke width etc., this valuable information can be utilized in CC grouping.For CC grouping Adaboost classifier is used which is use full in finding the adjacency relationship from CC. bounding box of c_i and denote its width and height as w_i and h_i respectively. Given a pair $(c_i, c_j) \in C \times C$ (i not equal to j), the horizontal distance, horizontal overlap, and vertical overlap between two boxes are denoted as d_{ij}, ho_{ij}, and vo_{ij} respectively.

ADABOOST ALGORITHM

This paper presents an algorithm for detecting and reading text in city scenes. This text includes stereotypical forms such as street signs, hospital signs, and bus numbers as well as more variable forms such as shop signs, house numbers, and billboards. The database of city images were taken in partly by normally sighted viewers and partly by blind volunteers who were accompanied by sighted guides using automatic camera settings and little practical knowledge of where the text was located in the image. The databases have been labeled to enable us to train part of our algorithm and to evaluate the algorithm performance. The negative examples were obtained by a bootstrap process similar to Drucker. First selected negative examples by randomly sampling from windows in the image dataset. After training with these samples, applied the AdaBoost algorithm to classify all windows in the training images (at a range of sizes).Those misclassified as text was then used as negative examples for retraining AdaBoost. The image regions most easily confused with text were vegetation, repetitive structures such as railings or building facades, and some chance patterns. The image shown in Fig.9 is the positive examples used for training Adaboost. The previous section described the weak classifiers used for training AdaBoost.

Fig.9 Positive examples used for training AdaBoost

TEXT READING

Then applied commercial OCR software to the extended text regions (produced by AdaBoost followed by extension and binarization). This was used both to read the text and to discard false positive text regions. Overall, the AdaBoost strong classifier (plus extension/ binarization) detected 97.2 % of the visible text in test dataset (text that could be detected by a normally sighted viewer).For typical examples of the text that AdaBoost fails to detect.

Most of these errors correspond to text which is blurred or badly shadowed. Others occur because do not train AdaBoost to detection vertical text or individual letters. (The training examples were horizontal segments usually containing two or three letters/digits). For the 286 extended text regions correctly detected by the AdaBoost strong classifier (plus extension/binarization), then obtained a correct reading rate of 93.0 % (proportion of words correctly read). This required a preprocessing stage to scale the text region. The 7 % errors are caused by small text areas. For text that can read successfully and for text that cannot read.

CANDIDATE NORMALIZATION

After CC Clustering, we have a set of cluster, normalizing these clusters corresponding regions for the reliable text/non-text classification. Also there are important differences between text and face stimuli because the spatial variation per pixel of text images is far greater than for faces. Facial features, such as eyes, are in approximately the same spatial position for any face and have similar appearance.

GEOMETRIC NORMALIZATION

Given $w_i \in W$, first localize its corresponding region. Even though text boxes can experience perspective distortions, approximating the shape of text boxes with parallelograms whose left and right sides are parallel to y-axis. This approximation alleviates difficulties in estimating text boxes having a high degree of freedom (DOF): only have to find a skew and four boundary supporting points. To estimate the skew of a given word candidate w_k , build two sets:

$$T_k = \{t\ (c_i)\ |c_i \in w_i\ \}$$

$$B_k = \{b\ (c_i\ )|c_i \in w_i\ \}$$

Where t (ci) and b (c_i) are the top-center point and the bottom center point of a bounding box of ci, respectively illustration of B_k .For every pair in B_k and T_k, the slope of a line connecting the pair is discredited into one of 32 levels in [−π/8, π8], and each pair votes for the skew angle. After voting, the most common angle is considered as a skew. Then, perform geometric normalization by applying an affine mapping that transforms the corresponding region to a rectangle.

BINARIZATION

Given geometrically normalized images, binary images are to be considered. However, performing the binarization separately by estimating text and background colors. It is because (i) the MSER results may miss some character components and/or yield noisy regions (mainly due to the blur) and (ii) have to store the point information of all CC for the MSER based

binarization consider the average color of CC as the text color and consider the average color of an entire block as the background color.Then, obtain a binary value of each pixel by comparing the distances to the estimated text color and the estimated background color.12 norms in RGB space are used.

TEXT/NON-TEXT CLASSIFICATION

Developing a text/non-text classifier that rejects non-text blocks among normalized images. In this classification, do not adopt sophisticated techniques such as cascade structures, since the number of samples to be classified is usually small. However, one challenge in this approach is the variable aspect ratio.

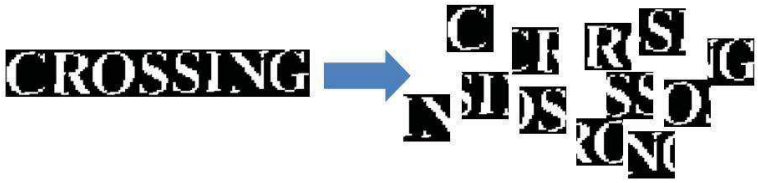


Fig .10 Example for Text/Non-text classification.

One possible approach to this problem is to split the normalized images into patches covering one of the letters and develop a character/non-character classifier. The image shown in Fig.10 is example for Text/Non-text classification. However, character segmentation is not an easy problem. Rather, split a normalized block into overlapping squares and develop a classifier that assigns a textness value to each square block. Finally, decision results for all square blocks are integrated so that the original block is classified.

FEATURE EXTRACTION FROM A SQUARE BLOCK

For the feature extraction, divide a square block into four horizontal and four vertical blocks and extract the features. The image shown in Fig.11 for the feature extraction, by horizontal and vertical blocks.

For a horizontal block Hi (i = 1, 2, 3, 4), consider

1) The number of white pixels,

2) The number of vertical white-black transitions,

3) The number of vertical black-white transitions As features, and features for a vertical block is similarly defined.

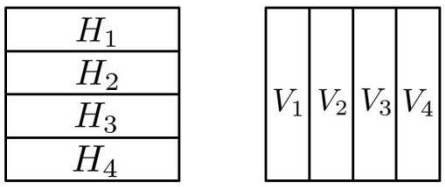


Fig.11 For the feature extraction, by horizontal and vertical blocks.

MULTILAYER PERCEPTRON LEARNING

For the training, normalized images. For this goal, the algorithm is used (i.e., candidate generation and normalization algorithms) to the training images. Shows the multilayer perceptron with two hidden layers. Then manually classified them into text and non-text. Discarded some images showing poor binarization results, and collected 676 text block images and 863 non-text block images. However, it has been found that more negative samples are needed for the reliable rejection of non-text components and collected more negative samples by applying the same procedure to images that do not contain any text 3,568 text images. Multi-layer perceptron is trained for the classification of square patches. One hidden layer is used consisting of 20 nodes and set the output value to +1 for text samples and 0 otherwise. To help the learning, input features are normalized. Finally, text is alone detected by filtering the non text areas.

IMAGE ENHANCEMENT

Feature vectors are extracted to measure useful information from the decomposed sub images. Many feature vectors have been use document image binarization. Most of them were applied to printed documents with clean (white) backgrounds but did not work well for degraded images. Three feature vectors are proposed in this paper, which focus on handwritten document image with messy background and faded writing.

OCR

OCR addresses the problem of reading optically processed characters and has become one of the most successful applications of technology in the field of pattern recognition and artificial intelligence. Most optical character recognition (OCR) systems are designed to transform text images to readable text codes, but perform poorly when text is embedded into complex background because of background interferences and low frequency of occurrence of text.An Adaboost text detection algorithm based on machine learning techniques is proposed. To be precise this method two classifiers are used: one classifier was designed to generate candidates and the other classifier was for the filtering of non-text candidates. MSER method to exploit multi-channel information. Optical character recognition which is used to match the image with the ground truth image. Finally original images are retrieved from the degraded image. In this method yields the state-of-the-art performance both in speed and accuracy.

CONCLUSION

In this paper an Adaboost scene text detection algorithm based on machine learning techniques is proposed. To be precise this method two classifiers are used: one classifier was designed to generate candidates and the other classifier was for the filtering of non-text candidates. MSER method to exploit multi-channel information.Optical character recognition which is used to match the image with the ground truth image. Finally original images are retrieved from the degraded image. In this method yields the state-of-the-art performance both in speed and accuracy. In this method is designed to address the text detection problem in document images, where English alphabets are placed horizontally. This method should be changed in order to detect Asian scripts and texts of arbitrary orientations. The general framework should be extended.

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Performance & analysis of hybrid overlay underlay Cognitive Radio waveform in fading Channel

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ABSTRACT: Spectrum Overcrowding continues to present a fundamental challenge for both military and commercial communications as earlier concerns over spectrum congestion and inefficient usage are manifest with 4G system emergence. Interest in Cognitive radio (CR) remains strong as the communication community strives to solve the spectrum congestion problem. In conventional CR Implementation, interference to primary users is minimized using either overlay or underlay waveforms.The overlay waveform that exploit unused spectrum holes and the underlay waveforms that spread their power spectrum density over an ultra-wide bandwidth. The proposed hybrid overlay underlay waveform that exploits both unused and underused waveform which effectively utilize the spectrum and improve spectrum efficiency.

KEYWORDS: Cognitive Radio Overlay, Orthogonal Frequency Division Muliplexing (OFDM-BPSK).

INTRODUCTION

The term Cognitive is usually associated with human thought process and reasoning abilities. It is defined as a mental processing to analyze given situation utilizing aspects such as, awareness perception, reasoning and judgement.Cognition in Cognitive radio sense is defined as, monitoring and structuring the knowledge of self, other users, and the environment to provide Information services[1,2]. It is also defined as learning from experience to tailor services user requirements, scenarios and environments. Similar to cognitive radios, there does not seem to be commonly accepted definition of cognition cycle. As a reference to cognition cycle in relation to cognitive radios, Mitola version of cognition cycle provides a good example. Mitola's cognition cycle in fig1.5 stems from the OODA loop concept [3-5]. The OODA loop is a concept that originated from the military strategies Col.Jonh Boyd of the United States Air Force. It main outline consists of four overlapping and interacting process: Observe, Orient, Decide and Act. In the cognition cycle of Fig.1, a radio gathers information regarding its operating scenario by observation (OBSERVE).The information is then analyzed (Orient) to determine its importance. Based on this evaluation, a radio sorts through its various options (Plan) and chooses the best option (Decide) suitable for that situation and radio scenario[6-9].. Finally, assuming a waveform change is necessary, the radio adapts, implementing the alternative solution (Act) by adjusting its resources and applying appropriate signaling. There are a number of different cognition cycles in the literature depending on one's need and interpretation of a cognitive radio. A cognition cycle can be as elaborate as the one in Fig1.5or as simple as the shown in Fig 2.

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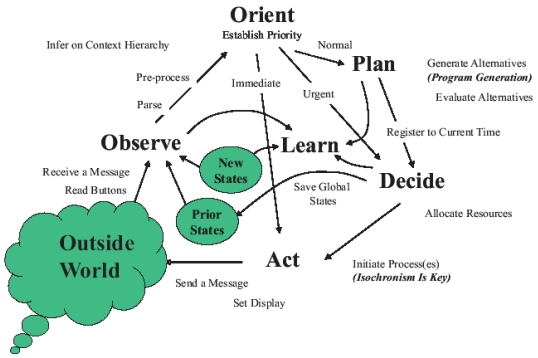

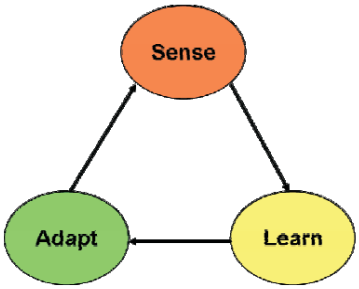

Fig.1: Cognition Cycle as defined by Mitola Fig 2: cognition cycle

PROPOSED SYSTEM

In the hierarchal access model, interactions between primary and secondary users are considered to achieve spectrum efficiency. The basic idea here is to open up the licensed spectrum to secondary users while inducing minimum acceptable interference into the primary users. Spectrum overlay and spectrum underlay are two approaches under consideration to accomplish this. Spectrum overlay allows unlicensed secondary users to utilize unused spectrum simultaneously with primary users on a noninterference basis. This overlay approach was first adapted and subsequently researched under DARPA's Next Generation (XG) program as an "opportunistic spectrum access" approach. Similarly, spectrum underlay allows unlicensed secondary users to simultaneously operate in primary user bands but under strict transmit power constraints. Of all the spectrum access models presented, the hierarchical access model is perhaps the most compatible with current FCC policies and legacy wireless systems. As proposed CR technology fits within the hierarchical access method. Even though the present CR definition only considers overlay approaches, the research trend suggests that a hybrid technique combining overlay/underlay concepts can be employed to maximize spectral efficiency by using both white and gray spectral regions. Therefore, CR can be further categorized as being either overlay-CR or underlay- CR depending on the spectral region being used.

CHANNEL CAPACITY

According to Shannon's channel capacity condition given by channel capacity can be optimized by increasing the signal-to-noise ratio (S/N) and/or channel bandwidth (W).

$$C=W\log(1+S/N) \quad (1)$$

In the current CR framework, the transmitter continuously monitors the radio spectrum and identifies frequency bands as being in one of two categories, either used or unused. The unused frequency bands are identified as CR bands for secondary users as shown in Fig.3. The channel capacity when utilizing unused CR bands can be written :

$$C_{CR} = \left(\sum_{k=1}^{N} W_{u_k} \right) \log \left(1 + \frac{\sum_{k=1}^{N} \Phi_{CR_k} W_{u_k}}{n_0 \sum_{k=1}^{N} W_{u_k}} \right) \quad (2)$$

where N is the total number of unused spectral bands in the total CR monitored bandwidth W, W_{uk} is the bandwidth of the k^{th} unused band and Φ_{CRk} is the power spectral density of the CR transmission in the k^{th} unused band.

UWB signaling can be used as underlay technique to support CR transmission. In UWB signaling, a very large contiguous bandwidth is used in a coexistence manner such that the spectrum is simultaneously shared with primary narrow band transmissions as shown in Fig 4. In this way, the total bandwidth W in (1) is maximized. However, to avoid interferences to primary (licensed) users, UWB transmissions are regulated by the FCC which limits the UWB transmitted power spectral density to a very low level. Hence, the channel capacity of UWB transmission is extremely limited and is given by (2). where n_0 is the additive Gaussian noise power spectral density, Φ_{UWB} is the average power spectral density of the UWB transmission

is the total number of primary users operating within total bandwidth W, Φ_{pi} is the narrow band average power spectral density of the i^{th} primary user and W_{pi} is the corresponding bandwidth of i^{th} primary user.

$$C_{UWB} = W \log \left(1 + \frac{\Phi_{UWB} W}{n_0 W + \sum_{i=1}^{M} \Phi_{p_i} W_{p_i}} \right) \quad (3)$$

The coexistence of an UWB transmission with primary narrow band transmissions Suggests that most of the narrow band transmission can tolerate a certain level of interference, i.e., even though some frequency bands are occupied by primary users they are likely to be underused. To maximize channel capacity, the so called used bands also need to be considered, this concept is illustrated in Fig. 5. Accounting for both unused and underused bands, the new SDCR channel capacity for a given Cognitive Radio transmitter can be written as,

$$C_{SDCR} = W \log \left(1 + \frac{\sum_{k=1}^{N} \Phi_{CR1_k} W_{u_k} + \sum_{i=1}^{M} \Phi_{CR2_i} W_{p_i}}{n_0 W + \sum_{i=1}^{M} \Phi_{p_i} W_{p_i}} \right) \quad (4)$$

Where Φ_{CR1k} is the CR transmitted power spectral density in the k^{th} unused band, and Φ is the CR transmitted power spectral density in the i^{th} underused band. Fig.6 illustrates a conceptual view of the unused and underused spectrum utilization using an arbitrary interference threshold (IT). IT is assumed to be a limit set forth by the primary users based on the measured power spectrum density in a given bandwidth.Two cases of under-utilized spectrum are demonstrated: 1) when the spectral assignments based on a binary decision the bands adjacent to the primary users are unavailable to overlay CR users and 2) primary users bands which are below the IT are also unavailable to the CR users. A soft decision CR (SDCR) will be able to exploit these underused frequency bands to increase channel capacity and improve performance. To support the envisioned SDCR system, the original SMSE framework is extended to account for both unused and underused frequency bands.

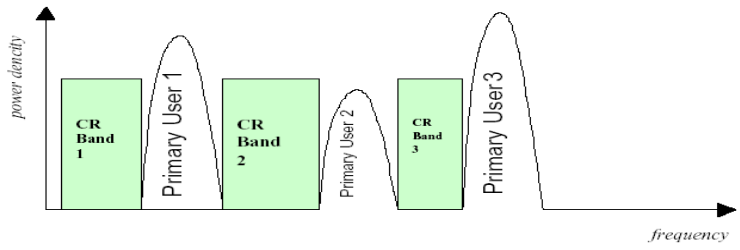

Fig 3 Illustration of Cognitive Radio Overlay Concept

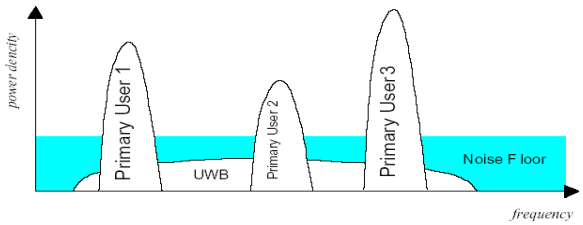

Fig 4 Illustration of Cognitive Radio Underlay Concept

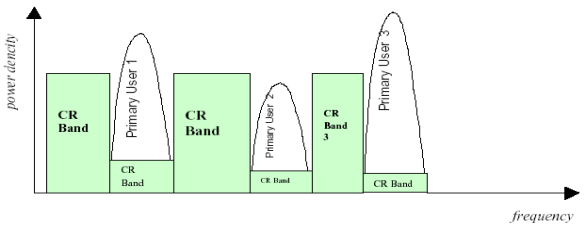

Fig 5 Illustration of Cognitive Radio Hybrid Overlay/Underlay Concept

INTERFERENCE THRESHOLD

Spectrum sensing techniques are helpful in detection of spectrum holes and identification of other primary and secondary users. In order to know if a certain portion of the spectrum is unused or underused, the power spectrum density (PSD) in a given bandwidth needs to be compared to a predetermined threshold called interference threshold. This interference threshold can be set forth by primary users or in conjunction with primary and secondary users.The concept of noise floor provides a means for evaluating the background noise in Over-utilized portions of the spectrum. Secondary user (SU) usage of the spectrum will raise the noise floor of the primary user (PU). To quantify this interference phenomenon, FCC spectrum policy task force has recommended interference temperature (IT) as a new performance metric. In May 2007 FCC issued another notice stating that it has terminated the IT concept. Even though, there are few supporters for adopting the IT approach to measure or set a threshold, there appears to be no clear cut method or rules to implement IT. The community in general (technical as well as user) argued that the IT approach is not practical and would only result in increased interference in its operating ranges. Even though FCC has temporarily abandoned the interference temperature concept, research community in general still considering IT as a viable metric, since IT is basically a measure of PSD in a receiver.

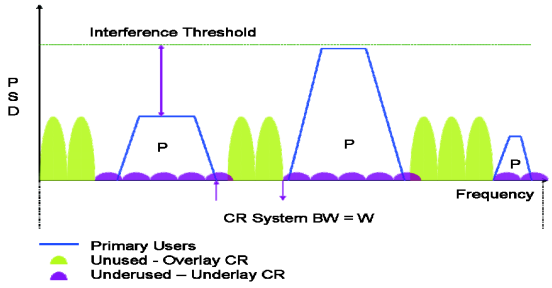

Fig 6: Identification of primary users, unused and underused spectral regions

SIMULATION RESULTS AND DISCUSSION

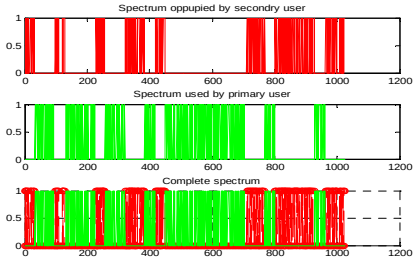

Fig 7 Cognitive Radio Spectrum Access

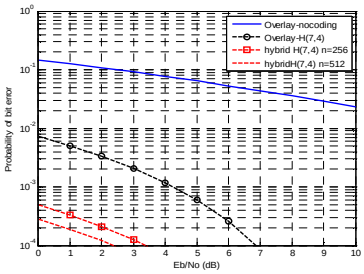

Fig8 Performance of Hybrid overlay/underlay waveform using Hamming codes in Frequency selective Fading channel

To maximize both spectrum efficiency and channel capacity, we have to take advantage of both unused and underused portion of the spectrum. In this section we demonstrate performance enhancement utilizing both unused and *underused* spectrum using a hybrid underlay/overlay waveform. The block diagram representation illustrates the conceptual view of the hybrid overlay/underlay approach. Systematic block channel coding is introduced to demonstrate the performance improvement gained by combining overlay and underlay techniques. Two popular block codes, namely a (7, 4) Hamming code with t = 1 error correction capability and a (15,5) BCH code with t = 3 error correction capability were chosen for demonstration purposes. In general, channel coding improves performance by adding redundant or parity bits. For a given communication system this translates into increased transmission bandwidth or a decrease in effective data rate. For example, a fixed bandwidth overlay system experiences a reduction in effective date rate where k and n represent the number of output encoded and input information bits, respectively.

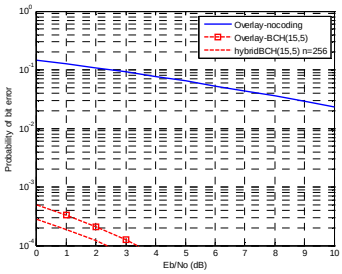

Fig 9 Performance of Hybrid overlay/underlay waveform using BCH codes in Frequency selective Fading channel

However, in the proposed hybrid overlay/underlay system, the information bits are transmitted using an overlay waveform (over unused frequency bands) while the redundant bits are transmitted using an underlay waveform (over underused frequency bands). Thus, both unused and underused frequency bands are exploited. When compared with a pure overlay system, the hybrid overlay/underlay system achieves channel coding gain without sacrificing data rate. More importantly, the hybrid overlay/underlay system possesses an increased degree of flexibility in receiver design: if preferred, no channel decoding has to be implemented and the receiver could simply demodulate the data from the overlay transmission; on the other hand, with channel decoding implemented the overlay/underlay receiver can significantly improve performance. Figure 8 shows the simulation results of overlay and overlay/underlay concept using hamming .The top solid line represents the OFDM-BPSK overlay system without channel coding. The bottom two dashed lines represents OFDM-BPSK overlay systems using H(7,4) channel coding respectively. The dashed lines represent the overlay/underlay combinations. The underlay waveform spread length was a t= 512. Figure 9 shows the simulation results of overlay and overlay/underlay concept using BCH codes illustrated in. The top solid line represents the OFDM-BPSK overlay system without channel coding. The bottom two dashed lines represent OFDM-BPSK overlay systems using BCH (7, 4) channel coding respectively. The dashed lines represent the overlay/underlay combinations. . It is evident from results in the figure that applying channel coding improves performance significantly but at the cost of reduced effective data rate. Performance of the proposed overlay/underlay system approaches that of the channel coded overlay system without experiencing the reduced data rate.

CONCLUSION

To maximize spectrum efficiency and channel capacity both *unused* (white) and *underused* (gray) spectral regions need to be exploited. Using a previously developed SMSE framework based on hard decision spectrum usage, The proposed extended soft decision SMSE framework (SD-SMSE) to support soft decision CR applications. The SD-SMSE CR implementation is

capable of dynamically generating spectrally efficient overlay, underlay and hybrid overlay/underlay waveforms. Performance is evaluated here for Hybrid overlay/underlay and overlay without coding and with coding. Channel coding increases performance at the cost of decreasing data rate whereas the hybrid overlay/underlay achieves channel coding gain without loss of data rate.

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IR SENSOR BASED WHEELCHAIR SYSTEM USING RASPBERRY PI FOR CHARCOT-MARIE-TOOTH

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ABSTRACT: The work depends on the development of a wheelchair that can be a fully automatic navigation system. It provides flexible operation to choose different modalities to command the wheel chair, this method is very useful to a people who can affected for charcot-marie-tooth disease. Patients can command the wheelchair based on their eye blinks, eye movement. The wheelchair can operate like an auto-guided vehicle, following IR sensor way. The digital commends from the IR sensor is moved to raspberry pi. It provides commands to be sent to the wheelchair. Several experiments are used in this technique to introduce an effective wheelchair for disabled persons.

KEYWORDS: IR sensor, Raspberry pi 2 model B+, Temperature sensor, Heart beat sensor, Ultrasonic sensor and Robotic wheelchair.

INTRODUCTION

One of the difficulties found by people with disabilities is related only on assistance. They people must need wheelchair .the patient their intact manipulation ability, to use a joystick. The system fully depends on the eye blink electric wheelchair. . As per requirement of the disabilities systems are available in market such as voice control or joystick control system. Sometime totally affected paralysis person like (charcot-marie-tooth) may be have very difficult to use that type of systems. . Here the Eye blink control system provide the independence to make their life easy and more convenient. However, many people with disabilities and who people can affect from a charcot-marrie-tooth disease do not have this manipulation ability so they must need a wheelchair. Automatic wheelchair systems can implement advices that allow them to move a patients from one place to another place. The head movement based system has much limitation so when the user can not able to access the system physically. When the voice recognition system is working properly move towards left, right, and stop, but noisy environment distracts the system command, system cannot respond properly.Smart wheelchairs studies since beginning of 1980s, with several developments in different countries, with wheelchair being commanded by eye blinks, eye movement position. IR sensor used to capture the blink position, so the system used save the huge amount of energy or external man power. .when the blink exceeds a threshold value the particular digital signal passes through a raspberry pi system. Stop the position of wheelchair using ultrasonic sensor for a particular range between obstacle and wheelchair must be stop. Used blink position on a panel on board to choose among different high level movement commands such as forward, left, right and stop an eye tracking interface.Appropriate image processing technique open CV open computer vision) library used for eye blink detection. To sense obstacles and have a LINE following algorithm for motor driving through doors and between the rooms.IR sensor sensing the eye blink position and captured the image in real time and analysis the image as input to set the commands to interface the motor driver IC passed through sending the commands to GPIO pins .In this Raspberry pi board is used to perform the control of the complete system operation.

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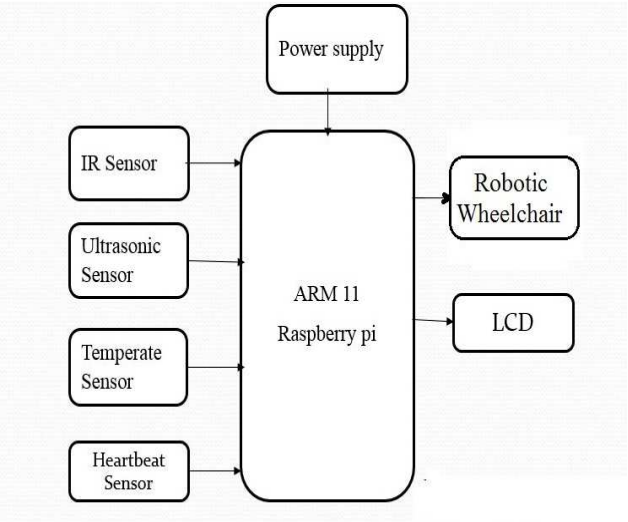

Figure 1) Block Diagram Of Eye Controlled Wheelchair Using Raspberry pi

The motor driver is used to perform the different moving operation. And several application and line following algorithms are used to find out accurate blink location detection and tracking of that. The Raspberry pi acquired the data should analyse it and performing their operation. Raspberry pi send the signal to motorfor driving circuit based on the position of the eye blink. This will decide to perform operation on motor like run the motor in forward, left, right and stop position. If sensor gets the obstacle very close to the wheelchair, it will send the command to the raspberry pi and raspberry pi sends the signal to motor driving circuit to stop the motor.

SYSTEM DESIGN MODEL

This system is based on the eye blinking IR Sensor, and all the module will work independent to each other. For the basic requirements of the any electronic system is Power supply. In this system there is mandatory to gives the proper power supply to individual components and the standard power supply should be used for Raspberry pi, IR sensor, ultrasonic sensor, temperature sensor, heartbeat sensor motors. The Figure 2 Represent the Overall Functionality Of the Novel Implemented System. The Raspberry pi board is the brain of the robot. In this proposed system model the module like ultrasonic sensor, heartbeat sensor, temperature sensor, IR sensor, dc motor, power circuit and the power supply. Then, the power supply is directly connected through the Raspberry pi board. In this system the Raspberry pi ARM11 processor is playing a main role of hardware part. A real time data acquisition and analyzing the signal Raspberry pi 2 model B board is very efficiently process the multiple image frames by frame. For capturing the eye blinking of the patient to normal IR Sensor PASCO CI-6628 is used in our system. By using this IR sensor will make the system cost effective and to reduce the processing time.

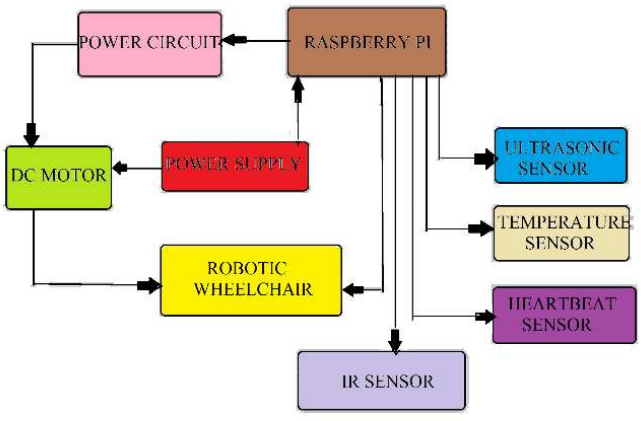

FIGURE 2) PROPOSED SYSTEM DESIGN MODEL

The Raspberry pi 2 model B gives the commands to the motor driver circuit, which is enable the GPIO pins to perform operation. Such as move forward, left and right operation performed based on the eye blinking according to the threshold value. Sensors are also mounted on the head of the robotic wheelchair for detecting the obstacles, controlling the wheelchair, measuring the temperature, heartbeats of the patient. Ultrasonic sensor is used for detecting the obstacle or any object is moving in front of the robotic wheelchair. The ultrasonic sensor (HC-SR04) is directly connected to the Raspberry pi board, it acquired the data and measure the distance between wheelchair and obstacle. This system comes under the real time data acquisition, data processing and control system. The temperature sensor (LM35) is mounted on the raspberry pi board, which is used to measure the temperature of the patient body. Green rubber Heartbeat sensor is also mounted on the raspberry pi 2 model B, in which it is used to measure the pulse rate of the patient who are affected by CHARCOT-MARIE-TOOTH. For using Raspberry pi board, they have its own operating system (OS) is known as “Raspbian”, which is Linux based operation system and also compatible with raspberry pi board. To detect the exact eye blinking according to the threshold value is very challenging. A new technique used for eye blink Detection and Controlling, which works based on the open computer vision (Open CV) library tool. Most ofcoding part done with the help of Open CV library, which is especially used in the raspberry pi board. To connect the raspberry pi board to desktop Putty software is used. Python language or embedded C is used for codding, which is user friendly and helpful to resolve the error efficiently. The Open CV (version 3.0.0) library with python is used in this system.

METHODOLOGY

The principle of this system is eye detection based on raspberry pi technology. A new algorithm introduced for detecting the eye by Image processing. In this technique used to find out the blinking of eye. During initial stage the system acquired the captured eye blinks by IR sensor. The figure 3 represents the complete methodology of proposed implementation.

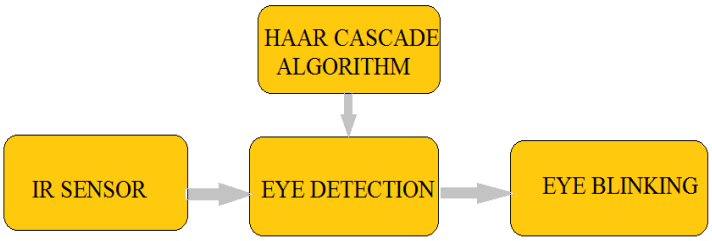

FIGURE 3 SYSTEM PROCESS DESIGN

Here, it will give the information of the system working. First, IR sensor is used to sense the eye blinks according to threshold value the robotic wheelchair will move towards the specific direction. For the eye detection Haar cascade algorithm is used. Then, according to the eye blinking, for a different threshold value direction will be vary. A minimum one blinking of eye the robotic wheelchair will move forward, for two blinking of eye it will move towards left side, for three blinking of eye it will move towards right side and if there any obstacle is present in front of the wheelchair the ultrasonic sensor is used to stop it robotic wheelchair movement. Once the power supply is switched on, the system will start working, and according to the command values system will work successfully.

IMPLEMENTATION AND SYSTEM DESIGN

The system implementation is working based on the real time data acquisition Operating System. The low power consumption Raspberry pi 2 model B advance board computer is used. Which provide well enough in/out pins, USB port, PWM, HDMI, UART and Ethernet adaptor port for connecting internet system devices via wired and wireless connection. Also, the Raspberry pi have a 512 MB of RAM. It will have up to 32 GB external memory and controlled based on ARM11 processor architecture. ARM11 processor is the CPU (Central Processing Unit) in the Raspberry pi board in which it has 700 MHz ARM1176JZF-S core.The IR sensor is mounted in front of user Eye. The IR sensor is mounted in front of the user Eye, IR sensor is interfaced to the control unit on the disabled person for sensing the IR signals transmitted by the eye blink.This data is conveyed to the control unit which moves the wheelchair as desired, either left, right or forward. In addition to this, for safety purpose ultrasonic sensor is mounted in front of wheelchair to detect the obstacles and automatically stop the

wheelchair movement.For controlling the dc motors driving IC, 12 Volt battery for power supply of motors is used.The motor driving circuit is connected with the Raspberry pi 2 model B, which is operates the entire system.

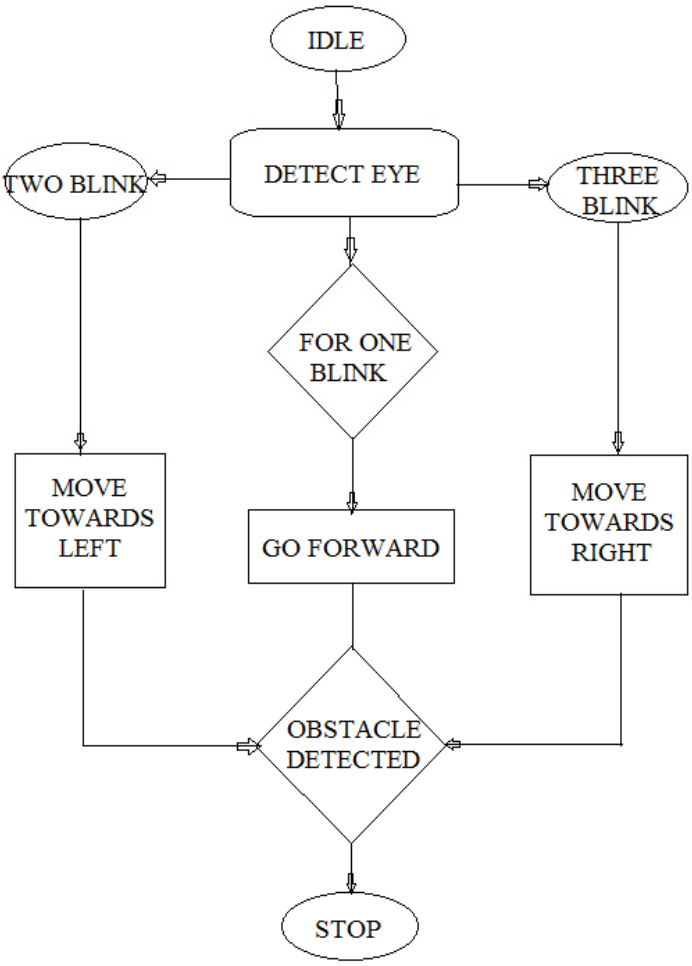

FIGURE 4) FLOW CHART OF WORKING SYSTEM

This systemgenerates the command signal to enable the GPIO pins and perform the Forward, Left, Right and Stop Operation.

RASPBERRY PI OS INSTALLATION

A very basic step is followed to install its own operating system in micro SD card (memory card). To boots a raspbian file win32 diskimager software used. While putting a bootable memory device on Raspberry pi 2 model B board, then it can access the Raspbian operating system directly without rebooting.

SYSTEM ALGORITHM

In this system open computer vision (Open CV) free access library algorithm used for image processing. The Open CV library plays a very important role. A novel algorithm used for system execution and perform the operation.

EYE DETECTION

For the eye detection the Open CV library can be used.

A very first Haar Cascade algorithm is used for both Face and Eye detection individually.

RESULT

The system acquired the resulted data of wheelchair movement according to the eye blinking by using the IR sensor based on the threshold value signal send to the motor driving circuit. There the system used temperature sensor, heartbeat sensor and ultrasonic sensor. The temperature sensor is used to measure the temperature of the patient body. The heartbeat sensor for pulse rate measurement, and successfully measured the heartbeat of the patient body.

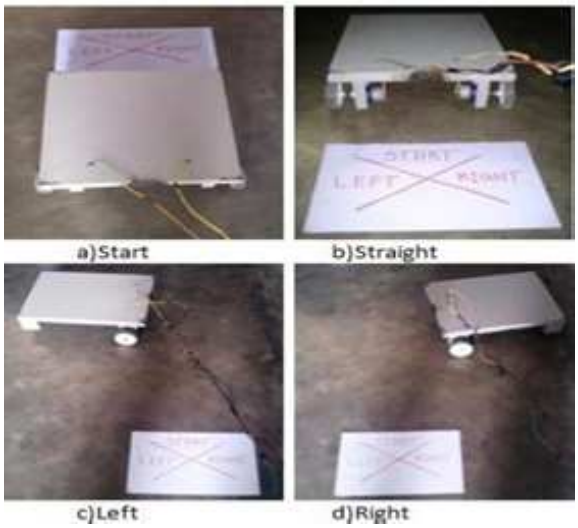

FIGURE 5) WHEELCHAIR PROTOTYPE MODEL

The ultrasonic sensor for obstacle detection. And successfully measure the distance between the wheelchair and obstacle. When the object is detected in front of wheelchair and cross the minimum distance threshold value, emergency brakes will be applied to stop the wheelchair movement.

CONCLUSION

This concept of eye blink controlled wheelchair movement is not only Shows the alternative resources but more important to help physically disabled persons to make independent accessible life without any assistance need. The main aim of implementing an IR sensor based eye controlled wheelchair movement is to highlight the features of digital Image processing in the embedded systems. There are some real time design constant measured like a system takes some time of seconds for eye blink to execute the system for processing the wheelchair eye movement in Real time Environment. Therefore this system performs the Wheelchair eye movement operation with some delay time of blink movement. It's very hard to track the Eye blink in dark light places, so this system works on an environmental light and in a room light with fluorescent mercury vapour lamps, which is low in infrared.

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Certain Investigations of an energy Efficient Predictive Technique Using OTSN

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ABSTRACT: The prediction based tracking technique using sequential patterns (PTSPs) designed to achieve significant reductions in the energy dissipated by the Object Tracking Sensor Network (OTSN) while maintaining acceptable missing rate levels. PTSP is tested against basic tracking techniques to determine the appropriateness of PTSP under various circumstances. The PTSP outperforms all the other basic tracking techniques and exhibits significant amounts of savings in terms of the entire network's energy consumption total energy consumed. And it can be enhanced by using Voronoi techniques. Including the active and sleep mode energy consumption for each sensor node in the network, and missing rate which represents a ratio of the missing reports to the total number of reports received by the application.

KEYWORDS: prediction based tracking technique using sequential patterns (PTSPs), Object Tracking Sensor Network (OTSN), Wireless Sensor Networks (WSN), Group Probability Suffix Tree (GPSTs), Data Aggregation Algorithm (GDAR).

INTRODUCTION

Wireless Sensor Networks (WSN) is a trend of the past few years, and they involved employing a large number of small nodes. The nodes then sense environmental changes and report them to other nodes over flexible network architecture. Sensor nodes are great for deployment in hostile environments or over large geographical areas. It consists of spatially distributed autonomous sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance. They are now used in many industrial and civilian application areas, including industrial process monitoring and control, machine health monitoring, environment and habitat monitoring, healthcare applications, home automation, and traffic control. In addition to one or more sensors [1,2].

Each node in a sensor network is typically equipped with a radio transceiver or other wireless communications device, a small microcontroller, and an energy source, usually a battery. A sensor node might vary in size from that of a shoebox down to the size of a grain of dust although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor node is similarly variable, ranging from hundreds of dollars to a few pennies, depending on the size of the sensor network and the complexity required of individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and bandwidth. To minimize the transmit power efficiently subject to transceiver. The basic goals of a WSN are used to determine the value of physical variables at a given location, Classify a detected object. The important requirements of a WSN are use of a large number of sensors, Attachment of stationary sensors, Low energy consumption, Self organization capability, Collaborative signal processing. Object tracking is considered as one of the killer applications for sensor networks. There are a lot of research issues in design and implementation of the object tracking sensor networks (OTSNs), including data fusion, aggregation, routing, and energy conservation, etc. Among those, energy conservation is one of the most critical one. Like other sensor networks, the OTSN is driven by scarce energy resource. Therefore, energy saving is the major issue addressed. In the following, it provide some background of the OTSNs, describe the assumptions the factors at contribute to energy consumption and design complexity of the OTSNs [3,4].

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In an OTSN, a number of sensor nodes are deployed over an area, called monitored region. The approximate geographical boundaries of the monitored region are known to the applications that retrieve the information of interests (such as location, speed, direction, size, and shape) of a tracked moving object. Base station or gateway acts as the interface between the OTSN and applications by issuing the command to the network and collecting the information of interests from the distributed sensor nodes. The sensor nodes are static and that a base station has good knowledge of the network topology (in terms of the location of each sensor node) during the operating period. The sensor nodes are enabled for computation, sensing and communication by the Micro-Controller Unit (MCU), sensor components and the RF radio component respectively. To facilitate the energy conservation, most of today's sensor nodes allow these three basic components to be inactivated separately when they are not needed. These sensor nodes have the responsibility for tracking any moving object which intrudes the monitored region, and reporting the properties of the moving objects to the applications in a specified frequency. Deciding the location, speed, and direction of a moving object needs several sensor nodes to work together, which may require hierarchical technologies and overlapping levels of sensing (this is called sensor fusion).

LITERATURE SURVEY

An untapped opportunity in the realm of wireless data lies in low data-rate (< 10 Kbits/sec) low-cost wireless transceivers, assembled into distributed networks of sensor and actuator nodes. This enables applications such as smart buildings and highways, environment monitoring, user interfaces, entertainment, factory automation, and robotics[5]. While the aggregate system processes large amounts of data, individual nodes participate in a small fraction only (typical data rates <1 Kbit/sec). These ubiquitous networks require that the individual nodes are tiny, easily integral into the environment, and have negligible cost. Partitioning the link by introducing repeater nodes results in a linearization of the energy as a function of distance. The high sensor network density ensures sufficient repeater nodes for message relay. Thus, the average wireless hop length is below 10 m, (mixers and oscillators) increase receive power (from 0.7 mW at 170 MHz to >100 mW at 2.4 GHz for existing low-data rate radios). In monitoring sensor networks, data coming from various streams of the sensor nodes have to be examined dynamically and combined into normal patterns in order to detect potential anomalies. These issues and considered mechanisms to achieve a higher level of security and reliability in these networks. In order to support data aggregation through efficient network organization, nodes can be partitioned into a number of small groups called clusters. Each cluster has a coordinator, referred to as a Cluster Head, and a number of member nodes. Clustering results in a two-tier hierarchy in which cluster heads (CHs) form the higher tier while member nodes form the lower tier. The member nodes report their data to the respective CHs. The CHs aggregate the data and send them to the central base through other CHs. Because CHs often transmit data over longer distances, they lose more energy compared to member nodes[6,7].

The network may be re clustered periodically in order to select energy-abundant nodes to serve as CHs, thus distributing the load uniformly on all the nodes. Besides achieving energy efficiency, clustering reduces channel contention and packet collisions, resulting in better network throughput under high load. Clustering has been shown to improve network lifetime, a primary metric for evaluating the performance of a sensor network. Although there is no unified definition of "network lifetime," as this concept depends on the objective of an application, common definitions include the time until the first/last node in the network depletes its energy and the time until a node is disconnected from the base station. In studies where clustering techniques were primarily proposed for energy efficiency purposes, the network lifetime was significantly prolonged. The security issues and some method of identifying faulty nodes are Energy Efficiency, Network Life Time, Data Accuracy ,Statistical en-route Filtering, Abnormal relationships test, Distributed deviation detection[8,9].

PROPOSED SYSTEM

DATA FLOW DIAGRAM

Wireless Sensor Network has some important requirements in use of a large number of sensors, Attachment of stationary sensors, Low energy consumption, Self organization capability, Collaborative signals processing. A sensor network is a network of many tiny disposable low power devices, called nodes, which are spatially distributed in order to perform an application-oriented global task. These nodes form network by communicating with each other either directly or through other nodes. One or more nodes among them will serve as sink(s) that are capable of communicating with the user either directly or through the existing wired networks. The primary component of the network is the sensor, essential for monitoring real world physical conditions such as sound, temperature, humidity, intensity, vibration, pressure, motion, pollutants etc. at different locations. The tiny sensor nodes, which consist of sensing, on board processor for data processing, and communicating components, leverage the idea of sensor networks based on collaborative effort of a large number of nodes. In the sequential pattern generation stage, the prediction model is built based on a huge log of data collected from

the sensor network and aggregated at the sink in a database. Producing the inherited behavioral patterns of object movement in the monitored area.

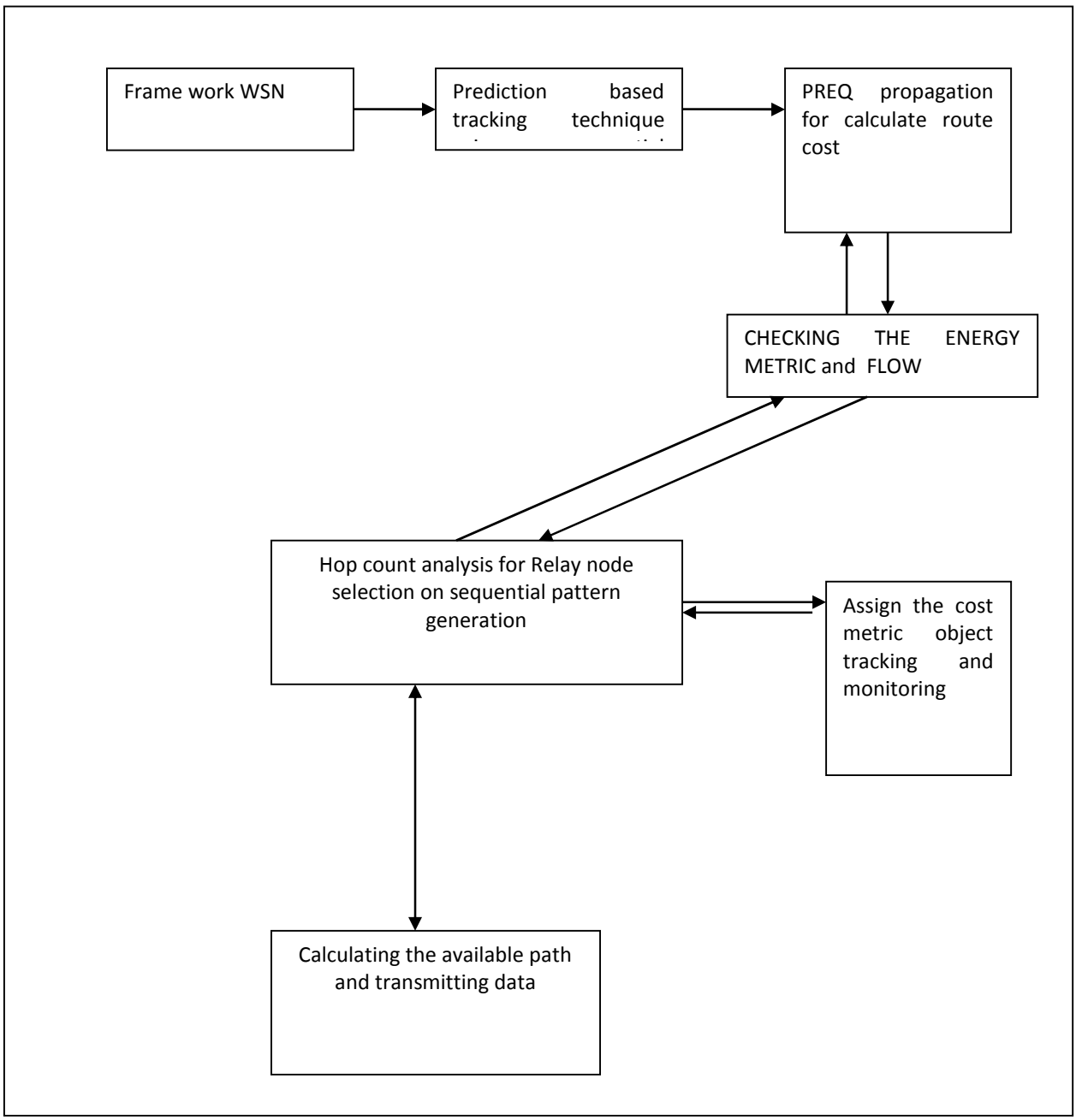

Fig :1 Frame work of WSN

HIERARCHICALLY PREDICTION-BASED QUERY ALGORITHM

After the groups and their best at Group Probability Suffix Tree (GPSTs) are produced. The information is sent to the CHs such that a group query and group update can be achieved efficiently. For the query-based OTSN, while receiving a query, the sink firsts predicts the most possible cluster that the object is currently located by using GPST and then sends the query to the CH. While the CH receives the query, it performs another prediction to get the most possible sensor that can detect the object. After receiving the query, the sensor invites its neighbors within Group Data Aggregation Algorithm (GDAR) to participate in tracking the object.

GROUP DATA AGGREGATION ALGORITHM

The update-based OTSN, while an object is detected by a sensor, a group data aggregation process is initiated. The sensor performs as the master sensor that invites its neighbors within GDAR to collaborate in tracking objects and handles the local data collection for a period. In order to transmit sensor data with the minimum electric energy, after that, the master sensor reports to the CH about the detected objects and the id of the sensor that detects most objects. Finally, the CH further compresses total data amount by using group id and filters redundant data according to the speciess precision

ACOUSTIC TARGET TRACKING ALGORITHM

In this paper, it devise and evaluate a fully decentralized, light-weight, dynamic clustering algorithm for single target tracking. This focus on acoustic target tracking, although the proposed approaches can be readily applied to other types of tracking applications. Sensors in the acoustic tracking systems perform two types of computation. Sensing the energy level of signals, .Analyzing and classifying the sound and performing the data fusion. The algorithms will be implemented in a centralized and distributed way, which is a novel and significant achievement. It can save a lot of energy and reduce the communication load of the supporting sensor networking systems; it will increase its robustness to failure and respectively the reliability of the tracking module. The innovative elements of this proposal rely on the powerful methodology and the focus on very important problems that have been in the scope of interest of scientists and engineers. Problems such as group object tracking and distributed particle filtering represent substantial research challenges which makes this research unique. Different techniques will be developed in this paper outperforming the previously existing techniques in the literature, which will be suitable for on-line implementations. The main interest will be focused on innovative Bayesian techniques, such as sequential Monte Carlo methods (also called particle filters), Monte Carlo Markov chains and Unscented Kalman filtering and its derivatives are used to solve the signal tracking algorithm. The Monte Carlo approach is generic, scalable, and flexible and has opportunities for parallelization and distributed implementation. Monte Carlo methods afford natural incorporation of constraints which is difficult or impossible with standard filtering techniques of moving objects as expected since the missing rate is the ratio of the missing reports to the total number of reports. Therefore, this ratio is not affected by the increase in the number of objects.

CONTINOUS MONITORING ALGORITHM

Even though it is likely that the number of missing reports will increase, this number will be matched with an increase in the number of total reports. Thus, the ratio remains unchanged. Another experiment has also been conducted to evaluate how the changes in the speed of a moving object could affect the energy consumed by a tracking technique. The prediction model is to predict the next location of an object and to activate the appropriate sensor. Additionally, since the CM is better than the SM, when there is a low number of an object in the network, we will only use the CM for the purposes of comparison against PTSP. This results from the fact that, when the object moves with a faster speed, the prediction for the destination sensor will be harder; thus, a greater recovery process is required and, eventually, an increase in the overall energy consumption of the network. We noticed that PTSP was outperforming CM when the object speed was below 30 m/s. This is considered an excellent performance when compared with the speed of the object; tracking an object moving at a speed of 25 m/s, for example, is not an easy task, if energy saving is also a factor of the tracking technique. The energy consumption of the CM is not affected by the object's speed, as it will be always able to locate the object. It is apparent that, in the context of the missing rate levels, PTSP has kept an acceptable level of missing rate, although it did increase along with the increases in the object speed. In this paper, It have evaluated the three previously explained recovery mechanisms (source recovery, destination recovery, and all neighbors recovery) in terms of energy consumption, the source recovery mechanism is the best in terms of energy consumption, which is based on activating the neighboring sensor nodes of the current sensor.

RECOVERY MECHANISM

The next best recovery mechanism is the all neighbor recovery mechanism, which combines the source and destination recovery mechanisms by activating all the neighboring sensor nodes of both the current sensor and the destination sensor. As for the worst recovery mechanism in terms of energy consumption, it was the destination recovery mechanism. This recovery mechanism became the worst because it required the network to go through the second phase of recovery more often than the other recovery mechanisms. The second phase of recovery involves activating all the sensor nodes in the network; it incurs more energy consumption in comparison with the first phase of recovery. Therefore, we have chosen the

first recovery mechanism (source recovery) as our recovery mechanism of choice in all the previous experiments since it was the most energy-conservative recovery mechanism.

ALGORITHM USED IN OTSN

CLUSTER HEAD

While a sensor detects an object, it invokes a group data aggregation and then informs a list of detected objects and a sensor id to the CH. CHs therefore collect objects' moving sequences within its cluster. In this section, we first present the group moving pattern mining algorithm and then propose an efficient object tracking sensor network. The group moving pattern mining algorithm has four steps: building PST for each object, constructing a similarity graph on PSTs, extracting highly-connected components, and selecting Group Probability Suffix Tree (GPST). After the mining is performed, CH sends the group information to upper layer and gets a group id in return. The group information, group id and GPST are used in the hierarchically prediction-based query and group data aggregation. Building PSTs for All Objects the movement data set in the CH is a set of moving sequences collected within this cluster.

In the step, the CH builds a PST for each object. We propose, with the use of Voronoi technique, a probabilistic leader volunteering procedure, and a sensor replying method. Initially, we enable all the sensors to calibrate their relative positions to their neighbors (at the CH <-> CH level and the sensor <-> sensor level) at the time of network deployment. The Cluster Head Selection is based on the following aspects:

1. Initial Energy: This is an important parameter to select the CH. When any algorithm starts it generally considers the initial energy.

2. Residual Energy: After some of the rounds are completed, the cluster head selection should be based on the energy remaining in the sensors.

VORONOI TECHNIQUES

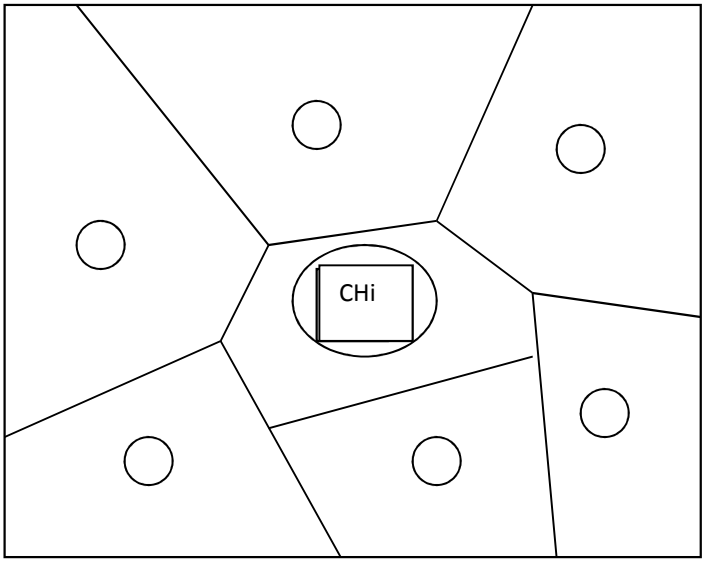

Fig 2 Voronoi diagram of CHi

Then, with the use of Voronoi diagram, each CH (or sensor) can calculate and tabulate the probability that given a distance estimate between a target and itself, the CH (sensor) is closest to the target. This information is used to set up the back-off timer used by a CH to announce its willingness to be active in the leader volunteering process. If no other CHs volunteer before the timer expires, the CH becomes active. Dynamic clustering mechanism for object tracking in wireless sensor networks. With forming the cluster dynamically according to the route of moving, the proposed method can not only

decrease the missing-rate but can also decrease the energy consumption .By reducing the number of nodes that participate in tracking and minimizing the communication cost, thus can enhance the lifetime of the whole sensor networks shown in fig 2.

ENERGY EFFICIENT CLUSTERING MECHANISM

In cluster re-forming procedure, after a new cluster head is successfully elected, a new cluster will be formed around it. The new cluster head is selected by the former cluster head through broadcasting a confirming packet. The sensor nodes of the old cluster which receive the confirming packet will first check out whether they are the neighbor nodes of the new cluster head, if so, they would go into listening mode and wait for getting new scheduling information from the new cluster head and if not they would go to sleeping mode immediately. After receiving the confirming packet from the former cluster head, the new cluster head will wait for a short random time, and when its timer expires it will broadcast a re-clustering command pack et which contains the new scheduling information to the neighboring sensors and then go into listening mode.

EXPERMENTAL RESULTS

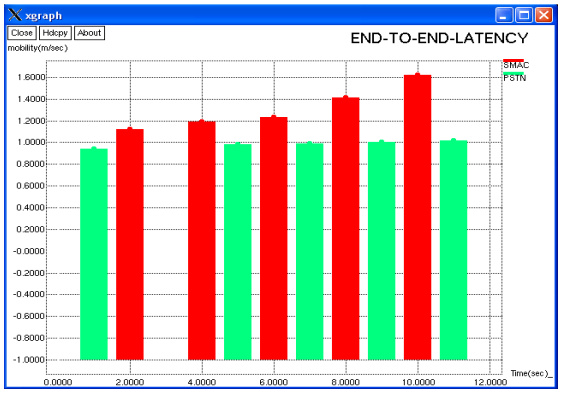

Fig3. END –TO-END LATENCY

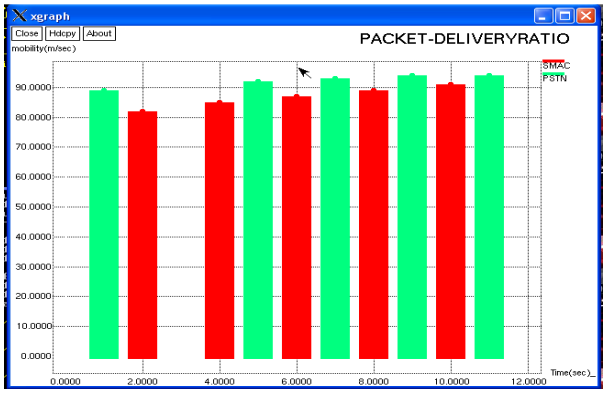

Fig 4. PACKET –DELIVERY RATIO

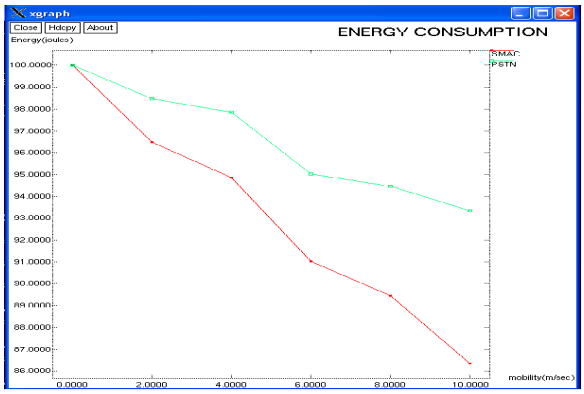

Fig 5. ENERGY CONSUMPTION

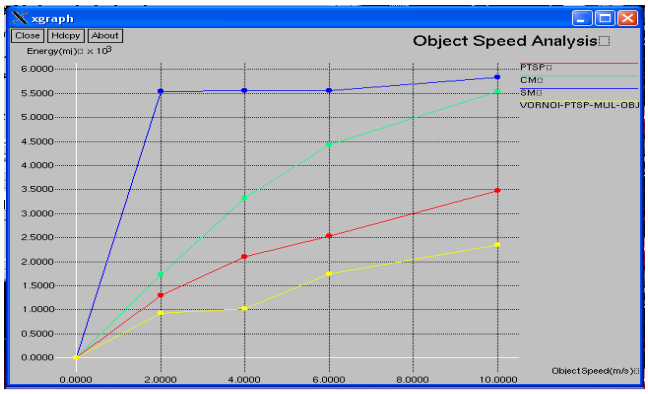

Fig 6. OBJECT SPEED ANALYSIS

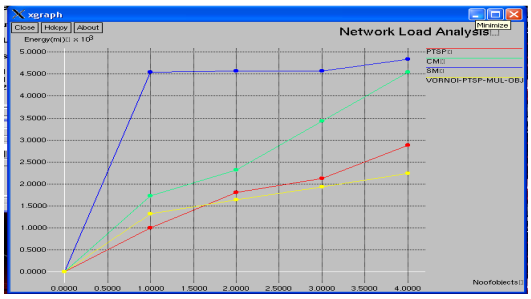

Fig 7.NETWORK LOAD ANALYSIS

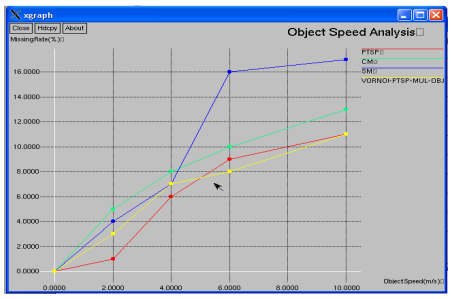

Fig 8. OBJECT SPEED ANALYSIS

There are five basic parameters to be analyzed. They are:

1. End to End Delay.2.Packet Delivery Ratio 3.Energy Consumption 4.Network Load Analysis 5.Object Speed Analysis

END TO END DELAY

This analysis is taken between PSTN technique and SMAC .In this prediction technique is used to define future state energy. End-End delay refers to the time taken for a packet to be transmitted across a network from source to destination. In the above graph, as the time increases mobility of SMAC increases and the PSTN rate remains constant shown in fig 3.

Delay = Inter arrival between 1st and 2nd Packet /Total data packets delivered time

X axis ⟶ Time (sec)

Y axis ⟶ Mobility (m/sec)

PACKET DELIVERY RATIO

Packet delivery ratio is the ratio between number of received packets received to the number of packets sent multiplied by hundred. This is a comparative analysis between SMAC and PSTN, as the time increases PSTN mobility gets increased. The greater value of packet delivery ratio means the better performance of the protocol is shown in fig 4.Finally Cetain analysis of packets sent and receives shown in fig 6,7,8.

Packet deliver ratio = (Number of packets received / Number of packets sent) ×100

X axis ⟶ Time in sec

Y axis ⟶ Mobility (m/sec)

ENERGY CONSUMPTION

Energy consumption is defined as the ratio of energy expanded in each node on ideal state, sleep state, transmitting and receiving state (i.e.) energy consumed in each state to the total average energy consumed is shown in fig 5.

Energy Consumption = (Energy consumed in each node based on ideal sleep transmit and Receive)/(Total average energy consumed)

Transmission Range = Throughput is varied with respect to the receiving signal strength

X axis ⟶ Mobility (m/sec)

Y axis ⟶ Energy (Joules)

CONCLUSION

In this paper we have proposed Voronoi PTSP algorithm, Recovery mechanism is the all neighbor recovery mechanism, which combines the source and destination recovery mechanisms by activating all the neighboring sensor nodes of both the current sensor and the destination sensor .Energy consumption will be more and it will reduces missing rate. Object tracking

is considered one of the most demanding applications in WSNs due to its application requirements, which place a heavy burden on the network resources, particularly energy consumption.

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LTE Femtocell Simulation of Different Modulation Technique under Different Multipath Fading

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ABSTRACT: The vision of Self-Organizing Networks (SON) has been drawing considerable attention as a major axis for the development of future networks. As an essential functionality in SON, cell outage detection is developed to autonomously detect macrocells or femtocells that are inoperative and unable to provide service. However, due to the two-tier macro femto network architecture and the small coverage nature of femtocells, it is challenging to enable outage detection functionality in femtocell networks. Self-healing functionality in femtocell aims to resolve the loss of coverage or capacity induced by cell outage to the extent possible in the femtocell networks. Existing systems uses local cooperation architecture which seeks solutions with the need for local collaboration among femtocells. Specifically, an outage is detected based on the measurements of surrounding femtocells. Based on these local measurements, a proper set of neighbor femto APs tune their parameters to compensate for the outage. The outage occurs due improper arrangements of femtocell network. Proper placing of the femtocell access points reduces the outage problems. The signal strength, threshold and various parameters are calculated for different configurations and for different modulation technique using a simulation mechanism. The analysis of the same is done .from this analysis proper configuration of the femtocell network is obtained.

KEYWORDS: LTE, Femtocell, Simulation, Modulation Technique, Multipath Fading.

1 INTRODUCTION

Since macrocell coverage becomes expensive to serve indoor customers with large service demands, new methods for the indoor coverage/capacity problem are required. One solution to enhance indoor coverage is the so-called FAPs (Femtocell Access Point) or home base stations [2].These are low-power base stations designed for indoor usage that allow cellular network providers to extend indoor coverage where it is limited or unavailable.

Femtocells are small cellular telecommunications base stations that can be installed in residential or business environments either as single stand-alone items or in clusters to provide improved cellular coverage within a building. It is widely known that cellular coverage, especially for data transmission where good signal strengths are needed is not as good within buildings. By using a small internal base station –Femtocell (femto cell), the cellular performance can be improved along with the possible provision of additional services. In order to link the femtocells with the main core network, the mobile backhaul scheme uses the user's DSL or other Internet link. This provides a cost effective and widely available data link for the femtocells that can be used as a standard for all applications. One of the key elements of the femtocell it's that its installation, organization and configuration should be completely trouble free and without any intervention from the home owner.

It is a prime requirement that femtocells must be able to be installed by people with no technical knowledge of their operation and once installed, they should continue to operate without any intervention, even if the surrounding environment

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changes. Therefore the installation of the femtocell should be totally plugged and play, and it should not require any intervention from the users apart from connecting it to an internet router and plugging it in to a mains supply. This requires a considerable amount of intelligence within the femto cell itself. With the deployment of femto cells within the macro cells, the role of interference management becomes extremely important. The idea is to optimize the macro network behavior with respect to interference and capacity relationship. Macro-Macro, Macro-Femto, Femto-Macro Interferences are considered.

For the sake of simplicity, interfering impact of a femto cell on the neighboring femtocell (Femto-Femto) is not considered ,mainly, because femto cells are low powered devices and added penetration loss due to indoor environment would make the impact insignificant. It is estimated that by 2012, there could be around 70million FAPs installed in homes or offices around the world, serving more than 150 million customers [3]. Consequently, the co-channel deployment of such a large femtocell layer will impact existing macrocell networks, affecting their capacity and performance [4]. Therefore, to mitigate this impact, several aspects of this new technology such as the access methods, frequency band allocation, timing and synchronization and self-organization need further investigation before FAPs become widely deployed. Since the number and position of the FAPs will be unknown, interference management cannot be further handled by the operator using traditional network planning and optimization techniques. Therefore, special attention must be paid to the mitigation of interference between the macro- and femtocell layers, as well as between femtocells.

2 PROPOSED SYSTEM

In a standard cellular system using OFDMA-based network access, frequency allocation must take into consideration both inter- and intra-cell interference. Each subcarrier should be allocated to only a single user within the cell (or sector) so that intra-cell interference is avoided. Moreover, users from adjacent cells (or sectors) might cause interference to the users in the cell of interest so frequency allocation has to be optimized to minimize the inter-cell interference. With femtocells overlaying on top of a traditional cellular deployment, the complexity of the interference problem increases significantly and new mitigation strategies have to be designed.

Assume that a femtocell network has a single macrocell base stations (MBS), and then one can expect to encounter three different types of uplink interference. They are listed below:

- MU to FAP interference
- FU to MBS interference
- FU to FAP interference

MU TO FAP INTERFERENCE

In OFDMA-based systems such as mobile WiMax, power control is employed for the uplink. It ensures that, at any time, a given MU is transmitting enough power to achieve a minimum signal to interference plus noise ratio (SINR) at the MBS receiver given the current channel condition, which is measured by the system periodically. If an MU is located far away from the MBS, the power control algorithm will set its transmitted power to a high level to meet the target SINR value, if an MU happens to be in the vicinity of a femtocell and also far away from the MBS, then its signal could be high enough to propagate through the walls of the building where the FAP is deployed and generate interference. This will happen only if the FU in the femtocell uses the same frequency as the MU. It is important to note that it is indeed on the macrocell edge where femtocells are most necessary and useful, so this kind of interference is expected to be very frequent.

FU TO MBS INTERFERENCE

Due to the frequency reuse among femtocells, it is possible that many FUs in different femtocells use the same subcarrier as an MU, thus they will interfere with the macrocellorder to overcome the interference from FUS to the MBS, the MBS measures the interfered subcarrier and applies the uplink power control on the MU, which will determine that it needs to transmit higher power in order to reach its target SINR at the receiver. This increase of the transmission power will worsen even more the MU to FAP interference.

FU TO FAP INTERFERENCE

A femtocell is, by definition, located indoors, so interference occurs when adjacent femtocells use the same subcarriers. The interference level between non-adjacent femtocells is negligible, because any signal coming from one FU travels through

at least two walls to reach the FAP of a non-adjacent femtocell. Therefore, the frequency allocation strategy should not allocate the same subcarriers in adjacent femtocells in order to avoid the intra-tier interference among femtocells.

A. INTER-TIER INTERFERENCE MITIGATION WITH PARTIAL COCHANNEL ASSIGNMENT

We focus on inter-tier interference mitigation under a single macrocell scenario. Based on the fact that there are much less number of FUs in each femtocell than the number of MUs in each macrocell, a portion of the whole spectrum would be sufficient for femtocells in most cases. Furthermore, in order to avoid performance degradation due to interference, it may be better to limit the spectrum that a femtocell can use, which is verified in section V.

Given a total number of available subcarriers N, we assume that Ns subcarriers are shared by the FU and MUs, whereas the remaining (N − Ns) subcarriers are used by MUs only. The transmitting power of MU is denoted as P MU and P MU min ≤ P MU ≤ P MU max by using power control according to the measurement of each subcarrier channel state. Owing to the small radius of the femtocell and FU and MU being the same type of terminal, we assume that the transmission power of FU, P F U, is constant and P F U = P MU min. It is shown that such constant power assignment on subcarriers will not bring noticeable rate decline compared to the Mercury Water-Filling (MWF) power control algorithm.

B. INTER-TIER INTERFERENCE MITIGATION STRATEGY

In this subsection we propose a co-channel interference mitigation strategy between MUs and FUs over the shared subcarriers. The uplink interference problem by considering the QoS requirements for both MU and FU in term of SINR. As for mitigating the interference from FUs to the MBS, the MU first uses power control to improve the SINR in order to satisfy its QoS requirement. If the MU cannot reach its minimum SINR requirement due to the long distance from the MBS and the interference from FUs, it should switch to the dedicated subcarriers.

If the MU can meet its target SINR, then it will be checked whether or not its transmission power is strong enough to interfere with its nearest co-channel FU. If the position of the MU is close enough to an FAP to interfere with the co-channel FU, it should use the dedicated subcarriers. The proposed strategy for eliminating the inter-tier interference (i.e., MU to FAP and FU to MBS) is summarized as follows

- For any given MU m, estimate the total path loss to the MBS and estimate the path loss to its closest active FAP by measuring the Reference Signal Received Power (RSRP) of the active FAPs in the downlink.
- Check whether the MU can meet its target SINR by using power control. If yes, consider the worst interference case from this MU to its nearest FAP, where the FU is on the edge of this FAP. Then the MU estimates whether or not its transmission power causes the FU's SINR below the minimum requirement. Here, the reason for considering the worst case scenario is to maintain the uplink coverage of the femtocell.
- If both the MU and the FUs in its closest femtocells can satisfy their SINR requirements, the MU is a regular user and can use either the shared subcarriers or the dedicated subcarriers.

Otherwise, the MU is a femto-interfering user and can only use the dedicated subcarriers. After the above strategy is applied, all MUs within the macrocell are classified as either "regular users" or "femto-interfering user." Such classification of MUs depends on many system parameters, such as the macrocell radius, femtocell radius, penetration loss through the building wall, transmission power of an FU, etc. Let's describe the classification procedure in detail.

C. CLASSIFICATION OF MU'S

In order to make sure that the MUs do not interfere any FU in the closest femtocell, consider the worst case scenario that an FU is at the edge of the femtocell. Assume that the estimated distance from the MU to the closest FAP d MF is obtained by the RSRP measurement from the FAP in the downlink. Based on the value of RSRP and the FAP transmission power which is set to be constant in partial co-channel deployment, the MU can calculate the path loss from the FAP to it, and then the distance from the MU to its closest FAP can be estimated according to the path loss model. Then the interference from the MU to the FAP is given by

$$\mathrm{I}^{\mathrm{MF}} = \frac{\mathrm{P}^{\mathrm{MU}}\mathrm{G}^{\mathrm{F}}\mathrm{G}^{\mathrm{U}}}{\mathrm{X}^{\mathrm{MF}}} \qquad (3.1)$$

Where P^{MU} is the transmit power of the MU

G^F is the antenna gain of the FAP

G^U is the antenna gain of MU

MF is the path loss from the MU to the FAP and related to MF. Whereas the antenna gains of FU since both MU and FU is the same type of terminals. As for the interference from FUs in other femtocells to this FU, after applying the auction algorithm for the shared subcarrier allocation to be described in the next section, the interference between adjacent femtocells can be avoided. Then the worst case scenario is shown on the right-hand side, where the femtocells with the same colour use the same subcarrier and interfere with each other. We analyse the interference from FUs in FAPs 3, 11, 15 and 23 to the FU in FAP 13 with the interfering FUs located at the closest positions to FAP 13.The interference from FUs in the outer rings is ignored due to the long distance and extra penetration losses through walls. Then, the sum interference from FUs in FAPs 3, 11, 15 and 23 to the FU in FAP 13 is given by

$$I^{FF} = \frac{4P^{FU}\, G^{F} G^{U}}{X^{FF}} \qquad (3.2)$$

Where X^{FF}accounts for the path loss from one of the interfering FUs to FAP 13 and can be calculated using the distance of 3RF C. GF is the antenna gain of FAP. The interference from FUs to the MU is given by

$$I^{FM} = \sum_{i \in m_{int}} \chi \frac{4P^{FU}\, G^{F} G^{U}}{x_i fm^2} \qquad (3.3)$$

As for I FM, due to the frequency reuse among femtocells, its value is mainly related to the minimum distance from FUs to the MBS and the active probability of femtocells, which varies much slower than χ MF. Therefore, different MUs have different χ MU max due to their different locations. The MU with a larger distance from its closest FAP will have a larger χ MU max. Any MU whose path loss to the MBS is less than its corresponding χ MU max will be classified as a regular user and it can use either the dedicated subcarriers or the shared subcarriers. The others will be classified as femto interfering users and they can only use the dedicated subcarriers. An intuitive way to understand the above MU classification scheme is by defining dmax as the distance where a given MU will suffer a total path loss of χ MU max. Any MU lying within dmax can use any subcarriers, whereas any MU located outside of dmax can only use the dedicated subcarriers. In this way, both the MU and FU can meet their target SINR requirements and therefore the inter-tier interference is avoided. Note that the actual value dmax is not a constant value and depends on the current values of path loss and the distance from this MU to its nearest co-channel femtocell, d MF.

D. BUILDING STRUCTURE

A regular building structure and each apartment/house admits same room layout and layout to simplify the model as shown in the fig.1

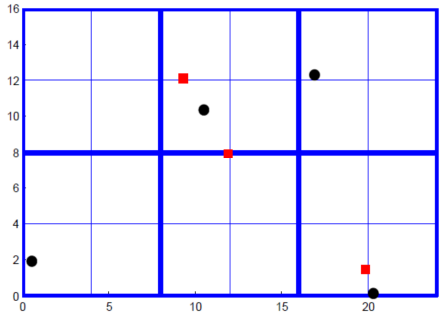

Fig.1 Grid Layout

A number of formalisms have been developed in architectural theories that aim to capture the architectural design process, or particular architectural styles as shown in the fig.2. These models have primarily been used to derive schematic geometric arrangements, rather than detailed floor plans. Formalisms such as shape grammars have so far not yielded models able to produce complete building layouts; akin to ones created by architects in practice. The underlying difficulty is that real-world building layout design does not deal exclusively with geometric shapes and their arrangements.

A central role in building layout is played by the function of individual spaces within the building, and the functional relationships between spaces. In practice, building layout design relies on a deep understanding of human comfort, needs, habits, and social relationships. Numerous guidelines have been proposed for the building layout process, and a few are near-universal in practice. One is the privacy gradient, which suggests placing common areas, such as the living room, closer to the entrance, while private spaces, such as bedrooms, should be farther away. Another concerns room shapes, which

should be largely convex and avoid deep recesses, due to the instinctive discomfort sometimes triggered by limited visibility in concave spaces. On the whole, however, the proposed rules of thumb have proved too numerous and ill-specified to be successfully modeled by a hand-designed rule-based system

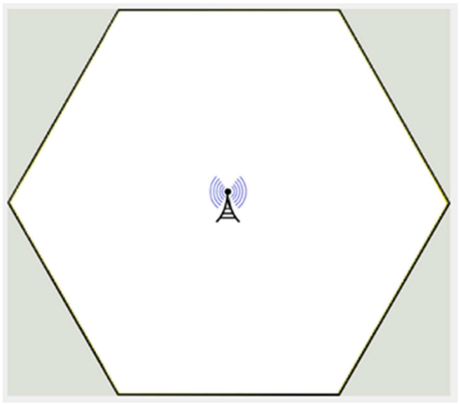

Fig.2 Main Layout of Macro network

The approach is to apply modern machine learning techniques to infer aspects of building layout design from data as shown in the fig.3 In order to derive the methods presented in this report and representation of the building layout process as it is carried out by residential architects in practice. The balance of this section summarizes this process, which serves as the model for our approach. The presented summary is distilled from interviews and on-site observations at three residential architecture practices in a large suburban area, as well as from published references. Schematic geometric arrangements, rather than detailed floor plans. Formalisms such as shape grammars have so far not yielded models able to produce complete building layouts; akin to ones created by architects in practice.

The underlying difficulty is that real-world building layout design does not deal exclusively with geometric shapes and their arrangements. While there is great variability in the design methods of different architects, this summary presents some significant commonalities. The first challenge in the process is to expand the incomplete and high-level requirements given by the client into a detailed specification for the residence. “I want a three bedroom house for under $300,000’ is a typical initial problem statement”. From these initial requirements, the architect produces a list of rooms and their adjacencies. An adjacency indicates direct access, such as a door or an open wall.

At this stage, the architect often sketches a number of bubble diagrams, in which rooms are represented by ellipses or rounded rectangles, and adjacencies are represented by edges connecting the room. Through prototyping with bubble diagrams, the list of rooms and their relationships is progressively refined. The architect toggles between floors, and specifications for one floor are not finalized until the other floors are pinned down.

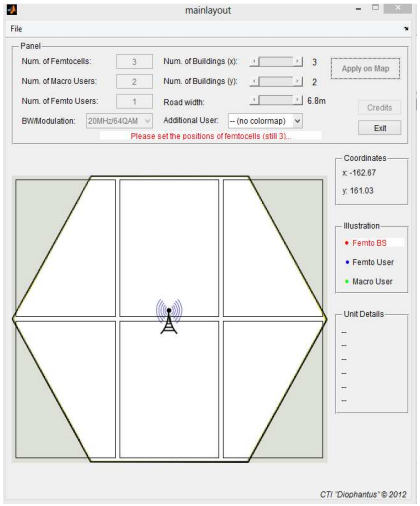

Fig.3 Building Design of Femtocell Network

Multi-story spaces, such as stairwells and atria, are indicated as such. After the architectural program is vetted by the client, the architect creates a schematic plan, or concept sketch. This is a rough planar layout as shown in the fig.4 of the spaces on each floor, such that adjacent spaces are next to each other, and the spaces have roughly the desired sizes. Exterior trim, as well as distinctive windows and entrances, are applied to customize the house in styles such as "American Craftsman" or "Colonial Revival." of internal spaces on each floor, their adjacencies, and their rough sizes.

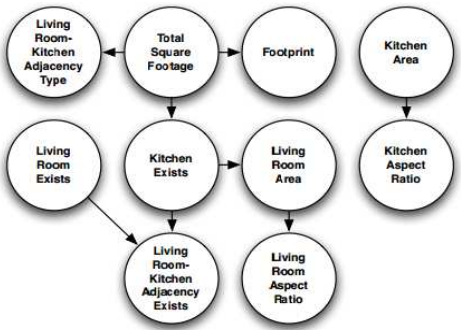

Fig.4 Schematic Process

Cell outage often results in decreased capacity and coverage gap. Such degraded performance leads to high user churn rate and large operational expenditures. Unfortunately, compared to macrocell networks, femtocell networks suffer from more severe outage issues. Unlike well planned macrocells, femtocells are usually user-deployed and much denser.

E. FLOOR PLAN OPTIMIZATION

Once an architectural program is generated, it is turned into a building layout: a detailed floor plan for each floor. These floor plans must realize the program and feature well-formed internal and external shapes. We compute these floor plans by optimizing over the space of possible building layouts. Different floors are optimized together to ensure mutual coherence. A space of floor plans is typically parameterized by the horizontal and vertical coordinates of the rectilinear segments that form the shape of the plan.

Since the number of segments is not constant across floor plans that conform to a given architectural program, the space we want to optimize over has varying dimensionality. Thus global optimization algorithms like Covariance Matrix Adaptation – which have recently been applied to a number of highly multimodal optimization problems in computer graphics – cannot be used. We have successfully experimented with Reversible jump Markov chain Monte Carlo for optimizing over the space of layouts.

However, the detailed balance condition and the associated dimension matching functions complicate both the implementation and the exposition. In practice, we have found the simple Metropolis algorithm, which has been widely used for the related problem of VLSI layout, to be sufficiently effective. Unlike greedy techniques, the Metropolis algorithm can accept moves that increase the cost function, in order to escape from local modes. Specifically, define a Boltzmann-like objective function.

$$f(x) = \exp\big(-\beta c(x)\big) \qquad (3.4)$$

F. MACROCELL/FEMTOCELL IN MATLAB

The designated RF spectrum of modern cellular-based wireless communication networks is every time more congested, whilst required to serve an increasing number of users. The RF spectrum reuse has been proposed as one of the key technology drivers for the deployment of next generation BWA systems. The efficient deployment of the previous scheme constitutes one of the main goals of CR. However, the opportunistic reuse of the RF spectrum requires the agile mitigation of the effects caused by in-band interfering RF signals. Interference management is therefore becoming an indispensable feature that has to be accounted throughout the joint design of the PHY and MAC layers of network infrastructure equipment, CPE and UE. Two major interference management categories can be found in the literature. The first one includes interference avoidance techniques such as spectrum sensing, aiming at the instantaneous allocation of unused-unlicensed spectrum.

3 EXPERIMENTAL RESULTS

Despite the advantages of femtocells, effects of femtocell deployments should be carefully analyzed before their release, in order to minimize the risks and failures of femtocells in real markets. Thus, the introduction of a system level simulator that can facilitate various simulations for LTE systems with femtocells. For development of the simulator, described five functional modules, including models of wireless channels, four kinds of IP traffics, and users' mobility, to emulate realistic LTE systems and network environments. In addition, detailed operational events and graphical user interfaces for efficient simulator operations were introduced.

The intensively analyzed signal interference between macro- and femtocells under four Femtocell deployment scenarios utilizing the developed simulator. From the results, it can be found that the imprudent deployment of femtocells may seriously affect performance of overall networks, and various aspects should be considered in the femtocell deployments. Especially, since femtocells are expected to be arbitrarily deployed by customers, transmission power control of femtocells based on self-optimization manner is important for efficient femtocell deployments. For further studies, by utilizing the developed simulator, the research on the transmission power control mechanisms which can effectively mitigate cross-tier interference between macro- and femtocells by actively adjusting transmission power of femtocells based on the close cooperation between eNBs and HeNBs.

In addition, various resource partitioning schemes, which statically or dynamically divide radio resources for femto- and macrocells in order to avoid interference and improve overall performance, will be addressed. The simulation is done for different modulation technique. In each modulation technique different configurations were made by varying the number and also by varying the places of the femtocell, macro users and femto users. The buildings in both axis and also the road width are also varied. The stimulated output for 20MHz/16QAM modulation technique for a certain configuration of femtocell-macrocell network.

Using this parameter a data sheet is made, which contains all the information. From this data sheet an analysis is made and a graph is obtained. The power loss of the femtocell users for different configuration of the femtocell-macrocell network is obtained from the stimulated output is tabulated in table 1 and is plotted as a graph in fig.5

POWER LOSS (DB) – FEMTOUSER

Table 1 Femtouser Power Loss Readings

FEMTO USER	
ID	PL(dB)
1	135.7
2	137.5
3	136.4
1	135
2	134.1
3	137.1
1	135.7
2	135.4
3	140.5

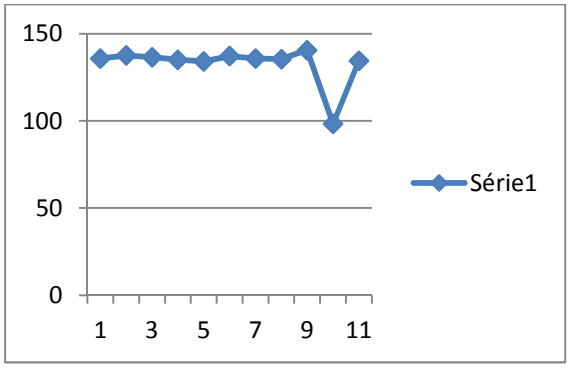

Fig.5 Femtouser Power Loss Graph

THRESHOLD (MBPS) – MACROUSER

The threshold values of the macrocell users for different configuration of the femtocell-macrocell network is obtained from the stimulated output is tabulated in table 2 and using the information from the table a graph is plotted as shown in fig.6.

Table 2 Macrouser Threshold Readings

MACRO USER 1		MACRO USER 2	
ID	THR(Mbps)	ID	THR(Mbps)
1	36	2	36
1	36	2	36
1	36	2	36
1	54	2	54
1	54	2	54
1	54	2	54
1	18	2	18
1	18	2	18
1	18	2	18
1	27	2	27
1	27	2	27

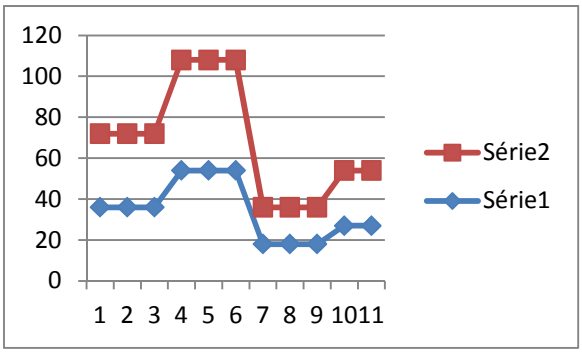

Fig.6 Macrouser Threshold Graph

4 CONCLUSION

The LTE FPC scheme compensates the PL between UE and BS as the OL approach of the PC which is the intended for different received SINR for UE of different locations. Other word to allow users near to the BS to have a better receive SINR compare to users far from the BS. The first period of analysis is focused on the LTE FPC scheme for selection of appropriate slope parameter for further simulation and knowing the correlation of the different slope parameter α and the transmit PSD(Power Spectral Density). The different α parameters 0.6, 0.8 and 1 values are chosen for comparison with different PC schemes in case of simulation. The second period of the analysis is focused on the simulation of the different PC schemes of in case of full power, LTE FPC and proposed APC schemes with chosen α slope parameters. And SINR and throughput comparison of the different PC schemes are illustrated. According to the analysis, could be concluded as below:

- For the SINR (Signal to Interference plus Noise Ratio) at the FBS1, it is seen that performances of the different power control methods are almost the same. But for the proposed scheme gradient angle is lower compare to other PC schemes.
- That means proposed APC scheme is stable in case of SINR. For the cell throughput, the proposed APC scheme is not better than the LTE FPC method.
- For the correction of the obtained results, some additional approach is stated in the next section as future works.

5 FUTURE ENHANCEMENTS

For the future work, the CL (Closed Loop) approach for the LTE Femtocell PC (Power Control) is will be studied. Also for improvement for capacity as minimizing the interference on the Femtocell environment HPC (Hybrid Power Control) technique which is combination of the AOLPC (Adaptive Open Loop Power Control) and ACLPC (Adaptive Closed Loop Power Control) technique will be studied. Besides, for the improvement on the analysis the system based simulation approach could be better solution as a future work.

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WIRELESS SOLUTION FOR SMART AGRICULTURE USING INTEL GALILEO (Gen 2)

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ABSTRACT: India is agriculture based country and its economy primarily depends upon the growth of agriculture sector only. Most of the cultivation activities are in row for transforming to automated system with the advent of embedded applications in agricultural activities. So in our project we planned to monitor and control some of the agricultural activities using multiple sensors based system. These sensors will constantly supervise the related ecological conditions, hydrological conditions, earth conditions and crop specific conditions in the field. Thus part of the farming works are accomplished in smart way by integrating Wireless Sensors in agriculture field. In this project the control of horizontal angle of sprinkler nozzle using stepper motor and soil moisture based closed loop control system reduce the water wastage in elegant way.Our embedded sensors are controlled by the "INTEL GALILEO"(Gen 2). Microcontroller development board.

KEYWORDS: smart agriculture, soil moisture, sprinkler, Intel Galileo.

1 INTRODUCTION

The major problem faced in many agricultural areas is that lack of mechanization in agricultural activities. In India agricultural activities are carried out by manual labor, using conventional tools. We can reduce a lot of manual work in the field of agriculture using automation. The main idea of the project is to automate the agricultural activities. So in our project we planned to monitor and control some agricultural activities using multi sensors. We also designed a device to control the usage of water for irrigation processes using soil moisture sensor [2]. If addition of a good deal of water is applied the problems arise such as plant decay, and also result wastage of water [3]. If too little water is applied different problems arise such as turf burnout. An irrigation regulator will function as automatic irrigation systems such as lawn sprinklers and drip irrigation systems

Combining all those techniques we proposed a sprinkler system that will be controlled by the servomotor. And based on the soil moisture observations, the sprinkler will rotate in angular motion [5]. We also planned to build an automatic shutter across the furrows of the field. These solutions are all meant to reduce the labour work and costs.

2 LITERATURE SURVEY

Water scarcity is the major issue faced all over the world. In India agriculture plays a vital role. There are several survey papers suggested some works related to smart agriculture.

[1] In 2015 Liu jie et al proposed a novel approach for data management for technique which will tend to decrease the packet size on the transmitter side zigbee located on the agricultural field that is intended for collection of various sensor values for light sensor, temperature sensor. The major drawback in this paper we have found was, short range of zigbee communication.

[2] In the paper Manoj H G1, Dr N G S Udupa2 2015, discussed an idea to detect the moisture level in the soil. Nowadays there is a scarce for the man power in agricultural field. To overcome this problem we introduce this device to detect the moisture level automatically There are three conditions that are possible in this field work. They are wet, normal and dry condition. In wet and normal condition the device is in on condition and it will check the moisture level in the soil at that time

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if the moisture level is enough means it will remain constant and does not work. In the dry condition the sensor senses the moisture level in the soil and it will detect that the low moisture level. And at that time the device interfaced with water pump is on and goes on until it reaches the normal or wet condition Sensors are placed and solenoid valves in all regions and check the moisture level in all the regions. For example in first region the sensor detect the moisture level and that level is normal means than the next sensor in the next field is ready to detect the moisture level in that particular field, if it gets the result as dry condition means the solenoid is triggered and which makes the device on. Until it reaches the normal condition it will going on this process. They used Arduino and soil moisture sensor controlling the irrigation system in low costs. This model is very useful to the farmers by monitoring the conditions of the field. It will always ensure the sufficient level of water in the fields. And it will not let it go on under irrigation as well as over irrigation. By having less amount of water we can able to irrigation to the vast areas The sensor used in this system is to measure the temperature, humidity and also the pressure of the soil. By using this method we can able to save larger amount of water.

[4] In 2014 P.Divya et al proposed a novel approach for effective water management in irrigation lands using wireless sensor network incorporating various mechanism that controls the operations time, numbers of sprinklers and angular adjustment in the sprinkler used for farming lands. The advantage of this method was the usage of watering database for different crops and effective use of field sensors. The only drawback found was that this method was only suitable for Pop-up sprinkler. The intention of this work is to reduce the water usage during irrigation processes. In this view, we have proposed [4] context aware wireless sensor network system for irrigation management. This multi-sensor system will continuously monitor the relevant environmental condition, hydrological condition, soil condition and crop specific condition

[5] In paper 2014, Joaquín Gutiérrez, Juan Francisco, the system to develop the automatic irrigation method to optimise the use of water was proposed. To establish this system all the sensors need to be placed in deep into the soil i.e. in root zone of the plants. The gateway will handle all the information about the sensors and sends the data collected to web page that have been created. They developed an algorithm based on threshold values of temperature & soil moisture that are interfaced with the microcontroller. This algorithm is to control the amount of water quantity need to be used. Also they used photovoltaic panels to power the sensor networks. This non conventional form of energy will have energy autonomy and of low cost implementation. This type of irrigation method suggests the cultivation process possible even in the place where the scarcity of water exists by increasing the sustainability.

[6] Nowadays qwerty mobiles plays a major role in agriculture fields as its capability of moving from different places resembles the nature of farming. Though its cost is high, its coupling power is used in too many practical applications. They are embedded with various sensors. This reveals the mobile applications that enhance the agricultural solution. Early 1500 articles shows through database based on specific aspects and then reviewed via full text results in 22 articles. The applications are based on farming functions. Those articles describe 12 farming application, 6 farm managing application 3 information systems and 4 service application. For their preparation they paper used GPS and camera. For future application, they plan to utilize other sensors to provide advance agriculture solution.

[8] In paper B. Balaji Bhanu, 2K. Raghava Rao, 2014, proposed the system of implementation of an agricultural monitoring system with the help of wireless sensor network. Temperature, humidity& carbon dioxide can be used for the productivity increases. The growth and quality in plants can get increased by these parameters. This system can measure the inner side of fields. The farmers or the agricultural experts can survive through the web. The main goal of the system is to increase the maximum crop productiveness; this can be achieved through the continuous monitoring of the environmental parameters. The main purpose is to protect the agricultural land from the weather effects, bugs and so on. Because agriculture is the backbone for all countries. So our mission is to detect and protect from our farm land from these external parameter. The alertness can be give through web. This paper also has, future work of simulation part and analyze the critical conditions of sensor nodes by solving the nodes failure and implementation of web application of data analysis.

3 PROPOSED WORK

Based on the results of the survey, in our project we have proposed a smart idea to monitor the agriculture field and also we control the irrigation process in smart way. The decisions that are taken by the motor depend on the sensors response.i.e from soil moisture sensor and humidity sensor. The smart way to do the automated irrigation process is achieved by Intel Galileo, controlled sprinkler The programmed stepper motor will command the sprinkler to rotate in an angle wise rotation. This will reduce the amount of water used for irrigation purpose.

4 INTEL GALILEO

Intel Galileo is a developer board designed to have powerful functionality and consumes less power. As a developer board, it has many peripherals for various applications [1]. The Intel board comes with default loaded Linux OS on SPI Memory like other boards which are usually used to boot the board.

Intel Galileo can be used in much application. Intel Galileo operating software can programmed through OS X, Linux, Microsoft windows. Both hardware and software of this board that can be interfaced with the Arduino screen system Intel Galileo has the Intel Quark SoC X1000 processor which is the first product from the Intel Quark technology family of low power, small-core products. Intel galileo products challenge to participate within markets such as the Wearable computing and Internet of things. It was ingenuous in Ireland, and it is a Pentium instruction set architecture, single-thread, compatible CPU, single core,32-bit,. Its working speed is capable of 400 MHz. The reason for choosing the Intel Galileo is to easily interface the multi sensors that are all required for our project.

BLOCK DIAGRAM

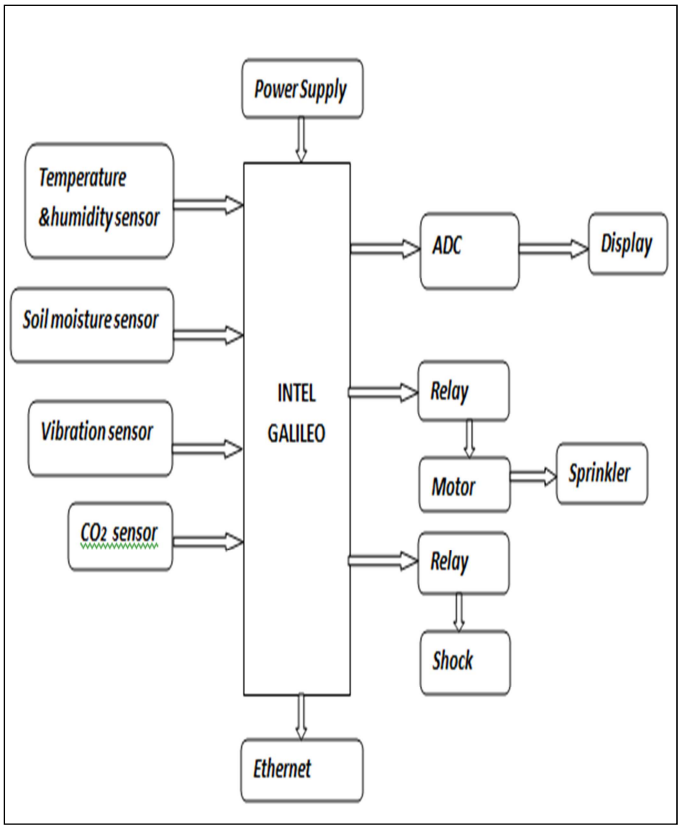

Figure 1 BLOCK DIAGRAM

A. COMPONENTS IN THE FIELD

- **TEMPERATURE &HUMIDITY SENSOR**

In our project we are using some various sensors, of those the very important sensor is temperature sensor, which will give the current temperature level. Humidity sensor is used to measure the moisture level present in the atmosphere. Measures the relative humidity in the ambient environment. It is important to measure the moisture level in the atmosphere. The current temperature &humidity readings of the field will be monitored and displayed.

- **SOIL MOISTURE SENSOR**

This sensor is used to measure the moisture level of the field. It measures the volumetric water content of the soil.Soil wetness is most important for agricultural development to help farmers for controlling their irrigation work more powerful. The perfect wet soil conditions on the fields, not only farmers are able to use less water to cultivate a crop, they are also able to enlarge the productions and the worth of the crop by enhanced managing of wet soil condition during significant growth of plants stage .

S.No	Sensor	Threshold value	Field condition	Motor condition	Door Condition
1.	Soil Moisture	<=300	Dry Soil	On	Closed
2.	Soil Moisture	<=700	Moisture Soil	Off	closed
3.	Soil Moisture	> 700	More Water	Off	Open

- **CO_2 SENSOR**

This is an electrochemical one that measures the concentration of CO_2 by oxidizing or removing it. The content of CO_2 in any place goes into the sensor through the porous membrane to the working electrode. There it is oxidized or reduced. This reaction results in an electric current that passes through the external circuit.

- **VIBRATION SENSOR**

Vibration sensor is a sensor which is used to monitor the unwanted entry of humans and cattle into the field. If the vibration sensor is disturbed slightly, then vibrations produced, then the farmers get intimated. By these vibration sensors we planned to give little sensible shock to the cattle that are entering into the field. This can be done by interfacing Relay board with the sensor.

- **SERVO MOTOR**

A servomotor is a kind of rotator or linear actuator that allows for particular rule of an angular or linear position velocity and acceleration. It coupled to a sensor for position feedback. It is a closed loop servomechanism that uses position feedback to control its motion and final position

B. CONTROLLING PART

In a system, the controller is the device which activates motion by giving a command to do something i.e. start or vary speed/position. This command is amplified and applied onto the motor. A command signal which is given by the user's interface panel comes into the servo's "positioning controller". Based on the readings of the soil moisture sensor the servo motor will turn in angle wise direction. The sprinkler with the servomotor will rotate along the direction which has been commanded by the sensor. All these controlling are all done automatically. This process can be viewed over internet through the Ethernet shield which is connected to the Galileo board.

- **RELAY**

Relays are electromechanical machines that use an electromagnet to control a pair of variable links from an unlock to a blocked position. Relay takes a moderately a small amount of power to function the relay coil. Here it is used to control the motors& lamp.

- **ADC**

An analog to digital converters is a device that converts a analog values into digital values (0 and 1).In our project all the sensors readings are analog (Temp, Pressure, etc). Hence, these signals will be converted to digital signals to be used by the Galileo quark X1000 processor.

- **ETHERNET**

Ethernet is one of the computer networking technologies commonly used in Local Area Networks(LAN). Ethernet evolved to higher bandwidth, improved media access control methods, and different physical media connected by Ethernet repeaters or switches. First you need to find which serial port your window system recognizes as connected to the Intel Galileo board. Low output ripple and noise(100mvpp),Input voltage range 36V to 57V,Overload and short-circuit protection,9V output, 1500V isolation(input to output), High efficiency DC converter, are all the features of Ethernet.

- **SERIAL MONITOR OUTPUT**

The readings that are collected by the various sensors are all fed to the Intel Galileo board, then the current level of the temperature, humidity, co2 level in air, soil moisture content in the soil, and also if there is any vibrations produced in the vibration sensor will be printed in the serial monitor of the Intel Arduino software

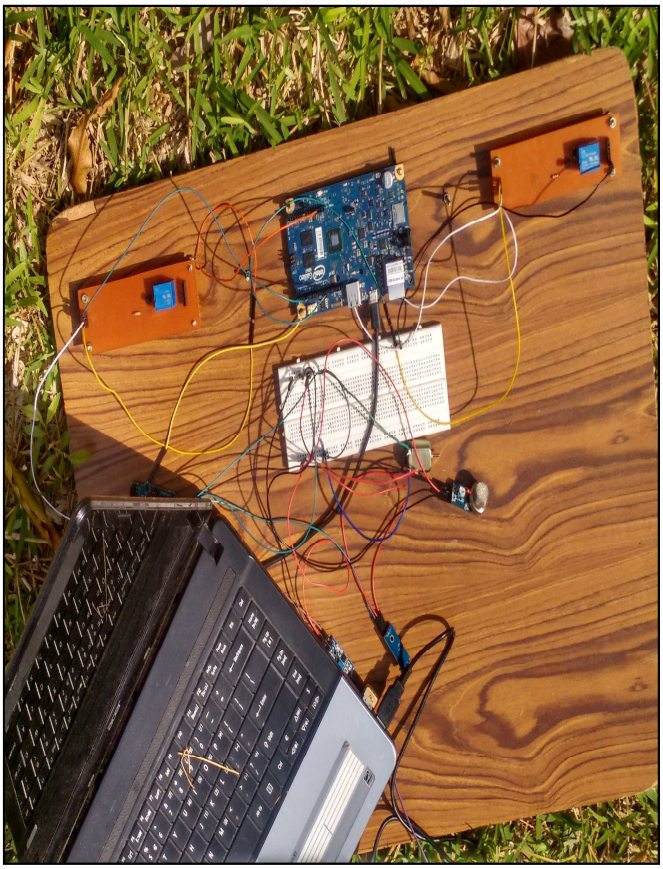

Figure 2: OUR WORK

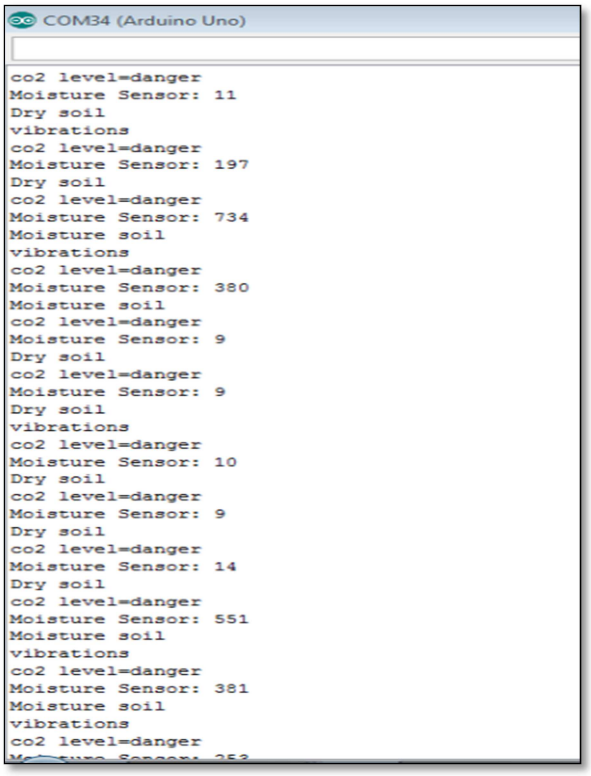

Figure 3: OUTPUT FROM THE SENSORS IN THE SERIAL MONITOR

5 CONCLUSION

This paper provides an efficient agricultural field monitoring and accurate monitoring of water usage in agriculture fields. By using vibration sensor animal entering into the crop cultivated is controlled. In future this work can also be extended with different platforms such as Lab VIEW and also additional sensors to increase the efficiency of monitoring and the parameters can also be monitored through internet with the help of HTML server.

ACKNOWLEDGMENT

We thank the Department of Electronics and Communication Engineering of Kalasalingam University, (Kalasalingam Academy of Research and Education), Tamil Nadu for permitting us to utilize the software and hardware products that are available in research lab.

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Sum Power Maximization in Cross Layer Based Mobile Satellite Communication

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ABSTRACT: Mobile satellite communication is concerned with internetworking of heterogeneous network which provides global coverage and reliable broadband communication. The demand for higher rate and reliable broadband communication with less consumption of power is drastically increasing. The existing work was to control the power by allocating power to the transmitters with the support of Mixed Integer Linear Programming (MILP) and achieving maximum data. This method failed to allocate power for any new Tx-Rx pair getting into the network. Hence Sum-Rate Power Control (SRPC) method is introduced. This proposing work helps to control the power with Quality of Service (QoS) constraints to achieve optimum power level in cross layer based Mobile Satellite Communication network. It allocates the power for Tx-Rx pairs present in the network and also for new Tx-Rx pairs coming to the network by applying Analytical Power Control Algorithm (APCA) and Distributed Power Control Algorithm (DPCA) in case of two Tx-Rx pairs and more than two Tx-Rx pairs respectively. This will result in achieving the optimum power level with QoS constraints.

KEYWORDS: Mobile Satellite Communication, Mixed Integer Linear Programming (MILP), Sum-Rate Power Control (SRPC), Quality of Service (QoS), Cross layer, Analytical Power Control Algorithm (APCA), Distributed Power Control Algorithm (DPCA).

1 INTRODUCTION

Satellite communication makes bridges for a number of new, intelligent markets in commercial and private. They have got worldwide connections in the public and private Terrestrial Telecommunication Network (TTN) [1]. Soon after Mobile Satellite Communications (MSC) and Navigation Communication came to serve navy, ground and air forces worldwide and for economic reasons, they also provided commercial MSC. MSC was used, particularly because ocean-going vessels have become dependent for their commercial and safety communications on Mobile Satellite Services (MSS). Although, other transportations started before ships, due to many unsatisfactorily experiments and projects they have to follow the evident lead of Inmarsat maritime service. Thus, the updated ship's Mobile Earth Stations (MES) are today implemented on land vehicles and airplanes for all civil and military applications, including remote or rural locations and industrial onshore and offshore installations.

Telecommunications are the carriage of signal, sound or electronic means from one point to other point [8]. Earlier, that intelligent was communicated with the help of audible callings, fire and vapour and image signals. Mobile radio is a development of technology to extend communications coverage, accessibility, power consumption of equipment, reliability by reducing the size, cost and improving efficiency.

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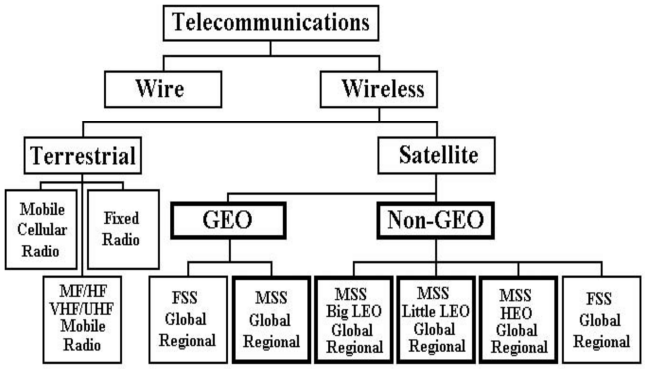

Fig.1. Overview of Telecommunication

The Global MSC network (GMSC) are GEO or Non-GEO satellite systems, which associates to all communications solutions that provides service directly to end users from a satellite and ground segment as well as TTN [4]. The term GMSC means not only global coverage but also involves local or regional. Some of the regional or local MSS can be integrated to establish a GMSC.

Fig.1 gives an overview of telecommunication systems [5]. The GMSC solution provides communication links to devices and later to aircraft and all kinds of road and railway vehicles. It must be noted that GMSC providing global and regional coverage represents a new technology era in which wire terrestrial and wireless cellular voice, image, video and data systems are combined with MSC applications. This provides communication services anywhere.

Additionally, new satellite technologies, such as Global Mobile Personal satellite Communication (GMPSC) and Very Small Aperture Terminals (VSAT), also allowed worldwide personal and commercial mobility. In fact, some of the new GEO or Non-GEO GMPSC systems have entered the field of MSC solutions, which for some years has been occupied predominately by inter-governmental Satellite Organizations. In recent years, a growing number of private entities have been prepared to develop and invest in satellite technology, such as Iridium, Globalstar, Teledesic, Ellipso, Orbcomm, LEO, etc.

2 RELATED WORKS

Earlier work was applied with Intelligent Network concept in Cross Layer Optimization (CLO) for MSN. Cross Layer Design (CLD) is a way of achieving information sharing between all the layers in order to obtain highest possible adaptability of any network. The wireless network consists of a number of interfering links. This leads to power control problem as well as rate maximization. The problem of allocating the transmitting power is intertwined with determining the links on which receivers can perform IC. Also power levels for new links cannot be allocated which becomes a major drawback of satellite network. In order to avoid such issues sum power maximization technique is used. A distributive solution is developed to decide optimal power allocation for new link problem. Distributed Power Control Algorithm (DPCA) is employed for power allocation.

3 EXITING WORK

The European Telecommunication Standard Institute Technical Committee (ETSITC) explained intelligent network based satellite network architecture that includes lower layers [4]. The satellite constellation involved was Teledesic. Teledesic plans to meet this demand using a constellation of (LEO) satellites operating in Ka-band (30/20 GHz).

The Teledesic network provided “fiber-like” service quality, including low transmission delay, high data rates, and low bit error rates to fixed and mobile users. The cross layer design required interfaces between non- adjacent layers. Each layer should know all the information about other layers so that the information can be exchanged between lower layer to higher layer and vice versa. Exchange of information through send and receive parameters has been done only at the adjacent layers in existing model [3].

The two basic cross layer approaches were: Implicit cross layer design and explicit cross layer design. During design process the exchange of information between layers were done in case of implicit design.

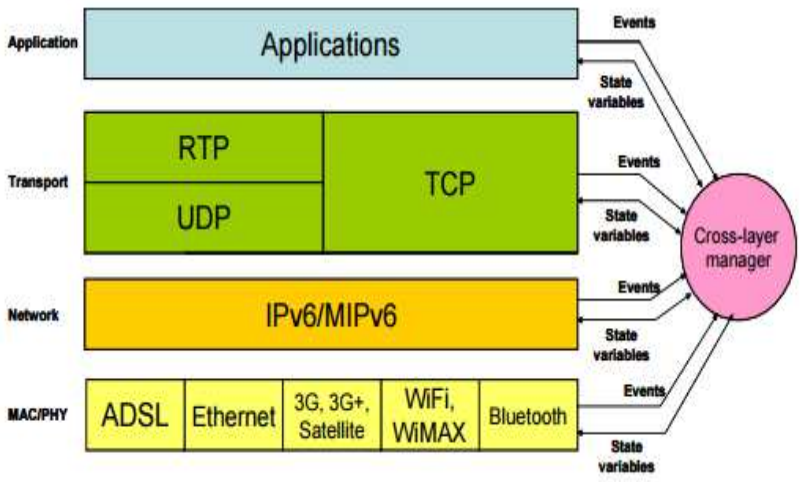

Fig.2. Cross Layer Design for MSC

Interactions among non-adjacent layers were done in order to perform dynamic adaptation for explicit design. In Fig.2 cross layer manager was used in order to perform the tasks between adjacent and non-adjacent layers.

This cross layer manager helps in performing the function without disturbing the information flow from lower to higher layer or higher to lower layer. The main layers involved are MAC/PHY, network, transport, application. The information about cross layer manager was known to all other layers so that it communicates with all layers and shares the required information to the particular layer.

In this work the parameter variations were considered and the environmental changes are also addressed to the required layer [3]. Adaptive techniques were deployed in tracking LEO satellites for communication. Hence the QoS was achieved in terms of minimum delay and higher throughput.

4 PROPOSED WORK

The wireless communication systems can make use of the spectrum for better use of licensed wireless bands. The system works at the equal frequencies, generating interference [1]. The number of interfering links present in wireless network leads to power control problem as well as rate maximization. Various algorithms were developed to minimize both interference and energy consumption in the networks.

Using a high SINR approximation, low complex sub-optimal power control algorithm is developed.

$$SINR_k = \frac{G_{kk} p_k}{\sum_{l \neq k} G_{lk} p_l + \sigma_k^{\,2}} \qquad (1)$$

Equation (1) shows the SINR experienced by the Rx. The algorithm provides QoS guarantees for individual links and can be implemented in a distributed manner for any number of TX-RX pairs in the network. Let R^i_{min} denote the target data rate constraint for TX-RX pair I in equation (2). We can formulate the optimization problem with the help of equation (3) & (4) for N TX-RX pairs:

$$\max_{P_1, P_2, \ldots, P_N} c(P_1, P_2, \ldots, P_N) = \sum_{i=1}^{N} R(P_1, P_2, \ldots, P_N) \qquad (2)$$

subject to

$$R_i(P_1, P_2, \ldots, P_N) \geq R_i^{\min}, \forall_i = 1, \ldots, N \qquad (3)$$

$$\sum_{i=1}^{N} P_i \leq P_T \qquad (4)$$

The optimization problem for N TX-RX pairs with QoS constraints can then be written as,

max

$$p'_1, p'_2, ..., p'_N \frac{1}{\ln(2)} \sum_{i=1}^{N} \ln\left(\frac{g_{ii} e^{p'_i}}{\sum_{j \neq i} e^{p'_j} g_{ji} + \sigma^2}\right) \quad (5)$$

subject to

$$\frac{1}{\ln(2)} \ln\left(\frac{g_{ii} e^{p_i'}}{\sum_{j \neq i} e^{p_i'} g_{ji} + \sigma^2}\right) \geq R_i^{\min}, \forall_i \quad (6)$$

With the help of equation (5) optimization problem can be solved using the Lagrange dual decomposition theory [2]. We can define the following Lagrangian function and power for user index i specified in equation (7) & (8),

$$l_2(P'_1, ..., P_N', \mu_1, ..., \mu_N, \lambda) = \frac{1}{\ln(2)} \sum_{i=1}^{N} \ln\left(\frac{g_{ii} e^{p_i'}}{\sum_{j \neq i} e^{p_j'} g_{ji} + \sigma^2}\right) \geq R_i^{\min}, \forall_i \quad (7)$$

$$P_i = \frac{(1+\mu_i)}{\lambda \ln(2) + \sum_{k \neq i} \frac{(1+\mu_k) g_{ik}}{\theta_k + \sigma^2}} \quad (8)$$

5 DISTRIBUTED POWER CONTROL ALGORITHM

An iterative algorithm is developed for more than three TX-RX pair problem with additional QoS constraints [1]. The algorithm is Distributed Power Control Algorithm. The steps are as follows:

1) Initialize power value to zero.
2) Transmit interference channel gain values to other TXs in the network
3) Receive the same from remaining TXs.
4) Calculate power P_i and broadcast it to other TXs.
5) Receive the values of power Pk from remaining TXs.
6) Compute the data rate Ri achieved by Tx-Rx pairs.
7) Compute the difference between targeted data rate and achieved data rate, and difference between targeted power and used power.
8) If the difference is greater than zero then set S_i^m = 1 else set S_i^m= 0.
9) Broadcast the value of S_i^m to other TXs.
10) Receive the values of S_i^m from remaining TXs.
11) The power difference is compared with a constant value and if it is greater than that and S_i^m =0 the Lagrange multiplier is updated and go to step 1.
12) The power difference is compared with a constant value and if it is greater than that and S_i^m =1 the Lagrange multiplier is updated and go to step 1
13) The power difference is compared with a constant value and if it is less than that and S_i^m =0, stop the algorithm and declare non-convergence.
14) The power difference is compared with a constant value and if it is less than that and S_i^m =1, stop the algorithm and declare convergence.

6 CHALLENGES IN DEPLOYING THE TECHNIQUE

The sum power maximization helps in allocation of power levels to new Tx-Rx pairs entering into the network and also helps in achieving maximum data rate. The major challenge in implementing this method is the computation of N-1 values of interference channel gains. In the network some links have high channel gains while some have low channel gains. Solving the quadratic equation is also one of the challenges.

7 SIMULATION RESULTS

This section describes the parameters such as power, throughput, and delay in cross layer based mobile satellite communication. As the QoS parameters such as throughput and delay has already been discussed in earlier work of Cross layer Optimization the power control issues should mainly be addressed. The results of the throughput and delay graphs has been specified below.

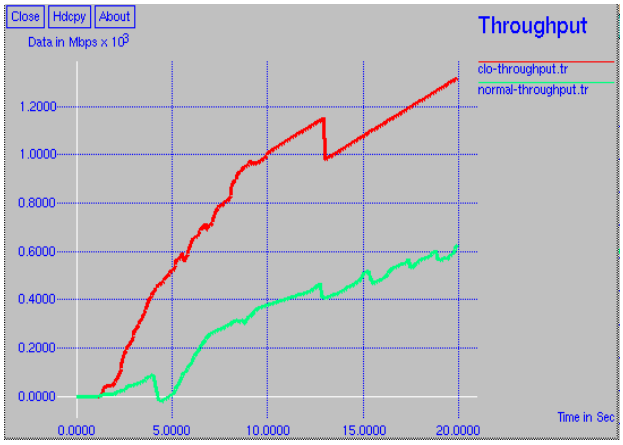

Fig.3. Throughput Comparison with and without Cross Layer Optimization.

Fig.3 shows Throughput comparison graph. Here throughput is given between time and data. The throughput increases with speed of transmission of information with the help of cross layer design in comparison with the existing OSI model

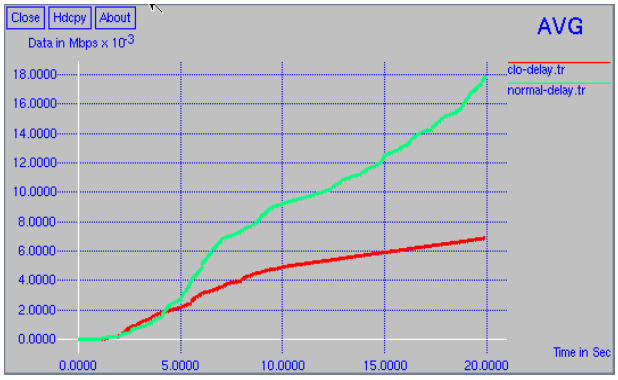

Fig.4. Delay Comparison with and without Cross Layer Optimization

Fig.4 shows the simulation output for delay. In this overall delay with the help of CLO is reduced as the number of packets increases with respect to time is in optimized level when compared to the existing OSI model.

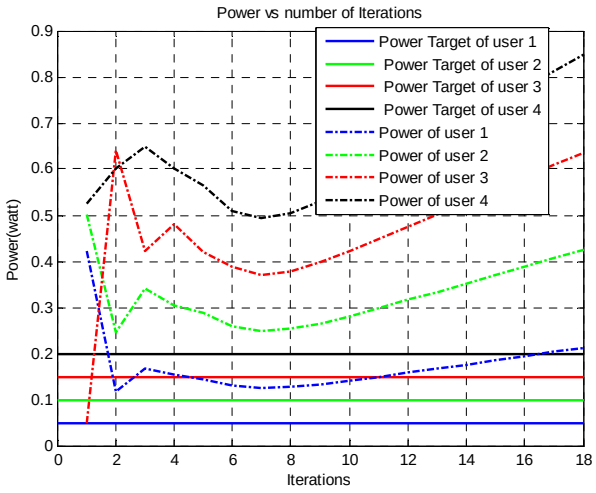

Fig.5. Power Allocation with MILP Approach

Fig.5 shows the power allocation using MILP approach for wireless networks. In this case, a targeted power is fixed and the power used by the user should reach the targeted power value. But the power used by the users does not reach the targeted power.

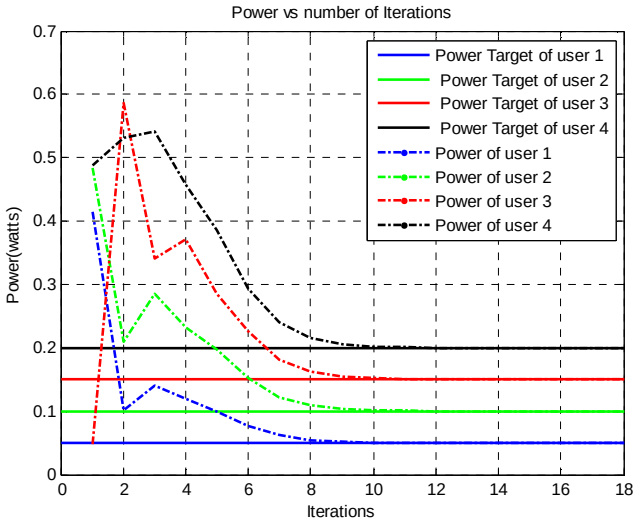

Fig.5. Power allocation with DPCA approach

Fig.5 The power allocation graph is plotted using proposed work DPCA approach for satellite network. Here the condition of reaching the targeted power is achieved. The power graph is plotted between iterations and power. Hence the power target is reached with the help of DPCA approach.

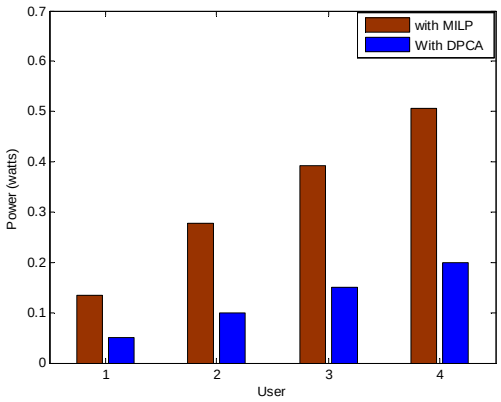

Fig.6. Power Allocation Comparison with MILP and DCPA

Fig.6. shows the power allocation graph plotted between MILP and DPCA approach for satellite network. The bar graph explains the power used the users both using MILP and DPCA method. The power used by the DPCA approach is less when compared with MILP approach.

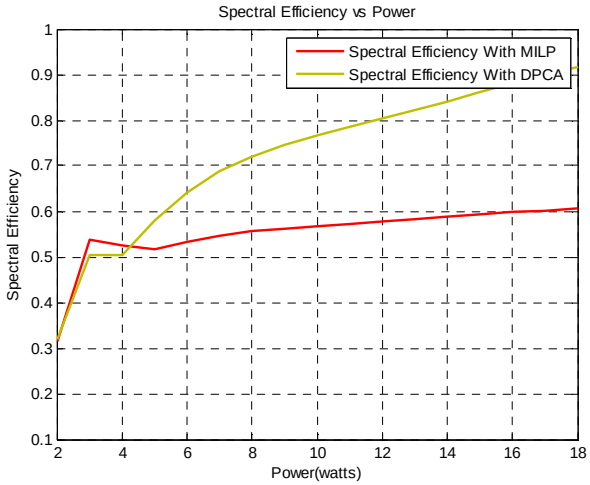

Fig.7. Spectral Efficiency Comparison with MILP and DCPA

Fig.7 shows the spectral efficiency graph plotted between no. of users and spectral efficiency. The DPCA approach is compared with MILP approach. As the no. of users increases the spectrum used by them also increases. The DPCA approach increases the spectrum efficiency with respect to the power.

8 CONCLUSION

This section discusses about the purpose of power control in cross layer based MSC. Power control plays a vital role during transmission of data from satellite to ground station or vice versa. An efficient power control task leads to reduced consumption of power and improved signal quality. Initially MSN and LEO satellite communication has been addressed. The power control method with DPCA algorithm has been analyzed. The algorithm is employed in case of N>3 Tx-Rx pairs. The challenges in using this method have been discussed. Finally the comparison between the DPCA and MILP in terms of power control spectral efficiency and throughput has been clearly mentioned.

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Design of Cascaded PADDL for DPA-Resistant Secure Integrated Circuits Using Penta Magnetic Tunnel Junction

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ABSTRACT: A novel design methodology is to implement a secure DPA resistant crypto secured processor such as advanced encryption standard (AES) and triple data encryption standard (DES), by secure side-channel attacks, such as differential power analysis (DPA). The methodology is suitable for integration in a common automated standard cell ASIC or FPGA design flow. Dynamic logic is obfuscates the output waveforms and the circuit operation, which reducing the effectiveness of the DPA attack for mitigating DPA attacks for applications of secure integrated circuit (IC) design. A Penta MTJ gate that provides self-referencing, simple cascading, less voltage headroom downside in pre charge sense electronic equipment and low space. These types of gate is implemented in (PADDL). Different logic gates and different writing circuitry is required, but the sensing portion is remains same. Therefore, the information is deposited in the pinned layers using series or parallel combinations of transistors as per the logic storing in the Penta MTJ. The logic gate is authenticated by simulation at the 22nm technology node using a tanner tool.

KEYWORDS: High-performance adiabatic dynamics differential logics (PADDL), Differential power Analysis (DPA) Attack, Penta MTJ, Magnetic tunnel junction, Magneto resistance, precharge sense amplifier (PCSA).

1 INTRODUCTION

Spintronics has been under extensive research because of non-volatility, endless endurance, and low power [1].The spin is hired for storing information and the charge for its processing. It has the potential to replace CMOS logic and memory [2]. In bottomless sub-micrometer, scaling of CMOS causes the leakage power to dominate over all other power components [3]. Digital signals are represented in conventional CMOS logic by the existence or nonexistence of electrical charge in terms of voltage VDD or ground. However, in spintronics, digital signals are represented by up and down spin of electron. In recent years, researchers have developed spintronic devices, such as magnetic tunnel junctions (MTJs), which operates on the principle of tunnel magnetoresistance (TMR) [4]. An MTJ is composed of two ferromagnetic layers detached by an oxide layer with the ability to improve the performance of CMOS logic circuit in terms of power dissipation, area required, and interconnection delay [5]. It can also be easily fabricated using 3-D backend integrationprocess, which is compatible with CMOS process, without any area overhead [6].

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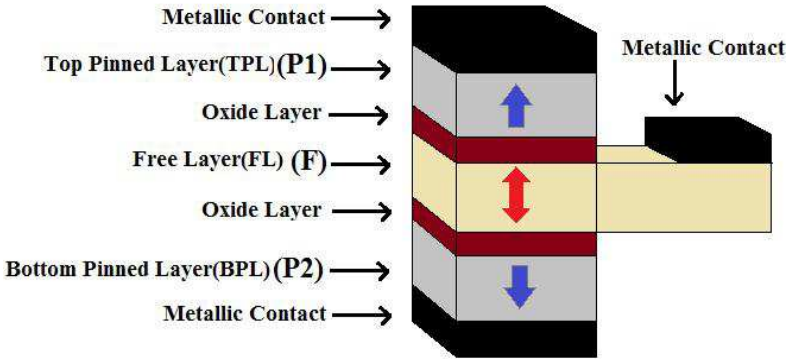

Fig.1. Structure of Penta MTJ with two pinned layers (TPL and BPL) and one free layer

MTJ has two properties such as processing and storage. Which helps to reduce the memory and interconnect delay/power[7] are needed to store the processed data back into memory. In [8] a magnetic XOR gate is containing six MTJs and the transistors. The area requirement is less nevertheless the number of MTJ increases and the writing energy also increases, which is a serious drawback of the hybrid circuit consisting of MTJ and CMOS. Friedman et al.[9] and Horowitz and Hill[10] proposed a spin diode and CMOS logic circuit respectively, which has the static power dissipation is more compared to the within power dissipation. This is due to the requirement of constant VDD supply for a node of spin-diode and the leakage-power dissipation in CMOS at the Nano scale, respectively.

SMART cards are any compact-size card that has embedded circuits. Smart cards are made up of plastic or tokens. it may provide a personal identification, authentication, data storage and application processing. They are used as credit or ATM cards , fuel cards , mobile phone SIMs, authorization cards for pay television, household utility pre-payment cards, high-security identification and access-control cards, and public transport and public phone payment cards. They are used in specific application so their size and software overhead may be minimized. In addition, smart cards are using a tamper resistant secure file system of crypto processor. They can provide a strong security authentication. In case of theft they can be programmed to preventing immediate reuse. It is more effective than cards. Due to their special importance on security to both software and hardware levels, smart card technology is moving towards multiple applications, higher interoperability, and multiple interfaces, such as TCP/IP, near-field communicators, and contactless chips.

Despite of secure software design, They still susceptible to side-channel attack, which is based on correlations of leaked secondary information and the output signal of IC. They include electromagnetic leakage, measuring[15] the amount of time required to perform private-key operations[14] and analysis of noisy power consumption[15]. In this the most effective attack is Differential Power Analysis attack(DPA)[16],where the attacker analyzes the power consumption in IC and it compares to the output of the signal. Due to the presence of entropy gain of the system provides a leaked side channel information.DPA attack is more effective, since most of the modern computing technology is based on CMOS. In this device reducing the power consumption makes the DPA attack more difficult. In this paper the design and analysis using high-performance adiabatic dynamic differential (PADDL) logic for effectiveness of DPA attack, which is a novel universal cell that perform a AND,OR,NAND,XOR,XNOR and NOR operations. The instantaneous power, average power and differential power of the PADDL cell are compared to the same metrics of conventional NAND, NOR and XNOR gates. In this paper spintronic is used instead of CMOS logic. The spin is used for storing information and charge for its processing. It has replaced to CMOS logic and memory, because leakage power is dominate the overall other power consumptions. Digital signal are represented in CMOS logic is presence and absence of electric charge in terms of voltage VDD or GND.

2 MOTIVATION AND BACKGROUND

A. DPA ATTACKS

In software systems security and hardware oriented security requires a two prong approach to smart card security. Smart card are not isolated in perfectly tamper proof location and it utilize operating system with cryptographic kernels and the memory devices are used to store. The result analysis of a chip's operation metrics are differential power consumption, radio frequencies, total execution time and magnetic field values allows attackers to gain sensitive user data.DPA attack is the use of power consumption to obtain their compromising information. In modern computing system use CMOS technology and in CMOS gate, the dynamic power consumption is proportional to its input signals[4]. Therefore,the analyze

of output power consumption allows the attacker to determination of correlation between data and key. since the CMOS gates switching is dependent on those inputs.

B. DPA PREVENTION

The primary drawbacks are addressing DPA attacks in the software level is that the power and the current variations being a analyzed by attacker occurs in the hardware level, and there is no software alogrithm,however it is effective but it can be affects the operation of a CMOS gate once it receives an input signal. Therefore, the most effective approach is to prevention of DPA attack includes security-based logic within the hardware implementation itself and to make it difficult for the attacker to ascertain the necessary information to determine their inputs. The three most important metrics are consider when designing CMOS circuits, such as power consumption, area, and operating frequency, since Ediss = C L *Vdd2 * f , where CL is the load capacitance, Vdd is the supply voltage, and f is the operating frequency.

C. PROPOSED PADDL CELL

In this section, we present method for implementation of PADDL design methodology for mitigating DPA attacks in high-performance applications. The data presented in this section was obtained using HPSICE simulations using the 22-nm predictive technology model presented [17].

The objective of PADDL is to design as a universal cell capable of dynamically performing all of the fundamental two-input logical calculations (AND, NAND, OR, NOR, XOR, and XOR) with the minimal differential power for each logical calculation. The device is both logically and physically bijective. This means that the input waveforms may be uniquely determined by reading the output waveforms, a necessity in implementation of low-power reversible and adiabatic designs.

The logical calculations of the output signals of PADDL are P = A_, P_ = A, Q = (A + B) $\oplus$ C, Q_ = (A + B) $\oplus$ C,R = AB $\oplus$ C, and R_ = AB $\oplus$ C.

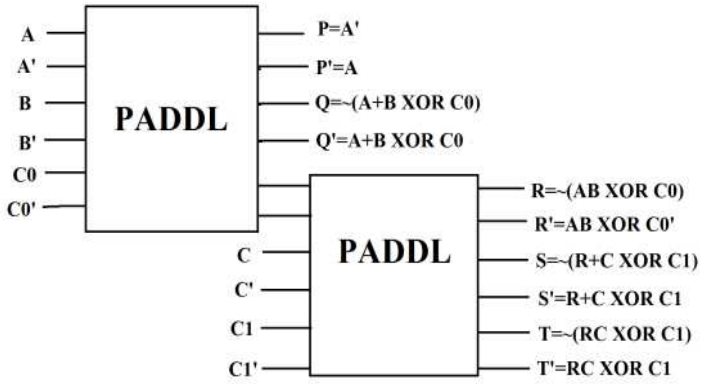

Fig.2 Cascaded PADDL cells with logic outputs shown

The arrows in the basic square diagram indicate what will occur if the signal shown is a logic 1. For example, in Fig. 2(a), if A is a logic 1, then there exists a path from C to Q, meaning that the logical values of C and Q will be equivalent. This is because the pMOS/nMOS pair will have the nMOS with 1 and the pMOS with 0, and the path will be activated. InFig. 2(b), the path from C to R will be switched OFF if A or B is 1. This is because the pMOS/nMOS pair will have the nMOS with 0 and the pMOS with 1. Therefore, to have C equal to R, then A must be 0, and B must be 0.

TABLE I.TRUTH TABLE FOR PROPOSED PADDL CELL

A	A'	B	B'	C	C'	P	P'	Q	Q'	R	R'
0	1	0	1	0	1	1	0	1	0	1	0
0	1	0	1	1	0	1	0	0	1	0	1
0	1	1	0	0	1	1	0	0	1	1	0
0	1	1	0	1	0	1	0	1	0	0	1
1	0	0	1	0	1	0	1	0	1	1	0
1	0	0	1	1	0	0	1	1	0	0	1
1	0	1	0	0	1	0	1	0	1	0	1
1	0	1	0	1	0	0	1	1	0	1	0

Control signal	P	P'	Q	Q'	R	R'
A=0	A'	A	$\overline{B \oplus C}$	$B \oplus C$	C'	C
A=1	A'	A	C'	C	$\overline{B \oplus C}$	$B \oplus C$
B=0	A'	A	$\overline{A \oplus C}$	$A \oplus C$	C'	C
B=1	A'	A	C'	C	$\overline{B \oplus C}$	$B \oplus C$
C=0	A'	A	$\overline{A+B}$	A+B	$\overline{AB}$	AB
C=1	A'	A	A+B	$\overline{A+B}$	AB	$\overline{AB}$

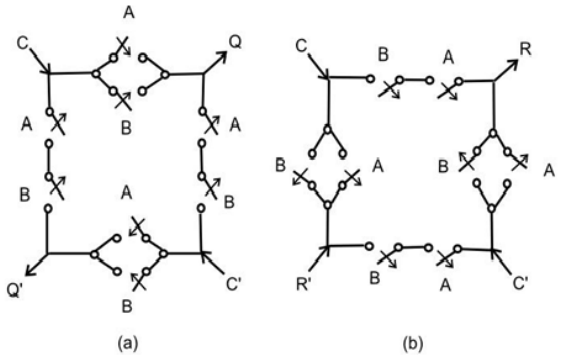

Fig. 3.Basic square circuit diagram for the proposed PADDL cell.(a) Logical calculations for the Q and Q_ outputs based on the A, B, and C inputs

The device has 32 transistors.it have their gate, drain, and source tied to an input or output signal. The pMOS transistors are biased to the minimal supply voltage, which is 0.8 V in the 22-nm model in [17], and the nMOS transistors are biased to ground. The advantage of this approach is that evaluation and discharge signals are not required, meaning that less powerrepresents the R and R_ output signals. The bottom waveform is the instantaneous power.

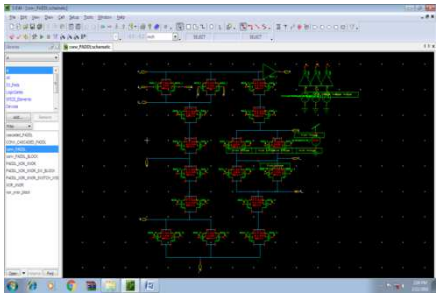

Fig 4.Conventional PADDL schematic diagram

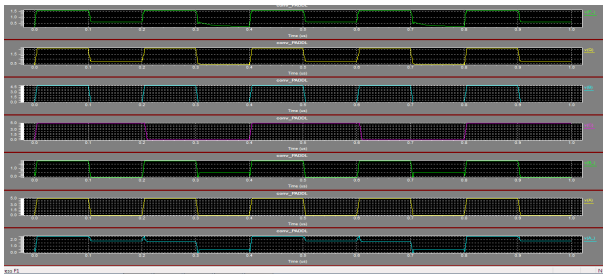

Fig 5. Simulation result for convential PADDL

3 COMPARISON TO PREVIOUS BENCHMARKS

Here, we compare our presented PADDL method with previous benchmarks in mitigation of DPA Attacks, SDMLp [18], ring- and counter-controlled delay logic (RCCDL) [19], and WDDL [20]. We reproduced those circuits in 22-nm technology using the methods presented in those papers. The average power consumption of each of these methods, as well as the conventional implementation in CMOS, is presented in Table III.The presented PADDL design is advantageous to the previous designs in average power for each of the fundamental calculations AND, NAND, OR, NOR, XOR, and XNOR. PADDL improves upon SDMLp by 76.41%, over RCCDL by 93.98%, and by 89.65% over WDDL. The implementation of SDMLp is the previously best implementation, since it uses evaluate and discharge phases. Locally, SDMLp is advantageous in terms of required transistors, since implementation of SDMLp requires 16 transistors as opposed to the 32 transistors needed in our proposed implementation. However, this advantage is erased when cascading the cells together. The hardware overhead required ensuring proper timing of evaluation and discharge stages of each cell increases exponentially as the length of the critical path of the device increases. The PADDL circuit does not require any overhead for maintaining evaluation and discharge phases, making it the better cell for larger implementations, such as DES circuits. However improving the area of the PADDL device is important. We address this issue in the next section through the use of body biasing in subthreshold operation of the adiabatic dynamic differential logic (ADDL).

In Table IV, we present the results of the average energy dissipation during the state transitions of the PADDL com-pared with the previously presented work. The frequency is 13.56 MHz, and the rise and fall times of the state transitions are 1.8436*10−8 s.

Table 2.Comparison of power

LOGIC	CMOS	WDDL	RCDDL	SDMLp	PADDL
AND	2.9182	6.9751	11.99717	3.705	0.8596
NAND	2.6382	6.4056	11.01763	3.705	0.8596
OR	2.8106	7.2350	12.4442	3.718	0.8596
NOR	3.0702	7.2350	12.18568	3.718	0.8596
XOR	3.3451	11.0587	19.02096	3.508	0.8587
XNOR	3.3451	11.0587	19.02096	3.508	0.8587
Avg	3.0212	8.3029	14.2811	3.643	0.8593
StdDev	0.2626	1.9653	3.380437	0.0961	0.0004
Transistor Required For Universal	26	42	32	16	32
Cell Area(nm^2)	505752	816983	622462	341622	532022

Eventhough PADDL has better than the other memory cells,such as ADDL,BADDL,WADDL and SDMLp.it is also has some drawbacks like more power consumption and delay because of its conventional XOR/XNOR logic so that we are adding pentaMTJ based XOR/XNOR logic for better performance

4 PENTA MTJ

1)(TPL) and 2) bottom pinned layer (BPL). The magnetizations of two pinned layers are opposite direction and fixed. In this paper, TPL (pinned 1) is parallel to the free layer when the state is assigned to 1 and BPL (pinned 2) is parallel to the free layer when the state is assigned to 0. The proposed structure of Penta MTJ [13]needs less current for writing as compared to the conventional MTJ. It requires only current for converting antiparallel to parallel state for one stack, the other stack is automatically comes into antiparallel state. Moreover, the effect of process variation of one stack is nullified by another stack and in case of Penta MTJ[13] contrary to two different MTJs, whose the process Variations degrade the performance[14]. Actually, there is no experimental data is available for the double barrier and hence, we have assumed that single barrier model is also valid for a double barrier for TMR ratio.

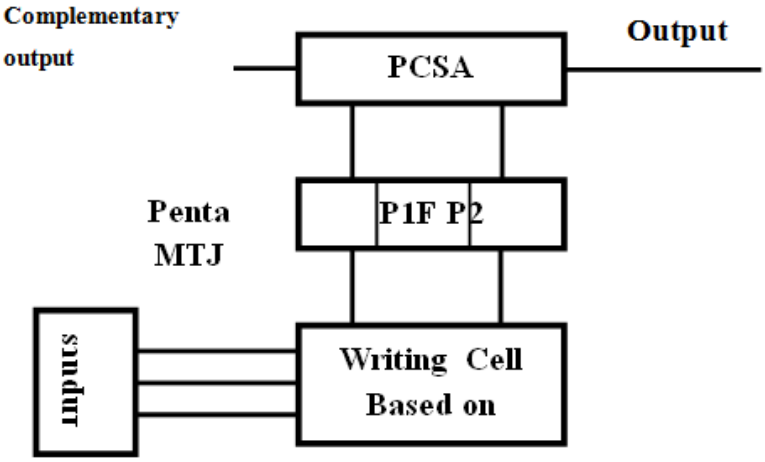

Fig 6.Block diagram of logic gates using Penta MTJ.

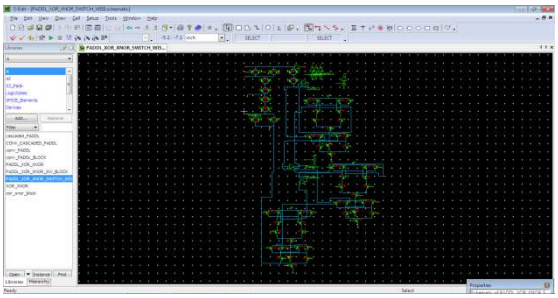

Fig7.circuit for switching diagram using penta MTJ

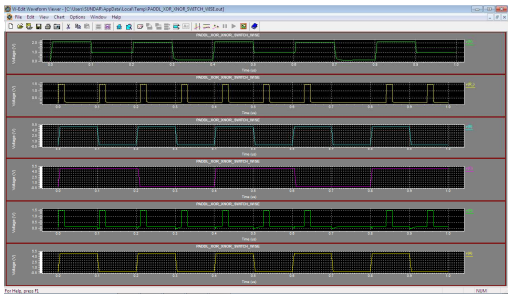

Fig 8.simulation results for switching diagram using penta MTJ

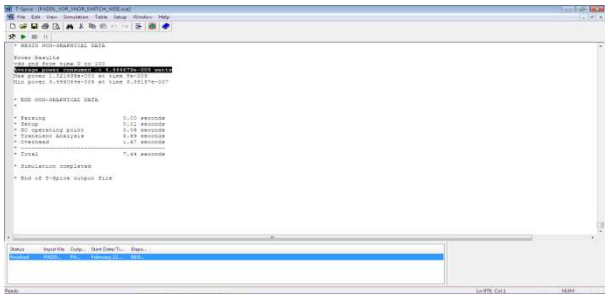

Fig 9.power consumption of switching diagram using penta MTJ

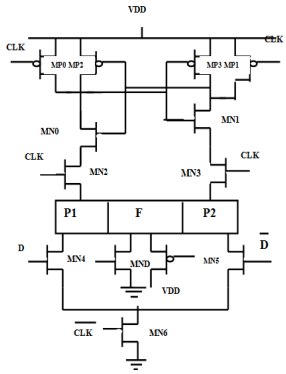

Fig 10. Writing, state detection, and amplification using PCSA of Penta MTJ cell

5 LOGICS IN MEMORY

In penta MTJ has three major important parts such as 1) PCSA (precharge sensing amplifier),2) penta MTJ logic and 3) penta MTJ writing cell. PCSA has two different phases such as precharge phase and evolution phase. The low read disturbance and dynamic sensing capability of an penta MTJ can reduces the delay. During precharging, CLK is low which disconnects the upper half from the lower half, i.e., precharging of PCSA at the time of writing leads to less delay as well as improved design. The PentaMTJs writing operation is done only one direction (from antiparallel to parallel state). Hence, the PCSA is discharging in only happens through the Penta MTJ and not through the writing transistors.

6 LOGIC GATES USING PENTA MTJ

The combinational and sequential circuits are building by logic gates. It is act as basic building blocks of Penta MTJ. The basic structure of Penta MTJ based logic gate is divided into three parts, as shown in fig.3(a) and described in section II.Fig.3(b) shows the based logic gates of penta MTJ.The different logic gates are required different writing circuitry but its sensing portion is remains identical.Hence,the information is saved in the pinned layer using series or parallel combinational of the transistor as the logic. The storing logic information of penta MTJ is designed such as for storing1,all logic combinations with high output are combined and the net expression is evaluated using K -map and for storing 0, the complement of the expression is evaluated. Fig. 6 shows the simulation results of logic gates. The A and B are the two inputs and its output 0 means discharging of PCSA where as 1 means no discharching of PCSA for the normal output. The evaluation phase begins after precharging the outputs of the PCSA to VDD using the clock CLK.

7 RESULT AND DISCUSSION

Using penta MTJ, the self-referencing property of the Penta MTJ is useful in decreasing the area overhead because of its differential nature. The switching current density in PMA is directly proportional to the magnetization, anisotropy field, and the thickness of the free layer. The thermal stability factor of MTJ/Penta MTJ governs the data retention capability of the digital logic. As compared with CMOS logic, the proposed magnetic logic gates consume more power and delay in writing but this logic gate consumes little static power which is a major power contributor along with the interconnect power at the Nanoscale.

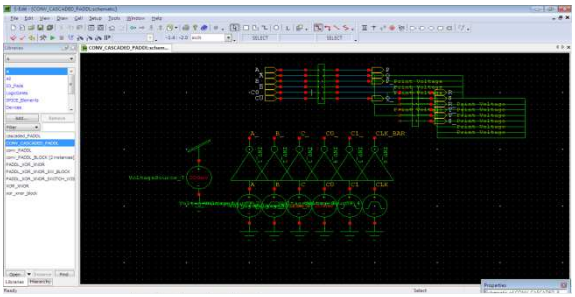

Fig 11. Circuit diagram for cascaded PADDL using conventional CMOS

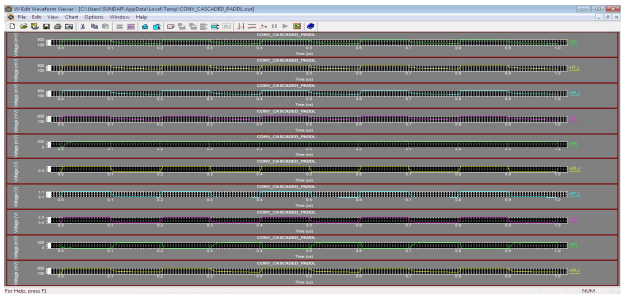

Fig 12.simulation results for cascaded PADDL using conventional CMOS

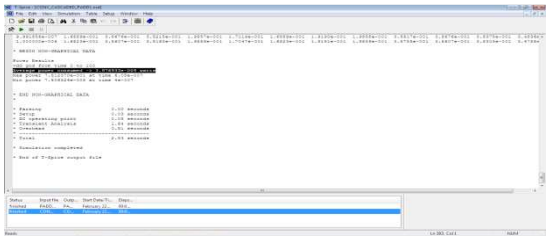

Fig 13.power consumption of conventional cascaded PADDL

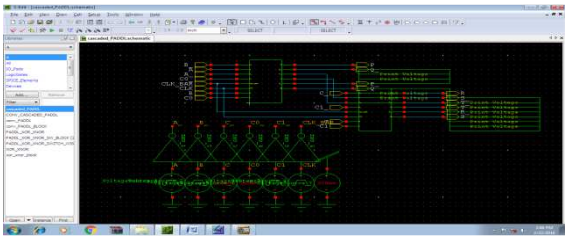

Fig.14 Circuit diagram for cascaded PADDL using penta MTJ

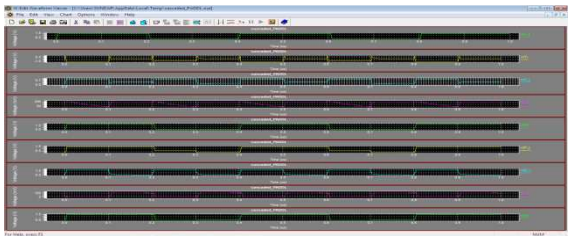

Fig.15 simulation results for cascaded PADDL using penta MTJ

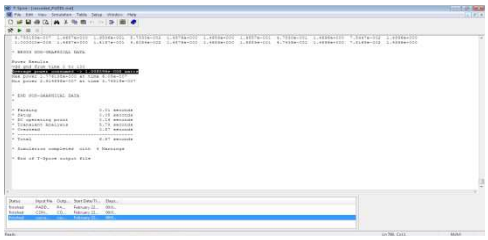

Fig.16 power consumption for cascaded PADDL using penta MTJ

CONCLUSION

In PADDL memory cell is constructed using conventional xor/xnor CMOS logic for reducing power consumption and delay but it is not achieved by using conventional xor/xnor CMOS logic. So that we are preferring penta MTJ –based CMOS logic for reducing power consumption and delay. In PADDL memory cell has almost all gate operations in it, so that we are using this memory cell in penta MTJ for easy cascading, self synchronization, less voltage headroom and better performance. The attractive features of MTJ/Penta MTJ-based CMOS logic are low static power, short interconnect delay and effective power gating because of non-volatility. Penta MTJ-based logic decreases the area overhead by removing the intermediate circuitry needed for conversion of voltage to current or current to voltage. Moreover, no initial condition is required for performing the logic operation and self referencing property removes the extra MTJs used for referencing. Penta MTJ also provides guaranteed disturbance free reading and increased tolerance to process variations due to its differential nature.

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Design of an efficient NOR Content Addressable Memory Bit cell Using memristor and MT-CMOS in FinFET Technology

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ABSTRACT: Content addressable memories (CAMs) are type of computer memory that is used in search intensive applications. It involves content based searching. The conventional CAM is designed using MOSFET, due to which the power consumption is very high because of parallel architecture and short channel Effects such as leakage current. However, the current trend is to use a new non planar device architecture, the so called FinFET to overcome the problems of planar MOSFET stated above. Among the alternatives to planar MOSFET, FinFET is proved to be more efficient in terms of power. Although the CAM using FinFET is efficient ,it is volatile. In order to make it non-volatile, a new element called memristor can be used. Also, when the device is idle,the leakage will be high. This can be overcome by the use of MT-CMOS for power gating. This paper proposes a novel design of NOR content addressable memory bit cell using memristor and MT-CMOS in 22-nm FinFET Technology. The design has been simulated in 22nm FinFET technology using Tanner EDA tool.

KEYWORDS: Content addressable memories (CAMs), FinFET, memristor, MT-CMOS, Short channel Effects, Tanner EDA, Power Gating Technique.

1 INTRODUCTION

Content addressable memories (CAMs) are computer memories, also known as associative memory that search data based on content instead of explicit address. The data to be searched is given as input to the CAM, and then the CAM compares the input data with data previously stored in the lookup table. If the data is matched, it outputs the location of the matched data within a single clock cycle. Thus it is mainly used in applications that require high speed search operations such as in translation look-aside buffers (TLBs), network routers database accelerators, image processing, parametric curve extraction, Hough transformation, Lempel–Ziv compression, image coding, virus detection and Huffman coding/decoding [3], [4]. Because of this fast searching operation in CAMs, there will be high dynamic power consumption [5] [6].This was a major problem in the CAM designed in the past. But, due to advancements in CMOS technology, leakage in memories became a huge concern [7] [8]. As the transistors are scaled in nanoscale, transistors are kept very close to each other, which increases the parasitic effects between individual circuit node than the transient behavior of memory bitcells, such as SRAMs [9][10]. When transistors are scaled to nanoscale, the conventional MOSFET started losing its property due to short channel effects. Multi-gate devices started replacing conventional MOSFETs. Double Gate FETs (DGFETs) are better substitute to planar MOSFETs as the two gates aid a better electrostatic control over the channel. FinFET is a type of DGFET that has better scalability and compatibility with the planar CMOS process [12], [13].

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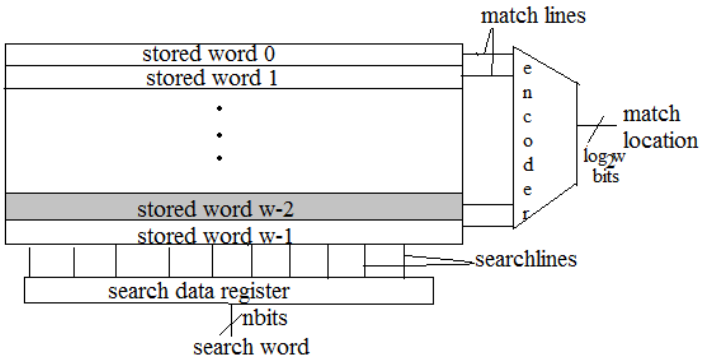


Fig 1.BLOCK DIAGRAM OF CAM

FinFETs are of three types, namely, Shorted Gate(SG), Asymmetric gate-workfunction Shorted –Gate(ASG), Independent Gate (IG). In the SG type FinFET, the two gates are shorted together and it yield largest ON current (I_{ON}).The ASG type FinFET is similar to shorted gate, but the two gates have different workfunctions. It has the same layout area as that of SG FinFET, and has lower leakage current achieved at the cost of 26% degradation in the drive current (I_{ON}). In IG FinFETs, the two gates are made independent by etching away the gate material above the vertical channel. Though the leakage current in IG FinFETs is one to two orders of magnitude lower than that of SG FinFETs (with appropriate back-gate bias), it is at the expense of a severe degradation in ION and increase in layout area due to the need to insert back-gate contacts [14]-[16].Out of the three FinFETs, SG FinFET is fast but leaky and ASG FinFET is slower but less leaky. IG FinFETs are less leaky but there is an increase in area. However, we employ SG FinFET than the other two types in designing CAM as it is superior in terms of delay and area[2].

2 CAM REVIEW

In this section, operation of the CAM and an example of its use in routing is described.

A. OPERATION OF CAM

Fig. 1 shows a simplified block diagram of a CAM. It consists of search data registers, encoder, match lines, lookup table. The input data is given to the search lines which are connected to the lookup table. All the matched lines are pre-charged to High level. The CAM bitcell compares the input bit with the stored bit. Matchlines with all bits matched maintain in the pre-charged high state. Matchlines in which at least one bit mismatch, discharges to ground. The match lines are given to an encoder that generates the match location corresponding to the matchline that is in the high state. A simple encoder is used if only one match is probable. Some CAM applications will produce more than one word as match. In such cases, a priority encoder is used instead of simple encoder [1].

B. EXAMPLE

An example of operation of CAM in Network routers is shown in Fig.2.The router has a routing table like TABLE I that has four entries. The “X” in the table denotes the “don’t care” which means X may be 0 or 1. For example, if router obtains a packet with destination address 10010, the packet is forwarded to port A. Suppose if packet with destination address 1101X is given to router, then both entry 3 and 4 matches in the lookup table. But, entry 3 is selected, since it has less X bits. The entry 3 is encoded to match location 10.This match location 10 is given as input address to RAM.RAM which contains a list of ports, outputs port 3 corresponding to input address 10. Then the packet is forwarded to port 3 [1].

TABLE I. EXAMPLE ROUTING TABLE

Entry No	Address(binary)	Output Port
1	100XX	A
2	1010X	B
3	1101X	C
4	110XX	D

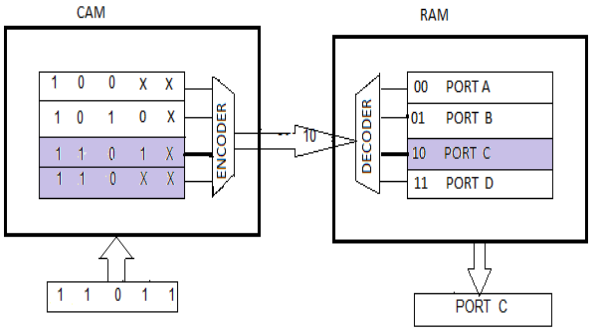


Fig2. CAM BASED IMPLEMENTATION OF ROUTING TABLE I

3 NEED FOR MEMRISTOR AND MTCMOS

While designing analog circuits, passive elements like capacitors, inductors and resistors are mostly used. But, there exists an another fundamental element called memristor which is made of semiconductor .Its resistance is called as memristance and it varies as a function of flux and current. It has many advantages: requires less energy and produces less heat. It won't consume power during idle state and are suitable with CMOS interfaces. Now, the undergoing research is how to use memristor in various analog, digital circuits, computers and sensors. For circuit level simulation, spice model of memristor is used which is efficient in terms of both size and power dissipation. In order to make CAM as non-volatile, spice model of memristor can be used. Fig.3 shows the symbol of memristor.

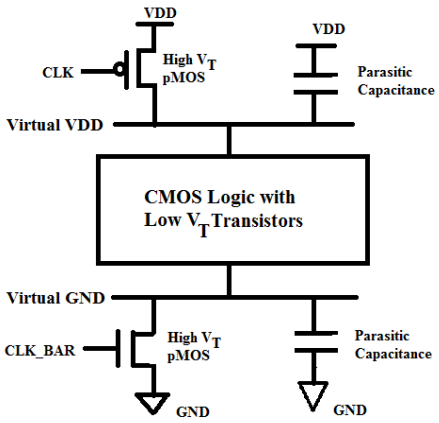


Fig.3 Symbol of memristor *Fig.3.2 Generic structure of a MT-CMOS logic gate*

Circuits based on single threshold voltage suffer from increased delay, power consumption and less responsive in producing output. These defects can be overcome by the emergence of a technique that use MOSFET with multi-threshold voltage. Most of the low power designs came into existence only with the use of this MT-CMOS Technique. The purpose of this MT-CMOS is to enable high speed operation during active mode and less power consumption during idle mode. This is achieved using both high and low threshold voltage (Vt) transistors. Low Vt transistors in the signal path as shown in Fig.3.2. reduces power dissipation without degrading the performance. High Vt transistors shown in Fig.3.2., also known as sleep

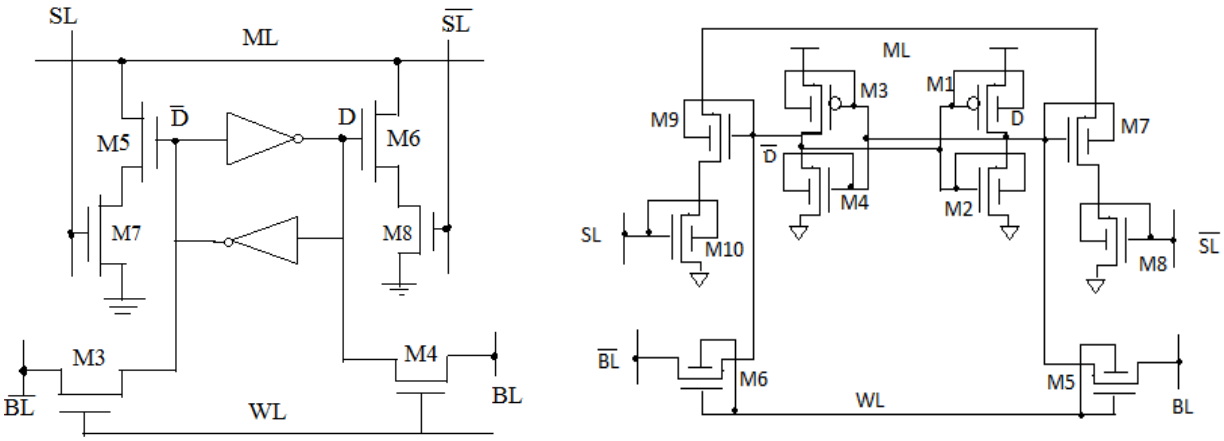
transistors, are used to isolate the circuit from the power rails so that the static power dissipation in the idle mode is reduced.

4 DESIGN OF FINFET CAM

In the architecture of CAM,the major part is CAM bitcells.In this paper,such a CAM bitcell is designed using Shorted Gate type FinFETs and memristor and MT-CMOS are included to improve its performance.

A. CAM CELL CIRCUITS

Each CAM bitcell contains two parts: a storage unit and a comparison circuitry. The storage unit is the one in which data is stored. The comparison circuit is to compare whether the search data is matched with stored data.Two types of CAM cells are used in most of the CAMs:Binary CAM cell



(a) Using conventional MOSFET *(b) Using SG FinFET*

Fig.4.1. Schematic diagram of NOR CAM bit cell

(BCAM) and Ternary CAM cell (TCAM). The BCAM cell is made of 6-9 transistors, while TCAM cell requires 12-17 transistors in standard CMOS design. Since the die area of TCAM is larger than the BCAM, BCAM is mostly preferred [1].

B. CAM USING SG FINFETS

In this paper, BCAM NOR cell is designed using ten transistors. The storage unit is made of a typical 6T SRAM cell. The comparison unit is made of XOR/XNOR matching circuitry for data comparision. CAM can be classified into NOR, NAND categories. The NOR CAM bitcell using conventional MOSFET is shown in Fig. 4.1(a), has cross coupled inverters and transistors M3 and M4 that forms the storage unit, while M5-M8transistors form the comparison unit. In the proposed diagram as shown in Fig. 4.1(b), the same NOR BCAM bitcell is designed using SG type FinFET. In that Fig. 4.1(b), M1–M6 forms the core SRAM cell, while transistors M7–M10 form the matching circuit. In the proposed architecture shown in Fig.4.2, a memristor is used in between VDD and the drain of M1 and M3. When VDD is ON, the memristor will be in cut off region. So, it transfers the charge fast down, and the CAM bit cell performs normal read and write operation. When VDD is OFF, it goes to saturation region and hence retains the data in the CAM Cell. It does not allow the normal operation such as read and write but allows to retain the data in the form of charge. The memristor is designed in 3nm technology because of less number of transistors and reduced size compared to 22nm technology. The memristor consists of comparator, multiplier and current conveyor. Here, double tail comparator is used. Thus, the proposed CAM will be equipped with non-volatile property and also it will have reduced.

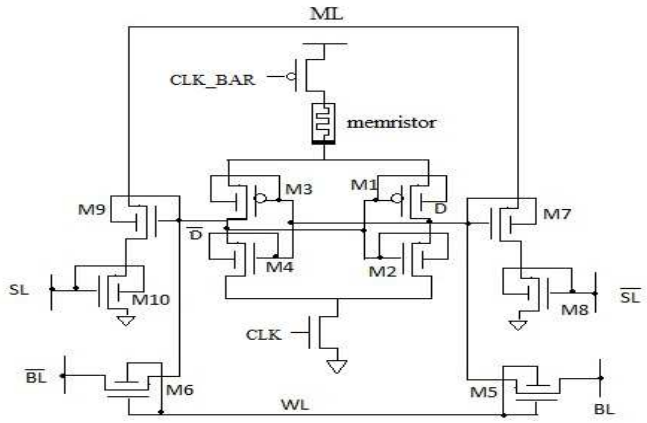


Fig.4.2 Proposed CAM bit cell using memristor

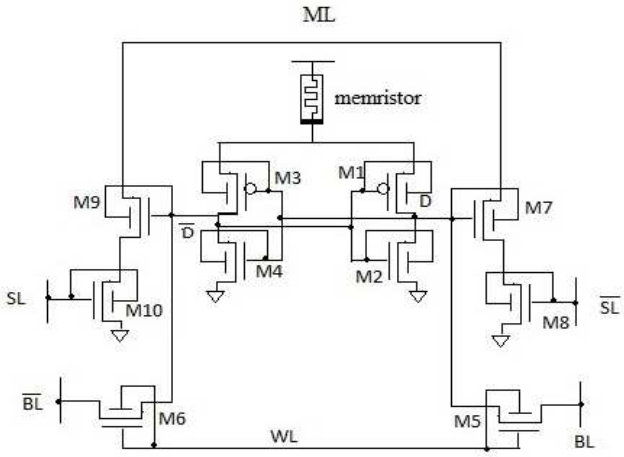


Fig.4.3 Proposed CAM using memristor and MTCMOS

Power consumption. Even though the CAM using memristor is efficient than the previous designs, the leakage still exists. When the device is idle, the leakage power increases. So, there is a need to turn off the device when it is idle. In order to achieve Even though the CAM using memristor is efficient than the previous designs, the leakage still exists. When the device is idle, the leakage power increases. So, there is a need to turn off the device when it is idle. In order to achieve this, it must be isolated from power rails.

For this, a novel architecture is proposed as shown in Fig.4.3, an additional PMOS is connected in between VDD and memristor and NMOS in between sources M2,M4 and GND. Thus, it will turn ON transistors only when CLK is enabled i.e. only when the CLK is HIGH or CLK_BAR is LOW. When the CLK is given HIGH, the device is connected to the power rails and it performs the normal operation. When the CLK is given LOW, the device is isolated from the power rails, thus reducing the leakage power. Thus, by using both memristor and MTCMOS an efficient CAM can be designed. By designing so, the average power consumption is reduced.

5 EXPERIMENTAL RESULTS AND COMPARISON

STEPS INVOLVED IN OBTAINING OUTPUT

STEP 1: CIRCUIT DESIGN USING S-EDIT

S-Edit is used to draw the schematic of the CAM bit cell. The CAM design shown in Fig.4.1(a),4.1(b),4.2,4.3 is drawn in S-Edit (Schematic Editor) of Tanner EDA as shown in Fig.5.1,Fig.5.2 and Fig 5.3 respectively. In order to draw, Predictive Technology Model (PTM) in 22nm library is used Since we use 22nm technology, the VDD required for the CAM bit cell is given as 200mv.The output is to be taken from D and D'. Then, the circuit is simulated. For Fig.4.2 and 4.3, 3nm memristor and 22nm MT-CMOS is used and the circuit is simulated.

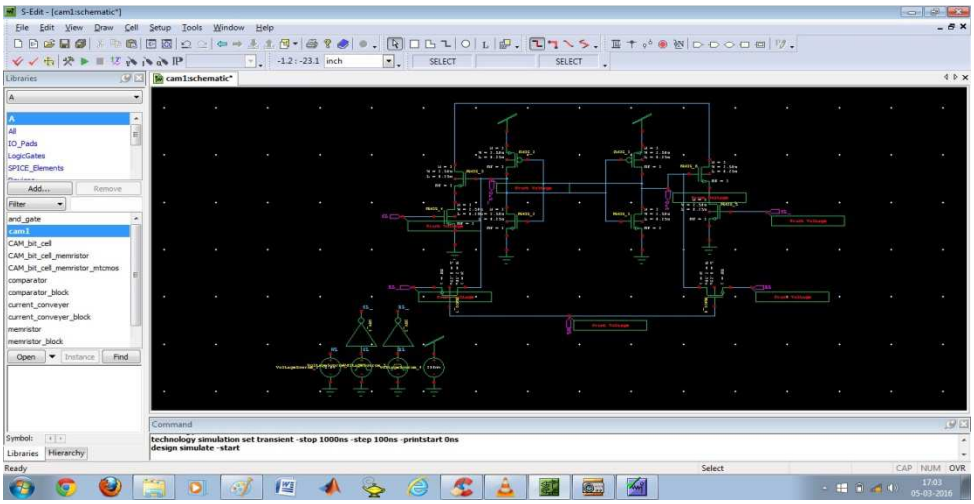


Fig.5.1 Schematic of NOR CAM bit cell using MOSFET in S-Edit Tool

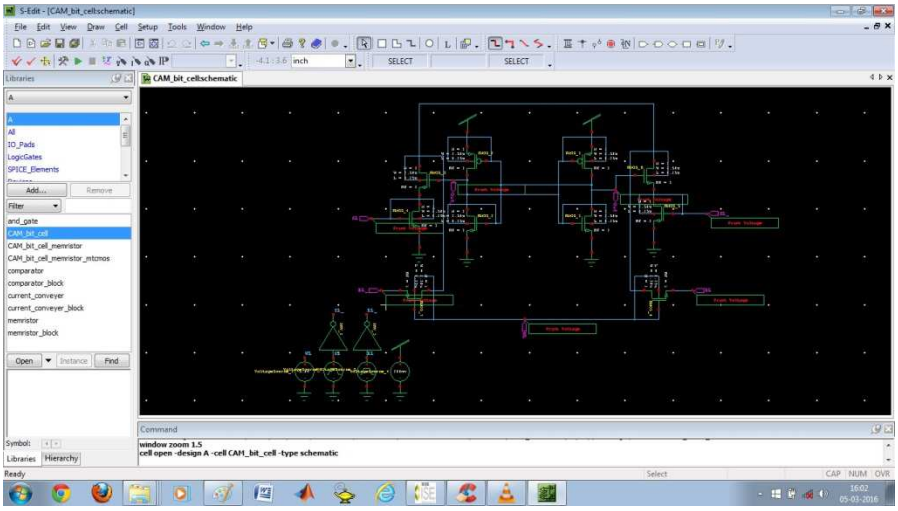


Fig.5.2 Schematic of NOR CAM bit cell using MOSFET in S-Edit Tool

STEP2: VIEWING THE WAVEFORM IN W-EDIT

After simulating the circuit in S-Edit, the W-Edit window opens and gives all the waveforms of the input and outputs such as waveforms of select line (SL,$\bar{L}$), match line (ML,$M\bar{L}$)and bit lines (BL,$B\bar{L}$) and output at D and D'(OUT,OUT_) are shown in Fig.5.5 , Fig.5.6,5.7,5.8 respectively.

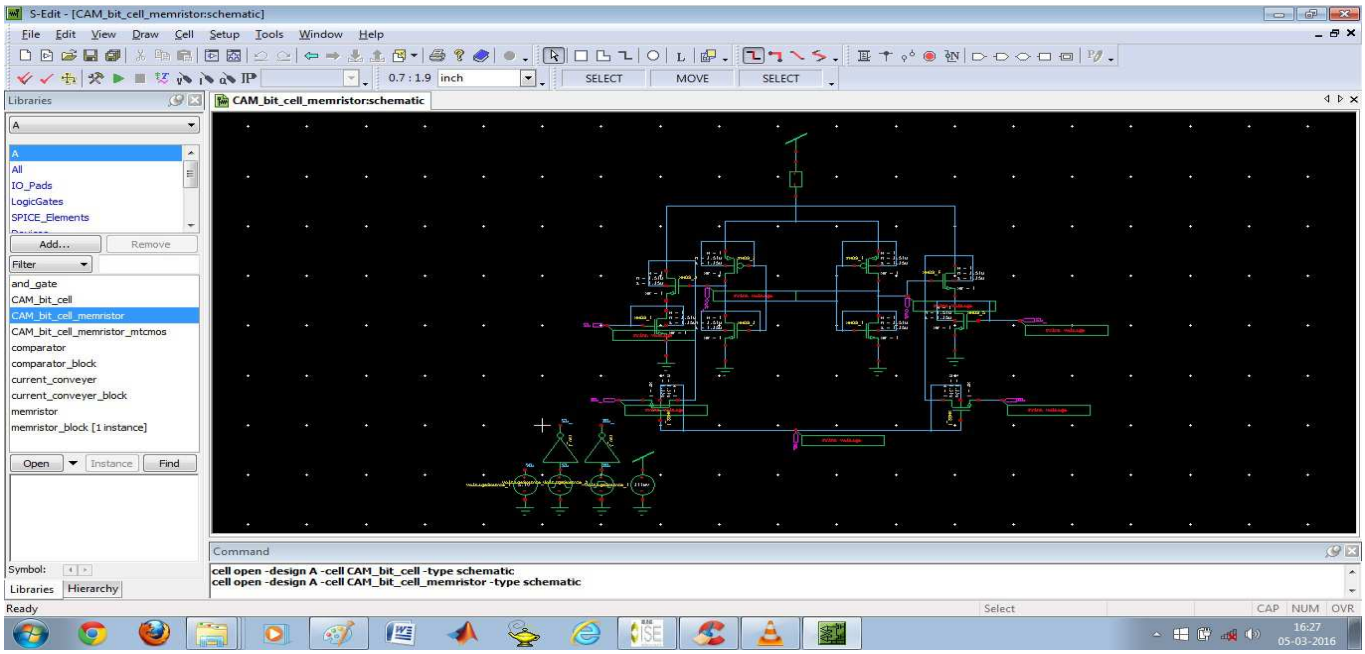


Fig.5.3 Schematic of proposed NOR CAM bit cell using memristor in FinFET Technology in S-Edit Tool

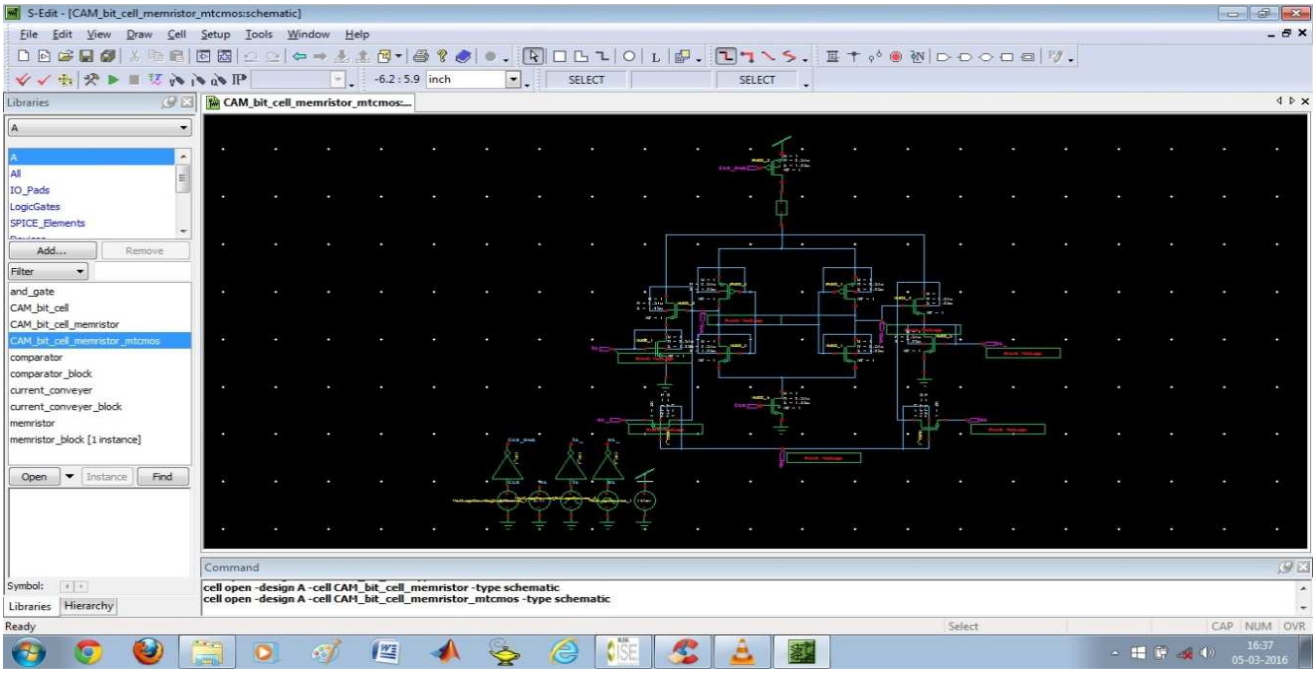


Fig.5.4 Schematic of proposed NOR CAM bit cell using memristor and MT-CMOS in FinFET Technology in S-Edit Tool

STEP 3: REPORT FROM T-SPICE

After the circuit is simulated in S-Edit Tool, it generates a code or program in T-Spice. Then, in order to find the power consumed, a code (.power) is used and temperature command (.temp) is used to obtain power in three different temperatures at 20,40 and 60 degree Celsius. Now, the T-spice code is simulated and the power outputs obtained are used for comparison as shown in TABLE 6.1. A graph is plotted for TABLE II as shown in Fig.5.9

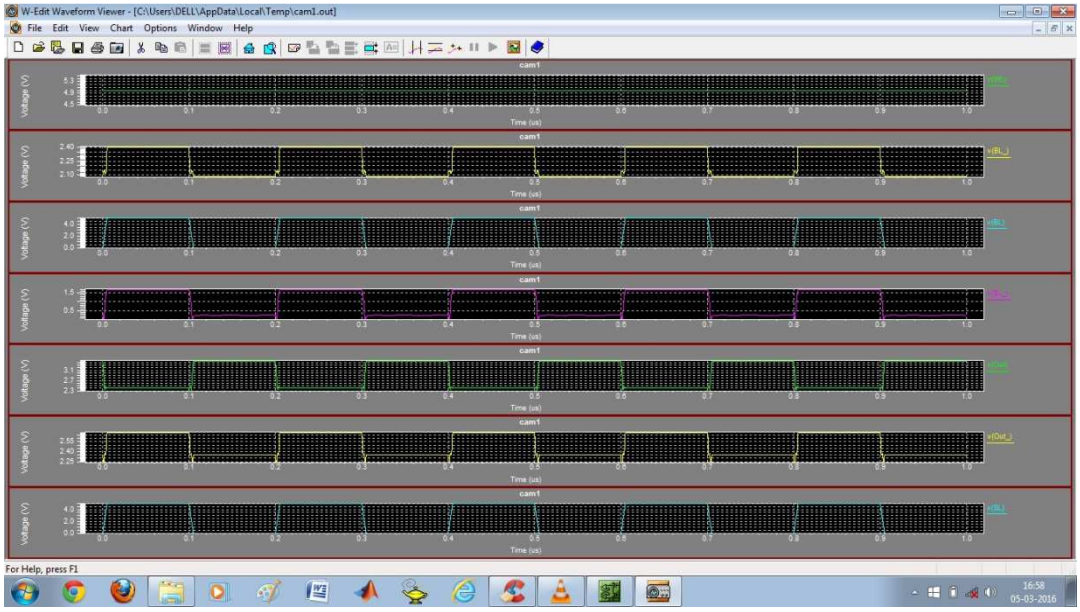


Fig.5.5 Output Waveforms of the NOR CAM bit cell using MOSFET in the W-Edit

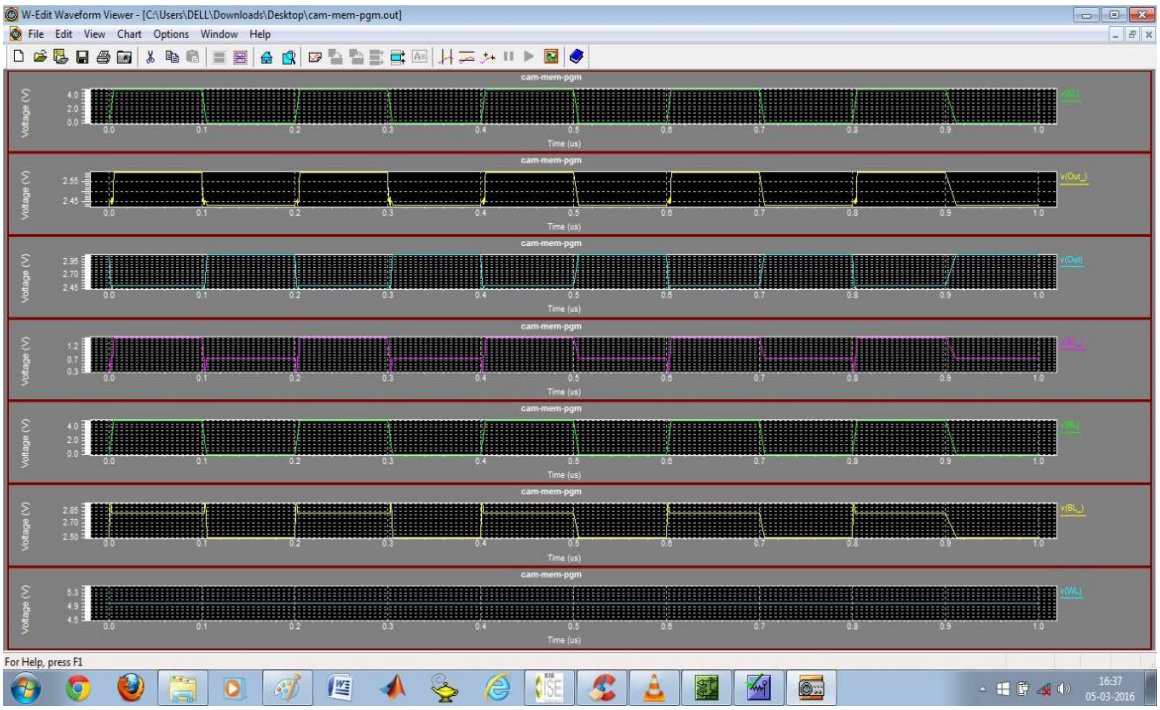


Fig.5.6 Output Waveforms of the NOR CAM bit cell using FinFET in the W-Edit

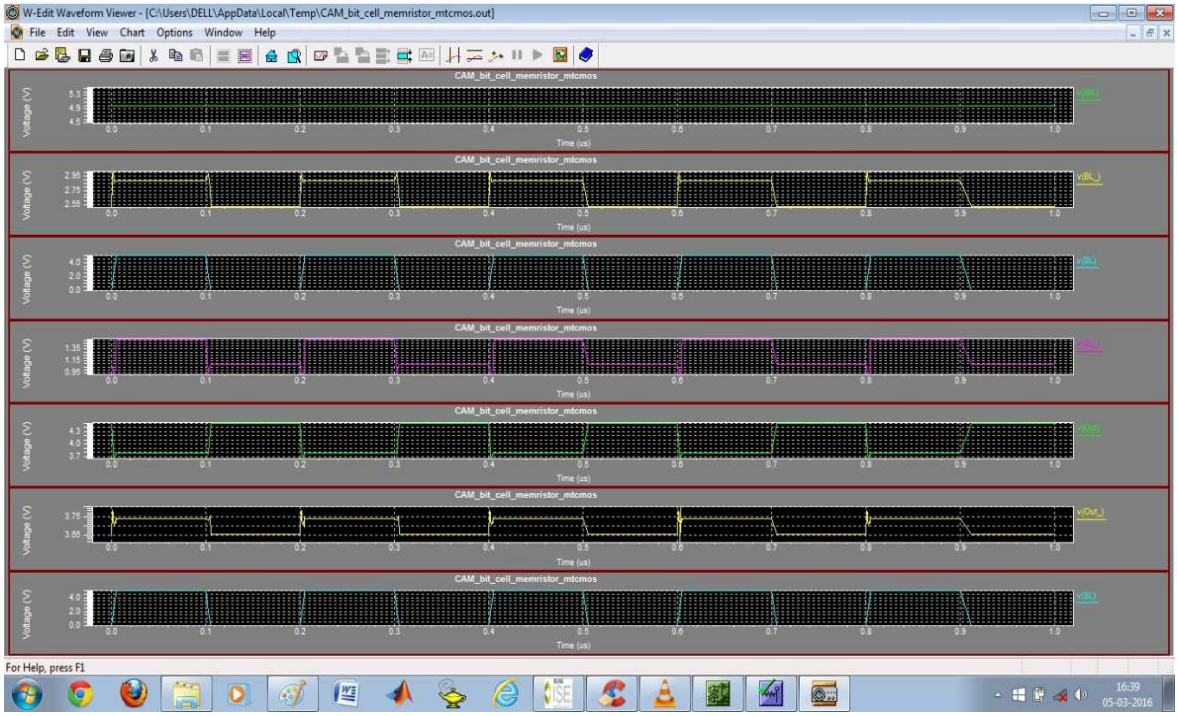


Fig.5.7 Output Waveforms of the NOR CAM bit cell using memristor in the W-Edit

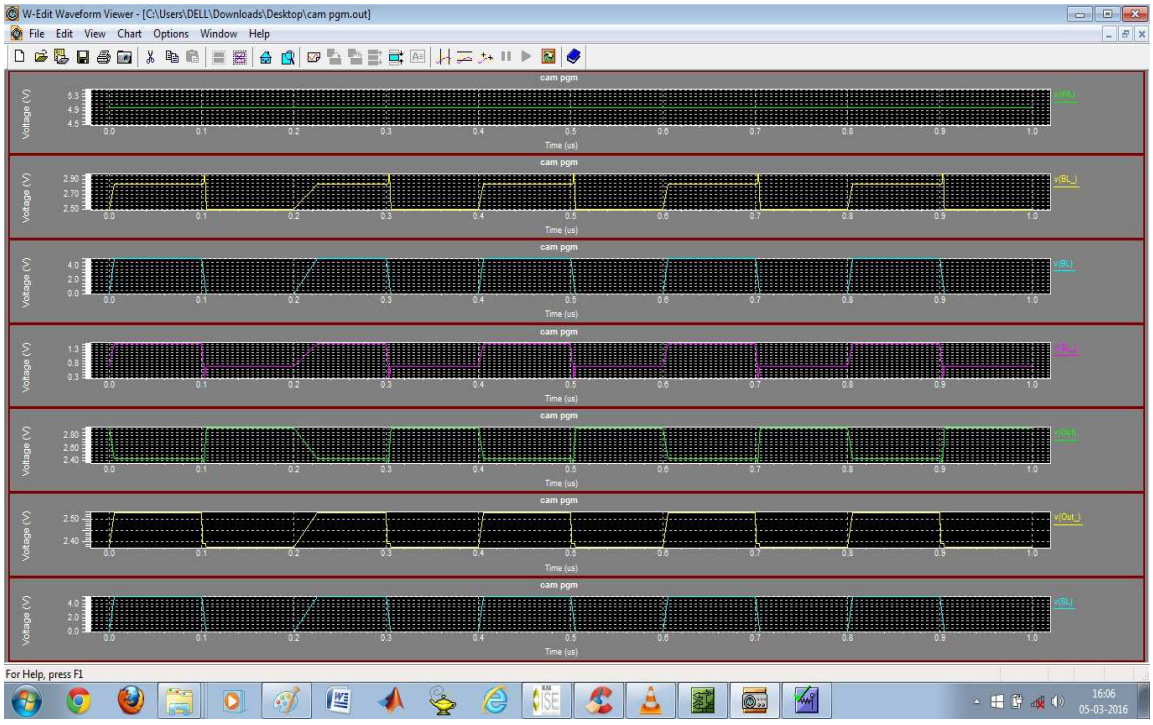


Fig.5.8 Output Waveforms of the NOR CAM bit cell using memristor and MT-CMOS in the W-Edit

COMPARISON OF OUTPUT

Fig 5.9 shows the comparison of power consumed at three different temperature

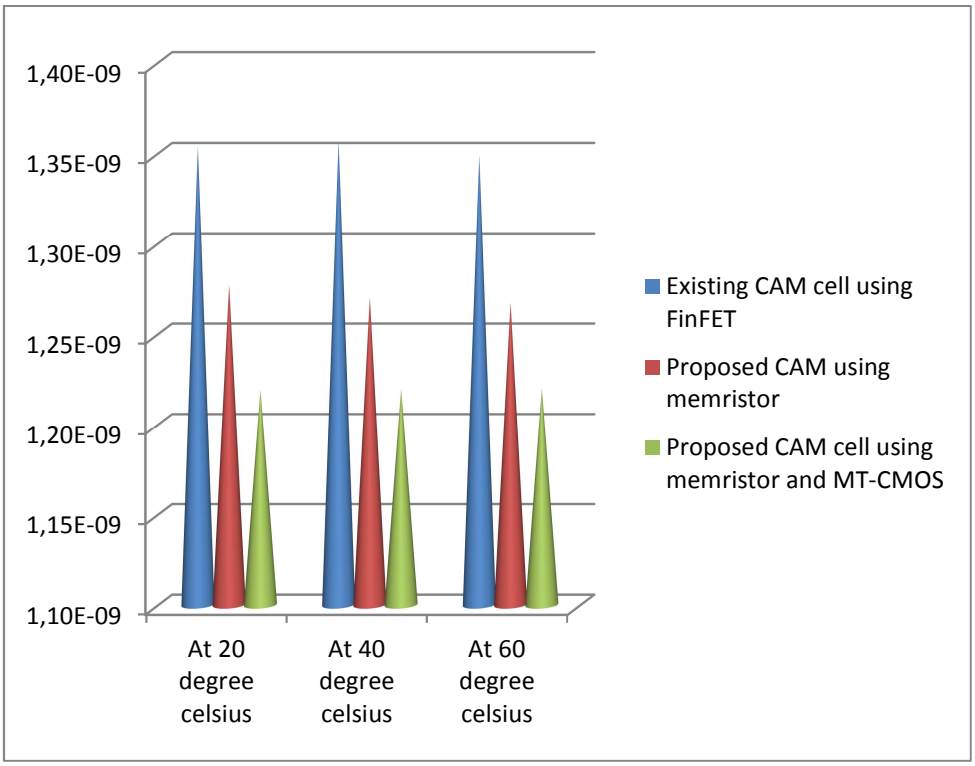


Fig.5.9 Comparison of average power consumed

6 CONCLUSION

The most important consideration in designing a device is less power dissipation and high performance. In this paper, An efficient design of Content Addressable memory using two elements namely, memristor and MT-CMOS has been presented. Because of the inclusion of memristor in the circuit, the CAM becomes non-volatile i.e. holds the data even when the device is not powered. This non-volatile property is nowadays an important consideration. Also, the usage of MT-CMOS reduces the leakage power which in turn reduces the average power consumed. Thus , a low power design of CAM is proposed and the design is drawn in S-Edit of Tanner EDA and output waveforms are seen in W-Edit and the average power consumed is measured. From the report obtained in T-spice. The graph showing comparison of the average power consumed in existing and proposed CAM is drawn. Thus, there is a significant reduction in the average power consumed. If a low power design of CAM is required, then the same circuit can be implemented in any of the logic styles of adiabatic logic using FinFET technology.

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Fabrication of Fire Fighting Robot

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ABSTRACT: In today's commercial, industrial and domestic world, Automation plays an important role, it is actually an arrangement of different elements in order to regulate, direct, sense and command itself to achieve a desired result. "Automatic Fire Fighting Robot" project employs the electrical thermostat technology for the controlling the fire 24 hrs. Robotics has gained popularity due to the advancement of many technologies of computing and nano technologies. So, we proposed to design something that can make humans life easier and comfortable. There are many possibilities a fire can start in an industry or in any remote area. For example, in cotton mills, garments, fuel storages, etc., electric leakages can lead to huge damage. Also it's a worst-case scenario, causing heavy losses not only financially but also destroying areas surrounding it. Robotics is the emerging solution to protect human lives and their wealth and surroundings. The aim here is to design a FIRE FIGHTING ROBOT using Arduino system. A robot capable of fighting a simulated household fire will be designed and built. It must be able to autonomously navigate through a modeled floor plan while actively scanning for a flame. The robot can even act as a path guider in normal case and as a fire extinguisher in emergency. Robots designed to find a fire, before it rages out of control, can one day work with fire-fighters greatly reducing the risk of injury to victims. The project will help generate interests as well as innovations in the fields of robotics while working towards a practical and obtainable solution to save lives and mitigate the risk of property damage.

KEYWORDS: DC Motor, Relay, Arduino Board, Motor Drive, Flame Sensor.

1 INTRODUCTION

Robotics is one of the fastest growing engineering fields of today. Robots are designed to remove the human factor from labor intensive or dangerous work and also to act in inaccessible environment [1].

The use of robots is more common today than ever before and it is no longer exclusively used by the heavy production industries. The need Fire extinguisher Robot that can detect and extinguish a fire on its own is long past due. With the invention of such a device, people and property can be saved at a much higher rate with relatively minimal damage caused by the fire. Our task as engineers was to design and build a prototype system that could autonomously detect and extinguish a fire. Also aims at minimizing air pollution. It is the Robot that can move through a model structure, find a lit candle and then extinguish it with help of a fire extinguisher. Our research paper describes the design of a small autonomous Fire Fighting Robot. We have worked on the same project at our college presenting a synopsis showing its basic construction and working [2].

The Fire Fighting Robot is designed to search for a fire in a small floor plan of a house of the specific dimensions, extinguish the fire with the help of the fire extinguisher, and then return to the front of the house. The fire detection to be put into use is relatively free of false alarms, it is anticipated that it will not overreact in nonfire simulations. This mission is divided into smaller tasks, and each task is implemented in the most efficient manner such as self-autonomous start of the robot, navigation of the robot in every room step by step, finds the fire in a specific room, approaches the fire at a very fixed distance, extinguishes it and finally returning to the front of the house.

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2 LITERATURE SURVEY

J. Reinhart V. Khandwala (2003) was et all discussed about design and the implementation of the fire-fighting robot. The key design elements of the robot to be discussed include: the assembly and construction of the robot hardware, the processing algorithm based on the sensors response, and the navigation algorithm that will enable the robot to find an efficient path in and out of the house model [1]

Lynette Miller Daniel Rodriguez (2003) was et all discusses the development of each component of the robot that is designed to find a small fire represented by a light emitting diode in a model home and extinguish it. This paper will talk about each component of the robot from the start signal to the robot platform to the line following and room finding and finishing with the fire detection [2].

Sahil S.Shah (2013) was et all discussed about design a FIRE FIGHTING ROBOT using embedded system. A robot capable of fighting a simulated household fire will be designed and built. It must be able to autonomously navigate through a modeled floor plan while actively scanning for a flame. The robot can even act as a path guider in normal case and as a fire extinguisher in emergency. Robots designed to find a fire, before it rages out of control, can one day work with fire-fighters greatly reducing the risk of injury to victims. The result shows that higher efficiency is indeed achieved using the embedded system [3].

U.Jyostna Sai Prasanna, M.V.D.Prasad (2013) was design the fire detection system using four flame sensors in the firefighting robot, and program the fire detection and fighting procedure using sensor based method. The firefighting robot is equipped with four thermistors/flame sensors that continuously monitor the temperature. If the temperature increases beyond the predetermined threshold value, buzzer sounds to intimate the occurrence of fire accident and a warning message will be sent to the respective personnel in the industry and to nearby fire station with the GSM module provided to it [4].

Swati A. Deshmukh (2015) was et all discussed about the fire detection system using sensors in the system, and program the fire detection and fighting procedure using sensor based method [5].

Saravanan P (2015) discussed about the Design and Implementation of this project is mainly based on control of Semi - Autonomous mobile robot (SA-BOT). The system controls four DC Geared motors which is powered by the Atmega2560 and controlled autonomously by Navigation system which comprises of integrated ultrasonic and infra-red sensors. The bot is outfitted with wireless camera which captures the video and transmits it to the base station. The fire detection system comprises of LDR and temperature sensor, if there is a fire, the sensors detects it and the bot will be moved to the source and starts extinguishing it. The Extinguishing System comprises of a BLDC motor with water container. The SABOT can also be operated manually for extreme conditions. We have provided a GUI support through which the bot can controlled from the base station [6].

Swati A. Deshmukh (2015) was et all discussed about the fire detection system using sensors in the system, and program the fire detection and fighting procedure using sensor based method [7].

Abhilash Dhumatkar, Sumit Bhiogade (2015) was et all Automatic Fire Fighting Robot" project employs the electrical thermostat technology for the controlling the fire 24 hrs. The system is cost effective, has a wide applications which when implement can show good and effective result. Synchronization of various equipment involve in the system i.e Thermostat Sensor, water jet, wireless remote and wireless android device WiFi enabled Camera. This is mean to simulate the real world operation of Robot performing a fire extinguishing function. Fuzzy logic provided an appropriate solution to the otherwise complex task of mathematically deriving an exact model for the non-linear control system upon which conventional control techniques could then be applied [8].

By review the various studies show that firefighting robot **usingarduino system** is not yet studied.so the aim present work is firefighting robot **usingarduino system** has been performed, and theproject is designed by following blocks fire sensor, Arduino board, line tracking sensor , Motor with driver circuit , Robot model, and Driver circuit with relay and Fire extinguisher.

3 EXPERIMENTAL METHODOLOGY

A. FIRE FIGHTING ROBOT PROCESS

It is a robot that autonomously detect and extinguish fire. It use flame sensor for detection and arduino board for processing. Fire extinguisher along with electronic valve (actuator) is used to extinguish the detected fire. The robot rotates

while actively scanning for fire. This scanning is performed by sensors placed on the sides. When a fire is detected, itmoves in the direction of fire an stops 30 cm in front of it and trigger the extinguisher to turn out the fire [1].

B. COMPONENT DETAILS

1) DC Motor: In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion [1]. The dc motor show in Fig 1.

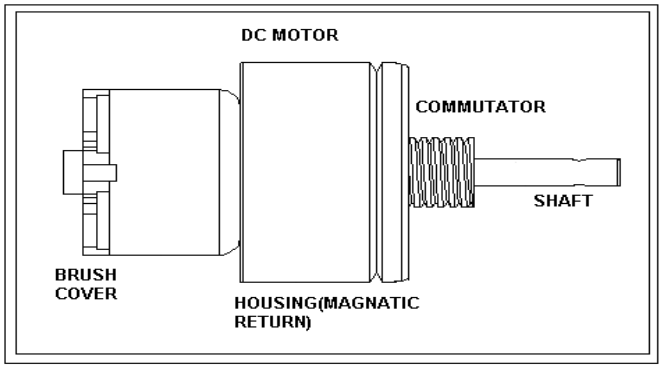

Fig. 1 DC motor

2) Relay; A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts as show in Fig2. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. Relay circuit as show in Fig 3. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical [2].

Fig. 2.Relay

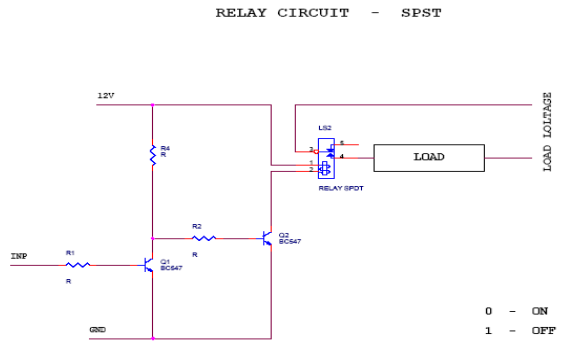

Fig. 3.Relay circuit

3) Arduino Board; An Arduino board historically consists of an Atmel 8-,16-or32-bit. AVR microcontroller AVR microcontroller (although since 2015 other makers' microcontrollers have been used) with complementary components that facilitate programming and incorporation into other circuits. it's shown in Fig 4. An important aspect of the Arduino is its standard connectors, which lets users connect the CPU board to a variety of interchangeable add-on modules known as *shields*. Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an I²C serial bus—so many shields can be stacked and used in parallel. Prior to 2015 Official Arduinos had used the Atmel mega AVR series of chips, specifically, the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560 and in 2015 units by other manufacturers were added. A handful of other processors have also been used by Arduino compatible devices. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants), although some designs such as the Lily Pad run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. An Arduino's microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer. This makes using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer. Currently, optiboot loader is the default boot loader installed on Arduino UNO

At a conceptual level, when using the Arduino integrated development environment, all boards are programmed over a serial connection. Its implementation varies with the hardware version. Some serial Arduino boards contain a level shifter circuit to convert between RS-232logic levels and TTL-level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods, when used with traditional microcontroller tools instead of the Arduino IDE, standard AVR ISP programming is used.

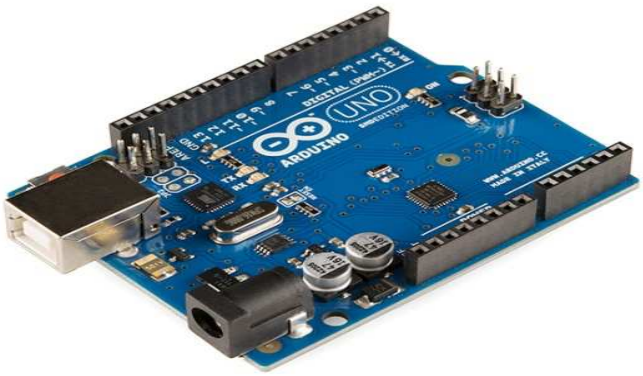

Fig. 4. Arduino board

4) Motor driver: A motor driver IC is an integrated circuit chip(Fig 5) which is usually used to control motors in autonomous robots. Motor driver ICs act as an interface between microprocessors in robots and the motors in the robot. The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control 2 DC motors simultaneously. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor. For this tutorial we will be referring the motor driver IC as L293D only The L293D IC receives signals from the microprocessor and transmits the relative signal to the motors. It has two voltage pins, one of which is used to draw current for the working of the L293D and the other is used to apply voltage to the motors. The L293D switches it output signal according to the input received from the microprocessor [4].Motor driver as show in Fig 6.

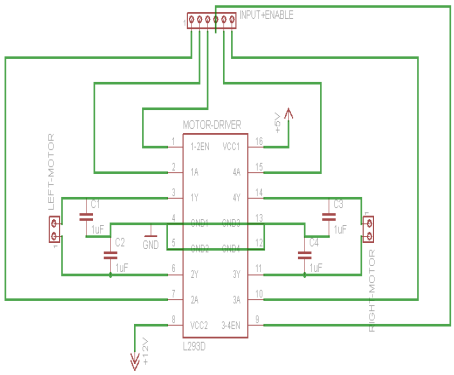

Fig. 5 motor driver chip

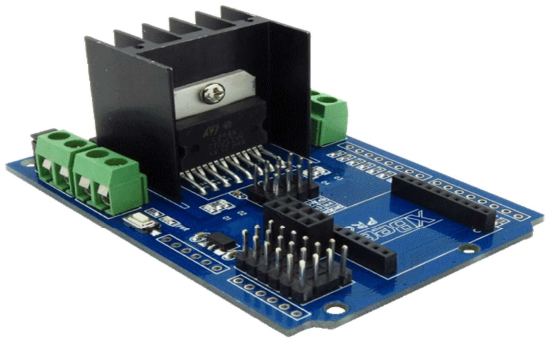

Fig. 6 motor driver

5) Flame sensor: The flame sensor (Fig8) is used to detect the flame occurrence. When the sensor detects the fire then it became short-circuit show in Fig 7. When there is no fire the sensor become open circuit. The flame sensor is connected with resistor. This connection formed the voltage divider network which is connected with inverting input terminal of the comparator. The reference voltage is given to non inverting input terminal. The comparator is constructed with LM 741 operational amplifier. When there is no fire, the flame sensor became open circuit. So the inverting input terminal voltage is greater than non inverting input terminal (reference voltage). Now the comparator output is -12V which is given to the base of the switching transistor BC547. So the transistor is cutoff region. The 5v is given to 7404 IC. The 7404 is the hex inverter with buffer. Hence zero voltage is given to microcontroller [5].

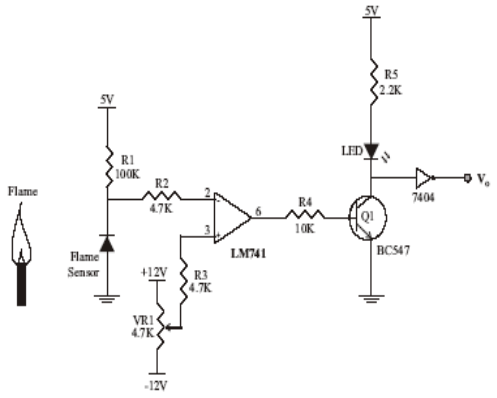

Fig.7 Flame sensor circuit

When there is fire occurred, the flame sensor became short circuit. So the inverting input terminal voltage is less than non inverting input terminal (reference voltage). Now the comparator output is +12V which is given to the base of the switching transistor BC547. So the transistor is turned ON. The zero voltage is given to 7404 IC. Hence +5v voltage is given to microcontroller[10,11]. In the microcontroller we can detect the fire with the help of software

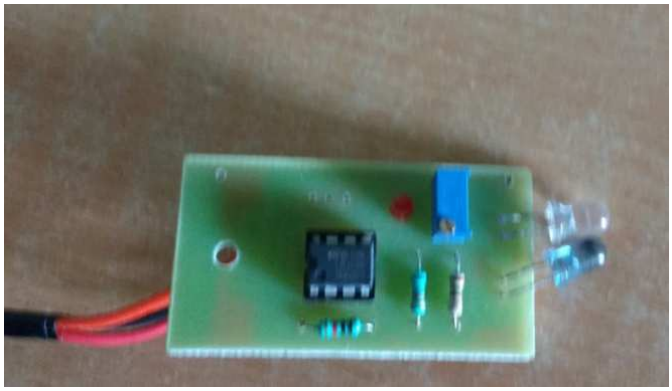

Fig.8 Flame sensor

6) Fire extinguisher: A fire extinguisher, or extinguisher(Fig 9), is an active fire protection device used to extinguish or control small fires, often in emergency situations. It is not intended for use on an out-of-control fire, such as one which has reached the ceiling, endangers the user (i.e., no escape route, smoke, explosion hazard, etc.), or otherwise requires the expertise of a fire department. Typically, a fire extinguisher consists of a hand-held cylindricalpressure vessel containing an agent which can be discharged to extinguish a fire.

Fig. 9 fire extinguisher

There are two main types of fire extinguishers: stored-pressure and cartridge-operated. In stored pressure units, the expellant is stored in the same chamber as the firefighting agent itself. Depending on the agent used, different propellants are used. With dry chemical extinguishers, nitrogen is typically used; water and foam extinguishers typically use air. Stored pressure fire extinguishers are the most common type. Cartridge-operated extinguishers contain the expellant gas in a separate cartridge that is punctured prior to discharge, exposing the propellant to the extinguishing agent. This type is not as common, used primarily in areas such as industrial facilities, where they receive higher-than-average use. They have the advantage of simple and prompt recharge, allowing an operator to discharge the extinguisher, recharge it, and return to the fire in a reasonable amount of time. Unlike stored pressure types, these extinguishers use compressed carbon dioxide instead of nitrogen, although nitrogen cartridges are used on low temperature (-60 rated) models. Cartridge operated extinguishers are available in dry chemical and dry powder types in the U.S. and in water, wetting agent, foam, dry chemical (classes ABC and B.C.), and dry powder (class D) types in the rest of the world[12].

4 DESIGN OF THE ROBOT

Many technical concepts from different areas like mechanical, electric, electronic and pneumatic systems were used to project a build the robot.

A. BLOCK DIAGRAM

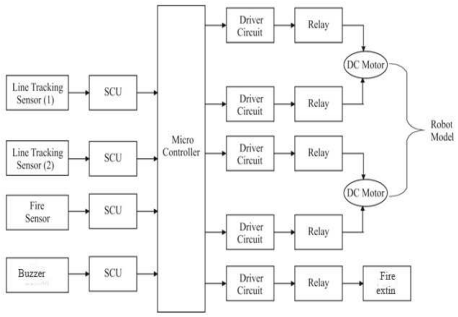

Fig.10Block Diagram

B. SYSTEM WORKING

The project is designed by following blocks fire sensor, Arduino board, line tracking sensor (2nos), Motor with driver circuit (2), Robot model, and Driver circuit with relay and Fire extinguisher.

The flame sensor is used here to sense the fire. The flame sensor output is very low voltage so we give that signals to signal conditioning unit. The signal conditioning unit gives the signal to Arduino board. The Arduino board used is flash type reprogrammable controller. Therefore, it receives the signal from signal conditioning unit and activates corresponding driver circuit.

If the fire is sensed by the sensor it gives the signal to Arduino board. By which the robot movement is controlled artificially, the Arduino board activates the alarm driver circuits. So the alarm makes sound for indication of fire. And at the same time Arduino board activates driver circuit for fire extinguisher. The keypad is used here to control the robot movements like as forward and reverse direction and left and direction control. The line tracking sensor is used to sense the line just below the robot model. There are two sensors kept at the front of the robot model at a certain distance. The two sensors are used to sense the left or right directions for further move of the robot model.

C. ASSEMBLY OF WORKING MODEL

The fig.11 shows that assembly of robot model.The robot was made designed for extinguishing the fire by detecting the flame with the help of flame sensor which are attached in robot body. when the sensor get the signal its send singal to the micro controller after receiving the signal the micro controller (adruino) activated the motor drive, which help robot to reach the area where fire is outcome. After reaching that area the robot activated the cam system so that it can push the fire extinguisher nozzle and thus fire is extinguished. The project carried out by us made an impressing task in the field of automobile department.

Fig .11 assembled robot

This project will reduce the cost involved in the concern. Project has been designed to perform the entire requirement task at the shortest time available.

D. FUTURE SCOPE

This project has been motivated by the desire to design a system that can detect fires and intervention. In thepresent condition it can extinguish fire only in the wayand not in all the rooms. It can be extended to a real fireextinguisher by increasing robot size and configurations. This provides us the opportunity to pass on to robots tasks that traditionally humans had to do but were inherently life threatening. Fire-fighting is an obvious candidate for such automation. Given the number of lives lost regularly in firefighting, the system we envision is crying for adoption. Of course, this project has only scratched

the surface. As in the design simplifications and the implementation constraintsin suggest, our project is very much a proof-of-concept. In particular, a practical autonomous fire-fighting system must include a collection of robots, communicating and cooperating in the mission; furthermore, such a system requires facilities for going through obstacles in the presence of fire, and ability to receive instructions on the fly during an operation. All such concerns were outside the scope of this project. However, there has been research on many of these pieces in different contexts.

5 CONCLUSION

The conclusion is to provide security of home, laboratory, office, factory and building which is important to human life. We develop an intelligent multisensory based security system that contains firefighting system in our daily life. We design the fire detection system using sensors in the system, and program the fire detection and fighting procedure using sensor based method.The system is cost effective, has a wide applications which when implement can show good and effective result. It can be use deliberately in industrial applications, commercial and in domestic sectors where the requirement of automatic work demands

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Effects of Titanium (Ti) Addition on Wear Behaviour of Powder Metallurgy (P/M) Plain Carbon Steel

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ABSTRACT: Wear is a damage to solid surface that generally involves progressive loss of material and is due to relative motion between that surfaces. The present work aims to study the effects of Titanium (Ti) addition on wear behaviour of Powder Metallurgy (P/M) plain carbon steel. Elemental powders of atomized iron (Fe), graphite (C), and titanium were weighed accurately and homogeneously mixed to compose an alloy powders of Fe-1%C, Fe-1%C-1%Ti, then compacted into cylindrical billets of size (Ø25X33mm) using suitable circular die-punch set in a 100T capacity hydraulic press. The compacted specimens were subjected to sintering and subsequently sintered specimens were once again heated to a temperature 1000°C and hot upsetting was carried out on the heated specimens. Then the machining was performed on hot upset specimens to get wear test specimens of sizeφ6X50mm. Using design of expert (DOE) software, the sliding wear experiments were planned on pin-on-disc Tribometer. The images of maximum worn out surfaces and microstructures of the alloy steels were captured and compared with wear behaviour of the alloy steels. The results are represented on 3D &2D Surface plot for comparing the response factors of both the alloy steels. It is found that the delamination wear is predominant at higher loads on both the alloy steels. The empirical equations for mass loss and coefficient of friction with respect to load and speed are developed for both the alloy steels.

KEYWORDS: Wear; Mass loss; P/M alloy steels; Co-efficient of friction.

1 INTRODUCTION

Powder metallurgy (P/M) is a field of science which concerns with the processing of metal and ceramic powders to form of desired shape. Powder characterization and homogenization is the process which is responsible for the continuity of properties in all region of the metals. In the compaction process, high pressure is applied to give powders to the desired shape. The compacts are sintered at the temperature below the melting point of the chemical element, which increases its strength and the secondary operations are used to attain the required properties. Automobile and industrial parts and machinery parts are also produced on P/M technique. In present work, the tribological study was carried out on plain carbon steel and the addition of Ti to the plain steel was also studied in order to find the influence of Ti on wear behaviour of the plain carbon steel. The wear tests were conducted using pin-on-disc tribometer adopting ASTM standard.

A number of researchers has carried out research work in the field of wear on P/M materials. Dhanasekaran et al. [i] have studied the wear behaviour of molybdenum di sulphide added Fe-C-Cu steels and have reported that the addition of molybdenum disulphite increases the compressibility and increases the part density and increases the strength and hardness better than the base composition. Increasing the percentage addition of MoS_2 is found to improving the wear resistance of the alloy steel. Tekeli et al. [ii] have investigated the wear property of Fe-0.3%C P/M steel at various heat treatments. They have found that the annealed specimens are subjected to lower wear rate compared to as-sintered specimens. Ozkangulsoyet al. [iii] have studied the triobological behaviour of different percentages of boron added iron based P/M alloys. They have found that the boron addition results in decreasing the wear rate of alloys and also observed that the plastic deformation with delamination of surface layers at the subsurface initiated by the cracks on worn out surface.

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Kandavel et al. [iv] have analysed the wear behaviour of the sintered Fe-C-Cu-Mo P/M alloy steels and have found that the addition of alloying elements such as Cu and Mo invariably enhances the wear resistance of the alloy steels. They have also observed that the delamination wear mechanism is predominant in the alloy steels. Dhanasekaran et al. [v] have carried out research work to study the influence of Ni addition to Fe-C-Cu alloy steels on wear property. They have reported that the Ni addition not only enhances wear resistive property and also increases the frictional coefficient during sliding wear test. Sudhakar et al. [vi] have studied the wear behaviour of Fe-0.2% Ni -0.47%C and Fe-0.2%Ni-0.2%C (P/M) alloy materials at various heat treatments. They have observed that the delamination wear is predominant in as sintered and oxidative wear is dominant in hardened and tempered specimens. Wang et al. [vii] have studied the tribological behaviour of copper added titanium alloy using ZrO2 as counter-face material. They observed that the Cu addition invariably enhances the wear resistance of the alloy steel and both adhesive and abrasive wear are observed to be common wear mechanism in the material. Qiu et al. [viii] have conducted dry sliding wear tests on Ti-47Al-2Cr-2Nb-0.2W (at. %) alloy at four different environments using zirconia as a counter-face disc for the tribological study [7]. They have found that the oxygen environment exhibits lower wear rate and hydrogen environment has a little effect on wear rate. Jun'anwang et al. [ix] have studied the influence of heat various treatments on wear property of Fe-1%C-3.5%Mo alloy steel and have reported that the quenched and tempered specimen is subjected to higher wear coefficient compared to the as-sintered specimen. They have also stated that the alloy steel exhibits low and stable wear rate. Tekeli et al. [x] have analyzed the tribological behaviour of Fe-C-Ni steel under various heat treatments. They have found that the inter-critically annealed specimen exhibits higher hardness and strength than that of other heat treated specimens. Anton et al. [xi] have investigated the tribological behaviour of sintered steels with high content of manganese-nickel and have found that the addition of C and Mn increases the wear resistance property of the alloy steel. Colaco et al. [xii] have studied the wear behaviour of AISI M42 HSS material under various sintering techniques. They have found that the abrasive wear resistance of laser melted and tempered alloy steel is lower than the as sintered material. LorellaCeschini et al. [xiii] have investigated the wear behaviour of Fe-C-Mo and Fe-C-Cr P/M alloy steel at various sintered temperatures. They have reported that Mo alloyed steel is observed to have more hardness than the other alloy steel and mild oxidative wear is found as common wear mechanism at lower load and delamination wear is common at the higher load conditions for the alloy steels. Kandavel et al. [xiv] have studied the plastic deformation and densification of Fe-C-Cu-Mo-Ti sintered alloy steels. They have stated that the addition of alloying elements invariably enhances the hardness of alloy steel, which in turn may enhance wear resistance of the alloy steels. Straffelini et al. [xv] have analyzed the wear behaviour of steam treated Fe-2%Cu and Fe-0.3%C P/M alloys. They have observed delamination wear at lower sliding speed and combination of both delaminative and oxidative wear at the higher sliding speed.

2 EXPERIMENTAL DETAILS

Elemental powders of atomized iron (Fe), graphite (C), and titanium (Ti) were weighed accurately and homogeneously mixed in a pot mill to compose an alloy powders of Fe-1%C, Fe-1%C-1%Ti, then compacted into cylindrical billets of size Ø25×33mm using suitable cylindrical die-punch set in a 100T capacity hydraulic press. During compaction graphite plus oil used as a lubricant and hydraulic load of 18T (180kN) was gradually applied on it to obtain 85% theoretical density for the green compacts of alloy steel. The indigenously prepared ceramic coating was applied over exposing surface of green compact specimens to prevent the surface oxidation during sintering process. Sintering is carried out in a 3.5 kW muffle furnace at a temperature of 1100 °C ±10 °C for a period of 30 minutes and samples are left in the furnace to cool. The sintered specimens were once again heated to a temperature 1000 °C and hot upsetting was carried out on the heated specimens to convert it into square rod of size 10X75mm. Then, the machining operation was carried out on square specimens to get standard wear test specimens of size (Ø6 mm × 50 mm). The contact surface of the pin was polished to conduct dry sliding wear tests using pin-on-disc Tribometer. EN31 hardened steel disc (53.5 HRC) was used as a counter-face material for all the wear tests. The wear test was conducted by keeping the pin at a track radius of 17 mm and maintained constant for the entire dry sliding wear tests. The wear experiment was carried out as per the standard ASTM G99-05. The D-optimal design on response surface methodology by Design Expert (DE) software was used to plan the experimental test and the tests were carried out based on the test plan provided by the DE software. In the present work, the load and speed are considered as input parameters and mass loss and coefficient of friction are considered as output parameters. The load was set at the range 15-50 N and speed was set at 300-1200 rpm and keeping the time (30 min) constant for the entire dry sliding wear tests. The test plan of the experiment is illustrated in Table 1. The wear loss is calculated by measuring the mass of pin before and after the tests using four decimal Shimadzu digital balance (Made in Japan). The coefficient of friction was obtained from the computer system interface with the tribometer. The optical and micro structure images were captured by KYOWA, ME-LUX2, microscope fitted with CCD camera. SEM images of maximum worn out specimen was captured by using JEOL-Field Emission Scanning Electron Microscope (TSM-6701F, Japan).

TABLE 1. WEAR TEST PLAN FOR P/M ALLOY STEELS

Runs	Load (N)	Speed (rpm)
1	15	300
2	26.67	300
3	50	300
4	50	600
5	32.5	750
6	15	900
7	15	1200
8	26.67	1200
9	50	1200

3 RESULTS AND DISCUSSION

A. HARDNESS OF P/M ALLOY STEEL

Compositions	As-sintered (HV)	Hot upsetting (HV)
Fe-1%C	167.5	247.5
Fe-1%C-1%Ti	204.5	302.5

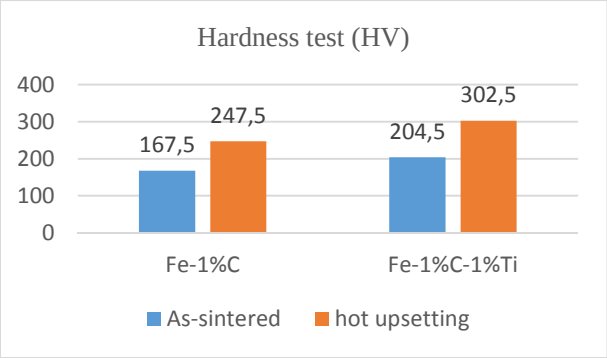

Fig. 1 Hardness test for both as-sintered and hot upsetting specimens

The density of hot upset specimen has been increased significantly due to the pores closure of as sintered preforms during the upsetting process irrespective of the alloy steels. Addition of Ti to the plain carbon steel is also attributing for the enhanced hardness in the alloy steel. Titanium is one of the known alloying elements to enhance the hardness the material. The possible formation of TiC during sintering process could also contribute for further enhancement of hardness in the material [14].

B. MASS LOSS BEHAVIOUR OF P/M ALLOY STEELS

The mass loss is one of the important response factors for wear studies. In machinery, each component has a relative motion with another and in long period the wear loss due to friction with matting parts affect the normal functioning of the component. It is essential that the study on wear behaviour for any material is warranted. The wear characteristics of P/M material is a complex phenomenon due to the presence of pores at the contact surfaces. Table 3 provides the experimental results of P/M alloy steels. The mass loss behaviour of the plain carbon steel is shown in Fig. 2(a) & 2(b). The mass loss trend is similar with respect to load and speed of the wear tests for the plain carbon steel. The maximum wear loss (0.0103g) is exhibited at the highest load/speed conditions. As the mass loss is continuously increasing with increase in load and speed, it is understood that the delamination wear has occurred in the plain carbon steel during the wear test. The wear loss characteristics of Ti added plain carbon steel is depicted in Fig. 2(c) & 2(d). Though the similar kind of trend is exhibited by the specimen as like the plain carbon steel, the mass loss values are significantly reduced in the alloy steel. Addition of Ti plays vital role in reducing the mass loss in the P/M alloy steel, on the other hand Ti addition significantly improves the wear resistance of the alloy steel [7]. The maximum mass loss (0.0036g) has occurred at the highest load and speed conditions.

There is possibility of formation of carbides of alloying element during sintering process, which could attribute in increasing the hardness and there by wear resistance too in the alloy steel.

C. COEFFICIENT OF FRICTION OF P/M ALLOY STEELS

Fig. 3(a) & 3(b) illustrate the frictional coefficient behaviour of the plain carbon steel during wear test. Initially, the friction between the contact surfaces are more, and it is declining with increase in load and mounting up with increase in speed. It is observed from the plot that the minimum frictional coefficient is exhibited at the highest load irrespective of the speed. Due to delamination wear character, the frictional coefficient is continuously varying in the plain carbon steel. The coefficient of friction characteristics of Ti added plain carbon steel is shown in Fig. 3(c) & 3(d). Though the trend seems like a base metal, the friction coefficient exhibited by the alloy steel is higher. It is observed from the plots that the frictional coefficient is higher for a particular value of load and then descending to the minimum irrespective of speed. The higher frictional value is due to the presence of carbides in the alloy steel. At the higher load the contact surface becomes polished, which in turn reduces the friction during wear test.

TABLE 3. EXPERIMENTAL RESULTS OF P/M ALLOY STEELS

Run	Load (N)	Speed (rpm)	Time (min)	Mass loss (g) Fe-1%C	Coefficient of friction(μ) Fe-1%C	Mass loss (g) Fe-1%C-1%Ti	Coefficient of friction(μ) Fe-1%C-1%Ti
1	15	300	30	0.0017	0.6186	0.0004	0.6331
2	26.67	300		0.0031	0.5316	0.0013	0.5893
3	50	300		0.0083	0.4747	0.0029	0.4389
4	50	600		0.0092	0.4989	0.0033	0.4634
5	32.5	750		0.0075	0.5258	0.0025	0.5603
6	15	900		0.0069	0.5973	0.0019	0.6236
7	15	1200		0.0078	0.6004	0.0024	0.6193
8	26.67	1200		0.0089	0.6281	0.0031	0.653
9	50	1200		0.0103	0.4653	0.0036	0.3513

D. EMPIRICAL EQUATION FOR MASS LOSS AND COEFFICIENT OF FRICTION

Generalized mathematical equation of wear behaviour of P/M alloy steels for mass loss and coefficient of friction corresponding to the speed and load has been generated from the ANOVA module of design software [4]. The equations are as follows: The generalized equations of mass loss (Z_{ML}) and coefficient of friction (Z_{μ}) for Fe-1%C are given in the equations (A) and (B).

$$Z_{ML} = (-4.76539\times10^{-3}) + (1.55835\times10^{-5}\times X) + (1.57529\times10^{-4}\times Y) - (1.32808\times10^{-7}\times XY) - (4.157693\times10^{-9}\times X^2) + (1.02108\times10^{-6}\times Y^2) \quad \text{- (A)}$$

$$Z_{\mu} = +(0.65793) - (6.43088\times10^{-5}\times X) - (3.13871\times10^{-3}\times Y) - (7.74573\times10^{-7}\times XY) + (7.2853\times10^{-8}\times X^2) + (1.57865\times10^{-6}\times Y^2) \quad \text{- (B)}$$

The generalized equations of mass loss (Z_{ML}) and coefficient of friction (Z_{μ}) for Fe-1%C-1%Ti are provided in the equations (C) and (D)

$$Z_{ML} = -(1.83012\times10^{-3}) + (3.30194\times10^{-6}\times X) + (9.95656\times10^{-5}\times Y) - (4.453\times10^{-8}\times XY) - (1.85802\times10^{-10}\times X^2) - (2.0927\times10^{-7}\times Y^2) \quad \text{- (C)}$$

$$Z_{\mu} = (0.53559) + (5.39802\times10^{-5}\times X) + (7.66825\times10^{-3}\times Y) - (3.35787\times10^{-6}\times X\times Y) + (1.85296\times10^{-8}\times X^2) - (1.73736\times10^{-4}\times Y^2) \quad \text{- (D)}$$

Where, X- speed (rpm) and Y- load (N). Based on these empirical correlations the mass loss and friction coefficient of alloy steels could be evaluated at any load and speed. From the equations (A),(B), (C) and (D), the response parameters the P/M alloy steels are calculated and tabulated (Table 4) for comparison with the experimental results. It is understood from the comparison that the degree of accuracy between the experimental results and the results obtained from the mathematical correlation.

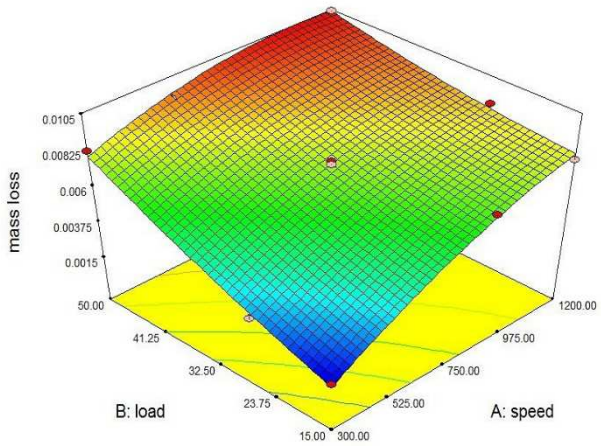

Fig.2 (a) 3D-plot graph for Fe-1%C

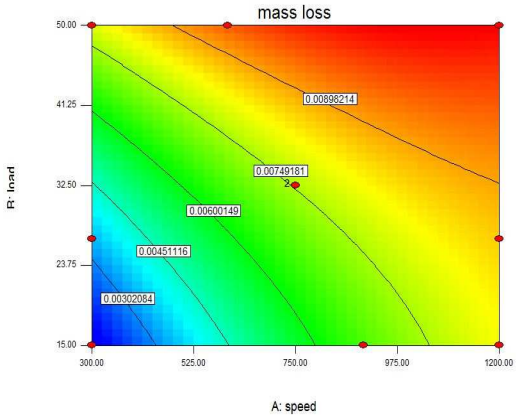

Fig.2 (b) 2D- contour surface plot graph for Fe-1%C

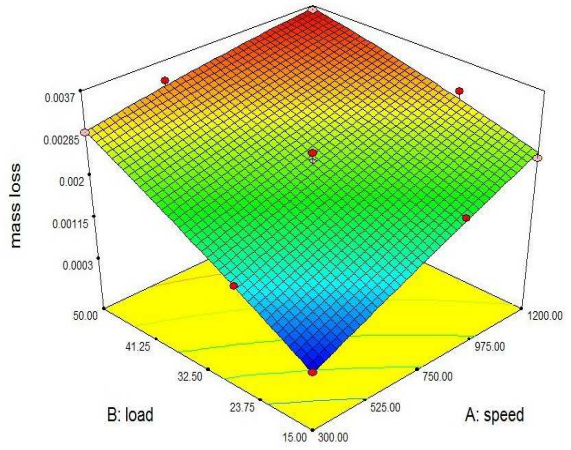

Fig.2 (c) 3D-plot graph for Fe-1%C-1%Ti

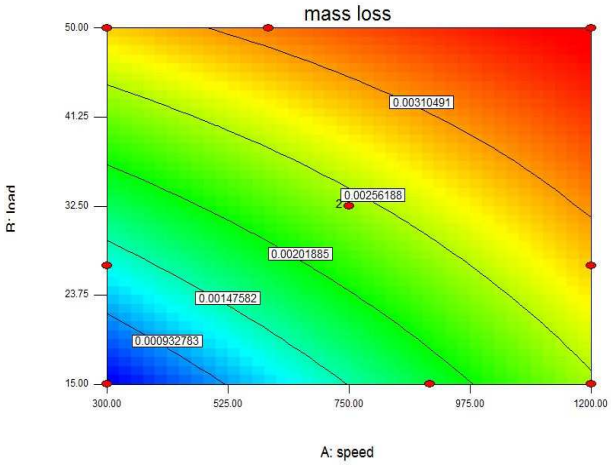

Fig.2 (d) 3D-plot graph for Fe-1%C-1%Ti

Fig. 2 (a) - (d) wear behaviour on P/M alloy steels at various speeds and loads

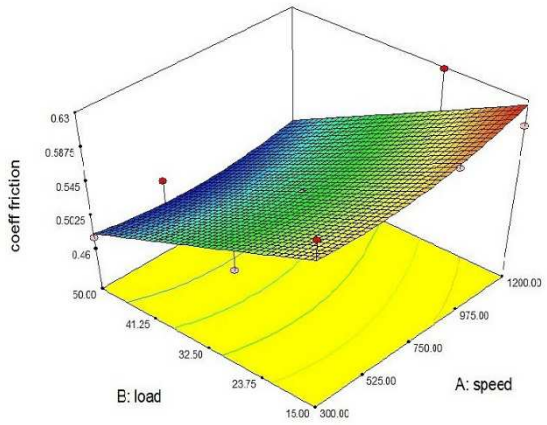

Fig. 1. Fig.3 (a) 3D-plot graph for Fe-1%C

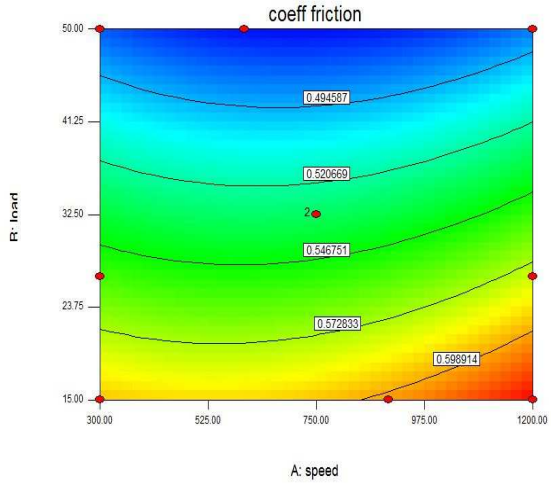

Fig. 2. Fig.3 (b) 2D- contour surface plot graph for Fe-1%C

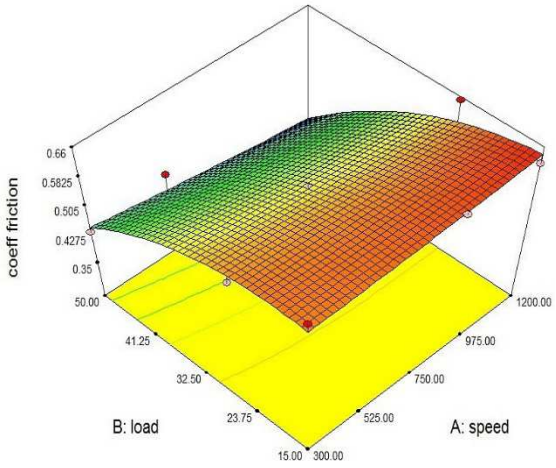

Fig.3 (c) 3 D –plot graph for Fe-1%C-1%Ti

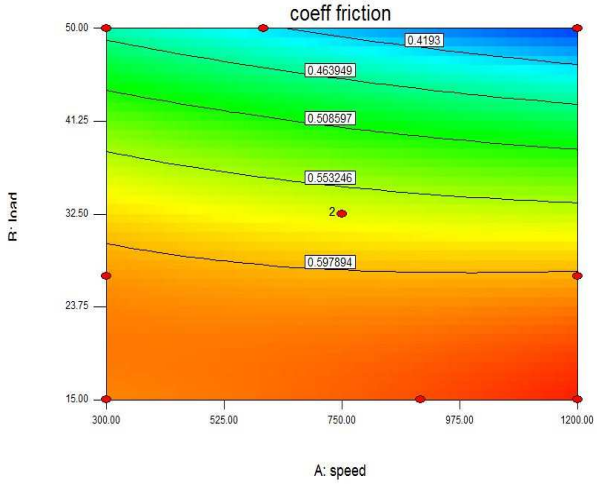

Fig.3 (d) 2D –contour surface plot graph for Fe-1%C-1%Ti

Fig. 3 (a) - (d) Coefficitent of friction on P/M alloy steels at various speeds and loads

TABLE 4. PREDICTED VALUES OF P/M ALLOY STEELS.

Composition of alloy	Speed (rpm)	Load (N)	Mass loss (g)	Coefficient of friction (μ)
Fe-1%C	750	32.5	0.0075	0.5314
Fe-1%C-1%Ti			0.0024	0.5703

E. X-RAY DIFFRACTION AND MICROSTRUCTURE

1. XRD analysis:

XRD has been taken on wear debris of the alloy steels. The wear debris was collected after the wear test and was crystal structures. It is found from the wear debris analysis that the higher amount of Fe, and lesser amount of C and Ti is present in the wear debris. Fig.4 (a) & 4(b) are the XRD peak analysis for wear debris of the plain carbon steel and Ti added P/M alloy steels respectively. It is observed from the images that iron (Fe), carbon (C), iron Carbide (Fe_2C), titanium carbide (Ti_2C) are present in the wear debris. Iron and carbon display cubic structures and Iron carbide (Fe_2C) in various forms such as orthorhombic and hexagonal crystal structures. Titanium carbide (Ti_2C) display a hexagonal crystal structures.

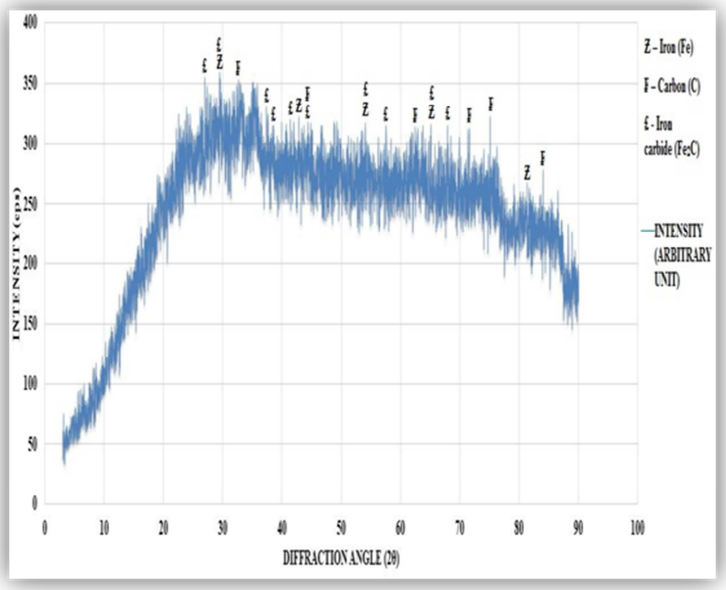

Fig.4 (a) XRD peak analysis on wear debris of Fe-1%C

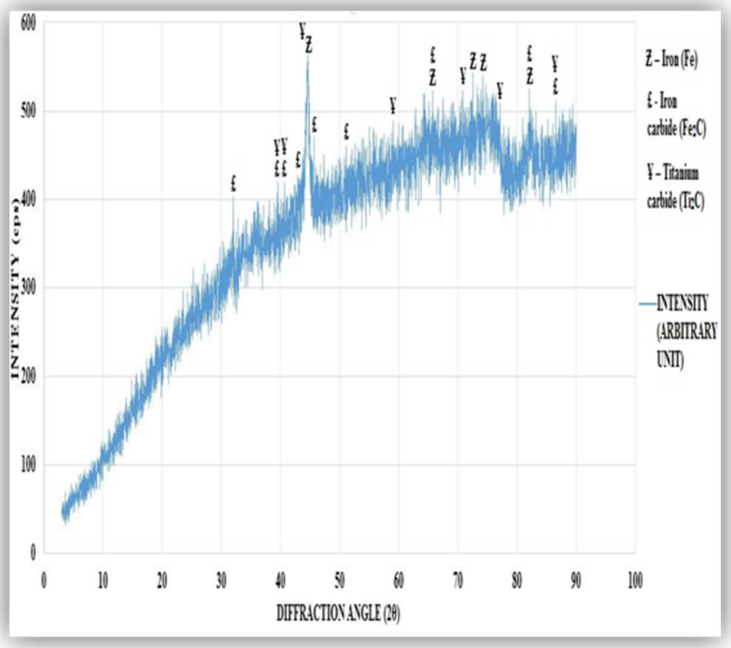

Fig.4 (b) XRD peak analysis on wear debris of Fe-1%C-1%Ti

2. *Microstructure:*

The microstructure of plain carbon steel and Ti added P/M alloy steels are depicted inFig.5 (a) & 5(b) respectively. The basic microstructure for both the alloy steels is Ferrite-pearlite. The microstructure of the Fe-1%C is shown in Fig. 5(a). Ferritic grains are clearly visible and pearlites are embedded on ferrite matrix. Iron carbide is also appeared in the image. Needle structure is also visible in random and is due to the hot upsetting of the preforms for making a tensile test specimen. Fig. 5(b) shows the micro image of Ti added plain carbon steel. Ferritic and pearlitic structure is observed in the image. The formations of TiC and FeC during sintering are also appeared in the image of the alloy steel. Tiny pores are seen sparingly. The presence of carbide of alloying element promotes the wear resistance of the alloy steel and at the same time it offers more frictional coefficient.

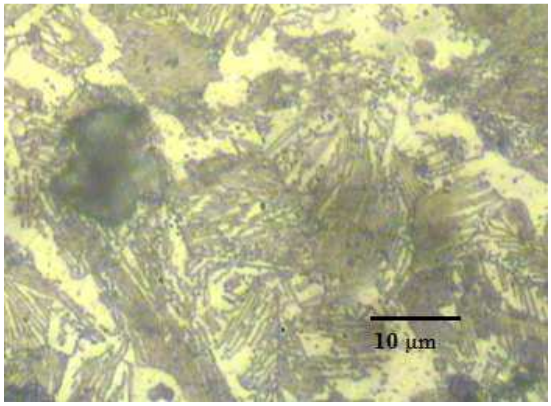

Fig.5 (a) Fe-1%C

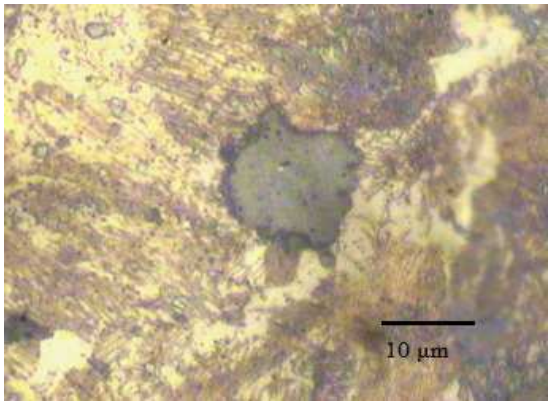

Fig.5 (b) Fe-1%C-1%Ti

F. WEAR PATTERN AND SEM IMAGES OF MAXIMUM WORN-OUT SPECIMENS :

The wear patterns of maximum worn out specimen of alloy steels are shown in Fig. 6(a) & 6(b). The wear pattern for the plain carbon steel is depicted in Fig. 6(a). It is understood from the wear pattern that the material is subjected to uniform wear and the wear loss is also higher as the image shows the wide wear track. Fig. 6(b) shows the wear pattern of Ti added alloy steel. The wear track appeared in the image is smaller in width; this is due to the higher resistance of alloy steel against the wear. The image is also exhibiting non-uniform wear pattern, could be due to the presence of carbides of alloying elements.SEM images of contact surfaces of test specimens are shown in Fig. 6(c) & 6(d). Fig. 6(c) shows the SEM image of the plain carbon steel. The plain image in the figure shows the uniform wear over the entire region of the contact surface. The oxides chemical element is appeared as white patches in the image. Iron carbides are appeared at some places. Micro pores are observed randomly in the image. Fig. 6(d) depicts the SEM image of Ti added alloy steel. It is clearly understood from the image that the specimen is subjected to non-uniform wear in the test. The wear loss has occurred at the soft region of the contact surface and the minimum wear has occurred at the carbide formed regions, which makes the wear pattern non-uniform for the alloy steel. The carbides of alloying elements are appeared as black patches at some places. The oxide of material is also visible as small white patches in the image. The formation of carbides due to alloying elements attributes for improving the hardness and wear resistance of the alloy steel.

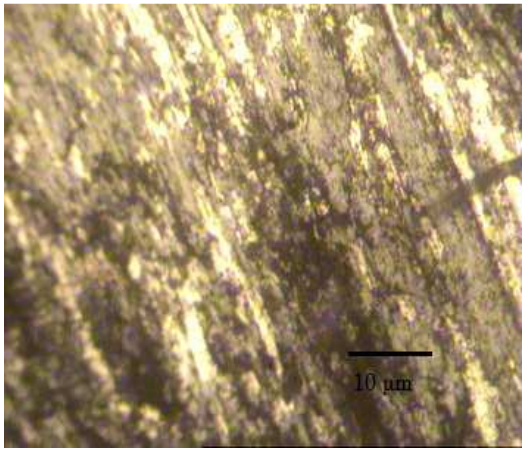

Fig. 6 (a) maximum wear on worn-out surfaces of Fe-1%C

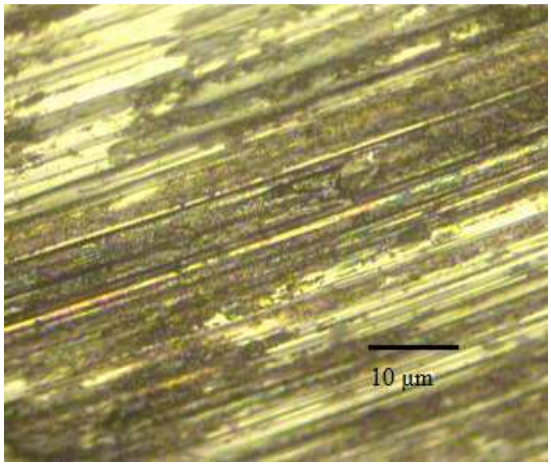

Fig. 6 (b) maximum wear worn-out surfaces of Fe-1%C-1%Ti

In SEM image and wear pattern image of Ti addition is decreases the wear rate and coefficient of friction on higher load due to formation on worn-out surfaces delamination of thin layer of oxide formation [7], [4].

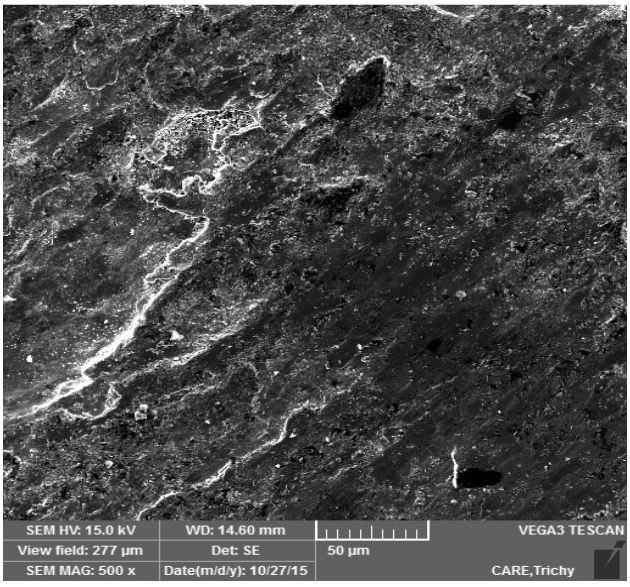

Fig. 6 (c) SEM image on worn-out surfaces of Fe-1%C

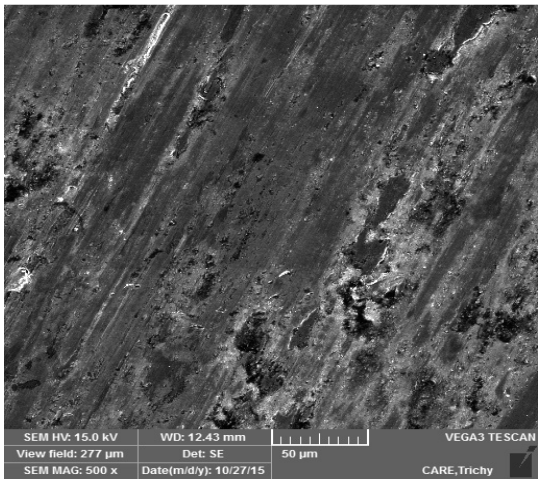

Fig. 6 (d) SEM image on worn-out surfaces of Fe-1%C-1%Ti

4 CONCLUSION

Based on the dry sliding wear tests to study the wear characteristics of the P/M plain carbon steel (Fe-1%C) and Ti added plain carbon steel (Fe-1%C-1%Ti) the following conclusions could be arrived.

1. The plain carbon steel (Fe-1%C) exhibits higher mass loss and lower frictional coefficient.
2. 1%Ti addition to the plain carbon steel significantly enhances the wear resistance and hardness of the alloy steel due to the formation of carbides.
3. The formation hard phase (TiC) invariably increases the friction coefficient of the Ti added alloy steel.
4. The delamination wear mechanism is observed for both the alloy steels.
5. The generalized mathematical correlations are generated to find the mass loss and coefficient of friction for the alloy steels and also validated with the experimental results.
6. The plain carbon steel is containing Ferritic-Pearlitic microstructure and iron carbides is placed at some places in the microstructure. Ti added alloy steel contains TiC along with other micro phases appeared in the plain steel.
7. Titanium added alloy steel is subjected to non-uniform wear due to the formation of hard phases.

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Effects of copper addition on Thermal behaviour of P/M iron metal

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ABSTRACT: Powder metallurgy is the science of procuring powder, consolidation into required shape and sintering it to obtain final product. The final density of the product depends upon the compaction pressure and sintering temperature. Thermal conductivity is a property to measure the heat conducting ability of the material. It depends upon the composition and porosity of the material. In this study, the thermal conductivity of Fe-Cu powder is studied and compared with plain iron powder prepared at the same density. Finely powdered metal powders are compacted in a die using an UTM machine. The disc obtained is sintered in a furnace to improve its strength. The thermal conductivity of Fe-Cu Powder alloy is found to be greater than that of plain iron powder because of the addition of copper, which has higher thermal conductivity. The Rockwell hardness value is also studied for the influence of hardness on thermal conductivity. The material developed can be used in various thermal applications like cooking ovens, clutch plates, and other industrial applications.

KEYWORDS: Powder metallurgy, Thermal Conductivity, Powder iron, Fe-Cu alloy, sintering.

1 INTRODUCTION

Powder Metallurgy is a process of mixing single or different powders, compacting the mixture using a die, heating in a controlled furnace to create metallurgical bonds to improve its strength. PM process enables manufacturers to make products that are consistent and predictable in their behaviour across a wide range of application. It is an old technology used as early as 3000 BC. Yet, it has gained its importance only recently. Powder metallurgy involves four steps that are as follows. 1) Powder manufacturing, 2) Blending of powders, 3) Compaction, 4) Sintering. Powders are manufactured by physical, chemical or mechanical methods depending upon the application. Blending is done to obtain a homogeneous mixture generally using a ball mill. Compaction involves application of pressure on the powder mixture to get the desired shape. Compaction done in room temperature is called cold compaction. At elevated temperatures, it is known as hot compaction. Die compaction is the most common method of compaction. Sintering is a process of heating the compacts in a furnace to improve its density and strength. Air, nitrogen, argon, ammonia are some of the sintering atmospheres. Air is the cheap and common one. Post-sintering operations are done in some cases to improve its properties. Powder metallurgy is advantageous over the conventional manufacturing process because of the ability to produce complicated shapes with high utilization.Some of the advantages of powder metallurgy route is net shape obtainability, and high utilization of materials.But cost and part size acts as a limitation. Nowadays, its vastly used in automobiles and cutting tools.

Johnson and Gennan [i] has revealed in their studies that die compaction method is suggested as a good way of compacting powder metallurgical parts over other processes. Koh and Fortini [ii] concluded that the thermal conductivity and electrical resistivity can be related to the solid material properties and the porosity of the porous matrix regardless of the matrix structure.Vincent et al. [iii] studied that the thermal conductivity and porosity behavior showed three distinct domains. In all the domains the thermal conductivity decreases as volume fraction of porosities increases. Molina et al. [iv] found that the thermal conductivity of tested composites gradually increases with the applied infiltration pressure because of the inherent reduction in porosity of the material. Kononenko et al. [v] observed that, the thermal conductivity decreases with increasing porosity. This is due to the fact that, as the size of the air gap between adjacent particles increases, the surface area of contacts between the particles decreases. Kurt and Ates [vi] studied that thermal conductivity decreases with porosity

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rate in PM materials. Change of the thermal conductivity in PM materials due to porosity is also discussed. Wilson Nunes dos Santos [vii] inferred that addition of glass phase decreases the thermal conductivity of material. Pia and Sanna [viii]concluded that the thermal conductivity reduces as the range of pores present gets reduced. Hadas et al. [ix] cooling rate improves with decrease in porosity. Fathy et al. [x]studied that slight improvement in density dramatically increases the mechanical properties of the material.

1.1 FORMULATION OF PROBLEM STATEMENT

Iron powder has always been used in many applications because of its cost and availability. Powdered iron can be used to prepare clutch materials in automobile industry. The heat gets accumulated in the clutch due to friction caused by engagement and disengagement. With higher thermal conductivity, the material can dissipate heat more efficiently to the surroundings. The aim of this project is to develop an alloy of iron that has higher thermal conductivity than the iron keeping in mind the weight factor. The samples are prepared by powder metallurgy route. In this study, copper powder is chosen for alloying with iron powder, because of its higher thermal conductivity compared to that of iron powder and compared with pure iron of same theoretical density**.**

2 EXPEREMENTAL WORK

2.1 POWDER PROCUREMENT

Copper (Metal) Powder Electrolytic 99.5% of mass 500 g are procured from a Scientific supplier. Tightly sealed iron powder which was already available is made use of in this work.

2.2 MIXING OF POWDERS

Mixing is done to combine different materials to yield homogeneous powder of the alloy. The iron-copper alloy powder is taken in a cleaned glass jar. The addition is done alternatively using a funnel. Ceramic balls are added along with the powders inside the jar and sealed to prevent losses. The jars are loaded into a ball mill. The sides of the ball mill are cushioned using soft clothes and crushed papers. This is to prevent breakages during rotation of the mill. The ball mill is allowed to run for 10 hours to give it a thorough mix. Rotation is carried out at constant low speeds to get a homogeneous mix. Homogeneous mixing of powder is essential for obtaining even properties throughout the mass of the final product.

2.3 COMPACTION

The powder, after mixing is weighed and mass of powder required for one piece is found. That quantity of powder is separately stored in an air tight cover. Same procedure is carried out for other pieces. Then the powder is poured inside a circular die of diameter 50 mm and height 7mm.The disc, die and the punch are lubricated with graphite oil. Graphite oil is useful particularly in high loads. An universal testing machine operates the punch and a load of 180 kN is applied to get the green specimen. The green specimen is given an aluminium paint to prevent oxidation from happening on the surface.

2.4 SINTERING

Sintering of the coated and dried samples was done in a 3.5 kW muffle furnace at a temperature of 1000 ˚C for a period of 120 minutes.

2.5 THERMAL CONDUCTIVITY TEST

Thermal conductivity test was carried out using a heater placed between the specimens that are stationed on either side. Thermocouple sensors, six in number are inserted in various locations of the setup to obtain the temperature values on both the heated and non-heated sides of the specimen. The different layers of the setup are clamped tightly by a nut-bolt mechanism to minimize the air gap that decreases the accuracy of thermal conductivity measurement.

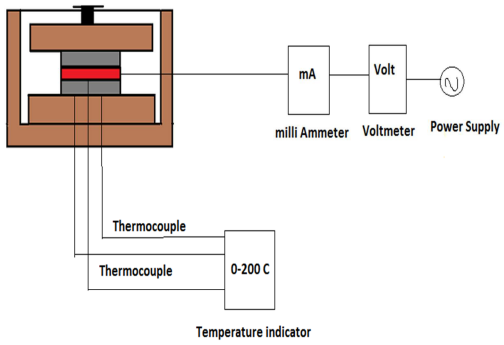

Fig. 1 Schematic diagram of thermal conductivity setup

2.6 ROCKWELL HARDNESS TEST

The Rockwell hardness test is carried out to find the Rockwell hardness number. This is to study the relationship between hardness and thermal conductivity values.

2.7 MICROSTRUCTURE

The microstructure is looked at to find out the microscopic science behind the observed phenomenon.

3 RESULTS AND DISCUSSION

3.1 THERMAL CONDUCTIVITY TEST:

TABLE I. THERMAL CONDUCTIVITY OF IRON AND IRON-COPPER P/M ALLOY

Specimen	Voltage (V)	Heat Flux(W/m²)	Thermal Conductivity (W/mK)
Fe	50	1401.02	2.46
	60	2123.42	3.64
	70	3283.64	6.06
	80	4290.62	7.35
	90	5253.82	12.20
Fe- Cu	50	4073.50	7.13
	60	6123.05	7.14
	70	8311.60	11.63
	80	10827.62	15.15
	90	13285.01	15.49

- The thermal conductivity value increases with increase in voltage
- The thermal conductivity of Fe-10%wtCu is found to be higher than that of plain iron of same percentage theoretical density as copper has higher conductivity.

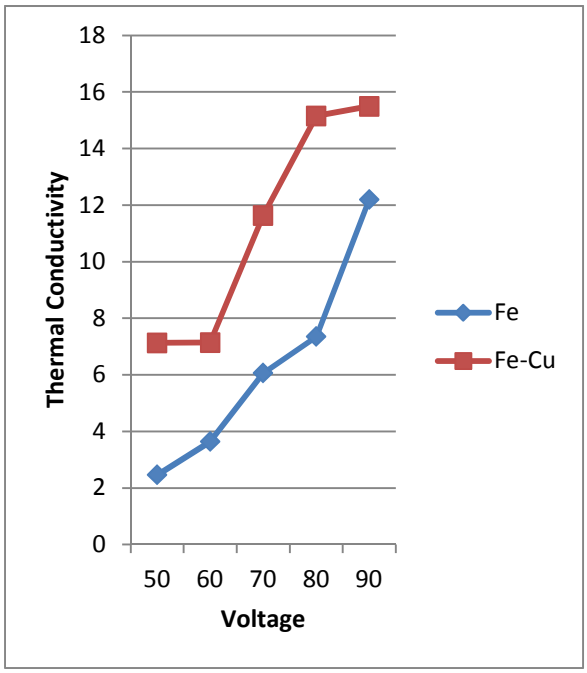

Fig. 2 Voltage vs Thermal Conductivity

3.2 ROCKWELL HARDNESS TEST

The Rockwell hardness number of the two samples are determined and the Fe-10%wtCu material is found to show higher value of hardness. The reason behind higher value is because of the presence of copper. Copper has higher density compared to iron, hence leads to greater hardness value of the sample.

TABLE II. ROCKWELL HARDNESS VALUE

S.No	P/M Material	Rockwell Hardness number(R.H.N) B-SCALE
1	Fe	68.6
2	Fe-10%wt Cu	104.12

3.3 MICROSTRUCTURE

The microstructure of the Fig.4 shows pearlitic grains in ferrite matrix. Fig. 3 shows copper being homogenously distributer in iron matrix. The two figure shows the microstructure of the two samples at a magnification of 100x. The presence of copper which is shown as orange particles in the image, is the driving factor for higher thermal conductivity of Fe-10%wtCu.

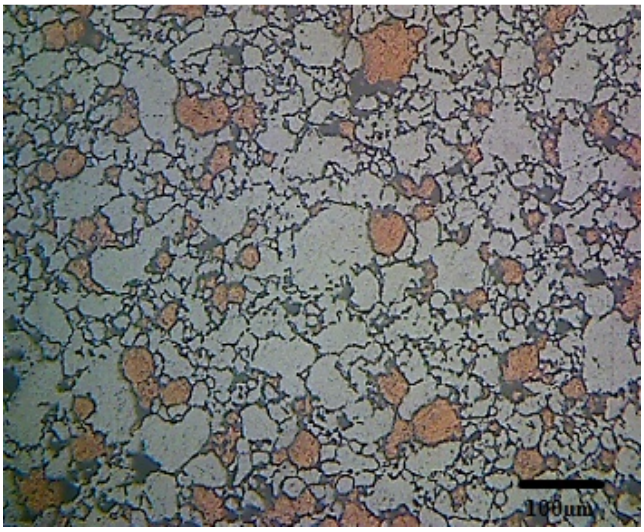

Fig. 3 Fe-10%wtCu at 100x magnification

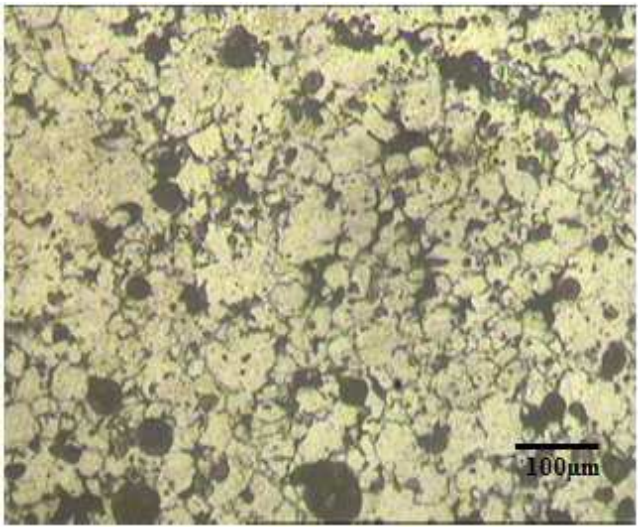

Fig. 4 plain Fe at 100x magnification

4 CONCLUSIONS

- Thermal conductivity of the material improves with increase in heat flux.
- Introducing higher thermal conductivity material in the matrix leads to improve the thermal conductivity of the alloy.
- Addition of copper (Cu) to the iron material enhances the hardness apart from the thermal conductivity.

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Cloud based framework to handle and analyze diabetes data C

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ABSTRACT: Diabetes Mellitus is one of the growing vitally fatal diseases world-wide. Diabetes causes serious health issues invariantly to all. It will not bother about age, ethnic and also the racial group of a people. Diabetes is a Chronic Disease which is increasing rapidly due to the lack of awareness, change in urban culture, unhealthy foods, lack of physical activity and also due to hereditary. As per the statistical reports the impact of Type2 diabetes is very high comparing to Type 1 diabetes. Especially diabetes on children, adults, pregnant women and also people those who are suffering by other serious diseases needs to be monitored closely and their risks should be addressed specially through various researches and studies. Creating awareness and imparting knowledge about managing diabetes is very essential to safeguard our future world. Due to huge population, the volume, velocity and also the varieties of diabetic data increases tremendously. So for storing such large volume of data we need an elastically scalable environment such as Cloud. Cloud is a fast deployable and scalable platform very much suitable for accommodating huge amount of dynamic data. While handing those large size of data we will meet the problems of data synchronization, concurrency, job scheduling and fault tolerance. By applying the Hadoop-programming model the fore mentioned problems can be handled in a simple and efficient way. The dynamic and large sized health care data can be effectively stored and processed by using the proposed architecture where the risk factor (in terms of %) for type 2 diabetes is extracted based on the ratio of BMI (Body Mass Index) and age. This Cloud based framework helps the patients and physicians to access their data globally anywhere at any time.

KEYWORDS: Diabetes, Dynamic data, Data Analysis, BMI, Cloud Storage.

1 INTRODUCTION

As per the study conducted to asses awareness and knowledge about diabetes in four geographical regions of India such as Chandigarh, Tamilnadu, Jharkhand and Maharastra only 43.2 % of total study population had heared about diabetes. The urban residents had 58.5 % of awareness rate compared to rural residents of 36.8 %. About 46.7% of males and 39.6% of females are aware of diabetes. The 41.5% of people among the general population are aware of diabetes and among them 80.7% of people knew that prevalence of diabetes was increasing. Among the general and diabetic population 56.3% and 63.4% respectively were aware that diabetes could be prevented. Similarly 51.5% of general population and 72.7 % of diabetic population knew that the diabetes could affects other organs of the body [1][2]. Based on the assessment and knowledge score among general population, Tamilnadu had the highest score (31.7%) and Jharkhand has the lowest score (16.3%). The Indian Council of Medical Research India Diabetes study (ICMR-INDIAB study)says that India had 62.4 million people with diabetes in 2011 and by 2030 it will be increased to 101.2 million [1]. Based on the above study the knowledge and awareness about diabetes and its complication in human life span time is very poor. So the process of conducting various awareness and education programs related to diabetes is essential to the society.

The powerful weapon to fight against Diabetes Mellitus is awareness or knowledge. The knowledge and awareness help the people to realize the impact of diabetes and helps them to identify correct health care providers and their respective treatment. Due to the increased complication of diabetes over the various organs of the body, it is essential to assess the health state of the patients periodically and counseling them to understand the need for treatment at right time. Due to

increased population the size of the medical data also increases dynamically. Storing and analyzing such a big data is very much challengeable process nowadays. Researchers demands supportive mechanism to efficiently process large amount of data and hospitals The main challenges in processing large medical dataset is sufficient infrastructure to accommodate the data.Usually such a huge infrastructure requires large investment as capital. But the Cloud computing provides many on-demand virtual infrastructure in pay-per-use model.

In this model we can avail the dynamic infrastructure for data processing as per the increased or decreased size of the data sets. There are various cloud service providers offering services for large data processing as part of the cloud services. Map Reduce as a service is an main advantage in the field of bigdata analytics. But it has some limitations. Such as those services offered in the form of Platform-as-a Service, but there is no transparent information about the implementation and workflow details of MapReduce service. Similarly the user does not have control over the Map Reduce Software stack and its configuration. This causes the optimization, performance and compatibility problems. And also these services are always vendor-specific and are customized corresponding to their own infrastructure and also it locks the clients from preferring multiple service providers[R2]. So a development environment which has the vendor free exploration platform is essential for managing medical records of patients themselves and hospitals. The main objective here is to provide an innovative and cost effective solution to handle large and dynamic diabetes data and analyze them further for future prediction, spreading awareness among the community and preventing the loss of young minds due to diabetes.

2 DIABETES AND TYPES OF DIABETES

2.1 UNDERSTANDING DIABETES

As per the statement of WHO(World Health Organization),the biggest health concern faced by people nowadays is Diabetes. WHO defines diabetes as “a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces”. Insulin is a hormone that regulates blood sugar.A common effect of diabetes is Hyperglycemia or increased blood sugar[2]. There are very serious health issues due to diabetes including blindness, kidney failure, stroke and heart diseases. Type 1 diabetes is the nature when the body produces insufficient quantities of insulin. It is usually detected more in children. Type 2 diabetes occurs when the body does not effectively use the insulin produced. This is very frequently due to lack of physical activity, obesity or incorrect dietary habits. Gestational diabetes occurs among pregnant women. In about 90 percent of cases, it is Type 2 diabetes that people are suffering from. The occurrence of Type 2 diabetes or Diabetes Mellitus may be prevented or delayed by adopting a healthy lifestyle[8][9].

2.2 DIABETES IN INDIA

The statistics report from the International Diabetes Federation (IDF), India has more diabetics than any other nation of the world. Currently there are 62 million people suffering by diabetes daily.This is the 10 million increase comparing to the statistics of 2011.The researchers says that by 2030 over 100 million people in India may have diabetes[11].

2.3 PREVENTING DIABETES MELLITUS

The causes of Type 2 Diabetes can be delayed or prevented by balanced diet and exercise and by maintaining ideal Body Mass Index(BMI) is an important factor in diabetes prevention. Based on the age also ,the possibilities for diabetes attack can be predicted and can be prevented. Middle aged and Older adults are still having highest risk for developing type 2 diabetes. As per the statistics of CDC(Centers for Disease Control and Prevention),adults aged 45 to 64 were the most diagnosed age group for diabetes. In the study conducted among 12,782 persons who underwent diabetes screening in the past year by a diagnostic lab ,2,713(21%) of people who were aged 20-29 suffering from high sugar levels[15][16].From this it is clearly understood that Type 2 diabetes has genetic causes and is affecting the youth. So the prevention of diabetes is essential one and can be achieved by technology assisted awareness methodologies which should reach the society in easiest way and also should help the health service providers to mange and manipulate data in effective ways[14][17].

3 CLOUD BASED FRAMEWORK FOR HANDLING DIABETES DATA

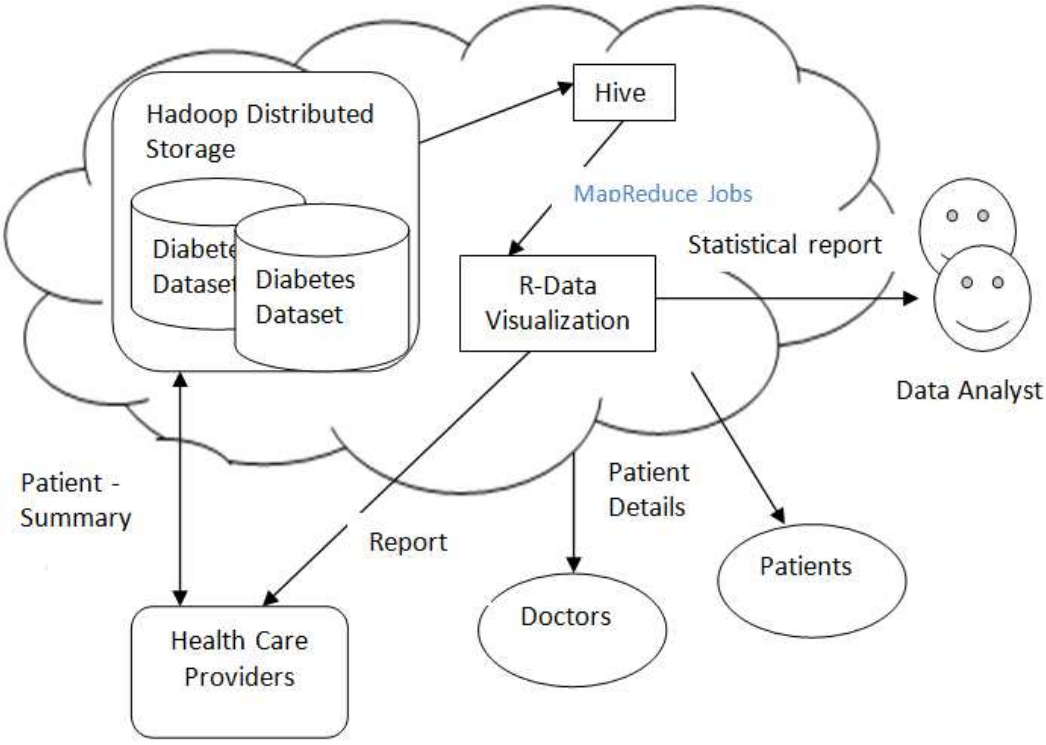

Figure 1: Cloud Architecture for handling diabetes data

The Hybrid Cloud architecture for handling large sized diabetes data is as shown in Figure1.

3.1 ARCHITECTURE OVERVIEW

The proposed Cloud framework of efficient methods and technologies will make possible the collaborative investigation of diabetic risk factor and other diabetic related diseases(as part of future work) with health care providers of hospitals, doctors and patients. The main here is to avoid or minimize the risk of diabetes we have done a preliminary try by considering basic information of a person such as age, height ,weight .Based on the values the BMI(Body Mass Index) level of a person is calculated. Actual BMI is compared with the standard BMI and based on that the possible percentage of risk is calculated individually for both male and female.

The architecture mainly depicts four major part of handling medical data. Such as Distributed Data storage using Hadoop(HDFS) in Cloud by health care providers or hospitals ,SQL like interface for manipulation of data stored in Hadoop, of potentially manipulated Map Reduce Job to R data visualization tool. The statistical report gives the percentage of possibilities based on persons BMI level and age .In the Distributed Data storage module the diabetic datasets collected and maintained by healthcare providers are transferred to the cloud .In cloud ,the data sets are stored in HDFS. Here the Hadoop is dynamically deployed in virtual infrastructure provided by the public or private cloud providers. This architecture facilitates the transparent exposure of MapReduce workflow and its customization.

The Hive-SQL like interface receives the distributed chunks from HDFS and then it explores, structures and manipulates the data for calculating the risk factor based on the criteria posted. Here, for testing purpose 2500 persons age, weight, height are considered as an input and BMI ratio is calculated based on the standards. From the BMI value the level of risk is predicted for each person. The male and female candidates are segregated in two different clusters and are the possibilities for diabetes attack is analyzed individually. Finally the analysis reports were generated .Now the data analyst can perform various complex modeling on subsets of data. Similarly the doctors can view the history of the patients from cloud storage and can treat accordingly irrelevant to the mobility of the patients. At the same time the patients can view and retrieve their treatment history from cloud storage anywhere at any time and they can understand their level of risk for diabetes .

3.2 FLOW OF ARCHITECTURE

The below Figure: 2 shows the flow of data stored and manipulated in the proposed framework.

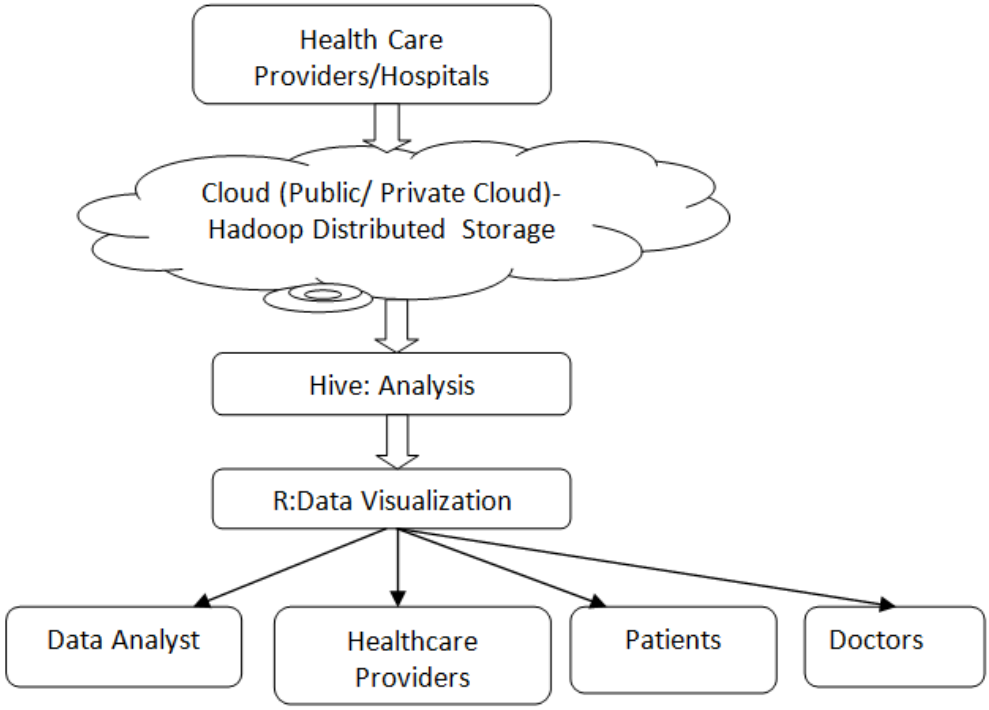

Figure 2:Flow of architecture

3.3 CLOUD STORAGE

Cloud storage enables users to remotely store their data and utilize the on demand high quality cloud applications without the burden of hardware and software management. Migrating data from our traditional storage to cloud storage offers convenient environment for storing and managing huge amount of data free from hardware complexities. Amazon EC2 and S3(Simple Storage Services) are well known public storage services. This internet based service provides large size of storage space and customizable computing resources [18].

3.4 HADOOP

When the data size exceeds the storage capacity of our available storage system, we have to distribute the data to multiple computers. The single framework which has the capacity of thousands of server is Hadoop. The HDFS (Hadoop Distributed File System) has a cluster system which stores the data chunks in multiple clusters and also it achieves reliable replication of data, fast fault detection and automatic recovery . Hadoop-Map Reduce programming model was proposed in 2004 by the Google, which is used in processing and generating large data sets implementation [19]. This model has the Mapper and Reducer interfaces to manipulate the large sized data.

3.5 HIVE-DATA ANALYSIS

The input from HDFS is fed to Hive to explore, structure and analyze the data. By querying the Pima dataset based on the criteria related to age, weight, height and BMI. Based on the query related the male and female data sets are segregated and analyzed as shown in sample Table 1 and Table 2(which is converted to an understandable simple form) . This results the risk level of both male and female individually.

Table 1: Female table

Female			
Age	**STD BMI**	**ACT BMI**	**Ris Factor**
20	63.77	68	28.2
25	59.25	52	50
30	52.25	68	100
35	48.95	65	100
40	59.25	52	50
45	52.25	58.5	40
50	62.9	54.6	50
55	66.65	58.6	50
60	59.25	68	60
65	48.95	58	60
70	70.45	78	50
75	66.65	57	60
80	66.65	51	100

Table 2 : Male Table

Male			
Age	STD BMI	ACT BMI	Risk Factor
20	59	52	40
25	48.95	58	60
30	52.25	68	100
35	48.95	65	100
40	48.95	55	40
45	66.65	58	60
50	70.45	63	50
55	66.65	60	40
60	59.25	52	50
65	62.9	54	60
70	52.25	55	20
75	59.25	52	50
80	55.7	61.5	50

3.6 R VISUALIZATION

The analyzed results from Hive are imported as a data frame and using ggvispackage (visualization package) for visualizing the analyzed result as graphs. Normally the level of glucose segregation and the usage of generated glucose become lower when the Body Mass Index (BMI) of a diabetic patient increases. The graph generated using R on the basis of age group and the corresponding graph has age, BMI and risk factor in x-axis and in y-axis . Statistical report as shown in Figure 3 and in Figure 4.The result can be viewed by health care providers or hospitals ,patients, doctors and also by data analyst for further review and research.

4 RESULT

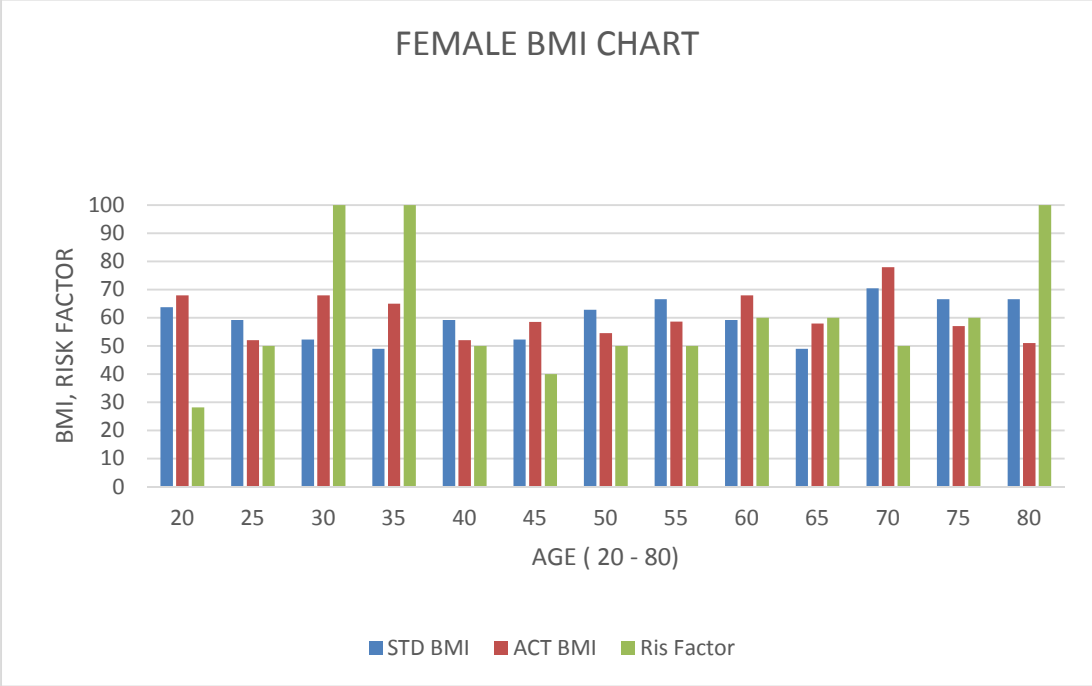

Figure 4: Male BMI and risk factor result

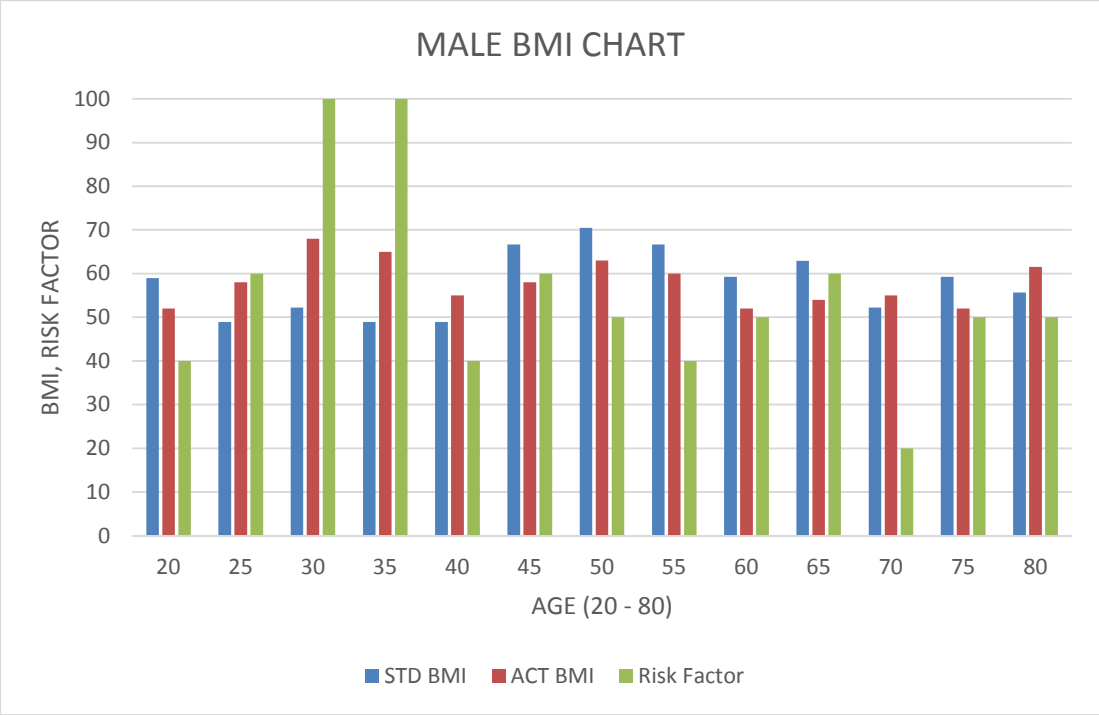

Figure 4:Male BMI and risk factor result

5 CONCLUSION AND FUTURE WORK

Currently, chronic disease like diabetes is growing constantly in society. Factors and reasons for the growth of this diabetes are various which includes improper knowledge of diabetic disease among the patients mainly living in rural areas, food habits. Most of the patients are unaware about the available health care centers for treatment. So if there is a global storage and retrieval infrastructure, people can get guidance at where ever they are. In order to effectively manage the huge dynamic diabetes data the proposed cloud based framework is very much suitable. It basically eliminates the pain of creating and maintaining heavy higher end infrastructure with more capital investment. Based on this framework a person who have BMI level greater than the threshold value of standard chart based on the age and their height, they are then categorized as male and female candidates. Based on the statistical report we obtained, male candidates have more possibility to be attacked by diabetes comparing to female candidates who have the same BMI level. Developing an secured cloud based pool with the improved result of above prediction for creating an awareness about diabetes among patients living in rural areas and also importing knowledge about available treatment in health care centers for diabetes will be the part of our future work.

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CONDITIONAL PRIVACY PRESERVING SECURITY PROTOCOL FOR GSM APPLICATION

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ABSTRACT: The idea of this work is to develop the prevention of theft of the ATM card and to control the usage of the ATM card by unauthorized person. The additional feature of this work is that no transaction can be done without the knowledge of the respective card holder for the cause that GSM transactions are being implemented. The description of the work is as follows; whenever the transaction has to be done, the card is inserted inside the ATM machine and devices are made to interact with some of the legacy systems. A message is received to the mobile phone of the rightful proprietor with a pin number of four digits. This number is entered in the ATM machine. In case of password being correct it moves on to the next level of money transaction, asking for the money withdrawal. Scenario like, the password is found to be defective the transaction will get cancel.

KEYWORDS: Spatial smoothing Processing (SSP), Radio Frequency Identification (RFID) technology.

INTRODUCTION

The idea of this work is to develop the prevention of theft of the ATM card and to control the usage of the ATM card by unauthorized person. The additional feature of this work is that no transaction can be done without the knowledge of the respective card holder for the cause that GSM transactions are being implemented. The description of the work is as follows; whenever the transaction has to be done, the card is inserted inside the ATM machine and devices are made to interact with some of the legacy systems. A message is received to the mobile phone of the rightful proprietor with a pin number of four digits. This number is entered in the ATM machine. In case of password being correct it moves on to the next level of money transaction, asking for the money with drawl. The Secure Mobile Wallet is the product belonging to the latest technology trends in mobile communications and IT security. As the client application of the larger system, SAFETM, Secure Mobile Wallet will introduce convenience, functionality and security in financial mobile transaction. The aim of the design is to provide people a more flexible way to use cash and credit cards securely. GSM provides recommendations, not requirements. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. The reason for this is to limit the designers as little as possible but still to make it possible for the operators to buy equipment from different suppliers.

The GSM network is divided into three major systems: the Switching System (SS), the Base Station System (BSS), and the Operation and Support System (OSS).The applications of SMS/GSM Based security system are quite diverse. There are many real life situations that require control of different devices remotely and to provide security. There will be instances where a wired connection between a remote appliance/device and the control unit might not be feasible due to structural problems. In such cases a wireless connection is a better option. Basic Idea of our work is to provide GSM Based security even if the owner is away from the restricted areas. For this we adopted wireless mode of transmission using GSM. Beside this there are many methods of wireless communication but we selected GSM in our work because as compared to other techniques, this is an efficient and cheap solution also, we are much familiar with GSM technology and it is easily available. This system

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consists of a GSM modem for sending and receiving the SMS, Intel 89S52 microcontroller which is controlling the entire system, LCD for the display purpose , keypad for entering the password and supporting circuitries like rectifier for ac to dc conversion. It can be installed at any desired location e.g., office (to protect important files and document), banks (to protect cash in locker) etc.

LITERATURE SURVEY

The additional feature of this work is that no transaction can be done without the knowledge of the respective card holder for the cause that GSM transactions are being implemented. The description of the work is as follows; whenever the transaction has to be done, the card is inserted inside the ATM machine and devices are made to interact with some of the legacy systems. A message is received to the mobile phone of the rightful proprietor with a pin number of four digits. This number is entered in the ATM machine. In case of password 0being correct it moves on to the next level of money transaction, asking for the money withdrawal. An array antenna based localization using Spatial smoothing Processing (SSP) is proposed for wireless security and monitoring, referred to as array sensor. The proposed method is based on the array sensor that exploits an array antenna at the receiver to detect the propagation environment of interest. If an event occurs, e.g., human motion, the propagation environment is changed. Thus the eigenvector and eigen value spanning the signal subspace that is inherent to its environment changes as well. Using a machine learning technique based on the eigenvector and Eigen value, we can detect the event accurately. The proposed method is improved from our previous work which uses only a limited number of signal subspace features [1].Accuracy of target self-localization in RFID tag information networks and grids critically affects its situation awareness. With an in sufficient localization accuracy, information about local 2D or 3D surroundings delivered to a target by request may provoke collisions, even fatal. In RFID networking systems, target state can be observed over a big number of tags. For such a case, the Extended Kalman Filter (EKF) algorithm is modified and a new extended unbiased Finite Impulse Response (EFIR) filtering algorithm is developed. We show that redundant information captured from the tags allows increasing both the localization accuracy and system stability [2].This author [3] described by a novel Radio-Frequency Identification (RFID) smart shelf that accurately locates tagged objects using standard passive UHF RFID tags. This standard-based commercial off-the-shelf approach provides significant advantages over custom HF RFID and other near-field RFID approaches, including reduced tag costs, minimal infrastructure costs, and simple operation. In order to achieve accurate location sensing of objects sitting on the shelf, we utilize a novel localization algorithm that utilizes detected changes in a tag's readability to infer the presence of neighboring tags. According to our experimentation results, with a single RFID reader antenna for two wooden shelves of size 91 cm × 152 cm, our smart-shelf system estimates nine box-level object locations with an average error of just 18.48 cm, which is a 71% improvement in accuracy compared with the previously published k Nearest Neighbor (KNN) algorithm.

A survey for success factors of Web application development reveals that development methodologies, tools, and techniques are not considered as important by developers for the success of Web application development. Rapid application prototyping, ERD (Entity Relationship Diagram), program flowchart, and application framework are more highly regarded than the object-oriented tools such as use case diagram, class diagram, object diagram, and sequence diagram. Developers focus more on maintainability and scalability than end users and management for evaluating the success of Web application development. Ambiguous user requirements, scope creeping, and lack of success metrics are evaluated as the most important issues for the failure of Web application development. Research results also indicate that developers need more help in communication, management, and control than the technology aspects of the development process. The overall findings point to flexible, simple, proven, participative, and management-oriented methodologies, tools, and techniques to address ambiguous and changing user requirements in the next generation development approaches for Web applications [4]. Radio-Frequency Identification (RFID) technology has been widely used in passive RFID localization application due to its flexible deployment and low cost. However, current passive RFID localization systems cannot achieve both highly accurate and precise moving object localization task owing to tag collisions and variation of the behavior of tags. Most researchers increase the density of tag distribution to improve localization accuracy and then consider using either anti-collision process embedded in the hardware of the RFID reader or advanced localization algorithms to enhance localization precision. However, advanced anti-collision processes for RFID devices are challenged by the physical constraint characteristics of radio frequency; and improved localization algorithm cannot fundamentally reduce the impacts of tag collision on localization precision [5].

This [6] has been explained by indoor localization system using Radio Frequency Identification (RFID) technology. Locations of passive RFID tags are determined by scanning multiple RFID reader antennas' radiation beams. During each scan, the horizontal and elevation angles of the reader antenna are recorded when the transition of a tag entering or leaving the antenna beam's coverage area occurs, and this angle information is used in the developed algorithm to calculate the tag's location. The proposed system requires a minimum of two reader antennas, without the need for reference tags.

Experimental results obtained from a controlled environment demonstrate that the average localization error distance of the proposed beam scanning method is less than 20 cm. Device-Free Localization (DFL) with Wireless Sensor Networks (WSN) is an emerging technology for target localization, which has received much attention in the area of Internet of Things. Received Signal Strength (RSS) measurements are the key to realize DFL and mainly affects the localization performance. Most existing approaches need to measure the RSS of all the wireless links in WSN, which take much time on measurement process and localization algorithm due to the large amounts of RSS data, thus they are inefficient, especially in the case of target tracking. In this paper, by making full use of the consecutiveness of motion, we present an efficient measurement strategy based on a small set of correlated wireless links. Furthermore, a lightweight Compressed Maximum Matching Select (CMMS) algorithm is proposed to localize target, which only needs a small-scale matrix-vector product operating for one estimation [7].In the NFC application support only android mobile phone and worked in small distance. So it will overcome by using GSM application.GSM support the any mobile phones and distance is very high. In this system is more efficient than the NFC application.

PROPOSED SYSTEM

In this session has two section one has transmitter and other receiver section. The transmitter section consists of power supply, encoder and RF txr Receiver section consists of GSM, decoder, microcontroller, UART, relay, pc, 4x4 keypad, motor, camera switch and RF receiver shown in figure 1&2.

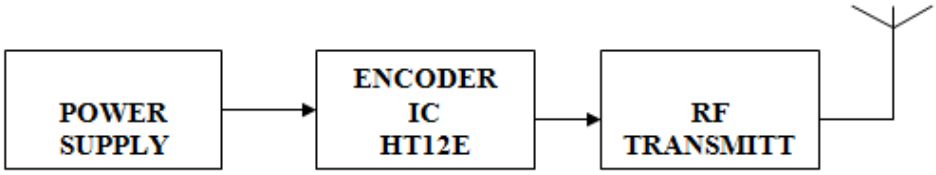

Fig.1 BLOCK DIAGRAM (TRANSMITTER SECTION)

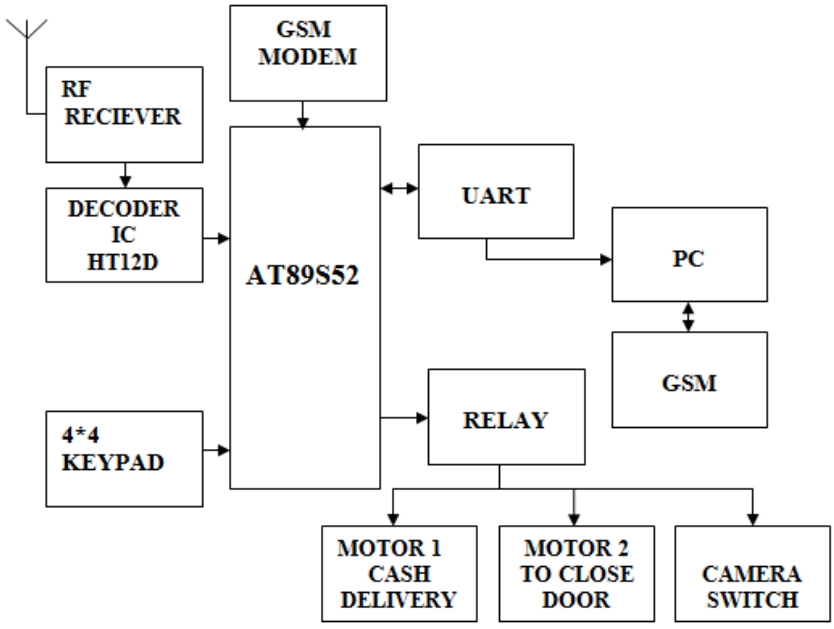

Fig.2 BLOCK DIAGRAM (RECEIVER SECTION)

The RFID reader reads the id number from passive tag and send to the microcontroller, if the id number is valid then microcontroller send the SMS request to the authenticated person mobile number, for the original password to open the door, if the person send the password to the microcontroller, which will verify the passwords entered by the key board and received from authenticated mobile phone and allows for further process. Transmitter section, when given the power supply the LCD display shows “show your ID”. Then RFID reads the id and transmit the OTP code to receiver. In receiver section,

when receive the OTP code from transmitter and the receiver send the password to transmitter section. So it will given by user. Then further process is done by microcontroller.

The main goal of this paper is to design and implement an ATM security system based on RFID and GSM technology which can be organized in ATM centers. In this system only authentic person can be recovered money from the ATM. We have implemented a security system based on RFID and GSM technology containing door locking system and money transaction using RFID and GSM which can activate, authenticate, and validate the user and unlock the door for transaction process. The RFID reader reads the id tag and send to the microcontroller, if the id number is valid then microcontroller send the SMS request to the authenticated person mobile number, for the original password to open the door, if the person send the password to the microcontroller, which will verify the passwords entered by the key board and received from authenticated mobile phone. So that further procedure can able to process. Fig 3 shows that the microcontroller used to storing the programs and monitoring the system functions and control the modules. If the password will be matched the next process of transaction has to be done or otherwise error will be generating and making the alarm sound by buzzer. Then RFID used to transmit and receiving the required signals with autonomous function. The encoder is used to convert the one form of code to another. Decoder is reverse.

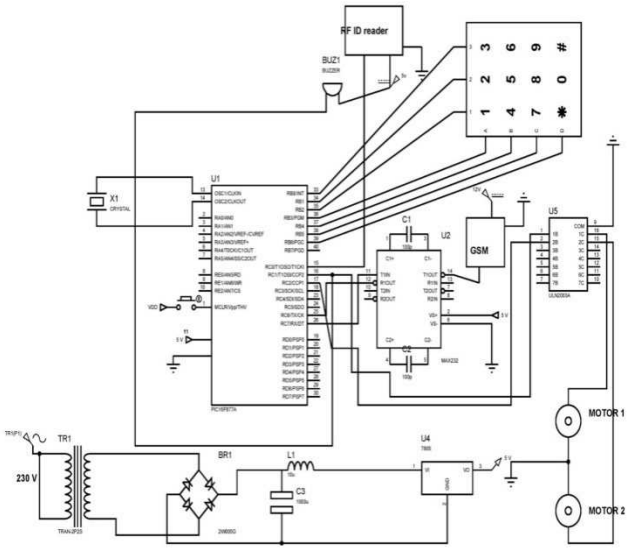

Fig.3 circuit diagram

Process of encoder function the power supply unit is used to convert the 230v ac to 12v dc by using step down transformer. Relay is a switch contact which is used to open or close the contact and operated in electrically or mechanically. In this figure [3] the GSM is used to communication between user and ATM machine. It has two motors. One is withdraw the money and other used for door closing and opening function.

RF READER

The RFID reader reads the id number from passive tag and send to the microcontroller, if the id number is valid then microcontroller send the SMS request to the authenticated person mobile number, for the original password to open the door, if the person send the password to the microcontroller, which will verify the passwords entered by the key board and received from authenticated mobile phone and allows for further process.

MICROCONTROLLER

It is the heart of the embedded system which is used to store the programs and control the other modules. It is a 16 bit microcontroller which will verify the passwords entered by the key board and received from authenticated mobile phone and allows for further process.

ENCODER

An encoder is a device, circuit, transducer, software program, algorithm or person that converts information from one format or code to another, for the purposes of standardization, speed, secrecy, security, or saving space by shrinking size.

DECODER

A decoder is a device which does the reverse of an encoder undoing the encoding so that the original information can be retrieved. The same method used to encode is usually just reversed in order to decode.

GSM

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

MOTOR

It has two motors. One is used for money transaction and another motor used for door closing or opening function.

RELAY

It act as a switch which is open or close a contact and operated in electrically or mechanically and operating voltage is 5v.

BUZZER

It is an audio device. When the voltage is given the buzzer making a sound.

POWER SUPPLY UNIT

In this unit is used for given a supply to kit. It has many equipments such as transformer,regulator and rectifier etc.. regulator produced the output of constant DC 5v. the rectifier convert the ac to dc voltage. The transformer used to step down by 12v.

1X5 KEYPAD

It is input device which is used to enter the password to ATM machine.

EXPERIMENTAL RESULTS

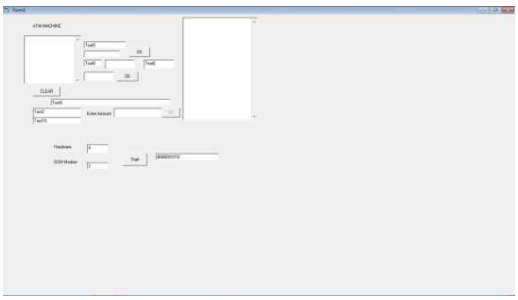

Fig.4 output

Fig .5hardware module

Fig 6 RFID reader

Fig .7 microcontroller

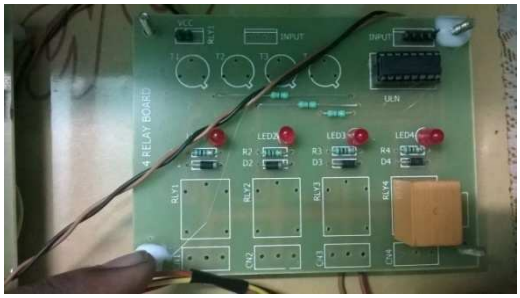

Fig .8 Relay circuit

Fig 9 GSM

Fig 10 switch and motor

In fig 4 and 5 is a output of hardware and software. The hardware module consists of RFID reader, relay circuit, GSM, motor and switch matrix which is connected in microcontroller. In fig 6 is RFID reader which is used to automatically detect the RFID card number i.e. for example ATM card. In fig 7 is microcontroller which is used to store the programs and monitoring the input and output and also used to control the all modules. The LCD display is used to displacing purpose. In fig 8 is relay. It is act as a switch open or closes the contact which is operated in electrically or mechanically. Fig 9 is a GSM which is used to communication between user and operating system i.e. call or Message through user. In fig 10 is a switch and motor. The switch is an input device which is used to type the password and input of an system.

CONCLUSION

This paper proposes when interrupt comes from the authorized person for money withdrawal in ATM centers. But there may be a delay caused because of GSM messages since it is a queue based technique, which can be reduced by giving more priority to the messages communicated through the controller. In future smart card system which includes face and voice recognition system to avoid delay. In this paper GSM and RFID implemented not only for ATM centers but also bank lockers and home security system. For the future work, the conditional privacy preserving security protocol for GSM application was implemented by prevents theft control and to avoid the getting money from ATM center by unauthorized person. It this system used for long distance between user and ATM center and also used for any mobile phones.

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Analysis of shift register using GDI AND gate and SSASPL using Multi Threshold CMOS technique in 22nm technology

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ABSTRACT: Shift register in this paper possess low efficient SSASPL (Static differential Sense Amp Shared Pulsed Latch). Timing problem between pulsed latches is solved using multiple non-overlap delayed strobe signal. Here latches are grouped into several sub-shift registers. To provide better results, leakage current and leakage power are reduced with MTCMOS (Multi Threshold Complementary Metal Oxide Semiconductor) and power-delay products are further reduced using Mod-GDI(Modified Gate Diffusion Input) technique. A 16-bit shift register in 22nm technology with supply voltage VDD =200mv and consumes 0.147mW. Power consumption in percentage is 43.04% in other words power reduced in comparison to the existing systems is 14.85%. Simulation is done using Tanner EDA TOOL in 22nm technology.

KEYWORDS: power-delay products, SSASPL, MTCMOS, strobe signal, Mod-GDI.

1 INTRODUCTION

With the advent of growing technology in the communication environment achieving long battery life is of major concern in low power micro electronics such as in laptops, cellular networks and other portable systems .Major applications of shift register include image processing IC's, digital filters and communication receivers[1]. The challenging scenario lies in the nanometer technology where the reduction in supply and threshold voltage puts forth

a great demand in new design methodology in order to meet the power constraints . overweening power dissipation also leads to over heating, performance degradation and reduction of chip life and its functionality .Increased levels of integration and improvisation in feasibility and reliability with efficient cost is obtained through minimal Consumption .Static power dissipation due to reverse biased diode leakage between diffusion regions , wells and the substrate is reduced to a greater extent in this paper. In recent trends replacing flip flops with pulsed latches is practiced due to its lesser dimensions. N–bit shift register consists of N data flip flops connected in series. In this paper timing problem between pulsed latches is solved using multiple non-overlap delayed strobe signal. Latches are grouped into several sub-shift registers with a small number of pulsed clock signal and an additional temporary storage latch[1]. Modified GDI is an excellent power efficient design technique with less number of transistor counts which reduces the average power consumption and considerably decreases the delay[3].Usage of MTCMOS for designing high speed power efficient SSASPL latch is computed in 22nm technology. MTCMOS being a circuit level technique use both low threshold and high threshold voltages[2].

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2 ARCHITECTURE

2.1 PROPOSED SYSTEM

Pulsed latches used in shift register causes timing problem where all the latches are meant to have constant input signal during a clock pulse .This is overcome by using delay circuits in between the latches .Moreover delay circuits inserted between the latches increases the operating time.

One common solution is to use multiple non overlap delayed pulse clock signal therefore each latch is updated with the output of its previous one. In other words each latch uses delayed pulse clock signal compared to its previous one gradually. This in turn increases the number of delay circuits needed.

In existing system the delay between latches are generated by using a pulse clock generator which is capable of producing a number of delayed pulse clock signals which is non overlapping with one another. This concept yields a better result compared to any conventional shift registers. Also here the latches are grouped as several 4-bit sub shift register according to the need as of either 8-bit shift register or 12-bit shift registers are needed and so on. 16-bit shift register with 4 4-bit sub shift registers along with its pulse generator circuit is shown in figure 1.

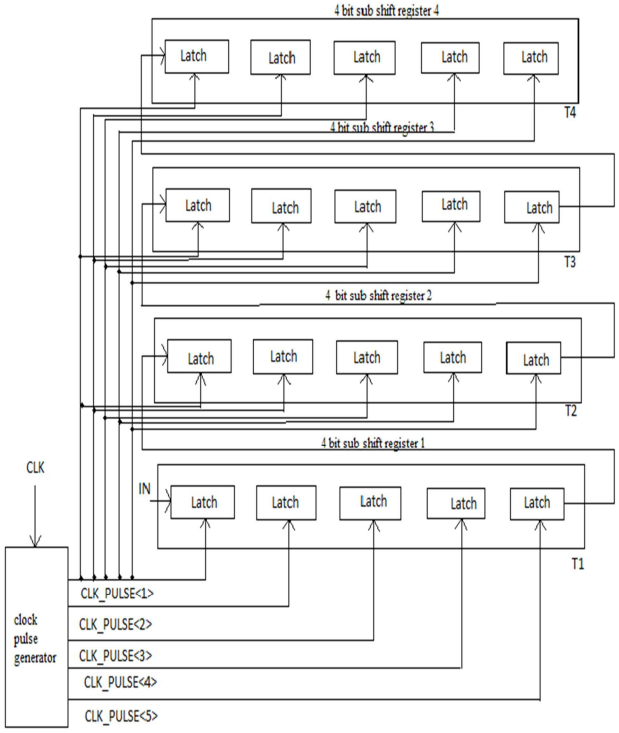

Figure 1. 16 bit shift register

A multiple non overlapped pulse clock signal is shown in figure 2 .(a).

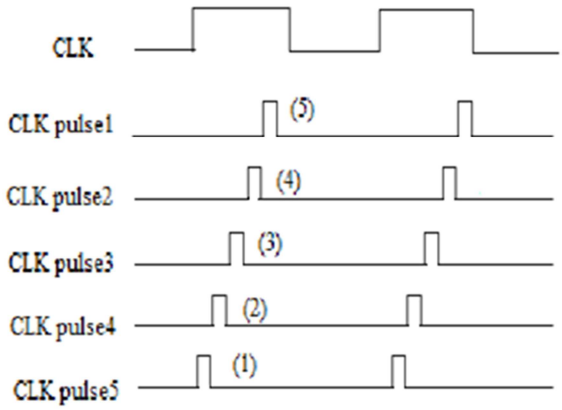

figure 2(a):multiple non –overlapped pulse signal

In proposed model, the width of the clock pulse is further reduced by using strobe signal instead of normal pulsed signal. Strobe signal contributes a larger reduction in power consumption required for the clock pulse to be enabled in order to activate the latch circuit. Major amount of power is consumed by latches and clock pulse circuits where each latch intakes power for data transition and for clock loading. In clocked systems, the strobe signal is treated as an enable signal for the corresponding latch or register . The data is captured on any clock edge for which the strobe or enable is active. This means that the timing is strictly relative to the clock edge. Multiple non-overlap strobe signal is shown in figure2. (b).

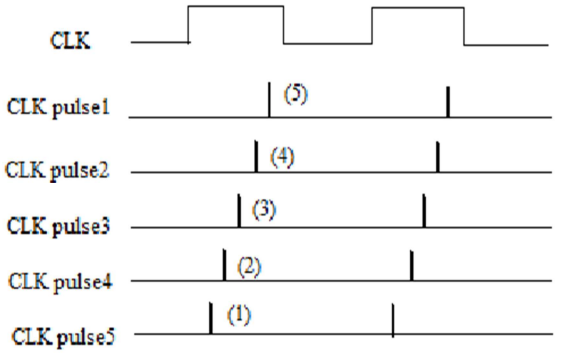

figure 2.(b):Multiple non overlap Strobe signal

2.2 DESIGN OF MTCMOS

Design of any logic circuits using MTCMOS can leads to overall enhancement in system performance [2].Digital circuits employs digital logic which is a function of present input whereas sequential logic output depends upon the present input as well as the past output which, this tells that sequential logic has memory and combinational logic does not have any memory.

Scaling of CMOS in any nanometer technology tends to reduce the required supply voltage and threshold effectively. Lowering the threshold voltage increases the sub threshold leakage current exponentially. Also reduction in number of transistors seriously retards the total power consumption of any integrated circuit due to its leakage current.

MTCMOS technology proposed here satisfies the requirement of lowering the threshold voltage and stand by current, the crucial factors necessary to obtain low power and high speed performance. MTCMOS technology employs two main features 1.PMOS and NMOS transistors are operated with two different threshold voltages within a single chip 2.two modes of operation i.e. active and sleep mode for efficient power management..General MTCMOS architecture is shown in figure 3.

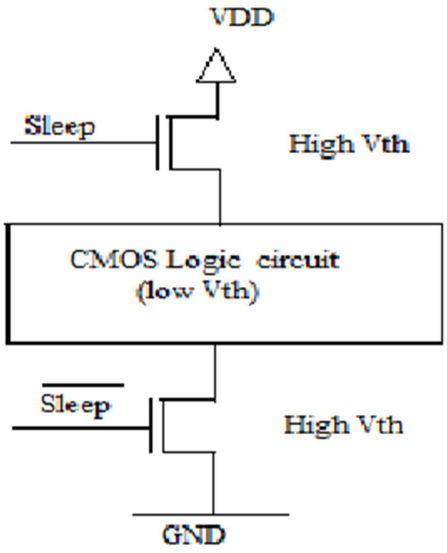

figure 3:MTCMOS architecture

High Vth devices are used on non-critical paths to reduce static leakage power without incurring a delay penalty. Typical high Vth devices reduce static leakage by 10 times compared with low Vth devices. Therefore only high threshold sleep transistor is used at the top and bottom of the logic circuit. Isolating the logic networks MTCMOS technique reduces the sleep mode logic power dramatically .

2.3 DESIGN OF GDI

New technology for low power design is Mod-GDI (Modified Gate Diffusion Input). This technique further reduces the propagation delay while maintaining low complexity of logic design . GDI based design is obtained from any conventional CMOS in such a way that the source of the PMOS and the source of the NMOS in a GDI cell is not connected to VDD and GROUND respectively.

GDI and modified GDI consists of three inputs G,P,N where G is the common gate input of PMOS and NMOS, P is the input to source or drain of PMOS and N is the input to source or drain of NMOS.GDI consumes less number of transistors compared to conventional CMOS. Basic GDI cell is shown in figure 4(a).

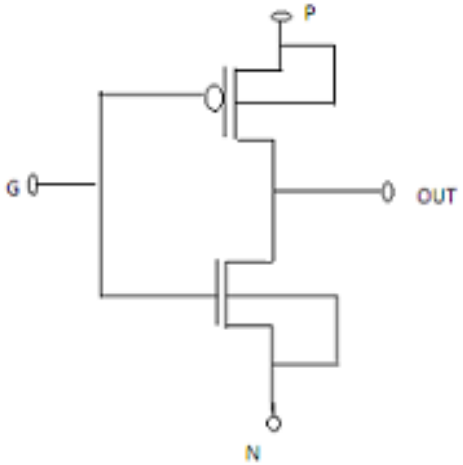

Figure.4(a): Basic GDI cell

Table 1 shows different logic function of the basic GDI cell based upon different input values. Thus implementation of various logic function can be realized using modified GDI with low power and high speed compared to conventional CMOS design.

Table 1: Logic functions of GDI

N	P	G	OUT	FUNCTION
0	B	A	A'B	F1
B	1	A	A'+B	F2
1	B	A	A+B	OR
B	0	A	AB	AND
C	B	A	A'B+AC	MUX
0	1	A	A'	NOT

GDI introduced in pulse generator of shift register is shown in figure 4(b).

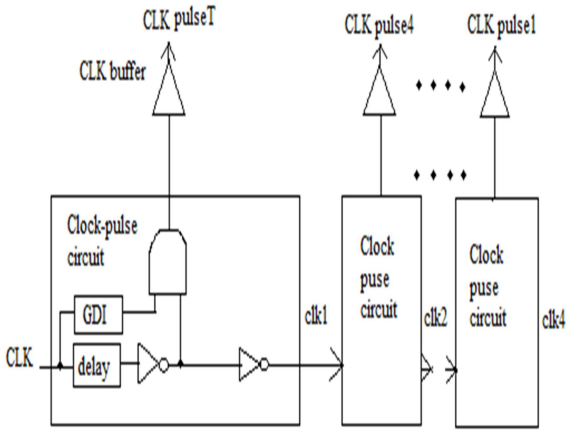

Figure 4(b):GDI based pulse generator

2.4 DESIGN OF SSASPL WITH MTCMOS

Due to parasitic capacitance and resistance short clock pulses cannot run through long shift registers. In contrast delay due to the wire increase rising and falling edge times of the clock degrading the shape of the clock pulse. A simple solution for this is to increase the clock pulse width but this decreases the maximum clock frequency .Another solution is to insert clock buffers with small wire delays but this increases area and power overhead. Moreover multiple clock pulses for multiple clock buffers increases the power overhead. Table 2 shows the general features of SSASPL latch.

Table 2: general features of SSASPL latch

Type of pulsed latch	SSASPL
Word length of shift register	256
Word length of sub shift register	4
Total number of pulsed latches	320
Area	6600
Power	1.2Mw
Max clock frequency	840MHZ 100MHZ

SSASPL latch using smallest number of transistors (7 transistors) consumes lowest clock pulse because it has a single transistor driven by pulsed clock signal. SSASPL updates the input data with 3 NMOS transistors and it makes use of other four transistors in cross coupled inverter manner to hold the data.

The size of PMOS and NMOS transistors in two inverters are 0.1µm and 0.5µm.SSASPL latch designed with MTCMOS is shown in figure 5.

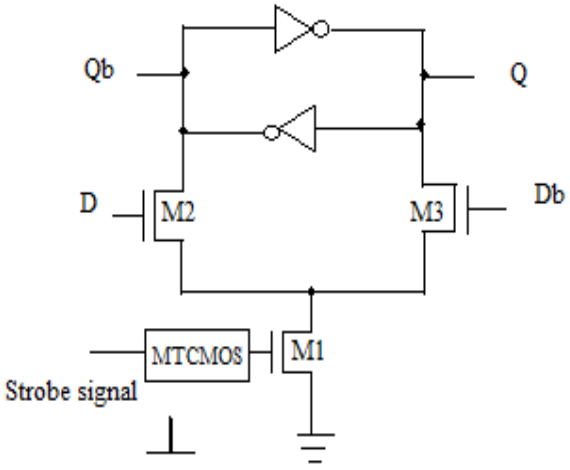

Figure 5: Design of SSASPL latch with MTCMOS

Conventional SSASPL latch consumes 0.10486mW power whereas SSASPL with MTCMOS technique consumes reduced power of 0.059253mW power. Thus SSASPL with MTCMOS consumes only 56.50% of power when compared to conventional SSASPL.

The overall power reduced in SSASPL when incorporating MTCMOS technique is 43.50%.

3 SIMULATION AND RESULTS

Here a detailed analysis of average power consumed in 16 bit shift register with MTCMOS and Modified GDI technique is proposed. Comparisons have been made between conventional master slave flip flop used shift register ,existing SSASPL based shift register and proposed 16 bit shift register based on SSASPL technique with MTCMOS technique and pulsed generator with Modified GDI have been done and successfully shown in table 3.

Table 3 :performance comparison

System	Power consumed	In %
Conventional master slave flip flop	0.3420mW (100%)	-
SSASPL based shift register	0.1983mW	57.89%
Proposed 16-bit shift register	0.1472mW	43.04%

Conventional master slave flip flop used shift register schematic in tanner is shown in figure 6(a).

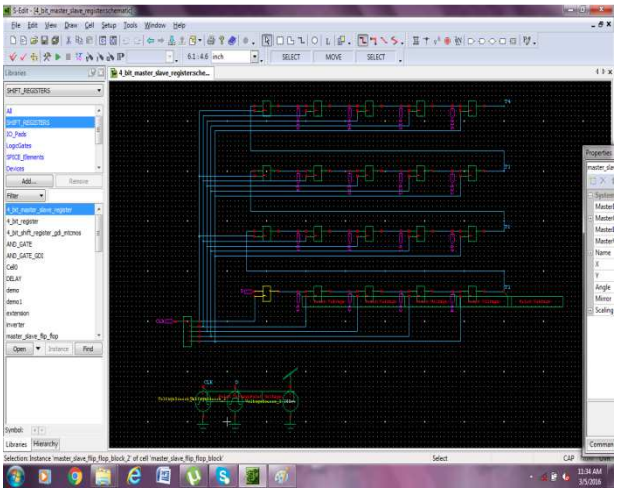

Figure 6(a): Conventional master slave flip flop used shift register

Output in tanner EDA tool is shown in figure 6(b)

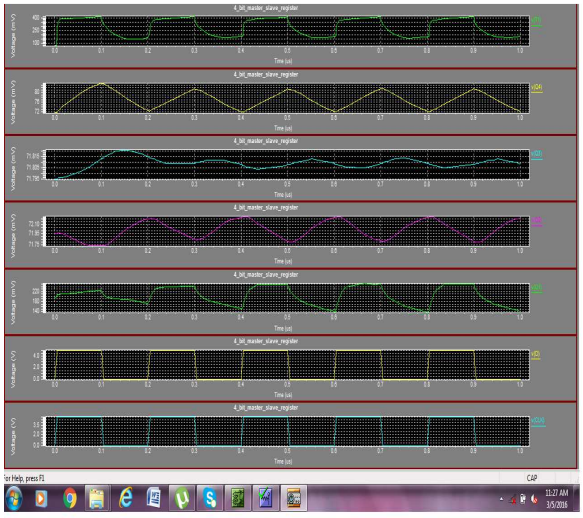

figure 6(b) Output in Conventional master slave flip flop used shift register

Existing SSASPL based shift register schematic is shown in tanner tool figure 7.

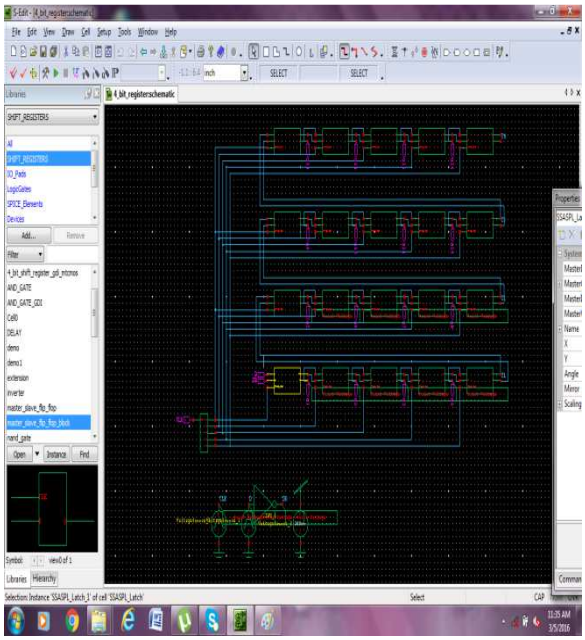

Figure 7: Existing SSASPL based shift register

Output for existing SSASPL technique is shown in figure 7(a).

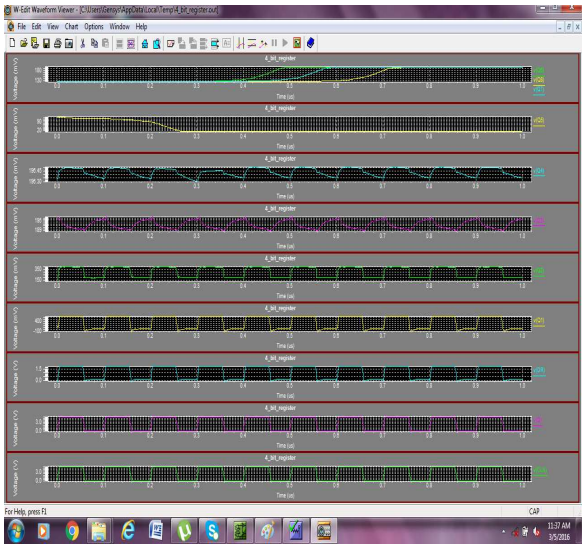

Figure 7(a) :output for existing SSASPL technique

Proposed 16 bit shift register based on SSASPL technique with MTCMOS technique and Modified GDI schematic is shown in figure 8.

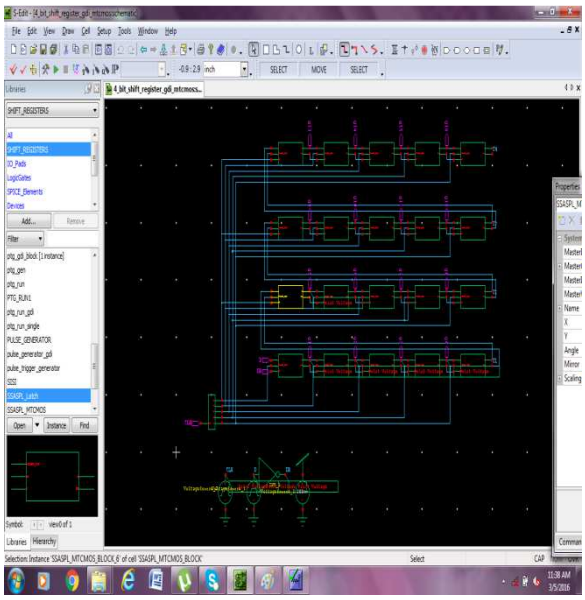

Figure.8: proposed 16 bit shift register based on SSASPL technique with MTCMOS technique and Modified GDI.

Output for proposed 16 bit shift register based on SSASPL technique with MTCMOS technique and Modified GDI is shown in Figure 8(b).

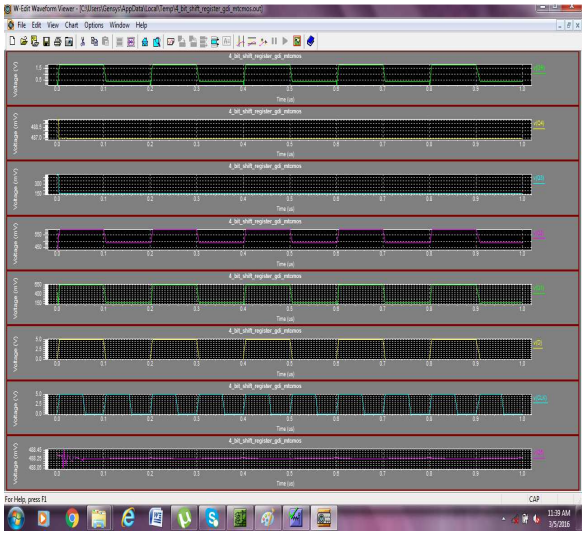

Figure.8 output for 16-bit proposed shift register

4 CONCLUSIONS

The reduction of static power consumption is achieved by replacing flip flops with pulsed latches. The timing problem between pulsed latches is reduced by using strobe signal instead of single pulsed clock signal. A 16-bit shift register in 22nm technology with supply voltage VDD =200mv and consumes 0.147mW. power consumption in percentage is 43.04% in other words power reduced in comparison to the existing systems is 14.85% . We hope the proposed method would help researchers for further research activities on shift registers.

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RFID Based Blind People Navigation for Easy Transportation

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ABSTRACT: Unfortunately, public transportation is not an easy mean to use and access by blind people in many countries. In case of buses, blind people have difficulty in recognizing and estimating the arrival of buses at the bus stations. In this paper a bus system using Radio Frequency Identification (RFID) is used. The blind people in the bus station are provided with the RFID reader which is recognized by the RFID tag in the bus. Then the blind people get the information about the arrival of the bus. The indication is made in the bus that the blind people is present in the station to the driver with the help of RF transmitter and RF receiver. So the bus stops at the particular station.

KEYWORDS: Radio Frequency Identification (RFID), RF transmitter and RF receiver, RFID reader, RFID tag.

1 INTRODUCTION

According to the report of World Health Organization about 285 million are estimated to be visually impaired worldwide published in 2014, there are about 39 million people blind and 249 million people have low vision. About 95% of the visually impaired people live in the developing countries. Each visually impaired people face many problems according to their levels of vision. With the support of various organizations, more visually impaired people have been given opportunity to education and many other mean. But still the issues of navigation for the blind are very complex and troublesome especially during public transportation. For the blind people it is difficult to read the traffic signal and street signs. In order to overcome these difficulties a visually impaired person might use cane, guide dog. As these alternatives are also helpful to the blind person as assistive devices but it is not so effective. Eventhough guide dogs and walking cane are also helpful but they are restricted to certain environment.

Radio Frequency Identification (RFID) is a feasible, cost effective and emerging technology in recent years. The application of RFID technology has been numerous and the usage of this technology has led to many applications that are being used today in many applications. RFID technology has been widely used in logistics, manufacturing, environment, agriculture, retail aviation and information technology [2]. It is method of storing and remotely retrieving data via radio frequency transmission by using devices called RFID tag and RFID reader.

The software part is Embedded C with Keil for programming the controller.Keil software is the leading vendor for 8/16- bit development tools (ranked at first position in the 2004 Embedded Market Study of the Embedded Systems and EE Times magazine).

2 PROPOSED SYSTEM

The RFID technology is used to identify the buses for the blind people. Each buses have individual tag for individual route. When the tag is read by the reader then the intimation voice will be sent to the blind people through headphone. And also

the RF transmitter is used to communicate with the RF receiver to alert the driver, that there are blind people nearer with the bus. There are two sections in this proposed system namely blind people section, bus section.

3 OVERVIEW OF RFID TECHNOLOGY

RFID system consists of three components namely transponder (tag), interrogator (reader) and computer containing the database, as shown in Fig. 1. The interrogator reads the tag data and transmits it to the computer for authentication. The information is processed and upon verification, access is granted. The system offers diverse frequency band ranging from low frequencies to microwave frequencies.RFID system operates in four ranges if frequency spectrum low, high, ultra high and microwave. Low frequency RFID system operate at 125 KHz and have a read range of less than 0.5m .High frequency system operates at 13.56MHz and provide a read range of approximately 1m.Similarly ultrahigh and microwave frequency system operate at 860MHz and 2.4GHz and provide read range of 3m and 1m respectively [2]. RFID technology uses a RFID tags and RFID readers to monitor objects in physical world. It can store some information (including a unique ID) and can communicate with a reader through a wireless channel. Depending upon the source of electrical energy, RFID tags are classified as either active or passive. The active tags use a battery for powering the circuit on the tag and transmit the tag information upon the reader request. However, these tags are very expensive and seldom used. On the other hands, passive tags get energy from the reader to power their circuit. These tags are very cost-effective and hence most of the applications use them. A comparison of these tags highlighting important features is shown in Table I [2].

Table 1.Comparison of active and passive tags

SPECIFICATION	ACTIVE TAGS	PASSIVE TAGS
Power Supply	Battery operated	No internal power
Communication Range	Long range (100m+)	Short range (3m)
Range Data Storage	Large read/write data (128kb)	Small read/write data (128b)
Required Signal Strength	Low	High
Application	auto manufacturing, hospitals – asset tracking, construction, mining, laboratories, remote monitoring,	libraries/bookstores, pharmaceuticals, passports, electronic tolls, item level tracking

The information on RFID tag usually contains a unique ID. When the RFID reader transmits a signal to the tag as shown in fig 1, tag communicates its identity to the reader. In the present work, passive RFID tags have been used. A passive RFID tag transmits information to the reader when it comes in the vicinity of electromagnetic field generated by the reader. The phenomenon is based on Faraday's law of electromagnetic induction. The current flowing through the coil of interrogator produces a magnetic field which links to the transponder coil thereby producing a current in the transponder coil. The transponder coil then varies this current by changing the load on its antenna [3]. This variation is actually the modulated signal (scheme is known as load modulation) which is received by the interrogator coil through mutual induction between the coils. The interrogator coil decodes this signal and passes to the computer for further processing. The reader has an antenna that emits radio waves; the tag responds by sending back its data. An RFID tag is a microchip combined with an antenna in a compact package; the packaging is structured to allow the RFID tag to be attached to an object to be tracked. Over the past decade, RFID technology has enjoyed the significant growth. With six billion tags sold in 2013, RFID technology has by now impacted application ranging from inventory control, supply chain management to people tracking.

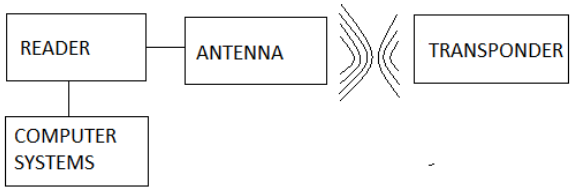

Fig 1. Basic RFID System

4 SYSTEM COMPONENTS

4.1 RFID TAG

RFID tag is a microchip combined with an antenna in a compact package.The packaging is structured to allow the RFID tag to be attached to an object to be tracked. The tag's antenna picks up a signals from an RFID reader or scanner and then returns the signal, with some additional data [5].

4.2 RFID READER

An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radiowaves; the tag responds by sending back its data [5].

4.3 POWER SUPPLY

A power supply is an electronic device that supplies electric energy to an electrical load.

4.4 MICROCONTROLLER

AT 89C51 is a low power, high performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable flash memory. The device is manufactured using Atmel's high–density non- volatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. It has 8K bytes of flash,256 bytes of RAM,32 I/O lines, watchdog timer, two data pointer, three 16 –bit timer/counter, a six –vectored two level interrupt architecture, a full duplex serial port, on chip oscillator, and clock circuitry[4].

4.5 BATTERY

A battery is a device that converts chemical energy directly to electrical energy.

4.6 LCD

A 16x2 is used to display 16 characters per line and there are two such lines.When the RFID reader senses the RFID tag then the information in the RFID tag is displayed in LCD screen.

Fig:2 Liquid Crystal Display unit

4.7 RF TRANSMITTER

The TWS-434 extremely small, and are excellent for applications requiring short-range RF remote controls.

The HT-640 IC encodes 12-bits of information and serially transmits this data on receipt of a Transmit Enable and a low signal on pin-14/TE.

4.8 RF RECEIVER

The receiver also operates at 433.92MHz, and has a sensitivity of 3µV.The TWS -434 receiver operates from 4.5 to 5.5V-DC, and has both linear and digital output. The 212 series of decoder is capable of decoding information that consist of N bits of address and 12_N bits of data.

5 SYSTEM OPERATION

The blind people section consists of RFID reader,AT89C51microcontroller,powersupply,voice synthesizer,headset,RF transmitter as shown in fig 4.The 230 V ac voltage is given to a step down transformer,which steps the ac voltage down to the 6V ac output.Then the 6V ac is fed as input to the rectifier.The rectifier converts the ac to dc voltage.The resulting dc voltage usually as some ripples or ac voltage variation.To avoid the ac ripples the low pass filter is used.IC 7805 voltage regulator is used to convert the 12V dc to 5V dc.The 5V dc is given to operate the microcontroller.The RFID tag or transponder has a sequence of metal pins or barcode strip made of a magnetic material(different from tags).The sequence of the metal pins or the bar code has a digital meaning behind it and it is unique to the particular tag.When the tag is interpreted or decoded,the sequence is displayed as numbers unique to the tag.Since it make use of the Radio frequency interference technique,Radio frequency helps in decoding the information.Each RFID tag has its own identification number(Electronic Code Number).RFID tag can store more than just a tag ID.This additional memory on the tag is of Electrically Erasable Programmable Read Only(EEPROM) memory type.Data on RFID tag can be updated through local processing.The radio frequency used to decode the data in the RFID tag is produced by the RFID reader.When a signal from radio frequency interacts with an RFID tag, the pins or the barcode energizes(only in passive tag) and produces its own magnetic field which has a unique interference pattern which when read by the RFID reader would obtain the unique number designated to the corresponding RFID tag.Thus the RFID reader obtains the address of the desired RFID tag(the address differs from each tag).This identified tag when attached to the real object (bus)will be the reference to that object.Thus the object is indirectly detected.Then the RS 232 is used to transmit the serial information to the microcontroller.Microcontroller is the heart of the device. This device is designed to provide a voice based announcement for the user. so that the user gets the voice which pronounces the destination location.APR9600 device offers true single chip voice recording, non-volatile storage and play back capability for 40-60 seconds. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage time needs. Then the information in the voice IC is heard in the headset.

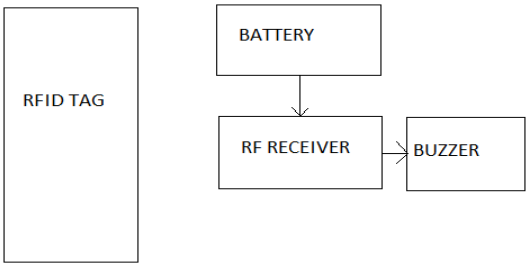

Fig 3. Functional Block Diagram Of Bus Unit

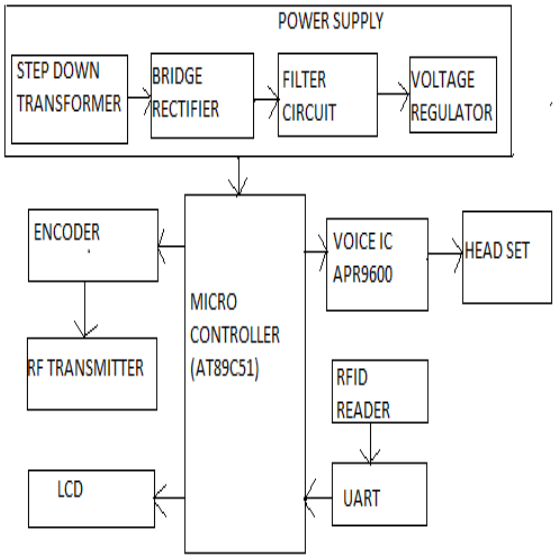

Fig 4. Functional Block Diagram Of Blind Unit

The bus section consist of RFID tag,RF receiver, buzzer and battery as shown in fig 3. The first step of application is to intimate the bus driver about the bus stopso that the driver can provide the special attention at him/her while he/she is boarding bus. To implement which we can consider important advantages as a form of wireless communication of transmitters and receivers nature of RF protocols using TWS 434 and RWS 434.

The TWS-434 transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC. The P2_0, P2_1, P2_2 and P2_3 pin of controller is assumed as data transmit pins. The DATA_OUT pin of encoder is connected to the DATA_IN pin of RF Transmitter and then the RF Transmitter transmits the data to the receiver. The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The TWS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs. The P2_0, P2_1, P2_2 and P2_3 pin of controller is assumed as data transmit pins. The DATA_OUT pin of RF Transmitter is connected to the DATA_IN pin of DECODER and then the data is processed by the decoder. The receiver which has the 12V battery receives the radiowave from the transmitter whichactivates the buzzer. The buzzer is used to indicate the presence of blind to the driver.The complete set up is shown in fig 5.

6 RESULTS AND DISCUSSION

When the person reaches the bus station, he can find the buses that pass through a particular location with the help of voice synthesizer.When the bus approaches the bus station, there is an indication in the bus by the beep sound of a buzzer that there is a blind person available in the bus station.This is achieved with the help of RF transceiver unit both in the bus unit and blind unit.

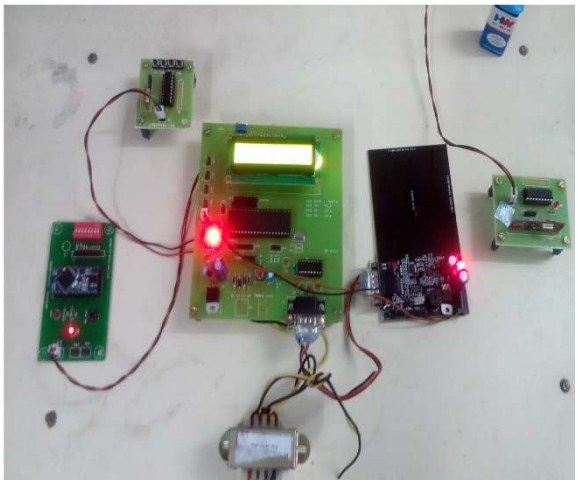

Fig 5.Prototype of the Proposed System

7 CONCLUSION

An interactive wireless communication aid system for the visually impaired to use city buses was developed in this study. Using the ultra-high frequency radio waves, this paper shows implementing a system that uses RFID tag and reader set up along with customized program that will help the blind in identifying exact bus. Thus this system shows the possibility of using the RFID technology to help the blind.

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Early Detection of Pulmonary Nodules Using Hierarchical Vector Quantization Scheme

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ABSTRACT: Computer-aided detection (CADe) of pulmonary nodules is critical to assist radiologist in early detection of lung cancer from computed tomography (CT) scans. So in proposed system we use CADe system based on hierarchical vector quantization (VQ) scheme. On comparing with commonly-used simple thresholding approach, the high-level VQ yields accurate segmentation of lungs from chest volume and in identifying initial nodule candidates (INCs) within lungs, low-level VQ proves to be effective for INC detection and segmentation, as well as computationally efficient compared to existing approaches. This proposed system also reduces false positive detection. False positive reduction is conducted via the rule based filtering operation in combination with feature-based support vector machine classifier. This proposed system shows out performance and demonstrate its potential for early detection of pulmonary nodules via CT imaging

KEYWORDS: CADe system, INC detection, INC segmentation, Computed tomography scans, Initial nodule candidates, Juxtapleural nodule annotation, Thoracic CT images.

INTRODUCTION

A lung nodule is defined as a “spot” on the lung that is 3 cm (about 1½ inches) in diameter or less it is also called benign which is non-cancerous. If an abnormality is seen on an x-ray of the lungs that is larger than 3 cm, it is considered as “lung mass” instead of a nodule, and is more likely to be cancerous and called as malignant. On the existing system x-rays and ct images are used on detecting pulmonary nodules. Lung nodules which is 8-10mm in diameter are only visible on the chest-xray. Nodules which is 0-2mm are visible through CT scan.

Many techniques where used on detecting pulmonary nodules, inspired on previous techniques, we have proposed a hierarchical vector quantization (VQ) approach to address the preprocessing and INCs detection issues in an adaptive manner, aiming to overcome the drawbacks of global thresholding methods. Compared with the existing approaches, the hierarchical VQ can be an alternative with either comparable detection performance and less computational cost, or comparable cost and better detection performance. To reduce FPs in the detected INCs, we make use of both rule-based filtering and supervised learning. Expert rules are learned from prior knowledge of true nodules annotated by the radiologists, while the classification rule for SVM is learned from two dimensional (2D) and (3D) features extracted from the INCs.

So in proposed system we use CADe system based on hierarchical vector quantization (VQ) scheme. On comparing with commonly-used simple thresholding approach, the high-level VQ yields accurate segmentation of lungs from chest volume and in identifying initial nodule candidates (INCs) within lungs, low-level VQ proves to be effective for INC detection and segmentation, as well as computationally efficient compared to existing approaches.

VQ was originally used for data compression in signal processing, and becomes popular in a variety of research fields such as speech recognition, face detection, image compression and classification, and image segmentation. It allows for the

modeling of probability density functions by the distribution of protype vectors. The general VQ framework evolves two processes: (1) the training process which determine the set of codebook vector according to the probability of the input data; and (2) the encoding process which assigns input vectors to the codebook vectors. The well-known Linde-Buzo-Gray (LBG) algorithm has been widely used for the design of vector quantizer.

The algorithm aims to minimize the mean squared error guarantees to converge to the local optimality. However the following properties of the LBG algorithm limit its application in image segmentation (1) it relies on the initial conditions, and (2) it requires an iterative procedure and long computation times. Hence in our previous work, the self-adaptive online VQ scheme was proposed to speed up the vector quantizer, where the training and encoding processes are conducted in a parallel manner.

This section will provide details of the proposed CADe system for lung nodules. The top-level block diagram of the proposed CADe system is depicted in Fig.1. In the preprocessor block, the chest volume is extracted from the field-of-view (FOV) of the image volume by simple thresholding (where the outside of the chest volume does not have anatomical structures). In the detector block, the two lungs are first separated from their surrounding anatomical structures via high level VQ and a connected component analysis. In order to include juxta-pleural nodules (i.e., nodules grow near, or originated from the parenchyma wall), the initial lung mask obtained by the above separation operation is refined by a morphological closing operation. Then low level VQ is employed to identify and segment the INCs within the extracted lung volume. In the classifier block, the obvious FPs are firstly excluded from the INCs via rule-based filtering operations, and then the SVM classifier is trained to further separate nodules from non-nodules based on the 2D and 3D features of the INCs. More details on the proposed CADe system are given by the following sections.

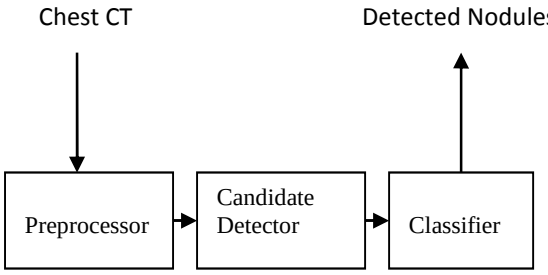

Fig 1. Top-level block diagram of the proposed CADe system for pulmonary nodules.

LITERATURE SURVEY

Surveying is the process of gathering each and every information about a think to know its growth. A literature review is a text of a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic, The purpose of literature is to demonstrate that the person is knowledgeable in the area of expertise that they requires.

CANCER STATISTICS, BY R. SIEGEL, D. NAISHADHAM, AND A. JEMAL

Maintaining a statewide cancer registry that meets both National Program of Cancer Registries and Centers for Disease Control and Prevention (CDC) high quality data standards and North American Association of Central Cancer registries (NAACCR) gold certification is accomplished through collaborative funding efforts.

Early lung cancer action project: Overall design and findings from baseline screening by C. I. Henschke, D. I. McCauley, D. F. Yankelevitz, D. P. Naidich, G. McGuinness, O. S. Miettinen, D. M. Libby, M. W. Pasmantier, J. Koizumi, N. K. Altorki, and J. P. Smith

The choice of treatment for patients with cancers diagnosed as a result of screening is selected by the treating physician in conjunction with the participant. However, each participating institution must be committed to document, for each diagnosed case of lung cancer, the timing and nature of the intervention(s) (if any) and also the prospective course in respect to manifestations of metastases. The development and refinement of the screening protocol has been a concern of the ELCAP (Early Lung Cancer Action Program) Group for more than two decades, and it has been updated in the framework of the International Conferences organized by this Group and in the resultant international consortium on screening for lung cancer, I-ELCAP.

LUNG IMAGING AND COMPUTER AIDED DIAGNOSIS BY A. EL-BAZ AND J. SURI

An image-based CAD system for early detection of prostate cancer using DCE-MRI is introduced. Prostate cancer is the most frequently diagnosed malignancy among men and remains the second leading cause of cancer-related death in the USA with more than 238,000 new cases and a mortality rate of about 30,000 in 2013. Therefore, early diagnosis of prostate cancer can improve the effectiveness of treatment and increase the patient's chance of survival. Currently, needle biopsy is the gold standard for the diagnosis of prostate cancer. However, it is an invasive procedure with high costs and potential morbidity rates. Additionally, it has a higher possibility of producing false positive diagnosis due to relatively small needle biopsy samples.

GUIDELINES FOR MANAGEMENT OF SMALL PULMONARY NODULES DETECTED ON CT SCANS: A STATEMENT FROM THE FLEISCHNER SOCIETY BY H. MACMAHON, J. H. M. AUSTIN, G. GAMSU, C. J. HEROLD, J. R. JETT, D. P. NAIDICH, E. F. PATZ, AND S. J. SWENSEN

There is no clear consensus regarding the definition of a pulmonary nodule. Yet, "nodule" is one of the most common words found in chest CT reports. A committee of the Fleischner Society on CT nomenclature defined a pulmonary nodule as "a round opacity, at least moderately well marginated and no greater than 3 cm in maximum diameter".

DETECTION OF PULMONARY NODULES USING MTANN IN CHEST RADIOGRAPHS BY PREETHA.J, G. JAYANDHI

Computer aided scheme for pulmonary nodule detection in chest radiographs are to detect the pulmonary nodules (lung nodules) that are overlapped by ribs and clavicles and to minimize the false positive results caused by the ribs. Computed Tomography is used to detect lung nodules, but X-Rays are preferred due to low cost and low radiation dose. But x-rays does not effectively detect lung nodules because ribs and clavicles suppress the nodules and produce a false positive result to the radiologists. The purpose is to develop the CADe scheme with improved sensitivity and specificity by use of Virtual Dual Energy (VDE) chest radiographs. Ribs and clavicles in the chest radiographs (X-ray images) are suppressed with MTANN.

CONCLUSION

The above discussion gives the clear information on what the paper is based on. On inspired on the previous work, we proposed a CADe system using hierarchical vector quantization which is used for early detection of pulmonary nodules and also reduce false positive detection using rule-based filtering.

PROPOSED SYSTEM

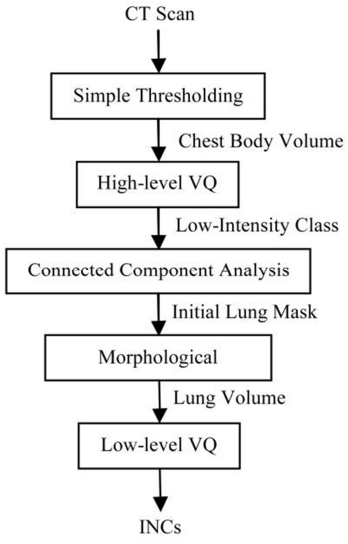

Fig 2.block diagram of proposed hierarchical vector quantization scheme for INCs detection

SELF-ADAPTIVE VQ ALGORITHM

VQ was originally used for data compression in signal processing, and becomes popular in a variety of research fields such as speech recognition, face detection, image compression and classification, and image segmentation. It allows for the modeling of probability density functions by the distribution of protype vectors. The general VQ framework evolves two processes: (1) the training process which determine the set of codebook vector according to the probability of the input data; and (2) the encoding process which assigns input vectors to the codebook vectors. The well-known Linde-Buzo-Gray (LBG) algorithm has been widely used for the design of vector quantizer. The algorithm aims to minimize the mean squared error guarantees to converge to the local optimality. However the following properties of the LBG algorithm limit its application in image segmentation (1) it relies on the initial conditions, and (2) it requires an iterative procedure and long computation times. Hence in our previous work, the self-adaptive online VQ scheme was proposed to speed up the vector quantizer, where the training and encoding processes are conducted in a parallel manner.

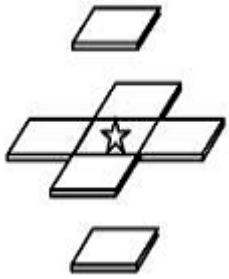

fig 3.a the 3D first order neighborhood to form a 7D local intensity vector

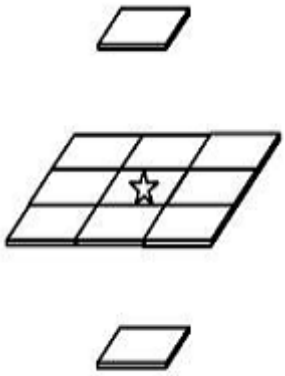

fig 3.b the 3D up-to-second order neighborhood to form a 11D local intensity vector

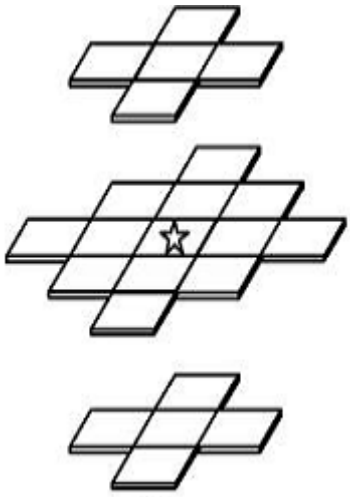

Fig 3.c the 3D up-to-third order neighborhood

Medical image segmentation is the key step toward quantifying the shape and volume of different types of tissues in a given image modality which are used for 3D display and feature analysis to facilitate diagnosis and therapy. The main idea of VQ for image segmentation is to classify voxels based on their local intensity distribution rather than voxels-based intensities. The local intensity distribution can be described by a vector of local intensities.fig 3.a,3.b,3.c illustrates three typical configurations of the local intensity vector that can be used by the VQ algorithm and in this study the 3D first order neighborhood was chosen to form the local intensity feature vector.

VQ models the local statistics, analyzes group features and classifies each voxel in the dimension-reduced feature space. VQ scans from the first voxel to the last one in a contiguous manner. For a given volume of interest (VOI), there is only one class at the beginning (i.e., the current total number of classes $K' = 1$) and its representative vector c_1 is the local feature vector of the first voxel. Since the initial value setup is data-oriented, the VQ algorithm is fully automatic. For each following voxel i, the squared Euclidean distance between its local feature vector ω_i and the representative vector c_k of every existing class $k = 1, \ldots, K'$ is calculated by

$$d(\omega i, ck) = \sum p=1p (\omega ip - ckp)\ 2 \quad (1)$$

Here the local feature vector ω_i and each representative vector c_k are both of dimensions P, which was previously determined by PCA. The finite set codebook $CB = \{c_1, c_2, \ldots, c_{K'}\}$ is then exhaustively searched for the nearest code vector c_{min} such that

$$d(\omega i, cmin) = min1 \le k \le K' \{d(\omega i, ck)\} \quad (2)$$

Let T denote the threshold for inter-cluster distance, so that if $d(\omega_i, c_{min}) > T$, a new class $K' = K' + 1$ is generated subject to the constraint of maximum class number K. Otherwise, if $d(\omega_i, c_{min}) = d(\omega_i, c_k) < T$ or $K' = K$, the representative vector c_k of the current class k is updated after adding a new member x_i into the class k. After a whole scan of the VOI, the representative vector, prior probability, and covariance of each cluster are generated. Meanwhile, all voxels have been classified under the nearest neighbor rule, where the exhaustive search under condition of eq(2) ensures the optimal classification result. As described above, our VQ algorithm only depends on two parameters: K and T. The maximum class number K can be determined according to radiologists' prior knowledge of how many major tissue types are perceived in the specific VOI. For instance in chest CT images, the lungs usually consist of four major tissue types: low and high frequency parenchyma, blood vessels, and nodules. And their average intensities increase from the lowest to the highest. To set an appropriate value for the classification threshold T is more crucial than the setting of K. If T is too large, only one class could be obtained. On the other hand, if T is too small, redundant classes might occur. According to extensive numerical experiments, a robust choice for T would be the maximum principle component variance of the local intensity vector series. In addition, to avoid the situation of resulting class number being less than the expected number of tissue types, the class separation threshold T may be tuned to be the second or third maximum principal component variance. Since the similarity threshold T is estimated from each CT scan, the algorithm is self-adaptive. The proposed VQ-based image segmentation algorithm is outlined as follows.

- Perform PCA to obtain the K-L transformation matrix for the target VOI, determine the reduced dimension P for the local intensity vector space, and calculate the K-L transformed local intensity vector $\omega_i = \{\omega_{i1}, \omega_{i2}, \ldots, \omega_{iP}\}$ for each voxel $i = 1, \ldots, I$.
- Set the classification threshold T as the maximum principal component variance, and set a value for the maximum class number K based on prior anatomical knowledge.
- $i = 1$, set the first voxel label $v_1 = 1$, its local intensity vector ω_1 as the representative vector c_1 for the first class, $n_1 = 1$ as the number of voxels belonging to class 1, and $K' = 1$ as the current number of classes.
- $i = i + 1$, calculate the squared Euclidean distance $d(\omega_i, c_k)$ between the local intensity vector ω_i of the current voxel and the representative vector c_k for each existing class $k = 1, \ldots, K'$.
- Let $d(\omega_i, c_m) = \min_{1 \le j \le K'}\{d(\omega_i, c_j)\}$, if $d(\omega_i, c_m) < T$ or $K' = K$, the label for the i-th voxel is $v_i = m$. c_m is updated by $c_m = (n_m * c_m + \omega_i) / (n_m + 1)$, and $n_m = n_m + 1$. Otherwise, a new class $K' = K' + 1$ is generated with representative vector $c_{K'} = \omega_i$, and the current voxel is labeled as $v_i = K'$ s.t. $K' <= K$.
- Repeat from step 4 until $i = I$ to complete a whole scan.
- If $K' < K$, repeat steps 1) to 6) for another whole scan while setting the classification threshold T to be the second or third maximum principal component variance until $K' = K$.

In this paper, we mainly focus on demonstrating the merits of our hierarchical VQ scheme in the detection of INCs, from where a novel CADe system is proposed to efficiently detect pulmonary nodules

INCS DETECTION VIA A HIERARCHICAL VQ SCHEME

A very important but difficult task in the CADe of lung nodules is the detection of INCs, which aims to search for suspicious 3-D objects as nodule candidates using specific strategies. This step is required to be characterized by a sensitivity that is as close to 100% as possible, in order to avoid setting a priori upper bound on the CADe system performance. Meanwhile, the INCs should minimize the number of FPs to ease the following FP reduction step. This section presents hierarchical VQ scheme for automatic detection and segmentation of INCs.To further investigate the maximum class number K, we conducted repeated experiments of applying VQ to lung voxels classification with different K values.

RULE-BASED FILTERING OPERATIONS

It is challenging to thoroughly separate nodules from attached structures due to their similar intensities, especially for the juxta-vascular nodules (the nodules attached to blood vessels). Since the thickness of blood vessels varies considerably (e.g., from small vein to large arteries), a 2-D morphological opening disk with radius of 1 up to 5 pixels was adopted to detach vessels at different degrees.

FEATURE-BASED SVM CLASSIFICATION

A supervised learning strategy is carried out using the SVM classifier to further reduce FPs. Our feature-based SVM classifier relies on a series of features extracted from each of the remaining INC after rule-based filtering operations.

EXPERIMENTAL RESULTS AND DISCUSSION

Most existing approaches utilize the outcome from simple thresholding to extract lungs from the chest volume. Though thresholding is computationally inexpensive, the associated side effect, called “salt and pepper” noise, diminishes the computational advantage. Furthermore, because of relatively high image contrast between pathologic abnormalities and normal lung parenchyma, it is known that the conventional thresholding methods fail to extract complete lungs from such scans. The proposed high level VQ scheme can avoid the failure on lung boundary corrections, as shown by the rectangular regions marked in fig.4. Although both thresholding and VQ are intensity-based approaches, VQ classifies each voxel based on its local intensity features rather than the single voxel intensity used by simple thresholding. Moreover, most simple thresholding approaches set a uniform threshold for all CT scans, which is unrealistic, while the similarity threshold in VQ is adaptively determined for each scan. This makes VQ more robust to intensity inhomogeneity and image noise.

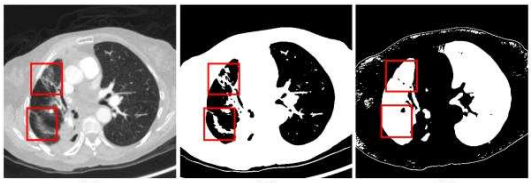

Fig 4.Comparison of simple thresholding and VQ for lung segmentation. Panel (a) shows a raw CT image with dense pathologies on the left lung lobe. Panel (b) illustrates the lung mask obtained by simple thresholding, and panel (c) obtained lung mask

By the high level VQ scheme, the obtained initial lung mask corresponds to the largest and the second largest (if left and right lungs are disconnected due to pathologic abnormalities) connected components in the low-intensity class, where the holes inside the extracted lung mask are filled by a flood-fill operation. Furthermore, in order to include juxta-pleural nodules into consideration, a 3D morphological closing operation using a spherical structuring element of radius 15 mm is applied to close the boundary in the binary lung mask.

CONCLUSION

In this paper, a novel CADe system was proposed for early detection of pulmonary nodules in chest CT scans. Based on our previous work of self-adaptive online VQ for image segmentation, we developed a hierarchical VQ scheme for INCs detection. The high level VQ proves to be feasible to replace the commonly-used simple thresholding scheme for extraction of the lungs in terms of higher accuracy, comparable processing time and automation level. The following low level VQ illustrates adequate detection power for non-GGO nodules, and is computationally more efficient than the state-of-the-art approaches. In this study, simple expert rules were firstly employed to exclude obvious FPs from being considered by the sophisticated feature-based SVM classifier, and further reduced the computational complexity. The SVM classification results indicated that gradient features contributed the most against any of the other three groups of features (geometric, intensity, and Hessian features). The forward feature selection strategy showed that the SVM classifier performed the best in the "gradient + intensity" feature space rather than in any other feature combination spaces. The optimal operating point of the SVM classifier for the best feature subset yielded a sensitivity of 92.7% and a specificity of 93.3%. In terms of the free-response ROC analysis, the proposed CADe system achieves an overall sensitivity of 82.7% at 4.0 FPs per scan. Compared with existing CADe systems evaluated on the same lung image LIDC database, our approach showed a comparable detection capability but a lower computational cost. In particular, we reported the performance of our system for the detection of juxta-pleural nodules. The outcome from our CADe system, with an overall sensitivity of 89.2% at a specificity level of 4.14 FPs/scan, is promising for tackling this challenging detection task. In a nutshell, the proposed hierarchical INCs detection approach is fast, adaptive and fully automatic. The presented CADe system yields comparable detection accuracy and more computational efficiency than existing systems, which demonstrates the feasibility of our CADe system for clinical utility.

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IMPLEMENTATION OF PROTABLE DEVICE FOR REAL-TIME ECG SIGNAL ACQUISITION ON SOC

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ABSTRACT: Heart attack is one of major cardiac disease. An electrocardiogram (ECG) is widely used to diagnose these diseases. Now a days, ECG monitoring is one of the major technique used in medical science. This is achieved by extracting amplitudes and durations of the parameter of ECG waveform such as P wave, QRS complex, RR interval and PR durations, temperature and heart beat. These parameters are compared with the normal values to determine the type of abnormalities. Under critical conditions, transmission scheme will ensure successful transmission of critical messages to doctors via Global system for mobile (GSM) network.

KEYWORDS: ECG Waveform, Mobile phone, Wireless sensor networks, GSM.

1 INTRODUCTION

Electrocardiography is the process of enrolling the electrical activity of the heart over a period of time. The electrodes placed on a patient's body and sensing the diminutive electrical changes on the skin that grows from the heart muscle depolarizing during each heartbeat. Cardiac monitoring is the continuous monitoring of the heart activity. Mobile phone has powerful computing, espial and better connectivity resources..ECG data is important for medical diagnosis of such health implications and many specific conditions, including a variety of cardiac arrhythmias. Cardiac arrhythmias is the irregular heartbeat (i.e.to slow or too fast). Tachycardia and Bradycardia are the different kind of beat level in heart. It is the fluster in normal activation sequence of the myocardium.

Cardiac monitoring also the continuous monitoring of the heart activity but it is different from hemodynamic monitoring [1]. The delay between the first attack symptom of any cardiac complaint and foretell the medical consults has a many variations depending upon the patient conditions [2]. The SOC modernize for the body sensor network (BSN) designate to make healthcare closer from the hospital to the patients, to appropriate the bio signal monitoring to be developed usually and limiting within the clinical environment [3]. R-R interval data boast using different HRV analyses and "potential of unbalanced complex kinetics" (PUCK)analysis to lineament of cardiac rhythm in normal condition and cardiac arrhythmia [4]. HBC technology commonly apply the narrow band modulation and its obtain the process FSK or on off keying (OOK) which generate a low data rate kbps [5]. The Conventis System seizures ECG data and mobile transmission. It helps to diagnose symptomatic and asymptomatic in cardiac abnormalities of cardiac arrhythmias [6]. The advance technique in wireless sensor/body area networks (WSN/WBAN) have offer in all ECG monitoring service[7]. ECG is obtained from anti aliasing also used for converting network[8]. The SCP-ECG is the large wide spread standards and differentiate the initial values that exchange and storage of ECG signals [9]. The GSM models easily attain the commands for developing any application [10].The digital heart beat monitor and alert system provides a more unique ,effective and efficient means of real time monitoring of a patients health parameter and as ever since witnessed and unprecedented tremendous advancement.

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2 SYSTEM DESCRIPTION

In Fig1.patients health parameters such as ECG, Heart beat and temperature is monitored. The values from the temperature and ECG sensor are an analog hence ADC is required to convert the values into digital. Heart beat sensor is digital sensors which can be directly converted with microcontroller. UART is interfaced between controller and Bluetooth for serial communication. UART is interfaced between microcontroller and Bluetooth for serial communication. The values are sent to the mobile through Bluetooth .In the mobile we can see ECG waveform with the heartbeat and temperature values. The GSM (Global System for Mobile Communications) Technique is used to transfer the values in the authorized peoples. The values of the entire system are obtained Continuously. Through this process the patient health is continuously monitored. This is very useful in case of severe health implication such as heart attack.

3 ECG IMAGE ACQUISITION

The Acquisition is the creation of images such as the physical sense of an object The acquired image is taken into processing, image compressing, reposting and impression. From the Fig1. The imaging values are taken from the sensors. These values given to the Microcontroller. The bio signal is taken from the living beings that can monitor and measured continuously. The output image of the system is the p-q-r-s-t waveform. The output waveform is confined as the ECG of a Heart in normal sinus rhythm.

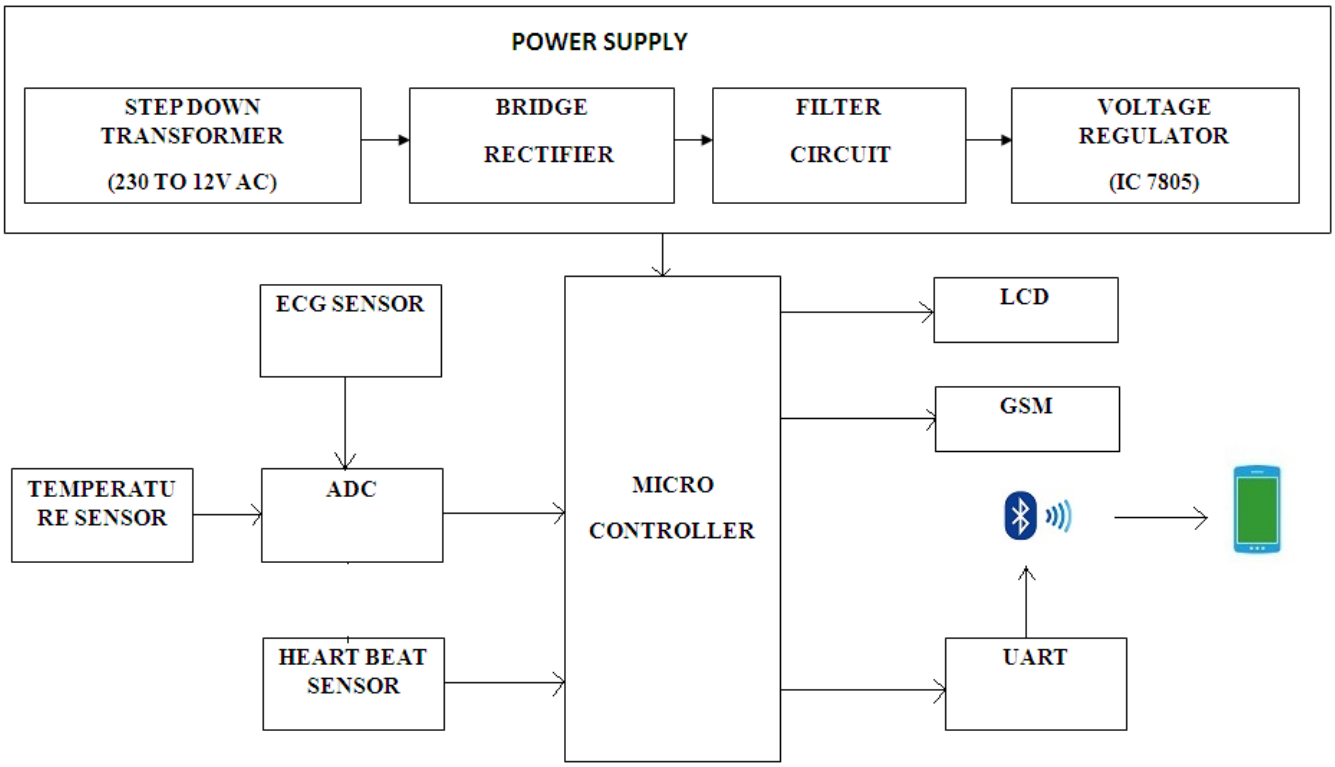

Fig 1.Block Diagram of ECG Acquisition

4 WIRELESS SENSOR UNIT

The optical sensors such as temperature, ECG and Heart beat sensors are used in image acquisition. ECG and Heart beat sensor is designed for the digital output of heart beat when a finger is placed on it. When the ECG and heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to controller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light Modulation by blood flow through finger at each pulse. The pulse value of the patient is measured through this sensor and these analog values are given to the micro controller. Temperature sensors are a device used to measure the temperature of a medium.This senses the temperature of an engine and provides the level of temperature. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

Fig 2.ECG Sensor with electrodes

5 HUMAN HEALTH MONITORING

Now days, there are many advance treatment in specialized hospital. The ECG image acquirement is one of the advance treatment for heart patients. Basically monitoring is the observation of a patient for some health parameters. The remote patient monitoring is the most advance techniques in the Telemedicine. It is the interface between the telecommunication and information technologies to provide healthcare at a distance. It is mainly used for emergency situation and the critical time of the patients. The ECG image values are taken in the home. The patients no need to suffer for consulting doctor. The main approach of the system is for the older peoples and cardiac patients.

6 SOFTWARE ASPECTS

The software is used to simulate the values of the ECG signal. The ECG waveform (p-q-r-s-t waveform) is simulated in the software and display in LCD screen.

6.1 EMBEDDED C

It is the high level language used in embedded system especially in Digital Processing systems. DSP is the assembly language to define the processor architecture inside out. If the video decoding takes 80 percent of the CPU-cycle budget instead of 90 percent, for instance, there are twice as many cycles available for audio processing. This coupling of performance to end-user features is the characteristic of many of the real-time applications in which DSP processors are applied. DSPs have a highly specialized architecture to achieve the performance requirement for signal processing applications within limits of cost and power consumption set for consumer applications. Unlike a conventional Load-Store (RISC) architecture, DSPs have a data path with memory-access units that directly feed into the arithmetic units.

6.2 MATLAB SOFTWARE

MATLAB is the matrix laboratory and multi-paradigm numerical computing environment in 4G language. The Output of the ECG waveform is simulated in the MATLAB software. It is mainly used for plotting the data and functions. Simulink is developed for programming, modelling, simulating and analyzing multi domain dynamic systems. It is the interfacing of the graphical block diagramming tool and customizable set of block libraries.

6.3 ANDROID APP

An Android app is created for the output of health monitoring system to visualize the smart phone. The authority having the app and monitor the patient continuously for the heart beat and pulse. The GSM communication is used for transferring the information of the patients to the authority. This can also be enhanced with continuous monitoring.

7 GSM COMMUNICATION

Global System for Mobile communication is the second generation networks. The GSM is used to intimate the information about the patients such as pulse rate, heart beat and temperature. Radio frequency (RF) communications allow dispatching the gene of the patient during the trouble of using cables. The range of broadcast the information is wider in the communication. The heart normal beat of

Fig 3.GSM module

the person is between 60 and 90 bpm (beats per minute)in the rest time. If the values changes at the rest time, the patient said to have arrhythmia disease.

8 OUTCOMES

ECG signal is captured in the analog values. These values are sampled and digitized by the digital application. EEPROM is the storage medium of the system and communicate by the GSM and Bluetooth. Our project is prototype equipment having the following features: low cost, easy to implement and versatile. In fact ,the hardware is made with cheap and well known components ;regarding the software, it is also developed in known and widely disseminated environments .The system has many task to be programmed ,which requires a real-time operating system this offers the opportunity of a certain parallelism in treatment .wireless and mobile technologies are key components that would help enable patients suffering from chronic heart diseases to live in their own homes In Fig4, The P-Q-R-S-T Waveform in the module of the ECG output.

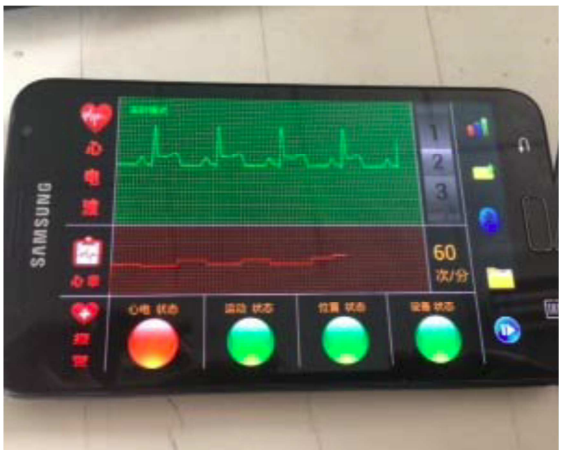

Fig 4.Output for ECG (P-Q-R-S-T waveform)

PR Interval : 0.12-0.20 sec
QRS Interval : 0.06-0.10 sec
QT Interval : (QT<0.40 sec)

P wave represents the sequential activation f the right and left atria.

QRS represents the simultaneous activation of the right and left ventricles.

ST segment is a misnomer, T is usually absent. ST-T wave is a smooth continuous waveform.

9 CONCLUSION

The overview of the technology to save the cardiac patients especially from the heart attack. The main approach of the system is used to display ECG signal and intimates the information to the consultants. The system is ameliorate with the sensors and controlled by the microcontroller. The exact values are sensed by the sensor efficiently. Controllers are high speed and has more storage space in this system.

It is the real-time application used in Multi- speciality hospitals. It is more useful in the Intensive Care Unit (ICU). The device is used to avoid the issues in the society.This prototype is mainly used in the severe attack of the patient by continuously monitoring the ECG singal. We are dedicating this to cardiac patients.

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Innovation Ecosystems: Practice vs. Prevailing Perceptions

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ABSTRACT: In recent years, researchers and policymakers have become increasingly interested in identifying the factors that explain the success or failure of innovation efforts. Recent studies around the world use the concept of a "national innovation ecosystem," and identify several key factors within this ecosystem that influence the emergence of innovation.
The purpose of this article is to evaluate the extent to which the Israeli practice, which has led to notable results, is actually in line with the perception presented in literature. The analysis is based on in-depth interviews with 25 leaders who shaped Israeli innovation processes over the past two decades, from government, academia and industry.
The findings show that the Israeli practice is explained by the same factors as shown in world literature, but an evaluation of the relative importance of each factor reveals quite surprising results. The contribution of main factors such as Government and Academia was evaluated as moderate, while the contribution of Culture was considered as major. This may be explained by the possible influence of the evolutionary and dynamic nature of the innovation ecosystem, where the nature of the contribution of each factor changes during the process.

KEYWORDS: national innovation system; venture funding entities; culture; academia; government, IT infrastructure.

1 INTRODUCTION

Given that the positive results of innovation have been understood now for many years, effort is being invested into understanding what feeds innovation and how its development can be influenced. The attempts at cracking the code for emergence of innovation have led to the development of various approaches, including the innovation ecosystem approach. This approach reflects the complexity of the innovation process, as we currently understand it, including interrelations, dependence and mutual influences between the various factors that take on forms and develop in a manner that is evidently not spontaneous.

However, despite the fact that various factors in the innovation ecosystem were found to make an important contribution to the emergence of innovation - such as academia, government, financial entities, etc., there is less research information about the hierarchy of their contribution to the emergence of innovation as part of a given innovation ecosystem. Furthermore, the answer to the question of development of the innovation ecosystem and the contribution of the various factors to emergence of innovation during the various stages of the ecosystem's development have yet to become clear enough to facilitate definition of an innovation policy that will support the existence of a dynamic, competitive and sustainable ecosystem.

This article focuses on Israel's national innovation ecosystem at present. Israel has impressive achievements in the field of innovation compared to any standard, as can be seen through various indicators published in world statistics. Thus, for example, Israel was ranked first in the world for innovative capacity by the IMD Global Competitiveness Yearbook 2014 and third for innovation globally out of 148 economies by the WEF Global Competitiveness Yearbook 2014-2015. Israel was also

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ranked in these reports as first for business expenditure on R&D, first for entrepreneurship, second for scientific research, and third for information technology skills. In fact, apart from Silicon Valley, the highest concentration of high-tech companies in the world is found in Israel [1].

The purpose of this article is to establish whether the Israeli experience has unique characteristics when compared to experience accrued in other countries, as is reflected in the literature relating to defining the key active forces in the national innovation ecosystem.

This article is organized as follows: the first part briefly presents the concept and components of a national innovation ecosystem, as described in the international research literature. It is followed by a presentation of the research hypotheses and methodology designed to examine it. The third part of the article includes the research findings and the discussion of these findings. Finally, the main conclusions arising from this study are presented.

2 THE MAIN FACTORS IN THE NATIONAL INNOVATION ECOSYSTEM AS SEEN IN THE LITERATURE

Since the end of the 20th century, the national ecosystem approach has been developed to analyze and understand the dynamics of innovation. The approach borrows the biological ecosystem model and implements it in a socioeconomic context [2, 3, 4]. Accordingly, the innovation ecosystem includes both the economic agents as well as the non-economic agents such as technology, culture, communications, etc. [5]. Among other things, the advantage of this approach is that it is holistic in the sense that it relates to a wide variety of factors that work together (in both planned and unplanned manner) to generate shared value, in the unique dynamic of a defined locale [6, 7]. Metcalfe and Ramlogan [6] argue that innovation ecologies are national by nature and reflect the laws, language, culture, business practices and sociopolitical regulations of businesses in their local economies. In contrast, innovation systems are problem- or challenge-centered, which arise for a particular purpose. As they perceive it, innovation ecology contains and supports several innovation systems. The distinction between an innovation system and innovation ecosystem is not self-evident. Some use this term as a synonym for innovation system, emphasizing the spatial aspect. However, others believe that the main difference between the two concepts is inherent in the level of planning involved in the innovation activity. While an innovation system tends to be planned and goal oriented, an innovation ecosystem constitutes all the conditions for the emergence of innovation, both planned and those that exist without advance planning. A developed innovation ecosystem enables the various players within it to function beyond their natural boundaries (such as the boundaries of the organization in which they are members) and thus support the transformation of knowledge into innovation [5]. In this sense the innovation ecosystem is a continuation of the line of thought on open innovation presented by Henry Chesbrough in 2003.

2.1 WHO ARE THE KEY PLAYERS IN THE INNOVATION ECOSYSTEM?

2.1.1 GOVERNMENT AND PUBLIC AGENCIES

The research literature shows that Government and Public Agencies play a central role in leading innovation and that they are actually key and highly influential innovation agents in the innovation ecosystem. The contribution of these factors to the emergence of national innovation is described as being broader and more comprehensive than addressing market failures and includes a variety of interventions in different contexts and time intervals [8]. The means for promoting innovation that are available to the Government and Public Agencies include both direct support of industrial R&D, deployment of physical infrastructures, financing of basic research, education and development of human resources as well as means that can stimulate innovation processes, which are not based on conventional expansionary fiscal policy such as tax incentives, enacting laws, regulations and agreements (for example, tax policy, copyright protection, international cooperation agreements, immigration policy, etc.). It was further found that the government, being the largest buyer in the economy, plays a significant role in promoting innovation by generating demand for innovation through government procurement, which drives the wheels of the economy and creates a source of research and technology innovation [6, 9, 10, 11, 12, 13, 14]. The Israeli government has generally received international recognition for its economic policy, which relates to growth and innovation challenges. Furthermore, a positive correlation was found between government programs and actions in the field of innovation and various aspects of innovation, as seen in the Israeli economy. Two salient examples in this regard are the Technological Incubators Program and the Yozma Program, which were successfully implemented by the government at the beginning of the 1990s [15, 16, 17, 18].

2.1.2 ACADEMIA AND RESEARCH INSTITUTES

Research literature shows that Academia and Research Institutes have a marked impact on the emergence of innovation, which can be seen in the creation of two critical components of innovation - human capital and knowledge. These inputs form the foundation of applied research, product and process innovation in industry [19, 20, 21, 22, 23, 24]. Moreover, over the years, the role of universities in the field of innovation evolved into active involvement in the economy, as evident in the concept of the 'entrepreneurial university'. This development occurred at the same time as the innovation process was transformed from being internal within a firm to one that extends beyond those limits and includes a wide variety of external parties, which in turn gave Academia and Research Institutes room to act [25].

2.1.3 VENTURE FUNDING ENTITIES

The importance of the financing bodies in the emergence of innovation can be seen, firstly and foremostly, through their being suppliers of capital and virtually the only source of financing for entrepreneurial and innovation activity which entails great risk. A strong financial system includes a wide range of financing parties and enhances the efficiency of innovation activity. The opposite is also true: the lack of venture financing entities has been found to be a barrier to innovation activity and economic growth [26, 27, 28]. Furthermore, the contribution of these entities to the emergence of innovation is also manifest in other aspects that improve the odds of success for innovative ventures such as monitoring of venture development, assistance in building quality management teams, mentoring based on know-how and professional experience, connections to local and global networks, providing a strong reputation to the funded companies, and more [29].

Over the past twenty years, the importance of the Venture Funding Entities has grown significantly. Two main trends have had an impact on these players and their role in promoting innovation. One is globalization, and the other is technological development during this period. These trends are interrelated and have led to a marked increase in global investments made by the various financing bodies as well as a dramatic decline in the costs required to start an innovative venture and, accordingly, creating a variety of new types of experting financing entities (such as micro funds and crowdfunding) [30, 31].

2.1.4 CULTURE

The findings of the various studies provide empirical evidence of the marked impact of Culture on the national and organizational level of innovation. Cultural values such as tolerance of risk and failure, individualism, low power distance and lack of formality were found to have a positive impact on the emergence of innovation and also to explain the difference in the level of innovation between countries. These findings indicate that an attempt to increase innovation through means such as increasing the resources directed at research and development or building industrial infrastructures that support innovation may prove futile without promoting cultural values that support innovation [32, 33, 34]. Similarly, a tendency towards networking, pluralism, cultural openness, spirit of authenticity, engagement and common purpose were also found to be elements that explain the power of certain innovation ecologies and firms over others [35, 15, 36, 37, 38, 39].

2.1.5 TECHNOLOGY

Information and Communications Technology (ICT) is described in the literature as having a substantial impact on increasing efficiency and productivity of innovation activities. In general, a strong correlation was found between the degree of development of ICT infrastructure and the country's level of innovation [40]. As a result, many countries attribute a great deal of value to the development of technological infrastructure that supports innovation and to increasing its use. A developed ICT infrastructure significantly reduces the impact of geographic distance on the emergence of innovation and serves as a catalyst for its formation by reducing the costs associated with innovation activities and raising capital, making global platforms of knowledge and information accessible, and enhancing the ability to share, process, discuss and distribute information [41, 27, 42, 43, 44, 30, 45].

3 THE INNOVATION ECOSYSTEM IN ISRAEL - RESEARCH HYPOTHESIS AND METHODOLOGY

3.1 RESEARCH HYPOTHESIS

In this study, which is essentially an exploratory study, we sought to determine the main factors at play in the innovation ecosystem in Israel and whether the factors identified in the international research literature as being central and essential to the emergence of innovation are also key in today's Israeli innovation ecosystem. Therefore, the main hypothesis of the study is that the national level of innovation depends on the performance of the factors at play in the innovation ecosystem, the primary of which are Government and Public Agencies, Academia and Research Institutes , Venture Funding Entities, Culture and Technology.

Beyond identifying the main factors in the innovation ecosystem, we also wanted to evaluate the contribution of each factor, in and of itself, to the emergence of innovation in Israel. Based on the research literature, which describes these factors as main anchors that strongly influence the level of innovation, a secondary hypothesis was derived, according to which each of the above mentioned key factors has a considerable influence on the emergence of innovation in the Israeli economy.

3.2 METHOD

The study included field work in the form of semi-structured in-depth interviews with key players in the Israeli innovation ecosystem. The findings of the interviews were analyzed and examined against the international research literature.

The group of interviewees included 25 well-placed key players in the Israeli innovation ecosystem, who were carefully selected from a variety of sectors (see Table 1) and based on their contribution, work and prominence on the Israeli innovation scene. In this regard, it is noteworthy that all of the experts invited to participate in the study agreed to do so.

The group of interviewees included, among others, the chief scientists who guided the government policy in the field of innovation over the past several decades, leading academic researchers and highly prominent leaders in the industrial sector who implemented important innovation projects in industries with diverse technological intensity.

This is naturally not a random sample of interviewees, nor a survey of opinions about the reasons behind the growth of the innovation process in Israel. This is an indepth collection of information from a group of persons who actually conceived and built the process of innovation in Israel during the last decades. The collected information included actions taken by each of the interviewees in the process of innovation, relationships with other representatives of the ecosystem, evaluation of the inflluence and actual effects of such actions and relationships.

Table 1 - Description of the Group of Interviewees According to Sectoral Affiliation

Sectoral affiliation	Number of interviewees	% of all interviewees
Industry	17	68
▪ High tech	10	59
▪ Non high tech	7	41
Academia	3	12
Government	5	20
Total	25	100

Furthermore, it is noteworthy that 60% of the interviewees have diverse experience and sectoral backgrounds, beyond the sector with which they are affiliated and which they represent in the study. These interviewees have great importance in a study dedicated to examining the operation of the innovation ecosystem, as their heterogeneous experience allows them to provide the integrative and holistic perspective of the innovation scene.

The interviews were conducted in 2013-2014 and included questions regarding the key factors in the Israeli innovation ecosystem and their contribution to the emergence of innovation. Some were open questions (without options to choose from) and others were questions in which the interviewees were asked to rank their responses on a scale of four values: Significant, Moderate, Minimal and Not at all. The numeric values assigned to the ratings are: 3, 2, 1 and 0, respectively. In this regard, it is important to stress that in terms of the identity of the key players in the innovation ecosystem, an open question without optional answers was presented, with the range of answers being consolidated into key factors.

Analysis of the data included a breakdown by three parameters: (1) sectoral affiliation (industry, government or academia), (2) the experience and background of the interviewee (heterogeneous or homogeneous) and (3) industrial affiliation according to technological power (high tech or non-high tech).

4 FINDINGS

In general, it was found that the five factors found in the research literature to be significant in the emergence of national innovation, meaning - Government and Public Agencies, Academia and Research Institutes, Venture Funding Entities, Culture and Technology, were also noted by the interviewees in this study as key factors in the Israeli innovation ecosystem, which supports the research hypothesis.

In the next phase, the interviewees were asked to evaluate the contribution of each of the aforementioned main factors to the emergence of innovation in Israel today. This evaluation was performed through presentation of a closed question that included a four-point scale for each factor: (A) Significant contribution, (B) Moderate contribution, (C) Minimal contribution, and (D) No contribution at all. In this regard, analysis of the findings demonstrates that the contribution of the main factors to the emergence of innovation is not perceived as equal and there is a clear hierarchy in how the interviewees evaluate their contribution. Culture is perceived by the interviewees as having the greatest contribution of all five factors, with the contribution of Technology coming second behind Culture. The contribution of Venture Funding Entities as well as the Academia and Research Institutes to the emergence of innovation was found to be moderate, and the contribution of the government was perceived as being moderate to low (see Table 2 below).

The research literature that deals with the factors involved in the innovation ecosystem does not relate to their relative importance and the ranking of their contribution to the emergence of innovation and the assumption is that they have equal importance. However, that was not what was found in the current study.

Table 2 - Ranking of the Contribution of the Main Factors in the Israeli Innovation Ecosystem to the Emergence of Innovation

Average Ranking / Main Factors	Overall	Sector affiliation			Background		Technological Intensity**	
		A	G	I	Hetero-geneous	Homo-geneous	Non-High Tech	High Tech
(n)	(25)	(3)	(5)	(17)	(15)	(10)	(10)	(7)
Culture	**2.9 [0.3]**	3.0 [0.0]	3.0 [0.0]	2.8 [0.4]	3.0 [0.0]	2.7 [0.5]	2.7 [0.5]	2.9 [0.3]
Technology	**2.3 [0.7]**	1.3 [0.6]	2.3 [0.5]	2.5 [0.6]	2.3 [0.7]	2.4 [0.7]	2.7 [0.5]	2.4 [0.7]
Venture Funding Entities	**2.1 [0.9]**	2.0 [1.0]	2.6 [0.5]	1.9 [1.0]	2.3 [0.9]	1.8 [0.9]	1.8 [0.8]	2.0 [1.1]
Academia and Research Institutes	**2.1 [0.9]**	2.7 [0.6]	2.0 [1.0]	2.1 [0.9]	2.1 [1.0]	2.2 [0.8]	2.1 [0.7]	2.0 [1.1]
Government and Public Agencies	**1.9 [0.9]**	2.0 [1.0]	2.4 [0.5]	1.7 [0.9]	2.0 [0.8]	1.7 [0.9]	1.9 [0.9]	1.6 [1.0]
Average	**2.3 [0.4]**	2.2 [0.6]	2.5 [0.4]	2.2 [0.5]	2.3 [0.4]	2.2 [0.4]	2.3 [0.5]	2.2 [0.5]

* *The standard deviation in each category appears in square brackets.*

** *This category includes a breakdown of interviewees who belong solely to the industrial sector.*

*** *Legend: A = Academia; G = Government; I = Industry, (n) = Number of interviewees*

Examination of the research literature against the findings of the interviews indicates that in certain fields there is a gap in the evaluation of the contribution of the various factors to the emergence of innovation (see Figure 1).

This gap is expressed in the interviewees' underevaluation of the contribution of the Government and Public Agencies, Academia and Research Institutes, and Venture Funding Entities to the emergence of innovation in Israel today. To a certain extent, it is also reflected in the overevaluation of the contribution of the Culture factor to the emergence of innovation in Israel today.

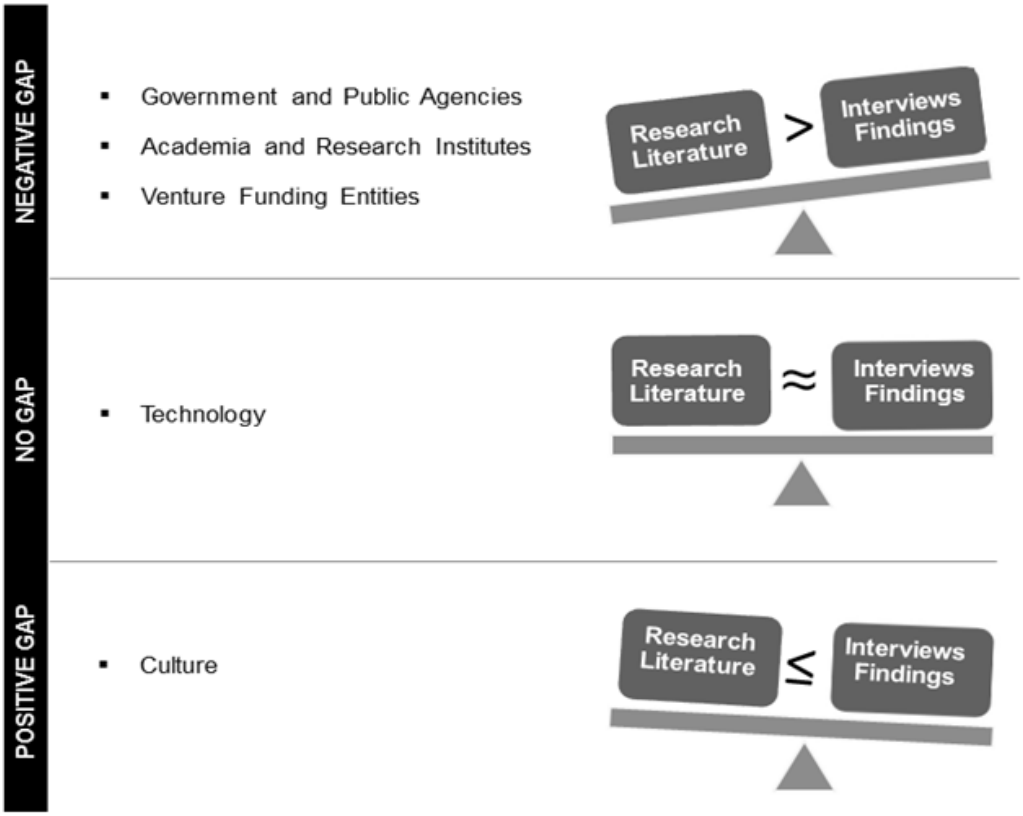

Figure 1: Gaps between the Research Literature and the Findings of the Interviews by Factor

Below are the field work findings and their examination in light of the research literature for each of the five central factors in the innovation ecosystem as identified in this study:

4.1 GOVERNMENT AND PUBLIC AGENCIES

Despite the evidence in the research literature regarding the importance of the contribution of Government and Public Agencies to the emergence of national innovation, the findings of the interviews show that on average, the interviewees in this study did not perceive their contribution in the current period as significant and ranked it as lower than moderate in power (average score 1.9 out of 3). Moreover, the Government and Public Agencies were rated relative to the other factors examined in this study as having the lowest contribution to the emergence of innovation in Israel today. This finding is especially interesting given the fact that half of the interviewees who belong to the industrial sector received support from the government to finance their innovative activity.

As can be seen in Table 1, the contribution of Government and Public Agencies to the emergence of innovation is stable, and is generally ranked, relative to the other groups of factors, as having a low contribution to the emergence of innovation. However, the high average score given to the contribution of Government and Public Agencies by the interviewees belonging to the government sector and the relative homogeneousness of their scores was salient (average score 2.4, standard deviation 0.5), particularly compared to interviewees in the academic and industrial sector. The latter rated the contribution of Government and Public Agencies as moderate to low (average score 2.0, and 1.7, respectively). An examination of the breakdown of the industrial sector according to technological intensity of the industries to which they belong indicates that the interviewees who belong to the high-tech industries (the focus of innovation in Israel) tend, on average, to estimate the contribution of the Government and Public Agencies as lower than those in sectors other than high tech (average score of 1.6 and 1.9, and standard deviation of 1.0 and 0.9, respectively).

It is important to note that despite the relatively low score interviewees gave the contribution of Government and Public Agencies in the emergence of innovation in Israel today, it was clear in the interviews that there was a consensus that the Government and Public Agencies in general have a strong potential influence on the emergence of innovation. Most of the interviewees even praised the work of the government to encourage innovation at the very earliest stages of the emergence

of the innovation ecosystem in Israel and noted the gap that exists between the contribution in the past and present, when the innovation ecosystem is already developed.

4.2 ACADEMIA AND RESEARCH INSTITUTES

A gap between the literature and the findings of the current study was also found with respect to the relative contribution of the Academia and Research Institutes to the emergance of innovation. On average, the interviewees in the study attribute only a moderate contribution of Academia and Research Institutes to the emergence of innovation in Israel today (average score 2.1). Furthermore, a difference was found in the evaluation of the contribution of this factor by those in the academic sector and those in the government and industrial sectors. As can be seen in the analysis in Table 2, interviewees in the academic sector attribute great importance to the contribution of Academia and Research Institutes to the emergence of innovation in Israel (average score 2.7 and standard deviation 0.6). In contrast, interviewees in the government sector scored the contribution as being moderate (average score 2.0) and having the lowest relative importance of the five factors.

A breakdown of the group of experts by background and sectoral experience as well as the technological intensity of the industries to which the interviewees belong indicates similar results - namely that the contribution of academia is moderate and was ranked fourth among the five factors examined.

4.3 VENTURE FUNDING ENTITIES

As opposed to what is standard in the literature, it was found that the Venture Funding Entities are perceived by the interviewees as having only a moderate influence on the emergence of innovation in Israel today (see Table 2). The average score given to the contribution of these factors to the emergence of innovation in Israel is lower than that for Culture and Technology, the same as that for Academia and Research Institutes, but higher on average than that for government. Even in this regard, it was found that the score for this factor differed between the various sectors. Interviewees from the government sector evaluated the contribution of the Venture Funding Entities as significant and ranked them second (average score 2.6, standard deviation 0.5). In contrast, the interviewees in the academic and industrial sector ranked their contribution as moderate (average score 2.0 and 1.9 respectively). Furthermore, it was found that interviewees with a heterogeneous background ranked the contribution of the Venture Funding Entities to the emergence of innovation as higher than did interviewees with a homogeneous background (average score 2.3 compared to 1.8).

4.4 CULTURE

The factor that was found to have the most significant contribution to the emergence of innovation in Israel is the local culture (average score 2.9, standard deviation 0.3). The low standard deviation demonstrates the high level of homogeneity in the interviewees' responses.

In their book, *Start-up Nation*, Senor & Singer [46] describe Israeli culture as being devoid of hierarchies and formality, a culture that includes a willingness to work hard, dedication, mutual responsibility, willingness to take risks and a unique approach to failure. This description is to a great degree in line with the responses of the interviewees, who stated that these cultural values form the foundation for the success of Israeli innovation. In this regard, they specifically mentioned the tolerance of failure in Israeli society, according to which failure is legitimate and is a step on the path to success. The common perception among the interviewees is that failure improves the odds of success in the future, as it is reasonable to assume that someone who has failed once will not repeat the same mistakes. This attitude was found to enable risk taking, which has a positive effect on the tendency to be involved in innovation.

According to the unique attitude towards failure found in Israel, it was found that Israeli culture is not averse to situations marked by uncertainty. In this context, a large number of the interviewees noted the contribution of military service in Israel as a factor that shapes and influences the perception of risk and ability to maneuver in conditions of uncertainty. It combines original thought with initiative and strong performance that later translate into a culture that supports innovation in the business arena. Thus, for example, Eyal Waldman, founder, President and CEO of Mellanox Technologies (defined as one of Israel's greatest high-tech success stories), said, "The combat units in the Israel Defense Force are a survival arena, in which soldiers learn how to solve problems creatively, take risks, improvise and the like. These skills help them later when involved in innovation in their civilian lives."

Other cultural aspects noted in the interviews as supporting innovation include the tendency to challenge conventions, thinking outside the box, strong improvisational skills and a strong tendency to network.

From the statements made by the interviewees in this study, it is clear that Culture is a key element on the national innovation scene and is the "secret ingredient" in the Israeli innovation "recipe." They argue that while other factors in the innovation ecosystem (such as Technology and Venture Funding Entities) that influence the level of innovation are also found in other innovation ecologies, the special culture in Israel is perceived as being a differentiating factor and the underlying reason for the success of Israeli innovation. A review of the literature shows that there is a strong correlation with the attitudes of the interviewees in matters related to the contribution of Culture to the emergence of national innovation.

4.5 TECHNOLOGY

The findings of the interviews show the positive contribution Technology has on the emergence of innovation, and are in line with those in the literature. This factor was ranked second among the five factors examined in this study (average score 2.3 and standard deviation 0.7). Furthermore, these findings were stable even in the breakdown by the different parameters. What was outstanding was the relatively low ratings given by interviewees in the academic sector in Israel (average score 1.3, standard deviation 0.6). The interviewees' statements show that this is evidently due to reference to different aspects of this infrastructure when providing the rating. While most of the interviewees from the industrial and government sector related to Technology as a factor in the innovation ecosystem that allows the flow of information and connectivity between the various factors at the core of innovation. The interviewees in the academic sector related to the technology infrastructure mainly as a research infrastructure, and in this regard ranked it as having a low contribution to the emergence of innovation.

5 DISCUSSION

The underlying assumption of this study was that innovation arises within the framework of an innovation ecosystem. As a result, identifying the main components and assessing the extent of their absolute and relative impact on the emergence of innovation is very important.

In this study, we attempted to examine this question based on the Israeli experience which serves as a striking example of a small country that is geographically remote from global markets, but within a short time was able to transform itself into a country know for its innovation.

The study included in-depth interviews with a unique sample of key players on the Israeli innovation scene. Through these interviews, we attempted to establish the identity of the key factors in the Israeli innovation ecosystem and their contribution to the emergence of innovation. A literature review shows that the main factors identified as important to the emergence of innovation include the Government, Academia and Research Institutes, Culture, Technology and Venture Financing Entities.

The findings of the study support the research hypothesis that in Israel, as shown in the literature, the main anchors in the innovation ecosystem are the Government and Public Agencies, Academia and Research Institutes, Venture Funding Entities, Culture and Technology.

However, examination of the interviewees' evaluation of the contribution of these factors to the emergence of innovation in Israel today demonstrates that their contribution is not perceived as being equal and that there is a clear hierarchy in the interviewees' evaluations of their contribution.

An examination of the findings of the study in light of the literature from around the world demonstrates that in certain fields there is a gap between the research literature and the positions of the interviewees, as expressed in this study (see Figure 1). Two types of gaps were found. One is negative and relates to the factors Government and Public Agencies, Academia and Research Institute and Venture Funding Entities. This gap indicates that the interviewees in this study perceive the contribution of these factors in the ecosystem to the emergence of innovation as lower than that described in the literature. The other gap, is essentially positive and points to the strength of the interviewees' perceptions of the contribution of Culture to the emergence of innovation in Israel.

As far as the negative gaps revealed, they do not detract from the interviewees' evaluations of the importance of the contributions of these factors to the emergence of national innovation. Based on the statements made by interviewees in this study, we can see that these gaps are attributable to the fact that they related to the current contribution of these factors, when a developed innovation ecosystem exists. The rating of the contribution of the three factors listed above (namely, the Government and Public Agencies, Academia and Research Institutes and Venture Funding Entities) to the emergence of innovation in Israel is evidently based on a distinction between their contribution, role and assistance in the emergence of a developed innovation ecosystem in Israel and the contributions currently require to maintain the innovation ecosystem competitive, dynamic and sustainable. The interviewees related to the first of these as givens, so that in fact, their

ranking of the contribution of the various factors to the emergence of innovation was to a strong degree based on other aspects of these factors related to enhancement of the Israeli innovation ecosystem today. For example, government support for industrial R&D provided through the Chief Scientist's Office of the Ministry of Economy was perceived by most as a given and, at times even noted as being less essential and effective now, when the Israeli venture capital industry is among the world's most developed (as opposed to the case at the beginning of the 1990s, when Israel was in the initial stages of developing its innovation ecosystem and the financing for innovation provided by the government was almost exclusive and, therefore, critical to the emergence of innovation). According to the interviewees in this study, the government should have a broad perspective of the field of innovation that includes emphasis on actions beyond support of industrial research and development. Infrastructure aspects of Israel's innovation ecosystem, including educational infrastructure, regulatory and physical infrastructures, were noted by the interviewees as being critical to promoting innovation in Israel today.

In this regard, the interviewees argued that the government does not adapt as required or do so at the pace, strength and coordination that is less than optimal. They claim that the government has a key role and important potential contribution to the emergence of innovation, but must adapt its policy tools to the innovation ecosystem's development stage, through an ongoing dialog with the business sector.

Similarly, the interviewees related to the financing aspect of the contribution of the Venture Funding Entities as a given, and underevaluated it when estimating their overall contribution to the emergence of innovation. In other words, the interviewees tended to rank the contribution of the added value of the Venture Funding Entities to the emergence of innovation beyond the financing itself, which is perceived as a given. The diverse and accessible range of Venture Funding Entities in the Israeli innovation ecosystem today along with the technological developments that have significantly reduced the initial financing required for innovation activities, can explain why the issue of financing, in and of itself, despite its importance, is not perceived by the interviewees in this study as the most important contribution of the Venture Funding Entities to the emergence of innovation in Israel today. Most of the interviewees viewed the added value of these financing entities as their main contribution to the emergence of innovation. Some even mentioned it as being highly significant and more important than the financing aspect. For example, Dr. Yossi Vardi, a very prominent figure on the Israeli and global innovation scene, said, "What's more important than the financial investment itself is the training, consulting and mentoring that entrepreneurs receive from the Venture Funding Entities... The financing itself is important, but its importance is much lower than the contribution made by the mentoring and guidance of the entrepreneur."

In this regard, aspects such as connections to global networks, consulting, guidance and business training were mentioned by the interviewees as most important to the emergence of innovation in Israel today. From the interviewees' statements, we can see that the "smart money" aspect the Venture Funding Entities are supposed to bring with them (meaning the added value beyond pure financing), is not reflected sufficiently in the Israeli innovation ecosystem at present. Therefore, the ranking of their contribution to the emergence of innovation today is only moderate.

Furthermore, when evaluating Academia and Research Institutes, the interviewees related to their traditional contribution (human capital and know-how) as a given and underweighted it when evaluating its overall contribution. They further focused on the gap between the potential contribution of Academia and Research Institutes to the emergence of innovation for economic ability and their actual perceived contribution. This gap is not surprising and stems from the different objective functions of the various sectors. While academia is measured according to indicators such as publications and scientific achievements that are not necessarily applicable in the short term, industry strives to maximize its profits in the short term and therefore promotes applicable research. The difference between academic and business culture is seen both in the different perceptions of time and the conflict of interest regarding publication of studies. According to most of the interviewees in this study, Academia and Research Institutes do not work effectively and exhaustively in the field of innovation, which as previously noted, developed over the years and is based on partnerships in all aspects of the innovation process. The interviewees in this study perceive Academia and Research Institutes as key agents of innovation and as playing a significant role, beyond training human capital and generating knowledge. Most of them believe that these organizations must be more actively involved in the economy.

Evidence of this can be found in the following quote by Mooly Eden, former Senior Vice President and President of Intel Israel, "The main contribution of academia in Israel to the emergence of innovation is seen in scientific research and the quality of the human capital trained at its facilities. However, in fact, academia has the potential to make a greater contribution to innovation than it does today. This potential is untapped due to a lack of meaningful relationship with the industry in Israel." The findings of the study indicate the importance of creating mechanisms that will coordinate and integrate the activity of Academia and Research Institutes with the requirements and needs of the industrial sector. Most of the interviewees recognized the fact that in recent years, the scope of activity on academic campuses to promote entrepreneurship and innovation has increased dramatically, but they claim that this development is slow and less than what

is required. This explains why the contribution of Academia and Research Institutes to the emergence of innovation in Israel today was ranked as only moderate.

Beyond what is set out above, at times there seemed to be a lack of correspondence between the interviewees' evaluation of the contribution of the factor to which they belong sectorally in this study and the way in which interviewees from other sectors evaluate the contribution of the same factor to the emergence of innovation in Israel. For example, interviewees assigned in this study to the government sector, on average evaluated the contribution of the Government and Public Agencies to the emergence of innovation in Israel as higher than interviewees from the academic and industrial sector (see Table 2). A similar finding was also found for academic and research institutes. The contribution of which to the emergence of innovation in Israel was ranked by interviewees in the academic sector as significantly higher than the rating of its contribution by interviewees from the government and industrial sector. This finding may indicate the existence of knowledge gaps between the different sectors regarding their activities in the field of innovation, which may reflect connectivity and coordination problems in the Israeli innovation ecosystem.

As far as the positive gap found in terms of Culture, the findings of the interviews show that there is correspondence with the research literature and beyond. The local culture was found as having the greatest impact and contribution to the emergence of innovation in Israel on every dimension and according to any breakdown performed in this study. Specifically mentioned in this regard was the tolerant attitude in Israel towards failure, the tendency to take risks (evidently attributable to the tolerant attitude towards failure), tendency to challenge conventions, critical thinking, persistence, low power distance and lack of formal mannerisms. Another cultural dimension found to support innovation and to be very typical of Israeli culture is the tendency to develop and nurture social and business networks both at the local and global level. Examination of all aspects of Israeli culture indicate that, indeed, Israeli culture supports innovation and drives its strength from a variety of sources that come together to transform it into the most significant component in the national innovation formula. Most of the interviewees argue that while other factors in the innovation ecosystem (such as Technology and Venture Funding Entities), which influence the level of innovation are also found in other innovation ecologies, the special culture in Israel is a differentiating factor and the underlying reason for the success of Israeli innovation. The high ranking the interviews gave the contribution of Culture to the emergence of innovation in Israel and the homogeneity of their responses indicate the strength of their perceptions of the contribution of Culture and its centrality to the emergence of innovation in Israel.

Regarding Technology, no gap was found with the research literature. Most of the interviewees in this study reported this factor as being significant to the emergence of innovation in Israel.

6 CONCLUSIONS

The findings of the study demonstrate that there are five key factors in the Israeli innovation ecosystem. They are Government and Public Agencies, Academia and Research Institutes, Venture Funding Entities, Technology and Culture. However, it was found that while there is correspondence with the international research literature regarding the factors themselves, there are evidently gaps between countries with respect to the relative contributions of the various factors.

The study found that in certain fields there are gaps between the evaluation of the contribution of these factors to the emergence of innovation as documented in the literature and the evaluation of the interviewees in this study of their contribution to the emergence of innovation in Israel today. This is particularly salient in the rating and evaluation of the contribution of Government and Public Agencies, Academia and Research Institutes, and Venture Funding Entities.

According to the interviewees in this study, we can see that the ranking of the main factors in the innovation ecosystem was based on how they distinguished between the contribution, role and assistance of these factors to the emergence of innovation in the early stages of development of the ecosystem and the contribution currently required to maintain the Israeli innovation ecosystem dynamic, competitive and sustainable. For example, policy measures that were found effective in the early development stages of the innovation ecosystem were perceived by the interviewees as insufficient to enhance innovation today, when the Israeli innovation ecosystem is mature and developed. We maintain that the dynamic nature of the innovation ecosystem shows that in order to enhance national innovation, the performance of the players in the innovation ecosystem must constantly be adapted to the innovation ecosystem's development stage. These findings provide insight into the evolutionary nature of the innovation ecosystem, and should be examined in a follow-up study.

This study focused on examining the aspect of the "factors" in the innovation ecosystem and their relative importance. However, it should be recalled that these factors (both at the level of the firm and the entire economy) are less effective as innovation agents when they work in isolation. They contribute to promoting innovation because they are connected in a manner that facilitates the flow of know-how, capital and people. Therefore, a follow-up study should examine the aspect of

coordination and connectivity between the factors in the innovation ecosystem, which were identified in this study, while relating to the aspect of connectivity during the various stages of development of the innovation ecosystem.

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ROBUST FACE DETECTION USING DELAUNAY TRIANGLE BASED GEOMETRICAL FACIAL FEATURES

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ABSTRACT: Facial features are classified or grouped to generate the unique identity of individual human faces. The quality of face images detected should be sufficient to guarantee an accurate detection response and reduced true positive rate to identify the original human face, which in turn provide high security in public gathering applications. Though efficient face detection was ensured, trade off occurred between true positive rate and computational complexity. To address the challenge of increasing the true positive rate and reduce the computational complexity, this paper proposes a novel technique named Robust Face Detection using Delaunay Triangle (RFD-DT). In this model, first apply Spectral Cluster for efficient face detection from images acquired using Faces94 dataset. Subsequently, gender detection for the detected face is performed by applying Delaunay Triangle to guess whether the given image is a male or female. Finally, age estimation is carried out by applying Wrinkle Textured Seed Point. Extensive experiments carried out on the Faces94 dataset have revealed the outstanding performance of the proposed RFD-DT technique when benchmarked with various well established high-tech schemes. The results obtained by RFD-DT witness a significant increase in accuracy by improving the true positive rate with minimized computational complexity when compared with the results produced by the other methods.

KEYWORDS: Face Recognition, Region of extraction, Spectral Cluster, Wrinkle Textured, Seed Point.

1 INTRODUCTION

Face detection along with gender and age identification is an active research area that determines the presence of human faces in color images. Given with the face images, robust face detection based on gender classification finds out whether the given facial image belongs to the gender male or female. Though significant strides have been made in tackling the problem and providing security in public gatherings, major challenges remain in solving it in the geometrical regional texture.

To improve the recognition performance and speed, Blur and Illumination Robust Face Recognition (B-IRFC) via Set Theoretic Characterization [1] algorithm was proposed. This algorithm solved challenges involved in blind image de-convolution. The blur information affected due to the probe image was easily detected and low dimensional face feature was extracted to handle the illumination variations for efficient face recognition. It works very well for small blurs. However, parameters related to blur kernels increase the computational complexity and therefore it affects the average face recognition rate.

The identification of exact face features, age and gender need to handle different facial expression and face views of the acquired face images. Another method called, Robust Face Recognition for Uncontrolled Pose and Illumination Changes (RFR-UPIC) [2] was presented to handle different facial expressions and views of an images. It was said to be robust and therefore addressed pose and illumination variations. This in turn enhances the overall accuracy of face recognition. But, the qualities of images were not sufficient to guarantee an accurate recognition response and the error rate of this is not being sufficient for high level security provisioning.

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The aforementioned works and other analogue methods have clearly shown the necessity to propose and develop robust face detection model to improve the true positive rate and reduce the computational complexity for efficient face detection. The main contributions of this work are as follows: (1) it proposes a simple and reasonable way to simultaneously improve the true positive rate and reduce computational complexity in the training and test samples. (2) The designed algorithm can lead to robust face detection by properly integrating the distance measure and region of interest to be extracted in a significant manner.

The rest of the paper is organized as follows: In section 2 review works related to robust face detection model is presented and subsequently proposed technique for robust face detection based on geometrical facial features in section 3. In section 4 experiments to evaluate the efficacy of this technique using Faces94 dataset is presented. Finally 5 discusses on various parametric definition and analysis with state-of-the-art methods. Finally, concluding remarks is presented in Section 6.

2 RELATED WORKS

An obvious approach to provide novel face representation and detection approach would to decompose into different scale and orientation using multi scale and multi orientation Gabor filters [3]. However, it involves a challenging problem of uncontrolled illumination variation and it was addressed in [4] by applying hybrid fourier features.

Up to now, many face representation approaches have been introduced including multimodal palm print and hand geometry features [5] and image quality assessment [6]. However, pose variations remained unaddressed. In [7], Markov Random fields were applied to for pose-invariant face detection using an extension of Lucas-Kanade algorithm. However, none of these techniques explicitly perform human identity and gender detection. Therefore, these techniques may pose significant challenges when applied to real world applications. In [8], sparse reconstruction-based metric learning method was presented to exploit the detection and improve the rate of accuracy.

Over the recent years, a few researchers have developed face detection model using multi-scale image fusion [9] and face antispoofing [10]. Authors have achieved promising results for a large group of images. However, the performance of the approach heavily relies on accuracy of the pixel level and person specific, which can deteriorate under pixel differences and pose variations.

Behavioral analysis of human faces has been a hot topic in the areas of computer vision and pattern detection due to the increasing need from real-world applications. Recently, optimal fusion algorithms [11] were introduced with the aid of virtual multi modal to improve the effectiveness of the false accept using log likelihood ratios. Another method based on Nuclear Norm Regularized Regression (NNRR) [12] method to improve the robustness and reduce the complexity of face detection.

Though several face detection methods have been introduced, face detection poses with significant difficulties. This is because of large intra-subject variations with changes in the same individual that make the face detection system to be more different to analyze. In [13], compressed sensing theory was introduced to improve the detection rate to certain types and levels of occlusion. In spite of over two decades of intense research, pose invariance remain significantly challenging aspects of face detection for most real time applications. A photometric model [14] was designed with a statistical model to improve the face detection rate using same identity likelihood ratio. In [15], Coupled Latent Space discriminant analysis was presented for invariant face detection.

In order to handle intra and interclass variations a novel detection approach was presented in [16] using robust auxiliary dictionary learning to improve the detection rate. For pattern classification problems, it is highly required to design a model for face detection to minimize the presence of noise and to enhance the robustness of the classifier. In [17], a new representation based classification method was introduced to reduce the classification error and therefore increase the face detection rate.

The recently proposed face detection model based on the representation of geometrical features has performed very well in high-dimensional pattern classification problems. However, the training images collected from different media posed serious issues. In [18], to present a robust face detection model obtained from different gamut of media. However, face images having low resolution captured at a distance degrades the face matching performance. In [19], to address this issue, linear prediction model and camera motion control was investigated to improve the identification accuracy. Low rank matrix decomposition [20] was investigated on different face databases for improved face detection performance.

With the aforesaid methods, in this paper, a Robust Face Detection using Delaunay Triangle (RFD-DT) technique to reduce the computational complexity for robust face detection by optimizing the true positive rate is presented. Further the discussion of the proposed work is stated in a detailed manner.

3 ROBUST FACE DETECTION USING DELAUNAY TRIANGLE

The facial detection of a person with gender and age identification helps in knowing the person's behavior and possible actions being produced. In addition, different facial expressional classes give a scope for identifying the appearance and age estimation, and hence for any detection algorithm to work in practice, it must account for these variations. First, a spectral cluster model for extracting exact facial portion is presented. Next, this model is used along with the Delaunay Triangle to classify the gender classes of the detected human face objects. Finally, Wrinkle Textured Seed Point is applied to the human face image to identify the age, maximizing the age identification rate from acquired input. Pursued by, each step of this technique is explained in briefly.

3.1 SPECTRAL CLUSTER-BASED FACE DETECTION

The first step in a face detection based application is the efficient detection of faces within an image. For detection of facial features, it is foremost step to detect face from the attained image. In the proposed work, the face and its characteristic points are located through the skin color features by determining whether the image pixel is a skin color or non skin color. With this differentiation, the non skin color regions are rejected whereas the image pixel possessing the skin color is used for further analysis. This is performed by applying Spectral Cluster to the acquired input images, improving accuracy of human face images being detected. Figure 1 shows the structure of Spectral Cluster-based Face Detection (SC-FD) model.

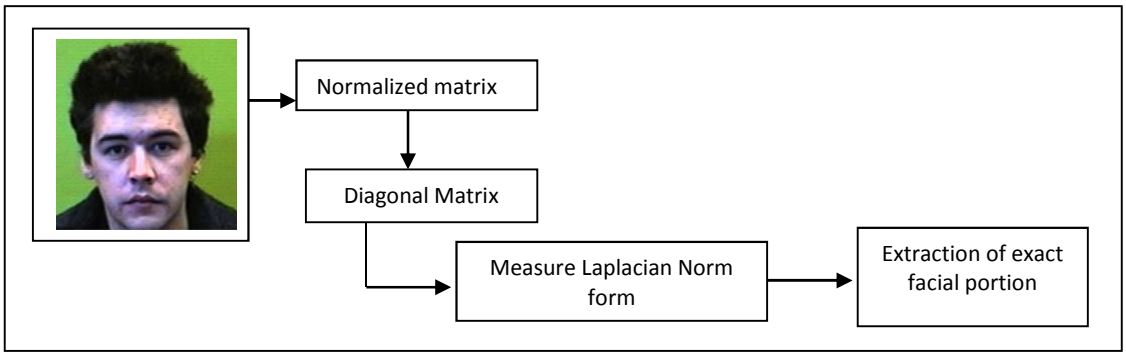

Figure 1 Structure of Spectral Cluster-based Face Detection

As shown in the Fig.1, the SC-FD model is introduced to evaluate the skin color features and generate spectral color featured clusters of the attained face. In SC-FD, a graph 'G' is assumed to be a weighted model, where each edge between two vertices '$v_1\ and\ v_2$' possess a non-negative weight '$W_{ij} > 0$'. The degree of vertex is as given below.

$$D_i = \sum_{i=1}^{n} W_{ij} \tag{1}$$

From (1), the similarity distance bound values are obtained and the spectral clusters are generated using Laplacian form. From (1), 'n' connected points are considered and represented in the form of a diagonal for the matrix 'M' as given below.

$$M = \begin{bmatrix} L_1 & L_{11} & L_{12} \\ L_{21} & L_2 & L_{22} \\ L_{31} & L_{32} & L_n \end{bmatrix} \tag{2}$$

$$D = \begin{bmatrix} L_1 & \dots & \dots \\ \dots & L_2 & \dots \\ \dots & \dots & L_n \end{bmatrix} \tag{3}$$

From (2) and (3), the Laplacian form is normalized into a diagonal matrix with the objective of evaluating the skin color features and therefore reducing the false positive rate. The Laplacian Normalized form 'Lap_{norm}' is then evolved using the normalized matrix 'M' and the diagonal matrix 'D' as given below.

$$Lap_{norm} = I - D^{-1/2} * MD^{-1/2} \tag{4}$$

Let us consider an image 'A', then by measuring the average value of 'R, G, B' for an image 'A' and identifying the greatest average value with respect to the '$ith\ jth$' coordinate, similarity distance bound are attributed to spectrum of skin color value. It is formulated as given below.

$$R_A = \frac{1}{ij} \sum_{i,j=1}^{n} R_{ij} \quad (5)$$

$$G_A = \frac{1}{ij} \sum_{i,j=1}^{n} G_{ij} \quad (6)$$

$$B_A = \frac{1}{ij} \sum_{i,j=1}^{n} B_{ij} \quad (7)$$

$$MAX(R_A, G_A, B_A) = MAX\ (MAX(MAX(R_A)\ G_A)B_A) \quad (8)$$

Now, the skin color features are extracted using a prior estimation likelihood threshold 'δ' arrived from the trained human faces. Therefore, the skin color and non-skin color features are obtained as given below.

$$If\ (MAX(R_A, G_A, B_A) > \delta)\ then\ EF = Skin\ color\ features \quad (9)$$

$$If\ (MAX(R_A, G_A, B_A) < \delta)\ then\ EF = Non - skin\ color\ features \quad (10)$$

From (9) and (10), by ignoring the non-skin color features and using the skin color features, the exact facial portion of the acquired human face image is obtained, therefore improving the spectral cluster accuracy. Next step is to categorize the face as male or female using Delaunay triangle technique and fully discussed in the further section.

3.2 DELAUNAY TRIANGLE-BASED GENDER DETECTION

Once the face is detected from the obtained image, Delaunay Triangles is applied to the detected face for gender identification. Let us consider a point 'PN' or the extracted features 'EF', then the Delaunay Triangles for gender detection either using the point 'PN' or extracted features 'EF' is given as below.

$$DT = \begin{cases} T\ (EF_l, EF_m, EF_n)\ , where EF_l\ \in PN, EF_m \in PN, EF_n\ \in PN, \\ \frac{C\ (EF_l, EF_m, EF_n)\ \cap EF}{(EF_l, EF_m, EF_n)} = \emptyset \end{cases} \quad (11)$$

Where '$C\ (EF_l, EF_m, EF_n)$' represents the circle circumscribed by vertices 'EF_l, EF_m, EF_n' forming a Delaunay Triangle '$T\ (EF_l, EF_m, EF_n)$'. Delaunay Triangulation is then calculated for the Euclidean distances as given below.

$$Dis\ (P, Q) = \sqrt{(Q_1 - P_1)^2 + (Q_2 - P_2)^2 + \ldots\ldots + (Q_n - P_n)^2} \quad (12)$$

Where '$P = (P_1, P_2, \ldots\ldots, P_n)$' and '$Q = (Q_1, Q_2, \ldots, Q_n)$' represents two points '$P\ , Q\ \in PN$'. The Euclidean distances obtained from (12) are then loaded into the database. Figure 2 shows the structure of Delaunay Triangles for input image. As seen in figure, features detected from face have been labeled in green boxes. Once all the features have been extracted, the next task is to decide whether these features represent female or male face.

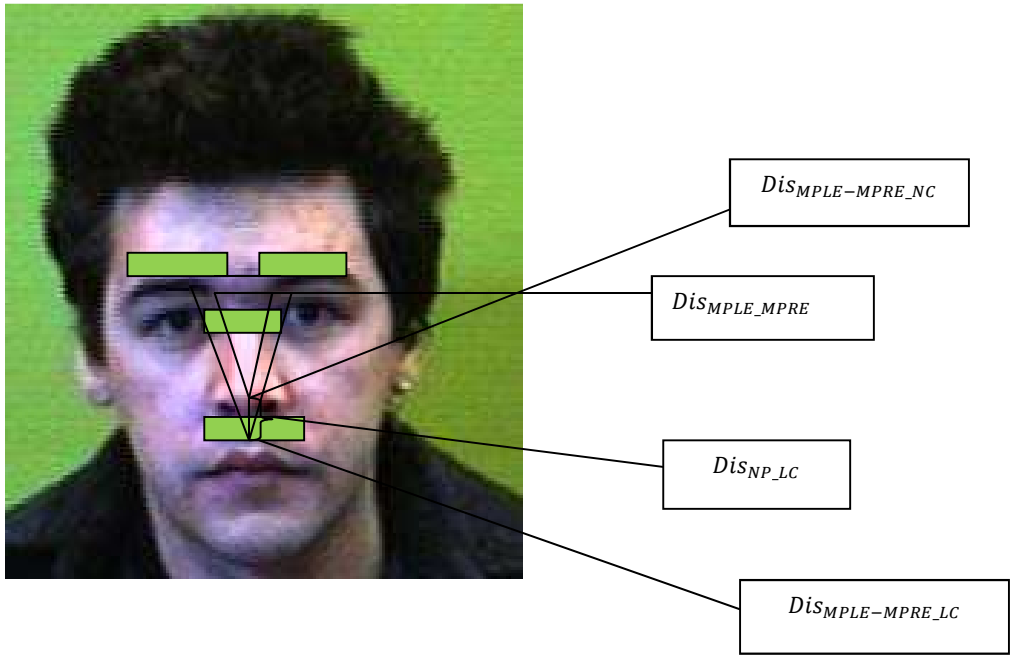

Figure 2 Structure of Delaunay triangles for gender detection

As shown in the Fig.2, the proposed work evaluates the correlation of male and female to obtain the threshold valued. Based on the four ratios threshold values, the decision regarding the male or female is made. The four ratios threshold values include the Distance between left eye midpoint to right eye midpoint and nose center ($Dis_{MPLE-MPRE\_NC}$), Distance between midpoint of left eye and midpoint of right eye (Dis_{MPLE_MPRE}), Distance between nose tip and lip center (Dis_{NP_LC}) and Distance between left eye midpoint to right eye midpoint and lip center ($Dis_{MPLE-MPRE\_LC}$). They are evaluated as given below.

$$Dis_{MPLE\_MPRE} = \frac{Dis\ (LE\_RE)}{Dis(E\_N)} \quad (13)$$

$$Dis_{MPLE-MPRE\_NC} = \frac{Dis(E\_N)}{Dis\ (E\_NC)} \quad (14)$$

$$Dis_{MPLE-MPRE\_LC} = \frac{Dis\ (LE\_RE)}{Dis(E\_LC)} \quad (15)$$

$$Dis_{NP\_LC} = \frac{Dis\ (N\_L)}{Dis\ (NC\_LC)} \quad (16)$$

From (13), (14), (15) and (16), four threshold values are obtained that serves to differentiate between male and female face. Fig.3 shows the algorithm steps for Delaunay Triangle-based Gender Detection.

Input: Image 'I', Extracted features 'EF', Threshold 'RT_1, RT_2, RT_3, RT_4'
Output: reduced true positive rate and computational complexity

Step 1: Begin
Step 2: For each Image
Step 3 : For each matrix 'M'
Step 4: Obtain diagonal matrix 'D'
Step 5: Obtain normalized form using (4)
Step 6: Differentiate skin color and non-skin color features using (9) stored extracted features in 'EF'
Step 7: Form Delaunay Triangles for the extracted features using (11)
Step 8: Measure distance between midpoint of left eye and midpoint of right eye 'Dis_{MPLE_MPRE}' using (13)
Step 9: Measure distance between left eye midpoint to right eye midpoint and nose center '$Dis_{MPLE-MPRE\_NC}$' using (14)
Step 10: Measure distance between left eye midpoint to right eye midpoint and lip center '$Dis_{MPLE-MPRE\_LC}$' using (15)
Step 11: Measure distance between nose tip and lip center 'Dis_{NP_LC}' using (16)
Step 12: If '$Dis_{MPLE\_MPRE} > RT_1$' && '$Dis_{MPLE-MPRE\_NC} > RT_2$' || '$Dis_{MPLE-MPRE\_LC} < RT_3$' && '$Dis_{NP\_LC} > RT_4$'
Step 13: Detected image is "Female"
Step 14: Else
Step 15: Detected image is "Male"
Step 16: End if
Step 17: End for
Step 18: End for
Step 19: End

Figure 3 Delaunay Triangle-based Gender Detection algorithm

As shown in the above figure, the Delaunay Triangle-based Gender Detection algorithm involves two parts. The first part extracts the face image using spectral cluster technique by differentiating skin color and non-skin color features. With the face image obtained, gender detection is performed using Delaunay Triangle in the second part. Once the necessary features are extracted for gender identification, then Euclidean distance is calculated among the features, next the ratios of male and female are evaluated and the threshold value is identified. Based on those threshold values, the given facial image is decided whether a male or female. Followed by, the explanation of age estimation based on wrinkle textured seed point technique in briefly.

3.3 WRINKLE TEXTURED SEED POINT-BASED AGE ESTIMATION

Once detecting the face and gender of an image, next tread is to calculate the age of an image based on Wrinkle Texture Seed Point technique. This model aims at improving the age identification rate using the ROI approach. Extraction of Region of Interest on the face is a good starting point to evaluate the unique feature based on the lines seen between midpoint of the nose to left and right end of the mouth.

The ROI approach proceeds with the principle that a seed point searches the seed point's neighbors to determine whether they belong to the same region. Finally, the seed point is obtained based on the line textured value of similar ranges that list down different wrinkles of the ROI portion of the face image.

The textured values of the ROI are measured from Eigen vectors that use the Euclidean distance of the regional pixels by calculating the distance between the testing image and already available training images. Then the minimum distance is observed from the set of values. The wrinkle texture seed point is trained for evaluating the age ranges from the training sample face images. Multiple trained wrinkle lines are generated and stored in template for testing the detect face image to identify the age ranges of the human face.

The Euclidean distance (ED) of the regional pixels is measured for each expression and is formulated as given below,

$$ED = \sqrt{\sum_{i,j=1}^{n} (x_i - x_j)^2} \quad (17)$$

From eqn.(17), the distance between two pixels '$x_i - x_j$' is the Euclidean distance of their wrinkle feature vectors. As a result, by applying this model, the age identification rate is improved significantly.

4 EXPERIMENTAL RESULTS

In this paper, the aim is to improve the true positive rate and reduce the computational complexity during robust face detection. A dataset containing images obtained from 150 facial images composing of 20 female, 113 male and 20 male staff images. The image resolution was represented in 180 by 200 pixels portrait format in separate directories, each for male and female respectively is used to evaluate the performance of proposed technique.

By using Faces94 dataset and the defined testing method results are compared with existing method. RFD-DT technique is compared with the existing Blur and Illumination Robust Face Detection (B-IRFC) [1] and Robust Face Recognition for Uncontrolled Pose and Illumination Changes (RFR-UPIC) [2]. Experimental evaluation using RFD-DT technique is conducted on various factors such as true positive rate, computational complexity, age identification rate and accuracy rate of face image detected with respect to different face images.

The true positive rate for gender classification is measured based on the number of face images taken as input for experimentation and the number of faces improperly classified are considered. The true positive rate for gender classification measures the ratio of difference between the number of face images provided as input and the number of faces improperly classified to the face images given as input. The True positive rate for gender classification is mathematically formulated as given below.

$$TPR = \frac{(n - No\ of\ faces\ improperly\ classified)}{n} * 100 \quad (18)$$

From (18), the true positive rate for gender classification 'TPR' is measured in terms of percentage (%). Higher the true positive rate for gender classification more efficient the method is said to be. The computational complexity involved during gender detection is the product of number of face images and the time taken for gender detection. The computational complexity is measured as given below.

$$CC = No.of\ face\ images * Time\ (gender\ detection) \quad (19)$$

The accuracy rate of face image being detected refers to the rate at which the number of face images (i.e. testing image) that accurately extracts the exact facial portion for further evaluation. With the exact facial portion, the face detection rate is also said to improve. The mathematical formulation for obtaining the accuracy rate is as given below.

$$A = \frac{No\ of\ face\ images\ extracting\ exact\ facial\ portion}{n} * 100 \quad (20)$$

From (20), the accuracy rate of face image being detected 'A' is evaluated and is measured in terms of percentage (%). Higher the accuracy more efficient the method is said to be.

5 DISCUSSION

The result analysis of Robust Face Detection using Delaunay Triangle (RFD-DT) technique is compared with existing Blur and Illumination Robust Face Detection (B-IRFC) [1] and Robust Face Recognition for Uncontrolled Pose and Illumination Changes (RFR-UPIC) [2] respectively.

5.1 IMPACT OF TRUE POSITIVE RATE FOR GENDER CLASSIFICATION

Table 1 represents the true positive rate for gender classification with different number of face images extracted (from male and female) using Matlab simulator. Out of 113 male and female facial images, 70 face images were used for experimentation and comparison is made with two other methods, namely B-IRFC [1] and RFR-UPIC [2].

Table 1 True positive rate for gender classification using RFD-DT, B-IRFC and RFR-UPIC

No. of face images	True positive rate for gender classification (%)		
	RFD-DT	B-IRFC	RFR-UPIC
10	79.39	69.48	60.21
20	82.32	72.45	65.15
30	85.56	75.36	66.18
40	80.18	70.29	61.14
50	82.24	72.35	64.19
60	86.42	76.17	66.11
70	89.47	79.60	69.40

In order to conduct experimentation, a total of seventy face images with background in plain green color where the subjects or male sit at fixed distance from the camera. With these images, the true positive rate is identified and tabulated in table 1.

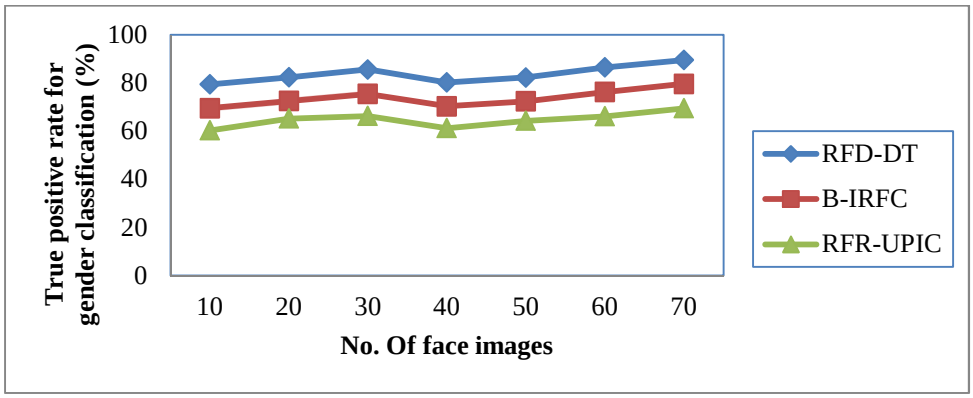

Figure 4 Measure of true positive rate for gender classification

Fig.4 illustrates the true positive rate comparisons for gender classification averaged over 70 random training of 153 images. It can be observed that the proposed measurement outperforms the others, indicating that it best describes the statistical distortion. The results reported above confirm that with the increase in the number of face images provided as input, the true positive rate also increases and comparatively observed to be higher using RFD-DT. The true positive rate for gender classification is improved with the application of Delaunay Triangle. The Delaunay Triangle considers circle circumscribed by vertices and evaluates the correlation of male and female to obtain the threshold value. Furthermore, the decision regarding the male or female is made based on the four ratios threshold values. As a result, the true positive rate for gender classification is improved by 11.94% compared to B-IRFC and 22.75% compared to RFR-UPIC.

5.2 IMPACT OF COMPUTATIONAL COMPLEXITY DURING GENDER DETECTION

The results are conducted to measure the Computational complexity during gender detection are listed in Table 2. In the experimental setup, the number of face images ranges from 10 to 70, out of which 15 female samples and 25 male samples were considered.

Table 2 Computational complexity measured using RFD-DT, B-IRFC and RFR-UPIC

No. of face images	Computational complexity during gender detection (ms)		
	RFD-DT	B-IRFC	RFR-UPIC
10	0.37	0.49	0.56
20	0.64	0.75	0.82
30	0.78	0.90	0.99
40	1.00	1.07	1.16
50	1.07	1.22	1.28
60	1.19	1.34	1.39
70	1.33	1.48	1.54

As listed in Table 2, the RFD-DT technique measures the computational complexity during gender detection which is measured in terms of milliseconds (ms). The computational complexity during gender detection obtained using this technique RFD-DT offer comparable value than the modern methods. The time taken for gender identification for single face image using RFD-DT technique was 0.03ms, 0.049ms using B-IRFC and 0.056ms using RFR-UPIC.

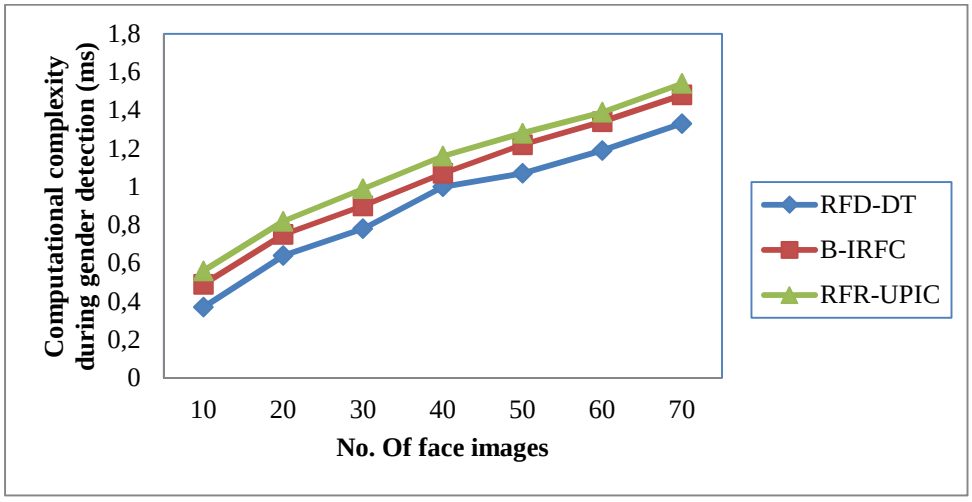

Figure 5 Measure of computational complexity

As illustrated in figure 5, when 10 face images were used as input, the computational complexity using RFD-DT was 0.37ms compared to B-IRFC and RFR-UPIC that showed 0.49ms and 0.56ms respectively. The advantage of applying Delaunay Triangle-based Gender Detection algorithm in RFD -DT technique where Euclidean distances are evaluated with the correlation of male and female to obtain the threshold value. This threshold value is then used for arriving at the decision whether the given face image is male or female. This in turn reduces the computational complexity by 15.70% compared to B-IRFC and 24.94% compared to RFR-UPIC.

5.3 IMPACT OF ACCURACY RATE OF FACE IMAGE DETECTED

In table 3, compare the rate of Accuracy rate of face image detected obtained by different number of face images for robust face detection. The experiments were conducted using seventy face images with background in pale green color and minor variations observed in head turn, tilt and slant respectively and the accuracy rate of face image detected is measured in terms of Percentage (%).

Table 3 Accuracy rate using RFD-DT, B-IRFC and RFR-UPIC

No. of face images	Accuracy rate of face image detected (%)		
	RFD-DT	B-IRFC	RFR-UPIC
10	91.37	80.52	70.25
20	93.34	85.45	75.26
30	95.18	89.29	79.10
40	92.29	83.40	73.21
50	94.50	85.61	75.72
60	96.81	87.92	77.73
70	97.25	88.36	78.17

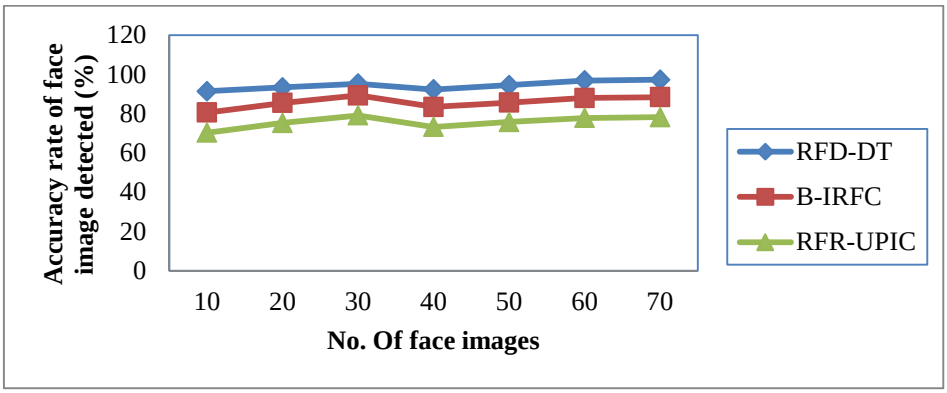

Fig. 6 Measure of accuracy rate of face image detected

From Fig. 6, it is illustrative that the accuracy rate of throughput for face image detection is improved using the proposed RFD-DT technique. This is because with the application of spectral cluster and Delaunay Triangle, the accuracy rate is increased where face detection is made by ignoring the non-skin color features and using the skin color features. Then, from the extracted skin color features, gender identification is made. This results in the improvement of accuracy of face image detected using RFD-DT technique by 9.12% compared to B-IRFC and 19.89% compared to RFR-UPIC.

5.4 Impact of Age identification rate

In order to increase the age identification rate with respect to different number of face images, the age identification rate using the RFD-DT technique and two methods, B-IRFC and RFR-UPIC with visual comparison is presented in table 4.

Table 4 Comparison of age identification rate

Methods	Age identification rate (%)
RFD-DT	95.17
B-IRFC	88.47
RFR-UPIC	82.27

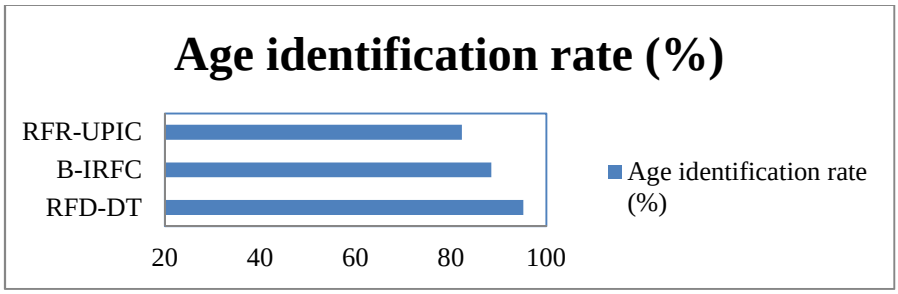

Fig. 7 Measure of age identification rate

From the Fig.7, the age identification rate is higher by applying the proposed RFD-DT technique than when compared to the existing methods respectively. This is because of the application of Delaunay Triangles and The Wrinkle Textured Seed Point-based Age Estimation model that attains 7.04% improvement when compared to B-IRFC [1] method and 7.00% compared to RFR-UPIC [2] method which shows that there is a significant gain using the proposed RFR-DT technique.

6 CONCLUSION

This paper proposes three novel face representations. First formulate Spectral Cluster model for face detection and then apply Delaunay Triangles on extracted faces, and finally Wrinkle Textured Seed Point for age estimation. In order to improve the true positive rate and reduce the computational complexity, Delaunay Triangles-based Wrinkle Textured Seed Point with distance measure and region of interest extraction is further proposed to represent a robust face detection technique. The correlation of male and female is evaluated and based on the threshold values, the decision regarding the male and female is made to reduce the computational complexity and robustness of the proposed representations. In robust age estimation phase for, Delaunay Triangles and Wrinkle Textured Seed Point are utilized to improve the age estimation rate and make the representation more compact and, thus, to improve the efficiency of the algorithm. Experimental results validate the efficacy of the proposed technique.

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