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Secure Routing to Prevent Blackhole Attack in MANET's

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ABSTRACT *MANETs are temporary, infrastructure less, easily deployable, dynamic and self- configuring in nature. Decentralized administration and lack of coordinator are the major reasons for MANET to be more prone to attacks such as the blackhole. Malicious node (Black hole) attack is a famous issue in MANET's. The Malicious node replies source node to have the shortest route to the destination. It attracts the network traffic towards itself in order to drop it. MANET containing such type of nodes may not behave according to the protocol which is used for routing. Most common protocols used in MANET's are DSR and ADOV. However, these are not designed to detect blackhole attack. In this paper we propose a secure routing algorithm to prevent black hole attack in the beginning stage of route discovery. In our approach, one validity value is attached along with a request to reply (RREP) which guarantees that no attack took place along the path. Our approach is simulated in NS2 and validates trough performance analysis.*

Keywords: *MANET; black hole attack; route reply; AODV; validity value.*

I Introduction

MANET is a cluster of collaborative, mobile and wireless nodes. Mobile ad hoc network is planned to build up in natural disasters scenarios and battlefield operations wherever it is complicated to organize the wired network. MANET's network topology is not fixed and does not possess any centralized control over the network. Here nodes are mobile and easily deployable and they communicate with each other using wireless links. Direct communication between the nodes is possible if they are in the same communication range otherwise neighboring nodes can be used as routers to transmit data [1] [2]. Decentralized management and dynamic network topology [3] are the reasons that make routing process more challenging. Different types of routing protocols are available namely proactive routing protocols, reactive routing protocols (on demand) and hybrid protocols. In proactive routing protocols, total data about the routing of the network is preserved at each node. Here updating of routing tables of the entire nodes takes place for any alteration in the network topology. HSR, GSR, DSDV etc are examples of proactive routing protocols. In reactive the routing only nodes which are part of active route maintain routing information. The reactive protocols like DSR, AODV, LAR, etc find the route which is on demand and Hybrid protocols are the combination of both proactive and reactive routing protocols.

AODV is the most broadly used routing protocol in MANET's [4] [5]. As it is a type of reactive routing protocols, it cannot handle security threats such as blackhole[5] [6]. Without proper security, malicious nodes may corrupt the routing operation. Blackhole is a well known and one of those types of attacks [4] and effect of this attack becomes more severe if two or more than two nodes cooperate with each other to cause the attack. Now a day's research world is focusing on single node black hole attack. In our approach, we focus on both single node as well as multiple node collaborative attack by reducing overheads and time. Rest of this paper is composed as follows. Section 2 represents literature survey on AODV. Section 3 presents our proposed strategy. Section 4 represents Result and analysis. Finally in section 5 conclusion and future work is discussed.

II Literature Survey

Continuous changing network topology is a challenging task to forward packets between source and destination nodes [7]. AODV is a kind of on-demand protocols which serve the aim of steering packets linking pair of nodes. Ad hoc On-demand Distance Vector (AODV) is a reactive protocol, it explores for route which is on demand. AODV is advanced over DSDV i.e. it is DSDV with added benefits of DSR. Route discovery and its maintenance system are taken from DSR protocol whereas the multi-hop routing and sequence number are taken from DSDV. The use of sequence numbers is one of the reasons to prevent loop choice and count to infinity problem [9]. Below are the two stages in which AODV works:

Route discovery*:* When a source node is ready to send data to any other node, first it checks its own routing table for a best possible route to destination node. If any route is present, data is sent through that route

otherwise route finding stage takes place with the help of distributing RREQ to its nearby nodes which explores for the desired route in their routing table also responds through RREP if present. This process proceeds until destination node is discovered or a node having route to destination is found. The intermediate nodes make the entry of RREQ and RREP messages in their route table. Each entry in the routing table is linked with timer and the entry will be deleted on expiry of timer.

Route maintenance*:* At the time of data transmission if a route breakage occurs then the other nodes are informed with RRER message. The RRER message is sent to all those nodes which are using the breakdown path for their communication. Whenever a basic node receives this RERR message from other nodes then it has to restart route discovery process.

Black hole attack*:* It is a type of denial of service of attack and it is also called as the data packet drop attack. The node within the network or outside of the network launches this attack [4]. At the starting time of route discovery process, if internal attacker node is present, on obtaining RREQ message, it will send a fake RREP message. The RREP sent by attacker node attains the source node early ahead of RREP's sent by other nodes. This happens because of attacker node sending RREP without checking its route table. The RREP sent by attacker claims to have the shortest route to the destination node. It shows the minimum value of hop count and a maximum value of sequence number which shows that new adequate route to the destination node is available. Here source node will be deceived by this false RREP and select this path to forward data packets. On receiving these packets, the malicious node will not forward them it simply drops these packets.

III Related Work

In [10] a system is known as anti blackhole mechanism (ABM) is described in which the difference between RREQ and RREP is calculated to find the doubtful value of a node. Some of the abnormality based IDS [11] [12] which supervise malicious activities in MANET are presented. However, to posses IDS in a network requires a centralized monitoring which is not possible and impractical in MANET. A method to negotiate with the nodes claiming to have shortest and fresh route is proposed in [13]. However, this system adds an overhead and delays to prevent blackhole attack.An approach called SAODV is described in [14] where source nodes wait for a particular period to receive replies from all the nodes. However, this method adds nominal overhead but a significant delay is added.

Payal et al. in [15] proposed a method to update threshold value dynamically and consistently. The value of sequence number from each RREP is checked with this threshold value. If a higher value of sequence number is greater than the threshold then it is confirmed that the RREP sending node as blackhole. Here one alarm packet is distributed to illuminate that a malicious node is present in the network. However, this method adds minimal delay and overhead in the network. H. Weerasinghe et al in [16], describes how malicious nodes are identified in a Data Routing Information table. This approach uses more memory to store the previous routing information and results in increased overhead. Memory is also wasted due to storing of past routing information.

IV Proposed Method

Our proposed approach keeps the process of AODV unchanged. In AODV, when a source node is ready to send data to any other node, first it verifies its own routing table for a best possible way to the destination node. If any route is present, data is sent through that route otherwise route finding stage takes place with the help of distributing RREQ to its nearby nodes which explores for the desired route in the routing table and responds through RREP if present. The whole process will carry on until the destination node is discovered or a node having route to the destination is found. In our approach a validity value is added with RREP message. This checked by intermediate node and is implemented at destination node. The flow graph of our proposed approach is shown in Fig.1.

A validity value is added with RREP message and is reserved in route table at each node of the active route. If a source node receives route request which is the projected destination route, then RREP message is created by setting value for validity bit in RREP. The RREP with validity bit is sent back to its nearby hop from where it has obtained RREQ. In the proposed approach RREP message differs in the validity bit with the basic AODV RREP message. However, the validity value operation is developed in RREP message. Generally, in the basic AODV protocol, the route table contains nine fields: Valid Destination Sequence Number Flag, Network Interface, Destination Sequence Number, Other state and routing flags, Destination IP address, Next Hop, Hop Count, Lifetime, and Precursor List. We are proposing an additional field for validity value along with nine fields which are used to check the validity of route. Whenever a node receives an RREP and if validity bit in that RREP is set then only it will be processed. If the validity bit is set

entry for that route will be made in the route table. The malicious node is unaware of this strategy it will simply reply without checking its route table. The RREP message sent by attacker node doesn't have validity bit attached. So a node which receives this type of RREP simply drops it without making an entry in the routing table. Therefore the routing table will be free from false routes.

Our approach is same for single, as well as, collaborative malicious node attacks. In collaborative attacks, the attacker nodes which are in collaboration can forward RREP among themselves. But they cannot transmit RREP message to a node which is not in cooperation with them. Therefore both single as well as collaborative attacks can be avoided before actual transmission of data.

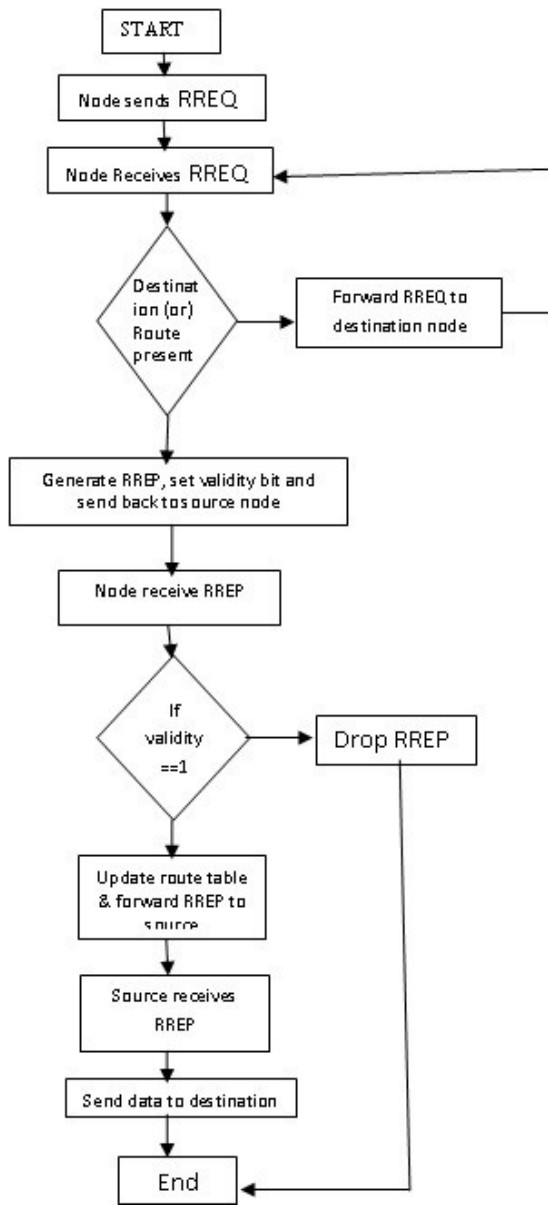

Figure 1: Flow graph of proposed model

Simulation parameters used in the proposed approach are shown in below table:

Parameter	Value
Type of Simulator	NS2
Area for Simulation	1000x800 m
Total Simulation time	100 sec
No. of nodes	20,40,60,80,100,120
Mobility speed	25 m/s
Type of Protocol	AODV
Packet size	512 Bytes

Table 1 : Simulation & Parameters

Simulation of our proposed approach has carried out through parameters of table1.The following graphs shows the comparison of AODV and our proposed AODV. Here the packet delivery ratio (PDR) is compared for AODV that is under blackhole attack, AODV, and Proposed AODV in figure 2. Packet delivery ratio drops with the raise in the number of nodes in the network. There is a significant drop in PDR due to presence of black hole node. However this node can be prevented from participating in the network by using proposed AODV protocol which has similar PDR.

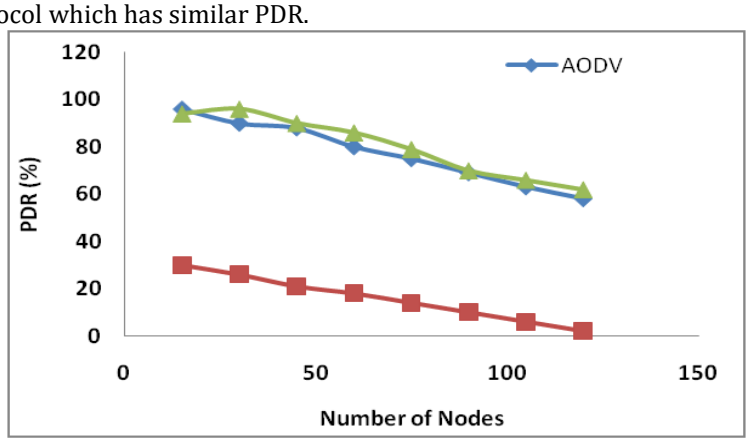

Fig. 2: Comparison of packet delivery ratio

Figure 3 shows comparison of routing overhead, where introduction of overhead by proposed approach are not extremely varying. Here routing overhead increases with node mobility speed. The reason is as nodes move faster there will be more change in the network topology which results in the reconstruction of new routes. Figure 4 shows standard end to end delay. Here like PDR, the number of nodes also affects standard end to end delay.

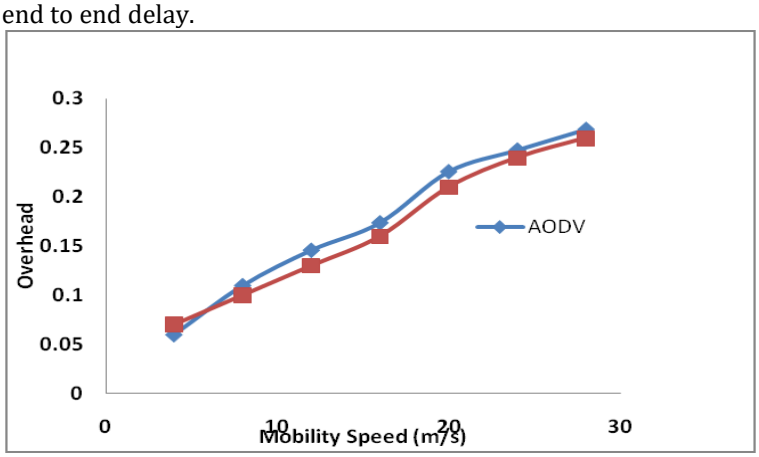

Fig. 3: Comparison of Routing overhead

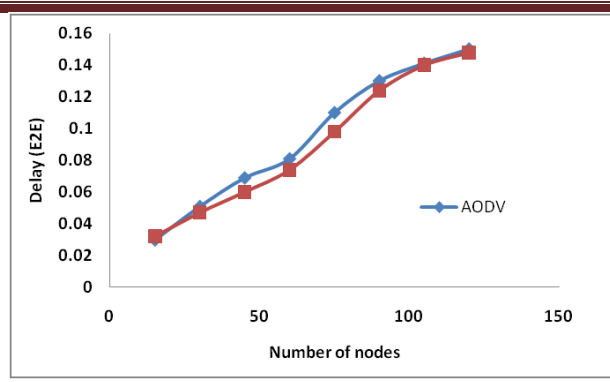

Fig. 4: Comparison of average end to end (E2E) delay

IV.CONCLUSIONS AND FUTURE WORK

Mobile wireless networks like MANET are more likely to be suffered from security threats due to their characteristic like open medium. This paper discusses a well known security threat called black hole attack and proposes an efficient solution for the same. Proposed system neither requires heavy processing nor extra memory. With the addition of negligible overhead, black hole attack is prevented before actual data transmission phase, even before the participation of malevolent node in the network. Therefore the legitimacy of route is confirmed. Proposed strategy is compatible with other reactive routing protocols. The proposed method will be applied for other reactive routing protocol as a part of future work.

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Design and Analysis of RCS Measurement of Launch Vehicle for its Dynamic Trajectory

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ABSTRACT *Radar System plays a important key role to track the launch vehicle by providing continuous trajectory data for the range safety purpose to evaluate the launch vehicle performance during real time.Launch vehicles are encountered highly fluctuating dynamic rates while placing the satellite into an orbit. Radar Cross Section (RCS) guides the detection of the launch vehicle range and highly dependent on space vehicle physical configuration, aspect angle, frequency and polarization [1]. For continuous tracking of space vehicle from the launch pad, it is essential to estimate the RCS and investigate the factors which contribute the RCS fluctuations. This paper analyzed the RCS characteristics of the launch vehicle in dynamic nature by MATLAB based software simulations and validated the results with the Monostatic Radar measurement by taking a case study.*

Keywords: *Radar Cross Section (RCS), Range Safety, Monostatic Radar, Launch Vehicle, Aspect Angle*

Introduction

Launching of a launch vehicle is potentially hazardous and complex in nature. Radar tracking data is critical to take range safety decisions during the real time launch. RCS is an important study parameter for space applications specially dealing with launch vehicle tracking which deeply influences the radar tracking performance. Launch vehicles fly in pre-defined trajectories to keep the satellites in different orbits. There are possibilities of encounter of the tracking breaks with sudden signal dips due to RCS fluctuations, which misleads in prediction of the vehicle position and estimation of impact point of the launch vehicle stages after their separation. Hence, it is very much essential to get the good amount of RCS to track the target continuously by the radar for the range safety purpose [8]. RCS is an important factor for evaluating the performance of modern long range radars.

RCS estimation for simple shape of targets like plates, spheres, cylinders etc., is easy with application of exact methods in analytical techniques but difficult to apply for complex targets like aircraft, missiles, launch vehicles etc, [2] The significance RCS is the effective area by which the amount of EM signals reflects back towards radar after the incident wave. It is a target particular characteristic and depends on its physical area seen by the radar. Higher RCS warranted for space and civilian applications easy to detect. In certain cases, like fighter aircrafts, ships and missiles need very low RCS design to escape by the enemy radars [5]. The RCS not only determines the existence of the target but also the approximate size and shape.

The radar is used for detecting and ranging the target by transmit EM signals towards the target and receive echoes from the target and process the data. The radar range equation is the basis for design and estimation of the dynamic RCS of the targets. The influence of RCS on the received power by the radar is shown by the radar equation [2] for free space propagation is given by

$$P_r = \frac{P_t G_t G_r \lambda^2 \sigma}{(4\pi)^3 R^4} \quad (1)$$

Where, the transmitted and received power is denoted by P_t and P_r,the transmitting and receiving antenna gain is denoted by G_t and G_r, λ is the operating wavelength, R is the radar range and σ (Sigma) is the RCS of the target.

The reflected power by the target is the product of its effective area and the incident power density. It is called echo of the object. The echo intensity clearly described by the RCS of the object. The definition of RCS is [7]

$$\sigma = 4\pi \lim_{R\to\infty} R^2 \frac{|E^{scat}|^2}{|E^{inci}|^2} \quad (2)$$

Where E^{inci} is the incident electric-field strength of the is wave imposing on the target and E^{scat} is the reflected electric-field strength of the wave towards the Radar and R is the far field distance. RCS is

representing in logarithmic scale for convenience due to large variations in RCS patterns from one aspect angel to another [2].

$$RCS\ (dBsm) = 10 \log_{10} \sigma \quad (3)$$

The different factors determine how the electromagnetic energy returns to the source such as [3]: target material, size, incident and reflected angles, polarization of the transmitted and the received powers with respect to the target orientation. RCS estimation for complex targets is difficult as it is not possible to include all practical phenomena into consideration. The launch vehicles are constructed with different stage configurations to accommodate the required fuel and associated systems. The stages of launch vehicle are separated as per pre-defined trajectory toplace the satellites in various intended orbits. The complex objects like launch vehicles, missiles are constructed using simple arbitrary objects like sphere, cylinder, rectangle, triangle, circular plates, cone etc [3]. The RCS estimation of launch vehicle is difficult due to its dynamic nature and environmental conditions.

2 Case Study

Design and Analysis of the RCS fluctuations of a launch vehicle in dynamic nature by proven software simulation and Monostatic Radar Measurement is carried out in the following phased manner. It is required to analyze the signal strength fluctuations of launch vehicle before the launch for its designed trajectory shown in Table-1. It is useful for radar operator to alert where the signal reaches the threshold.

2.1 Configuration and Design of Launch Vehicle

One of the complex launch vehicles model was taken for RCS estimation The following launch vehicle configuration with the geometrical dimensions is designed in AutoCAD. This model used as input for simulation software for RCS estimation showed in Fig.1 and Fig.2

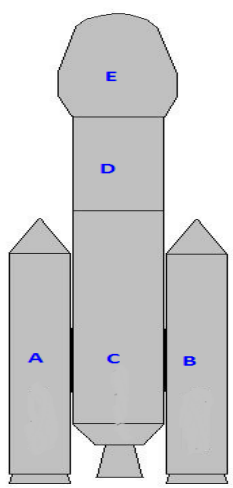

Fig 1. Launch Vehicle Configuration

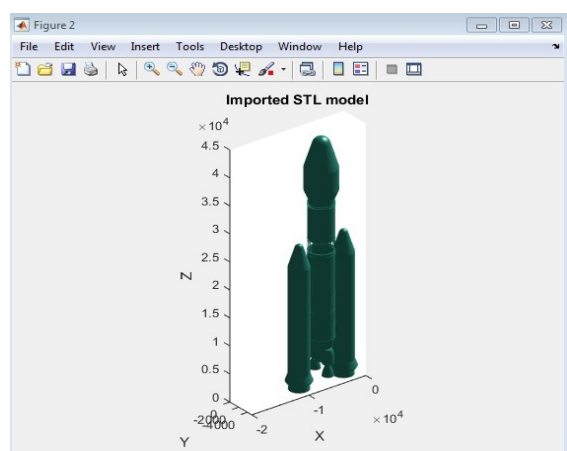

Fig 2 . Launch Vehicle Design in AutoCAD

Description of launch vehicle stages

A, B: Solid Boosters fires from T+0 sec. to T+140 sec. and separates at T+140sec.

C: Liquid Stage fires from T+140 sec. to T+319 sec. and separates at T+319 sec.

D: Cryo Stage fires from T+322 sec. to T+964 sec.

E: Heat Shield of the Satellite separates at T+224 sec. and Satellite is placed in the orbit at T+979 sec.

Table 1. Flight Trajectory of the Launch Vehicle

TimeS.Range	Elev	Azim	Range Rate	Elev Rate	Azim Rate	Aspect Angle
(s)	(km)	(deg)	(deg)	(km/s)	(deg/s)	(deg/s)	(deg)
0.0	5.932	0.178	69.429	0.000	0.000	-0.000	89.768
1.0	5.932	0.188	69.429	0.000	0.029	-0.000	89.768
2.0	5.932	0.236	69.429	0.000	0.078	-0.000	89.733
3.0	5.932	0.343	69.429	0.000	0.127	-0.000	89.633
4.0	5.932	0.497	69.429	0.000	0.179	-0.000	89.480
5.0	5.933	0.700	69.429	0.000	0.234	-0.001	89.286
6.0	5.933	0.961	69.429	0.000	0.295	-0.001	89.036
7.0	5.934	1.289	69.429	0.001	0.360	-0.002	88.694
8.0	5.934	1.685	69.426	0.001	0.427	-0.002	88.045
9.0	5.936	2.148	69.417	0.002	0.496	-0.001	87.206
10.0	5.938	2.678	69.417	0.003	0.567	0.000	86.315
50.0	10.964	48.389	77.391	0.283	0.669	0.423	26.657
100.0	38.363	52.881	99.748	0.936	-0.232	0.297	11.721
200.0	192.908	31.312	107.994	1.943	-0.168	0.012	4.914
300.0	452.649	18.197	108.446	3.464	-0.096	0.000	4.829

2.2 RCS Estimation of the Launch Vehicle by Software Simulation for the given trajectory

The RCS simulation software used is POFACET 4.1 version which was implemented with the physical optics method [4]. It is well established simulation software tool with high processing capabilities is used for the estimation of RCS which was developed by David C. It is more user friendly and employs the MATLAB computational features with Graphical User Interfaces functions for efficient calculations of RCS [6][9].

POFACETS software asuitable tool for representing the of complex shapes by triangular facets. It calculates the Monostatic or Bistatic RCS of the targets as per user specified inputs and displays the targets geometrical models and RCS plots. The launch vehicle is designed in AutoCAD which is input for the simulation software for RCS estimation. The RCS fluctuations of above launch vehicle for its given trajectory of 300sec data with 1sec interval is simulated. The signal strength variations with respect RCS fluctuations against aspect angle plotted in Fig 3.

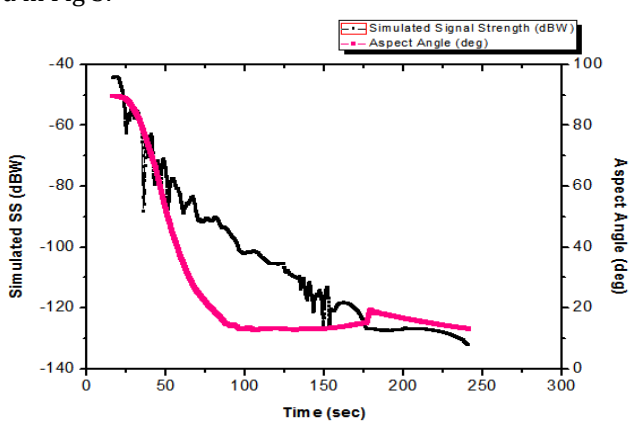

Fig 3. The Simulated RCS of the Launch Vehicle with Aspect Angle

2.3 RCS Measurement of Launch Vehicle in Dynamic Nature by Monostatic Radar for a sameTrajectory

RCS fluctuations of the above launch vehicle measured by Monostatic Radar with transmitting electromagnetic energy towards the target and receive the back scattered echo signal in skin mode towards the same radar antenna. The RCS measurement by Monostatic Radar carried out by Signal Processing Technique during the Real Time for same trajectory with the following parameters.

Frequency of Operation	: 2800 MHz (S-Band)
Power	: 1MW
Polarization	: Horizontal
Gain	: 39 dB
Receiver Noise Temperature	: 587 ° kelvin
Receiver Bandwidth	: 1.4 MHz
Noise Figure	: 2.5 dB

The Radar Received Signal Strength values of the launch vehicle with respect to aspect angle for the given trajectory logged in 10ms interval in Radar Data System during the Real Time. The logged data parameters processed with respect to aspect angle. The data is considered from T+15 sec where the launch vehicle lift off from the launch pad shown in Fig 4.

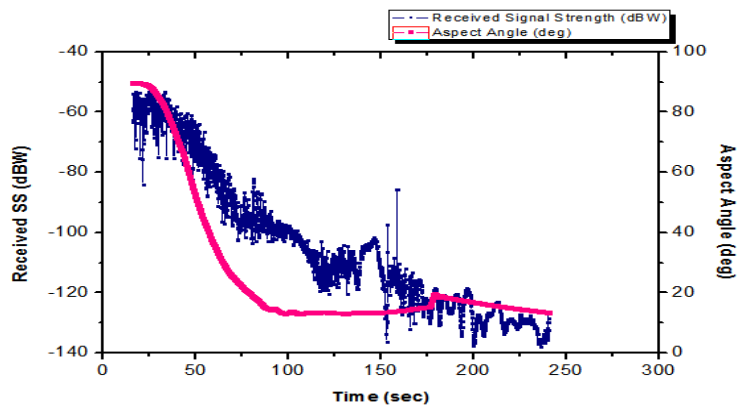

Fig 4. Radar Received Signal Strength plot with Aspect Angle

Results and Analysis

The RCS estimation in terms signal strength values for the launch vehicle by the Radar Measurement Method and Software Simulation Method for given trajectory results are plotted in Fig.5

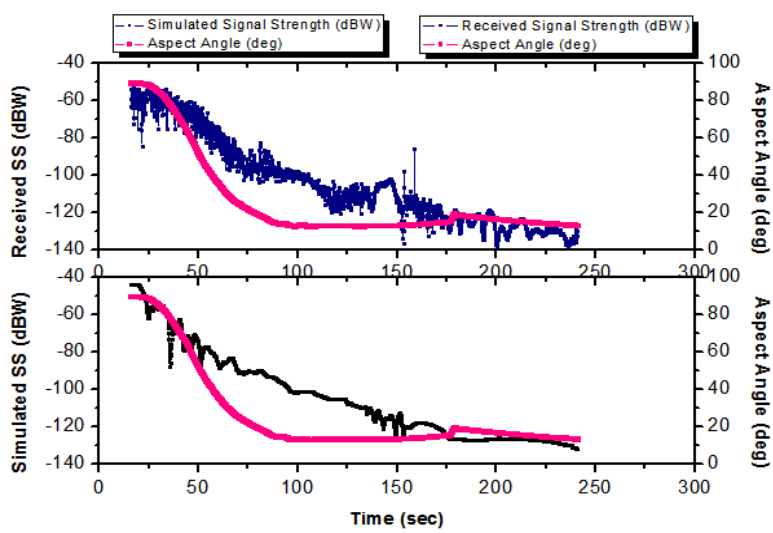

Fig 5. Combined Signal Strength variations of Space Vehicle for its trajectory.

This paper presented the measurement of RCS fluctuations of a launch vehicle by MATLAB based POFACET software and validated the results with Monostatic Radar Technique for its trajectory.

The simulated RCS of the launch vehicle for its trajectory is comparable with Radar Real Time measured RCS with acceptable agreement levels. Simulated RCS shows around 1dB to 2dB more, this is due to non-considering the environmental conditions in software simulations. The RCS values improved after T+110 sec in both methods due to improvement in aspect angle and decreased after T+200sec onwards.

More RCS fluctuations are observed in radar measurement due to presence of environmental conditions. Signal strength improved in radar measurement at T+140 sec onwards due less flame attenuation by the liquid stage of the vehicle. But it was not present in simulation due to non-considering the flame attenuation. Overall results shows that RCS of the launch vehicle is dependent on aspect angle and shape of the launch vehicle.

Conclusion

In this paper RCS measurement of launch vehicle in dynamic nature was designed and analyzed. The RCS of the launch vehicle was simulated with proven software for its trajectory and results were validated by Monostatic Radar signal processing technique. The software simulated RCS values shows good agreement with the Monostatic radar measurements except few intervals due to non-considering the real time RF environmental phenomena.

Results shows that RCS of launch vehicle depends on aspect angle and its size of the launch vehicle. It also to be further investigated the effect of RCS fluctuations of the launch vehicle with respect to different polarizations and frequencies by taking the RF environmental conditions into account.

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Energy-Aware Sensor Node Design With Its Application in Wireless Sensor Networks

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ABSTRACT *Current use of Wireless Sensor Network (WSN) technology and the use of power for exploitation remains the main obstacle. This paper provides the power-aware sensor node design and implementation that helps build energy-efficient WSNs. A power-efficient strategy has been proposed to minimize energy consumption from both the sensor node level and the network level. To reduce the communication power consumption of the sensor node, the distance between the transmitter and the receiver is estimated before the transmission is available, and then the lowest transfer power required to transfer the measurement data is calculated and determined. The sensor nodes are also set to sleep mode between two consecutive dimensions for energy saving in normal operating conditions. Furthermore, energy networking can be achieved by estimating energy consumption within the entire network under whole network configurations, and then achieving energy efficiency.*

Keywords: *1.wireless sensor network, 2.sensor node, 3.zigbee network, 4.media access control protocols, 5.transceiver, 6.adequate simulation*

I INTRODUCTION

WSN [7] refers to a group of spatially dispersed and dedicated sensors for monitoring and recording the physical conditions of the environment and organizing the collected data at a central location. WSNs measure environmental conditions [6] like temperature, sound, pollution levels, humidity, wind, and so on.

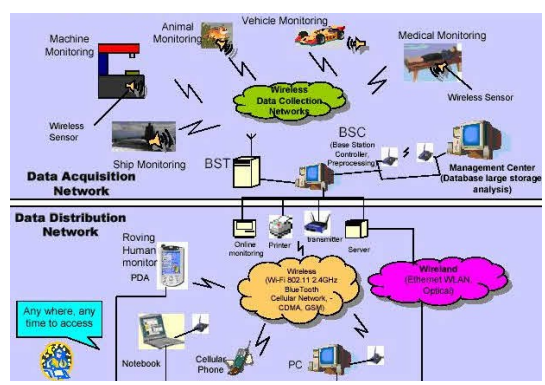

Figure1 Wireless Sensor Networks

WSN is a wireless network that consists of base stations and numbers of nodes (wireless sensors).These networks are used to monitor physical or environmental conditions like sound, pressure, temperature and co-operatively pass data through the network to a main location as shown in the figure 1.

II EXISTING SYSTEM

Fast development of wireless communication, wireless communication and on-chip signal processing encouraged the development of wireless sensor technology, which enabled extensive applications for industrial system monitoring and environmental sensing from situation management management. The number of wireless sensors [1][2] is generally considered to be wireless sensor network (WSN), implemented for real-life applications, is rapidly growing in recent years, and the trend is expected to increase further in the following years. However, energy consumption is still a major obstacle to completing this technology and the batteries are recharged, eg through solar power-breeding systems [3]

The Transmission-Application Media Access Protocol is designed to reduce the power consumption [4], allowing the sensor nodes to remain low-powerless and not work in the mode of transmission or receiving mode. Data based systems are divided into two different categories: data compression and energy efficiency data collection

Previous studies have studied different policies, such as data-based systems to reduce duty-cycling and energy consumption. Duty cycling can be achieved by a low-distance cycle through sleep / wake-up protocols and media access control protocols. For example, a small topology and power management system [9][10] has been proposed to improve network lifetime by setting some unnecessary nodes to sleep mode

A power-saving strategy involving node-level energy savings has been proposed at the meeting with positive network configuration[5] by conserving positive radio frequency (RF) power setting and network-level power.

III PROPOSED SYSTEM DESIGN

The proposed system adds an extension / sleep-up scheme to the sensor node design, in which node-level power saving. The entire communication system and experimental test has also been updated since the main controller of the microcontroller LPC2148 [8] is used for the sensor node.

The proposed system consists of mainly three sections such as monitoring unit, master unit and slave unit. The multiple slave units collect the user requirement sensors information and passed to the master controller through zigbee network which works at frequency of 2.4GHz. The master controller collects the different sensor nodes information and passes to the monitoring unit comprises personal computer. Here instead of wasting power, we adopt a system where these sensor nodes switch automatically to power on and off modes. If two sensor nodes were arranged with short distance between, the slave controllers switch sensors to on and off states, reducing power wastage for being monitoring continuously as two sensors give same information with some variance.

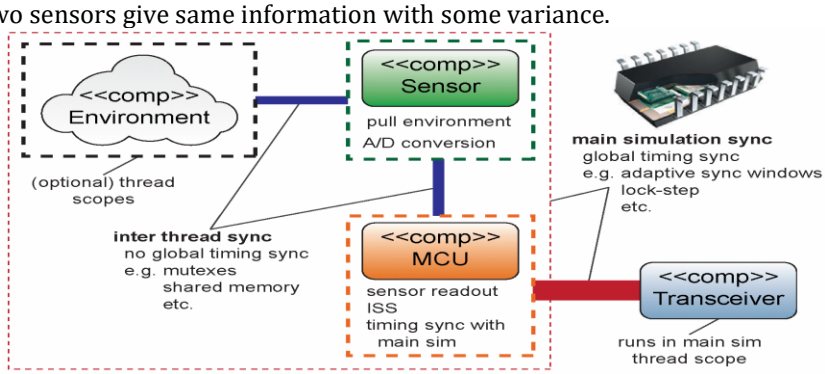

Fig 2: Sensor node environment

The Figure2 defines a sensor node (environment) as a sensing environment (an environment model to sense, sensing devices and a micro controller unit (MCU) encapsulated as simulation-component) and a transceiver. When these entities are modeled as simulation-components their actual simulated behavior can be parallelized by maintaining separate timelines at simulation-component level up to the points of necessary interaction both within and beyond component borders (e.g. the MCU duty cycle reaches a state where the environment needs to be sensed, the transceiver listens and receives an incoming message etc.). While these entities need not to be simulated at all when their behavior is not influential to the simulation target parameters (e.g. power consumption) at the moment, thus saving computational resources, doing so in threads of execution of their own can be highly beneficial in the context of simulation in a number of scenarios while maintaining adequate simulation performance (e.g. real-time event injection during simulation runtime etc.).

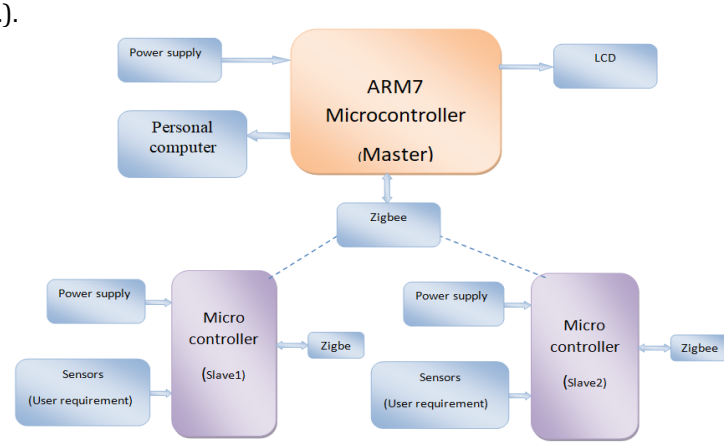

Figure3: Block diagram of energy aware sensor node design

The figure3 illustrates the architectural overview of sensor node system.The proposed system consists of mainly three sections monitoring unit, master unit and slave unit. The multiple slave units collect the user requirement sensors information and passed to the master controller through zigbee network which works at frequency of 2.4GHz. The master controller collects the different sensor nodes information and passes to the monitoring unit comprises personal computer. Here instead of wasting power, we adopt a system where these sensor nodes switch automatically to power on and off modes. If two sensor nodes were arranged with short distance between, the slave controllers switch sensors to on and off states, reducing power wastage for being monitoring continuously as two sensors give same information with some variance.

IV EXPERIMENTAL RESULTS

The proposed system is realized using Embedded C and being run KEIL µVision3.The source code of the system design results are captured and presented as snapshots

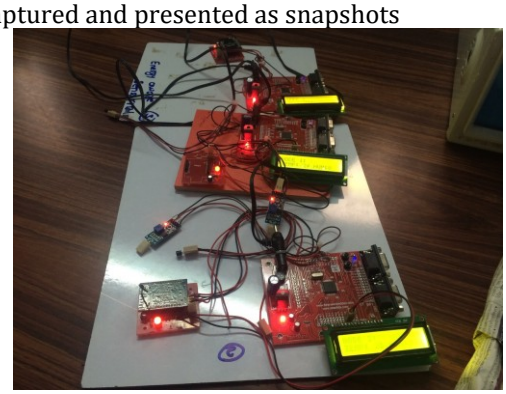

Fig 4 Complete snapshot of the working Module

The performance of network-level power saving is investigated by comparing the power consumption of a fixed network configuration to a compatible network configuration. Implemented by advanced hardware system software and results are shown on the LCD showing results.

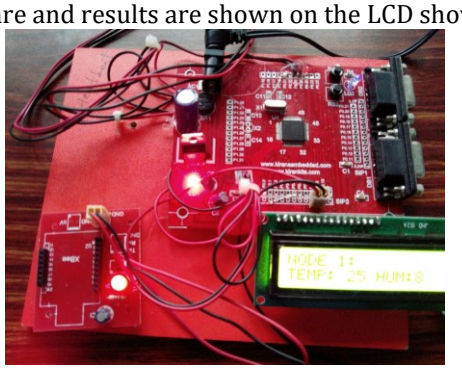

Fig 5 slave 1 is activated

In this experimental examination, we compare the communication power consumption of a fixed transmission power configuration called a traditional scheme as a traditional scheme, which enables scheme 1 to be used on the network with a positive transmission mode. Subsequently, the performance of the periodic sleep / waking scheme was further investigated by comparing the power consumption of a sensor node in many labor models

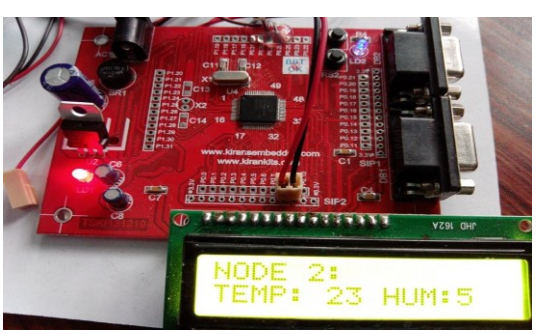

Fig 6 slave 2 is activated

V CONCLUSION

The “Energy Aware Sensor Node Design and its applications in Wireless Sensor Networks" based on ARM is built around the state of art architecture of the ARM7LPC2148 micro controller has showed the desired results without ambiguity. The system has showed the results exactly at the implementation level in the Zigbee coverage area practically. This system can be effectively utilized for the effective management of Energy consumption in various applications. This research paper provides the design and implementation of a fuel-sensitive sensor node, which creates a power-efficient WSN through "node-level energy savings" and "network-level energy savings”. “Node level energy savings" can be achieved through positive transmission power configuration and through a periodic sleep / wake-up scheme, while "network-level energy savings" is achieved through positive network configuration. Experimental tests have confirmed the effect of the schemes for energy savings in the WSN

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Congestion Control at MTP-L3 and STD methodology in Signaling-System-7

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ABSTRACT *The signaling can be defined as the process to exchange information to maintain and provide the call service between the call components. The communication between telephones-switches in public telephone networks with different set of protocols are known as Signaling System Number 7 (SS7). The function of SS7 are call control, maintenance capabilities based on office telephone network and network management remotely. The telephone networks are vulnerable to attacks and congestion occurring in the telecommunication. Therefore, to avoid such problems, " Congestion Control at MTP-L3 (Message Transfer Part-Layer3)" is used for controlling the traffic occurring at the MTP-L3 layer using Transfer Control (TFCs) and transfer restricted mechanism (TFRs). The "Secured Tracking Devices (STD)" is used for secured transmission of voice and data in the telecommunication by identifying the attackers. Hence, the "CC at MTP-L3 STD" methodology provides better results by varying Link carried traffic (E) using different Octets values (600 and 800) and Prior (T) values respectively.*

Keywords: *Congestion Control, Transfer Control, Transfer Restricted Mechanisms, Signaling System Number 7, Secured Tracking Devices.*

1. Introduction

Signal System-7 (SS7) is a set of protocols, which describes a means of communication between telephone switches in public networks. SS7 is highly sophisticated form of common channel signaling (CCS), which is to provide remote network management, call control, and maintenance capabilities for the (inter-office) telephone network [1]. The authentication mechanism is done using mobile and base station to analyze the effectiveness of current authentication mechanism using Global System for Mobile Communication (GSM). The GSM mobile communication is to make mobile phone system secured with proper authentication methodology [2]. The digital cellular mobile network GSM (Global System Mobile) is build into the system to deactivate or break the encryption on the radio link in order to eavesdrop on mobile phone conservation [3]. The PSTN contains more number of switches in which it includes redundant hardware and extensive self-checking and recovery software. The PSTN designers made the coupling-interactions trade-off in favor of loose coupling, in which it allows human operators to intervene in the event of failure than relying entirely on computer control [4]. The security flaws of the GSM network and its transport channels has influenced revolutionized different aspects of the human life. GSM uses radio communications for its mobile subscribers for the persons who are unauthorized users via. different base station [5].

The IP backbone network topology is synthesized based on various qualitative and quantitative criteria for environment. IP network design process and network designs are typically characterized by a trade-off of cost versus performance and availability [6]. Traffic delay is one of the important metrics used for performing network functions. The main function is to examine the optimal range of quanties used for estimating the IP packet variation in the Next generation networks [7]. Telecommunication next generation network NGN is a converged network, which aims to provide a multitude of services over a signal integrated network infrastructure. An optimal method for planning, designing and capacity dimensioning for the next generation network is used for increasing the subscription ratio of the service and guarantee the service of the network [8].

The network of VoIP involves sending voice information in digital from using packet based switching rather than using the traditional protocols of public switched telephone network (PSTN) [9]. The three broad techniques currently being employed in performance analysis of computer networks based on analytical medaling, simulation and measurements. The field of performance analysis of computer networks is highly dynamic and progressive [10].

To overcome various problems in the telecommunication, the "CC at MTP-L3 using TFCs and TFRs and secured tracking device (STD)" methodology to avoid congestion/traffic in network by reducing the

unknown source entering in the telecommunication. The "CC at MTP-L3 STD" methodology performs by varying Link carrier traffic (E) in terms of 600 and 800 octets.

2. Related Works

Jinoo Joung et al. [11] has implemented a flow-admission-control in next generation networks with flow aggregate information exchange for calculating end-to-end delay bounds of flows aggregate. The delay-bound and admission-control scheme are evaluated with simulations in a few realistic scenarios.

Rossouw von et al. [12] had addressed various types of unknowingly participating attacks in cyberspace. The ICT becomes increasingly integral part of the supporting systems interm of information security.

A.A. Obiniyi et al. [13] has presented new innovations in performance analysis of computer networks with a view for intimating network users, administrators and designers with a high level of cooperation with the software-defined networks and the next-generation protocol (Ipv6).

Dr.S.S.Riaz Ahamed [14] has addressed primary function of SS7 is to provide call control, remote network management, and maintenance capabilities for the inter-office telephone exchanges. The SS7 architecture enables communication to take place between entities within the network effectively.

Garima Sharma and Dr. Harish Mittal et al. [15] had presented security on SS7 Signalling Protocol in the mobile networks, which is still long for interoperability and background compatibility in international roaming. The security method were less to handle, if new variety of attacks are added in the network.

The above illustrated papers has some limitations yet to be performed well in telecommunication such as congestion control and security. Thus, "CC at MTP-L3 STD" methodology performance efficiently than the recent related papers.

3. Overview of Signaling System 7 (SS7)

The Signaling System 7 (SS7) is an architecture, which are used in the functions of billing, routing and public switched telephone network (PSTN). The exchange of information is done to maintain and provide the call service between the call components process is known as Signaling. The exchange of network elements by the user of PSTN takes place, when the user dialing the numbers, at dial tone, call waiting tone etc happens. The important medium of exchanging information in the elements of telephone network is SS7. The SS7 network protocol are used in;

a. Advanced features in calling for example., Call forwarding and information of caller.
b. Personal communication services (PCS) and wireless roaming.
c. Conference calling
d. Authentication of mobile subscriber
e. Effective and secured worldwide communication

Signaling Links

The SS-7 messages are exchanged between network elements over 50 or 60 kilobit per second (kbps) in which signaling links are defined as the bidirectional channels. Signaling exist out- of-band on dedicated channels in place of in-band on voice channels. The different types of Signaling Link are described below.,

- SSP (Signal Switching Point) – Telephone switch call and dial are functions
- STP (Signal Transferring Point) – Transfer Routing Messages
- SCP (Signal Control Points) – Control and monitor transmission in the network. It is also called as Intelligent Network.

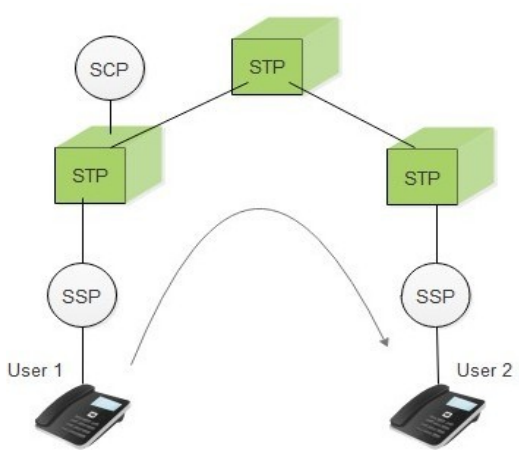

Figure.1. Basic PSTN Network Topology

The Basic PSTN Network topology is given in Figure.1. Each SSP has two links in which messages sent over either link are treated equivalently as a result of the STPs of a mated try area unit unvarying. The SCPs are often displayed in pairs. The SCPs are expected to service evently like SCPs. SCPs don't seem to be directly connected by a try of link.

- **A (access) Link –** "A" link joins a signaling end point to one STP. On link A only messages created from or coming to the signaling end point are channeled.
- **B (bridge) Link** - "B" link joins one STP to another STP. A quad of "B" links joins companion STPs of another network. The contrast between a "B" link and "D" link is rather irrational. Because of which link may be referred to as B/D links.
- **C (Cross) Link -** "C" link joins STPs doing similar functions into a mated pair. The "C' link is used, when link failure occurs and STP has no available route to destination signaling point.
- **D (diagonal) Link -** "D" link joins a secondary like local or regional STP pair to a primary STP in a quad link manner.
- **E (Extended) Link -** "E" link joins a SSP to an equivalent STP. "E" links provide a replacement signaling path if an SSP's "home"
- **F (fully associated) Link** - "F" joins SSPs and SCPs, which are the two signaling end points. "F" links directly joins signaling points in networks without STPs.

SS7 Protocol Suite and OSI Reference Model (RM)

The SS7 protocol stack is aligned with the layer in the OSI RM to provide various function in telecommunication. The important purpose of SS7 network is to convey difficult signaling information between nodes (i.e SS7 nodes) such as telephone exchanges, call control and network management and related to call control. The Figure.2, explains SS7 protocol suite and OSI RF. The three levels of the message transfer part (MTP) collectively provide a highly reliable and resilient connectionless message transport mechanism. SS7 Protocol Suite provide three level of the MTP, which functions are described below.

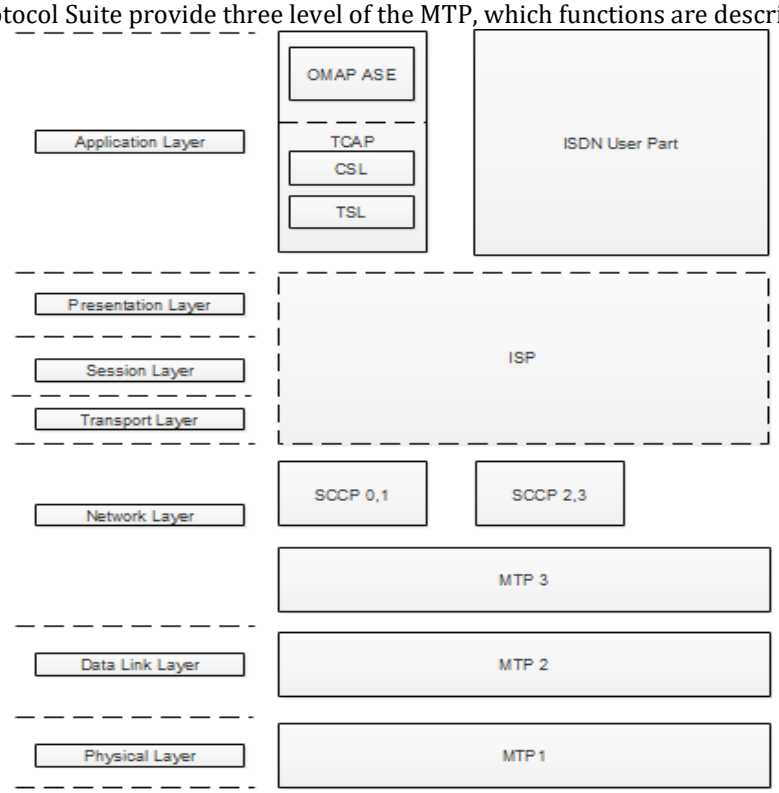

Figure.2. Relation between SS7 and OSI Reference Model

- **MTP Layer-1 –** Defines the physical characteristics of the data links used in the signaling network.**MTP Layer-2 –** Provides the functions and procedures for the reliable transfer of signaling information over a single data link.**MTP Layer-3 –** Elaborate routing and signaling network, which permits in-sequence and non duplicated connectionless message transfer even under adverse conditions like network congestion and failure.

- **SCCP –** Enhances the services provided by the MTP to provide both connectionless and connection oriented modes. SCCP provides management functions, which broadcast the status of its "user" to other nodes in the network by adapting their routing the changing availability of telephone users.
- **TCAP -** Provides application layer formatting and procedure for real-time intensive response type applications. TCAP consists of two sub layers such as component and transaction sub layers. **Component Sub layer (CSL) and Transaction sub layer (TSL)** are modeled after and aligned with the remote operations service protocol.
- **Common Management Information Protocol (CMIP) -** has same services and associated protocol.
- **ISDN User Part (ISDN-UP) –** is a message-oriented applications, which defines for providing call control (call establishing, supervising and releasing voice and data calls over a circuit-switched connections among telephone exchanges, which serves an ISDN).

It is very hard to find out how MTP reacts to congestion thereby constituting a more easily accessible information source than the standards. Hence, below explanation describes, how the congestion takes place in MTP-L3 layers and prevention and detection using Transfer Control (TFCs) and transfer restricted mechanism (TFRs).

4. Congestion Control at MTP-L3 using TFCs and TFRs

MTP-L3 assumes equal sharing of the traffic load among the routes in the route set. When a link in a link set is congested, the whole link-set is considered as congested. Similarly, when a route is congested, the corresponding route is considered as congested.

As of whole, the route set towards the signaling point is considered as congested. MTP-L3 differentiates between congested and failed links. When a link failure and traffic take place the signaling link is re-routed to an alternate link.

Traffic routed to a congested signaling link is placed in the level 2 transmission buffer irrespective of the congestion status of the link. The MSUs are simply discarded, when the transmission buffer becomes full. Figure.3, explains congestion signaling on MTP-L3.

Links D-F and D-E are assumed to have priorities 1 and 2 respectively, which forms routing towards F. A UP at A is communicating with a UP at F, when a link in the link set D-E becomes congested by the way the whole network is considered as congested. Hence, the adjacent STPs B and C suggest not to use D for routing of traffic to F.

However, the B and C omits the path based on the Transfer Restriction (TRs) and transfer to another path. It is slight difficult to continuously monitor the traffic/congestion status of the traffic routeset. The signaling-routeset-congestion-test procedure is used to find out congestion priority, which can be sent on a particular routeset. The signaling-routeset-congestion test procedure is repeated until the congestion status comes to Zero (i.e. until the congestion has ceased).

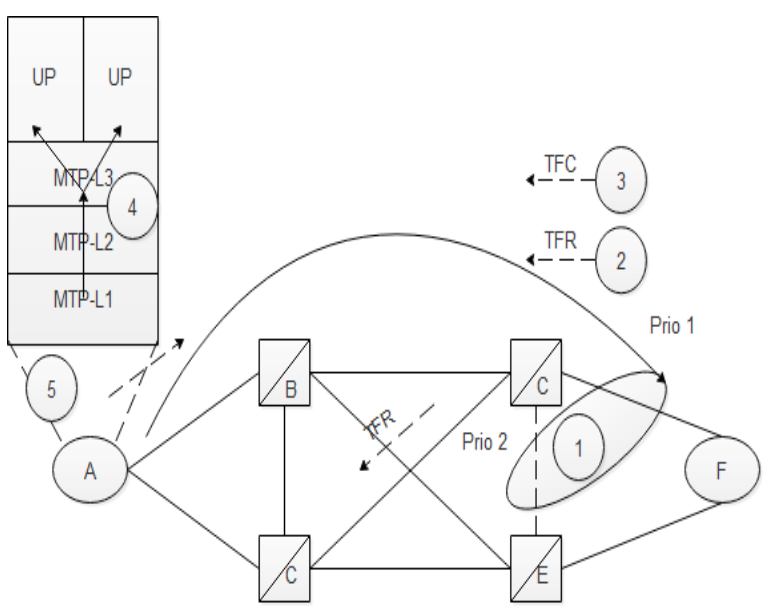

Figure.3. Congestion Signaling on MTP-L3

Hence, the routeset-congestion test procedure is repeated until the congestion reduces using TFRs and TFCs (Controlled and restricted). Therefore, there are many possible new attacks in SS7, which affects the security in telecommunication. To overcome the attacks, below mentioned techniques are developed.

5. Secured Tracking Devices (STD) for avoiding Vulnerabilities

The mobile networks are the most dynamic part of critical communication infrastructure and the key instrument used to perform regular activities varying from voice and text messaging to providing signaling for emergency services and critical infrastructure. The "Secured tracking devices" is an independent location for finding solution for Universal Mobile Telecommunication Service (UMTS).

The secured tracking devices helps in finding capabilities based on the ability to send and handle standard signaling messages via. SS7 network. This device does not require any special hardware or software installation neither in the cellular network in the mobile phone. Hence, tracking devices can track virtually in the world even if the subscriber's mobile phones is not GPS enabled. In telecommunication, subscribers are identified by the international mobile Equipment identity (IMEI). The SMS delivery protocol allows the source network to receive information about the subscriber's location for further routing of the message.

The Figure.4.a and 4.b shows the with and without STD in the telecommunication. When subscriber "A" makes a call, the request along with the number of destination subscriber are sent to the attacker's equipment. Then, attacker can then redirect the call and create a three-way such as., i) Destination Subscriber ii) Calling Subscriber and iii) Attackers. The STD used to track the attacker and send acknowledgment to the Subscriber "A" by sending SMS.

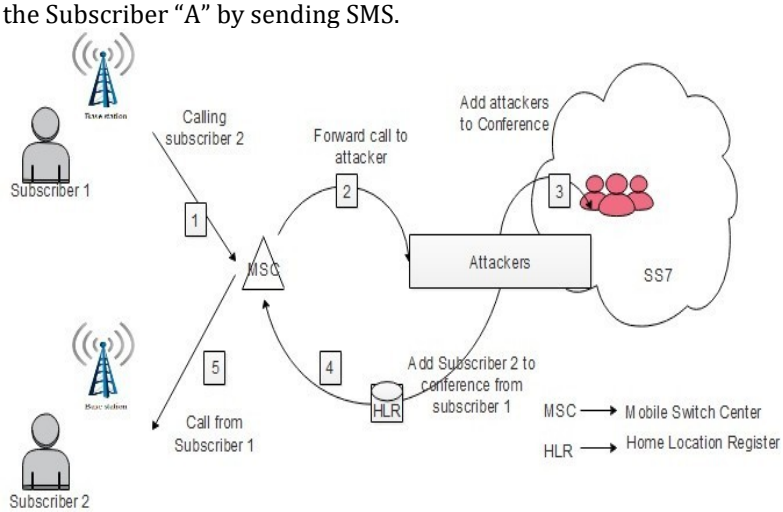

Figure. 4.a. Without STD in SS7 telecommunication

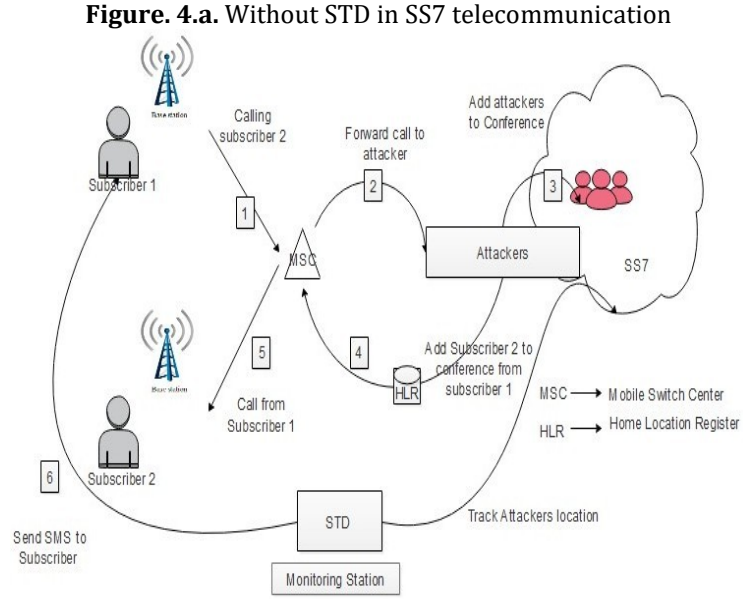

Figure. 4.b. Without STD in SS7 telecommunication

4. Result and Discussion

The "Congestion Control at MTP-L3 and STP" techniques are used for avoiding traffic using TFCs and TFRs techniques. The complete work is done using I7 system with 8 GB RAM. This section gives a detailed view of the results that are obtained using "CC at MTP-L3- STP" method. The following parameters of the two-priority message traffic model are explained to be aggregated into a single virtual priority class. The two-priority message traffic model is taken as Threshold value with 600 Octets and another threshold value with 800 Octets. First the queue control on frequency and time is varied based on the Link carried traffic (E) with two different Octets values such as (600 and 800 Octets).

The Figure 5 and 6, shows the Queue Control on Frequency (/s) and time (s) by varying link carried traffic (E). The threshold effects the frequency of invocation of the MTP-L3 control. As frequency of control invocation increases as the abatement threshold is set closer to the onset threshold, refer Figure. No. 5. The level 2 queue length is maintained at a high level, so that control is invoked less often, but it says on each time for a much longer period, refer Figure.no.6.

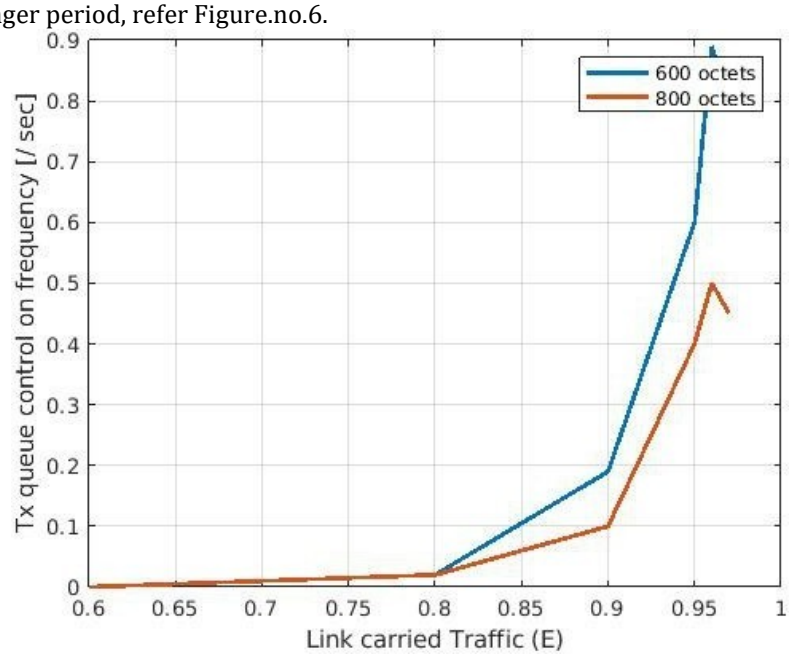

Figure.5. Control on frequency versus load

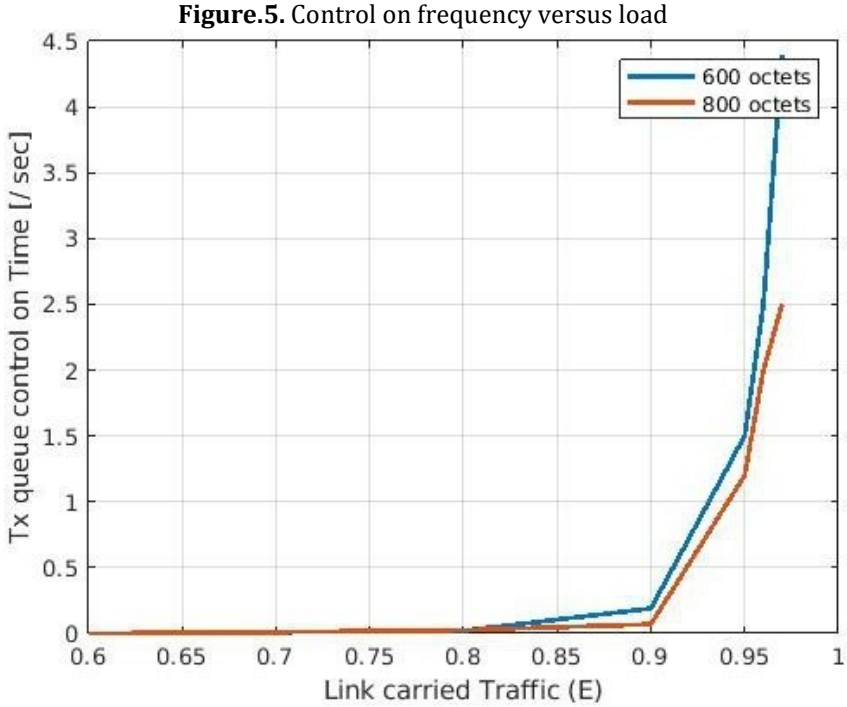

Figure.6. Time versus load-Tx queue control

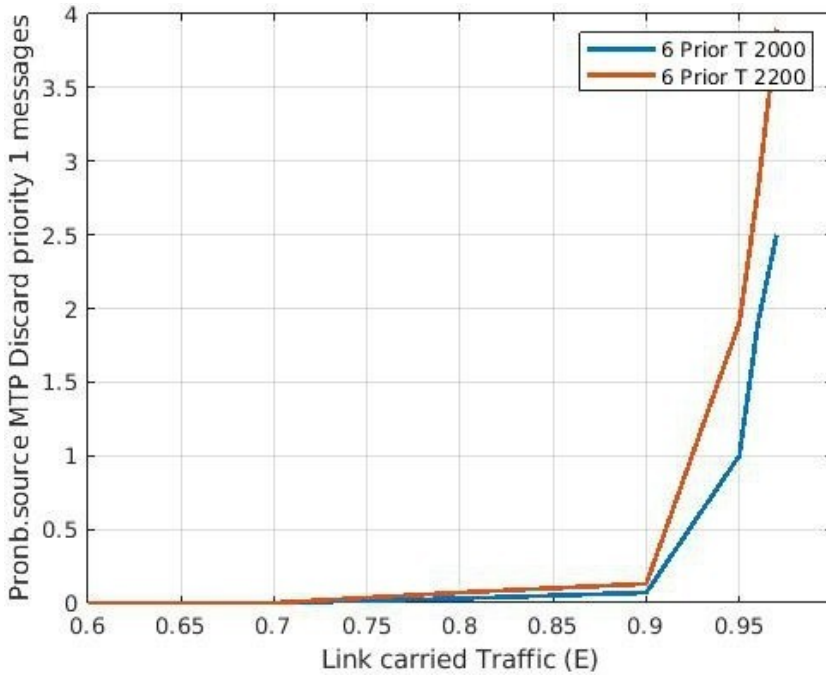

Figure.7. Probability of low-priority message discard versus load

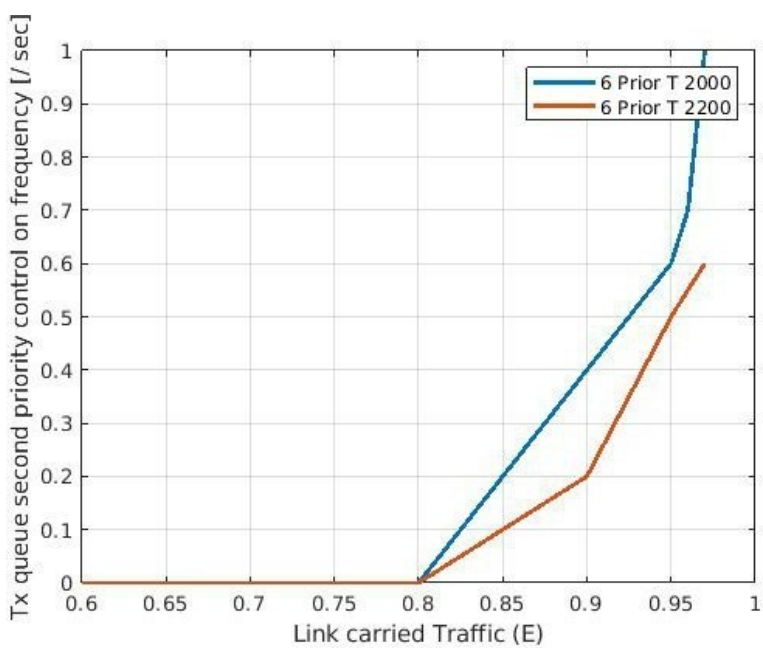

Figure.8. TX queue second threshold control on frequency versus load

From Figure.7 and 8 depicts the impact of discard threshold on the probabilities of low- priority messages being discarded at both the source or at the level 2 queue whose controls are being analyzed. The threshold value is varied based on 2000 and 2200 priority with different link carrier traffic (E).

5. Conclusion

The SS7 network has emerged as a standard, extremely secure, low-delay and reliable infrastructure designed to support voice transport and services over the circuit-switched network. The “CC at MTP-L3 STD” methodology control congestion using Transfer Control (TFCs) and Transfer Restricted Mechanism (TFRs) with 'Secured Transmission Device” for monitoring telephone communication. Hence, variation of

different octets and prior such as 600 and 800, T = 2000 and 2200 respectively gives better results in telecommunication.

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IOT and RF-ID Based E-Passport System

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ABSTRACT *RF-id has been considered as the most efficient and eco-friendly way of identification. It is portable as compared to the passports that are in use presently. Unlike passports that have a barcode which can be easily spoofed, spoofing of an RF id requires skillset of electronics. Use of RF Id makes it easier to scan the passport at airports. It also helps to reduce the labor being employed for scanning of passports. The security of RF ids can be further increased by using iris scanners and biometrics. A passport is a unique identifier that is used all over the world, a cloud server is used to store all the information on a database. The information present in this database is secured and editing of the information on this database is possible only for authorized persons. Through this, one passport can have only one identity and it is impossible for any other person to change the details of the passport.*

Keywords: *Mathematics; Teaching Method; Performance; Students' variables; Teachers' variables.*

Introduction

The present passports in India are designed using paper and plastic which takes a lot of space and is not eco-friendly [1-3]. Replacing RF ids with electronic passports can make the work on the go and easy. Radio frequency identification is one of the most widely used technologies in several domains like health cards, tram passes, car parking etc [1], [4-7]. Several such applications have emerged based on RF Id. A passport is one of the unique identities that have worldwide recognition using an RF id without security can be an issue. To overcome such securities issues, biometrics can be added [8-10]. But this, in turn, increases the labor being employed to monitor and increases labor costs. The best way is to add up the technology of IoT to these E-Passports. These E-passports are already being used in countries like Malaysia, Norway, Japan and several European countries. But several security issues have been encountered during the course of the period [11,12], [15]. Such issues can be prevented by using a secured database. The passport holders will have permission to access the information but cannot edit the information. The authorized employees of government organizations are given a password in order to edit the information present in the database. This can help to increase the security of the E-passport [13-14].

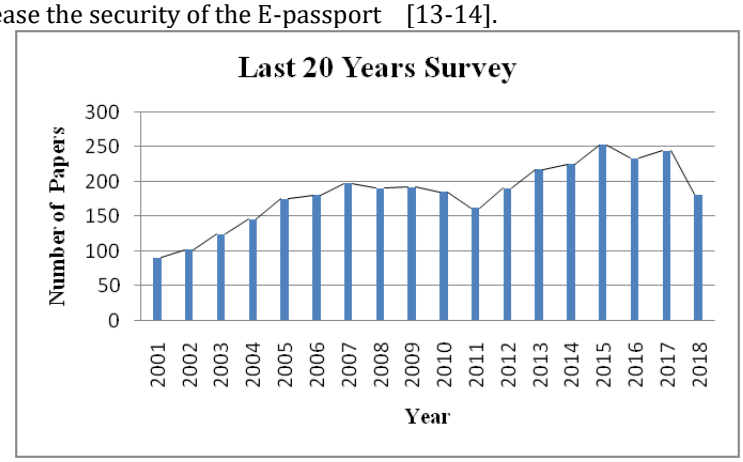


Fig. 1: The Graph showing the number of papers published during 2001 to 2018

According to the last 20 years study based on E-Passport is showing the continuous attraction regarding this research area for all research community as shown in Fig.1. This entire data was taken from the well-known standard website science direct using the keywords i.e. E-Passport System. The number of papers shows the extent to which research is going on in the e-passport technology. Several papers have been published stating several encrypting algorithms and various methods to develop a secure, portable and

mobile e-passport. The IoT technology helps to maintain a logged database of the passport holder and the country it was accessed on so that it would further help in case of any investigations [16-19]. We would like to draw your attention to the fact that it is not possible to modify a paper in any way, once it has been published. This applies to both the printed book and the online version of the publication. Every detail, including the order of the names of the authors, should be checked before the paper is sent to the Volume Editors [20-24].

2. Literature Analysis

Several efforts have been made to make the issue and usage of passports easy. Some of them include using RF ids as an E-Passport that just displays the details on an LCD display. This was the base idea of our project but the concept of IoT still advances and makes the usage of E-passport more secure and efficient. Other forms include passports made from plastic, documented passport and passport by the usage of biometrics. Even though usage of biometrics is safer, several technologies have emerged for spoofing of biometrics of a person. So an electronic passport that contains an RF id with highly secure encoded code can protect the safety of passport. These details can be accessed at any part of the world and the editing of these details can only be done by authorized persons but not the passport holder.

S. Sharma et al. (2016) proposed a new device based on Implementation of cryptography algorithm for E-passport security. The authors describe a method that can be implemented for improved security in e-passports. It describes an algorithm in which data stored in e-passport can be encrypted [2].

S. Kundra et al. (2014) proposed the study of recent technologies used in E-passport system. The authors describe the recent technologies that are being employed in passport industry throughout the world [5].

M. Butt et al. (2013) proposed a new device e-Passport Duplicate Enrollment Check in the European Union. The newly proposed device gives an automatic passport check at airports and borders to reduce the number of workers employed for passport checking [24].

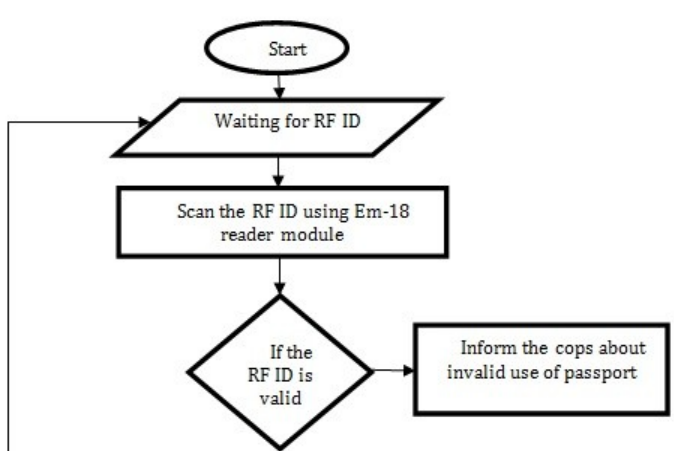
3. Problem Statement

The main problem with the existing passports is that they are delicate and duplicating by means of spoofing is an easy task. This leads to the increased effort for cops to track the thieves. Also, the labor being employed for scanning these passports must be limited. The visa information can be electronically stored within the passport, unlike a stamp that is being used currently. Carrying of passports is also a big issue, the mobility of the passports are to increase by means of technology.

Proposed Methodology

The aim of this project is to access the complete details of the passport holder using RF Transceiver and RF-id passive tags as shown in Fig. 2. EM-18 reader module is the Transceiver being used. The microcontroller used in this project is LPC2148 which consists of the ARM7 processor. When the RF-id is scanned the Em-18 reader module reads the unique serial code stored in the Tag and sends it to the LPC2148 microcontroller using serial communication. RS 232 protocols are followed using a MAX 232 IC and a 9 pin UART1 serial port. The microcontroller then retrieves the passport number which is stored in its flash memory. The name of the passport holder and the country of birth are displayed on a 16*2 LCD display (JHD162A). Then the same passport number is sent to the PC using UART0 and the PC retrieves the complete information of the passport holder like name, last name, address, communication details and a photo of the passport holder from the cloud database.

Flow Chart



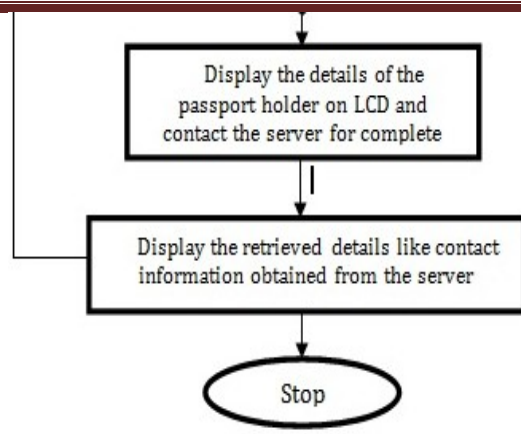


Fig. 2: Shows the flow chart of the working of RF-ID based e-passport

5. Result

When the valid RF ID passports that are in the database are scanned, the passports details of the passport holder are displayed on LCD and PC as shown above. A log of where the passport was scanned, date and time of scanning are recorded using a database log. And if the artificial passports are scanned an error message is immediately displayed and the cops are warned and informed about the place of access. A total of 50 person's passports were tested with this equipment and all were successful. Some of the outputs of this e-passport are displayed below.

Fig. 3(a)

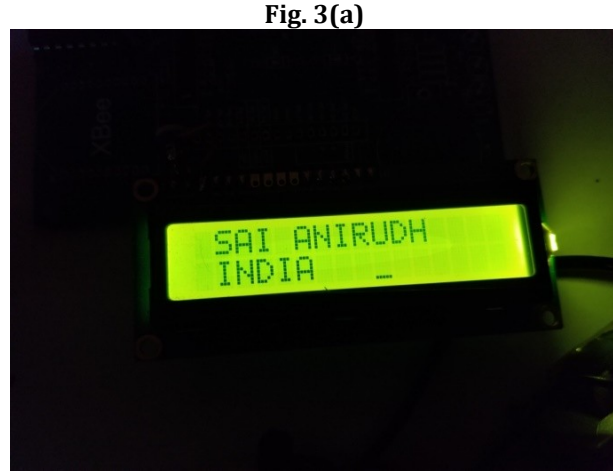


Fig. 3(b)

Fig. 3 (a & b): Shows details of first passport holder on LCD and PC

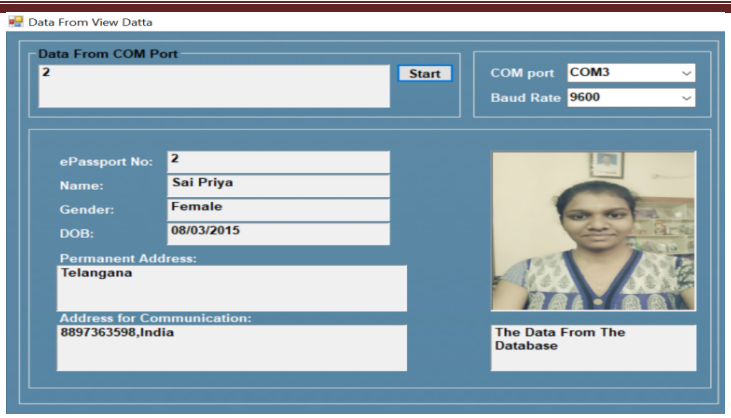


Fig. 4(a)

Fig. 4(b)

Fig. 4 (a & b): Shows details of second passport holder on LCD and PC

Fig. 5(a)

Fig. 5(b)

Fig. 5 (a & b): Shows details of third passport holder on LCD and PC

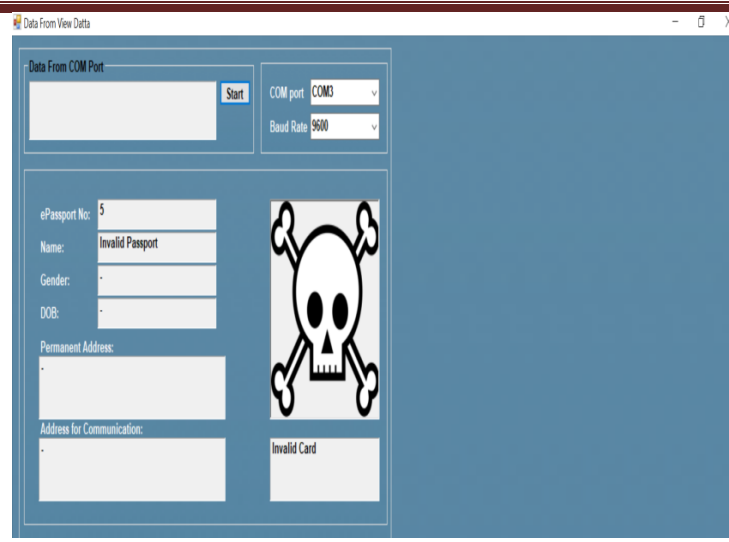


Fig. 6: Shows the output when an invalid passport is scanned

Algorithm: 1

Step-1: Switch on the power supply

Step-2: Check the status of Em-18 with the help of beep sound and green light turning on.

Step-3: Scan an RF-ID passport and check whether the details are being dialed on the LCD**.**

Step-4: Check the details of the passport holder on the E-passport Tool displayed from the database server using PC.

Step-5: Test the correctness of the setup by using an RF id which is not registered in the database.

Overall Algorithm of our project as shown in Algorithm 1 and finally this device gives better information about the passenger whether that passenger is authentic or not as compared to other devices.

Conclusion

The risks of the present passports used can be overcome by using the e-passports and the cost of employment can also be cut down. In addition to these, additional security is a plus point and carrying of the passports also becomes easier. Passports can be user-friendly and any errors in passports can be easily rectified by electronic means. It also reduces the cost of manufacturing and the unique passport number stored in the e-passport can be secured. The security check at the airports and borders can be faster than usual. The probability of culprits escaping with fake passports can be minimized to a maximum extent by using E-passports. The mobility of these passports can be easier as it is one of the internationally recognized identities.

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Assets Management Device using Embedded Based IoT and RF-ID System for Remote Monitoring

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ABSTRACT *The objective of this work is to provide an "off the shelf" assets tracking and management solution that will enable staff to track and manage Virtual Data Memory for Cloud System through an RFID based centralized database information. In a cloud based data center the VDM assets inventory is maintained manually, a staff is walking through the assets and noting the same. Human errors are possible with this type of method and may cause huge loss. Misplace of these assets can also affect the maintenance. An RFID sticker on top of the asset is placed and a hand held RFID readers would enable us to track these objects. The hand held module has a controller, RFID reader and a memory card reader of a Wi-Fi device integrated with controller. The information about the assets are either stored in memory card or updated in google spread sheet on a Gmail account. The information about these assets can be accessed to verify the availability of assets and helps in tracking and monitoring.*

Keywords: *Assets, Cloud data center, Virtual Data Memory (VDM), RFID.*

Introduction

1.1 ASSET TAGGING :

An asset is defined as any physical thing which has high value or is very important and if lost may cause high loss. Examples of such assets include servers, PCs, RAM, hard drives etc. Asset Management is process of managing assets from purchase to disposal, including replenishment and monitoring the movement or placement of the asset inside the building, which is very difficult task for big organizations who have thousands of assets placed in various part of their office. To address this problem, this consultancy project is deliberated [1].

1.2 EXISTING METHODOLOGY:

Manual handling-

In this method assets are handled with a label which has a unique code that needs to be updated in the organizations sheets which is used for tracking the assets location.

Drawbacks for manual handling methodology-

The manual technique is tedious and a very time consuming process. The manual entry of assets in the records which may lead to incorrect inputs that may lead to mishandling of assets. It is also has an impact on the man power which is consumed in this process. In this process whenever there is add or a change in the asset a new id is needed to be generated. Which might go wrong. Changing on labels at a daily process which is again a time consuming process.

Barcode reader (or **barcode scanner**) –

An electronic device that can read and output printed barcodes to a computer. Like a flatbed scanner, it consists of a light source, a lens and a light sensor translating optical impulses into electrical ones. Additionally, nearly all barcode readers contain *decoder* circuitry analyzing the barcode's image data provided by the sensor and sending the barcode's content to the scanner's output port.

Drawbacks of Barcode scanners:

Costly and they Can Breakdown. Just like your computers can breakdown at any given time, your employees can even get sick, barcode scanners can eventually breakdown. It will most likely have a higher risk of breaking down comparing to a high quality scanner.

QR code - the trademark for a type of matrix barcode (or two-dimensional barcode). A barcode is a machine-readable optical label that contains information about the item to which it is attached. A QR code uses four standardized encoding modes (numeric, alphanumeric, byte/binary, and kanji) to efficiently store data; extensions may also be used.

Drawbacks of QR scanning-

The process of QR scanning can prove to be tedious and time-consuming. Mobile users have to take out their phone, launch their reader, scan the code, and wait for it to direct them to the landing page.

Table 1. Comparison of Existing Methodology

Parameters	Manual recording	Bar code	QR code	RFID
Manual interference	High	Moderate	Moderate	Low
Time to complete task	High	Moderate	Moderate	Less
Accuracy	Low	Moderate	Moderate	High
Speed	Slow	Moderate	Moderate	High
Storage	Hard copy	Digital storage	Digital storage	Digital storage
Price	High	Moderate	Moderate	Low

1.3 PROPOSED METHODOLOGY

Asset Tagging using RFID technology – The methodology for automated handling of assets using tagging of assets using RFIDs is proposed. RFID tags which are attached to the assets have a unique 12 digit binary code which is read by the scanning device which is embedded device with an RFID reader which is attached to it [3] and [4]. This 12 bit code represents the location of assets such as data center, hall number and rack number. This information is decoded from the RFID code and the asset information is stored in a memory card and sent to the cloud portal which is custom designed for assets management. The details about the assets uploaded in to the cloud is now monitored and tracked. This unique code now represents location of each asset which can now be easily monitored without having any assistance of manual man power or so.

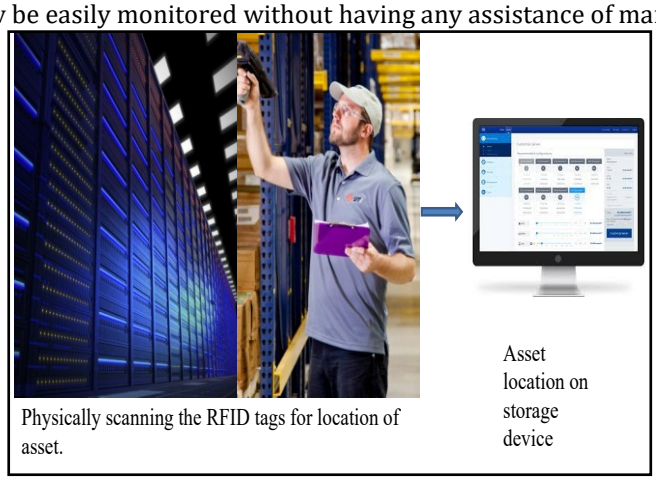

Fig 1 Tagging Assets using RFID

Benefits of Asset RFID Tagging technology – Comparing to the manual and other techniques of handling of assets this can be better possible way of handling of assets as.

1. Human efforts-As everything is automated there isn't any need of appointing a person to handle the work.
2. Accuracy is maintained which helps in reliability of data.
3. Acquiring of data is faster, as it consumes very less time when compared to the other scanning process.
4. Easy to access- Data is easily available and accessed as it reaches the local servers or any secondary storage device.
5. Labor fee eliminated- For the manual process when a specific person was required but in this process which requires very less assisting and data is easily available.

1.4 RECOMMENDATION METHODOLOGY

There are three recommendations are given for implementation of assets tracking and monitoring at CtrlS Datacenter.

- Version 1- Asset Management using Arduino based RFID reader with memory card storage.
- Version 2- Asset Monitoring using NodeMcu and uploading data to Google cloud (spreadsheet).
- Version 3- Design of Autonomous Robot for Geo- Tagging of Assets using RFID.

2. Version 1- Asset Management using Arduino based RFID reader with Memory card storage.

2.1 DESCRIPTION

The objective of the module is to track the asset by reading the RFID card in to Arduino and displays it on the LCD consequently saved in the SD card. As the RFID system used here is of passive type, the information on the RFID Cards is pre-programmed. In order to read that data, the card must be brought in proximity of the reader.

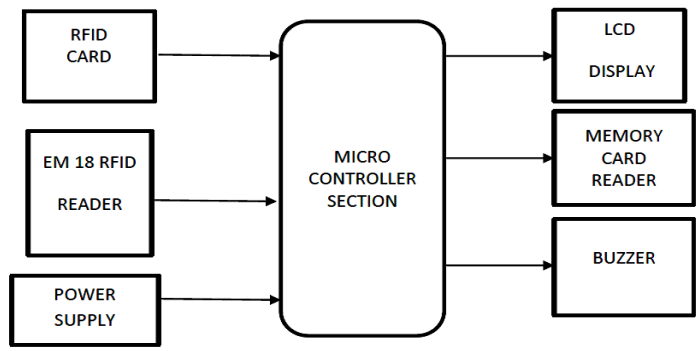

Fig 2. Block Diagram of Version 1 with Memory Card Storage

The RFID reader module continuously emits electromagnetic radiation in the form of radio waves at a frequency of 125 KHz. When a passive RFID card is brought near this field, due to the concept of mutual induction, the electromagnetic field from the reader induces a small current in the antenna coil of the card. The data received by the RFID reader is now transmitted to Arduino UNO using UART communication protocol. Arduino in turn displays this message on the LCD also. The SD card is removed from the board and the information about the assets is viewed in the text file saved in the SD card. Memory card slot section contains a memory card and memory card reader. A memory card of 2GB is used to store the assets information and the RFID reader READ / WRITES the asset information from/to memory card. Buzzer produces a beep sound whenever the

2.2 RFID TAGS:

RFID is abbreviation of Radio Frequency Identification. RFID signifies to tiny electronic gadgets that comprise of a small chip and an antenna[5,6] . This small chip is competent of accumulating approx 2000 bytes of data or information. RFID devices is used as a substitute of bar code or a magnetic strip which is noticed at the back of an ATM card or credit card, it gives a unique identification code to each item. And similar to the magnetic strip or bar code, RFID devices too have to be scanned to get the details (identifying information). A fundamental advantage of RFID gadgets above the other stated devices is that the RFID device is not required to be placed exactly near to the scanner or RFID code reader. As all of us are well aware of the difficulty which store billers face while scanning the bar codes and but obviously the credit cards & ATM cards need to be swiped all though a special card reader. In comparison to it, RFID device can function from few feet away (approx 20 feet for high frequency devices) of the scanner machine. RFID Micro-Chip tags are basically fabricated to function at certain frequencies which are license free.

These are:

- High Frequency (HF) 13.56 MHz
- Microwave 2.45 GHz
- Ultra High Frequency (UHF) 868-930 MHz
- Low Frequency (LF) 125-135 KHz
- Microwave 5.8 GHz

2.2 EM-18 RFID Reader:

The EM-18 RFID Reader module operating at 125kHz is an inexpensive solution for your RFID based application. The Reader module comes with an on-chip antenna and can be powered up with a 5V power supply. Power-up the module and connect the transmit pin of the module to recieve pin of your

microcontroller. Show your card within the reading distance and the card number is thrown at the output. Optionally the module can be configured for also a weigand output.

FEATURES:

- Operating voltage range 3.3V to 5.5V
- Operating frequency 125kHz
- Current Rating < 50mA
- Reading distance 10–15 cm
- Communication parameters 9600bps, 8-N-1
- Supports Tags which work at 125kHz
- TTL serial & Wiegand 26 Interface
- 100% EM-18 RFID reader module compatible (Hardware & Software)

2.3MICRO SD CARD:

This Micro SD Card is used for transferring data to and from a standard SD card. The pin out is directly compatible with Arduino and also can be used with other microcontrollers. It allow us to add mass storage and data logging to our project. **MicroSD** is a type of removable flash memory card used for storing information. The cards are used in mobile phones and other mobile devices. It is the smallest memory card that can be bought; at 15 mm × 11 mm × 1 mm (about the size of a fingernail), it is about a quarter of the size of a normal-sized SD card.[2] There are adapters that make the small microSD able to fit in devices that have slots for standard SD, miniSD,.

2.2 RESULTS:

When swiping the card the EM-18 module scans the corresponding card information and is stored in the memory card. Fig 7 shows the stored information in the SD CARD. The card ID and the corresponding asset number is stored in the file and is displayed.

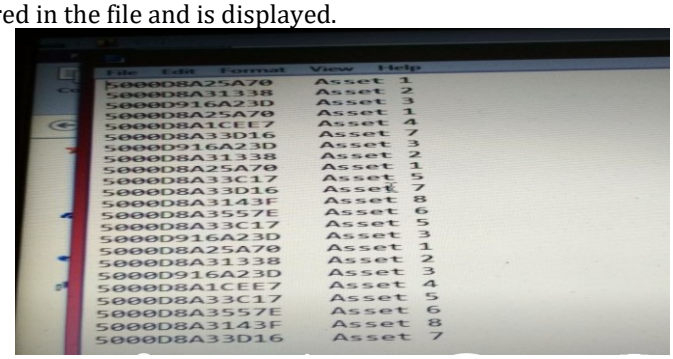

Fig 7 Data Written in to Text File

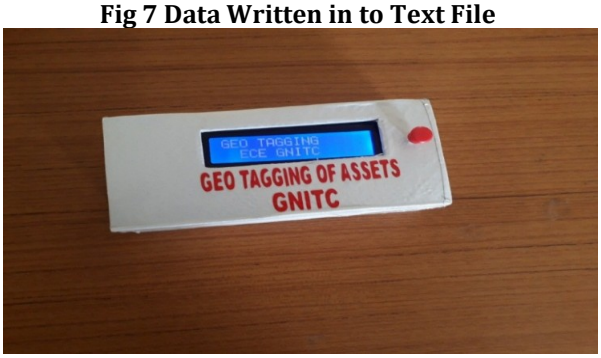

Fig 8 Hand Held Product

Fig 9 Final Product with SD Card Slot

Product Specification

S NO	SPECIFICATION	DETAILS
1	SIZE (L H W)	12.8 x 3.8 2x 5.8 cm
2	Display	LCD
3	Power	5v Battery (Removable)
4	Weight	180 grams
5	Memory	2 GB (SD Card)
6	Speed	16 MHz
7	RFID Sensing distance	(3 – 5) cm
8	Size	7.2 x 5.8 x 3.6 cm

3. Version 2- Asset Management using NodeMCU and Uploading Data to Google Cloud (Spreadsheet).

3.1 Description

This proposed method for automated handling of assets is designed such a way the details of assets is updated in web portal [7]. An embedded device is designed which works with an integrated Wi-Fi which is used for tagging of assets using RFIDs and these are used for knowing the assets location. In this method, the High Frequency RFID tags are attached to the assets, these RFIDs which have a unique 12 digit binary code which is read by the RFID reader [8]. The generated code is a 12 bit unique ID that can be saved send from the device to the cloud in a Google spread sheet on a Gmail account. This unique code now represents location of each asset which can now be easily monitored with less human effort. The time and date of data recording is also updated in the Google spread sheet. .

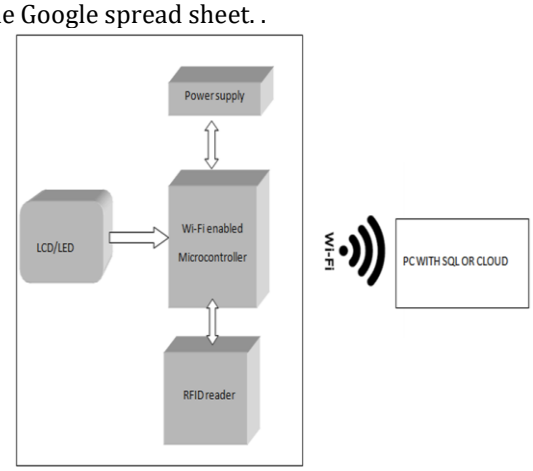

Fig 10 Asset Management using NodeMCU.

It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "**Node MCU**" by default refers to the firmware rather than the development kits.

ESP8266 Features

- 802.11 b/g/n protocol
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLL, regulators, and power management units
- +19.5dBm output power in 802.11b mode
- Integrated temperature sensor
- Supports antenna diversity
- Power down leakage current of < 10uA
- Integrated low power 32-bit CPU could be used as application processor
- SDIO 2.0, SPI, UART
- STBC, 1×1 MIMO, 2×1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4μs guard interval

- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)

3.2 RFID READER RC-522

RC522 - RFID Reader / Writer 13.56MHz with Cards Kit is used in this method which includes a 13.56MHz RF reader cum writer module that uses an RC522 IC and two S50 RFID cards. The MF RC522 is a highly integrated transmission module for contact-less communication at 13.56 MHz. RC522 supports ISO 14443A/MIFARE mode. RC522 - RFID Reader features an outstanding modulation and demodulation algorithm to serve effortless RF communication at 13.56 MHz. The S50 RFID Cards will ease up the process help the 13.56 MHz RF transition to your project. The module uses SPI to communicate with microcontrollers. The open-hardware community already has a lot of projects exploiting the RC522 – RFID Communication, using Arduino.

RC522 - RFID Reader / Writer Features:

- Integrated MF RC522
- 13.56MHz contactless communication card chip.
- Low-voltage, low-cost, small size of the non-contact card chip to read and write.
- Suitable for Smart meters and portable handheld devices.
- 14443A compatible transponder signals.
- ISO14443A frames and error detection.
- Supports rapid CRYPTO1 encryption algorithm, terminology validation MIFARE products.
- MFRC522 support MIFARE series of high-speed non-contact communication, two-way data transmission rate up to 424kbit/s.
- Low cost, and ideal for user equipment development.
- The reader and RF card terminal design meets advanced applications development and production needs.
- Can be directly loaded into the various reader molds, very convenient.

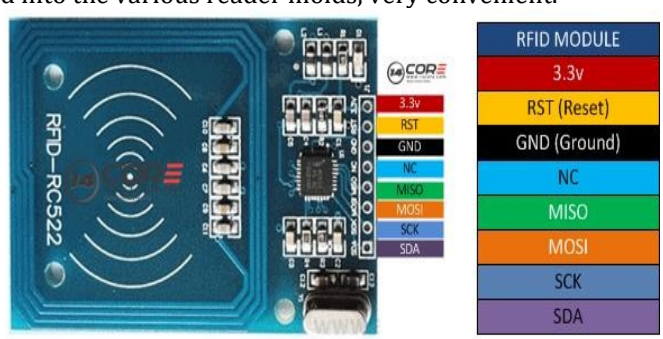

Fig 11. RC522 - RFID Reader

RC522 - RFID Reader / Writer Specifications:

- Operating Current :13-26mA / DC 3.3V
- Idle Current :10-13mA / DC 3.3V
- Sleep Current: < 80uA and Peak Current: < 30mA
- Operating Frequency: 13.56MHz
- Supported card types: mifare1 S50, mifare1 S70 MIFARE Ultralight, mifare Pro, MIFARE DESFire
- Environmental Operating Temperature: -20 - 80 degrees Celsius
- Environmental Storage Temperature: -40 - 85 degrees Celsius
- Relative humidity: relative humidity 5% - 95%
- Reader Distance: ≥ 50mm / 1.95" (mifare 1)
- Module Size: 40mm × 60mm
- Module interface: SPI
- Data transfer rate: Maximum 10Mbit/s

3.4 GOOGLE SPREAD SHEETS

Google Spreadsheets is a Web-based application that allows users to create, update and modify spreadsheets and share the data live online. The Ajax-based program is compatible with Microsoft Excel and CSV (comma-separated values) files. Spreadsheets can also be saved as HTML. Google's product offers typical spreadsheet features, such as the ability to add, delete and sort rows and columns. The application also enables multiple, geographically dispersed users to collaborate on a spreadsheet in real

time and chat through a built-in instant messaging program. Users can upload spreadsheets directly from their computers. A beta version of Google's offering lightweight , lacking the full functionality of a product like Excel. Other Ajax-based spreadsheet applications include ZohoSheet, iRows and numsum.

MODEL SPECIFICATIONS

- MICROCONTROLLER: NODE-MCU V1
  Operating Frequency: 2.4 GHz.
  Operating Current: 13-26mA / DC 5V
- RF – ID : RC522
  Operating Frequency: 13.56MHz.
  Operating Current: 50mA / DC 3.3V
- POWER SOURCE : Li-ion power pack
- DETAILS IN GOOGLE SHEET
  SL-No., Date-Time, Asset ID, Data(if any)

3.5 RESULTS:

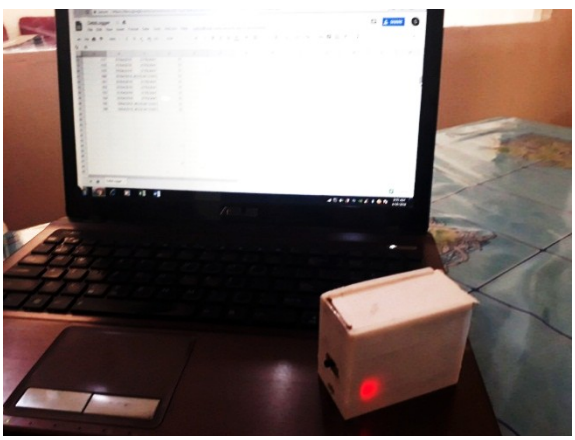

Fig 13. Module 2 Tracking Assets and upload in Google Sheet

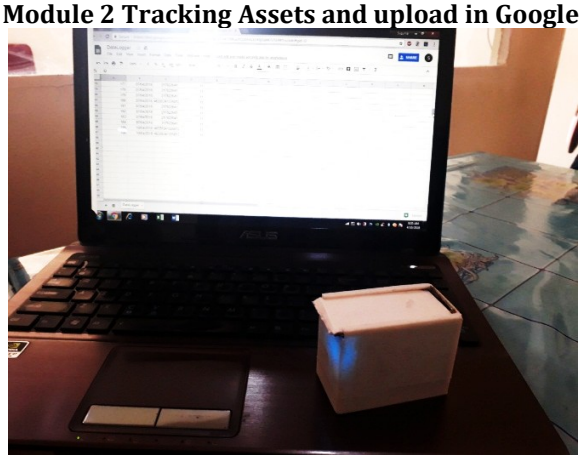

Fig 14. Module 2 Tracking Assets and upload in Google Sheet – Connected to WiFi.

Product Specification

S NO	SPECIFICATION	DETAILS
1	SIZE (L H W)	7.2 x 5.8 x 3.6 cm
2	Display	Not Available
3	Power	3.3v Battery (Rechargeable)
4	Weight	50 grams
5	Memory	Not Available
6	Speed	13.56 MHz
7	RFID Sensing distance	(3 – 5) cm
8	Wi-Fi	MFRC522 (2.4 GHz)

4. Version 3- Design of Autonomous Robot for Geo- Tagging of Assets using RFID

4.1 DESCRIPTION

"Autonomous Robot" is a wheeled electronically operated form of control system which has basically been fabricated to traverse any trajectory on the basis of the program written on the microcontroller [9]. A line follower robot is an autonomous body expected to navigate in a network by following a specific line. The block diagram is shown in Fig 15. The track on which the robot is expected to navigate is coloured black and the background is white. Line follower robot uses LDR sensor which detects the line and sends the information to Arduino and to motor driver the then passed to motor as per shown in Fig 16. The robot travels in its path, a LDR is placed at the side of robot to sense the arrival of a rack which aligns with a LED placed in the rack of assets. Once the LDR senses the LED the robot executes stop to hold the robot. As the robot stops the conveyor belt which carries the RFID reader runs a rotation to make the RFID reader to scan the assets as shown in Fig 17 and 18 . This information about the assets is updated in to the google spread sheet. It helps the user to identify the asset location and it helps to store the misplaced items. It travels on a path which is given by the user and it directs automatically without any instructions, while moving in the path it detects the LDR and it stops the main motors and starts to scan the assets and the scanned asset is uploaded google sheet. This method provides a framework for better managing of assets without any human use. Enhances the transparency of asset management activities and thus assets are managed and accounted with robotic based system.

The module is developed using Arduino board with color sensor with analog to digital converter and light dependent resistor with four dc motors and a battery of 12v. It travels on a path which is given by the user and it directs automatically without any instructions, while moving in the path it detects the LDR and it stops the main motors and starts to scan the assets. The motor driver unit will control the speed and it will run according to our required speed. The speed and power calculations are done as per eqn 1 to 7 [10].

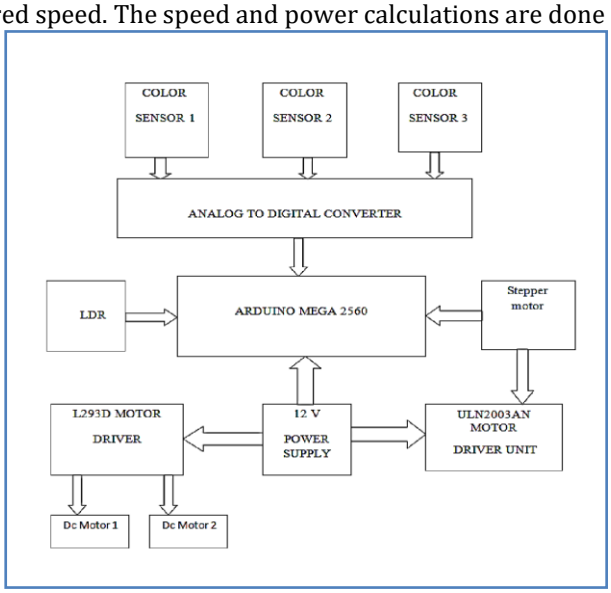

Fig 15. Block Diagram of Robotic System

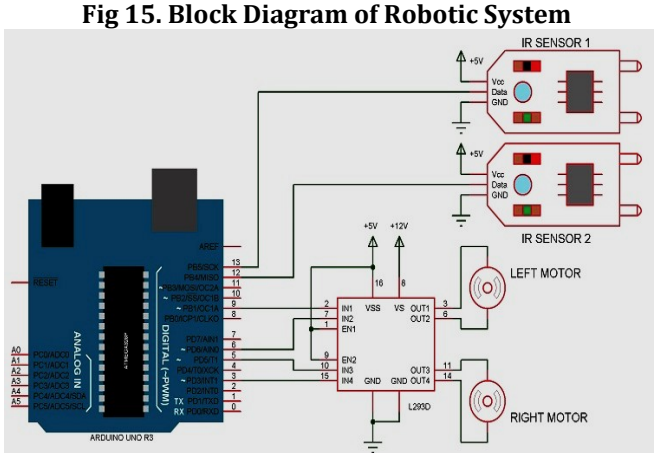

Fig 16. Connection of Motor and Sensors of Robotic System

4.2 Subsystem: Actuators and Sensors.

The prototype described in this work uses DC motors as actuators [6]. In order to estimate the mechanical capacity of these actuators, it is proposed to use the maximum velocity, acceleration, and weight of the system as

$$v = 1\text{m/s}, a=1\text{m/s}^2, m = 1.74\text{ kg}. \quad (1)$$

Based on the mass m and acceleration a, force F is calculated as

$$F = ma = (1.74\text{ kg})\ (1\text{m/s}^2) = 1.74\text{N}. \quad (2)$$

Force, F_{rm} for the right wheel motor and F_{lm} for the left wheel motor. One motor provides half of the total force required, that is,

$$F_{\text{rm}} = F_{\text{lm}} = F/2 = 1.74\text{N}/2 = = 0.87\text{N}. \quad (3)$$

The wheel diameter is 0.07m (r = 0.035 m), the required torque for each motor is

$$\tau_{\text{rm}}=F_{\text{rm}}r=\tau_{\text{lm}}=F_{\text{lm}}r= (0.87\text{N})\ (0.035\text{m}) = 0.03045\text{Nm}, \quad (4)$$

Since $v = \omega_{\text{w}}r$, the angular velocity is related to each wheel and it is determined by

$$\omega_{\text{w}} = v/r = 1\text{m/s}/0.035\text{m} \approx 28.5714\text{ rad/s} \approx 272.8282\text{ rpm}. \quad (5)$$

Hence, the power required, P_{w}, is calculated as follows:

$$P_{\text{w}} = \tau_{\text{rm}}\omega_{\text{w}} = (0.03045\text{Nm})\ (28.5714\text{ rad/s}) \approx 0.869\text{W}. \quad (6)$$

So that the motors selected are *GNM3150* (24V, 55W) and the desired velocity ωd between 65% and 90% of the no-load motor velocity (i.e., 3526 rpm), and thus

$$2291.9\text{ rpm} < \omega_d < 3173.4\text{ rpm}. \quad (7)$$

The power for the motors is supplied with two YUASA batteries 12V@12Ah.

4.3 Results.

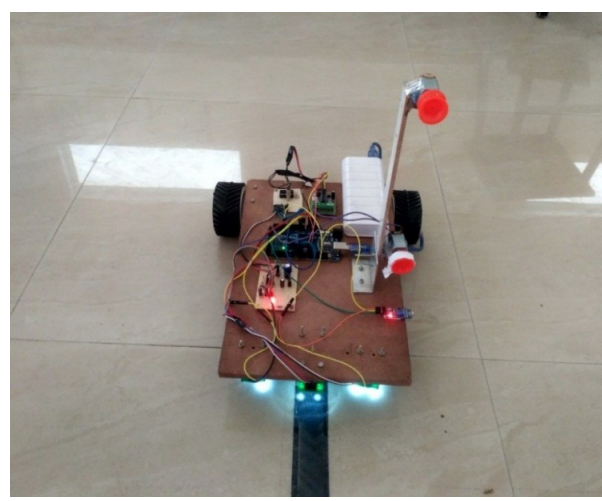

Fig 17. Robotic System Moves on Black Line

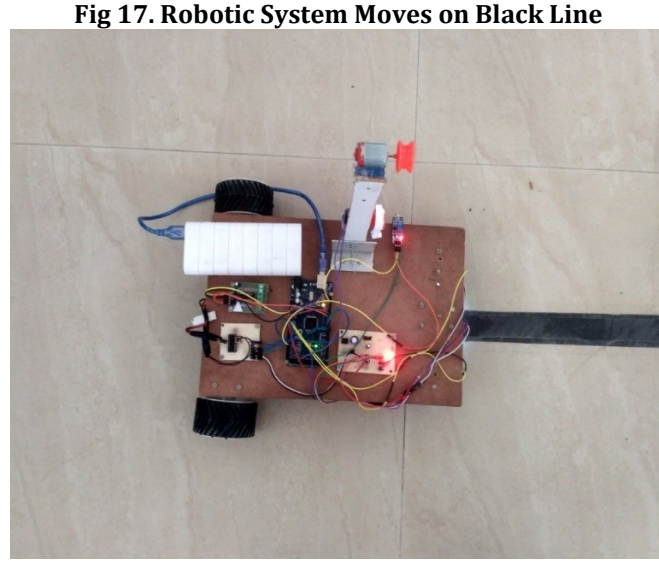

Fig 18. Robotic System Moves on Black Line

5. CONCLUSION

The whole project was designed to overcome the problem of asset management and following conclusion can be made:

1. The entire project was planned to reduce the need of skilled asset managing staff, expense involved in asset managing, size and space of the existing system and to help the authorities to monitor and trace their assets remotely.
2. The system is inexpensive, security is ensured, more efficient and can be monitored remotely with much human interference.
3. RFID in Asset management speeds up and add new features to all the processes involved in asset management like recording asset details, finding asset location, finding the status of asset such as asset is in use or is in store room and also helps the authorities to know when to replace an asset, monitoring of asset remotely, visualization and manipulation data.
4. Performance of a system depends upon the data on the tag, effectiveness of RFID reader position, tag position, Internet speed and speed of uploading data in to cloud.
5. Developments in RFID technology and Cloud storing computing continue to earn larger memory capacities, wider reading ranges, faster processing, more tools for data visualization and data monitoring system. Assets are now more comfortably traceable, improved utilization of resources like manpower, framework, infrastructure etc.
6. Less time consumed, minimized manual intervention, minimized manual errors, and fast access to assets are the major advantages after implementation.
7. The whole project can be customized based on user requirement which makes the whole task and system of asset management more user friendly, easy to use and more economical solution for automated asset management system which are present in market.

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NEARBY OPTIMIZATION STRATEGY AND AN EXTRA CHANGE LEVEL FOR SOLVING TRAVELING BUSINESS PERSONS PROBLEM

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ABSTRACT *The Traveling sales representative issue (TSP) is ended up being NP-finished as a rule. The hereditary calculation, Genetic Algorithm (GA) is one of the standout amongst all the other most helpful calculations for caring of this issue. In this paper, a customary GA is contrasted and an enhanced crossover GA in settling TSP. The enhanced or cross breed GA comprise of ordinary GA and two neighborhood streamlining systems. The principal methodology is separating all successive bunches including four urban communities of tests and changing two focal urban communities each other. Second nearby enhancement system is like an additional transformation procedure. In this progression with a low likelihood a test is chosen. In this specimen two irregular urban communities are characterized and the way between these urban communities is turned around. The calculation demonstrates that proposed technique likewise discovers preferred ways over the regular GA inside an adequate calculation time.*

Keywords: *Genetic algorithm, Travelling salesman problem, NP-complete, complexity, and mutation.*

1.Introduction

The GA maps an arrangement of individual items or components, each with a predefined esteem, into another set of the populace [1]. This calculation endeavors to discover a roughly decent answer for the framework by hereditarily reproducing the arrangement of people over a progression of cycles [2, 3]. The GA calculation begins by picking an arbitrary set characterized as starting populace of people (an arrangement of arrangements) and goes before them generationally [4]. Amid every age, people with high wellness esteem in the present populace are chosen to be a piece of the populace shaped in the cutting edge [5, 6]. By and large, the calculation stops after a settled number of ages or, then again when a satisfactory wellness level has been gone after the last populace [7]. The point of voyaging businessperson issue (TSP) is to locate the most brief visit that passed every city once and precisely once in a known guide with various separations between urban areas. TSP has been broadly contemplated in the fields of manmade brainpower, diagram hypothesis, arithmetic and software engineering because of its applications in certifiable [14, 15]. Be that as it may, there are no polynomial calculations for the NP Complete issues [16]. Correct, estimated and extremely insightful techniques are broadly intended for TSP. The correct strategies sit idle and memory and generally are inaccessible so neighborhood seek rules are utilized to discover an around clever response. This nearby look rules are effective and ready to locate the most brief or semi briefest way in a polynomial calculation time. The nearby inquiry rules, for example, the area data [17], might be trap into the neighborhood minima and don't locate a smart response. Along these lines, the nature of the arrangements can't be assessed because of its irregular nature and the absence of reply. The wise calculations for example, GA are different techniques for tackling TSP. They locate the best or inexact arrangements in view of the transformative standards that vary from the neighborhood seek rules. Meanwhile systematic and some of other shrewd techniques can be joined with GA for improving its execution. The hereditary calculation is enhanced by [18] with the support transformation which depends on the support learning. The hereditary calculation, firefly technique, reenacted toughening, insect province, honey bee and molecule swarm enhancement are some of savvy techniques that can be joined with GA for fathoming TSP [19]. The hindrance of GA based techniques is trap into the nearby minima. Basic or customary change can't right this issue, consequently GA most limited way is typically has so greater than the best way. In this paper two neighborhood improvement procedures endeavor to enhance GA exactness.

The article is sorted out as takes after. In area 2 GA calculation stages including hybrid and change administrator contemplated in TSP. Two neighborhood improvement systems are depicted with points of interest.

2.The Genetic Algorithm

For unraveling the TSP with a hereditary calculation, we require a coding, a hybrid technique, and a transformation technique. As a matter of first importance, calculation ought to produce a change of whole number numbers that each number alludes to the i^{th} city in the visit. In this stage each number may just happen precisely once and have a place with interim [1 k], else we don't have a total visit. The regular GA one-point hybrid technique isn't wrong to do this and some other hybrid strategies good with TSP recommended.

2.1. Crossover

2.1.1. Partially Mapped Crossover

In part mapped hybrid (PMX) tries to keep Childs as comparative as guardians. To accomplish this objective, a substring is swapped look like two-point hybrid and the qualities in all other non-conflicting circumstances are kept. The clashing positions are changed with the qualities which swapped to different positions.

An example:

p1 = (1 2 3 4 5 6 7 8 9)

p2 = (4 5 2 1 8 7 6 9 3)

For swapping, we have assumed that positions 4–7 are selected. If the conflicting position is omitted, the two offspring's are given below

o1 = (* 2 3 | 1 8 7 6 | * 9)

o2 = (* * 2 | 4 5 6 7 | 9 3)

Now take conflicting positions and fill what was swapped to the other offspring. For the instance, 1 & 4 were swapped. Therefore, replace the first position 1 o1 by 4, & so on:

o1 = (4 2 3 1 8 7 6 5 9) o2 = (1 8 2 4 5 6 7 9 3)

2.1.2. Order Crossover

Request hybrid (OX) depends on this rule the request of urban communities is vital in think about with its positions in the visit. Like PMX, OX swaps two adjusted substrings. The rest of the substrings calculations are finished with the accompanying way that contrasts from PMX way. So as to delineate the OX technique, think about the above illustration (p1, p2) concerning PMX. Basically swapping two substrings and overlooking every other position, the outcome is:

o1 = (* * * | 1 8 7 6 | * *)

o2 = (* * * | 4 5 6 7 | * *)

For computing the open positions of o2, write down the position in p1, but starting from the position after second crossover site:

9 3 4 5 2 1 8 7 6

The shortened result is obtained by discarding the values remain in the offspring after swapping (4, 5, 6, and 7), which is:

9 3 2 1 8

Now this list is inserted into o2 by OX, starting after second crossover position. Then the updated o2 is:

o2 = (2 1 8 4 5 6 7 9 3).

The following results are obtained by repeating the process to o1

o1 = (3 4 5 1 8 7 6 9 2)

2.1.3. Cycle Crossover

OX and PMX for the most of the part present urban areas outside the hybrid destinations, which is not available in either parent. For instance, for example, the 3 in the principal position of o1 in the OX illustration seems neither in p1 nor in p2. Cycle hybrid (CX) tries to defeat this issue and ensure that each string position in any visit has a place with one of the two guardians. Let us proceed with the accompanying case:

p1 = (1 2 3 4 5 6 7 8 9)

and p2 = (4 1 2 8 7 6 9 3 5)

CX starts from the first position of o1:

o1 = (1 * * * * * * * *)

and o2 = (* * * * * * * * *)

o2 may have a 4 only in first position, because the method does not want any new values introduced there: Hence

o1 = (1 * * * * * * * *)

and o2 = (4 * * * * * * * *)

Since a 4 is fixed for the o2 first position and to guarantee that no new positions for the 4 are introduced, CX keeps it in the same position for o1. In addition, we have to keep the 8, in the fourth position of o2 for the same mentioned reason:

o1 = (1 * * 4 * * * * *)
o2 = (4 * * 8 * * * * *)

This process is repeated for all the cities until end up in a value which has been considered earlier to complete a cycle:

o1 = (1 2 3 4 * * * 8 *)
o2 = (4 1 2 8 * * * 3 *)

For the second cycle, CX start with any value from p2 & insert into o1:

o1 = (1 2 3 4 7 * * 8 *)
o2 = (4 1 2 8 5 * * 3 *)

After same computations, the obtained result is as follows:

o1 = (1 2 3 4 7 * 9 8 5)
o2 = (4 1 2 8 5 * 7 3 9)

The last cycle is the simple replication & the final offspring's are as follows:

o1 = (1 2 3 4 7 6 9 8 5)
o2 = (4 1 2 8 5 6 7 3 9)

2.2 Mutation

Dissimilar to the choice and hybrid, in all GA variations like genuine living, the change likelihood is set into a little esteem [8]. On the off chance that the change likelihood is set into a vast esteem, the GA is infrequently met and on the off chance that it is set into a little esteem, the GA will effortlessly trap into neighborhood optima [8]. In this paper, we allocate p_m equivalent to 0.05. In the proposed transformation process an arbitrary number allocate to every city of a tyke. In the event that this number is lower than p_m, the relating city is changed with the second characterized city that has an irregular number lower than pm. On the off chance that the quantity of urban areas lowers than p_m in a youngster was odd, the remainder of them is disposed of. In this procedure the changed urban communities is swapped each of the other in a consecutive request. This strategy guarantee that no copy happen in tests.

3. Local optimization strategies

3.1. First local optimization strategy

The principal neighborhood streamlining technique is extricating every single successive gathering including four urban areas of tests and changing two focal urban areas with each other. The name of this procedure is four vertices & three lines imbalance, which is connected to all examples and the most brief way in each test, is chosen. In light of just two changes in each example in examination with primary test, it isn't important to register all separations in each procedure. As a heuristic just the three separations of the chose gathering ought to be figured. In the event that this number is lower than starting gathering, the primary example is recreate with this new game plan and if this number is higher than starting gathering, calculation check the following gathering. For a visit including N urban communities we have N-3 gathering with four urban areas and just three calculations is expected to contrast sub tests and each other. This implies the computational weight of this progression is adequate and can be disposed of altogether calculation time.

3.2. Second local optimization strategy

In the perfect circumstance calculation should concentrate and contrast every single consecutive gathering incorporating 4 with N-3 urban areas in each example and checking all mixes of them with each other. In an expansive matrix this implies a shocking run time. To diminish this many-sided quality, we proposed another change plot as second nearby advancement methodology. In the proposed technique an arbitrary number is doled out to each specimen. In the event that this number is lower than pm2, that is chosen 0.02 in this paper, the test was chosen for this level of streamlining. In the wake of choosing an example, two number irregular number in the vicinity of 2 and N-1 are created (N is the quantity of urban areas) and all urban areas between these numbers will be turned around. In the event that this new specimen visit is lower than starting gathering, the principle test is reproduced with this new game plan and if this number is higher than starting gathering, calculation disposes of it. In reproduction process, we can oversee run time and precision with the pm2 esteem.

The pseudo code - proposed method

- Choose initial paths
- Evaluate the each of the path's length
- Determine the average length of the path's
- Repeat
  - To reproduce, select the best-ranking paths
  - Randomly mute the pairs
  - Apply crossover operator
  - Apply level 1 mutation operator
  - Apply level 2 mutation operator
  - Evaluate the each of the path's length
  - Determine path's average lengths
- Until terminating condition
  (E.g. until at least one path has the desired length or enough generations have passed)

4. Simulation result

The main parameters of the GA set as follows: Initial samples are created randomly in search space. The number of initial samples is set to 256. Only N/2 samples with lower tour distance are chosen and other samples are discarded (Ideal selection). We used partially mapped crossover that described in 2.1.1. The mutation process is similar to 2.2 and pm is set to 0.05. In the second local strategy the value of pm2 is equal to 0.02. Ftv170 as a standard complicated database is selected from TSPLIB for testing the proposed method and we will compare its efficiency with traditional GA methods. The main parameters for comparing two methods are runtime and answer accuracy. Based on random nature of the total process, we run the two algorithms in 30 times and the average results are shown as final results.

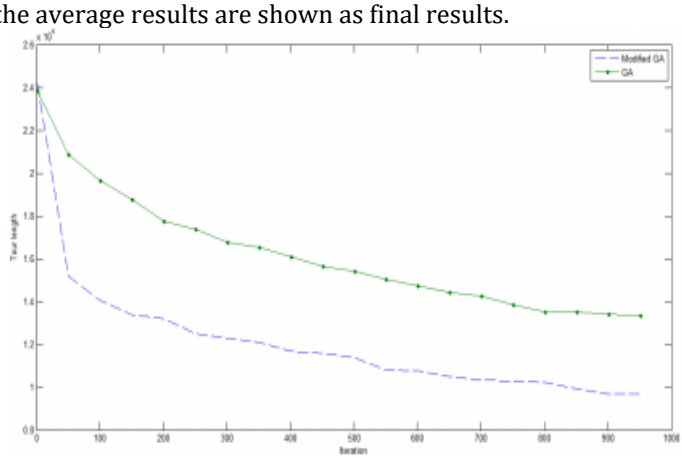

Fig. 1: The tour length vs. iteration number in proposed method and conventional GA

Figure 1 shows this result for two algorithms. The modified method tour length is about 31% lower than the conventional GA and that shows the algorithm improvement. The proposed method average runtime in 1000 iterations and 30 times run, in Core i5 processor with RAM size of 4GB is about 140.5 seconds thatin compared with 70.4 seconds of conventional Genetic Algorithm (GA). This is about two times higher. Notice that the total run time is negligible and thus the time is not a critical parameter in this comparison.

5. Conclusion

In this paper, an enhanced cross breed GA strategy is utilized for explaining TSP. The proposed technique comprises of regular GA and two nearby improvement systems. The main nearby advancement procedure is extricating every single successive gathering including four urban areas of tests and two focal urban areas changing with each other and is connected to all examples and the briefest way in each specimen is chosen. The second nearby improvement technique is like an additional change procedure. In this venture with a low likelihood a specimen is chosen. In this specimen two irregular urban areas are characterized what's more, the way between these urban areas is turned around. The calculation demonstrated that the proposed technique additionally locate the preferred ways over the customary GA inside an adequate calculation time. Later on we intend to utilize other meta-heuristic calculations rather than GA and apply our techniques.

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LOW POWER APPROXIMATE MULTIPLIER AND ADVANTAGES OF IMAGE IN SIGNAL PROCESSING

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ABSTRACT *Modern Digital signal processing and image processing applications are aiming towards energy efficiency. The prime arithmetic operation performed for these processes is multiplication. Hence energy efficiency of multiplication is critical. Since many digital applications use fixed- point arithmetic, it exhibits computational error tolerance. In this brief, a multiplier is proposed that can trade-off computational accuracy with energy consumption. Segmenting the original operands with significant bits and performing the multiplication only for those segments is the main principle. The proposed method of approximate multiplier consumes lesser power and hence notably lesser energy with average computational error of ~1%, when compared to the existing approximate multipliers with similar principle. Further optimization of the proposed multiplier is also done which improves the average computational accuracy along with a considerable reduction in the area consumed by the proposed multiplier.*

Keywords:

I.INTRODUCTION

The theme for modern VLSI design and Embedded Systems research is Green Technology, which explores the ability of VLSI and embedded circuits and systems to positively impact the environment. Demand for developing energy-efficient VLSI architectures, designing intelligent monitoring and control systems using integrated circuits or embedded systems to leverage novel green technologies.

To improve energy efficiency of such computing devices, many efforts have already been suggested at various levels, from software to architecture, and all the way down to circuit and technology levels. Embedded and mobile computing devices are frequently required to execute some key digital signal processing (DSP) and classification applications. Further improvement energy efficiency for executing such applications can be achieved by, dedicated specialized processors often integrated in computing devices. It has been reported that the use of such specialized processors can improve energy efficiency by 10 100 times compared with general-purpose processors at the same voltage and technology generation [1].Second, many DSP and classification applications heavily rely on complex probabilistic mathematical models and are designed to process information that typically contains noise. Thus, for some computational error, they exhibit only slight degradation in overall DSP quality and classification accuracy instead of a severe failure.Finally, these algorithms are initially designed and trained with floating-point (FP) arithmetic, but they are often converted to fixed point arithmetic due to the area and power cost of supporting FP units in embedded computing devices. Even though this conversion process leads to some loss of computational accuracy, it does not highly affect the quality of DSP and the accuracy of classification applications due to computational error tolerance.

The multipliers play a significant role in arithmetic operations in DSP applications [10]. Multiplication is a hardware intense operation, and the main areas of interest are higher speed, lower cost, and less VLSI area. Two significant yet often conflicting design criteria are power consumption and propagation delay. Considering these constraints, the development of low power multiplier is of great interest. Many research efforts in the design of multiplier have been introduced to obtain energy efficiency in VLSI circuits [3].

The rest of this thesis is organized as follows. Section II details the emergence of various approximate multiplication techniques. Section III gives a detailed description about the proposed approximate multiplication technique. Section IV analyzes simulation and implementation results. Finally, Section V concludes the thesis.

APPROXIMATE COMPUTATION TECHNIQUES

Approximate computing is an emerging design paradigm that enables highly efficient hardware and software implementations by exploiting the inherent resilience of applications to in-exactness in their computations. Several previous efforts have explored approximate computing in software and hardware with promising results. Software techniques typically improve performance by skipping computations or

reducing the use of costly operations such as inter-thread synchronization, whereas hardware techniques modify the design at various levels of abstraction to introduce tradeoffs between output quality and efficiency. These efforts have established the significant potential of approximate computing. To evaluate the quality of a particular n-bit approximate arithmetic circuit, several error criteria can be used such as Error magnitude, Relative error, Average error magnitude and Error probability (error rate) [2].

Approximate circuits have been considered for error-tolerant applications that can tolerate some loss of accuracy with improved performance and energy efficiency. Applications including recognition, multimedia and data mining are inherently error-tolerant and do not require a perfect accuracy in computation. For such applications, approximate circuits may play an important role as an effective alternative for reducing power, area and delay in digital systems that can tolerate some loss of accuracy, thereby achieving better performance in energy efficiency. Such exhibit the interesting from both extrinsic and intrinsic sources. These algorithms [4] are designed to process large amounts of input data that has significant redundancy and may frequently contain significant imperfections or noise. The algorithms typically use iterative, successive refinement techniques, which imparts them with a self-healing nature since subsequent iterations may correct errors introduced in previous iterations.

To improve energy efficiency of multipliers, previous studies have explored various techniques exploiting computational error tolerance. They can be classified into three categories: Aggressive voltage scaling; Truncation of bit-width; Use of inaccurate building blocks. In [9], a new systematic approach based on the concept of scalable effort hardware, for the design of efficient hardware implementations for algorithms that demonstrate inherent error resilience was presented. The efficiency of digital multiplication can be improved tremendously by truncation methods provided precise outputs are not required for the operation. In the paper [8], a new multiplexer based truncation scheme with lower average and mean square errors than existing truncation methods was proposed. In [7], with a mean error of 1.39% 3.35% and power savings between 30% 50%, the under designed multiplier architecture presented allows for trading of accuracy for power. In the paper [6], we have proposed a framework for designing a low power multiplier using energy efficient full adder. In the paper [5], recent progress on approximate computing is reviewed, with a focus on approximate circuit design, pertinent error metrics, and algorithm-level techniques.

PROPOSED APPROXIMATE MULTIPLICATION TECHNIQUE

Segment Based Multiplication

Energy efficiency of multiplication is a critical objective. Since many digital applications use fixed- point arithmetic, it exhibits tolerance for computational errors. In this project, a multiplier is proposed that can tradeoff computational accuracy with energy consumption.

Segmenting the original operands with significant bits and performing the multiplication only for those segments is the main principle". The proposed technique performs approximate multiplication exploiting significant segments of operands unlike the existing techniques such as aggressive voltage scaling; truncation of bit-width and use of inaccurate building blocks for approximate multiplication.

The general procedure for the segmentation based multiplication is given below: If two n- bit operands are to be multiplied then the general procedure for multiplication through the method of segmentation is given below:

- Given two n-bit (say 16 bit) operands
- Select m-bit (say 8-bit) segment from each n- bit operand
- This Segment must contain the leading one bit
- Multiply these two m-bit segments
- Expand the 2m-bit product to 2n-bit product

Methods

Based on the way in which a segment is selected from the operand, three methods are followed:

Dynamic Segment Method (DSM) Static Segment Method (SSM)

Enhanced Static Segment Method (ESSM)

DSM is an earlier existing segmentation method. The proposed technique of approximate multiplication includes SSM and ESSM. The complete description about each method is given below in detail.

Dynamic Segment Method (DSM)

In order to motivate and describe the proposed multiplier [1], we define an m-bit segment as m contiguous bits starting with the leading one in an n-bit positive operand. We dub this method dynamic segment method (DSM) in contrast to static segment method (SSM) that will be discussed later in this section. With

two m-bit segments from two n-bit operands, we can perform a multiplication using an m ×m multiplier. In this method, we can achieve 99.4% accuracy for a 16 × 16 multiplication even with an 8 × 8 multiplier. This method can capture m-bit segments starting from the exact leading one bit position as shown in Figure 1

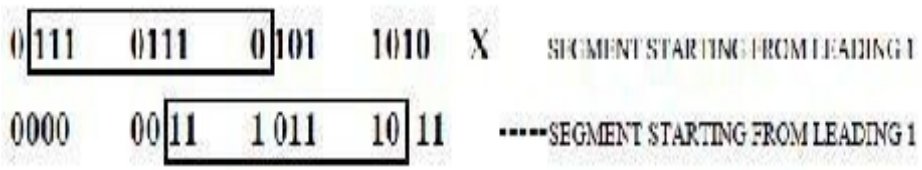


Figure 1: An example of Dynamic Segment Method

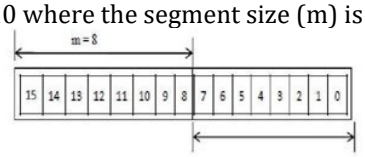
Such a multiplication approach has little negative impact on computational accuracy because it can eliminates redundant bits (i.e., sign-extension bits) while feeding the most useful m significant bits to the multiplier. Furthermore, an m×m multiplier consumes much less energy than an n×n multiplier, because the complexity (and thus energy consumption) of multipliers quadratically increases with n. For example, the 4 × 4 and 8 × 8 multipliers consume almost 20 × and 5 × less energy than a 16×16 multiplier per operation on average.

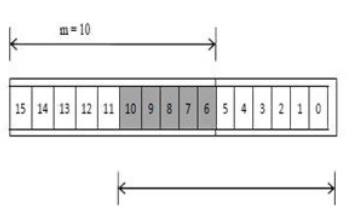
A DSM requires: Two LODs; Two n-bit shifters to align the leading one position of each n-bit operand to the MSB position of each m-bit segment to apply their m-bit segments to the m×m multiplier; and One 2n-bit shifter to expand a 2m- bit result to 2n bits. Hardware requirements incur considerable area and energy penalties completely negating the energy benefit of using the m × m multiplier; The area and energy penalties associated with three requirements in DSM are to capture an m-bit segment starting from an arbitrary bit position in an n-bit operand because the leading one bit can be anywhere. Thus, to limit possible starting bit positions to extract an m-bit segment from an n-bit operand to two or three at most in SSM is proposed.

Static Segment Method (SSM)

The proposed method for approximate multiplication is the Static Segment Method (SSM).Regardless of m and n, we have four possible combinations of taking two m-bit segments from two n-bit operands for a multiplication using the m-bit SSM. For a multiplication, we choose the m-bit segment that contains the leading one bit of each operand and apply the chosen segments from both operands to the m×m multiplier. Two design architectures using two different numbers of bits for the segment is given as shown in figure 2 and 3 below:

- SSM_8X8 where the segment size (m) is 8 bit
- SSM_10X10 where the segment size (m) is 10 bit





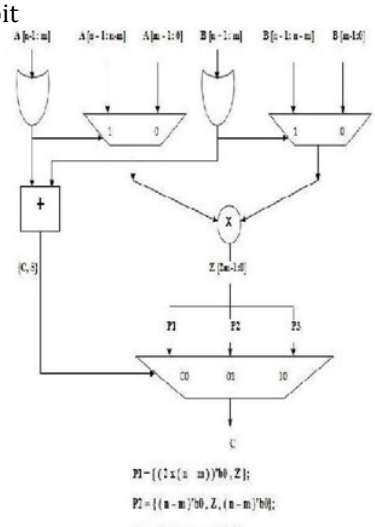


Figure 2: Segmenting in SSM where m=8
Figure 3: Segmenting in SSM where m=10

The SSM greatly simplifies the circuit that chooses m-bit segments and steers them to th e m×m multiplier by replacing two n-bit LODs and shifters for the DSM with two (n m)- input OR gates and m-bit 2-to-1 multiplexers; if the first (n m) bits starting from the MSB are all zeros, the lower m-bit segment must contain

the leading one. Furthermore, the SSM also allows us to replace the 2n-bit shifter used for the DSM with a 2n-bit 3-to-1 multiplexer. Since the segment for each operand is taken from one of two possible segments in an n- bit operand, a 2m-bit result can be expanded to a 2nbit result by left-shifting the 2m-bit result by one of three possible shift amounts as shown in Figure 4:

1) no shift when both segments are from the lower m-bit segments;
2) (n m) shift when two segments are from the upper and lower ones respectively;
3) 2× (n m) shift when both segments are from the upper ones.

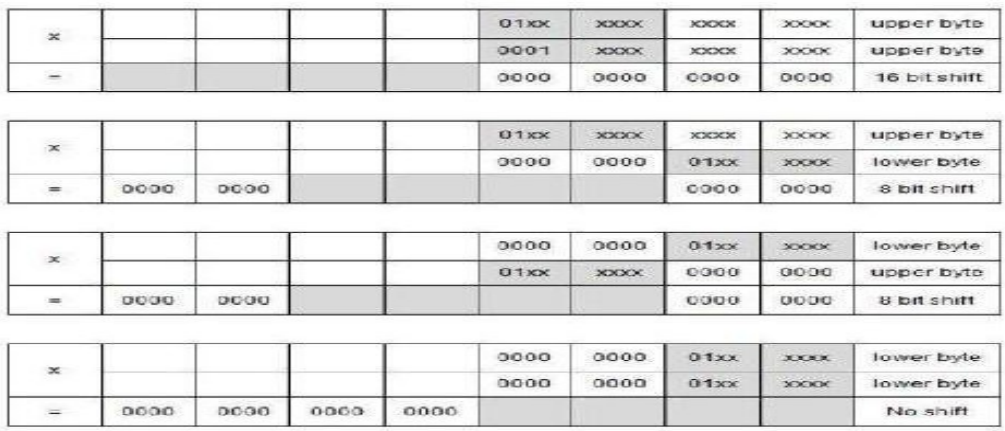


Figure 4: Three possible shifting processes in SSM

Figure 5: SSM architecture

Figure 5 shows SSM to take an m-bit segment from two possible bit positions of an n-bit operand. The key advantage is its scalability for various m and n, because the complexity (i.e., area and energy consumption) of auxiliary circuits for choosing/steering m-bit segments and expanding a 2m-bit result to a 2nbit results scales linearly with m.

For applications where one of operands of each multiplication is often a fixed coefficient, we propose to pre compute the bit- wise OR value of B[n 1:m] and preselect between two possible m-bit segments (i.e., B[n 1:n m] and B[m 1:0]) in Figure 5, and store them instead of the native B value in memory.

The accuracy of an SSM with m = n/2 can be significantly low for operands shown in figure 6:

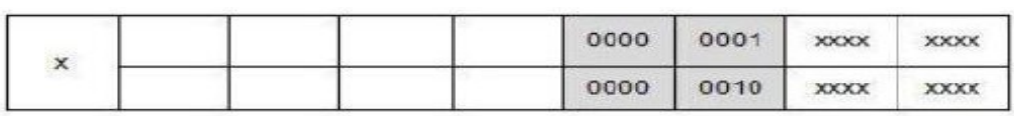


Figure 6: An example for low accurate operands

Here many MSBs of m-bit segments containing the leading one bit are filled with zeros. On the other hand, such a problem becomes less severe as m is larger than n/2; there is an overlap in a range of bits covered by both possible m-bit segments as shown for m = 10.

Enhanced Static Segment Method (ESSM)

To support three possible starting bit positions for picking an m-bit segment where m = n/2, the two 2-to-1 multiplexers at the input stage and one 3-to-1 multiplexer at the output stage are replaced with 3-to-1 and 5-to-1 multiplexers, respectively, along with some minor changes in logic functions generating multiplexer control signals. These changes lead to an enhanced architecture method called Enhanced Static Segment Method (ESSM) which is shown in figure 7.

This enhanced SSM design for m = 8 and n = 16 (denoted by ESSM8×8) can provide as good accuracy as SSM10×10 at notably lower energy consumption.

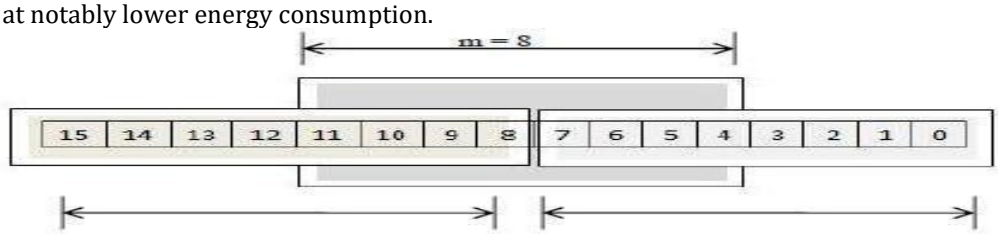


Figure 7: Segmenting in ESSM where m=8

Optimization of Proposed Architecture

The proposed ESSM method of multiplication though consumes lesser energy than SSM method of multiplication, it has large area overhead. Thus further optimization is done with a modification to the SSM algorithm. As a result of this modification, SSM method can achieve a better computational accuracy with considerable reduction in area overhead. This optimized SSM is named Improved Static Segment Method (ISSM).

SIMULATION AND IMPLEMENTATION RESULTS

In this project, design and implementation of energy efficient multiplier architectures were simulated using Verilog Hardware Description Language. The Xilinx Design ISE (Integrated Software Environment) 13.2 was used to analyze the performance parameters of these architectures. The performance parameters include power, delay and area. Spartan 6 was considered as the operating device.

4.1 Comparative Analysis of Approximate Multipliers

The comparison here involves around the performance parameters of approximate multiplier methods discussed so far. Table 1 represents the average computational error (in %) of the product obtained from different methods discussed. On an average, 30 different pairs of operands are considered for this tabulation. ESSM proves to be better in accuracy.

Table 1: Analysis of Delay, Power and Area

Segment Methods	Delay (ns)	Power (mW)	Energy (pJ)	Area (No. of LUTs)
SSM_8X8	13.073	29	379.12	28
SSM_10X10	12.451	27	336.18	28
Proposed Methods.				
ESSM_8X8	13.691	27	**369.66**	59
ISSM_8X8	14.380	30	431.40	**38**

Table 2 represents the analysis of performance parameters such as delay, power, energy and area consumed for all the

SSM_8X8	~6
SSM_10X10	~1
Proposed Methods	
ESSM_8X8	~1
ISSM_8X8	~3

CONCLUSION

In this brief, an approximate multiplier that trades off accuracy and energy has been proposed. The proposed method of approximate multiplier takes m consecutive bits (i.e., an m-bit segment) of an n-bit operand either starting from the MSB or ending at the LSB and applies these two segments that include the leading ones from two operands (i.e., SSM) to an m×m multiplier. The proposed Enhanced Static Segment Method consumes lesser power and hence notably lesser energy with average computational error of ~1%, when compared to a true multiplier. Further optimization of the proposed multiplier is also done which improves the average computational accuracy along with a considerable reduction in the area consumed by the proposed multiplier.

Thus the proposed approximate multiplier can lead to better quality in signal processing and image processing computations when compared to other forms of approximate multiplier such as truncated multiplier. The most important aspect of this proposed method is that it is maintaining the quality even in energy efficient devices. It can also lead to better performances when one of the operands of the multiplication is kept fixed.

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Multi Level Image Thresholding Using Random Vector based Differential Evolution

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ABSTRACT *Image thresholding, it is the technique used to separate objects from its background at pixel level. It is one of the most important operations that can be used for image analysis. Image segmentation, done via multilevel thresholding, splits the image into various parts by selecting multiple threshold points. Most of the thresholding methods are depending on histogram; with those methods boundaries obtained between regions are no clear. To overcome the drawbacks of conventional techniques, a new method of algorithm called meta-heuristic Differential Evolution (DE) is proposed, which incorporates the fuzzy partition in which the Shannon entropy and fuzzy entropy are to be calculated and are to be compared. Based on flow of methodology, algorithm terminates for fixed number of thresholds as defined earlier. The performance of new method for segmentation is compared with well known algorithms optimization, like Particle Swarm Optimization and Genetic Algorithms for accurate convergence.*

Keywords: *Particle Swarm Optimization (PSO), Genetic Algorithm (GA) and Differential Evolution (DE).*

1 Introduction

Image segmentation had wide variety of applications in image analysis. Many algorithms are proposed for segmentation. No algorithm is convergent, based on image and application, different algorithms are to be tried and the algorithm which gives optimum result will be considered. As most of the methods for threshold based segmentations are histogram dependent and obtained boundaries are having not clear separated regions. To overcome the drawback, we propose new method metaheuristic Differential Evolution (DE). The proposed algorithm can be evaluated using MATLAB (R2012a) 7.14 version or any later released versions of 'MATLAB 7.0' programming language can be used for implementation of the proposed project importantly with image processing tool box to be included.

2 Existing Methods

2.1 Genetic Algorithm

The ultimate concept of Genetic Algorithm is to resemble the natural selection and the survival of fittest chromosomes. The solutions are considered as chromosomes which are having highest fitness value. The chromosomes are assessed for fitness values and they are arranged from top (Highest fitness value) to worst (Lowest fitness value based on their fitness value given. The procedure to generate new solutions in GA is impersonating the naturally choosing of living organisms, and this procedure can be achieved through repeated applications of three generalized genetic algorithm operators such as: selection, crossover and mutation [1]. At the beginning, the better chromosomes are chosen to become parents to reproduce new chromosomes. To simulate the survivor for the fittest, the chromosomes with better fitness are selected with larger probabilities than the chromosomes with smaller fitness values.

After the completion of selection of mother-father (parent) chromosomes, the crossover operator is introduced and combines the chromosomes of the parents to reproduce new baby chromosomes. Since chromosomes with larger fitness values are being selected generally, in such a way that there is a tendency that the new solutions may become alike after several generations of reproduction, and the assortment of the population may decline; and this could lead to population stagnation. Mutation is a procedure to introduce or stimulate diversity into the population of chromosomes so that stagnation can be avoided, that is they are more active when compare to parent [2].

2.2 Particle Swarm Optimization

In PSO, a candidate solution is considered as a particle, and population of solutions is called a swarm of particles. Each particle has two main properties: position updating and velocity updating. Each particle propagates to a new position based on velocity updating formulae. Once a new position is obtained, the best position of each particle and the best position of the group updating are needed.

The velocity of each particle is then adjusted based on the communication between them. The process is repeated until a stopping constraint is met. As in GA, the fore most process of PSO is initialization there by the initial swarm of particles is generated [3]. Particle is initialized with a random velocity and position, and then determined for new fitness value. Each time a fitness value is to be determined and it is to be compared with the previous best value of fitness of the particle and the previous best value of fitness of the whole swarm and based on that the personal best and global best positions are to be updated. After attaining stopping constraint, the new values of velocity and position are obtained to generate a new group of particles.

3 Proposed Method – Random Vector based Differential Evolution

Most of the proposed methods for thresholding based segmentation are histogram dependent with which there is no clear boundary between regions is defined; this situation leads to undefined boundary regions with ambiguity. To overcome the drawback, we propose new method metaheuristics Differential Evolution in this paper [4]. DE is conceivably one of the most powerful real parameter augmentations of current interest. The DE can surpass GA and PSO when it is used for multi-level thresholding of digital image segmentation problems. In DE algorithm, a solution is considered as a D-dimensional vector.DE starts with a randomly generated initial chromosome population of size N of D-dimensional random vectors.

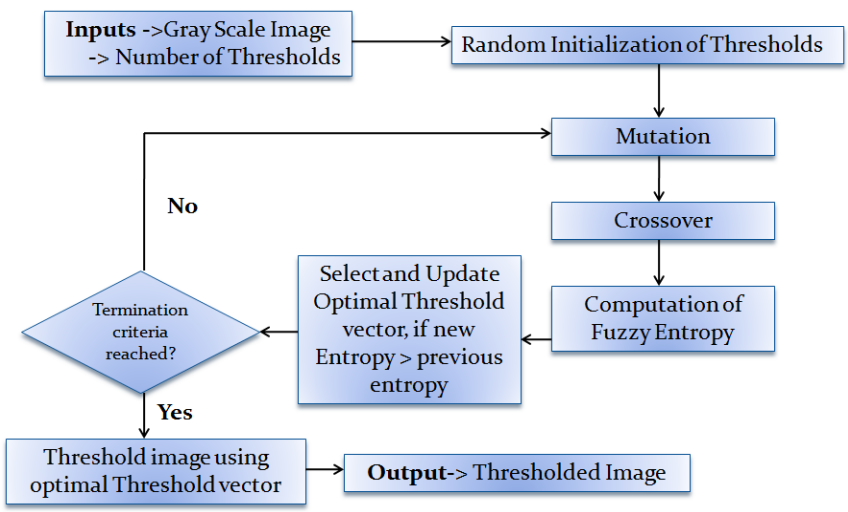


Fig: 1 Flowchart of Methodology

In DE, the values in the N-dimensional coordinate space are commonly considered as real numbers. Again, the conceptualization of solution representation is applied in GA and PSO in the same way as it is applied in DE. The major difference of DE to GA or PSO is in a new mechanism for producing new resolutions [5-10]. DE produces a new solution by merging several solutions with the candidate solution. The population of solutions in DE progress across repeated cycles of three main DE operators as like: mutation, crossover and selection. However, the operators are not all quietly the same as those with the same names in GA. The key process in Differential Evolution is the generation of test/trial vector. Consider a candidate or target vector in a population of chromosomes of size N of N-dimensional vectors.

3.1 Calculation of Multi level Fuzzy Entropy:

A traditional/classical set A can be described as a contribution of element that can belong to or not belongs to set A .Whereas as stated from fuzzy set, which is a generalization of traditional/ classical set, an element can partially belongs to a set A[11-13]. A set can be described as

$$A = \{(x, \mu_A(x)) \mid x \in X\}, \quad (1)$$

For simplicity trapezoidal membership function is used in the paper to estimate the membership of n regions, $\mu_1, \mu_2, \ldots\ldots, \mu_n$ by using $2\times(n-1)$ unspecified fuzzy(indistinct) parameters, like wise are $a_1, c_1 \ldots a_{n-1}, c_{n-1}$ Where $0 \le a_1 \le c_1 \le \ldots\ldots \le a_{n-1} \le c_{n-1} \le L-1.$

$$\mu_1(k)=\begin{Bmatrix} 1 & k\le a_1 \\ \frac{k-c_1}{a_1-c_1} & a_1\le k\le c_1 \\ 0 & k>c_1 \end{Bmatrix}$$

.
.

$$\mu_{n-1}(k)=\begin{Bmatrix} 0 & k\le a_{n-2} \\ \frac{k-a_{n-2}}{c_{n-2}-a_{n-2}} & a_{n-2}<k<c_{n-2} \\ 1 & c_{n-2}<k<a_{n-2} \\ \frac{k-c_{n-1}}{a_{n-1}-c_{n-1}} & a_{n-1}<k<c_{n-1} \\ 0 & k>c_{n-1} \end{Bmatrix}$$

.
. (2)

$$\mu_n(k)=\begin{Bmatrix} 1 & k\le a_{n-1} \\ \frac{k-a_n}{c_n-a_n} & a_{n-1}\le k\le c_{n-1} \\ 0 & k>c_{n-1} \end{Bmatrix}$$

The highest fuzzy entropy of each partition of n-level segments can be defined by

$$H_1=-\sum_{i=0}^{L-1}\frac{p_i*\mu_1(i)}{P_1}*\ln\left(\frac{p_i*\mu_1(i)}{P_1}\right)$$
$$H_2=-\sum_{i=0}^{L-1}\frac{p_i*\mu_2(i)}{P_2}*\ln\left(\frac{p_i*\mu_2(i)}{P_2}\right) \quad (3)$$

.
.

$$H_n=-\sum_{i=0}^{L-1}\frac{p_i*\mu_n(i)}{P_n}*\ln\left(\frac{p_i*\mu_n(i)}{P_n}\right)$$

Where,

$$P_1=\sum_{i=0}^{L-1}p_i*\mu_1(i), P_2=\sum_{i=0}^{L-1}p_i*\mu_2(i),....,P_n=\sum_{i=0}^{L-1}p_i*\mu_n(i) \quad (4)$$

The optimum value of parameters can be attained by improving the total entropy to its maximum value as

$$\varphi(a_1,c_1,.....,a_{n-1},c_{n-1})=Arg\max(\left[H_1(t)+H_2(t)+.....+H_n(t)\right]) \quad (5)$$

The (n-1) no of threshold values can determined using the fuzzy parameters in the following way:

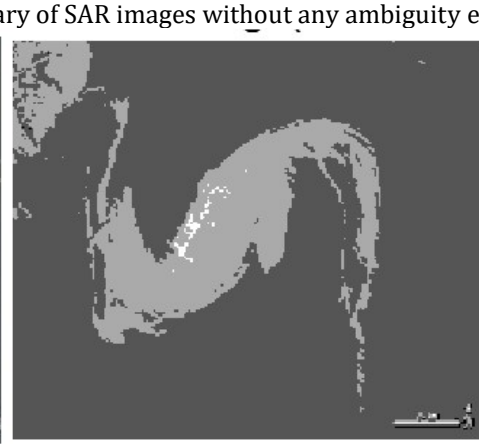
$$t_1=\frac{(a_1+c_1)}{2}, t_2=\frac{(a_2+c_2)}{2},.....,t_{n-1}=\frac{(a_{n-1}+c_{n-1})}{2} \quad (6)$$

The Shannon entropy can be calculated as specified in Shannon's theorem related to digital images.

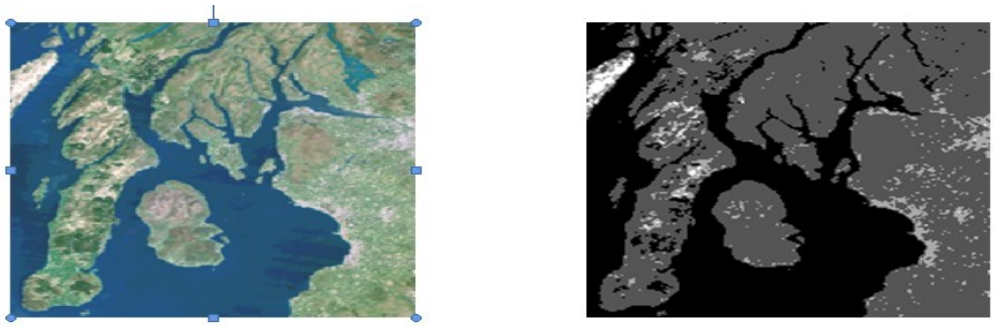
4 Experimental Results

DE has good performance when compared with other algorithms like GA, PSO. The computational time of DE is comparatively very less than GA, PSO algorithms. Further this Differential evolution can be used for level setting which would give the exact boundary of SAR images without any ambiguity errors.

Original image



3-Level Thresholding image



Original image 3-level Thresholding image

Fig: 2 Original and three level thresholding SAR images.

Original image of brain 3-Level thresholding image

Fig: 3 Original and three level thresholding Brain images

By using GA, PSO and DE, we get almost the same output images as shown in figure 2 and 3. But the difference is in terms of their time complexity as stipulated in the below table.

Algorithm	**Time complexity**(in sec)
GA	18.783
PSO	8.99
DE	3.809

Table. No: 1. Time complexity of algorithms

The above time complexity is calculated with the system configuration of 500GB-Hard Disk, 4GB-RAM, i3-Processor.

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Blurred Face Recognition using Adaptive Sparse Domain Regularization with LGRP feature based SRC Classification

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ABSTRACT *The challenging task in face recognition is due to uncontrolled conditions like illumination and blur. Image degradation caused by blurring is commonly present in real world imagery. This problem is more concentrated in Face Recognition community. This type of degradation corrupts facial information and affects the alignment in the image which results in less recognition rate. The main problem is to know the inference of Point Spread Function (PSF) which represents the method of blur on faces. This paper presents a novel technique to recognize faces that are degraded by Gaussian blur. Blur from atmospheric turbulence can be modeled as a Gaussian PSF. Haar Wavelet transform (HWT)method is used to identify whether the given test face is blurred or not. Features are extracted using Local Gabor Binary Pattern (LGRP). Finally, Sparse Representation Classification(SRC) is used to compare the extracted features of unknown individual face image with the labeled face images in the database. AR database is used for this experiment. The recognition rate of 95.83% is achieved.*

Keywords: *Adaptive Sparse Domain Selection Blurred image, Face Recognition, Gaussian Blur, Local Gabor Rank Pattern, Sparse Representation.*

Introduction

Face recognition is an energetic research area in computer vision applications, making very important contributions since 1990's. Face recognition has improved in reliability with various types of techniques and algorithms to make its ability equal to Human brain. But, it is still not accurate all the time. The capability to properly classify a face image rely on different parameters like variation in lighting, pose, facial expressions and image quality. [1]. Many times, it is questioned to know whether face itself is sufficient source to recognize a person from large crowd or population with good accuracy. Certainly, the human brain also depends much on contextual information and works on limited population. The other challenging features exist in these unconstrained environments are occlusion and blur [2]. Recognition of Gaussian blurred faces are considered in this paper. Different types of blurriness are observed in real world environments like relative motion, atmospheric turbulence and out-of-focus lens.

Gaussian blur occurs when a face image is acquired through a turbulent medium and the acquisition times is far longer than with the period of Browinian motion of the elements in the medium. Some of the examples are: Capturing pictures through a fog, fluorescence microscopy, underwater imaging, ground-based astral images acquired through atmosphere, etc. Gaussian kernel is used as an estimate of some other blurs. It is very much difficult to work with these blurs. This blur is introduced as sensor blur, occurs due to a finite sampling pulse size [3]. Sometimes Gaussian blur is introduced into the face image purposefully, to 'soften' the image or to cut off additive noise or to do local averaging before down sampling the image. There are three methods to classify blurred image against clear database images. i) Generate all probable blurred version of all templates that are incorporated into the database. But this is practically not possible. ii) Remove the blur from an input image and then classify the deblurred face image using any standard method. This is a semi-blind deconvolution technique because it knowns the kernel in parametric form, but their parameters are unknown. This which makes Gaussian Kernel as unstable [4]. iii)The third approach is based on blur-insensitive recognition with image descriptor [5]. These descriptors have many applications not only for face recognition, but also in Medical Imaging [6]-[8], Character Recognition [9], Aerial and Satellite images [10]–[13], etc.

The given query face image is blurred or not is identified with Haar Wavelet Transform [14]. If the image is blurred, then an effective deblurring technique 'Adaptive Sparse Domain Selection and Regularization (ASDSR)' is used [15]. Later Local Gabor Rank Pattern(LGRP) [16] features are extracted for deblurred gaussian and original AR clear database face image. An efficient classification is done using with most powerful technique known as Sparse Representation Classification [17].

Proposed Method

The proposed method consists of four steps. The first step is to identify whether the given face image is blurred image or sharp image. This process of identification of blur is achieved by applying Haar Wavelet Transform with decomposition level as 3 and observing different types of edges. If the given query face is blurred, then Adaptive Sparse Domain Regularization method of deblurring technique is used to obtain restored image. For this image Local Gabor Rank Pattern features are extracted. Also, LGRP features are extracted for original AR database. These features are given to SRC classification method. Figure 1. shows the block diagram of the proposed method.

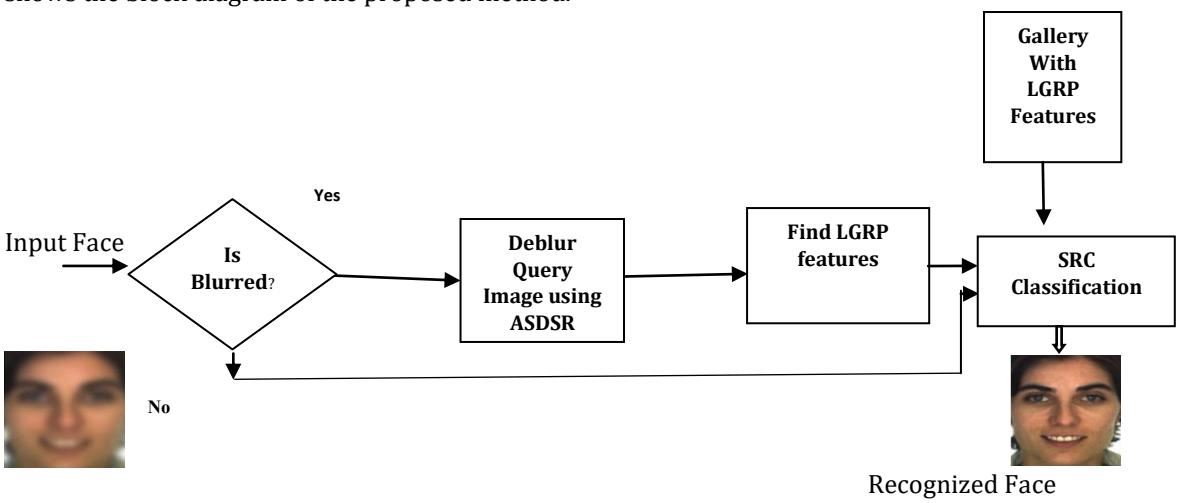

Figure 1: Block diagram of the proposed Method

Identification of Blur using HWT

Image is degraded due to presence of blur. Natural images consist of various types of edges namely: a) Dirac-Structure, b) Roof Structure and c) Step-Structure (A-step-Structure and G-step-Structure). When blur occurs i) Dirac-structure and A-step Structure will disappear, ii) Roof Structure and G-step Structure tend to lose their sharpness. HWT is applied to the test image with decomposition level of 3. Different Edge points are calculated as in [14] and existence of blur is defined as $B_l = \frac{N_{da}}{N_{edge}}$.

Deblurring method using ASDSR

Sparse Representation is one of the most powerful image modeling statistical technique that is used in different image restoration applications. Because of implementation of l1-norm optimization techniques, the success rate is more for sparse representation as natural images are essentially sparse in some domain. The significant contents of different images or different patches in a single image is considered. Various sets of bases are learned from a pre-collected dataset of example image patches. To process for a given patch, adaptively one set of bases are selected. This characterizes the local sparse domain. This sparse representation framework consists of two adaptive regularization stages. In the first stage, a set of autoregressive (AR) models are learned from the data, that consists of example image patches. The best fitted AR models for a given patch are selected adaptively to regularize the local structures of an image. In the second stage, another regularization term known as image non-local self-similarity is introduced. Further, the image restoration performance is improved by estimating adaptively the sparsity regularization parameter. Image Restoration is a typical ill-posed inverse problem [18] and generally it can be modeled as

$$\boldsymbol{y=DHx+}\upsilon \qquad (1)$$

where the unknown image to be estimated is represented as x, H and D represents the degrading operators and υ is additive noise. The Image Restoration(IR) becomes a denoising problem when H and D are considered as identities. When D is considered as identity and H as blurring operator then IR becomes deblurring. IR can be considered as compressed sensing [19]-[21] when H is a set of random projections and D as identity. When D becomes down-sampling operator and H as blurring operator, IR becomes (single image) super-resolution. The regularization models used commonly in many cases is based on Total Variation (TV) model [22]-[23]:

$$\hat{x} = arg\ \min_{x} \|y - DHx\|_2^2 + \lambda . |\Delta x|_1 \qquad (2)$$

$$K = \begin{bmatrix} DH \\ \gamma . (I - A) \\ \eta . (I - B) \end{bmatrix} \qquad (3)$$

This is a reweighted l1-minimization problem, which can be effectively solved by the iterative shrinkage algorithm [10]. In the method [15], error 'e' is a pre-specified scalar which controls the convergence of the iterative process and computes thresholds locally.

LGRP Feature Extraction

The face representation plays a very important role in recognition. A good face representation must be insensitive to different image transformations. So, designing robust and distinctive descriptors is dynamic research area in Face Recognition. Many global and local descriptors are proposed in literature. Global descriptors include shape, texture and contour features to define an image as a complete set. Examples of global descriptors are shape matrices, invariant moments, etc. Local descriptors represent significant points in the image as patches. Examples of local descriptors are LBP, Gabor filters, LGXP, SURF, SIFT, LGGP [24], etc. For low level applications like detection and classification, global descriptors are used and for high level application like recognition, local features are used to attain efficient/ best results. The most successful method used in face recognition is based on Gabor filters [25]. In [16] Gabor filtered images are encoded with local ordinal ranking to attain face representation in more effective manner. The ordinal variables have meaningful value and are in absolute order. It provides the relative rank or order of items in each set [26]. The initial step in this method is to apply complex Gabor filters on a face image. The neighboring pixels at each response points are sampled and assigns different ordinal numbers. A decimal number is allotted based on the ranking order of the sequence (LGRP code). The relative intensity information given by ordinal measurement are more useful than with raw intensity values in many computer vision applications because they are insensitive to external effects like illumination variation. The magnitude relationship in Local Binary Pattern (LBP) is the ordinal relationship between its center and neighboring pixels. But it does not consider ordinal relationship between neighboring pixels, whereas relative ordinal data of neighboring pixels are encoded in LGRP. Intermediate binary string is not required and based on the ordinal relationship of surrounding pixels, each pixel is assigned with a decimal number in LGRP code.

Further Local Gabor Rank Pattern (LGRP) extracts two descriptors namely called as Local Gabor Magnitude Rank Pattern (LGMRP) and Local Gabor Phase Rank Pattern (LGPRP) descriptors. Using Gabor coefficients variance measure, different weights are assigned for LGRPs. The descriptors are modeled from the response of encoded Gabor filters using local histograms. The classification accuracy is improved by fusing properly these two descriptors (LGMRP and LGPRP descriptors) [16].

Classification using SRC

Sparse Representation Classification (SRC) method attains a great success in Face Recognition and it enhances the research of sparsity- based pattern classification. In sparse representation-based Face Recognition, face images are usually aligned and codes a signal 'y' over a dictionary Φ such that y≈ Φα and α is a sparse vector. Sparse Representation is denoted by $\Phi \in \Re m \times n$, a dictionary of atoms. If Φ is complete, then for any signal $x \in \Re m$, can be represented accurately as linear combination of the atoms Φ. If Φ is orthogonal, it is required to use many atoms from Φ to represent x faithfully. The orthogonality forced on Φ is relaxed if less atoms are used. But in FR scenario, face images from each class usually lies in a small subspace of $\Re m$ [27]-[28]. That is, the feature vector of much lower dimensionality is designed for a m-dimensional face image x. The training samples of class i (Xi) are considered as dictionary for this class. But in practice, the training samples (atoms) of Xi are correlated. Assume sufficient training samples for each class are available, then all the images of class i can be represented by Xi faithfully. This makes Xi an over-complete dictionary as the correlation of training samples of class i, which concludes that a test sample y of class i can be sparsely characterized over dictionary Xi. The algorithm used for SRC [17] is described below.

Algorithm

Step-1: To attain unit l2-norm, Normalize the columns of X.

Step 2: Code y over X via l1-minimization

$$(\hat{\alpha}) = \arg\min_{\alpha} \|\alpha\|_1 \text{ s.t. } \|y - X\alpha\|_2 < \varepsilon \qquad (4)$$

where constant ε is the parameter to represent the dense small noise in y and to balance the sparsity of α and the coding error of y.

Step-3: Compute the residuals

$$e_i(y) = \|y - X_i\,\hat{\alpha}_i\|_2 \quad (5)$$

where $\hat{\alpha}_i$ is the coding coefficient vector related with class i.

Step-4: The Output is defined as identity of y as

$$\text{Identiy(y)} = \arg\min_i\{e_i\} \quad (6)$$

Results and Discussion

The given test face is blurred or not is checked using Haar Wavelet Transform method [8a]. If the test face is identified as blurred face, then it is deblurred with Adaptive sparse based regularization. Later its LGRP features are extracted. These LGRP features are compared with LGRP features of Original Gallery dataset using to SRC classifier. AR database with 400 faces of 40 persons with 10 subjects are considered in this method. The Structurally Similarity Measure (SSIM) and Peak Signal to Noise Ratio (PSNR) are the measurements to identify the quality of the degraded Image. Initially AR database is blurred with Gaussian Blur with variance equal to 1. These faces are deblurred with Adaptive sparse based regularization. Table.1 shows the SSIM and PSNR values for AR database. Figure 2.a are the original AR database faces, Figure 2.b are gaussian blurred faces and Figure 2.c shows Gaussian deblurred faces.

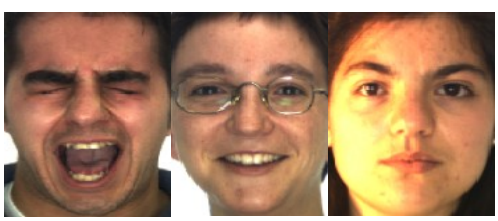

Figure 2.a Original clear AR face database images.

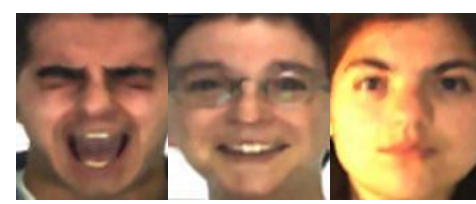

Figure 2.b Gaussian Blurred AR face database images

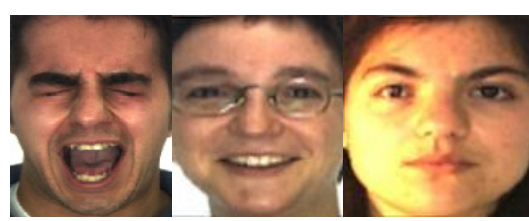

Figure 2.c Gaussian deblurred AR face database image

Table .1 SSIM and PSNR for AR Database (40 Faces)

Database(DB)	**SSIM** Deblur Face	**PSNR** Blur Face	**PSNR** Deblur Face
AR_DB (40 faces)	0.931023	25.06475	33.74
ORL DB (40 faces)	0.931145	26.33121	34.12

The next step is to find LGRP features for Original AR database and for Gaussian Deblurred faces. These features are given to SRC classifier. Further LGRP features are given to Linear Discriminant Analysis (LDA) classifier. Table 2.a shows Recognition rate using SRC and LDA classifier with LGRP features of original AR database with different combinations of training and test faces. Table 2.b shows Recognition rate using SRC and LDA classifier with LGRP features of deblurred AR database. Table 2.c shows Recognition rate using SRC and LDA classifier with LGRP features of original AR database as the training set and deblurred faces as test set.

Table 2.a Recognition rate for Original AR database with LGRP features

Train Faces	Test Faces	Recognition Rate (%) LDA	Recognition Rate (%) SRC
320	80	81.3	95.83
280	120	80.11	91.85
240	160	76.76	91.25
200	200	66.23	87.5
160	240	59.21	83.33
120	280	51.9	81.479
80	320	--	70.9

Table 2.b Recognition rate for Gaussian Deblurred AR database with LGRP features

Train Faces	Test Faces	Recognition Rate (%) LDA	Recognition Rate (%) SRC
320	80	81.3	95.83
280	120	80.11	91.85
240	160	76.76	91.25
200	200	66.23	87.5
160	240	59.21	83.33
120	280	51.9	81.479
80	320	--	70.9

Table 2.c Recognition rate using SRC classifier with LGRP features of original AR database as training set and Gaussian Deblurred faces as test set

Train Faces	Test Faces	Recognition Rate (%) LDA	Recognition Rate (%) SRC
320	80	77.26	93.3
280	120	72.91	92.25
240	160	70.56	90
200	200	68.29	88.5
160	240	56.67	85
120	280	42.2	77.12
80	320	--	70

Conclusion

In this paper, Blurred Face Recognition using Adaptive Sparse Domain Regularization with LGRP feature based SRC Classification is proposed. Firstly, the presence of blur(Gaussian) is determined using Haar Wavelet Transform. The blurred faces are deblurred using ASDSR technique. LGRP feature descriptors are extracted for the deblurred test face and original database gallery. SRC method is used for recognition. Training with Original dataset and testing Gaussian deblurred database, 93.3% recognition rate is achieved. The recognition rate is 97.5% for unblurred faces from AR database. Further the recognition rate is 95.83% for gaussian deblurred faces is achieved. Further fusing with local and global feature descriptors, the recognition rate can be increased.

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Identification of Skin Diseases using Computer Vision and Artificial Intelligence Techniques

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ABSTRACT *The purpose of this study is to develop a methodology for assessing the recent developments in computer vision technology system in the field of medical & healthcare industry. Computer vision has numerous methods to identify the diseases and apply those methods to detect and displays numbers, symbols and information for diseases in its early stage. The proposed work aims to use machine vision and artificial intelligence techniques to detect various kinds of skin diseases. The adoption of this emerging technology in the identification of skin diseases and common problems in adults & child's will be of immense benefit to the healthcare system. Different automated techniques give different speed which varies with accuracy to detect skin diseases. To developed skin detection diseases automated processes must be developed.*

Keywords: *Computer vision, healthcare industry, artificial intelligence techniques, automated processes.*

INTRODUCTION

It goes without saying that from the last few decades the problems with skin diseases are increasing rapidly. There are numerous reasons which affect skin diseases mainly it effect due to change in climate or bad weather conditions and living in a densely populated area which produces toxic and harmful gases which consist of bacteria and viruses which is directly proportional to skin diseases which frustrate, change texture of the skin, or damage the skin and shows symptoms like swelling, burning, redness and itching, Allergies, and some diseases effects on immune system further which produce dermatitis and other skin problems[1]. In addition skin diseases also effect on persons daily life, loss of self-confidence, many skin diseases, such as acne, alopecia, ringworm, eczema also affect your look leads to depression, even to ruin relationships[2]. Furthermore, some terrible skin diseases also produce different Eczema, Urticaria, Impetigo and Milano skin cancer. to detect we use different skin cancer devices and tools like punch biopsy which is used to detect Cancer, including skin, vulgar, and cervical cancer[3]. And also Skan is a device which is used to detect melanoma. In this contemporary world most of the fields are proffering to work with artificial techniques rather manually which reduce time and produce high accuracy in the same way computers have taken the medical field to a new level In the field of medical science there is a great demand for computer-aided tools to facilitate many tasks[4]. Many things that were done manually using traditional equipment have been replaced by automated systems. by using computerized image processing we can detect skin cancers and many skin diseases which cannot be detected manually. Skin diseases are detected by different methods like segmentation, filtering, feature extraction to get the improved image we need to convert that into digital format so that we can apply functions onto the image to get clear output[5]. By using digital image processing we can identify any diseases and provide treatment with short duration of time[6].

LITERATURE REVEIW

In the work of author presents a survey of various skin disease diagnosis systems using image processing techniques in recent times. Skin diseases become one of the common diseases which affect not only humans but also found in animals and trees. Most of the skin diseases are caused by bacteria or due to infection. Some skin diseases like acne, alopecia, ringworm, eczema, spot, and allergies may have the dangerous effect on our body due to its spreading over time. Which cannot be identified manually? to identify these diseases we use different computerized technologies some of them are image processing data mining artificial neural network(ANN) which resolve the image into a clear vision which gives result in initial stages. Among all image processing is one of the best technique used to detect skin diseases which shows the form of affected area and color.[6]

It is clear evidence that skin care products from the last few years have risen there product sales which is 34.1 billion in the world in 2000 which is one of the fastest prompts which has been seen chosen for personal care market. On the other hand, 19.9 billion was spent on makeup and cosmetics. Human vision

system categories 128 various hues and 130 different saturation levels and 20 different shades hence we can obtain 330,000 colors.[7]

Image processing technique provides the information of human body samples like blood or sputum to examine the disease which can be captured faster compare to manual process to solve the problems and to take the decision in initial stages [8]. Skin surface is very sensitive and highly complex which has different features according [9] to its optical properties and position like cheeks, forehead, neck and also it varies according to the gender and age of the person.

Skin cancer is increasing gradually compare to all other skin cancers as 132000 melanoma skin cancer accuses in the world every year while 2 to 3 million are affected by non-melanoma skin cancers. Besides, skin cancer is growing 3% to 7% yearly. One in every three cancers diagnosed is a skin cancer in fair-skin persons according to skin cancer foundation one in every five Americans will develop skin cancer in their lifetime.

Interested Area of Research

This paper attempts to detect early skin cancer melanoma with the technique computer vision[10], digital image processing techniques with high precision to detect the disease at its early stage.[11] So this paper is the enhanced work on previous research. the literature review shows us that early detection was also too late. This paper attempts to make a technical detector of melanoma at a very early stage. It's possible when expert examines patients table factions and by seeing symptoms of this diseases. Recognition has to be predicted in primary level corresponding to given feature set based on a better knowledge obtained through training**.**

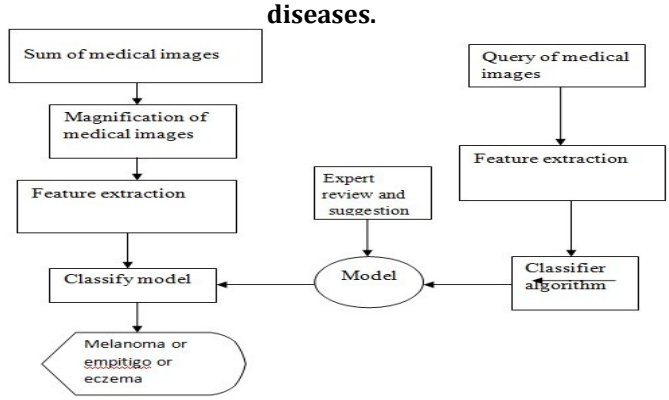
SYSTEM FRAMEWORK:

Dermatology patient psychology is under research so we could not exactly examine due to lack of clarity. However, we covered the psychosocial effect that skin disease can have but, it should be up to patient representation with their illness. by understanding this illness which observed in a patient. by detecting that dermatological illness we can suggest better treatment for that particular disease[12]. The literature indicates that there are so many distress psychological diseases with skin but there is also some crucial studies and research which shows that there is a weak bond between diseases and psychological functioning. Even though it depends heavily on the way that people represent their illness. we have many technique Pattern recognition mainly originates from the need for automated machine recognition of different images, objects, signals or any decision-based approach, on the basis of the set of features. The goal of this technique is to detect and predict correct level according to its main features. The goal of these technologies is to detect and predict correct level according to its main features[13]. The below flowchart shows the steps how to develop this technique it is possible only when both expert and machine contribute equally.

IMAGE ENHANCEMENT

To solve the above-discussed issue we need to follow the standard system of machine system for diagnosis the skin disease. in this flowchart, we need to focus on a pattern. First, a system needs images to a certain level where patterns are clearly visible for usage and also we can remove noise, sharpen or brighten of digital images, making easier to identify the key feature. Then we extract the certain features like area Features color features that can be used to creating the Classification model. With this model, we can easily predict the disease for a new image of skin disease. Furthermore, based on the resulted predicted diseases.[14]

Fig1: **Flowchart which shows the process of top level architecture of the system to detect skin diseases.**



The system will decide disease type and it is a condition with again used of data mining technique. After all, these steps system will suggest treatment according to the predictions of the respective skin.[15]

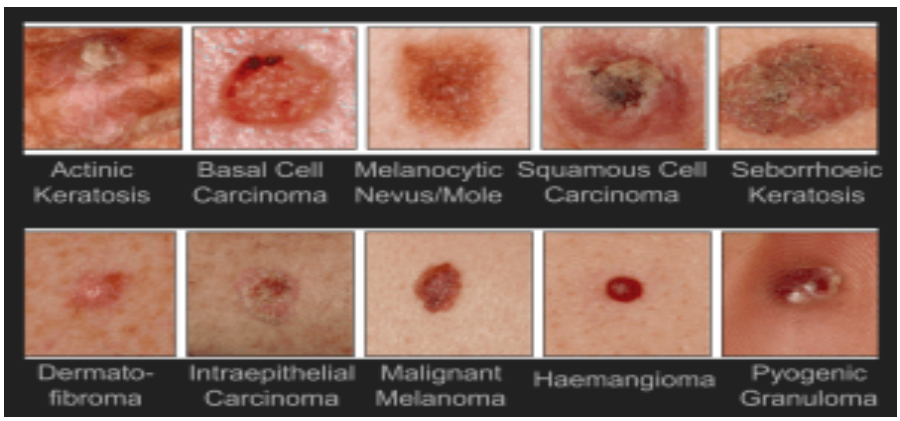


Fig: *skin image data set*

Histogram equalization

Histogram equalization is a method in image processing which is used for contrast adjustment using the images. It's not necessary to always increase the contrast there is also some scenarios where contrast can be decreased. A histogram gray image consists of the number of levels depending on its type, for example, if the image is of 8 bit then its divided into 256 levels. Each pixel in the image consists of different intensity levels. The image which contains histogram intensity level and the number of pixels which contains intensity level is termed as histogram image.[16]

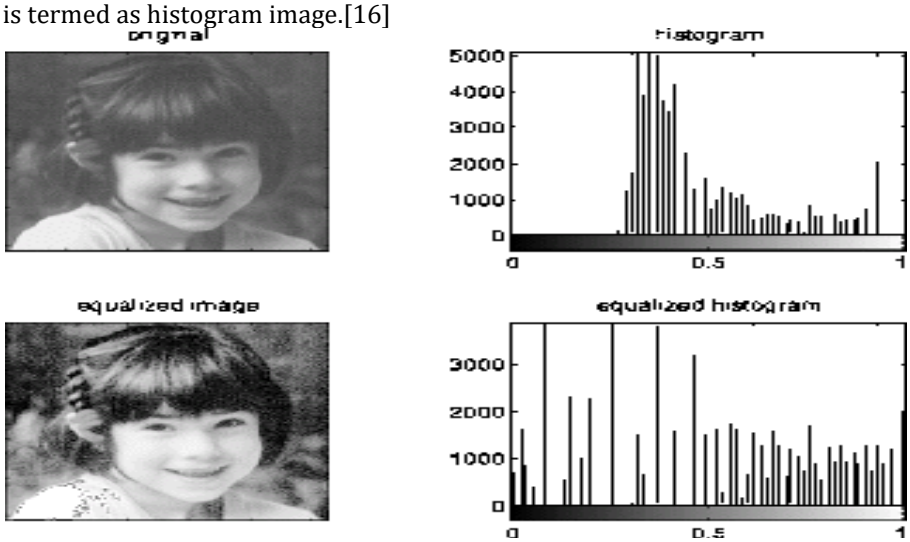


Fig: *comparison of histogram equalization and non histogram equalization gray image*

MATLAB PROGRAMME FOR HISTOGRAM EQUALIZATION

```
function [b]= imhimhiseq(a);
[m n]=size(a);
c=zeros(256);
for p=1:255
  for i=1:m
    for j=1:n
      if (a(i,j)== p)
        c(p)=c(p)+1 ;
      end
    end
  end
end
d=zeros(255);
for p=1:255
```

```
  for i=1:p
    d(p)=d(p)+c(i);
  end
end
f=(d/(m.*n)).*(255);
e=round(f);
for p=1:255
  for i=1:m
    for j=1:n
      if(a(i,j)==p)
        b(i,j)=e(p);
      end
    end
  end
end
figure,imshow(b);
t=im2uint8(b);
figure,imshow(t);
```

Edge detection

Edge detection is an image processing technique for identifying the borders or boundaries of detected objects in images. It works by detecting discontinuities in brightness. Edge detection is used for image segmentation and data extraction in areas such as image processing, machine vision, and computer vision.[17]

FEATURE EXTRACTION

In image processing and pattern recognition field, the feature extraction is a technique which is used for collecting various features and use color, texture, and color histogram features to represent lesion areas from the image because color and texture are only properties which play the vital role to predict and detect the disease. To reduce Dimensionality so many techniques are used. I discussed histogram equalization technique and edge detection technique which is widely used in image processing [18].

CONCLUSION

In this paper, we used two techniques to evaluate and get highest accuracy level of skin disease. Our system will consist of some questions from human to diagnosis skin diseases. Which manage the information of different skin diseases and suggests for treatment by predicting the symptoms and provides statement to proceed? And also this has high reliability and High Performance. Both image-based technique histogram and edge detection play the major role to detect skin diseases. Besides, all the techniques an expert is still far away to detect the disease in its initial stage. The aim of this paper is to find the disease in its primary stage which is only possible when expert and machine both share their equal effort. As most of the experts depend on techniques and tools. However, by using a technique we will get exact and accuracy in the result but expert must be taken action before disease going to reach its final stage.

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