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EDITORIAL COMMUNICATION

This Special Issue of Bioscience Biotechnology Research Communications, Vol.13 No(2) 2020 on " Recent Trends in Advanced Information and Communication Technology" aims to provide a collection of Original research articles from advances in image processing and applications; mobile networks; applications and usability; reliable communication systems; advances in computer vision, artificial intelligence and soft computing; Nano electro mechanical systems, recent trends in knowledge management and software engineering and banking.

This Special issue contains more than 30 articles on recent topics of Advanced Communication Technology. All submissions have been reviewed carefully to ensure the technical quality of the manuscripts. The articles available in this issue will be a very important source of information for researchers working in new emerging technology based areas of communication technology. This special issue further aims to foster the growth of a new research community, acting as an international forum for researchers and practitioners in academia and industry to present research that advances the state of the art and practice of communication for multimedia big data, identifies emerging research topics, and defines the future of the field.

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Intelligent Safety System for Women Security

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ABSTRACT

The world is respecting women and they escalated in all aspects. At the same time the criminality against women are also growing at a higher rate. The women workers are feeling insecure due to increasing offences. So, in this proposed system we have used raspberry pi based secured device inside a pendent which can be easily wore, to capture and record the crime and some safety measures is also available in our device. Since the video is captured for every 10 secs, if there is any unusual things happens, the victim is definitely safeguard by their family members. Hence by this system we can assure the safety of the women in any circumstances.

KEY WORDS: INTELLIGENT SAFETY, RASPBERRY PI, SAFETY OF THE WOMEN.

INTRODUCTION

In countries like India, giving respect to woman and they are treated as god sometimes. But in real time, recently most cases are reported from many areas regarding child and woman harassment. The main cause is due to the inadequate awareness about ethics and this is done by, uneducated persons due to the impact of social media. So far, many devices are introduced to protect them, but each type has some advantages and disadvantages. The information regarding the past inventions and its methodology are described here.

In recent years, acts of a violence and assault against women are rising. With the tremendous growth of female workers in all sectors of our government and private, it is necessity for every individual female to attend the work at all the times required and visit distant places from their locations. But it is making us unhappy that, there is an exponential raise in stabbing and ferocity with respect to women workers in the previous few years is a threat to us which limits their growth and development in general. Protection is not only the remedial measure, instead a security system has to be developed (Madhura Mahajan et al 2016).

In most of the situation of female attack, it is depicted that women's are restrained. Therefore the need of hour is a simpler safety device,that can be activated in emergency situation and can instantaneously send warnings to the persons closer to the victim. According to the reports of World Health Organization (Abhijit Paradkar and Deepak Sharma, 2015) National Crime Records Bureau which is a social-government institution 35% of Women throughout the world are facing a lot of unscrupulous physical provocation in public places like railway station, main bus stoppings, important place foot paths etc. A wearable Safety system (Sathyasri et al, 2019) which communicates continuously to the neighbours through their smartphone and IOT and it is named as smart band. This consists of microcontroller, GPS and GSM module.

To avoid the misbehavior of drivers when women passenger is travelling, a embedded board is fitted in the vehicle (Shambhavi et al, 2016) which has display, keypad, GPS, GSM to give information about the driver

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details.Instead of this, a device called suraksha (Nishant Bhardwaj and Nitish Aggarwal, 2014) which is used to flash a warning to inform about the instant location of the panic victim to the police is introduced. By this method incident can be prevented and the culprit is punished. Compared to the other devices an advanced system which can capture the video of the event as well as give alert messages of the victim to the respective mobile numbers was designed (Gonde Priyanka Yuvaraj, 2018). This smart system is better than famous mobile apps, bulky belts and a separate garment which is known to all.

Another system contains a normal belt and when it is activated, tracks the location of the victim using GPS and sends emergency messages using GSM (Basavaraj Chougulaet al, 2014), to the three emergency contacts and the police control room. Similarly a Global Positioning System and Global System for Mobile communication based vehicle tracking women employee security system (Poonam Bhilare et al,2015)that provides a specific software to track the location of the vehicle as well as provides alert messages when pressing a emergency button. The vehicle position collected by the device can be viewed on Google maps app. In spite of tracking the victims place, they can intimate important contacts that the person is in crisis and share the exact place (Sridhar Mandapati et al,2015). We can add more no. of users in the emergency list. The only thing they have to do is to trigger an SOS button provided and this app also provides additional first-aid measures.

This paper highlighting on a secured system which is intended exclusively to serve the purpose of providing confidence and protection to women. The purpose of this current work is to create a portable shelter device for women, which provides following facilities 1. Alerts family and friends by sending emergency message 2.Captures the images/video of the aggressor to maintain evidence for legal actions. In the developing countries like India, women continue to face societal trials and are often victims of cruelty and intense crimes and according to a global poll conducted by Thomson Reuters, India ranks fourth in most hazardous country in the world when considering G20 countries. This project focuses on the safety system that is developed exclusively to serve for the women so as they at no time feel stranded while fronting such social challenges. Our system will aids people to take defensive measures as soon as probable during: Domestic violence, Being followed while walking Bidden physical or sexual stabbing and Precarious neighbours.

MATERIALS AND METHODS

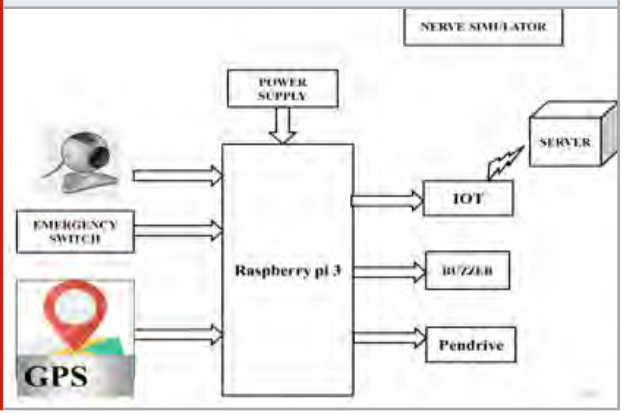
In existing system, a disaster response state distinguishing app VithU developed so as to offer women safety even in the disaster situation. VithU, is an emergency App that, when two times continuously clicking of the power button of our Smartphone, readily sending out warning messages every two minutes to our contacts that we feed into the app as the chosen receivers or caretakers. The message says "I am in danger. I need help. Please follow my location." These alert messages can be in any languages using speech recognition (Revathi et al, 2018). The receiver will receive a link to our location in the time gap of every 2 minutes giving them our updated location. Also, we will get updates on the Crime Scene in India and a "Tips Feed" option exclusively giving you safety tips in an emergency situation.

Disadvantages

- The device doesn't have any camera inside to detect the emergency situation and to safeguard our privacy.
- It is very tough to monitor the device
- The rate of arriving will be high which leads to misguiding.

This paper proposes the intelligent safety system for women security using Raspberry Pi. If a woman is imperilled to attack by an adversary, then a indication has to be done automatically, by her (it will be ideally situated at a convenient place on the body). This switch will trigger the controller (raspberry pi) to capture the image/video of the aggressor and send it to the mail through IOT (Rajapriya et al, 2019) and also the captured video/image are stored in pen drive for the purpose of evidence and identification. Efforts have been made to improve a method by which this image can be intimated on a web server and also indicate through the buzzer. A Global Positioning System module will track the location and uploaded to the web server. Advantages of the proposed system are High secure, system will be easy to handle, Environmental friendly system (Subasri et al, 2018).

Figure 1: Block diagram of the device



Hardware Device: Figure 1 represents the methodology used in our paper. There will be two switch power switch and emergency switch. The device can be activated by just pressing the power switch. When the power switch gets switched the camera starts to capture the video coverage for each 10 seconds. Simultaneously, the Buzzer gets activated and it will alert the surrounding by giving sound which we encoded in the coding.Here we have given the word "HELP ME,HELP ME". The video coverage will be sent to the contact which was given by us in coding. When the emergency switch gets pressed,

Nerve simulator will starts working. The Nerve simulator can be made like a pad which can be placed in slippers or in shoes. When the emergency switch is pressed nerve simulator gets activated and gives upto 1 amps shock to the crime person by kicking him.

The mail which sent during the process consists of live video coverage in the time period of each 10 seconds along with the current location tracked by Global Positioning System(GPS).This security alert will be send to the mail which we are encoded in python coding. More than three mail can be given in the coding. The video recorder is activated when the power switch is pressed. The video coverage will be taken for each 10 seconds. It records the whole incident and it is useful for the crime investigation. The components required to build the system is given in Table 1.

Figure 2: Nerve simulator

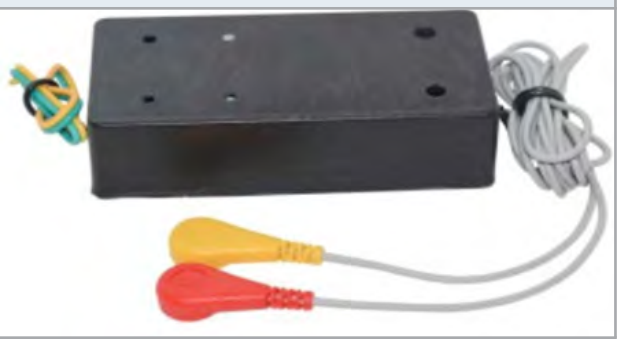


Figure 3: Global Positioning System(GPS)

RESULTS AND DISCUSSIONS

Figure 4 represents the location sent with an alert message to the pre-set contacts for every 10 seconds when the power switch gets switched. In addition to this, the main feature of this system is it takes the video for every 10 secs to all our premier contacts, hence in emergency situation, they can readily find the status of the victims. This will be useful to find the exact location and what steps we have to take immediately against that to rescue them. In the previous system only through internet it will be sent to the contact persons, so in most of the situations if networking is not in good condition and there will be a lack of communication. In contrast to this, in our proposed system, in the absence of Internet also we can send the messages to the contact persons. Nerve simulator is used to suddenly disturb the person who involved in violence for a very short duration to safeguard the victim for a fraction of seconds. Transcutaneous electrical nerve stimulation (TENS) is the use of electric current produced by a device to stimulate the nerves for therapeutic purposes.

Table 1. system specifications

Hardware Specifications	Software specifications
GPS	Python
Raspberry Pi	Python IDE
Camera	-
Emergency button	-
IOT	-
Buzzer	-
Nerve Simulator	-

Figure 4.a: Security alert message

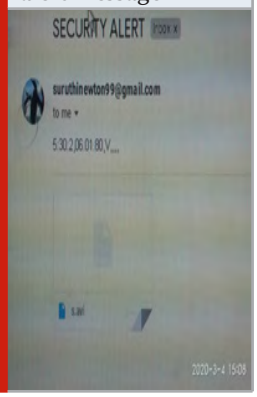


Figure 4.b: Security alert system

CONCLUSION

This type of idea plays an important role towards providing the fastest way of safety for women. The proposed design will deal with critical issues encountered by women in the latest preceding and will help to solve them through using safety devices. This work was focused on developing a smart low-cost device to help women, feel them safer and prevent the occurrence of rape, harassment and other dangerous situations. The project would aid in enhancing the welfare and confidence of all despairing and harassed women and children.

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Performance Analysis Between IEEE 802.11a/b/g/n/p and ac Standards

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ABSTRACT

The advancement in technology had led to the evolution of various IEEE 802.11 standards in communication systems. A MANET (mobile ad hoc network) self-configures continuously as the network consists of movable devices which are linked wirelessly. Hence, the network is also known as infrastructure-less network. The mobility in the network causes dynamic changes in topology which can provide various challenges in wireless communication. There are different types of standards in IEEE 802.11 like 802.11a/b/g/n/p and ac which have different specifications that can suite any type of application that the standard is intended for. This paper gives insight about the performance analysis between the IEEE 802.11 standards from various aspects and the evaluation has been simulated using NetSim Simulator.

KEY WORDS: IEEE 802.11, WIRELESS COMMUNICATION, MANET, NETSIM, DSR, OSI MODEL.

INTRODUCTION

The ability to communicate between the devices instantaneously is the ultimate goal for the communication system and the utilization of these systems has brought tremendous change in the information society. They are two categories of communications i.e. wireless and wired. Wired technology is not suitable for long distance communication as it has many disadvantages like high cost of cables, cable ageing, flexibly is limited etc. Hence, for long coverage of area it is achievable only through wireless network. The growth in wireless technology is considered to be very important as it has vast applications starting from a simple remote control to communication for a long distance. In wireless network the devices can communicate each other through a wireless channel. Mobile ad-hoc network well- identified as wireless ad hoc network is wireless network that is dynamic in nature. These are established and maintained by mobile nodes without relying on fixed routers.

Many new technologies have emerged in the communication market which follows various standards as a high level of data rate for transmission purpose is essential in order to meet the increased requirement for better quality services. In 1997, 802.11 standards are released by IEEE (Institute of Electrical and Electronics Engineers) for wireless networks (Han, 2004). As these standards will define how the devices communicate with each other in any application. Thus, due to advancement in communication systems these standards came into existence. The purpose of IEEE 802.11 standard is to proffer specifications for connectivity of wireless network for fixed or moving stations. In Figure 1 IEEE 802.11 protocol stacks is presented. In OSI (open system interconnection) model, IEEE 802.11 covers bottom layer.

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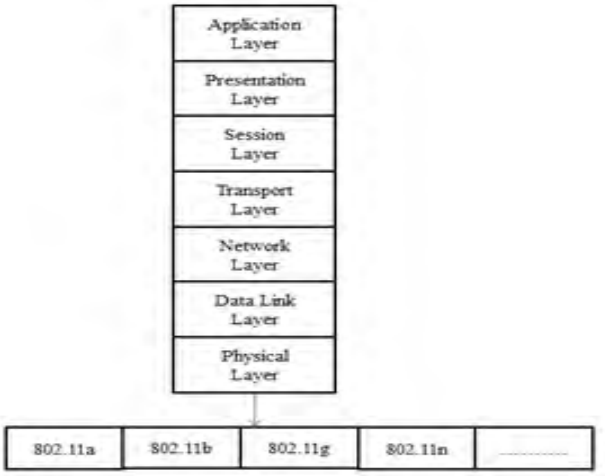
Figure 1: IEEE 802.11 Protocol Layers



Evolution Of Ieee 802.11: The list of IEEE 802.11 standards are shown in Table1. This technology even today continues to evolve as these standards are widely accepted. According to other technologies, 802.11 offer few advantages like greater data throughput, high speed data rates, reliability and low cost.

Table 1. List of IEEE Standards

S.No	IEEE Standard	Release Date
1	802.11	June 1997
2.	802.11 a	September 1999
3.	802.11b	September 1999
4.	802.11g	June 2003
5.	802.11j	November 2004
6.	802.11y	November 2008
7.	802.11n	October 2009
8.	802.11p	July 2010
9.	802.11ad	December 2012
10.	802.11ac	December 2013
11.	802.11af	February 2014
12.	802.11ah	December 2016
13.	802.11aj	April 2018
14.	802.11ax	September 2019

IEEE 802.11 STANDARDS: Designed for wireless networking, 802.11 (Hiertz, et al., 2010) is a multiple set of standards which can be used according to different applications. Earlier, these standards had supported data rate of 1Mbps to 2Mbps for most of the applications but later, the IEEE group realized that the initial standards would not be sufficient due to the increase in demand of wireless communication to attain reliable transmission. Hence, different extensions to IEEE 802.11 had been developed which have diverse specifications and can operate at various frequencies. The different types in IEEE 802.11 standards are:

IEEE802.11a: In the year 1999, IEEE created an extension to the original standard 802.11and named it as IEEE 802.11a. This standard operates at frequency of 5GHz. It allows reception and of information at rate of 1.5 to 54 Mbps. It uses OFDM (orthogonal frequency division multiplexing) modulation scheme as it has spread spectrum technology. The main advantage of this standard is to provide maximum speed. It is more expensive and less prone to interference.

IEEE802.11b: In July 1999, this standard has been introduced and it offers data rate of 11 Mbps in the operating frequency of 2.4 GHz. 802.11b employs direct sequence spread spectrum (DSSS) scheme(Pursley, M. B. 2002) and provides least expensive wireless LAN specification. It is prone to interference and has lowest maximum speed.

IEEE802.11g: In 2003, the IEEE802.11g standard was ratified. It can provide bandwidth up to 54 Mbps. 802.11g operates at frequency of 2.4 GHz and can employ DSSS or OFDM modulation schemes. It has fast maximum speed and prone to interference. It uses SISO (single input single output) antenna technology.

IEEE802.11n: The main aim of IEEE802.11nstandard (Perahia, et al., 2013). is to increase the data throughput rates significantly in WLANs. In 2009 this standard was ratified and operates both in 2.4 or 5 GHz. This standard has fastest maximum speed as it supports maximum bandwidth up to 300Mbps. It uses MIMO (multiple input multiple output) antenna technology.

IEEE802.11ac: IEEE 802.11ac was released in the year December 2013 and in Wi-Fi networking it is the latest generation. It utilizes dual band wireless technology and has 5GHz operating frequency, bandwidth of 20, 40, 80 and 160MHz. 802.11ac has different ranges for bandwidth segments like 15 – 200Mbps for 40MHz, 7.2 – 96.3Mbps for 20MHz and, 65 – 866.7Mbps for 160MHz and 32.5 – 433.3Mbps for 80MHz. It offers enhanced performance and coverage compared to other standard protocols i.e. IEEE 802.11a/b/g/n. IEEE 802.11ac uses Multi- user MIMO modulation scheme (Sharony, 2006). This scheme is a set of multiple-output and multiple-input technology for wireless network, in which multiple users can communicate with each other easily.

IEEE802.11p: It is developed to support communication between vehicles. This standard can be used for high speed vehicle communication as it includes WAVE (wireless access in vehicular environments). The main function of IEEE 802.11p(Jiang, D., et al.,2008)is to improve traffic efficiency and to prevent accidents. It uses channels with in the 75MHz bandwidth in the 5.9GHz band.

Compraision Table: The comparison between different IEEE 802.11 standards (Bhoyar et al., 2013) is shown in Table 2.

Application OF IEEE 802.11: 802.11 standards are utilized in various applications. IEEE 802.11a is used in small

range areas and it supports video streaming. 802.11b is used for internet access. 802.11g is used by small size business users. 802.11n is used where sharing of large files like video or voice takes place. 802.11ac provides streaming of HD 802.11 standards (Varshney, 2003)are utilized in various applications. IEEE 802.11a is used in small range areas and it supports video streaming. 802.11b is used for internet access. 802.11g is used by small size business users. 802.11n is used where sharing of large files like video or voice takes place. 802.11ac provides streaming of HD video simultaneously to multiple clients. 802.11p is used in vehicular communication systems. The standards like 802.11 and 802.11ah are used in IoT (Internet of Things) as these offer extended operating range in low frequency range.

Table 2. Comparison Table

	a	b	g	n	ac	p
Release	Sep	Sep	Jun	Oct	Dec	July
date	1999	1999	2003	2009	2013	2010
Frequency (GHz)	5	2.4	2.4	2.4/5	5	5.9
Bandwidth (MHz)	20	22	20	20/40	20/40 /80/160	20
Stream Data Rate Min-Max (Mbit/s)	6-54	1-11	6-54	7.2-72.2/ 15-150	7.2 -96.3/15-20 0/32.5-433. 3/65-866.7	6-54
Modulation	OFDM	DSSS	OFDM	MIMO-OFDM	MIMO-OFDM	OFDM
Range(m)						
Indoor	35	38	38	70	35	
outdoor	120	140	140	250		1000
Interference	Less	More	More	More on 2.4 /Less on 5	Less	More
Throughput (Mbps)	27	4-5	20-25	160	433	27

Figure 2: Discovery of Route

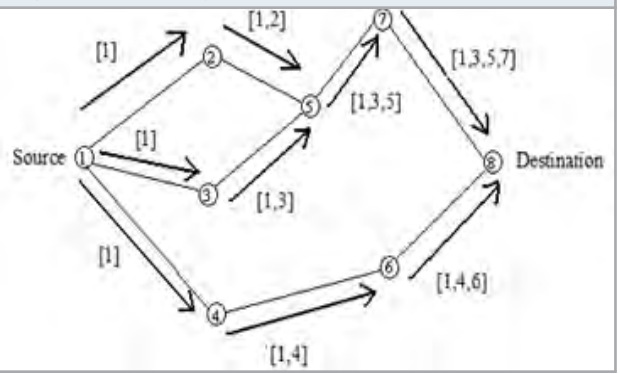
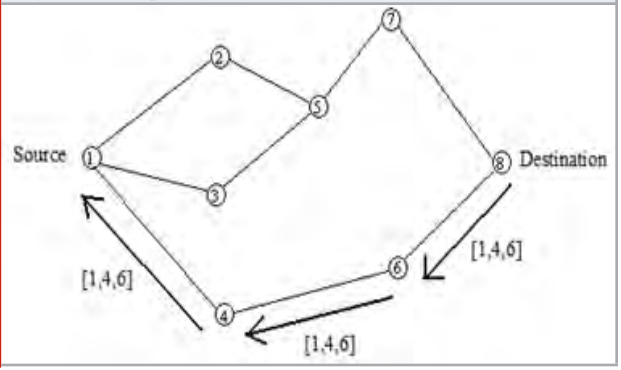


Figure 3: Propagation with Route Record



Dynamic Source Routing: In MANET, DSR (Acs, et al., 2006) is a demand routing protocol which is particularly aimed for mobile nodes. This protocol acts as reactive routing, which is utilized for wireless ad hoc networks. The two significant functions in DSR (dynamic source routing) are discovery of the route and maintenance of the route as the devices maintain and discover the routes in the network by utilizing these two functions. Every single node in the grid/network maintains route cache to store the discovered paths. DSR is a simple, efficient protocol and the shortest path can be easily created with in the network. The advantage of this protocol is as per the requirement route will be established so, in the network the necessity to discover the remaining paths to other nodes is eliminated. The discovery of the route from source to destination is shown in the Figure 2.

The destination sends route reply packet to the source as shown in the Figure 3. The shortest path is considered as it contains least number of nodes and thus the information is transmitted accordingly. Hence, the consumption of the bandwidth is low and in the network when it is required the route is always perfectly discovered.

Table 3. Simulation Settings

Parameter	Value
Simulation time	900s
Size of the Packet	1460 bytes
Mobility Model	Random Way Point
Velocity	10m/s
Pause time	1s
Environment Size	500 x 500m
Traffic Type	Constant Bit Rate(CBR)
Number of Nodes	20
Routing Protocol	DSR

METHODOLOGY

The simulation was conducted by using NetSim simulator software. NetSim is used for network design as it is a network emulation and network simulation tool. NetSim facilitates the user to virtually build a network consisting of links, devices etc, and to study the performance, behavior of it.

A. Performance metrics: It refers to the capability of the network in which, how efficiently the nodes will deliver the data. Some of the metrics are:

1. Packet delivery ratio: It is the ratio of total number of packets generated at the source to the total number of packets received by the destination.

2. Throughput: Throughput (Madhavi, et al., 2011) is total number of packets which are successfully received in unit interval of time.

3. Delay: It is total amount of time consumed by the packet from source to destination.

4. Packet Loss: It is overall number of dropped packets during the simulation.

B. Simulation Parameters: The nodes in the network move according to the model used Table 3 shows the different simulation parameters. In random way point model, each node or device selects random target and move to that target according to the speed given to it and upon reaching to that target, the node pauses and again travels to the random destination. The analysis has been shown in later section.

RESULTS AND DISCUSSION

A. Packet Delivery Ratio: Figure 4 indicates the delivery ratio of packets for various IEEE 802.11 standards in the application layer. The ratio of packet delivery is high in IEEE 802.11a and ac compared to other standards.

B. Throughput: Figure 5 shows throughput variation for different IEEE802.11 standards in the application layer. The throughput for IEEE802.11b, g and n is high.

Figure 4: Packet delivery ratio

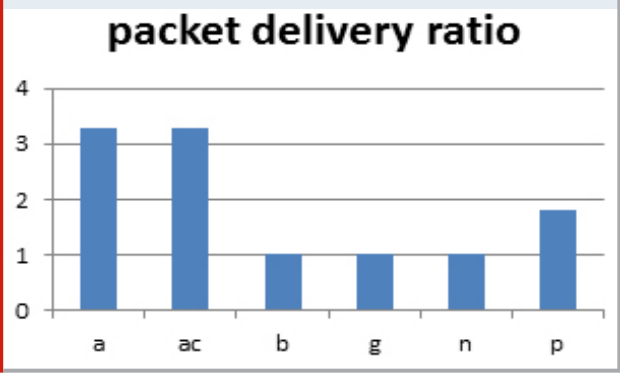
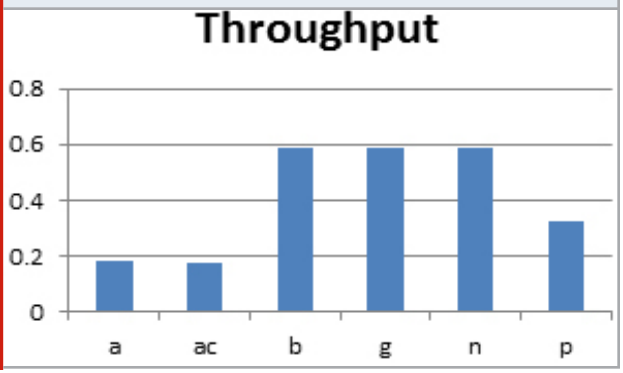


Figure 5: Throughput



C. Delay: The comparison of delay for different IEEE 802.11 standards is presented in the Figure 6 for the application layer. Delay is high in IEEE 802.11ac and b.

Figure 6: Delay

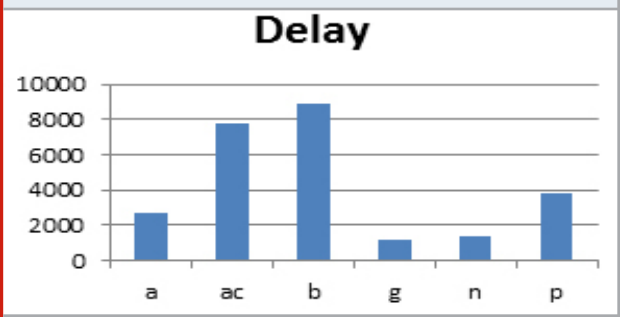
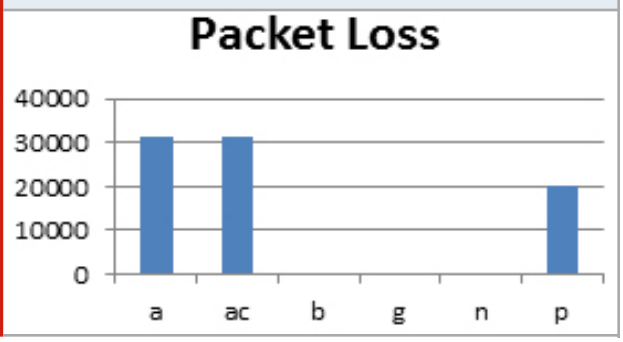


Figure 7: Packet Loss



D. Packet Loss: Figure 7 displays the loss of packets in network. There is no loss of packets in 802.11 b, g and n where asin 802.11 a, ac standards, the packet loss is very high in application layer.

CONCLUSION

The main advantage of utilizing IEEE 802.11 standard in wireless communication is the capability to transfer data rate at high speed in order to meet the increased requirements. In this paper, for various IEEE 802.11 standards the performance is analyzed on the basis of metrics like packet delivery ratio, throughput, delay and packet loss. Each standard has its own advantage and can be used in different scenarios depending upon its application.

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Automation of Antimicrobial Susceptibility Testing using Image Processing Techniques

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ABSTRACT

The Emerging technologies like Image processing, Nano technology , Bio Nanomaterials, Sensor Technology, MEMS and NEMS helps to accelerate the AST test for rapid and accurate results and leads to the automation of the systems for Telemedicine, Teleconsulting, Telemonitoring , Teleadvice electronic prescribing and mobile health specially for Veterinary applications. For Humans visual Communication and instrumentation are the important tools for diagnosis but in the case of animals today the expertization of the former or doctor is the major role as cost is high and lack of the skilled technical experts leading to the use of the antibiotics randomly, which causes the death of the animals and unnecessary deposition of Antibiotic in the Animal Body. In the case of the humans Isolation and identification of the organisms are important but in the case of animals identification of the right antibiotic in right dosage in less time is important. Digitalization and IOT are the key tools for the penetration of the systems to the formers at remote location and automation of the systems is the best solution to reduce the expertise professionals and costs . No of standard methods like agar dilution, broth , optical , mechanical , thermal and nontechnology methods are existing . Each one has advantages and disadvantages based on the several factors such as ease of doing , flexibility, cost, time, reliability and accuracy. In this paper a schematic study was made on the different methods of the AST for the scope to automate the method for best in terms of cost, time and accuracy. This review paper provides the scope of different promising, emerging and future technologies for automation and ease of the procedure in the field of rapid and accurate Antimicrobial Susceptibility Testprofiling.

KEY WORDS: ANTIMICROBIAL SUSCEPTIBILITY TEST, AUTOMATION.

INTRODUCTION

The In veterinary bacterial Infectious diseases caused by bacterial pathogens are a worldwide burden. For a veterinarian to confirm the susceptibility to chosen empirical antimicrobial agent or to detect the resistance in individual bacterial isolates the performance of the AST in terms of time, ease of doing, accuracy is most important . The identification of the appropriate antimicrobial agent and its Chemical resistance and residues and controlling of the bacterial diseases of the animals are for best growth rates and reproductive rates for both animal health and human food security. There is great pressure on the veterinary community to reduce the overall usage of antimicrobial agents which reflect in the human health.

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It is the responsibility of the Clinical Microbiological Laboratories along with the patent magnet system includes the isolation and identification of the causative Bacterium by performing the ASTs are very complex , labour oriented and in accurate and time taking depending on the growth of the pathogens .

The information by the AST will helps the veterinarian to select the appropriate antimicrobial agent and to develop the antimicrobial stewardship programmes. In human medicine standardized AST test are available1960 but for the veterinary is only from 2000. In humane medicine isolation and identification of the each and every minor organisms are important resulting the expertization and expensive. But in Veterinary the selection of the right antimicrobial agent for the treatment of the individual animal and profile can be used for the entire folk. The diversity in the host animals and the application of the test results has made the drastic development of ASTs that provide the accurate reproducible, clinically relevant results for veterinary pathogens.

The conventional culture-based antibiotic susceptibility testing (AST) methods are too time-consuming (typically 24–72 h), rapid AST is urgently needed for preventing the increasing emergence and spread of antibiotic resistant infections. There is no of Veterinary pathogens test methods are developed by the Clinical Laboratory & Standards Institute (CLSI) and its Subcommittee Veterinary Antimicrobial Susceptibility Testing (VAST) for Animal welfare like agar dilution, broth , optical ,mechanical , thermal and nontechnology methods are existing.

Most of the these method involve the manual interface for the result data. Some of these methods give either quantitative or intermediate or only resistant to a particular anti microbial agents. ASTs for individual isolates like no of Enterobacteriacese, Pseudomonas species , Staphylococcus species ect. is important with the species that may posses the acquired resistance mechanism.In most of the standard tests lot of time will be consumed for the growth of the organism on the nutrient media and for the quantitative results for the resistance to the particular antimicrobial agent. The methods are to be engineered to address these problems.

On the application of the amino acids and proteins and the bio nano materials, the concentrations of the required organisms can be magnified by separating the organisms from the samples of large quantities to small quantities for test. Today Extensive research is going on for the integration of the digital and nano technologies with the standard ASTs to make it possible to develop the automated AST systems to penetrate to the remote locations of the former. By making use of IOT plat forms one can develop the networking between the formers, pathologists and Veterinary Doctors and pharmacists for telemedicine and telemonitoring and teleadvise. . By developing the algorithms to compile the ASTs results one can develop the electronic prescription and mobile health app. By using the AI and Machine learning one can develop the system for the prediction of the animal health profile .once the electronic data was developed it can be used for validation of the electronic prescription and as ell as for R & D purpose.

Among the different ASTs some one can felicitate the automation techniques and can develop the electronic data for further processing. By using the image processing methods Agar dilution method , Chromogenic agar medium , broth micro dilution, disc diffusion, spiral gradient end point technique, micro dilution method can be automated to generate the online quantitative data for the dynamic ASTs from time to time. In mechanical methods sensors like Asynchronous magnetic bead rotation sensor, single cell AMBR bio sensor, surface acoustic wave sensor, cantilever based mass sensors are developed. In optical methods like optical density measurement , biomimetic polymer sensing technique, FACS technique, optical tweezing technique can be tailored for the automation and dynamic measurements. Fiber optic Raman Spectroscopy method is emerging for precise measurement. Micro fluidics and micro droplets is the another emerging flied which facilitate the sample at micro levels and gives the precise results. Inventions in the bio nano materials and fluorescent nano materials led new dimensions for the ASTs.

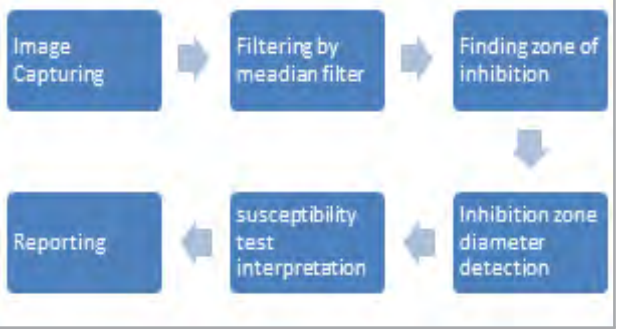
Automation of the strategies results in lowering the working cost, capacities to at the same time test with numerous specialists, and intensity for programmed/ automatic test. consequently, procedure of this test not just creates the exact estimation by dispensing with of estimation variety and human mistakes. But it also offers other benefits like: reduction of times for technicians, reduction of laborious jobs, managing of larger samples and maintaining information .Electrical information that is associated with the Laboratory Information System (LIS) is appropriate to processing, digitizing and transmitting telemedicine targets via the communication network.

Asts For Image Processing Techniques: Image analysis(Collins, Sean R., et al,. 2006) of the images which will give the information on the reaction of the pathogens with the antimicrobial agents by changing the properties like either color analysis or boundaries or intensity of the pic cells or the area of the inhibition zone for the susceptibility in the image . This process involves image processing principles such as noise cancellation, image smoothening, Shaping of the Image, area of the image, edge enhancing, edge detection and area detection methods. The image may be in color or in gray and the analysis The ASTs suitable for this method are Agar dilution method , Chromogenic agar medium , broth micro dilution, disc diffusion, spiral gradient end point technique, micro dilution method, Etest are common in most of the microbiology labs.

The benefit of these strategies (Rhoads et al., 2015) has been its lower operational expense, ability to concurrently check with several agents, and automated

testing efficacy. The automated testing method provides reliable calculation by removing human error, and also offers other advantages such as: reducing tedious job, managing large data sets, and maintaining electronic data. The design of automated test consists of electronic equipment; like plate reader, video capture board, and software that accurately calculate and analyze the sensitivity results from the zone of inhibition in the disk diffusion test output. The methods of determining and analyzing were justified on the basis of image analysis, like image smoothening, edge enhancement, edge identification including zone identification.

Figure 1: AST Processing Diagram with Image Processing



Among all above mentioned methods disk diffusion method (Bayer et al., 1966) is best and cheaper and easy applicable for image processing method for automation methods also. One can develop the programs for the calculation of the area of the colonies time to time. Form such calculations it can be determine the susceptibility of particular antibiotic and the rate of susceptibility for a particular antibiotic within 2-3 hours depending upon the growth of the medium on the agar. Antibiotic disks before and after growth using agar dilution are shown in figure1.

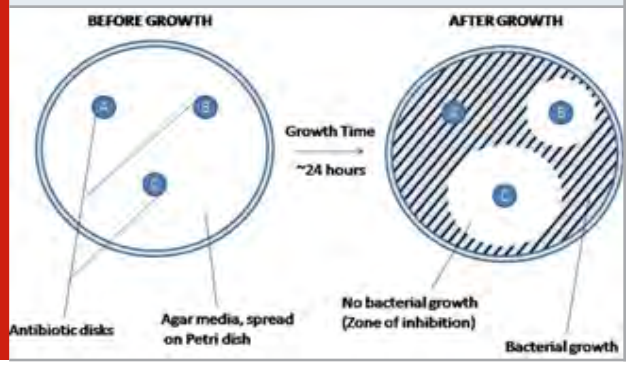
Figure 2: Bacterial Growth on Agar Plates

Steps for disk diffusion test on agar plates are
1. Collect the sample with culture swab
2. Plating on culture plate and incubate overnight and after incubation agar plate will be as shown in figure2
3. Colony Morphological identification
4. Disperse colony in a culture media
5. Pour it onto culture plate to spread uniformly.
6. Place the antibiotic discs all around the nutrient agar plate as shown in figure3 and incubate it overnight

Figure 3: Antibiotic Disk Placed on Nutrient Agar Plate

In Figure 4 Extremely efficient Antibiotic C creates large circle indicating no growth of bacteria whereas an inefficient antibiotic A displays growth of bacteria against corresponding organisms. Its Inhibition area could be used to measure the effectiveness of moderate antibiotic B. With this technique most suitable antibiotic for the microorganism can be determined.

Figure 4: Antibiotic disks before and after growth using agar dilution

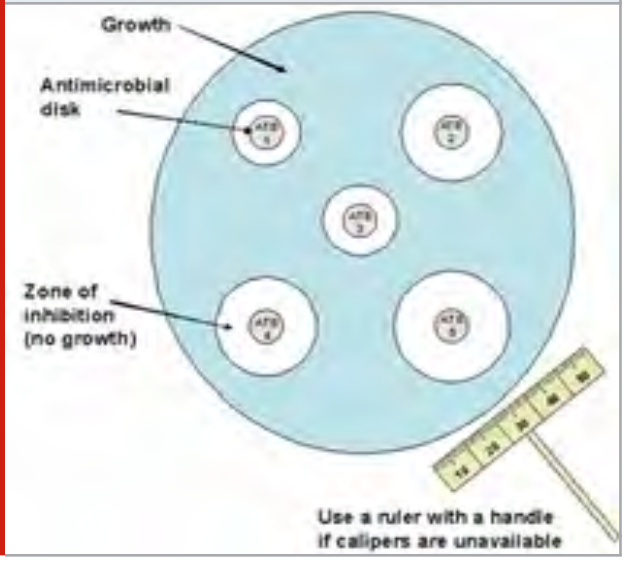


As Automated/semi-automated zone inhibition readers are more costly generally measuring the diameter of the inhibition zone often is done by technician using a scale as shown in figure5. Different Software Available For The Processing Of The Images

AntibiogramJ: This software implemented using Java, is an easy to use tool to determine zone of Inhibition with Images captured using even with mobile or digital cameras .This software doesnot uses any hardware equipment, even with Images captured using even with mobile Zone of Inhibition can be calculated.

Automated Plate Assessment System(APAS): The APAS(Glasson, John, et al,2016) framework utilized in this investigation comprised of a plate-taking care of component, a lighting module, a computerized camera, and diagnostic programming. A great screen connected to the framework was utilized for checking on advanced plate pictures. It is a picture examination gadget committed to screening agar plates for development. It can specify the different state types present, and, with utilization of an interpretive calculation, apply standard guidelines to allot each plate and case into advantageous classes for further preparing.

Figure 5: Measurement of zone of Inhibition using ruler



YeastXtract Software: YeastXtract(Shah, Najaf A., et al., 2007) programming was created for dynamic development bend investigation of spotted agar cultures. It is a product application that breaks down time arrangement images of yeast cell clusters, with the end goal of dynamic development bend investigation, and can be utilized on working frameworks with the Java. From the YeastXtract UI, an arrangement of pictures is chosen utilizing a 'Peruse' work, and computerized investigation is started by choosing the "Start Analysis" button. After examination is finished, the identified regions of culture spots are shown.

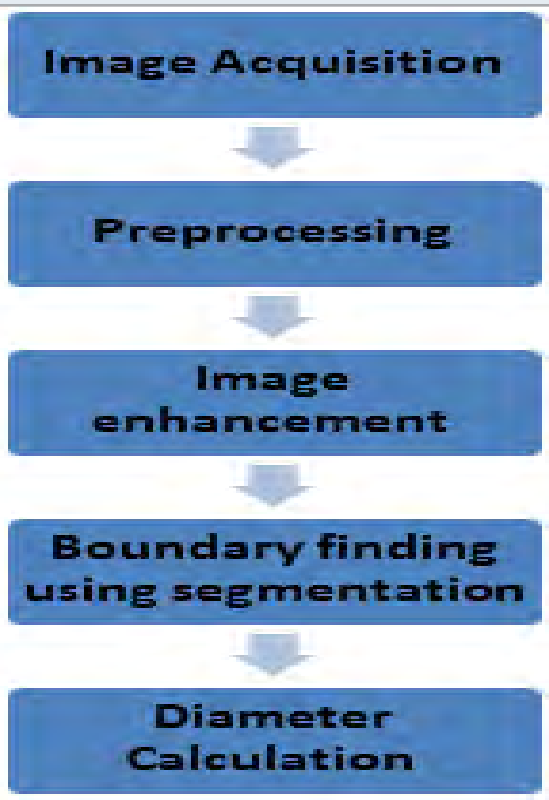
Colonyzer: Culture thickness can be evaluated from agar plate pictures. photographic picture catch is less expensive and quicker than spectrophotometric examination of cell thickness in fluid wells. Colonyzer's(Lawless, Conor, et al, 2010) specific quality is its affectability in distinguishing colonies with low thickness. It accomplishes affectability by redressing for any lighting inclinations in caught photos, and by fragmenting pictures, separating among agar and culture, utilizing a two-segment Gaussian blended model.

CellProfiler: Open-source programming, Cell Profiler™(Lamprecht, Michael R. et.al,, 2007) to consequently distinguish and quantify images. The programming utilizes the idea of a pipeline, which is a progression of modules A commonplace pipeline comprises of stacking the images, redressing for lopsided light, recognizing the objects, and afterward taking estimations on those objects

AutoCellSeg: It contains intuitive and simple to-utilize highlights choice, post-altering and investigation. AutoCellSeg (Torelli, Angelo, Ivo Wolf et.al, 2018) accompanies a GUI which enables the client to choose images, change the parameters, pick the method of activity, select from the earlier data, correct the outcomes graphically, make plots and spare every one of the outcomes. Contingent on the measure of information, the level of exactness required and the degree of trouble in division, a client is allowed to choose a completely programmed methodology, where post-altering happens after every one of the pictures have been fragmented

Flow diagram for the image processing: The flow diagram for the image processing of the images(Puchkov, Evgeny.,2016) is shown in figure 6

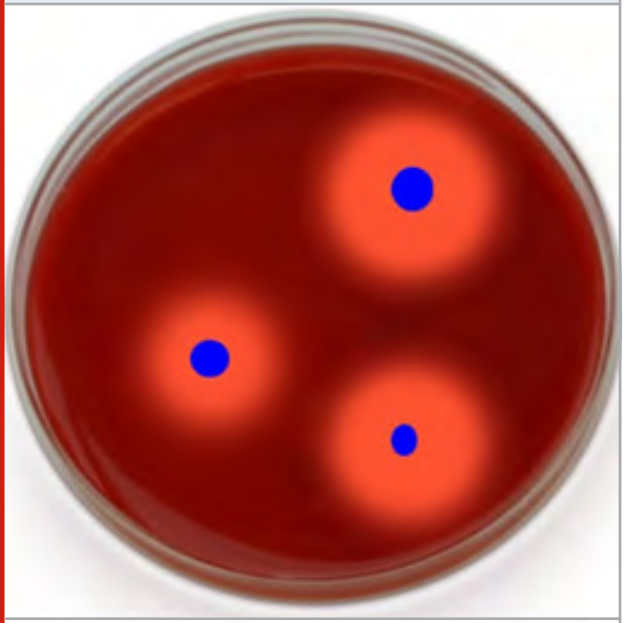
Figure 6: Block Diagram Implementation of AST using Image Processing



Preprocessing: The input image is enhanced via bicubic interpolation and suppressing the unwanted data like noise. The grey color image is extracted after resizing the input image

Filtering: Filtering is utilized to evacuate the unwanted noise, for agar plate image median filter is used to remove the noise. Median Filter is a non-linear digital filter. Such noise reduction is a typical preprocessing step to improve the results.

Figure 7: Generated Agar Plate Image exhibiting Zone of Inhibition using Antibiotics



Centroid		MajorAxisLength	MinorAxisLength
177.69	283.76	75.701	75.465
315.37	167.92	107.23	106.99
313.78	341.92	98	97.255

23.0939964827489mm
36.0205677419745mm
11.4231038302302mm respectively

Boundary detection: It is one of the important techniques for finding the boundaries of the objects within the image. It is one of the essential approaches to locate object boundary inside the image. It functions through finding illumination discontinuities.

Segmentation: Segmentation (Altuntas, V et.al., 2018) is utilized to partition an picture into multiple parts or a segment based on characteristics of the image. It is mainly used to detect foreground pixels from background pixels. Watershed segmentation technique in our segmentation process. A watershed has always been a transition described on a picture of a greyscale. The transformation of the watershed views the picture on which it works with both the intensity of every other level reflecting the height and the lines running around the ridges tops.

Zone of Inhibition Calculation: After segmentation, the diameter of zone of inhibition is calculated. Diameter of inhibited zone is calculated using region growing algorithm.

RESULTS AND DISCUSSIONS

The results are showing in good agreement with the generated sizes and the accuracy is within 1%

CONCLUSION

Antimicrobial Susceptibility tests can be automated with the image processing and the results can be achieved with in 2-3 hours based on the growth of the medium with in the accuratcy of 2-5 %. In feature studies One can increases the accuracy and reduce thes time with the application of the nano particles like Fe3o4 can be used for separation of the bacteria by which the growth period can be reduced drastically

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Intelligent Gloves for Physically-Challenged People

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ABSTRACT

There is always a miscommunication or difficulties present in understanding the dumb people sign language. For that the recognition of that sign language and convert it into voice can be much more convincible. But that can be possible my means of applying the hand gesture recognition method. Actually this solution can be attained through hardware as well as software modules usage. In case of the hardware part, the sensor gloves plays major role in recognizing the gestures which comprises of five accelerometer sensors, Bluetooth and microcontroller which are situated in module, in light of investigation of American Sign Language (ASL) signs. The plan of glove and the idea of translating signals are made by considering the orientation axis and its corresponding voltage levels. An Android application said to be Speaking gesture (voice-English) act as a software portion. These two portions are connected through Bluetooth, changes over them into content. The actual framework will respond to the dumb peoples' hand gesture which converts into text with proper accuracy and high range of inputs.

KEY WORDS: ACCELEROMETER SENSOR, ANDROID APPLICATION, AMERICAN SIGN LANGUAGE, BLUETOOTH MODULE, HAND GESTURE RECOGNITION, INTERNET OF THINGS.

INTRODUCTION

As of late, hand motion recognition is broadly utilized in human Computer collaborations. They assume an essential job in charge application like automated arms, tele-robotics, 3-D mouse and virtual reality controlling. It can likewise be utilized in application speaking to the truly tested network like deaf and dump people. Hand gesture identification is the development of intelligent systems, most part utilized for change of communication via gestures into vocalizations.

The target of this paper is to solve the issue of constrained speech ability of the debilitated individuals who realize sign based communication by changing it into a type of verbal and vocal correspondence. Sign acknowledgment should be possible by two significant strategies to be specific vision-based methodology and haptic based methodology. In this proposed system, a haptic based methodology is presented. As the earlier vision based approach had constraints like lighting, low speed response, large data processing Sign based communication is the essential methods for deaf and dumb society. As like some other language it has grammar and vocabulary but utilized visual approach for interchanging information. The issue emerges when deaf or dumb individuals attempt to communicate to others by utilizing these sign language grammars but ordinary persons are generally unaware of these grammars.

This is because normal people are usually unaware of these grammars. As a result, sign language is known by deaf and dump society or her/his family members. The

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work portrayed right now with a point of introducing a framework to help hard of hearing and dumb individuals which interpret the sign language acknowledgment into content with static palm side of right hand pictures. This task presents a fast algorithm that can be mainly used for recognition of the number of fingers opened in a sign indicating an alphabet of the binary sign language. This proposed framework can be operated using the gestures with the help of android mobile phone. In this proposed system, an accelerometer sensor can be utilized to convert hand gesture into processor known signals.

For sign identification the accelerometer information is determined. Also to measure the magnitude as well as the direction of gravity accelerometers are used. So as to decide the accelerometers, we turn the touchy pivot as for gravity and utilize the resulting sign as an all out estimation. Coordinating a solitary chip remote arrangement with a MEMS accelerometer would yield a self-sufficient gadget sufficiently little to apply to the fingernails, on account of their little size and weight. Accelerometers are appended to the fingers. The location of the accelerometers shows the sensitive direction of the accelerometer in the plane of the hand. An accelerometer sensor based gadgets can be effectively reachable to the ordinary man as of its simple function.

Literature Review: There are so many related works has to be done by various methodologies and some of they can be explained as follows: In case of data glove is utilized to confine the hand sign of a user. Glove is fixed by flex sensors. It is placed in all fingers that varies with degree of bend.(Philomina et al., 2015) In the analysis of the possibility to apply the role of a remote mouse, by identifying human gestures. It is based on dual channel doppler radar sensor. (Younghook,Kim et al., 2016) . A device with wireless glove comprises of accelerometer and flexes sensors. It senses the action of fingers and hands which consists of speech synthesizer circuit. Here, the circuit converts the actions of hand to speech output. (Fale et al.,2015).

In some other proposed work which uses both flex sensors and accelerometer which is portable and less expensive too. (Divyani Shende et al., 2016). One of the papers with proposed system is a keen glove which can change over communication via gestures (Albert Mayan et al., 2016) in which the glove is embedded with an MEM sensor And the embedded hardware with Flex sensor and micro sensors are placed which helps in reading the gestures performed by the user. (Rajapriya et al., 2019) IoT has the application even in monitoring purpose, in which the ultrasonic sensor can also be used to sense the damages happing in module and provides the alert to the users (Kalaivani et al., 2019).An automatic sign language identification framework has been developed by random forest classifier a machine learning algorithm, (Pallavi et al, 2019) and to translate the sign alphabets and words into text and sound. (Revathi et al., 2018).

The speech recognition can be achieved by means of NOIZEUS information list; thereby the noisy speech can be created. In this good work, the Euclidean distance between the actual test parameters as well as the clusters parameter can be analyzed. Then this condition can be analyzed with and without the utilization of adaptive filters. One of the major advantages of an IoT can be that it can act as universal global neural network, in which the cloud and the other decision making things can be happened. And so many potential added things of various research works can be discussed in this work (Subhasri et al., 2018). The major intend of this proposed framework is to build up a cost efficient framework which gives voice to voiceless individual with the aid of intelligent glove.

Framework Using Flex Sensor: Six flex sensors are joined on the palm index, thumb, ring, middle, pinky fingers of a glove so as to quantify the bowed of the fingers and the grasp of the hand then the gyroscope and accelerometer is set on the back of the hand in request to decide the movement and position of the hand on space. Sensors were interfaced with Arduino mega 2560. All the information gathered with different features according to the motion is sorted with their individual letters in order or word as their objective data, and the last gathered information is randomized so as to reduce the change and to ensure that the model stay common and over fit fewer.

After preparing the trained dataset, the machine was trained with Random Forest Classifier. Here, the machines are prepared with dataset. for the specific gesture, the glove sensors information is handled by the controller changing over those raw information to significant information. Then the information is transmitted from the microcontroller to serial port. After that, it is collected by the python through the serial interface. Then it is saved as temporary dataset and finally it send through the machine. It extracts and predicts the suitable output for corresponding gesture with reference to the Random Forest Classifier model. As the out has been recognized as per the model, laptop screen and speaker has been used. Output recognized was printed on the python output screen as well as the vocal of the particular gestures being recognized was played.

MATERIAL AND METHODOLOGY

Around Five accelerometer sensors (ADXL337) are attached to the five fingers of the hand .these sensors are mainly used because it can measure even a small voltage change in the hand movement. The pins are available in all the three axes. The X, Y, Z pins are for output connection. The sensors are used to measure the voltage change. The analog value is sent to the ATmega2560 microcontroller. UARTs,a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to maintain the microcontroller, simply connect it to a computer with a USB cable or power. An android application called "Voice English" is created with the American Sign Language gestures. A Bluetooth element is utilized to build communication between the microcontroller and

the android application made. A LCD display is used in the transmitter side to know the transmitter what they are doing. It is coded with the software part that is made with the embedded c language using the Arduino IDE .The smart glove created is worn in the people hand. According to their movement in their hand gesture, the analog voltage measured is sent to the microcontroller. Within the microcontroller, the paired android application receives the text from the controller. This can also used as a voice player to detect their speech.

Figure 1: Block Diagram of proposed system

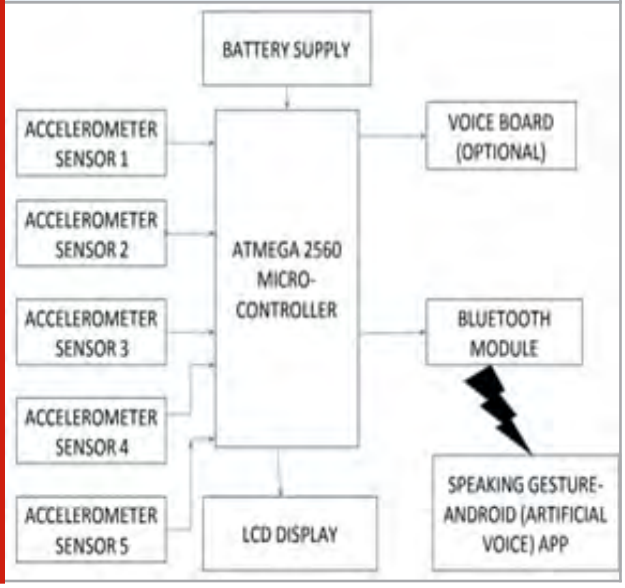

Figure 2: An example for alphabet 'G' is displayed

RESULTS AND DISCUSSION

A moveable communication framework is designed by utilizing the accelerometer sensors, an android mobile and microcontroller. Existing framework having only restricted communication ability. For speech synthesis, an android mobile function can be utilized to defeat this problem. Here, the accuracy and vocabulary is quite superior when compared to some other speech synthesizers. This framework comprises of accelerometer sensors. It is used to find the hand motions. Here, the sensor readings are stored on the microcontroller unit. Based on the hand motions, LCD displays an output. Embedded C programming is utilized. Arduino software is utilized to build up the framework. This framework discovers the hand motions in few seconds. The kit uses American Sign Language which has an added advantage over the British sign language. And also it is a single hand gesture module. It is easy to use and give many voltage variations even for a small moment.

CONCLUSION

The developed hand gesture is tested and works satisfactorily. It has a good response with ADXL337, activating the microcontroller connected to the module. In this paper, a new hand gesture is proposed with several merits such as low cost, easy controlling, good reliability, and reduced complexity when compared with other gestures. This proposed hand gesture module can be used by the deaf and dumb people, paralyzed people who are under care .With the use of wifi technology, gestured message can be reached to a person irrespective of the distance they hold. Location tracking option can also make the application even more interesting and pros to the application.

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Characterization and Simulation of Amperometric Biosensor in Detection of Cancer with DCCV Technique and Applied Physics

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ABSTRACT

Rapid detection,reliable identification and real time monitoring of un regulated growth of living cells and non living cells which are causing diseases like cancer remain not only a scientific problem but also a practical challenge of vast importance, especially in tailoring effective sttratergies.A great challenge is therefore to develop rapid, high sensitive,specific devices and enable dynamic real time measurements of the dynamics of the growth of the cancer cells where the malignancy of living cells is a prime problem.Biosensor is one which redesigned the research in the detection of pathogens with high selectivity,sensitivity ,cheaper and resulting in less time. For the detection of the cells among various electro chemical sensors is one of the best platforms are the powerful quantitative tools with high sensitivity.DCCV technique is used and the reference electrode is coated with PANI to increase the conductivity from 110 ma to 1200 main oxidation domain.The conductivity is also increased from 110 ma to 1500ma range sharply by increasing the scan rates from 0mv/second to 500 mv/sec.Applied physics variables like surface tension, viscosity, thermal engineering variables, fluid mechanics are taken into consideration for doing the simulation studies and optimization of the biosensor.The experimentation results showed high stability, good selectivity, reproducibility and good sensitivity of quantification of cancer cells.

KEY WORDS: AMPEROMETRIC BIOSENSOR, DCCV, CANCER, ELECTRO CHEMICAL SENSOR.

ARTICLE INFORMATION

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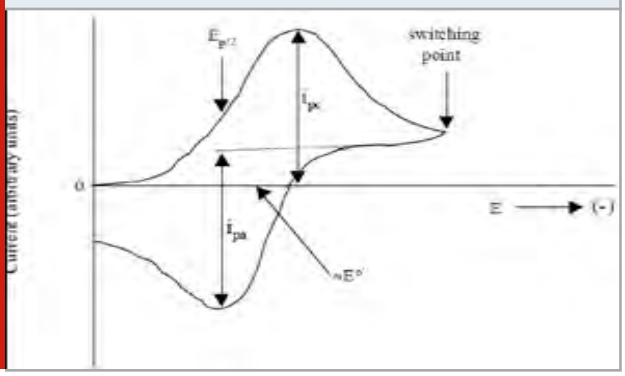
INTRODUCTION

The components of biosensor comprise of Working electrode made of glassy carbon, stainless steel and gold, Counter electrode made of platinum and calomel, Reference electrode made of silver and silver chloride. The following figure illustrates the schematic of biosensor in detection of malignant cells. Once the analyte is drop casted over the working electrode, the transport of electrons from anode (WE)to cathode(CE) takes place after a predefined voltage at reference electrode. The amount of current output is the measure of oxygen level in the analyte. Carcinoma cells appear as normal cells initially, slowly they divide and will not undergo differentiation, develop abnormal nuclei, also have altered metabolism. Normal cells have a specific genetic code to perform a particular operation of the human body. Cancer cells do not have a genetic code to perform a particular action instead they invade neighboring cells, steal energy from them and cause destruction to cell biology and bio chemical process.

Figure 1: Schematic of biosensor with 3 electrodes

Cancer cells are referred to as hypoxia cells whose oxygen intake is very less and so carbon dioxide outlet is very low. Amperometric biosensor whose output is current calibrated in terms of milli amperes, micro amperes is utilized for detection of hypoxia cells based on their oxygen content in the cell. The technique of Direct current cyclic voltammetry invented by (Graham Davis , 1984) is used in detection of carcinoma cells. The DCCV technique comprised of oxidation and reduction cycles where accumulation of high current in milli amperes is flown at oxidation and low current of micro amperes is flown at reduction. The potential in mv is taken on X axis and current in milli or micro amperes is taken on Y axis and the resultant plot of a DCCV.

Figure 2: DCCV plot of sensing cancer cells

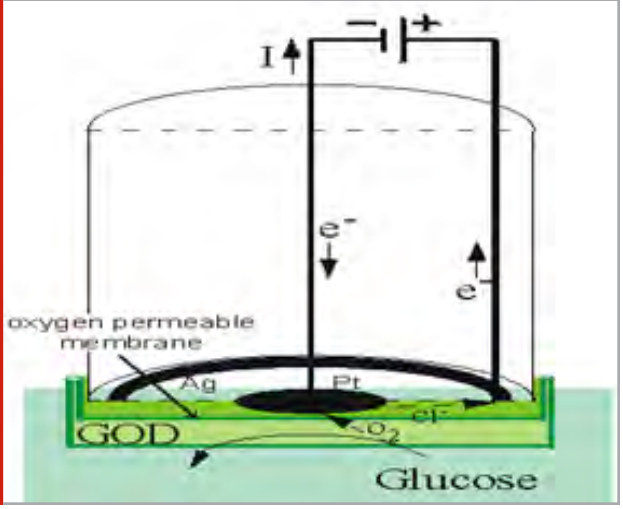


The above diagram shows a bare DCCV plot for voltage E in milli volts vs current in milli or micro amperes. I pc stands for peak current at cathode, I pa stands for peak current at anode. The above diagram shows the DCCV plot for one cycle at a fixed scan rate in milli volts/second. The current initially increases and reaches a peak value and then depletes in forward and reverse scan respectively. The oxidation and reduction cycles are compiled at a fixed scan rate completing one cycle. The DCCV method is used in calculation of bioelectric potentials in the past.In this work, it is used for detection of cancer by calculating REDOX potentials of cancer blood analyte. Normally the living cells without cancer have high redox potential insuring high redox current in the order of milli amperes, but cancer cells do not release much electrons and so the Redox potential is very low and the current being in nano ,pico and micro amperes.

MATERIALS AND METHODS

Amperometricbiosensor: It is used in all medical glucose monitors. The bio receptor segment is usually an enzyme, (R.Baronus , 2010) for example, glucose oxidase. The current created is legitimately corresponding to the analyte fixation and the assurance of current which is produced turns out to be a lot simpler. The key favorable circumstances of Amperometric (Michael et al, 2006) biosensors are their relative effortlessness and simplicity of scaling down. They present astounding affectability as well. Amperometric biosensors require the analyte important to be a substrate for an enzymatic response, an essential restriction in endeavoring to expand the utilization of this kind of biosensor. Along these lines, in the field of bio detecting, Amperometric is the most widely recognized location technique. On account of entire cell bacterial detecting, this is certifiably not a usually utilized strategy. Amperometric biosensors (Hristove, 2006) were invented 40 years ago and it is used for detection of the pathogenic concentration in a given analyte, cancer is not a Pathogen, so certain methods are adopted to detect cancer in a given blood sample.

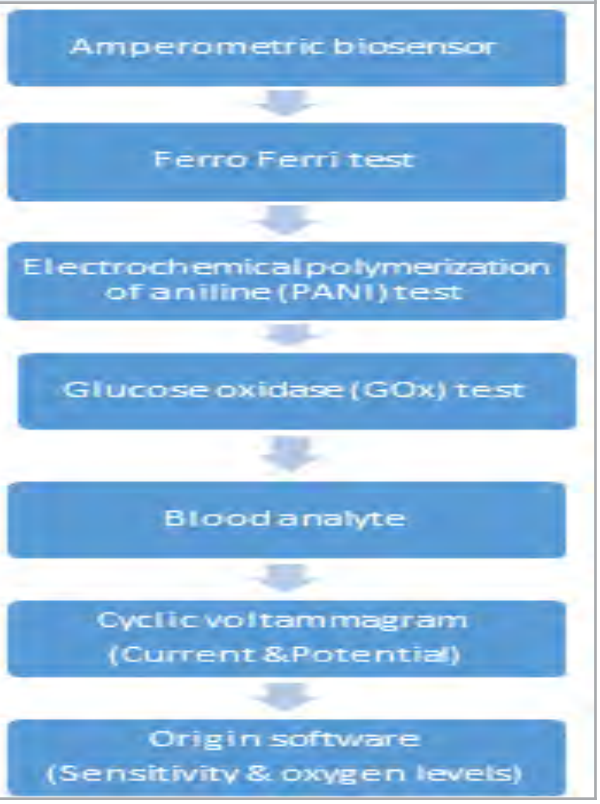
Figure 3: Amperometric Biosensor



The Amperometric biosensors which is also called as a "cell" are interfaced to a system having Electro com software. The red color denotes counter electrode made of Platinum, white speaks to the working terminal made of glassy carbon and green speaks to a reference cathode made of Ag/AgCl. The reference anode controls the potential at the working cathode. The reference anode was Ag/AgCl cathode. Controlling potential applied over working cathode & assistant terminals is the excitation signal. And it was shifted straightly through time the primary output decidedly (- 100 mV to 500 mV). At that point the voltage is filtered backward, triggering a negative sweep back to the first potential to finish the process. Single or different cycles can be utilized on a similar surface. (Ligi, 2020).

A cyclic voltammograms was the graph for reaction current at the operating terminal to excitation potential. Which implies, the response current at operating electrode and excitation potential were the two factors that determine the plot of the voltammograms. Proposed Methodology for Cancer Cells Detection Cancer detection through biosensors include three main steps. They are Ferro ferri, PANI and GOx tests. After performing the above mentioned above main steps, blood analyte is obtained from which both current and potential is measured. Finally, with the help of Origin software, the both sensitivity and oxygen levels are calculated from which the detection of the cancer cells is performed. All the mentioned steps are summarized in the following flow chart figure 4.

Figure 4: Flow chart of propsed method of Cancer Detection

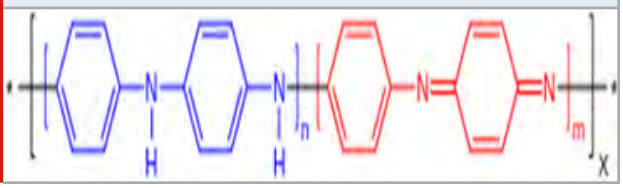


Ferro Ferri Test: The Ferro Ferri test is a startup potential for the biosensor to characterize. In the cyclic voltammetry (CV) plot, after performing this test the biosensor is ready for characterization. The cyclic voltammetry is a practical logical method utilized for the electroactive species study. As a triangular excitation potential is applied to the anode, the current at the working cathode is directed. CV screens the oxidation-decrease conduct of substance species inside a wide potential territory. (Dhananjaya, 2018) Cyclic voltammograms are electrochemical counterparts to the spectra in optical spectroscopy. The subsequent voltammograms can be broke down for major data with respect to the redox reaction. In current work, the reference electrode controls the voltage at operating electrode.

Reference electrode was Ag/AgCl electrode. The voltage applied over working electrode & counter cathodes goes about as the excitation signal. And it was fluctuated straightly through time. Initially, the sweep is shifted decidedly between - 100 mV and 500 mV. Last mentioned, the potential is checked backward bearing, delivering negative to first potential to end cycle. Single or various cycles can be utilized on a similar surface. When the applied excitation potential is taken on x axis and the reaction current at the working electrode is taken on y axis, the plot that is called as a cyclic voltammograms. Which implies, the applied excitation potential and the response current at the working electrode are the two factors that determine the plot of the voltammograms.

Introduction to PANI: Polyaniline (Sedan,2016) was found in the mid-1860s by Lightfoot. The main conclusive report of polyaniline didn't happen till 1862, it incorporated an electrochemical strategy for assurance of little amounts of aniline. In mid twentieth century, infrequent reports are distributed on the PANI system. The structure of polyaniline is given in the figure

Scheme 1



Structure of polyaniline (n+m = 1, x = half degree of polymerization).

Polymerized from the economical aniline, in one of three idealized oxidation states polyaniline can be found

- leucoemeraldine – white/clear & colorless (C6H4NH)n
- emeraldine – green for the emeraldine salt, blue for the emeraldine base ([C6H4NH]2[C6H4N]2)n
- pernigraniline – blue/violet (C6H4N)n

PANI Solution Preparation for the experimental work
The preparation of PANI solution includes the following steps:

Step 1: The utilized PANI solution in the current work experimental stage consists of Hydro chloric acid, aniline and water. The amount of hydro chloric acid is one molar, the amount of aniline is 0.1 molar and the amount of water is 2.5 ml.

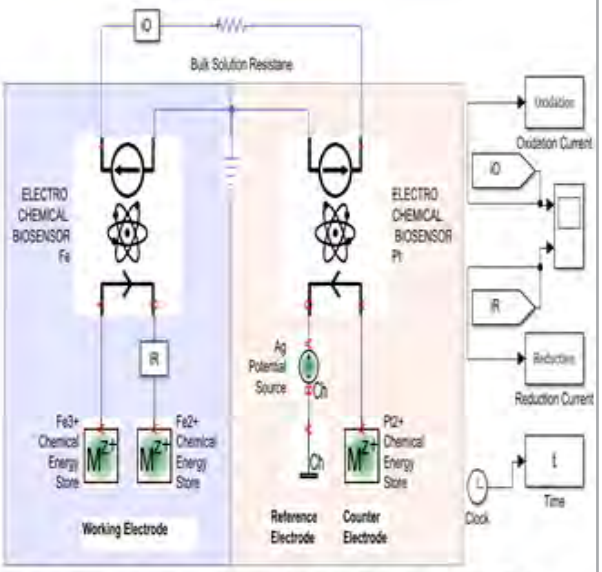
Step 2: Take solution of PH= 2 and add to the above solution.

Step 3: Mix both the solutions until the new solution becomes a perfect electrolytic solution.

After the completion of above mentioned steps, take a pippete (measuring instrument) and drop caste on the working electrode.

Simulation in MATLAB Simulink: The above diagram is MATLAB Simulink for electro-chemical sensing.

Figure 5: Electrochemical (amperometric) biosensor simulation study with Ferro ferri, PANI, GOx, Mobilization and Immobilization stages (www.mathworks.com)



Electrochemical (amperometric) Biosensor Simulation Study with Ferro Ferri, PANI, GOx, Mobilization and Immobilization Stages

RESULTS AND DISCUSSION

The sharp variation of current 110Ma in the oxidation and 1.14 micro amperes in reduction. This shows the biosensor is ready for characterization. This is a startup current which shows the transport of electrons between electrodes near the surface of bulk solution for amperometric biosensor in diagnosing pathogens and cancer.

The current being constant for 5milli seconds and dropping to null after 10 milliseconds.This shows the consistency of current flow results in enhancement of conductivity of Biosensor in detection of cancer. The fluid mechanics variables are high (60 mm of Hg for normal cells and very low(20 mm of Hg)for cancer cells. As cancer progresses, the value of fluid mechanics variables completely decreases towards zero mm of Hg.

Figure 6: Ferro ferri simulation of electro chemical biosensor.

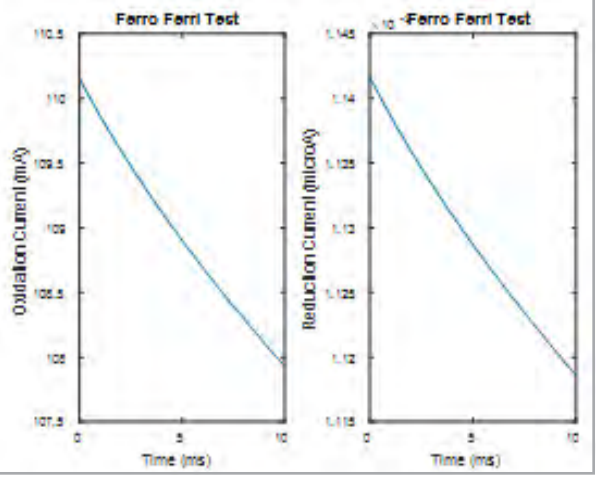


Figure 7a: PANI Simulation of Electro Chemical Biosensor PANI Solution.

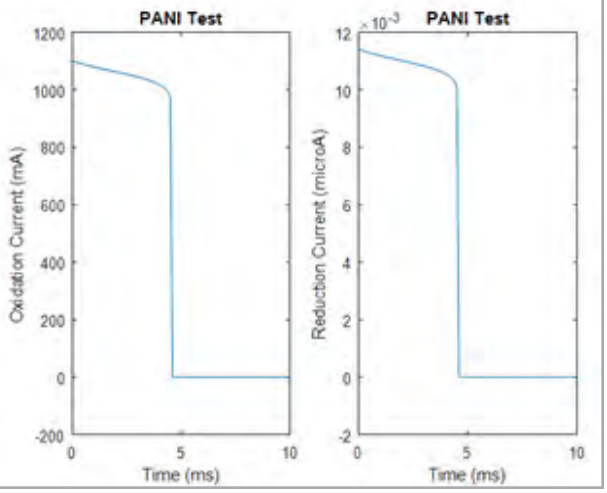
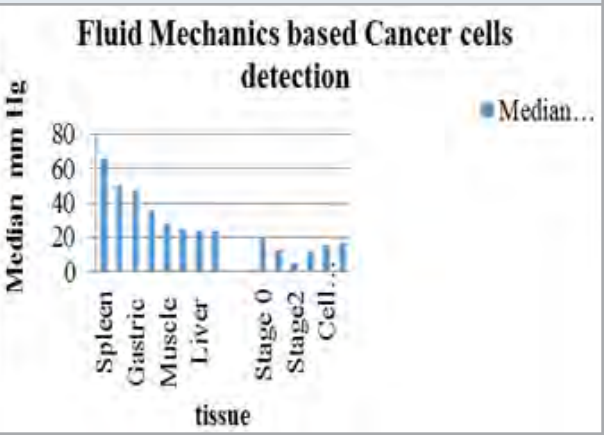


Figure 7b: The above diagram is fluid mechanics methodology detection of cancer cells. (Carmela,2017)



The surface tension is low for cancer cells and high for normal cells. It is found that surface tension is 20 milli newton/meter for cancer cells at early age and 40 milli newton/meter for age greater than 50 years. For normal cells , the value of surface tension is about 60 milli newton/meter.

The variation of viscosity between normal and cancer cells is shown above, Viscosity is high for cancer cells and low for normal cells. The values of viscosity are 300 Pascal for normal cell and 400 Pascal for cancer cells.

Figure 8: The above diagram of surface tensionbased cancer detection. (Amid ,2015)

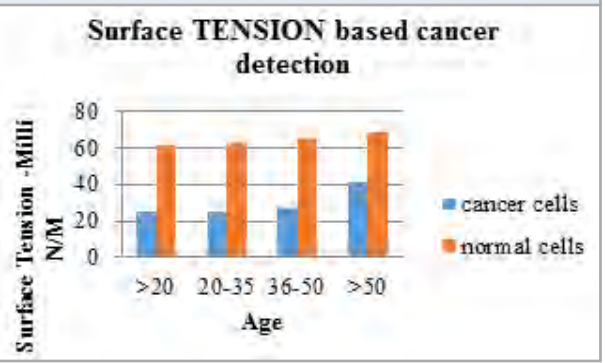


Figure 9: The above figure shows Viscosity based cancer detection .(Caster,2002)

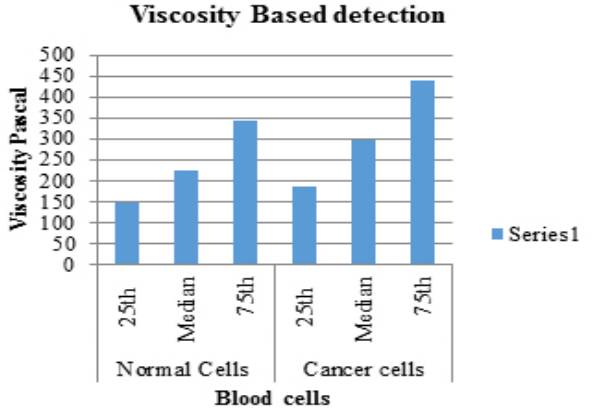
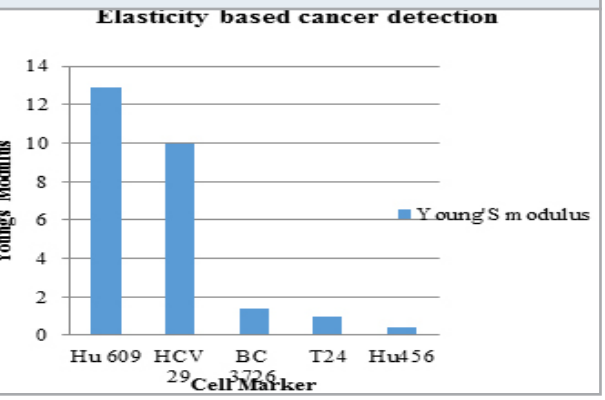


Figure 10: The above diagram denotes elasticity based cancer detection. (Alcaraz ,2003)



The variation of Young s modulus in cancer bio molecules is shown above in the above figure 12.It is found that elasticity is very high(14milli Newton/meter) for normal bio molecule labeled Hu609 and very low 1miili Newton/meter for cancer bio molecule Hu456

The thermal engg variable Blood pressure is high for cancer cells and normal (120/80) for normal cells.It is found that BP is very high for 180 for cancer cell and normal 120 for normal cells.

Figure 11a: The above diagram denotes thermal engineering based cancer detection.(Bining , 1986)

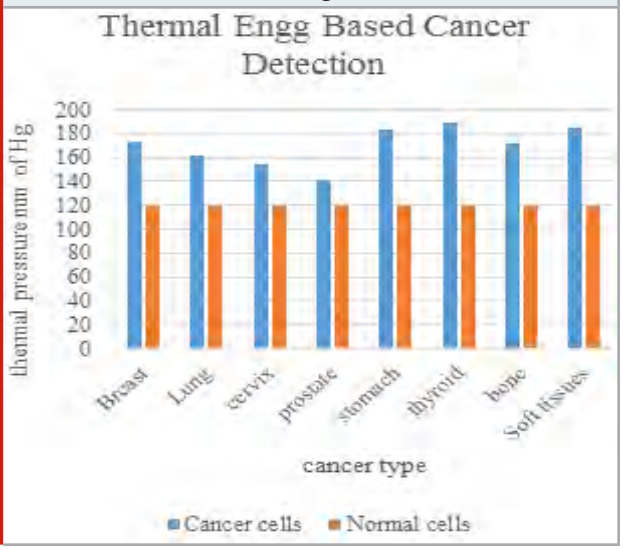
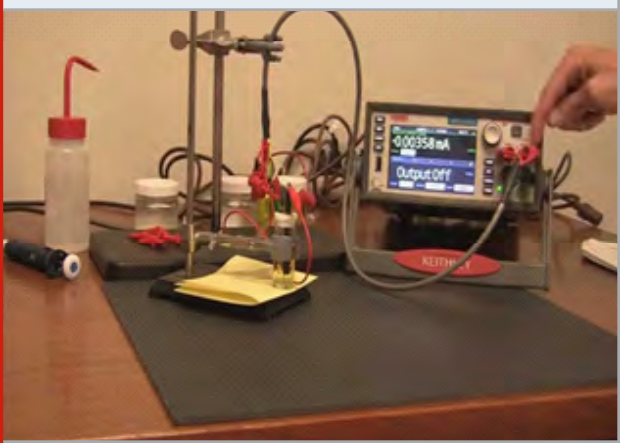


Figure 11b: Experimental set up amperometric biosensor for CANCER Detection



Experimentation in Real Time:

Results and Discussion in real time experimentation: The sensitivity increases with current in oxidation with platinum as counter electrode.the bulk solution used is K4(Fe(CN6)) and NaCL.So the sensitivity has increased enoroumously with current in oxidation.

It is increasing with current in oxidation for normal living cell. The above figure shows the increase in oxygen level in ppm with respect to current in oxidation

in micro amperes.The current in micro amperes is due to usage of platinum as counter electrode.the current range will be in the order of milli amperes if calomel counter electrode is used.

Figure 12: Sensitivity of amperometric biosensor against current in oxidation in micro amperes.

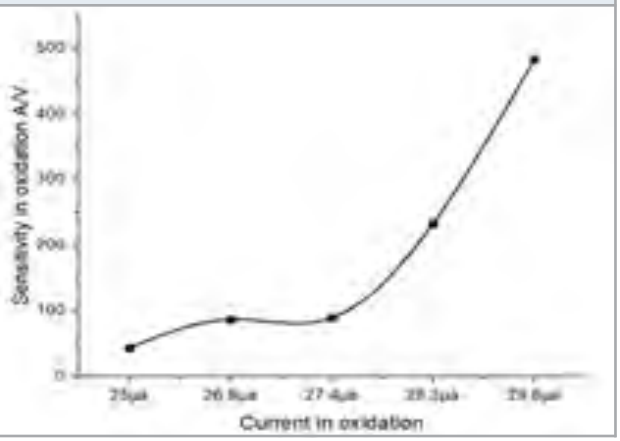
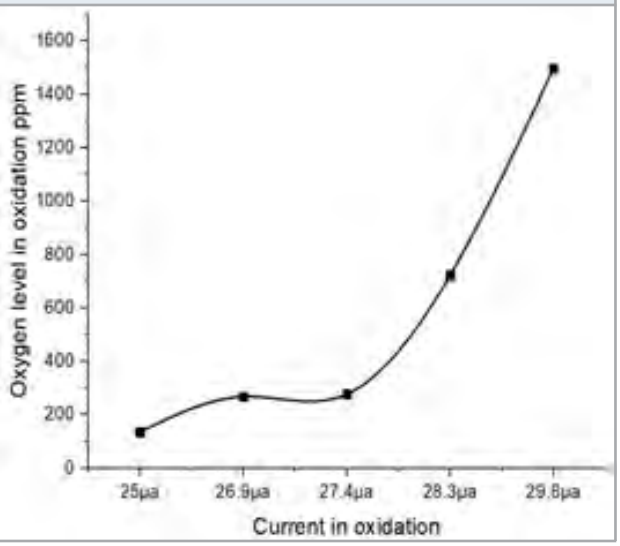


Figure 13: Oxygen content in oxidation in normal cell.



The above figure shows the increase in oxygen level against current in reduction in micro amperes.(Platinum electrode as counter electrode) Sensitivity and oxygen levels of biosensor can be calculated using the formulae as follows.

Sensitivity = 3.3 × standard deviation × slope
Oxygen level = sensitivity × solubility coefficient ×partial pressure. (Kelly's , 2010). Where, slope is obtained from voltammograms, solubility coefficient is given by 0.031 and partial pressure of normal cells is given by 760 mm of Hg and partial pressure for cancer cells is given by 6 mm of Hg.

Table1 describes the final Conclusion of differentiation between normal cell and cancer cell using electro chemical detection in Normal cell and cancer cell using Direct current cyclic voltammetry technique.

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Figure 14: Oxygen content increasing with current in reduction domain in normal living cell due to high electron release in transport of enzymes between working electrode to counter electrode.

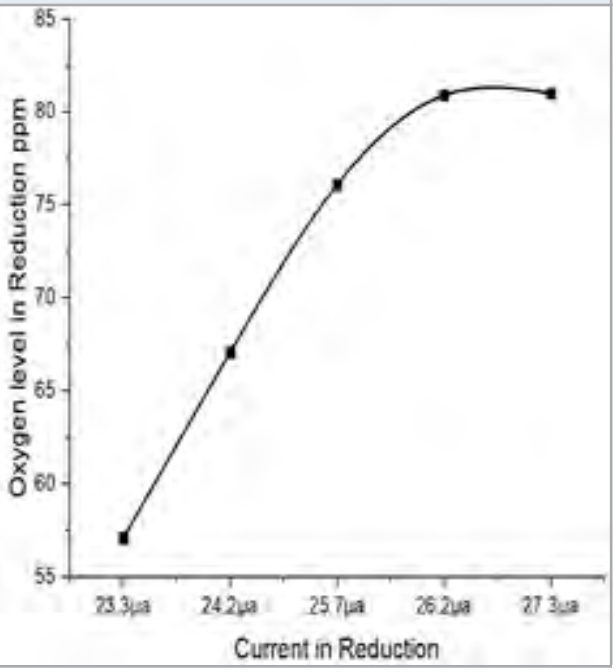

Table 1. Comparison between applied physics and Electro Chemical Cancer Detection

Applied physics variable	Accuracy	Cost	Time
Surface tension	Less	More	More
Viscosity	Less	More	More
Elasticity	Less	More	More
Pressure	Less	More	More
Fluid mechanics	Less	More	More
Electron spin	Less	More	More
Electro Chemical Biosensor	More	less	Less

CONCLUSION

In this paper cancer detection is done using an electro chemical amperometric Nano bio sensor. The electron release is very low in cancer cell where as it is high in normal cell resulting in micro amperes, Nano amperes, Pico amperes for cancer cell and milli amperes in normal cell. It is found that sensitivity, oxygen level come down drastically in a cancer cell. Those two parameters are taken into consideration for detection of malignant cells. So this paper can be concluded as cancer can easily detected through Nano amperometric biosensor through DCCV technique.

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Bio-Medical Signal Processing using Deep Learning

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ABSTRACT

With the enormous expansion of number of cardiovascular patients, the research on automatic classification cardiac arrhythmia, based on Electrocardiogram (ECG) signals have become essential and it also reduces the work load of doctors in diagnosis. Present research utilized Convolution Neural Network (CNN) based detection method for identifying Heart diseases. A Neural network of convolutional type contains more than one layer, then followed by neural network layers. The CNN structure is designed to take advantage of the 1D (sig-nal) or 2D (image) anatomical structure of the input. The two main CNN operations are Convolution,Pooling. We extracted the effcient features from the signal and classified those features using wavelet transform. The proposed design classified,Arrhythmia (ARR), Congestive Heart Failure (CHF) and Normal Sinus Rhythm (NSR) signals. The experimental results contains on ARR signals from the MIT-BIH arrhythmia ,CHF signals from the BIDMC Congestive Heart Failure and NSR signals from the MIT-BIH Normal Sinus Rhythm Databases proved that the proposed design is a promising detection with an accuracy of 90.63%, and significantly improved in performance of several existing methods in the literature.

KEY WORDS: ECG; CNN; WAVELET TRANSFORM; CLASSIFICATION.

INTRODUCTION

The Electrocardiogram (ECG) is a graphical measurement of the electrical voltage estimationof the human Heart. A heart produces minor electrical motivations, pulses can be differentiated by an ECG machine,it records heart fluctuations and showcases this information on a paper. This information is then deciphered by a restorative expert. ECG detects the reason for side effects and furthermore distinguishes abnormal heart beat from the normal status

Any heart inconsistency can change the electrical movement of the heart, so it changes ECG state. A specialist may suggest an ECG for patients who might be in danger of coronary illness in light of family ancestry of coronary illness, smoking, over-weight, diabetes, elevated cholesterol or hypertension. The heart complication that can be identified utilizing ECG incorporate strange heart behavior,extended heart.An ECG recording measures electrical property of the heartbeats and has become emerging tools in the diagnosis of heart complaints. Because of major death pace of heart infections,for discovering and exact separation of ECG sign at early stages is basic for the treatment of patients.

Early and exact discovery of ECG arrhythmia causes specialists to identify different heart maladies. Detection of abnormal signal using artificial intelligence strategies can give proper idea for doctors about the abnormal situation. Characterization and recognition of arrhythmia types can help in distinguishing the variation from the

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normal state of a patient. In the wake of recognizing the irregularity, the heart illnesses can be distinguished and the better treatment of the patient should be possible. Correct detection or classification into arrhythmia types provides sufficient information and helps physician in giving the best treatment or therapy. Signal modelling is an effective technique in ECG signal analysis. Classification of signals is a demanding problem due to problems involved in classification procedures.

Major issues in ECG classification are lack of standard methodology of acquiring ECG features,uniqueness of the ECG patterns, there is no existence of optimal ECG classification rules and variability in ECG waveforms of patients. In order to overcome these problems,most accurate classifier is developed that has an capability to detect arrhythmia is also an issue. Applications of ECG signal classification are in detecting abnormalities, detecting a new patient more accurately than manual checking. It is also used for diagnosis and treatment of heart patients. ECG classification includes steps namely preprocessing, feature extraction, feature normalization, and classification. In this paper a detailed of preprocessing techniques, issues in ECG classification, different database used by researchers, CNN classifier, and different performance measures are discussed.

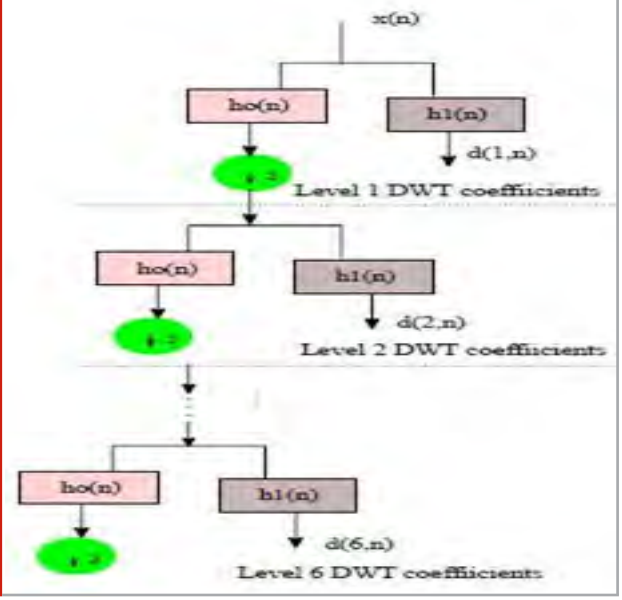
1.1. Arrhythmia: An ECG may be used to diagnose arrhythmia (Kora. P et al., 2015). It is a reading of heart rate and rhythm. In cases of respiratory sinus arrhythmia, the heart rate per minute is usually normal. However, the time between each beat may vary, indicating an arrhythmia (Padmavathi. K et al., 2015).

1.2. Congestive Heart Failure (CHF): CHF is a clinical disorder where the heart doesn't pump blood at the nominal rate by the utilizing tissues .The heart's powerlessness to pump an adequate measure of blood to address the issues of the body's tissues might be an after effect of deficient or damaged cardiovascular filling as well as impeded withdrawal and emptying. Compensatory systems increment blood volume, just as the cardiovascular filling weight, pulse, and heart bulk, to keep up the siphoning capacity of the heart and to cause a redistribution of blood stream. In spite of these compensatory systems, the capacity of the heart to contract and relax decays dynamically and increases Heart failures.

1.3. Normal Sinus Rhythm (NSR): The term normal sinus rhythm (NSR) is the other measurements on the ECG also fall within designated nor-mal limits, giving rise to the characteristic appearance of ECG when the electrical conduction system of the heart is functioning normally. However, other sinus rhythms can be entirely normal in particular patient groups, so it is considered a misnomer and its use is sometimes discouraged. Other types of sinus rhythm which can be normal include sinus tachycardia.Sinus rhythms may be include along with various other cardiac arrhythmias on the same ECG. Several transforms have been proposed for signal analysis (A. E. Hramov et al., 2015) and (M. Vetterli et al., 2008). The signal transforms analysis for those type of analysis is due to some favorable properties that these transforms have, including their signal representation of compact type, inversibility, availability of fast versions for computation, capacity of analyzing signals at each frequency independently, among others. One of the most commonly used feature extraction techniques used in many applications(Z. Xizhi, 2008), denoising (S. Poornachandra, 2008), feature extraction (O. Faust et al., 2015, R. Ceylan et al.,2011) a time-frequency transformation.

Wavelet transforms are preferred for feature extraction because they can express those features in time domain and frequency domains. Using wavelet transforms has a drawback, though, as additional processing is needed. Examples of others features identified are Principal Component Anal-ysis (PCA), Independent Component Anal-ysis (ICA), generalized discriminate analy-sis, or linear discriminate analysis. For each of these we have to use machine learning feature extraction algorithms, classifier model is fed by ECG data, which uses a predetermined algorithm to distinguish the features into their various classes. ECG signals are treated as a quasi-periodic,wavelet transform are inefcient. Therefore the common practice is used to obtain the key features used for distinguish. Different al-gorithms are used for the extracting the data from each ECG beat.

Figure 1: Discrete Wavelet Transform



MATERIALS AND METHOD

ECG data file consists of 162 files are Arrhythmia, Congestive Heart Failure, Normal Sinus Rhythm as shown in Figure 4. The first 96 rows of 'Arrhythmia' are modified copies of the two ECG data in the 48 data files contained in the MIT-BIH Arrhythmia Database. The next 30 rows of 'CHF' are modified copies of the two ECG data in the 15 data files encompassedin The BIDMC Congestive Heart Failure Database. The final 36 rows of 'NSR' are

modified copies of the two ECG recorded data in the 18 data files incorporated in the MIT-BIH Normal Sinus Rhythm Database. These are saved in the data file.

2.1.Wavelet Transform: Wavelet Transforms are effectively helpful for the distinguishing proof of sudden changes in the waveform. Wavelet is a quickly rot-ting wave that has zero mean.Wavelets are in different sizes and shapes. The accessibility of wide scope of wavelets is the important quality of wavelet investigation. The two significant ideas of wavelets are scaling and moving. For every ECG segment coeffcients of wavelets d(j, n), scaling functions c(n) are calculated as shown figure 1

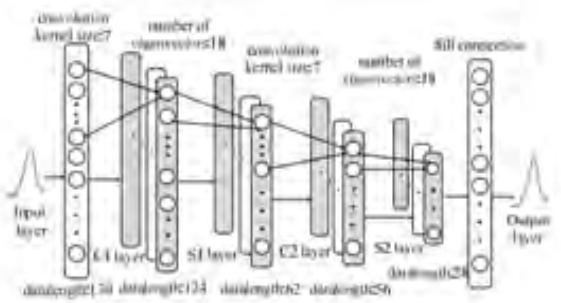
$$f(t) = \sum_{n=-\infty}^{\infty} c(n)\emptyset(t-n) + \sum_{j=0}^{\infty}\sum_{n=-\infty}^{\infty} d(j,n)2^{j/2}\varphi(2^j t - n) \quad (1)$$

$$c(n) = \int_{-\infty}^{\infty} f(t)\emptyset(t-n)dt \quad (2)$$

$$d(j,n) = 2^{j/2}\int_{-\infty}^{\infty} f(t)\varphi(2^j t - n)\,dt \quad (3)$$

2.2. Classification using CNN: CNN consists of two parts, feature extraction and classification. To put it plainly, these two segments total fundamental work of this paper helpfully.whereas piece of highlight extraction comprises of convolution layers and down testing layers. Convolution layers (C-layer) can be viewed as a flu y channel.In the final stage activation function is as shown Figure 2.

Figure 2: Structure of proposed convolution neural network



RESULTS AND DISCUSSION

3.1.Wavelet Transform outputs: An ECG signal, consists of many char-acteristic points. These points describes the behaviour of the ECG signal. An ECG signal consists of pointsless These features of the WT allows the decomposition of a signal into a number of scales. The procedure of signal x[n] is displayed in 3. At each subsequent level, the coefcients which are approximated are again divided into a coarser approximation (low-pass) and high-pass part. Each stage comprises of two digital filters and two down samplers.

Figure 3: CWT of the ECG Signal

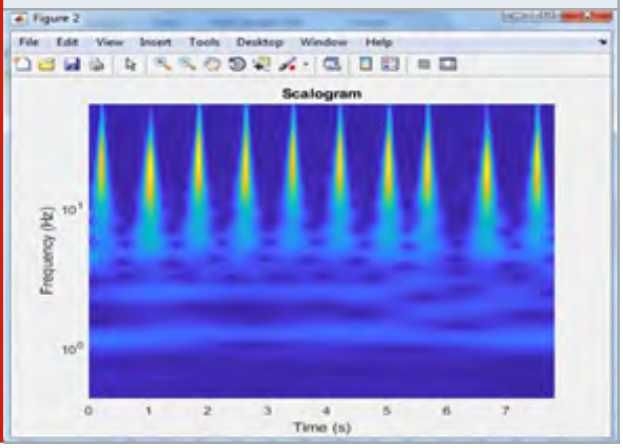


Figure 4: CHF and NSR Signals

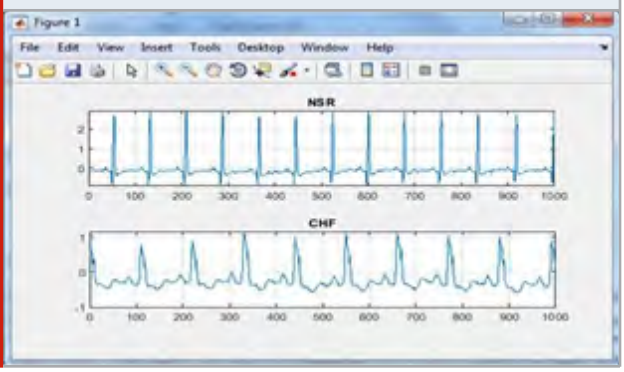
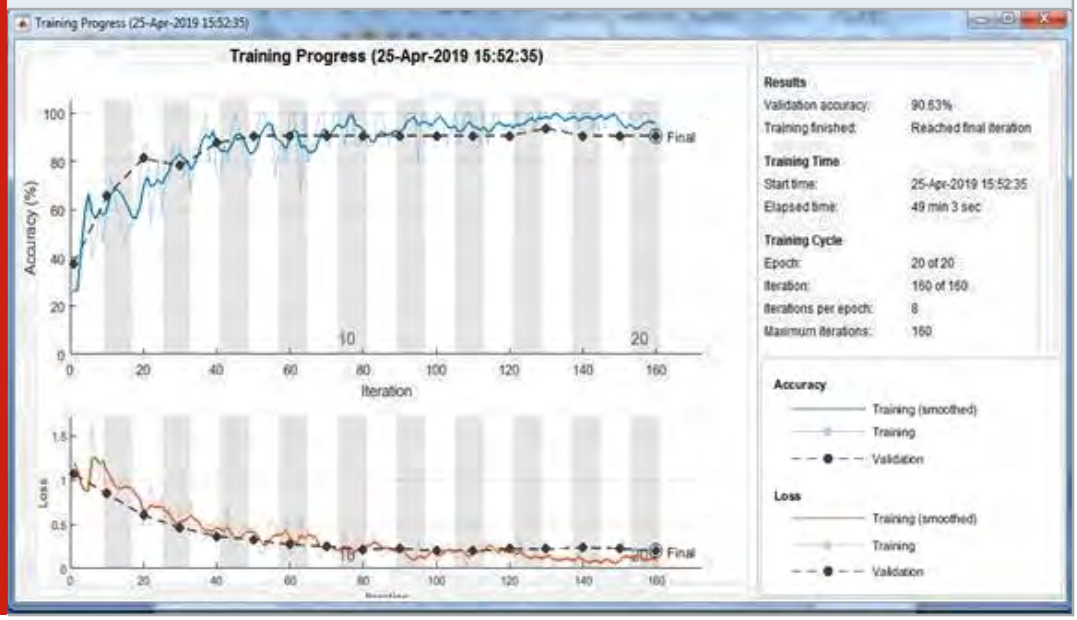


Figure 5: Accuracy using CNN classsifier

Epoch	Iteration	Time Elapsed (hh:mm:ss)	Mini-batch Accuracy	Validation Accuracy	Mini-batch Loss	Validation Loss	Base Learning Rate
1	1	00:01:37	26.67%	37.50%	1.1973	1.0480	1.0000e-04
2	10	00:04:27	60.00%	65.63%	0.8487	0.8438	1.0000e-04
3	20	00:07:20	86.67%	81.25%	0.6919	0.6918	1.0000e-04
4	30	00:10:10	86.67%	78.13%	0.6340	0.6424	1.0000e-04
5	40	00:12:57	75.33%	87.50%	0.5900	0.5632	1.0000e-04
7	50	00:15:46	86.67%	90.63%	0.3865	0.3222	1.0000e-04
8	60	00:18:43	100.00%	90.63%	0.1448	0.2713	1.0000e-04
9	70	00:21:59	86.67%	90.63%	0.2746	0.2486	1.0000e-04
10	80	00:25:31	93.33%	90.63%	0.2708	0.2186	1.0000e-04
12	90	00:28:26	93.33%	90.63%	0.1590	0.2216	1.0000e-04
13	100	00:32:26	100.00%	90.63%	0.0651	0.2026	1.0000e-04
14	110	00:35:25	93.33%	90.63%	0.2449	0.1984	1.0000e-04
15	120	00:38:14	93.33%	90.63%	0.1960	0.2245	1.0000e-04
17	130	00:41:10	100.00%	93.75%	0.1446	0.2224	1.0000e-04
18	140	00:43:46	100.00%	90.63%	0.0313	0.2324	1.0000e-04
19	150	00:46:25	93.33%	90.63%	0.1123	0.2264	1.0000e-04
20	160	00:49:10	93.33%	90.63%	0.0794	0.2003	1.0000e-04

Figure 6: Structure of proposed CNN



3.2. Output of CNN: The CNN is originally developed to handle the 2D data. In this paper we have to work with 1D data. So, we need to modify the data the before applying to CNN is demonstrated in Figure 2. Theevery neuron contribution is associated with yield of the past layer,which is utilized to remove neighborhood highlights. The general accomplishment is assessed by the parameters exactness and time passed are shown in Figures 5 and 6.

CONCLUSION

The ECG signals classification is helpful to avert and recognize the cardiovascular ailments and it is a trivial research in solving medicine problems using computer tech-nology. In order to acquire high quality results, we used Continuous wavelet transform filter bank in combination with CNN. Then, Convolution Neural Network model realizes the classification of Arrhythmia,Congestive Heart Failure and Normal Sinus Rhythm signals. Finally,CNN optimized model learns effective features,completes classification automatically. A good classification accuracy of 90.63% is obtained by comparing with the previous work. This work can also be useful for other researches in detecting Non-linearities in ECG classification and also used to analyze the research area. The basics of ECG classification, its analysis can help beginners to understand the research area.

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An IOT Based Safety Supporting System for Vehicle using Arduino UNO R3

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ABSTRACT

World becomes so fast, in such fast process, people may meet lot of road accidents due to liquor consumption, bad weather conditions. To avoid such problem, the proposed work is developed which can be done by utilizing sensors like alcohol sensor, vibration sensor, eye blink sensor, ultrasonic sensor, voltage sensor. Sensor readings are given to Arduino UNO R3 thereby the decision can be made accordingly. By implementing this framework in vehicles, a huge sort of accidents can be avoided. It is important to change the strategies and mechanisms with effective implementation. Here a cheaper and very prompt embedded based safety supporting system is discussed to stop driving while drunk. To prevent the accidents due to drunken driving, a paper is introduced on an automated framework that recognizes such circumstances and receives measure to avoid it. If any type of threat is detected the controller will automatically stops the vehicle and produces alert to nearby authorities.

KEY WORDS: ARDUINO UNO R3, L293D, IOT, LIQUOR SENSOR, ULTRASONIC SENSOR, VIBRATION SENSOR, VOLTAGE SENSOR, GSM AND GPS.

INTRODUCTION

Factors are proportional to the predicted energy requirements of the vehicle like battery level monitoring, battery charging monitoring, Additional features of sensors are used to prevent road accidents. Sends the information about the vehicle status to the receiver mobile phone. Road security is a significant region of concern. Terrible weather conditions are one of the significant purposes for the rising street accidents (Haddad et al., 2019).

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During foggy climate the perceive ability on street is less that outcomes in mishaps. The innovation has become a fundamental piece of our everyday life. The innovation can be utilized to enhance the road security as well. Utilizing innovations like brilliant vehicle can assist with improving the driving and also decrease the street mishaps (Lin et al., 2019). Individuals don't adhere to the speed rules during terrible climate. There is a need to plan a computerized framework that will assist driver with monitoring its speed during less perceive ability. The system will be sufficiently shrewd to caution the driver during awful climate conditions. For this, vehicles could be installed with shrewd sensor innovation.

A paper is presented on a modernized System that recognizes such conditions and gets measures to keep up a strategic good ways from it. At the point when liquor sensor distinguishes the specific degree of liquor utilization in vehicle that controller will consequently stop the vehicle and produces alarm to the nearby

authority individuals. If required we can also display text messages in the required language (Revathi et al, 2018)

Literature Review: Researchers suggested many approaches to prevent road accidents. Some of the approaches are presented in this section. The progression in innovation ought to be employed to come up with more reliable and cheaper solutions. IoT is a smartly related gadgets and structure contain splendid machine interfacing and speak with various machines (Subhasri et al., 2018). These days, independent vehicles are getting progressively dependable and robust and are relied upon to enter the transportation environment in a remarkable way. Another way to deal with handle the issue of traffic stream advancement by all the while controlling the rates and courses of vehicles (Haddad et al., 2019).

Both of these amounts can be controlled precisely in self-driving vehicles. It can possibly improve the smoothness of traffic stream, since vehicles don't stop at crossing points. This outcomes in the decrease of fuel utilization and travelling time because of the procedure of speeding up and deceleration .A self-ruling framework which is utilized to through the traffic optimization strategies for vehicle speed control (Malikopoulos et al., 2018). The statistics expose that >60% of drivers felt drowsy while driving. Alcoholic drivers are found in >40% of traffic accidents. Clever health care and smart transportation are considered as basic keen city application. The rising sensors encourage constant checking of driver status to distinguish alcoholic driving and lazy. It is observed by using ECG signals (Wan et al., 2018). An ongoing driver status observing is considered as the best technique to avoid traffic accidents (Jianqiang Wang et al., 2015). By means of ultrasonic sensors, the damages can be detected and continuously monitored well then the alert messages will be send to reputed individual thereby decision making can be taken (Rajapriya et al., 2019).

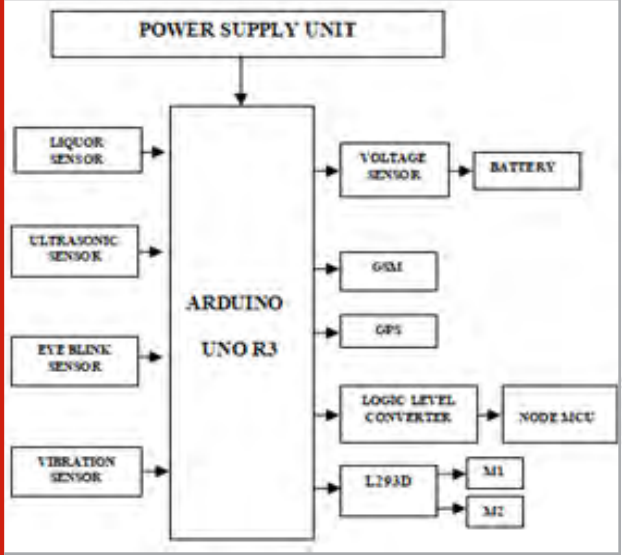
A smart vehicular telematics stage, screens the vehicular data, for example, oxygen, vehicle motor speed, water temperature and speed every hour, which can productively decrease significant accidents happening ratio (Liang-Bi et al., 2015). In addition, this system also gives immediate date and GPS coordinates of vehicle location that can efficaciously helps to retrieve the missing vehicle. In-vehicle security framework, which receives DC power line communication. It consists of a module of VTT- voice to text, two DC PLC transceiver element, a module of video and text message display and a distance measurement element (Lin et al., 2019). This framework is effectively introduced to accomplish back vehicles road security purpose.The GPS conveys real time information about the area of the vehicle and coordinates the directions by means of the Arduino stage. The observing station followed the vehicle well both in open and dense environment (Qian et al., 2018). It showed coordinates of vehicle safely on google earth without any delay irrespective of the noise, buildings and interference in the vehicle region (Ibraheemet al., 2018).

MATERIAL AND METHODS

In this proposed System, multiple sensors like liquor sensor, voltage sensor, ultrasonic sensor, vibration sensor, eye blink sensor are utilized to control the vehicle. A liquor sensor can be used to identify the level of liquor utilization by the driver. If consumption is sensed and a buzzer gets turned on as well as vibration sensor also turned on. Voltage sensor is utilized for checking the level of battery if it goes down, it intimates the message through GSM, Ultrasonic sensor is utilized for making sure the other vehicle to maintain its distance. Eye blink sensor is used for monitoring the driver status to detect drunk driving and drowsy.

Hardware Component: A power supply unit is reference to a source of electrical power. It is intended to change over high voltage AC supply to a reasonable low voltage supply for electronic circuits and different devices. This unit can be broken down into a series of blocks, every one of which plays out a specific function. It consists of transformer, rectifier, filter, regulator or stabilizer which helps to produce stabilized DC output.

Figure 1: A system architecture



An IOT based safety supporting framework architecture is shown in figure1. The level of alcohol consumption is detected by liquor sensor. If liquor consumption is identified, the vehicle is automatically stopped as well as vibration sensor also will turn on. Voltage sensor for checking level of battery. If it goes down, immediately it intimates the message through GSM. Ultrasonic sensor for making sure the other vehicle to maintain its distance to avoid accident. GPS is used to displayed the vehicle location to the receiver section or mobile unit and finally the L293D controller is used to control the motors which means it will gradually reduce the speed of motor and finally it stops the vehicle in autonomous process. Motor driver which is L293D act as an interface between Arduino UNO R3 and the motors. It comprises of two different H-bridges. H-bridge is the simple circuit

for controlling a low current rated motor driver. Node MCU is minimal effort open source IOT stage. Its firmware works on the ESP8266 WI-FI SOC and hardware which depended on the ESP-12 element with memory ability of 120KB.

In this proposed system, sensors are associated in an information pin of Arduino UNO R3 and LCD likewise associated. The stockpile voltage +12V is applied to IOT module is interface with the Arduino and driver circuit is set for drive the engine. Arduino consists of two memories. They are Program memory and data memory. The code is taken care of in streak Program memory; however the data is taken care of in the data memory. The Atmega 328 has 32 KB of burst memory for taking care of code. 2KB of SRAM and 1KB of EEPROM work with a clock speed of 16MHZ.

RESULTS AND DISCUSSION

This proposed safety supporting system uses embedded C for voltage sensor, eye blink sensor, vibration sensor, alcohol sensor, ultrasonic sensor which is dumped in to Arduino UNO R3 by using Arduino IDE software. MPLAB is a restrictive freeware integrated development environment (IDE) for the advancement of embedded applications. Here, the codes are compiled and convert into hex file then the converter file is dumped in to ARDUINO UNO R3 and the simulated output is viewed in the proteus version 8 software. Here, a proteus application is utilized and it is designed by under the automation concept. This software displays the different sensors operation and it will be updated for every 15 seconds.

Figure 2: Schematic diagram of safety supporting system by proteus software

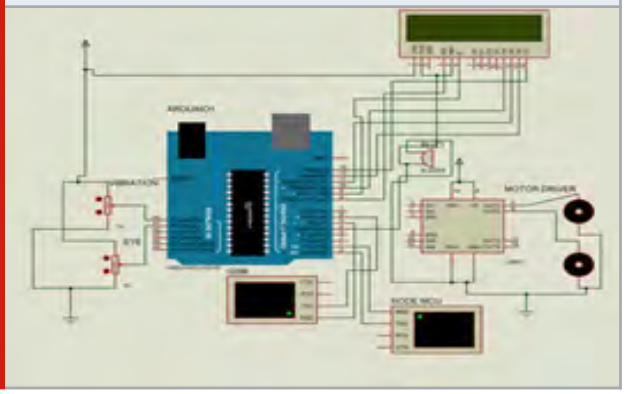


Figure 3: Simulation output by proteus software

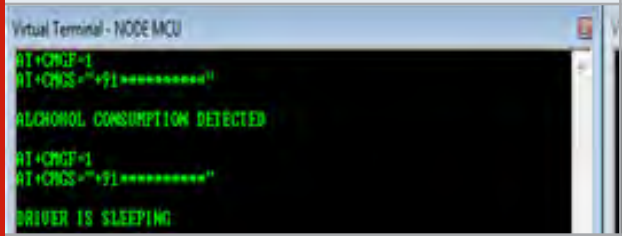
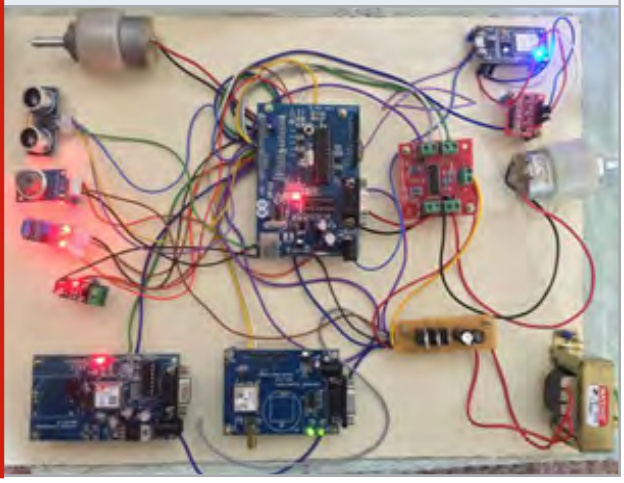


Figure 2 shows the schematic diagram of proposed safety supporting system which is implemented in proteus software and the simulation output is shown in figure in 3. This simulation output shows the current status of driver . The IOT stage is utilized viably for refreshing outcomes by means of mobile phone. If any threat is detected, this proposed safety supporting system sends information message or alert to the local authority or care taker through the GSM by using node MCU. This node MCU will sends the information about vehicle location by using GPS to the authorities. Also they can be viewed by the blynk software which is supported by the android. Figure 4 shows the hardware implementation of safety supporting system.

Figure 4: Hardware implementation of safety supporting system



CONCLUSION

In this paper, an IOT based safety supporting framework for vehicle is presented to avoid road accidents and the system is implemented in both hardware and software type. This prototype will create a platform for the upcoming vehicles to prevent road accidents. Here, the concept of safety driving by using various sensors, node MCU module is discussed. Furthermore, the proposed platform also provides a very prompt, cheaper embedded based safety supporting system is discussed to stop driving while drunk. This framework identifies such circumstances and receives measure to avoid it. If any type of threat is identified the controller will automatically stops the vehicle and produces an alert to nearby authorities. Compared with existing driving safety evaluation methods, this framework is designed for the current scenario. Future work will concentrate on further improvement of this model and the advancement of vehicle security help and smart control strategies.

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Industrial Parameters Monitoring Using Embedded System

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ABSTRACT

Industrial checking framework is utilized screen and controls these risks by utilizing IOT. Right now, proposed an inserted framework that is intended to screen natural parameters, for example, temperature, moistness and gas level. This framework has an IOT modem which is utilized to refresh the present status. This IOT server can be utilized to screen and control this framework. This framework is acknowledged by PIC microcontroller which is associated with the IOT modem. This IOT modem is liable for refreshing, putting away and preparing the information through the IOT server. This framework revives the sensor esteem for at regular intervals. These information can be utilized for additional reference. This framework is structured in a cost effective way which can be utilized to screen and control the ecological parameters with no human obstruction. The idea model has been created to show the working of this framework.

KEY WORDS: PIC,SENSORS, IOT, EMBEDDED SYSTEM,SERVER,NODE MCU.

INTRODUCTION

Modern checking is an assortment of information and status of ecological parameters. Assortment of these parameters is basic in ventures to keep away from any sort of serious harm to industry or the individuals working(Hasan Salman,etal,2017). To stay away from these dangers remote checking framework alongside IOT is utilized which is simple in gathering the information, conveying and putting away it for future reference. By utilizing remote observing we can screen and maintain a strategic distance from these mishaps with no human intercession(M.Trincavelli,etal,2008). The PIC microcontroller is utilized to control these sensors utilizing IOT from anyplace along the globe. This framework was created utilizing installed C programming(M. Dunbabin,,etal,2012). A site has been created which Modern checking is an assortment of information and status of ecological parameters.

Assortment of these parameters is basic in ventures to keep away from any sort of serious harm to industry or the individuals working(Liu et al,2010). To stay away from these dangers remote checking framework alongside IOT is utilized which is simple in gathering the information, conveying and putting away it for future reference.By utilizing remote observing we can screen and maintain a strategic distance from these mishaps with no human intercession.The PIC microcontroller is used to control these sensors using IOT from anywhere along the globe.(R. Shete et al2016). This system was developed using embedded C programming. A website has been developed which acts as a medium which the user can use to control the system. This system could be used to

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monitor and control the industrial parameter without any human direct contact.In this section, Existing system on environmental monitoring, IOT has been reviewed to summarize the existing system With the ARM based implanted framework a self-ruling framework which is utilized to screen the natural parameters utilizing IOT(B. Jiang,etal,2017).

A GPS controlled element has been acquainted with control the area of the robot.some input represents the structure for observing the city condition. Minimal effort Raspberry Pi utilized for embedding the framework. In any case, no accentuation has given on particulate issue which left the earth observing framework deficient. Environment Monitoring Smart Device (CEMSD) Revathi etal2018), that screens diverse natural parameters, for example, air quality, commotion, temperature, and dampness. The gadget gathers and sends information from focused estimation areas through a remote system or cell system to a cloud server.With on going advances in remote sensor innovation, low force single-board PCs, and short-go correspondence advances, remote detecting applications have improved towards arrangements that include universal registering(subhasrietal 2018). A Cyber-Physical gadget was once proposed for natural observing of surrounding stipulations in indoor spaces

MATERIALS AND METHODS

The proposed framework is intended to use for screen the mechanical parameters like temperature, gas and mugginess and it comprises of equipment and programming alongside IOT segments. The framework engineering is appeared in Figure .1.The block diagram of the IOT and PIC based embedded system and it is incorporated with one part: Industrial Monitoring System: This system collects data from the sensor and responsible for displaying it to the LCD display and uploading it to the website through IOT platform. The modern checking framework actualizes the PIC microcontroller to speak with three sensors, for example, temperature sensor (LM35),gas sensor(MQ2) and stickiness sensor(DHT11). The PIC controller gets information from wanted areas transfers the information into the IOT stage which can be gotten to legitimately by means of website page by the client and furthermore show the information in current area through LCD. The entrance for site page requires organize network set up by a WI-FI, it utilizes sensor to gather parameters information, hence the framework need not require increasingly human intercession. Also, the sensor esteems are refreshing at regular intervals in a site. Finally if any temperature was surpasses it limit the cooler fan is on naturally and chill off the warmth, and any gas will spilled in an industry the bell ON consequently. The LED was ON when the stickiness increments.

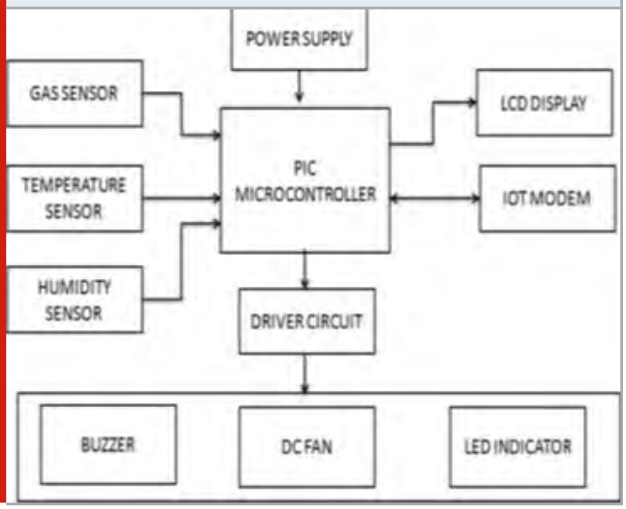
Pic Controller: PIC microcontroller and depends on RISC engineering. The variant of PIC microcontroller is PIC16f877a. Its memory engineering follows Havard design. The information memory comprises of 368 bytes of RAM, 256 bytes of EEPROM and SFR (Special Function Register).It has inbuilt A/D converter which requires reference voltage of 5V for its apportion. The clock recurrence extend from 30KHZ to 4MHZ.It is joined with CCP module.

Node MCU: It is minimal effort open source IOT stage. Its firmware runs on the ESP8266 WI-FI SOC and equipment which depended on the ESP-12 module with memory capacity of 120KB

Industrial Parameter Sensing: The framework utilizes sensors, for example, temperature sensor(LM35), gas sensor(MQ2), and mugginess sensor(DHT11).These sensors quantifies the modern parameters, for example, warmth, moistness and undesirable gases. The LM35 is the temperature sensor with simple yield 30V ability. This gadget draws just 60 Micro Amps from the stock, it has a highlights, for example, extremely low self warming, low yield impedance. This gadget is appraised for temperature ranges from - 40C to - 110C. It works from 4V to 30V. The MQ2 is extremely valuable for gas spillage discovery. Because of its high affectability and quick reaction time estimation can be taken at the earliest opportunity.

Hardware Design: The framework is worked by utilizing electronic segments. Fig 2 showsThe PIC microcontroller fills in as a focal piece of the framework. The three sensors are associated in an information pins of PIC controller and LCD additionally associated with a PIC controller. The stockpile voltage +5V is applied to controller. IOT module is interface with the PIC and driver circuit like hand-off is put for drive the ringer, DC fan and LED.

Figure 1: The block diagram for industrial monitoring system



Software Design & Program: The web application has designed by HTML it shows in the Fig3 and in this website displays the three different sensors value and it will updated for every 15 seconds.The MP lab is utilized as a coordinated improvement condition (IDE).The dumper pack is utilized to dump the program in the PIC. In that IDE the code was ordered and convert into hex document and afterward dumped in PIC.

RESULTS AND DISCUSSIONS

This proposed framework is very financially savvy when contrasted with the current framework. Fig 4.1,Fig 4.2,Fig 4.3 shows the sensors like gas, temperature, dampness measures are seen by PIC16f877a microcontroller. The IOT stage is utilized adequately for refreshing outcomes in site which gained from the microcontroller. The gas sensor information in ppm, temperature sensor information in degree centigrade and stickiness sensor information in percent relative humidity (%RH) separately.

Figure 2: Simulated Result of the circuit

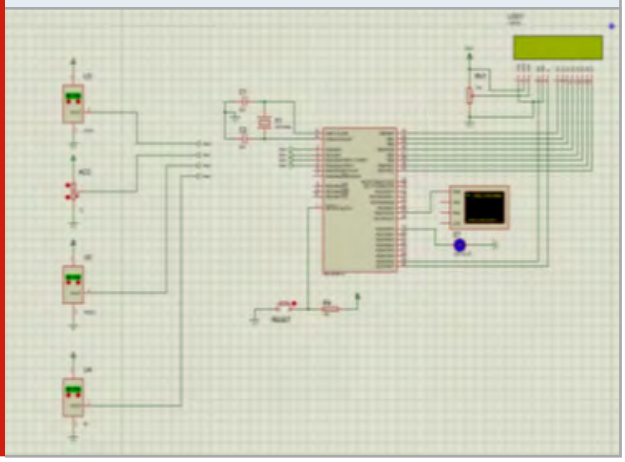


Figure 3: Software module

Figure 4.1: Result (a)

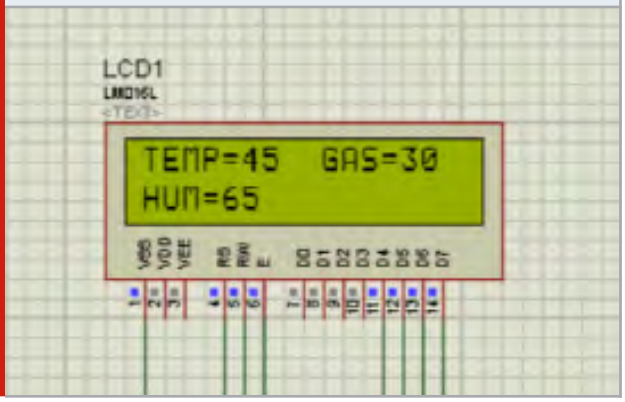


Figure. 4. 2: Result (b)

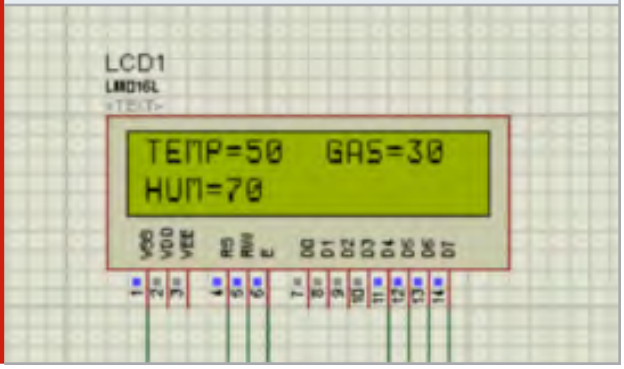


Figure. 4. 3: Result(c)

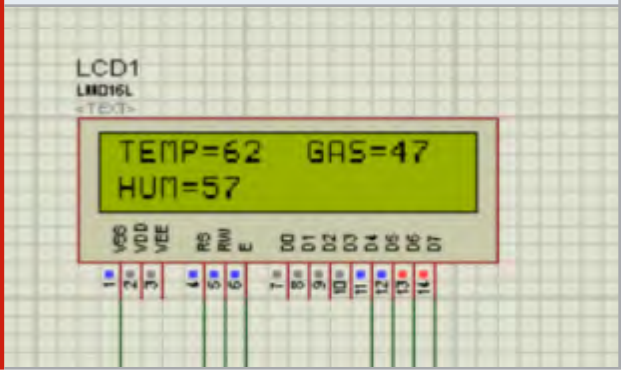


Figure 4.4: Tabulation of output

Sensors	Temperature	Gas	Humidity
Output 1	45	30	65
Output 2	50	30	70
Output 3	62	47	57

CONCLUSION

Right now, structure and execution of the mechanical parameter checking framework dependent on IOT have been practiced. The created framework can screen the mechanical parameters is minimal and practical. The created site shows the sensors esteems. What's more, it likewise utilized for ecological observing framework.

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Machine Learning Based Malaria Prediction Using KNN Algorithm

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ABSTRACT

In India, malaria is one of the life-threatening diseases. In remote villages, this parasitic disease leads to millions of death. Hence malaria is also known as deadliest disease in human history. Due to damaging of red blood cell this malaria- parasitic disease arises. Pre -mature forecast of malaria is the solution for control of malaria mortality, morbidity and also it reduces the risk of transmission of malaria. It assist as policymakers, medical officer, ministry of health along with other health organizations for better aimed medical resources to areas of greatest needs. A large number of procedures have been established to predict the malaria disease. This paper presents an premature detection as well as prediction of malaria disease using machine learning technique, "K-Nearest Neighbor" including Image processing technique. In our inspection we found that machine learning techniques have greater applicability for censorious identification of malaria which in turn it also helps the clinician for recognizing the disease.

KEY WORDS: MALARIA- PARASITIC DISEASE, MACHINE LEARNING, K-NEAREST NEIGHBOR.

INTRODUCTION

In this paper, we created a mock-up using color based contour observation along with segmentation function together with machine learning to spot all the parasites from cell representation. And also we used artificial intelligence, Ability to manipulate together with moving objects, representing the knowledge, arrangements, learning, default language, processing, and representation of what is perceived. Our parasitic identification procedure will be useful wherever it is hard to establish the expert in microscopic investigation of this blood report analysis (Kishor Roy et al., 2018).Together with it limits the practical errors while predicting the presence of malarial parasites in the blood specimen

Literature Review: In segmentation have been used they are HSV, watershed segmentation. This segmentation is used to reduce the false rate result in malaria detection. Malaria detection method is experts to find the microscopic changes occur in the analysis report this may helps to reduce the human error while testing the parasite present in the blood samples. According to the blood samples report different techniques has been used especially for imaging, image preprocessing, computation features, cell segmentation and classifying the cell. After collecting the different analysis for the blood sample all the recorded value have been imported to learner application. The application used here is K-Nearest neighbor algorithm. (KNN),specification involved is used to detect how much area it get affected and used to calculate the spreader area after receiving the specification the model was trained and tested ,predict the exact accuracy.

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Image Database: To collect the accurate data, two types of sample images / have been taken to formalize the database. Therefore 200 images have taken from the internet for tested with disease affected image. Acquisition is the process of collect the blood sample image through the internet from the diagnostic center. The gathered image is related to the computer via USB port. That has been tested using digitalized format. The digitalized microscope contains low generating power. Fee may get varied from hundred to thousand.

The value has projected with no longer wave length that transmitted a mild incident light from Light Emitting Diode using Camera lens. For identifying the parasite all the more precisely we have mapped two division systems which comprise of HSV Segmentation and Watershed division. Herpes Simplex Viruses denoted as Hue, extension and represent by value. Using this separation can calculate the parasite tone, segmentation and completing segment, parasitic position can be acknowledge in RBC (Santiniketan et al.,2012).The system is isolated into a few stages which are depicted underneath. Initially convert the picture into Herpes simplex virus design. In the wake of changing over it into HSV design the tone, immersion and the worth are determined. Parasitic shade parts remain more noteworthy than 0.3 to under 0.9 and the worth part kept under 0.8.

Figure 1: a) Image in RGB b) Image in specific color c) Extended Image d) Image represented as value

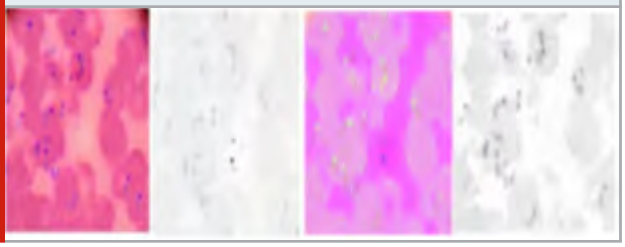


Figure 2: a) RGB image b) Grayscale image

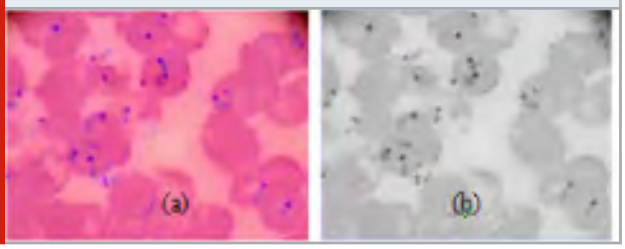
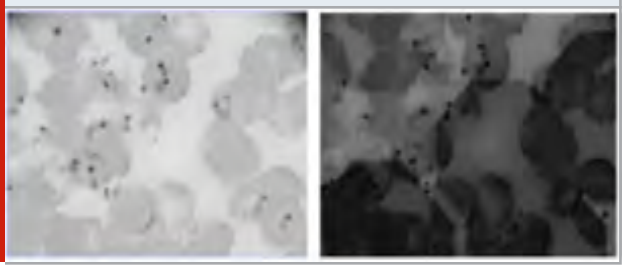


Figure 3: a) Grayscale image b) Morphological operation



Initializing the past value, the concept estimating the duplicate pixel record value by the parasite value deducted as 9.5 so that increasing the utilization of pixel image for following stage. The qualities checked for each stage using the factor of 9.5By HSV process the affected region cannot be viewed in light for bended shading image (Tiruveedhula et al.,2017) To analyze the particular region using the method called Watershed division. Gray scale image represent the 8 bit value with the intensity of light. By the sequence changing grayscale image from RGB image by using the histogram to distribute the deceivability of the parasite in the image. Morphological Transformation is based on the process of changing the shape of the image. The grayscale image establish the size of 50, is to expel the confused noise which is smaller than default component.(M. Dalla Mura et al., 2010)The morphological transformation is given in the figure 3.

B) Converting Black Into White Image: In converting method, finding the angle for black or dark edge and establishing to the lack of light esteem process to convert the term into high opposition image (Rahman et al.,2017). The measurement has analyzed for white image for accurate picture. If parasite is detected then the value is mentioned as 1 and if it's not detected the value is taken as zero. This picture is given in figure 4.

Figure 4: a) Parasite Detected b) Parasite not exists

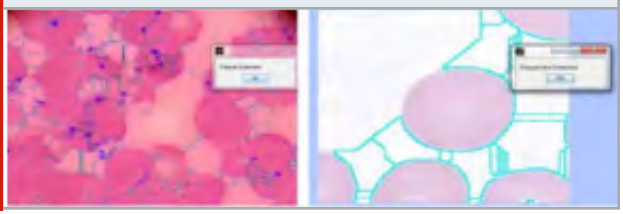
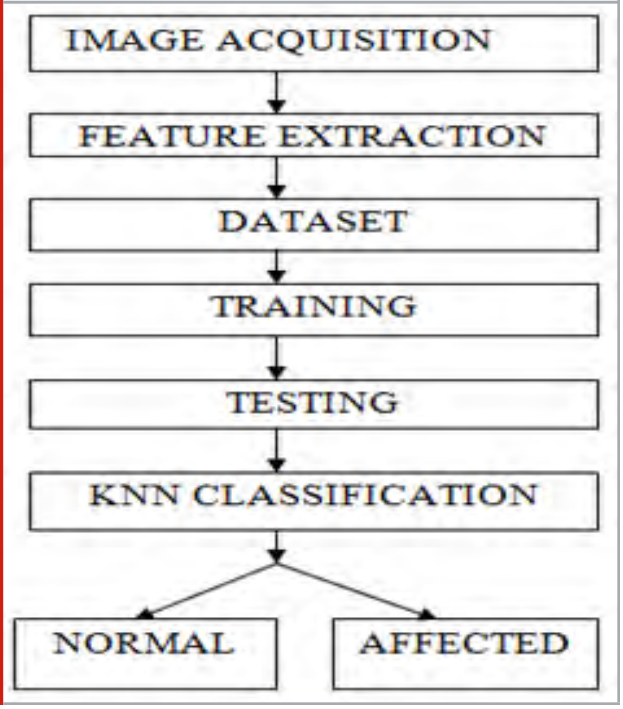


Figure 4: Class diagram



MATERIALS AND METHODS

When the information has been gathered in the configuration of csv documents, The scope of qualities expected by the complete proportion highlights has then separated into four equivalent intervening time Slightly affected.

- Unaffected
- Medium affected
- Highly affected

A)Feature Scaling: Finally,pre-processing step is applied for scaling features. Few standard are used to specialized the independent data or variable features. The value of X column is higher compared to Y column. For the same squared parameter of x and y in opposition to X2-X1 and Y2-Y1(Somasekar et al.,2011)

Figure 5: Feature Scaling

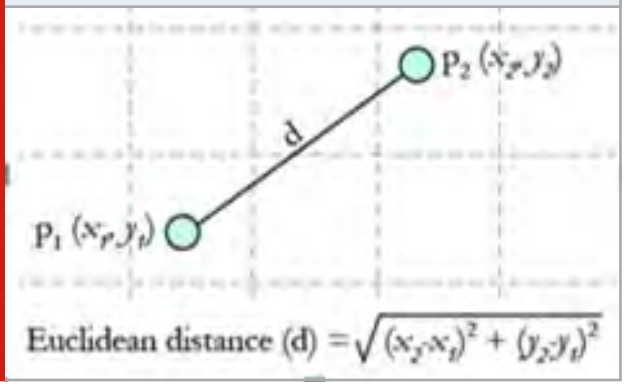
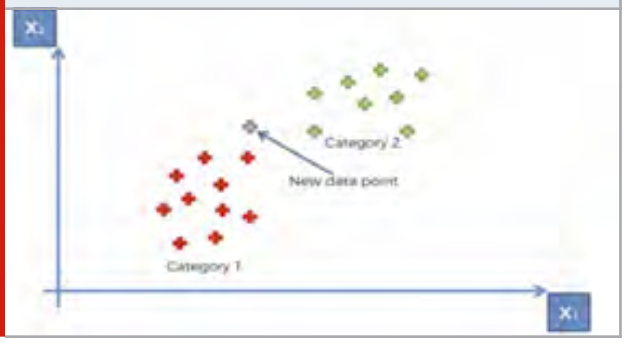


Figure 6: K- Nearest Neighbor



B)Knn Algorithm Steps

1. Generate the data for analysis.
2. Set the k value.
3. Determine the data between default and detected term.
4. Mention the index value and distance for k parameters.
5. Sort the ordered collection (in ascending order) by the distances
6. K value has been picked from largest to smallest value and labeled it
7. Then return the variable node k value.

C) Choosing The Right Value For K Term: In KNN calculation a few times with various estimations of K and pick the K that lessens the quantity of blunders we experience while keeping up the calculation's capacity to precisely make expectations. Conversely, as we increment the estimation of K, our forecasts become increasingly steady because of larger part casting a ballot/averaging, and in this way, bound to make progressively exact expectations (in a specific way). In the end, we start to observe an expanding number of mistakes. It is now we realize we have driven the estimation of K excessively far.

D) Confusion Matrix: A disarray lattice is a method for condensing the exhibition of a grouping calculation. Arrangement precision alone can be misdirecting on the off chance that you have an inconsistent number of perceptions in each class or on the off chance that you have multiple classes in your dataset. Figuring a disarray grid can give you a superior thought of what your order model is getting right and what kinds of blunders it is making.

Figure 7: Dataset

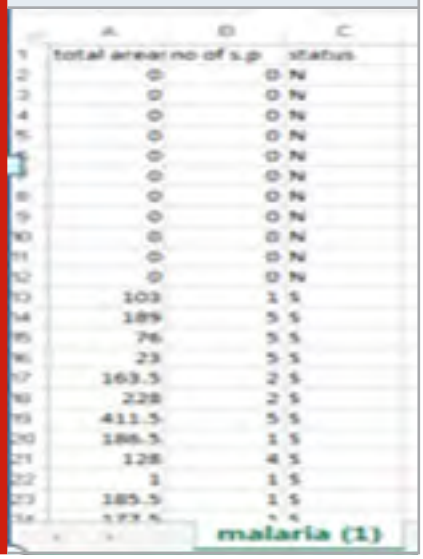


Figure 8: Splitting Dataset

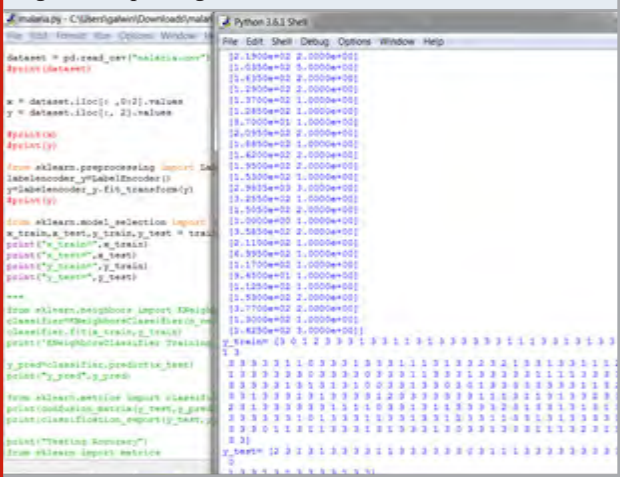


Figure 9: Training Accuracy

Figure 10: Confusion Matrix

Figure 11: Testing Accuracy

Figure 12: Infected Cell

Figure 13: Highly Affected Image

RESULTS AND DISCUSSION

At the point when we mapped both fragmented pictures before tallying the parasite the quantity of effectively recognized parasite expanded. The framework can identify all parasites when the picture contains power of light at a standard and equivalent worth. In any case, as the info pictures are distinctive in force of light among the parasites, which is the motivation behind why our framework neglected to identify parasites from some influenced picture

CONCLUSION

A well executing structure will require the interchange of several factors: they are microscopic characteristic, staining types, preparation of slides, together with image examination and software for machine learning. Still there are no clear winners for these factors.However, the forward movement has been done and it can be seen by the maturing types used for image examination along with machine learning. General proposed methods are unconventional from appeal domain. This evolution

has highly followed by the evolution in other different fields and it has adopted the serious techniques together with it has been successfully applied to malarial spot. These methods used for better performance such as images of blood smear, image analysis technique in machine learning.certainly the prospective that some of the types will gain much priority for malaria diagnosis, and in specific pre-processing along with the detection, segmentation for red blood cells in some other entreaty.

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Deep Learning Algorithm Based Breast Cancer Detection

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ABSTRACT

Medical imaging techniques play a vital role in the diagnosis and detection of breast cancer. The main demerits in previous methods are the huge time delay during the manual detection of individual image pattern with the help of professional radiotherapist. The accuracy can be diagnosed in terms of differentiating benign and malignant patterns. Convolutional Neural network (CNN) plays a vital role in radiologist. The accuracy can be diagnosed in the proposed system.

KEY WORDS: CONVOLUTIONAL NEURAL NETWORK, CANCER, ACCURACY.

INTRODUCTION

Malignant growth is the fatal infection which influences the development of the cells anyplace in the body in an uncontrolled way. There are such huge numbers of kinds of malignant growth in the world. Here, this proposed framework incorporates the identification procedures for the bosom malignant growth (M. Klemm et al,. 2009). The previously existing framework gives just the precision sooner or later level. In any case, this method works with ideas of profound learning. The computed topography (CT) is the sensitive strategy so as to take the photos of the influenced regions in the body. By taking these contaminated region pictures as information and afterward it process it to deliver a matrix form of yield. The refreshed matrix can be utilized as input information into neural system. Presently the filtered output will be segmented by the way towards masking. At that point, the last advance arrangements with field extraction which incorporates the high lightning influenced area in the breast.

Image Processing System is the mix of the various components engaged with the computerized picture preparing. Computerized picture preparing is the handling of a picture by methods for an advanced PC. Computerized picture preparing utilizes diverse PC algorithms to perform image processing on the digital images.

It comprises of following parts:-

1. Digitizer

The digitizer converts a pictorial image into a numerical representation reasonable for contribution to a computerized PC. The most commonly used systems are

- Plastic stylus
- Flying spot scanner
- Image dissector
- Digital camera
- solid- state arrays.

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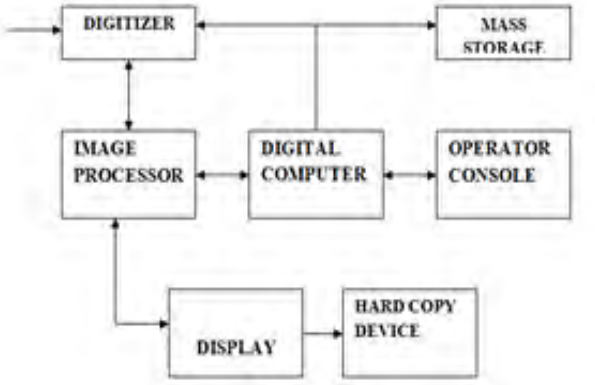
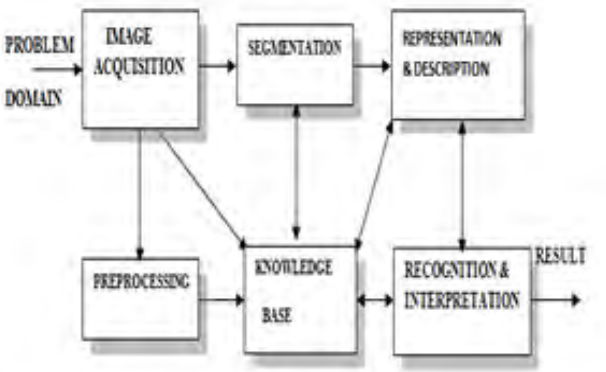
Figure 1: Basic image processing system



2. Image Processor: The image processor does the operation called image acquisition, storage, preprocessing, segmentation, representation, recognition and interpretation at the end it shows or records the corresponding image (M.Maheswari et al. 2015). The final picture gives the information about the basic grouping occupied with this system.

Figure 2: Block Diagram of Sequence Involved In An Image Processing System



As shown in the picture, the first stage in the sequence is image acquisition by a sensor related to a digitizer to digitalize the picture. The subsequent stage is the preprocessing step where the picture is improved being taken care of as a contribution to different procedures. Preprocessing normally manages improving; eliminating the noise, isolate the region, and etc (Qi Qi et al,. 2018). segmentation partition a pictorial image into its corresponding sub images or articles. Segmentation output gives the information about the raw pixels, which comprises of either about the region limit or the pixels in the image itself.

Representation is the technique towards converts the raw information about pixel into a valuable structure to prepare the Personal systems. The separation of one class of objects from another is performed by using the description. This may be done by the highlighting the portion of the objects. Based on the data given by the descriptors, the recognition assigns a unique name to the region. Interpretation also performs assigning the significance to an outfit of images which we have already observed. Information's which are related to the space issue can also joined into the information base. The information base guides the performance of individual modules and also restricts the coordination of these modules. It is not necessary that all modules must be present to do some of the operation. This image processing system has the individual structure based on its application. This image processor having the rate of frame approximately it may be 25 pixels casings per second.

3. Digital Computer: In this digital computer part the convolution, averaging and all arithmetic operations are done by the PCs. The above mentioned processes are all called as the Mathematical processing of the digitized image.

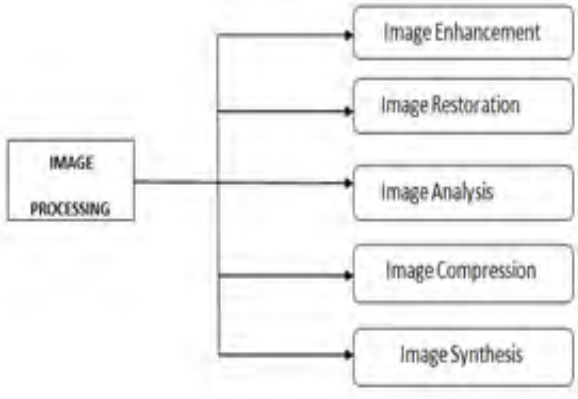
4. Mass Storage: FDs, Compact disk ROMs are also used as the secondary storage devices.

5. Hard Copy Device: The storage of this software and replica of the picture can be created by using this printed version gadget.

6. Operator Console: Administrator comfort comprises the hardware & courses of action to check the immediate outcomes & to do modifications in the system whenever it requires. This administrator is likewise fit for monitoring the subsequent mistakes and also for the arrival of necessary information.

Image Processing Fundamental: DIP refers preparing of the picture in mechanized structure. Current cameras may truly snap the photo in automated structure anyway generally pictures are started in optical structure. They are gotten by camcorders and digitalized. The binarization system sampling, quantization (Zhiqiong Wang et al,. 2019). By then these photos are taken care in terms of five crucial strategies, at any rate any of them, not so much all of them.

Figure 3: Image processing technique



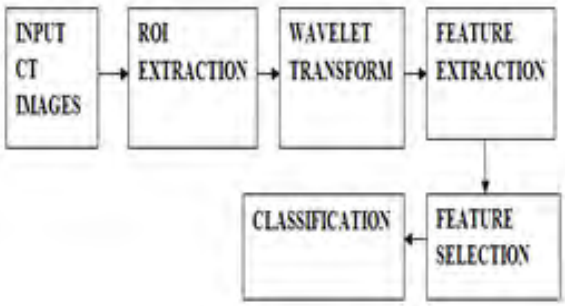
Types of Cancer Detection Systems: There are two primary computational frameworks created to help radiologists, they are: computer-aided detection (CAD) and computer-aided diagnosis (CAD x) systems.CAD frameworks identify sores through clinical pictures, for instance, marking conspicuous structures and areas. While CAD x frameworks plan to measure the lesion characterization, for instance, deciding the threat and staging of the cancer. Computer aided design x frameworks mean to improve the sensitivity, specificity, efficiency, and cost effectiveness of breast cancer screening programs.

A few papers played out a segmentation task to distinguish modules and the descriptors were processed in the spatial space. Different papers play out the arrangement just with clinically information. In any case, a paper that doesn't require the phase of segmentation and that utilization the wavelet transform as an element descriptor in a joint manner was not identified in the literature. Along these lines, those attributes are the fundamental contribution of this paper.

METHODOLOGIES

A procedure which utilizes a hybrid classification conspire was proposed by Breast module classification combining rule-based and SVM ((Qi Qi et al., 2018). The component extraction is actualized to decide the breast modules inside the CT examine. This causes that some blood vessels were classified as breast nodules.

Figure 4: Block diagram of existing system



Drawbacks

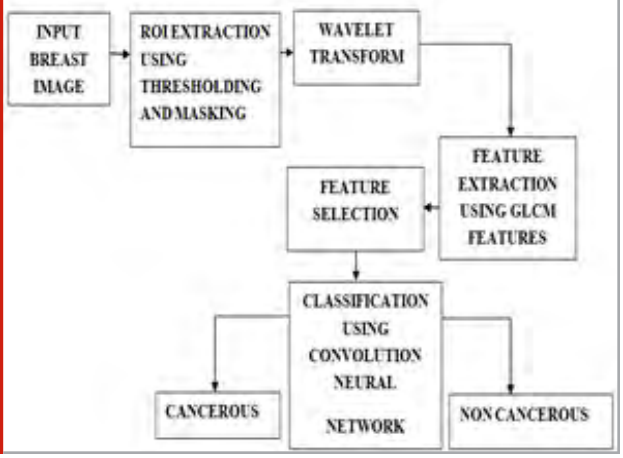
- The noise present in the image was not removed completely.
- Poor visual contrast
- Inaccurate Segmentation
- Misclassification between normal and diseased
- Low accuracy

The objective of the paper is to propose a breast cancer recognition system which can be used to categorize the malignant and benign images. One of the key inspirations right now to successfully coordinate the perceptions from the all the while gained both cancerous and non-cancerous images. The proposed algorithm created ought to be hearty and accomplish noteworthy execution improvement. The goal of this paper is to propose a strategy for cancer malignant growth acknowledgment framework dependent on the mix of preprocessing using Contrast Limited Adaptive. Histogram Equalization (CLAHE), segmentation or ROI extraction using thresholding, feature Extraction using GLCM classification and characterization utilizing convolution neural system.

This proposed method is on the advancement of new methodology for breast cancer characterization, which accomplishes altogether improved execution over recently proposed approaches. The acquired breast pictures are noisy with rotational and translational varieties coming about because of unconstrained imaging. In this manner, the gained pictures are first exposed to pre-processing steps that include:

- segmentation of ROI
- edge detection

Figure 5: Block diagram of proposed system

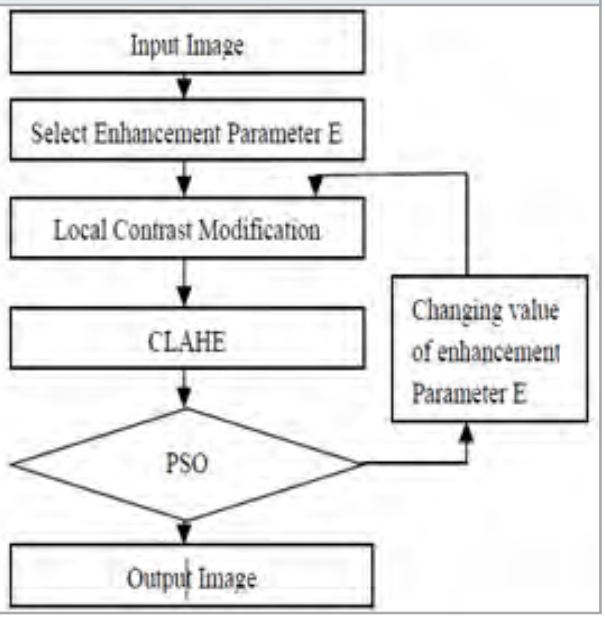


It is to separate the ROI part of the breast image. Each of the procured breast images is first exposed to binarization, utilizing a fixed threshold value, to coarsely limit the inside part (ROI) in the picture. A few bits of foundation despite everything show up as associated with the bright region, dominatingly because of improper illumination. Along these lines, the circle formed foundation in the subsequent pictures is rejected from the thresholding, i.e., in light of the low power estimations of the background (Angshuman Paul et al,. 2015). The subsequent binary mask is used to categorize the ROI from very first breast image. Then these pictures which are with low complexity and improper illumination are exposed to picture improvement. We use wavelet change to disintegrate the picture into low and high recurrence coefficients. We create GLCM feature for feature extraction. The Daubechies db1, db2, and db4 wavelet changes are registered with one and two level of decomposition.

From that point forward, 19 features are figured from every wavelet sub-band. Then, the sub-band and trait determination is performed. After the calculation of all the 19 statistical texture highlights, an investigation to quantify the pertinence of each element in every

wavelet sub-band was done (Jeyalakshmi et al,. 2018). The objective was to decrease the list of capabilities and this errand was completed naturally by picking the best component, for example, Autocorrelation and sum of entropy. Thus, best highlights are chosen and joined two by two as contributions to the Convolutional Neural Network (CNN) which is utilized to recognize CT pictures containing dangerous nodules from those not containing nodules (Zhiqiong Wang et al., 2019).

Figure 6: Image enhancement flow



Techniques Used

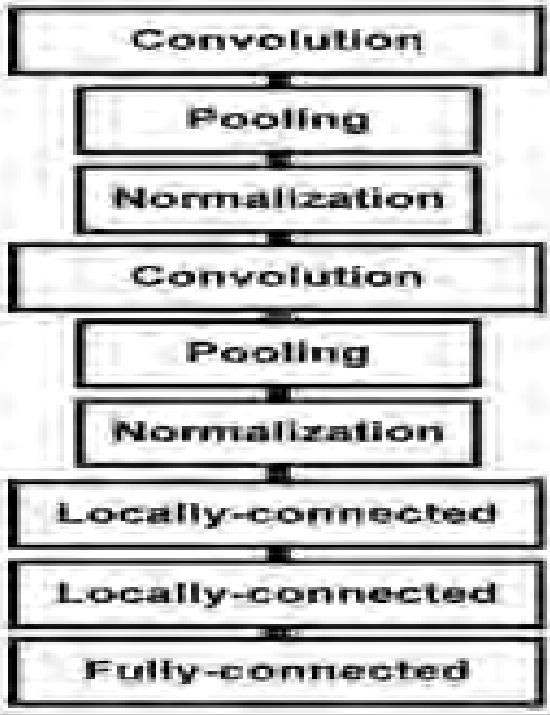
- Contrast Limited Adaptive Histogram Equalization
- Discrete WT (DWT).
- ROI extraction (Region of Interest) using thresholding
- GLCM
- Convolution NN (CNN)

1. Contrast Limited Adaptive Histogram Equalization (CLAHE): Contrast Limited Adaptive Histogram Equalization (CLAHE) is a system to improve the perceivability of neighborhood subtleties of a picture by expanding the differentiation of nearby areas. The algorithm (S-J Huang et al,. 2014) is broadly utilized by different examines for applications in clinical imagery. The disadvantage of CLAHE calculation is the way that it isn't programmed and needs two important parameters viz., N size of the sub window and CL as far as possible for the technique to work. Sadly none of the specialists have done the programmed choice of N and CL to make the calculation reasonable for any independent system.

This paper proposes a novel expansion of the conventional CLAHE calculation, where N and CL are determined naturally from the given picture information itself along these lines making the calculation completely versatile. Our proposed calculation is utilized to examine the improvement of elevated, clinical and submerged pictures (S.Sathiya et al,. 2014). To show the viability of our calculation, a lot of value metric parameters are utilized. In the conventional CLAHE calculation, we fluctuate the estimation of N and CL and utilize the quality metric parameters to acquire the best yield for a given combination of N and CL. It is seen that for a given set info pictures, the best outcomes acquired utilizing conventional CLAHE calculation precisely coordinates with the outcomes got utilizing our calculation, where N and CL are determined naturally.

2. CNN Architecture: First layer -> Convolution process -> ReLU layer ->Convolution process ->ReLU layer -> Pooling layer ->ReLU layer -> Convolution layer -> ReLU layer ->Pooling layer -> Fully Connected layer.

Figure 7: Flow chart of CNN architecture



All computer neural networks will have the layers called input layer, output layer, & hidden layers. The third layer will always consist of convolutional layers, ReLU layers, pooling layers, and fully connected layers.

- The convolution operation is performed by the convolutional layer and it is given as a input for the first section. The next section will get the information from the first section.
- Pooling joins the yields of groups of neurons into a solitary neuron in the following layer.
- Last stage layers associate each neuron in one layer to each neuron in the following layer.

Advantages

There are some of the advantages by using this proposed technique such as

- The noise present in the image was removed.
- Better image quality.
- Better Segmentation results
- Accuracy rate is high.

RESULT AND DISCUSSION

Our proposed method gives the information that the precise grouping of investigating the images can be accomplished by a profound studied images prepared and finish the style will depends on medical ROI comments just will place in underlying stage. When this entire classifier is constructed, That is very well tweaked utilizing extra datasets that need ROI comments, regardless of whether the pixel force conveyances varies frequently, then the situation that is related to the information where it is collected from clinical image stages(F Spanhol et al., 2016). From these discoveries can able to see that proposed technique will enhance the great business CAD systems, for example, iCAD Second Look 1.4 and R2 Image Checker Cenova, these are not already existed based and it's been accounted for achieving a normal AUC of 0.726.

Figure 8: Input image

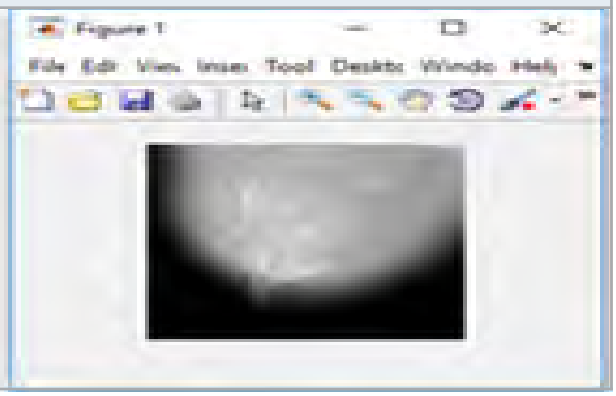


Figure 9: Classification of image based on the input

```
Reading image

Layers =

  10x1 Layer array with layers:

     1   ''   Image Input           256x256x3 images with 'zerocenter' normalization
     2   ''   Convolution           20 5x5 convolutions with stride [1  1] and padding [0  0]
     3   ''   ReLU                  ReLU
     4   ''   Max Pooling           2x2 max pooling with stride [2  2] and padding [0  0]
     5   ''   Convolution           20 5x5 convolutions with stride [1  1] and padding [0  0]
     6   ''   ReLU                  ReLU
     7   ''   Max Pooling           2x2 max pooling with stride [2  2] and padding [0  0]
     8   ''   Fully Connected       3 fully connected layer
     9   ''   Softmax               softmax
    10   ''   Classification Output crossentropyex

Training on single CPU.
Initializing image normalization.
|=========================================================================================|
|  Epoch  |  Iteration  | Time Elapsed |  Mini-batch  |  Mini-batch  | Base Learning Rate|
|         |             |   (seconds)  |     Loss     |   Accuracy   |                   |
|=========================================================================================|
|       1 |           1 |         19.70 |       1.3194 |      66.67% |          1.00e-04 |
|      20 |          20 |        384.96 |       0.2501 |      93.33% |          1.00e-04 |
|=========================================================================================|
```

Figure 10: Detection of cancer stage

Our all convolutional systems prepared utilizing a start to finish approach have profoundly serious execution and are progressively generalizable across various mammography stages contrasted and past profound learning strategies which are already accomplished Area under on Curves in the scope of 0.64–0.96 on the Doyle Dykes Signature Model and IN bosom specification, just as already predicted datasets 12. The late examinations gives the information as another business computer aided detection framework, Transpara 1.4.0, accomplished an area under the curve of 0.88 when it's always help to radiotherapist 15 and 0.83 in independent mode15. Computer aided based business utilized convolutional neural network's prepared utilizing the sore explanations about 9000 mastography with disease to create points in a fix range; Range of these every single identified area were then consolidated into a score at the assessment level (Indumathi et al,. 2018). As far as anyone is concerned, the business CAD can only with significant effort be adjusted on various mammography datasets without injury explanations. Our methodology has the benefit of requiring just picture level names for calibrating once the entire picture analyzier has worked for encouraging the ranging for a bigger goal set and moving for a newly discovered mastography system because which are quickly in advance.

CONCLUSION

The result of the recently proposed method is a convolution neural system algorithm which goes about as a tool for identifying the influenced cells in an a body precisely. By utilizing this proposed method it makes the procedure increasingly productive and simpler for recognizing contaminated areas. This proposed technique can segment the malignancy locales from the pictures definitely. The precise discovery happens with the strategies utilized all the while. The way toward recognizing beginning time discovery in the malignant growth detection happens with the all the advancements right now. The exactness got by this proposed technique is roughly 97.7% which is profoundly promising one. In this way, all these highlights make this method as a productive and exact recently proposed technique.

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Geometrical Sensitivity Analysis of Bio-Nano Electro Mechanical Systems Using FEM Analysis For Disease Detection

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ABSTRACT
Nano Electro Mechanical System (NEMS) based cantilever is the alternate form of Micro Electro Mechanical system (MEMS) with dimensional changes in perspectives like thickness, length, and width. These dimensional changes lead to significant improvement in the sensitivity and the performance with a portable structure. In this paper, a stepped-clamp Nanocantilever sensor with longitudinal cut is designed to meet the characteristics of Biosensor for the detection of atomic level pathogenic elements present in body fluid. This cantilever is compared with the conventional stepped cantilever. The deposition of antibody coating on the surface of NEMS cantilever causes it to deform, due to the reaction of pathogen/antigen present in the blood medium. The deflection occurred in Nanocantilever is detected by using a novel readout method called RCF Modulation. The characteristics and challenges associated with nano size structures are analyzed to design and develop a NEMS-based biosensor. The advantage of incorporating longitudinal cut at the fixed end of the cantilever is investigated for different materials with load analysis and stress distributed results. Finite Element Method of Analysis is used to perform the study of this nanocantilever, and the result shows that, with a longitudinal cut the sensitivity increased by 37.78% for $Si_3 N_4$ at maximum load. Spice© simulation software is used to design a novel readout method called RCF modulation

KEY WORDS: MEMS, NEMS, CANTILEVER, BIOSENSING, ANTIGEN, ANTIBODY, PATHOGENS, DISEASE DETECTION.

ARTICLE INFORMATION

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INTRODUCTION

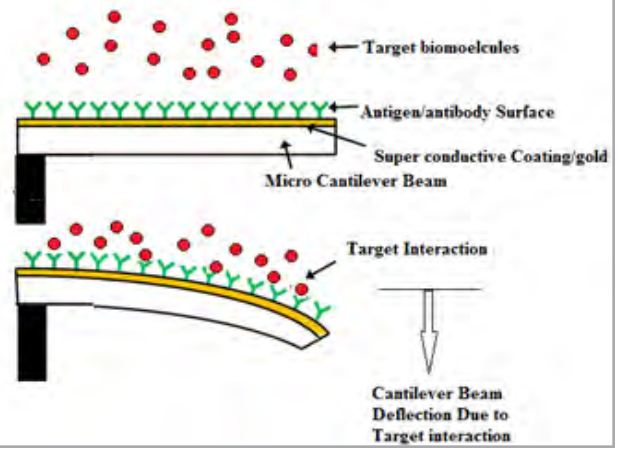
Because of the recent advancements in technology, miniaturized devices are feasible with micromachining processes. In addition to being portable, economical, energy efficient and more responsive (Srinivasrao K et.al. 2016),

They can also accommodate most complex electronic circuitry in a small die area with high-performance features. By understanding the key elements of Nanotechnology like surface to volume ratio, sensitivity, selectivity and resonance frequency this NEMS based cantilever are gaining the advantage over MEMS in the biomedical field. Moreover, Nanoscale devices are better suited to interact with bimolecule on both surface cells and inside the cells(Sangeetha and Juliet 2014). This property makes it feasible to detect the pathogenic agents in the human serum early. Conventional biosensing system requires complex electronic interfacing with packaging and maintenance. All these limitations can be avoided by using NEMS based cantilever as the Biosensor(Ali et al. 2017). If this NEMS cantilever surface area is being used to detect Biomolecule, then it is said to be Nanocantilever Biosensor. When the surface of the cantilever undergoes chemical or physical reaction based on pathogens present in human blood, it changes its electrical/mechanical properties(Chen 2013). In bio-sensing applications, NEMS-based biosensor gained a remarkable advantage due to its responsiveness and speed of detection.

In the process of detection, when a specimen sample is imparted at the free end surface area of the cantilever, it undergoes displacement and vibrations(Neethu and Suja 2016). Then, analysis of the relative shift in resonance frequency due to the change in vibration or movement can predict the mass of specimen sample located at the sensitive end of the NEMS cantilever. So as to observe the external signal, it is mandatory to interpret resonance frequency or displacement due to mechanical and electrical equivalent characters(Yanagida 2017).

A. Background: The detection of tropical diseases caused by pathogenic agents requires controlled environment ("Gopinath et al. 2015.), trained personnel, an enormous liquid body substance, and a prolonged workaround time. These pathogenic agents are widespread in both hot and cold climates. This leads to diseases which are more prevalent and cannot be predicted early causing loss of many lives. The pathogenic agents are microscopic in the order of nanometres and are present in body fluids. The detection of such smallest pathogenic agents requires sensors which can provide high sensitivity with specificity and good selectivity. Hence NEMS based cantilevers are better suited to detect pathogenic agents due to high surface to volume ratio. Even though MEMS based cantilever biosensors are available, NEMS cantilever structure provides better results in the detection of pathogenic agents because of their quantum sensitive range of geometrical structure(Dao et al. 2010). Here, the cantilever structure uses the principle of Mechanical and electrical transduction mechanism of the stress created on the free end of the cantilever owing to adsorption of Biomolecule as shown below in Fig.1.

Figure 1: Deflection of Cantilever Beam



Here the deflection of the beam due to binding of targeted molecules with an analyte on the highly sensitive surface leads to a change in resistance. This change in resistance is caused in the cantilever structure is easily measured with a microammeter or voltmeter

B. Challenges in Sensor Device Dimensions: Nanotechnology plays a crucial role in biomedical or Bio-sensing applications due to the fact that the characteristics of any material are different at the Nanoscale range because of the "large surface to volume ratio"(Dao et al. 2010), Nanoparticles can make materials more reactive, affect their electrical characteristics and quantum effects start dominating. Hence, the physical size of a sensor has some constraints in biology and medical applications in the direction of design and fabrication. According to the target measurand, the size and shape of the physical sensor must be designed appropriately(Hegner and Arntz 2003).

In the measurement process either in vivo/In vitro, a sample of bodily fluid is taken and placed in an analytical chamber(Parsediya, Singh, and Kankar 2014). In practical, the quantity of that liquid sample varies in the order of 50µL to 10µL from adults to premature babies. In the most commonly used microarrays for protein and DNA analysis, a typical sample volume is 10µL. For the purpose of disease detection using body fluids, it is essential to reduce the requirement of sample volume taken from the physical human body. To make this process minimally invasive that the sensor used in the biological environment have been reduced as possible(Luo et al. 2017). Miniaturisation is the basic requirement in fabrication method and technologies such as MEMS and NEMS. Henceforth, the recent developments changed the state of art in terms of sensing phenomenon from Micro to Nano domain.

In this paper, a stepped-clamp nanocantilever with RCF modulation readout method is used to detect the

deflection occurred in a piece of thin fabric. Meanwhile, material sensitivity is analysed for different materials under nanoscale dimensions. The geometrical structure of the cantilever also plays a crucial role in the improvement of deflection sensitivity. So, NEMS cantilever beam which incorporate Finite Element Method (FEM) of analysis for sensitivity and stress distribution are designed. Comparison between NEMS cantilever structure for two different cantilever beams is done to observe the deflection sensitivity.

MATERIALS AND METHODS

The mounting structure of the cantilever beam has one fixed end and one free end similar to a spring-mass system(Verma et al. 2017). The critical parameters of the cantilever beam that make it suitable for desired applications are resonant frequency and deflection sensitivity under static and dynamic modes(Bashir 2004). These two parameters depend on the material characteristics like Poisson's ratio, Young's modulus, and geometrical parameters such as length, width and thickness of a cantilever beam.

To analyse the geometrical characteristics of the basic cantilever structure, consider the general force balance equation of the spring-mass system

$$F_x = m\frac{d^2y}{dt^2} + \gamma\frac{dy}{dt} + k(y - y_0) \quad (1)$$

Where m the mass of the cantilever beam is,γ is the damping factory, y_0 are change in the deflection before and after mass is applied, *F* is the external force. *k* is the spring constant and it depends on material properties.

$$k = \frac{3EI}{l^3} \quad (2)$$

Where *E* is the Young's modulus of the material in Pa, I is the moment of inertia and l is the length of the beam in mts. Table (1) shows the typical weights of bio-molecules of a human body[14]

In the design of a cantilever for specific disease detection, there is no material whose single layer is good enough to improve the surface reactions(Verma et al. 2017). To overcome this, more than one layer is coated on the surface of the cantilever on which Biomolecule lands as shown in figure(1) during this process, the net thickness of the cantilever changes. This leads to a change in the spring constant of the beam.

Table 1. Mass of Bio-Molecules

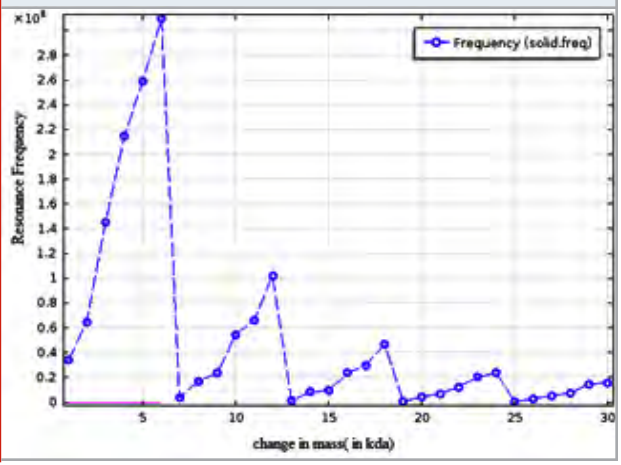
S.No	Name of the parameter	Dimensions
1	Human cell	1 nano gram
2	E-collie bacteria	1 pico gram
3	Virus/bacteria (10-50Mdaltons)	Order of 10s Atto grams
4	Amino acids(125dalton)	0.2zeptograms
5	DNA – 300 Dalton/bp	0.25 zeptograms
6	Biomolecule(180 Dalton)	0.3 zepto grams

Effect of mass on resonant frequency: In this paper, a simple double layer cantilever with and without a longitudinal cut at the fixed end is proposed. When a Biomolecule lands on the surface of the cantilever, the net change in Resonance frequency(Δω) is given by

$$\Delta\omega = -\frac{\Delta m}{2}\sqrt{\frac{\eta_2 E_a}{12\rho_a^3\eta_1^3}\frac{1}{wl^3}} \quad (3)$$

From the above equation (3), it can be observed that the net change in frequency(Δω)is directly proportional to the mass landed on the surface cantilever (Δm) and inversely proportional to the geometrical characteristics of cantilever beam such as width (w) and length (l^3). The net change in frequency(Δω) also depends on the properties of the material, which is used to fabricate the cantilever. Figure (2) shows the change in resonance frequency with change in mass.

Figure 2: Change in resonance with mass



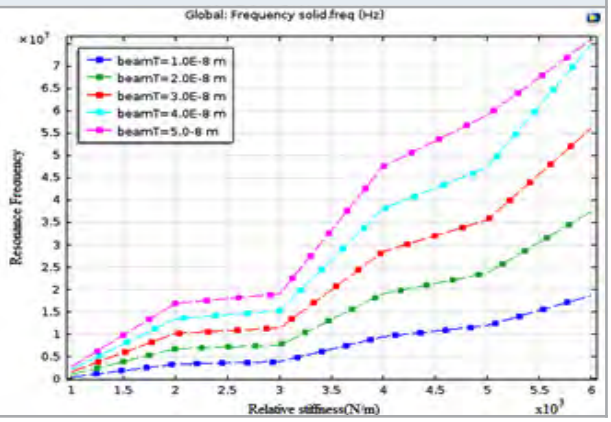
Effect of Stiffens on resonant Frequency: In the previous case, only change in mass is considered, and the spring coefficient is omitted. When multiple layers are coated on the cantilever surface, its stiffness becomes a significant factor in the cantilever sensitivity. Equation (4) depicts the relation between the change in resonance frequency(Δω) and the change in stiffness(Δk) of the material.

$$\Delta\omega = \frac{\Delta k}{2}\sqrt{\frac{12\eta_1\rho_b l^4}{\eta_2 E_b w t^2}} \quad (4)$$

From equation(4), it is observed that Δk strongly depends on the thickness of the cantilever beam.The thickness of the beam again varies with the size of the Biomolecule,

number of molecules, area of each particle and its thickness and other coatings if any. Figure (3) shows the change in resonance frequency (Δω) based on stiffness of the beam. In the Nanoscale range, equation (4) shows significant effect as the modulation of k due to molecular capture on cantilever typically changes by 10 – 40%.

Figure 3: Change in Resonance frequency with stiffness of the beam

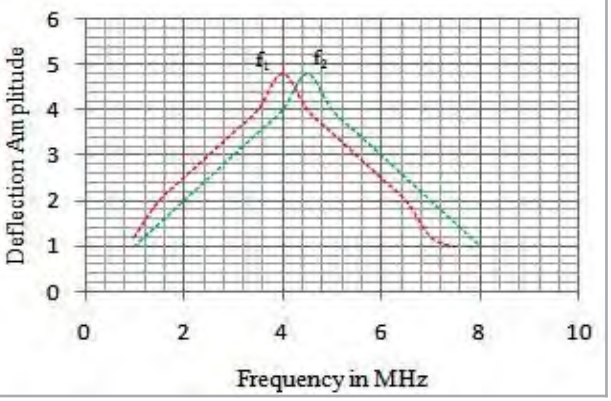


Critical thickness of the cantilever for nanoscale range: From the above analysis in section A and B, geometrical parameters vary in proportion. So, maintaining optimisation between mass and stiffness is necessary. Simplifying the above equation (4) gives us the

$$\frac{\Delta t}{t} = \sqrt{\frac{E_b \rho_a}{E_a \rho_b}} - 1 \qquad (5)$$

Where$\Delta t=t_c$, called the critical thickness of the cantilever beam, depends on material properties. It maintains the balance between mass and spring coefficient to avoid the composite effects and frequency reversal. Figure 4 shows the resonance frequency f_2 occurred when mass imparted on cantilever surface at time t_1, but due to the minor delay td causes resonance frequency shifted to f_1.

Figure 4



Effect of damping factor on resonance Frequency: The resonance frequency change due to damping (liquid medium) in response to transient input from the equation (1) equation to zero and its solution becomes

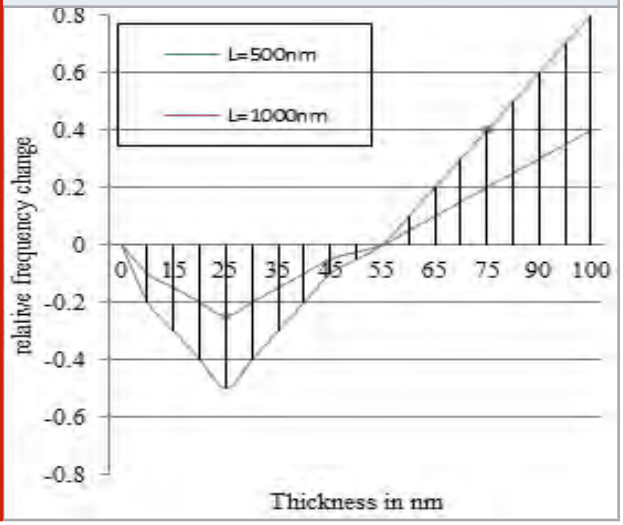
$$y = Ae^{-\beta\omega_o t}\sin(\omega_1 t + \varphi)$$

$$\frac{\Delta y}{y_o} = \frac{\Delta m}{m_o} - \frac{\Delta k}{k_o} \qquad (7)$$

$$\omega_1 = \sqrt{\frac{k}{m} - \frac{\gamma^2}{4m^2}}$$

From the above equation, it is observed that relative shift in resonance frequency is due to the factor $\frac{\gamma^2}{4m^2}$ and it is varied with respect to quality factor (Q).

Figure 5: Composite effects of Frequency reversal



Static Deflection: In the previous section, we discussed thefactors involved in dynamic biosensing, but it is not alone in the detection of small particles. Static deflection of the beam should also be considered in Nanoscale structure. Under the static deflection measurement, from the equation (1), the time-varying components become zero. i.e.

$$ky = F = mg \qquad (6)$$

Applying logarithmic differentiation on both sides with respect to its real values, we get For a instance consider a mass induced deflection on silicon fabricated cantilever beam with length-250nm, width-75nm, thicknes-20nm, Density (ρpsi) - 2330kg/m3, pathogenic elements with dimensions length-250nm, width-75nm, thickness-40nm, Density (ρp) – 1220kg/m.From equation (7), even though a negligible spring coefficient gives a greater deflection sensitivity, it is impractical. When we consider the basic equation (6), get the deflection of 41.07 fempto meters (fm). This displacement is practically unmeasurable. To address this problem, the spring coefficient k must be improved in order to give a better measurable deflection.

Effect of length on Deflection sensitivity: Figure 6(a) shows the parametric sweep of the cantilever beam length over displacement. From the figure, it can be observed that when the length of the cantilever beam increases, its relative displacement also increases. Here the length of the cantilever beam is varied from 1nm to 1μm for fixed width and thickness.

Similarly, Figure 6(b) shows the parametric sweep of the cantilever beam for width versus displacement. It shows that when the width of the cantilever beam increases, then the relative displacement decreases. Here the width of the cantilever beam is varied from 10nm to 50nm for fixed length and thickness. From the figure, it can be observed that sensitivity at Nanoscale is more typical to estimate due to insignificant change.Figure 6(c) shows the response of the cantilever beam under parametric sweep to predict the effect of thickness on displacement under the Nanoscale range. From the figure, it is observed that the movement of the cantilever beam decreases with increase in thickness, but it is more insignificant at the Nanoscale range. Here the thickness of the beam is varied between 5nm to 45nm for a fixed length and width..

Figure 6(a): Length Vs Deflection

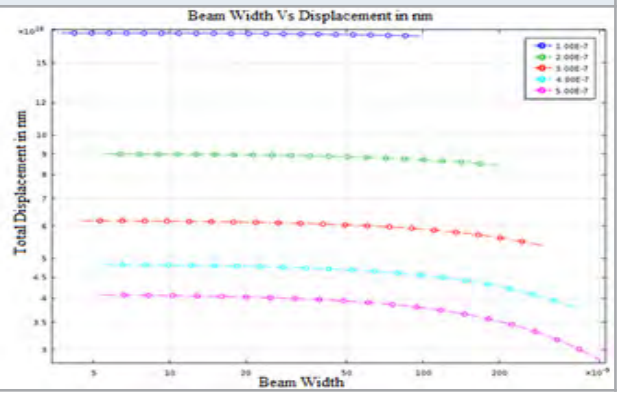


Figure 6(b): Width Vs Deflection

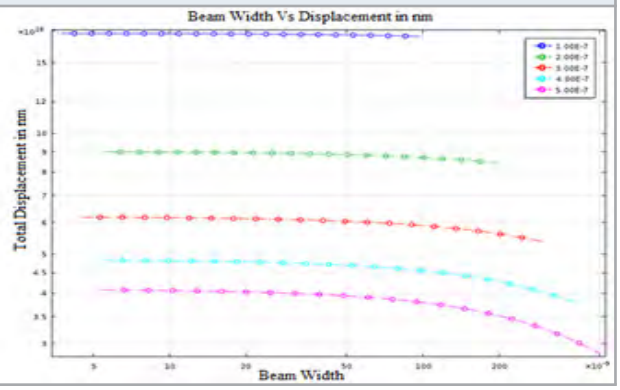
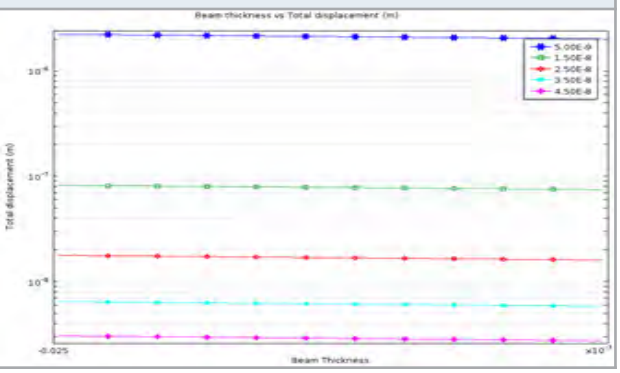


Figure 6(c): Thickness Vs Defection



Condition to get High Sensitivity: From the force balance equation (1), if we provide some additional static force (F_s) to(F_x) under steady state condition,under equilibrium condition, as if the spring is very weakened, we get the

$$k^1 = k\left(3 - 2\frac{y_o}{y}\right), y^1 = 0.67\, y_o \tag{8}$$

Where k^1 is the effective spring constant andy^1 is where maximum deflection occurs under nano scale structures.

Stoney's Formulation with respect to Geometrical structure: According to the Stoney's equation, the relation between deflection sensitivity and stress on a rectangular cantilever beam is given by(Gopinath, Anitha, and Mastani 2015)

$$ds = \frac{4(1-v)\sigma L^2}{Et^2} \tag{9}$$

Where ds is the deflection sensitivity,vis the Poisson's ratio,L is the length of cantilever beam, E is the Young's modulus,t is the thickness of the beam and σ is the stress applied on the surface.Similarly, the electrical behaviour of resonant frequency of cantilever structure in its mechanical equivalent as spring constantk isrelated by

$$k = \frac{Ewt^3}{4L^3} \tag{10}$$

According to the above Stoney's equation, deflection of cantilever beam is proportional to the stress applied on its surface under the assumption of small and fixed geometrical parameters length and thickness.The resonant frequency of the cantilever beam with mass density ρ is related as(Wadas et al. 2017)

$$f = \frac{\sqrt{E}t}{2\pi\sqrt{\rho}L^2} \tag{11}$$

From the above equation, it is observed that cantilever thickness is directly proportional and length is inversely proportional tothe resonant frequency.Meanwhile, from equation (1), deflection of the beam increaseswith length.Therefore the sensitivity of cantilever beam by considering deflection and frequency i.e. from equation (9) and (12) is defined as (Hegner and Arntz 2003)

$$ds \times f = \frac{2(1-v)\Delta\sigma}{\pi\sqrt{E\rho}t} \tag{12}$$

The cantilever stiffness coefficient k also plays a key role in determining the factor of sensitivity along with characteristics of a material and geometrical structure. From this analysis, it is observed that sensitivity of a

cantilever beam varieswith respect to the shape and the type of the material used to design the cantilever beam. Hooke's law explains this concept as F=-kx, where the negative symbol indicates a restoring force(Hegner and Arntz 2003).

Material Analysis: Before starting the design of a NEMSbased cantilever beam, it is necessary to check which material hasgood deflection sensitivity. So, this section will cover different silicon-based materialsandmetals which are used to design structural cantilever and simulated using COMSOL simulation software.

The deflection sensitivity and resonant frequency of any material depend on their geometrical structure and material characteristics like Young's modulus andPoisson ratio(Parsediya, Singh, and Kankar 2014). Figure 2 shows the deflection of a single layer cantilever beam over different materials for a fixed load of 1nN. In practical situations, pathogens available in a blood medium typically have a mass in the order of several nanograms. From the numerical analysis of the above said materials silicon and its compounds based cantilevers has a reduction in resonant frequency is insignificant compared to other polymer cantilevers. The silicon material has excellent thermal and mechanical properties with high elasticity. It will not affect by external excitations(Bashir 2004).

RESULTS AND DISCUSSIONS

Among the above materials, most commonly used semiconductor materials are Silicon (*Si*), silicon dioxide(SiO_2), polysilicon, silicon carbide (*SiC*) and silicon Nitride (SiN_4). These materials are thermally strong enough and chemically more viable. In this paper, we proposed a double layer cantilever structure with a longitudinal cut near the fixed end with an enlarged rectangular free end to provide bimolecular interactions at the surface. It exhibits relatively good sensitivity compared to a conventional cantilever, which is analysed using COMSOL simulator. From figures(4) and (6), Misses stress is calculated to find the yielding condition of a beam under the load. It gives the maximum operating capability of the material without fail beyond its strength.

The simple cantilever is the most common structure of MEMS and NEMS that is presently used. But single layer cantilever shows poor performance for biosensing related applications. Figure 8(a) shows a conventional double-layer cantilever, except the base layer, the top layer coated with superconductive material is used to exhibit very low resistivity and accommodate suitable environment for bimolecular interactions with chemical sensing(Nordström et al. 2008).

Figure 7: Cantilever Designs

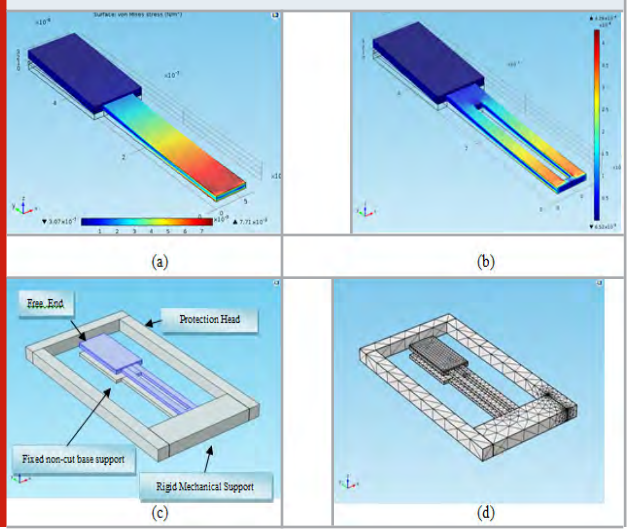


Figure 8: Comparison between Double layer cantilever beam sensitivity with and without longitudinal cuts

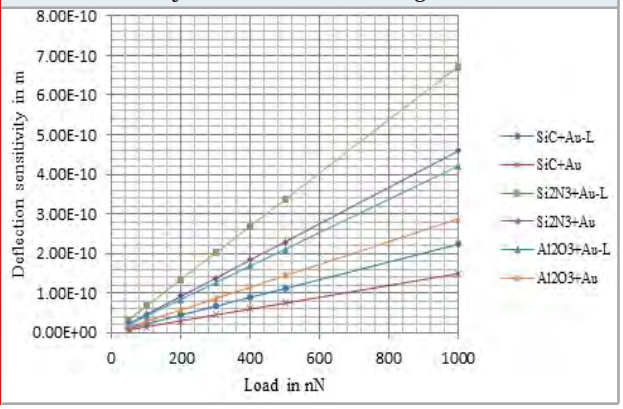


Table 3. Load Vs Deflection in Double layer Cantilever

Load in nN	SiC+Au	$Si2N_3$+Au	Deflection in meters			
			Al_2O_3+Au	SiC+Au-L	$Si2N_3$+Au-L	Al_2O_3+Au-L
50	0.7046e-11	2.2926e-11	1.4371e-11	1.1157e-11	3.3614e-11	2.1045e-11
100	1.4919e-11	4.5851e-11	2.8743e-11	2.2316e-11	6.7228e-11	4.2091e-11
200	2.9838e-11	9.1702e-11	5.7485e-11	4.4631e-11	1.3446e-10	8.4182e-11
300	4.4758e-11	1.3755e-10	8.6228e-11	6.6947e-11	2.0168e-10	1.2627e-10
400	5.9677e-11	1.8340e-10	1.1497e-10	8.9262e-11	2.6891e-10	1.6836e-10
500	7.4596e-11	2.2926e-10	1.4371e-10	1.1158e-10	3.3614e-10	2.1045e-10
1000	1.4919e-10	4.5851e-10	2.8743e-10	2.2316e-10	6.7228e-10	4.2091e-10

The structure of the cantilever beam with a longitudinal cut at the fixed end as shown in figure 7(b). This double layer cantilever with a longitudinal cut at the fixed end provides stress

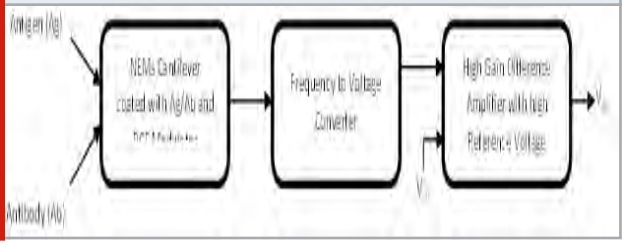
concentrated area and provides relatively good sensitivity compared to conventional cantilever structure in figure 7(a). The same structure with overhead protectionprovided is shown in Figure 7(c) and 7(d) shows the FEM analysis of proposed method.The NEMS cantilever beam with a longitudinal cut at concentrated stress region shows good deflection sensitivity.

The longitudinal cut at the fixed end is used as a focused stress Region here. The dimensions of this cantilever structure are taken as overall length 750nm, width 20nm, the thickness of base layer 10nm andgold coating at the surface layer 5nm. The significant effect of the longitudinal cut near the fixed end is analysed using Misses' stress value on the beam.

By analysing the structure of double layer cantilever beam with and without longitudinal cuts at stress concentrated regions, from figure 8 (a) & (b), it can be observed that a longitudinal cut Incorporated cantilever beam shows better deflection sensitivity.

Among the three different materials for a given dimension, Silicon nitride with a gold-coated surface shows good sensitivity. Table 2 shows the deflection sensitivity of the cantilever beam with a longitudinal cut for three different materials with variable load. In comparison with a conventional double-layer cantilever, it provides high deflection for the same load.

Figure 9: Block Diagram of NEMS Cantilever with associated circuit



Readout Methods: At the nanoscale range, since the parasitic effects are more dominating, the way of the "readout" is also more challenging. The table given below shows the basic principle and readout method used sofar for different cantilevers. RCF Modulation is defined as "The frequency magnitude changed in accordance with the instantaneous value of the Change in resistance (ΔR) and Change in Capacitance (ΔC). From the cantilever structure

$$\frac{\Delta R}{R} = 3k\frac{\left(1-\frac{L_{Piezo}}{2L}\right)d}{L^2}z \qquad (13)$$

In the above expression,k is the gauge factor, L_{Piezo} is the length of the Piezo resistive layer, L is the length of the cantilever, d is the distance from the neutral axis andz is the direction of deflection. Similarly

$$\Delta d = \frac{6(1-v)}{Eh^2\Delta S} \qquad (14)$$

Where Δd the change in deflection is, v is the Poisson ratio, E is the young's modulus andh is the thickness of the cantilever

According to RCF Modulation,

$$\Delta f = \frac{1}{2\pi\Delta R\Delta C}$$

here ΔR is the change in resistance due to tensile force applied on the cantilever surface as load The change in capacitance due to change in the distance between the surface plates is $\Delta C = \frac{\varepsilon A}{\Delta d}$

Table 4. Readout methods

Author References	Name of Structure	Dimensions (L x W x T)	Principle	Readout method
(Jithendra Prasad and Syed 2016)	Rectangular	100x25x2.5 (μm)	Static Mode	Piezo capacitance
(Murthy et al. 2016)	Rectangular	100x20x0.7 (μm)	Static Mode	Optical method
(Jithendra Prasad and Syed 2016)	Rectangular	150x30x1 (μm)	Static mode	Piezo resistive
(Srinivasa Rao K et.al (. 2016b)	Clamp shaped rectangular beam	500x100x1.5 (μm)	Static and dynamic	Piezo resistive and capacitive
(P Sangeetha et.al[2017)	Rectangular	500x100x0.5 (μm)	Dynamic mode	Piezo resistive
(Saeed et al. 2016)	Rectangular	600x50x1(μm)	Static mode	Capacitive
(Priyadarsini, Das, and Dastidar 2016)	Rectangular	305x30x3.86(μm)	Static mode	Piezo resistive

Application of RCF Modulation in Disease Detection of Malaria: Malaria is the most common disease brought on by mosquito bites dispersed through protozoan parasites. According to the statistics, each and every year almost 515 Lakh individuals are affected by this disease and approximately 300 Lakh individuals even die.

This malaria is of four types, Falciparum and Plasmodium oval, Plasmodium Vivax, and Plasmodium malaria. One of, the most damaging is the Falciparum and Plasmodium Vivax. This overall group is known as 'Malaria Parasite'. Female mosquitoes called anopheles would be the carrier of the parasite. This parasite enters human blood multiplies itself leads to symptoms of anaemia. Instead of this, occasionally affected with fever and migraines, grief may happen. Under severe situations, the patient may go unconscious or might even die in severe cases. Several precautionary steps will be required to prevent the spreading of this malaria. Such as Utilizing Mosquito nets while sleeping, DDT(Dichloro Diphenyl Trichloroethane) should be spray in the surroundings, Throughout the unused empty containers from the property assumptions, Under the Accumulated drain and stagnated water parasites lay eggs. Most of the worldwide Researchers carrying out to create the vaccination against malaria, but they are not yet available in the marketplace. However, post malarial medications for sale as chloroquine and quinine(Rahul, and Kumar 2019).

NEMS and MEMS devices show superior performance in disease identification. The technology developing exponentially and innovative products with a wide variety of programs in several disciplines. It has found its application in the field of Medical as Bio-NEMS and Bio-MEMS (Katta and R 2018). The diagnosis procedure of various diseases is changing the way for emergency scenarios using biosensors.

Now consider Antigen and Antibody combination of malaria *P. falciparum* histidine-rich protein2 (PfHRP2) and two enzymes involved in Plasmodium glycolysis; plasmodial lactate dehydrogenase (pLDH) and aldolase. PfHRP2- and pLDH-based antigen is used for the detections approximately 100 parasites/µL as 50KDa each.

Table 5: Quantitative Simulated Results

S.No	Load	Stress (N/m2)	Change In R(ΔR)	Change in C(ΔC)	Change In frequency(Δf)	Volt Equvalent Frequency	Output Voltage (Vout)
1	0	97.3	23K	56Pf	123.5Mhz	1.24V	1.76V
2	50KDa	584.0	56K	169Pf	16.85Mhz	0.25V	2.75V
3	25Kda	354.7	40K	113Pf	56.45Mhz	0.76V	2.24V

Figure 10. Quantitative Results of Malaria Detection

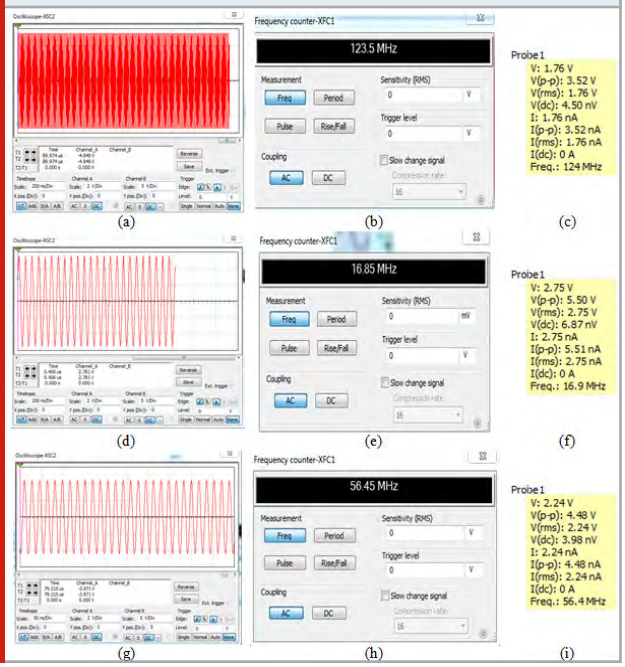


Figure 11 shows, a block diagram of NEMS cantilever with RCF Modulator together with Frequency to voltage converter and Differential gain amplifier. This setup incredibly provides sensitivity for interaction among the antigen and antibody. Table 3 reveals RCF modulator output in regards to change in resistance and capacitance of cantilever deflections is observed in MultiSim.

Figure 12(a) – (i) shows simulated results of Malaria disease by detection of its mass 50Kda and 25Kda. Figure12 (a), (b) & (c) shows, no load condition, but surface functionalization provides minimum deflection. Similarly 12(d)(e)(f) & (g)(h)(i) as a result of 50Kda and 25Kda mass reaction on cantilever surfaces provides significant change in output voltage.

CONCLUSION

The high sensitive NEMS cantilever is designed to detect the pathogens available in body fluids. They may be pathogens available in dengue, malaria, yellow fever, Chagas etc. In order to develop a universal biosensor to detect more prominent tropical diseases, this paper provides a preliminary solution to improve sensitivity. From the above analysis, the sensitivity of the sensor can

be enhanced by providing a longitudinal cut at the fixed end and choosing proper geometrical structure with the compatible material combination. The sensitivity of a cantilever beam increases with its length and decreases with its thickness. Ofcousre, several coatings on the base layer of the cantilever surface may increase the thickness, but it is optimized to improve the interaction between the biological and chemical elements. The cantilever structure developed here is compatible to implement a novel readout method called RCF Modulation. This Proposed Modulation technique improves sensitivity nearly 37.78% from statistical analysis compared to existing methods. The malaria disease is detected successfully using Novel techniques with enhanced sensitivity.

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A Study of Land Terrain Classification Using Polarimetric SAR Images Based on DTC

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ABSTRACT

Classification of terrain globally gained much importance in recent years due to its potential in assessing changes over a period of time. Remote sensing provides a major scope in this regard, especially after the launch of space-borne SAR satellites. These sensors are boon to the highly improved global imaging and mapping of terrestrial covers. This in turn requires exploration of the existing methods. In recent years the potential of decision tree classification are identified and research work undertaken towards analyzing and developing new algorithms for it. Decision tree classifiers can perform automatic feature selection and complexity reduction, while the tree structure gives easily understandable and interpretable information regarding the predictive or generalization ability of the data. Hence, the objective of the study is to investigate the existing classification techniques and critically analyze and compare the results with the proposed decision tree algorithm. The study area has chosen to be Roorkee city in India due to its assorted landscape. ALOS PALSAR L-band level 1.1 data has been used in this study. The DTC algorithm for terrain classification has accuracy of 92%, this work is mainly carried out in ENVI (Environment for Visualising Images) software.

KEY WORDS: LAND TERRAINS, BACKSCATTER, DECISION TREE ALGORITHM, SEPARABILITY INDEX, ENVI.

INTRODUCTION

Quantitative assessment of land cover is required for every country in order to make proper planning against earth surface alteration, since land cover change is related to global change due to its interaction with climate, ecosystem process, bio-geochemical cycles, biodiversity and human activity. Remote sensing plays a key role in the classification due to accessibility of various Synthetic Aperture Radar (SAR) images through ENVISAT, ALOS PALSAR, RADARSAT, Terra SAR-X, Tan DEM- X and many others. Classifying remotely sensed data into a thematic map is a very challenging task because it depends upon many factors. The factors, such as complexity of the landscape in a study area, selected remotely sensed data, adopted image processing and classification approaches, may affect the success of a classification. The goal is to

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produce high quality images of earth during day or night by means of SAR imaging. The increased availability of high-resolution SAR satellite images has led to new civil applications of these data. Among them is the systematic classification of land cover types based on the patterns of settlements or agriculture recorded by SAR. SAR is the radar used to create 2D/3D images of terrains and is mounted on a moving platform of aircraft or spacecraft. SAR performs better over conventional data beams by utilizing the motion of the radar antenna over a target region to provide finer spatial resolution. The distance the SAR device travels over a target in the time taken for the radar pulses to return to the antenna creates the large synthetic antenna aperture (the size of the antenna). Larger the aperture, higher the image resolution will be, regardless of whether the aperture is physical (a large antenna) or synthetic.

Presented work in Literature: Previously many researchers proposed different methods to classify various geographical regions. Some includes classification of crops, types of soil, land terrains etc. P.Mishra, D Singh and Yamaguchi.Y(2010), proposed a machine learning decision tree classifier for land cover classification, it was applied to fully polarimetric ALOS PALSAR data and identified 5 classes. Mahesh Pal and Paul M Mather (2001) presented a decision tree classifier for agriculture land area classification using Enhanced Thematic Maps (ETM+) data from LANDSAT-7.

In this study, 6 land use classes are selected for classification. From this it is observed that the DTC performs better and the overall accuracy is about 84.5%. It was further improved to about 2% to 86.5% with boosting techniques.

Figure 1: Proposed land cover classification procedure

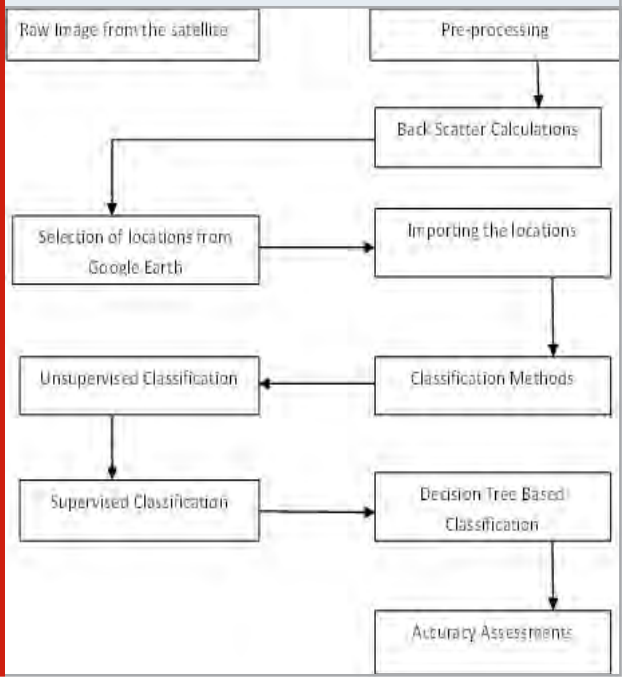
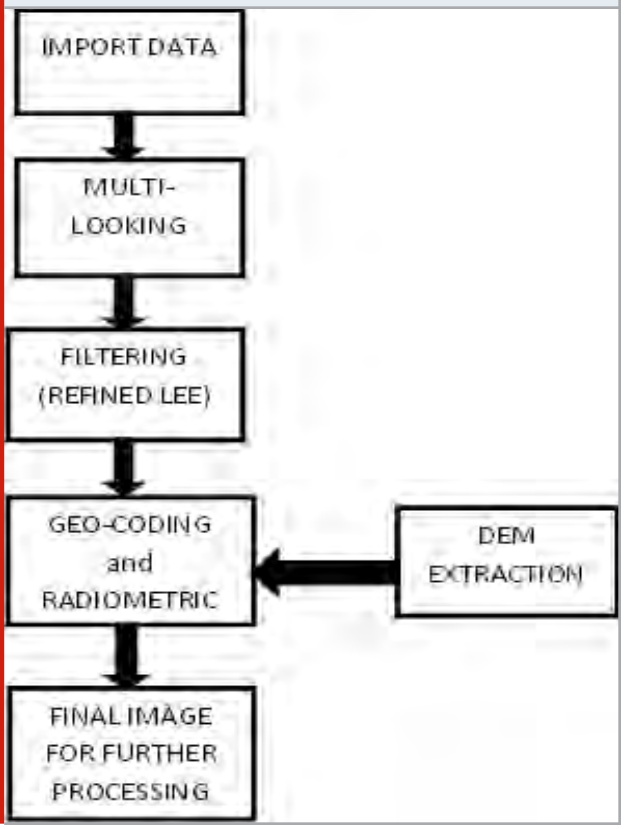


Figure 2: Raw Image data file from satellite

Figure 3: Flowchart representing pre-processing methods for a raw image



D.Lu&Q.Weng(2007) suggested that the image processing based pre-requisite methods were more successful in calibrating remotely sensed data into a thematic map. J.S.Lee ,M.R.Grunes and R.Kwok(2010) developed Maximum likelyhood classifier to segment polarimetric SAR data according to terrain types. Monte Carlo simulation is used to assess the classification methods. It yields higher accuracy than other classifiers but computationally intensive and time consuming technique. Overall accuracy is 85.95% based on confusion matrix. Wei Gao, Jian Yang and Wenting Ma (2014) proposed mixture models for modeling heterogeneous regions in a single look and multi-look polarimetric.

Qin Ma, University of Western Ontario (2013) summarized that SAR sensors (such as RADARSAT-2) are able to transmit microwaves through cloud cover and light rain and thus offer an alternative data source. NengZhong, Wen Yang(2015), proposed an unsupervised classification method based on sparsity based similarity on Hermitian Positive Definite (HPD) matrix. PolSAR data images are over segmented into superpixels followed by representing each superpixel by HPD matrix.

Figure 4: Output of digital elevation model (DEM) Extraction

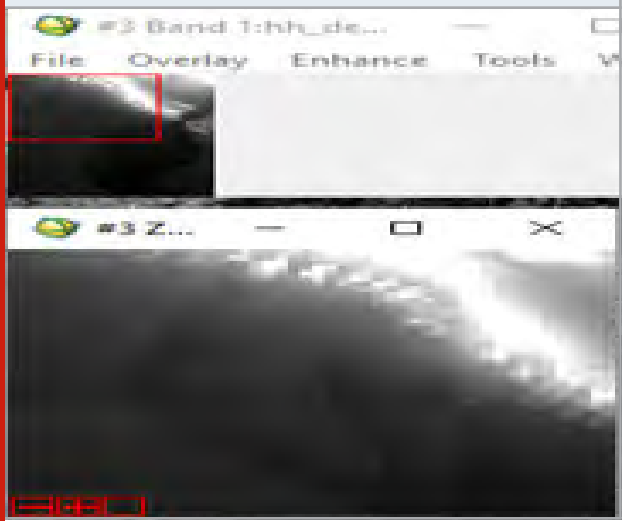
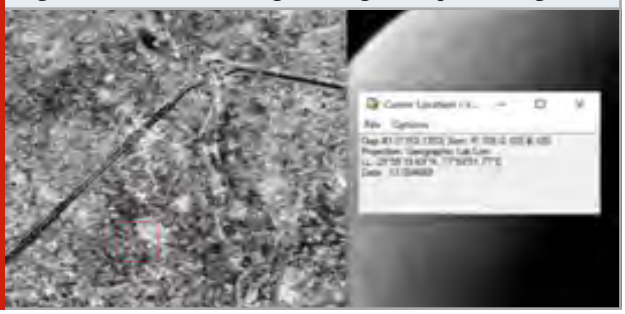


Figure 5: Calibrated Image through Pre-processing



Sheng Sun, Renfeng Liu and Wen Wen (2015) improved the accuracy of unsuperivised classification based on scattering models, by using the four component Yamaguchi model. Here the four component model is combined with Wishart model. In this experiments, seven areas of various terrains are carried out using AIRSAR data set. It can be seen that resolution and Accuracy is also increased significantly. S. Abdikant (2016) presented a paper, the potential of using SENTINEL-1 for Land cover mapping in urban areas is investigated. Support vector machine has been implemented. Results show that by combining dual polarization data, the overall accuracy increases up to 93.28% against 73.85% and 70.74% for individual polarization. Richa Sharma, AnirudhaGhosh and P.K Joshi (2013) used LANDSAT TM satellite data for classification using Waikato Environment for Knowledge Analysis (WEKA) software. This in band of signals is assigned to various terrains. The overall accuracy is to be 90%.

NengZhong, Wen Yang (2013), proposed an unsupervised classification method based on sparsity based similarity on Hermitian Positive Definite (HPD) matrix. Mahin Shaokrollahi, Hamid Edadi (2016) presented a study on various fusion methods based on feature and decision level fusion of PolSAR and Hyper spectral images are investigated. The experimental results show that the feature fusion has better performance than other decision fusion methods. The overall accuracy of feature fusion was 98.92%. Zhixin Qi; Yeh, Xia Anthony Gar-On and Li (2015) proposed a three component method for timely detection of Land cover changes using PolSAR images. Three components are object oriented image analysis (OOIA), Change vector analysis (CVA) and post classification comparison (PCC).

From the above literature, we have come to a conclusion that no specific method was able to increase the overall accuracy, however specific methods were able to increase the accuracy of individual terrains, and have not considered the possibility of classification based on separability index. Hence in this work we made an attempt to propose a DCT classifier which would bring a considerable change in the overall accuracy. The separability index has been taken into account is derived from standard and mean deviation values of the backscatter quotient. This proposed method would increase the overall accuracy.

MATERIALS AND METHODS

Proposed Technique to Classify the Land Cover Terrain: The complete Land cover classification process is shown in Fig 2. It includes many steps like raw data collection, pre-processing, back scatter calculations, importing locations on to the calibrated images. The satellite raw data (images) is pre-processed to obtain the calibrated images. The calibrated images are then put under the classification methods which are unsupervised, supervised and decision algorithm. To know the best method, accuracy is calculated.

i)Methods and Classification of Land Terrain: Methods and Classification provide an insight into the processes that are involved in the classification of land terrains. Methods include raw data collection from satellite, pre-processing, backscatter calculations, choosing and importing of locations from Google Earth to output of pre-processed image. Then backscatter values calculation and graphical analysis deals with accuracy and outputs. The classification can be carried out by means of un-supervised and decision algorithm

Raw data from Satellite: Raw data is the satellite images which are collected from IIT-Roorkee upon a formal request are shown in the fig.3.Raw data is in the form of four different polarization categories. Horizontally transmitted and horizontally received (HH), Horizontally transmitted and vertically received (HV), Vertically transmitted and horizontally received (VH), Vertically transmitted and vertically received (HV). ENVI software is used to process and analyze geospatial imagery.

Pre-Processing of Raw Data from Satellite: The inputs for pre-processing procedure include the raw data from the satellite. The SAR images cannot be used for classification in the form obtained. Therefore some prerequisite processing is required. The Fig. 4 represents the methods involved in the pre-processing.

Data Import to Software: The data is imported through SARSCAPE using ENVI-4.7 software to generate four Single Look Complex (SLC) files (HH.slc, HV.slc, VH.slc and VV.slc). Fig 5. Shows the Data import procedure. It must be kept into mind that the raw images obtained from the satellite are converted into standard format of SLC files. SLC files are compatible for further processing procedures.

Multilooking of UncalibratedImage: Radar speckle can be suppressed by averaging several looks (images) to reduce the noise variance. This procedure is called multi-look processing. Multiple looks are generated by averaging azimuth or range resolution cell. The goal is to obtain in the multi-looked image approximately squared pixels. To avoid over- or under-sampling effects in the geo-coded image, it is recommended to generate a multi-looked image corresponding to approximately the same spatial resolution foreseen for the geo-coded image.

Filtering of uncalibrated image: The second step in speckle suppression uses filtering methods, which fall into two main categories, namely, adaptive and non-adaptive filters. Adaptive filters use weights that are dependent on the degree of speckle in the image, whereas non-adaptive filters use the same set of weights over the entire image.

DEM Extraction of Raw data: It is digital representation of ground surface topography or terrain. The digital elevation model (DEM) is extracted by GTOPO30 technique. THE GTOPO30 technique makes the image into a suitable format where in which the images can be made compatible at the outset. Fig 9 b) Depicts the outcome after the DEM extraction has been carried out. It can be noted that the images are not grated on the grating scale. Hence it is to be sent to geocoding.

Geo-Coding of Uncalibrated image: Geo coding stands for geographical coding. It refers to the conversion of SAR images - either slant range (preferably) or ground range geometry - into a map coordinate system using DEM data. Fig 10 a). shows the process of Geo-coding. This procedure maps the calibrated image into a map coordinated system. The GRID SIZE contains x dimension and y dimension which are to be kept as 25.

Output: The output of the pre-processed image will be a calibrated image which will be free from the speckles and is convenient for further procedures. The Fig. 11 Contains the overall output of the pre-processing procedure. The noise variance and the speckle density have been drastically reduced. The pop up notification shows the latitude and longitude configuration of each and every location.

Backscatter Calculations Of Calibrated Image:
Inputs: The inputs of backscatter calculations include the pre-processed image and also the band-math formula which is loaded to the software using SARSCAPE. The band math tool helps in adding any kind of mathematical formula. It is used in arithmetic calculations such as addition of all calibrated satellite images.

The steps involved are as follows.
For calculation, the path is as follows.

Basic tools → Band Math → Enter b1 and b2

Enter the given expression 10*alog10 (b12+b22)-83-32
Click on Ok

Pairing of variables with bands is done.
Enter the path of output file by clicking choose button.

The variable in the expression b1 and b2 represents the real and imaginary reflection values of a specific latitude and longitude. The formula used here is used to obtain the backscatter values at each and every co-ordinate configurations

Outputs: The outputs of backscatter include the backscatter quotient at each and every latitude and longitude of the calibrated image. In Fig 12. DATA represents the backscatter value at those co-ordinate configurations.

Figure 6: Backscatter quotient of co-ordinate configurations

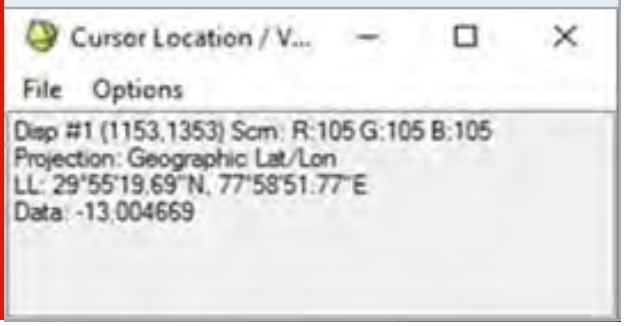


Figure 7: Illustration of how to choose locations from Google Earth

Selection Of Locations From Google Earth:
Inputs: Wtake the coordinates of 50 different locations from each terrain such as water area, vegetation, barren land, urban areas. We note down the backscatter values in a note file from all the selected terrain locations. Fig 13 depicts an example of the selection of a specific type of terrain locations. It is noted that the locations are selected from Google Earth.

e) Importing Selected Locations On To Calibrated Image:
Inputs: The points from the excel file are imported on to the calibrated image using ROI tool. The backscatter values at the selected locations of different terrains are observed and are noted down in another excel file. This new excel file is used for graphical analysis.

Graphical Analysis of Backscatter Values:
Inputs: The excel file containing the backscatter values of specified locations from different terrains is used to create a graph. The backscatter values are placed on the y-axis.

Figure 8: Shows the use of ROI tool in importing ROIs on calibrated image.

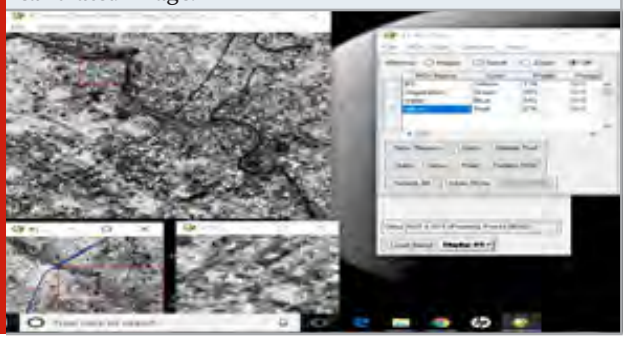
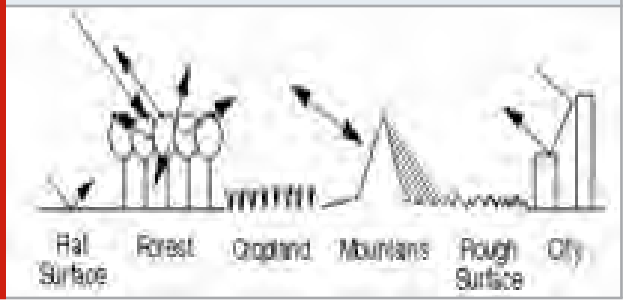


Fig 9 shows the scattering phenomenon on terrains like forests, crops, mountains. These graphs are prepared for each and every configuration of horizontally transmitted horizontally received (HH), horizontally transmitted vertically received (HV), vertically transmitted horizontally received (VH), and vertically transmitted and vertically received (VV). The graphical analysis for HH is as follows.

Figure 9: Different Scattering mechanisms on various types of terrains



Outputs: The graphs obtained are used to create the DCT. It is observed from the graphs that at most one specific terrain can be classified from one particular polarized calibrated image. Hence, various arithmetic operations between the four polarized calibrated images are required in order to obtain a single image where in which all terrains can be classified. Table1. Presents the tabular column where in the backscatter ranges of different terrains are tabulated.

Figure 10: Graphical analyses for HH.

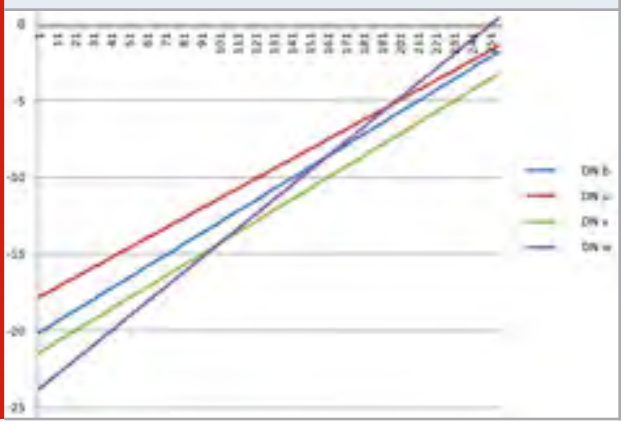


Figure 11: graphical analysis for HV.

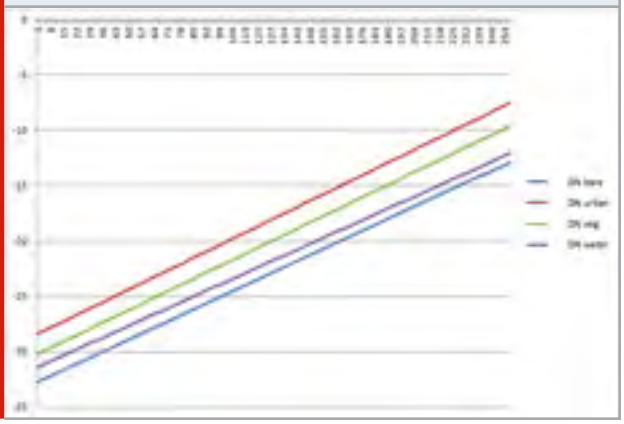


Figure 12: graphical analysis for VV.

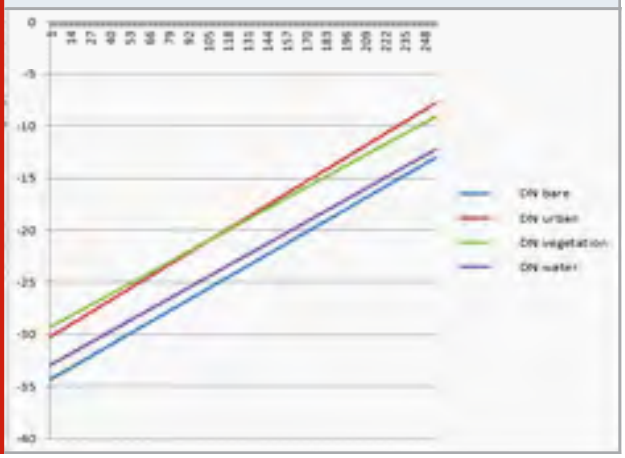
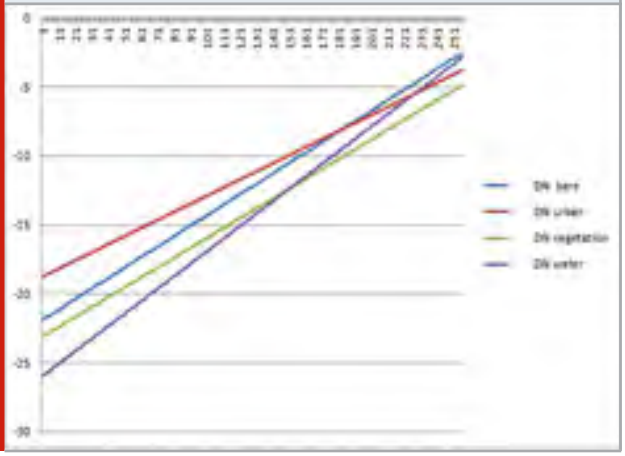


Figure 13: Graphical analysis for VH



f)Classification Methods of Calibrated Images:
Supervised: Few procedure involved here are parallel opipped method, MLC and minimum deviation methods. It is theoretically and practically proven that this type of classification has more accuracy than un-superivised classification comparatively.Un-supervised: This procedure involves only two algorithms namely Iterative Self Organising Data Analysis (ISODATA) and Clustering means (K-means) algorithm. ISODATA happens to be developed K-means by eliminating all the setbacks. Decision Tree: A research scholar can prepare the algorithm by keeping in mind the various parameters that are derived from the backscatter quotient such as standard deviation, mean deviation and separability index.

Inputs: The graphs obtained from the analysis along and calibrated images are used inputs for the classification methods. They are.

Outputs: The outputs that are obtained from these classification methods include the colour classified calibrated images where in which each colour specifies a particular terrain.

Table 1: Backscatter ranges of different terrains

	Water	Urban	Vegetation	Barren
Max	-12.09	-24.8874	-1.0788	-5.0786
Min	-22.4	-29.3675	-5.6779	-11.432

g)Unsupervised Classification Of Calibrated Image:
Inputs: The inputs to the unsupervised classification will be the arithmetic sum of all the four configuration of that geographical location i.e.; HH+HV+VH+VV.The image obtained is used for the classification for different terrains.

Fig 14 Represents the input for the unsupervised classification. This procedure involves using Band math tool where we provide the formula. The formula is b1+b2+b3+b4. b1+b2+b3+b4 represent the addition of HH, HV, VH and VV respectively.b1 = HH, b2 = HV, b3 = VH and b4 = VV.

ISODATA: ISODATA stands for Iterative Self Organising data analysis technique algorithm. ISODATA algorithm does not require to pre defines the number of clusters. The minimum and maximum numbers of classes are chosen as 5 and 6 respectively. As we increase the number of iterations, the more accuracy we obtain. After critical analysis, it has been seen that change threshold of 2.00% gives optimum results. Fig 15 Presents the output obtained after the classification of ISODATA. We can clearly observe that the different terrains are classified using different colour codes.

Figure 14: Addition of four caliberated images (HH+HV+VH+VV)

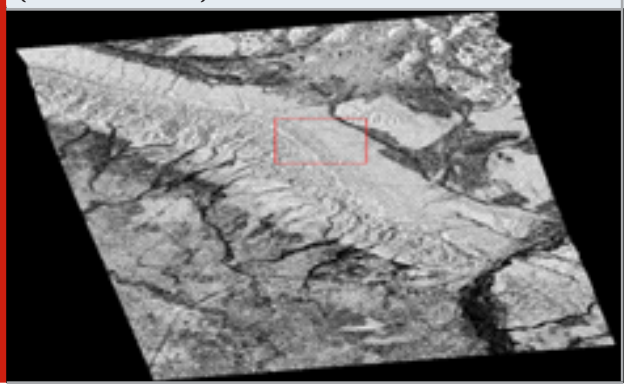
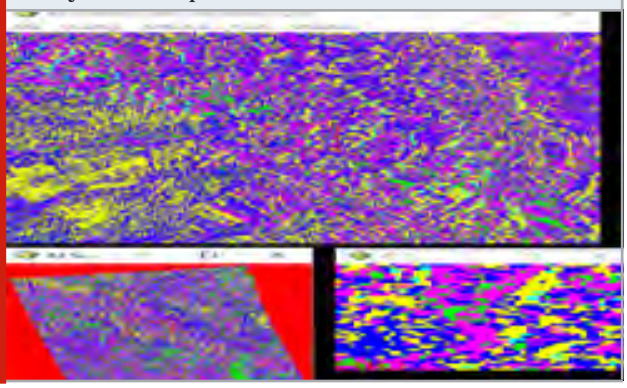


Figure 15: Output of Iterative Self Organizing Data Analysis Technique



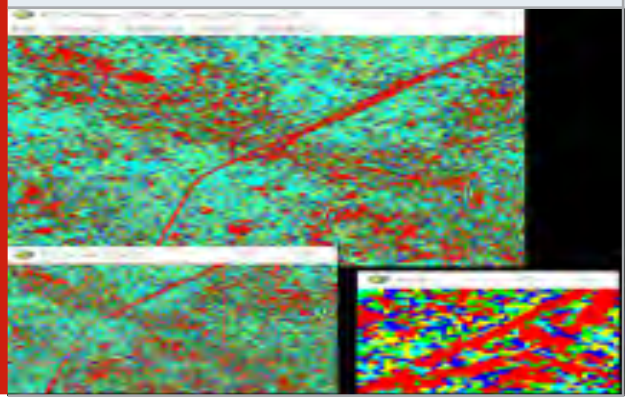
K-means: In general, the procedure carried out in K-means involves splitting of the geographical data into K number of clusters. The number of clusters is pre-determined in K-means. The number of classes is specified as 6 taking into account the unclassified pixels. A change threshold of 2.00% is chosen to obtain better results.

K-means Output: Fig 16 Presents the output of the Clustering means (K-means) classification. We can clearly observe that different terrains are classified using colour means.

h) Decision Algorithm For Classification Of Calibrated Images:

Inputs: The inputs to the Decision algorithm is the separability index calculated from mean deviation and the standard deviation value. This algorithm is an efficient tool for separating the pixels based on individual decisions on each and finally the desired result is obtained. Based on the decision one class is separated from the rest. According to the concept, the separability index is given by

Figure 16: K-means Output image under Unsupervised Classification



$$S_{ij} = \frac{|\mu i - \mu j|}{Sum\ of\ Standard\ \ deviation\ \ of\ i\ and\ j}$$

Where μ is the mean deviation Classes i and j represent different ground objects.
Table 4 Determines the number of training points which have been considered to determine the algorithm and are referred from Google Earth.

Table 2. Training points

class	Training Points
Water	50
Urban	100
Bare Soil	50
Vegetation	50

Figure 17: Decision Algorithm classifying different terrains in each step

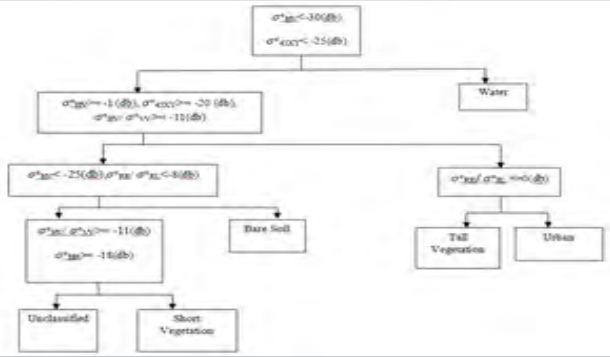
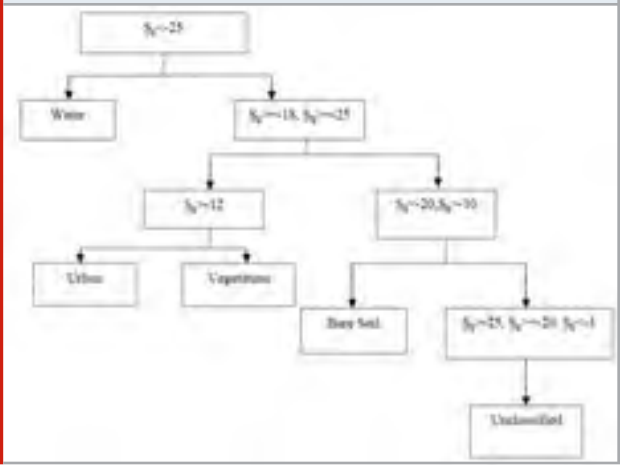


Fig 17 is the algorithm for decision tree classification. This algorithm is based on the standard and mean deviation values. It is seen that the algorithm starts with discrimination between water and other classes.
The modified decision algorithm is as follows.

Fig 18 Shows the modified decision algorithm in which the different terrains are classified in each and every step. It is observed that at every step a particular terrain is classified and the regions which do not satisfy the condition are classified into another group where the other probable terrains are possible. The scheme of classification is based on Separability Index. We have chosen separability index as it provides a more sophisticated means of classification when compared to other DTC. Also, it is proposed that the overall accuracy is improved. Few important observations have been identified and they are.

From the scattering mechanism, it is known that water bodies act as flat surfaces and have low backscatter values so that the backscatter co efficient is lowest of all.The reason behind taking urban and vegetation as a single class is that both exhibit almost analogous backscatter coefficient.Next the regions comprising of bare soil are sorted out from the remaining terrain.

Figure 18: Modified Decision Algorithm based on separable index



Output: The output of the decision algorithm is expected to be a colour classified image where the accuracy and efficiency is much more than the efficiency of Supervised and Unsupervised classification procedures.

RESULTS AND DISCUSSION

A comparative analysis between the existing methods viz, K-means and ISODATA over the calibrated images are discussed. All the processes stated here are done using ENVI and SARSCAPE which are image processing softwares.The results are calculated by importing another set of location co-ordinates chosen from Google Earth and importing those co-ordinates on to the classified image. Then these locations are cross verified and checked weather the resultant terrain obtained from

the classified image is same as that of the terrain from Google Earth. We choose a large number of locations in this case so as to increase the efficiency. The formula used for calculation of accuracy is as follows.

$$\text{Accuracy} \quad \% \quad = \frac{\text{Number of points chosen} - \text{Number of matching points}}{\text{Total Number of points chosen}} \times 100$$

i) Results of k-means classification: The obtained output is calculated in terms of accuracy. Here the points chosen from the selected region for classifying different terrains such as water,urban area, barren land and vegetation are matched with the points on another reference image The accuracy for K-means is found out to be 74.%.

ii) Result of ISODATA Classification: By observing the outputs of this ISODATA we can say that this method does not show any superior performance when compared to K-means method and hence yielding a lower accuracy. The accuracy of ISODATA method of classification is about 68%.

CONCLUSIONS

This work was started with the aim of observing a decision tree algorithm for land cover classification and to analyse the various classification methods such as ISODATA which does not need to know number of clusters to be classified and K-means which requires a pre-determined number of clusters .On these lines, various classification techniques are compared in terms of efficiency. From the comparison among the classification methods it is evident that water is estimated well by all the classifiers because the back scatter phenomenon for water is very well distinguished from other terrains. There is no definite method that gives satisfactory results in classifying the land into various terrains. But every method has its own significance in classifying a particular terrain.Among these we expect the DTC method to provide more accuracy.

Future Scope: This study provides a basic ground for the examination of land cover classification. All the methods used for the classification are implemented by the software. Their performance can be improved if more efficient codes are used withDTC to get higher accuracyThe future of this methods has a huge potential where in which various parameters such as Satellite images can be used to find the height and depth of mountains and oceans respectively. A possibility also exists where in which this method can be used to detect various metals that are available in a particular geographical locations which can be detected by the detection of radiation patterns using backscatter.

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Motion Estimation Algorithms With and Without Interpolation

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ABSTRACT
Motion estimation is an important process of detecting a change in position of a pixel. Motion vector is the one which defines the position of block matching at reference frame. For a typical video sequence, blur occurs due to the movement of camera or object. But the concept of interpolation process requires a large number of calculations. Here, we propose a new model sub-pixel motion estimation which is carried out without interpolation in which the concept of motion compensation & interpolation is not needed. To perform the matching of frames between the blocks, we are using full search and logarithmic search algorithms using MATLAB which provides comparatively good PSNR values and we are using tailor series approximation for refining the search process..

KEY WORDS: MOTION ESTIMATION, INTERPOLATION, SUB-PIXEL INTERPOLATION, PSNR VALUES.

INTRODUCTION

The H.264/AVC standard provides a best video quality vision feature at lower bit rates than previous standards. The two important special features are Scalable Video Coding (SVC) & Multi-picture inter-picture prediction. Using the previously encoded pictures as references, up to 16 reference frames to be used in some cases. To achieve sharper sub-pixel motion compensation six-tap filtering is used for source of half-pel luma sample predictions. Quarter-pixel motion is derived by linear interpolation of the half pixel values to save processing power. Interpolation is an important concept which is required in many image and video processing applications to determine the accurate motion vectors. Images produced after interpolation has smoother lines & a better large print than the original.

Minimum and reduced number of search points is used for analysis during the motion estimation using the concept of sub-pixel. This is achieved by searching the reduced area around the sub-pixel motion vectors. Pixel accuracy value is directly related to the number of times of enlargement of image along each direction, for example for 0.125 pixel accuracy achievement, we have to enlarge the image by 8 times along each direction. Since motion compensated frames are not required, a modified algorithm with no interpolation is analysed and discussed.

The literature survey is carried out as(Michal Irani,1993) Increased sampling rate could be achieved by obtaining more samples of the scene from a sequence of displaced pictures. The same method can also be used for de-blurring a single blurred image. [Jun-Geon Kim] High efficiency Video Coding (HEVC) sub-pixel motion estimation (SPME) technique with reduced computational complexity and

ARTICLE INFORMATION

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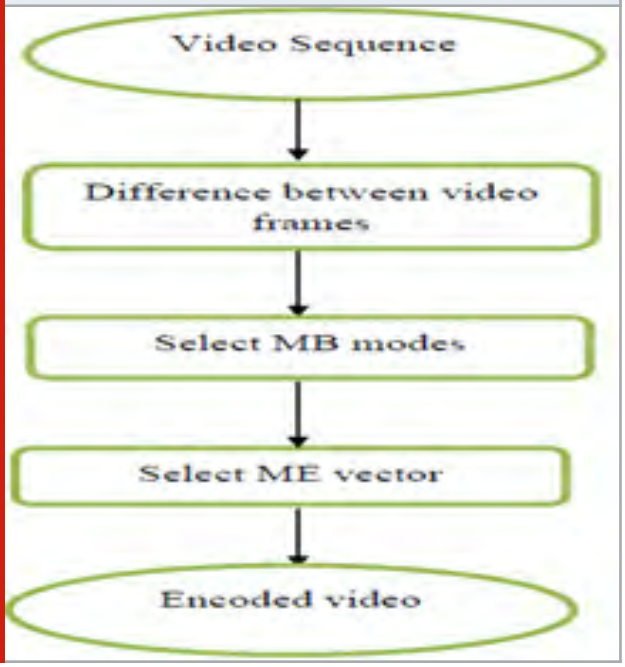
50% better video compression efficiency than H.264 standard. (Stanley H. Chan, 2009) Reduced computing rate and improved PSNR value with the concept of decimation, interlace interpolation. At 10 iterations CG algorithm is almost as good as LR algorithm. (Ahmet Can Mert,2016) In bilateral motion estimation (BME) scheme having a lower computation to estimate motion vectors (MVs) for an interpolated frame by applying vector refinement.

MATERIALS AND METHODS

(K.Priyadarshini,2016)Adaptive rood pattern search (ARPS) motion estimation algorithm is also adapted to reduce the motion vector overhead in frame prediction K.Priyadarshini,2016)The block matching algorithm (BMA) for motion estimation has proved to be very efficient in terms of quality & bit rate. (K.Priyadarshini,2012, 2018) An improved fast motion estimation algorithm is executed based on the increasing the count of reference frames in the place of one reference frame The proposed method result value proves that the process speeds up with improved PSNR value of 2.5 dB. In(K.Priyadarshini,2016, 2014, K. Mohana Chandricka,2019), the high performance analysis using the single frame interpolation concept for half pel and quarter pel is executed. The multimedia communication is efficient and standard video coding compression. The first frame can improve the resolution process and second frame can use the location of quarter pixel. In (K.Priyadarshini,2016), presents the differential evolution block matching algorithm optimization .Two optimization technique can be using the method, of optimization of partial swarm and the protocol of differential evolution(DE) .The proposed method the high PSNR and compared with PSO algorithm.

Figure 1: Stages of the proposed approach



The method followed now is an enhanced approach with reduced time for encoding of Motion estimation and selection of Macro blocks mode. Fig.1 shows the approach which consists of three stages. First stage measures the difference between video sequence test frames. Second stage selects the macro blocks modes and the third stage determine the motion vector. Motion vector follows Full pixel, Half-pixel fraction and pixel fraction calculation .Selection of the macro-block and motion vector estimation reduces the processing time. Discarding the concept of interpolation in motion estimation is by using block matching and optical flow.

Table 1. Analysis of Full Search algorithm with various interpolation values

Search Algorithm	Video Sequence	Interpolation Values	PSNR	MSE
		0.15	31.090 E-04	7.4012
Full Search	CITY	0.25	30.809	7.8774E-04
		0.5	30.256	8.9006E-04
	FOREMAN	0.15	28.177	0.0016
		0.25	27.264	0.0019
	SALESMAN	0.5	27.143	0.0020
		0.15	30.230	5.4409E-04
		0.25	29.922	5.7708E-04
		0.5	29.6458	6.0894E-04

Table 2: Test video sequences

Video sequence	Motion Type	Frame Size
Akiyo.QCIF	Medium	352x288
Container.QCIF	Low	352x288
Carphone.QCIF	Medium	352x288
Stefan.CIF	High	352x288
Foreman.QCIF	Medium	352x288
Bus.QCIF	High	352x288
News.QCIF	Low	352x288
Tennis.SIF	High	352x240
Mecid.QCIF	Medium	320x240
BQmall.CIF	High	160X120

Full Search Algorithm: To achieve the best match block in the reference frame, we have to compare the current block with all the candidate blocks of the reference frames. FSA determines and evaluates the best PSNR value.

Logarithmic Search Algorithm: TTo match blocks in the form of quadrant monotonic model, 2D logarithmic

algorithm of search is followed. Search area is reduced to smaller one during multi stage approach. Decreasing the number of macro block causes maximum computation with expected PSNR values.

RESULTS & DISCUSSION

The performance comparison of full search and logarithmic search algorithms for three video sequences are shown in the above Table I and Table III. Table II depicts the test video sequences used in our analysis It clearly shows that decreasing the interpolation value increases the PSNR. For example let's take the video sequence city, the PSNR values of city are 31.0908 for 0.15, 0.8098 for 0.25 and 30.2568 for 0.5 and this shows how the PSNR values increases with decreasing the macro block size.

Table 3: Analysis of Logarithmic Search algorithm with various interpolation values

SEARCH ALGORITHM	VIDEO SEQUENCE	INTERPOLATION VALUES	PSNR	MSE
	CITY	0.15	31.1794	7.2517E-04
		0.25	30.8898	7.7337E-04
		0.5	30.2999	8.8127E-04
Logarithmic Search	FOREMAN	0.15	28.4163	0.0015
		0.25	27.4294	0.0018
		0.5	27.2966	0.0019
	SALESMAN	0.15	30.4022	5.2189E-04
		0.25	30.1476	5.5358E-04
		0.5	29.8156	5.8558E-04

Figure 2: Comparison of PSNR and Interpolation values using Full Search algorithm

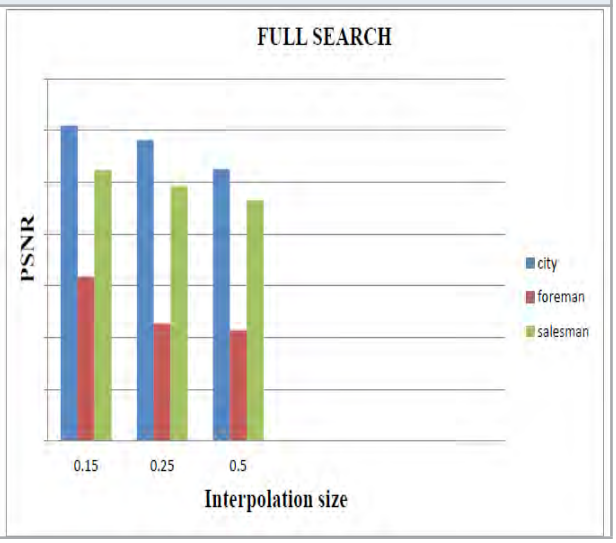


Fig.2 & Fig.3 shows the comparison results values of PSNR for various interpolation values of 0.15, 0.25 and 0.5 for the various video sequences of City, Foreman and Salesman.

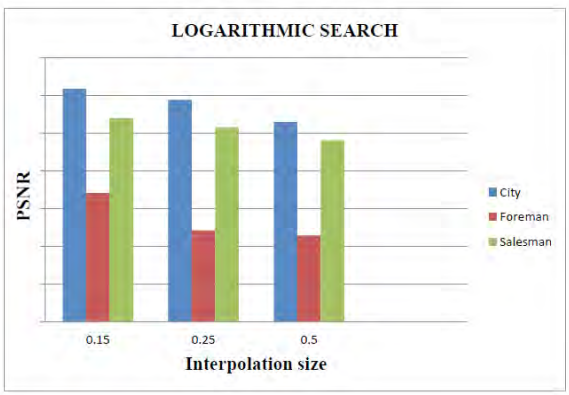
CONCLUSION

In this work we proposed a method of sub-pixel motion estimation for motion de-blurring, which does not require interpolation. Since there is no use of interpolation this is the fastest method than the conventional methods. here sub-pixel motion estimation was implemented using two

Table 4: Video sequence used for analysis

S.NO	VIDEO SEQUENCE	
1.		CITY
2.		FOREMAN
3.		SALESMAN

Figure 3: Comparison of PSNR and Interpolation values using Logarithmic Search algorithm



algorithms namely full search algorithm & logarithmic search algorithm. Taylor series approximation has been used for refining the search process. The results were compared based on two performance measures MSE & PSNR. The video sequences which gives the PSNR value above 30 are providing good resolution. Here city video sequence gives PSNR values as 31.0908, 30.8098 and 30.2568 for interpolation values of 0.15, 0.25 and 0.5 respectively for Full search . PSNR values of 31.1794, 30.8898 and 30.2999 is achieved for interpolation values of 0.15, 0.25 and 0.5 respectively for logarithmic search . Hence it gives best resolution because it has less motion vectors than Salesman and Foreman video sequences. In salesman video sequence also we can see that decreasing the interpolation value as 0.15 gives PSNR value 30.2301 in Full search and interpolation values 0.15 and 0.25 gives PSNR values 30.4022 and 30.1476 respectively for logarithmic search.

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A Novel 7T-SRAM Architecture Using Power Gating for Effective Reduction in Standby Power Dissipation

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ABSTRACT
As the technology nodes scaled-down, the requirement of low power, higher operating frequency circuits are essential in VLSI design. Static random access memory (SRAM) is a primary memory element with high speed of operation and faster access time in most of the system on chips (SOCs), so efforts are being made to design low power SRAM with different topologies. This paper explains various conventional SRAMs, with variation in transistor count. In this paper, we propose a novel 7T SRAM with a power gating technique in 90nm technology using cadence virtuoso Environment. From these implementations performance characteristics like power consumption, delay, power-delay product, Read static noise margin (RSNM), variation of power, delay with respect to VDD are verified. Results shows that our proposed design provides 10% reduction in power consumption, delay of 73.47psec.

KEY WORDS: LOW POWER, SRAM, POWER GATING TECHNIQUE, POWER CONSUMPTION, DELAY, POWER DELAY PRODUCT, READ STATIC NOISE MARGIN(RSNM)..

INTRODUCTION

According to the statement of Moore's law, the size of transistors embedded on die can be scaled down continuously .Because of these scaling of transistor size (Mistri and Allen ,2007) ,which leads to reduction of channel length According to the statement of Moore's law, the size of transistors embedded on die can be scaled down continuously .Because of these scaling of transistor size (Mistri and Allen ,2007) ,which leads to reduction of channel length

$$P=C * F * V_{dd} \qquad (1)$$

Where C is load capacitance, F is operating frequency, V_{dd} ddis supply voltage. One of the way to reduce power dissipation is due to supply voltage since it is in proportional relation. In order to reduce the higher power consumption, lower performance ,these scenario can be overcome by low power design. There are different types of low power techniques that are used to reduce power consumption. Some of them are input vector control, increasing threshold voltage, gating the supply voltage (Y.T.sai et al. 2004).The above expression also explains that, power dissipation is inversely proportional to time delay. Among those low power techniques power gating technique provides efficient power reduction. Power gating, a technique reduces power dissipation by shutting off idle logic blocks using header switch/sleep transistor. It requires a MTCMOS process. Logic circuit can be implemented with low threshold voltage transistors, header switch with high threshold voltage transistors (Jiang et al. 2005).The logical topology of power gating circuit is as follows

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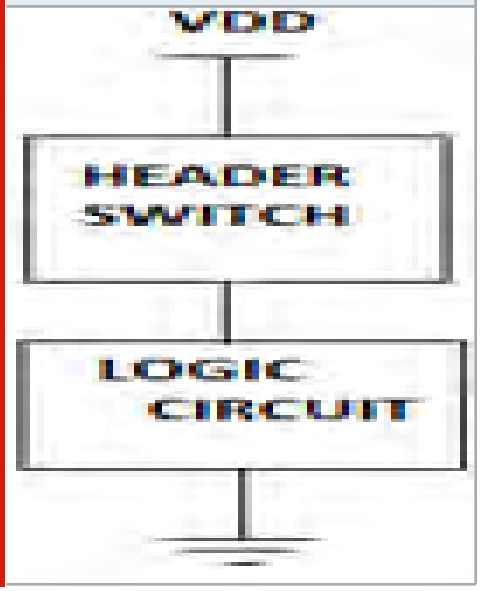
Figure 1: power gating topology



Memory is one of the key element in System on chip (SOC).So, power consumption of memory circuit is in considerable range. The physical memory consists memory circuit which consists of different types of memories. Types of memories are Random access memory (RAM), Read only memory (ROM).There are different types of RAM's they are as follows static random access memory (SRAM),Dynamic random access memory (DRAM).SRAM is a primary memory element used in many IC, because it operates as long as supply voltage is turned on. In order to reduce power dissipation by SRAM, the size of SRAM cell is scaled down gradually (Lim et al. 2014). While designing SRAM there are two design aspects power dissipation, propagation delay of cell during read and write operations.

The battery life of portable devices can be determined by dynamic power dissipation which occurs during read, write operation. One of the important parameter used to define stability of SRAM is static noise margin (SNM), which depicts whether the memory operates correctly or not. Static noise margin can be calculated by voltage transfer characteristics. There are two types of static noise margin ,read static noise margin (RSNM) which defines read stability, write static noise margin (WSNM) for write stability. Static RAM(SRAM) offers high speed of operation until power supply is turned on, medium power consumption, there are some disadvantages volatile in nature, more number of transistors and costlier than Dynamic RAM(DRAM),low storage capability (Asifa amin, Pallavi 2017).

The contents of paper are organized as follows Section II describes various topologies of SRAM. Section III describes Technology Effect estimation, results and analysis are discussed in section IV and followed by conclusion in section V.

Sram Topologies: There are different topologies of Static Random Access Memories (SRAM's)i.e., 6-transistors(6T),7-transistors(7T),8-transistors(8T),9-transistors(9T) SRAM's and so on.

1. 6T-SRAM Topology: In digital circuit, two cross coupled inverters are treated as a memory element called as a latch. In 6T-SRAM there are two more gates called as a pass gates controlled by word line terminal, which are used for accessing of data from memory element or write the data in to memory element through bit line, bit line bar ports. The 6T SRAM topology is as follows.

Figure 2: 6T SRAM topology

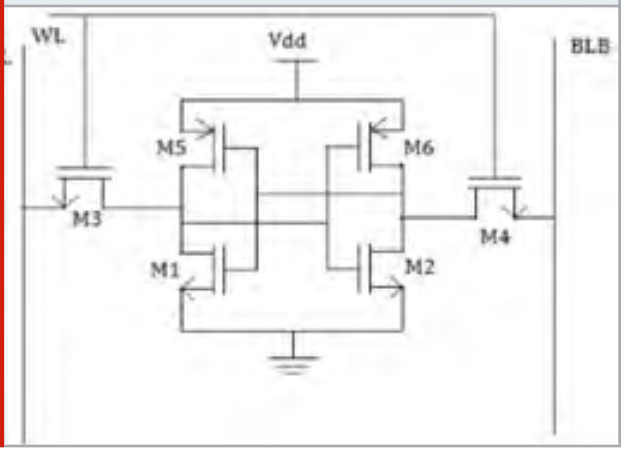
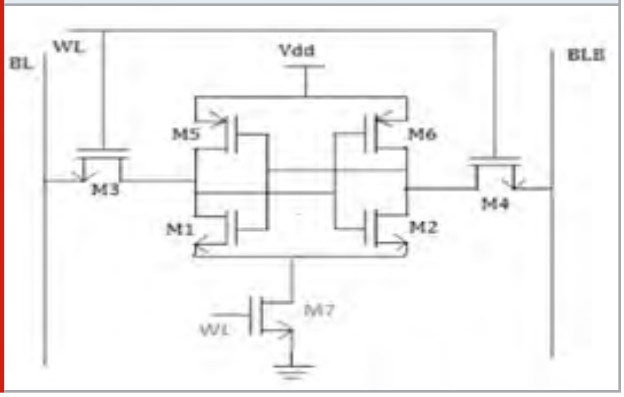


Figure 3: 7T SRAM

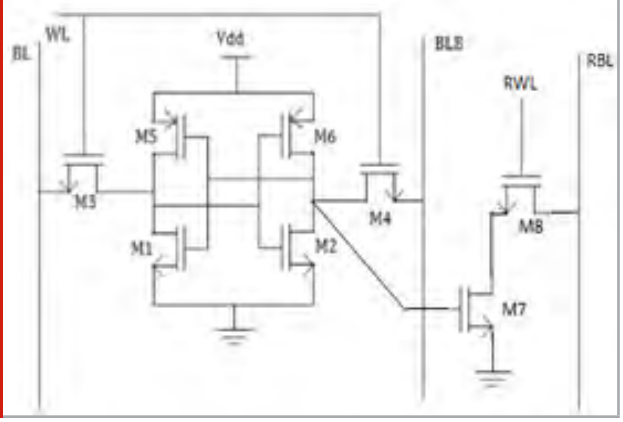


SRAM operates in three modes write mode, read mode, hold mode. During the write operation, the data that is written can be placed on bit line and bit line bar .Then we have to trigger wordline, the data on bit lines are written in to the latch and we have to verify outputs at the q, q-bar terminals. In read mode, the bit lines are precharged to V_dd.when the wordline terminal turns ON,the data from the latch can be accessed by charging or discharging of bit lines. Sense amplifier which is used to access the data from the corresponding memory location and placed at the output bus in an Integrated circuit. Whereas in hold mode, word line terminal is in OFF condition the latch can be separated from bitlines. It holds data until supply voltage V_dd turns ON (Shikan saun and Hemanth kumar 2019). The disadvantages of

6T SRAM are high power dissipation, less read and write stability.

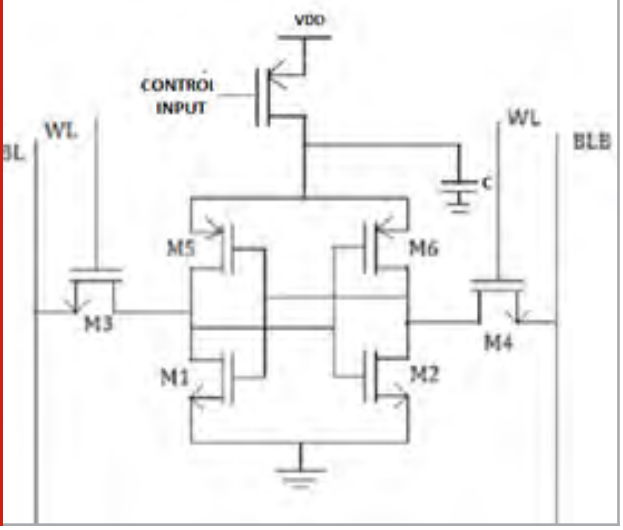
7T SRAM topology: The architecture of 7T SRAM is same as 6T SRAM,but there is a extra transistor in between source and ground terminals of pull down transistors. Which reduces leakage power and currents,this transistor is controlled by wordline terminal.The 7T SRAM topology is as follows

Figure 4: 8T SRAM



During hold mode,wordline is set to low,the source terminals of pull down transistors are floating and data is stored in latch.in write mode,the data on bitlines is written in to the memory through access transistors by triggering of bitlines.whereas in read mode the bitlines are precharged to Vdd,when wordline is triggered the data in latch can be accessed by charging or discharging of bitlines voltages,in addition to this the leakage transistor provides proper grounding to the pull down transistors (Vema Vishnupriya and Ramesh 2013).The disadvantages in 7T SRAM is more area occupation ,nmos leakage transistor will provide more power consumption than pmos transistor.

Figure 5: Proposed 7T SRAM topology



3. 8T SRAM topology: In contrast to 6T,7T SRAM's single ended write operation i.e., using of either q or qbar ports for writing the data in to the SRAM in addition to this separate read access is done by using two nmos transistors on which one transistor is fed by qbar and another transitor is controlled by read wordline terminal. The topology of 8T SRAM is as follows

During write operation write wordline is set,the data on bitline is latched in to memory element.In read mode,the scenario changes ,the signals on qbar,read wordline defines the read output.when qbar is logic 0,the pull-down nmos read transistor is in off state,when read wordline is set the data on read bitline is obtained as read out or when read bitline is in off state,readout is logic 0 (Manu, Shashibhushan 2017). The disadvantages of 8T SRAM is more area requirement,high power consumption than 6T,7T SRAM's.

4. Proposed 7T SRAM using power gating technique: In order to reduce power dissipation during same transistors in off state,we use power gating technique.In this technique we use header switch or sleep transistor which provides connection between supply voltage to logic block (Jiang et al. 2004) ,decoupling capacitance of 50fF which prevents degradation of core operation. The proposed 7T SRAM topology is described as

The power dissipation of this structure mainly depends on control input of header switch.when control terminal of header switch is high,supply voltage is connected to drain terminals of pull up transistors,decoupling capacitance charges to supply voltage. In write operation,when wordline is set,the data on bitlines are fed in to memory element through pass gates.In read mode,bitlines are precharged to supply voltage,when wordline is active,the data in memory element is latched out to bitlines.In hold mode ,the dissipation is reduced by header switch,the data is hold mode until supply voltage is connected.so,the pulsated control input will provides less hold time.

Technology Effect Estimation: The circuits we are implemented in 90nm technology using cadence virtuoso environment for power ,delay,Read static noise margin(RSNM),power-delay product calculation.Hence DC supply is 1.2v (Manu, Shashibhushan 2017).

RESULTS AND DISCUSSION

Figure-6.Waveform of 8T SRAM during write and read modes

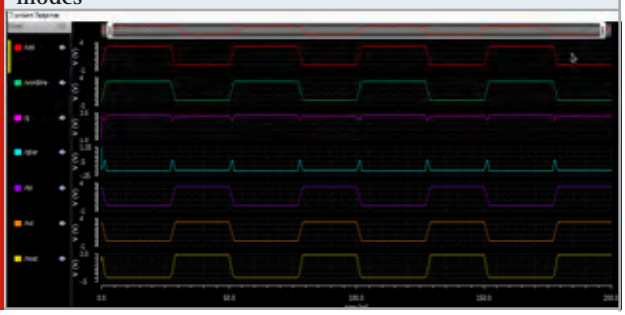


Figure 7: schematic of proposed 7T SRAM using power gating during write mode

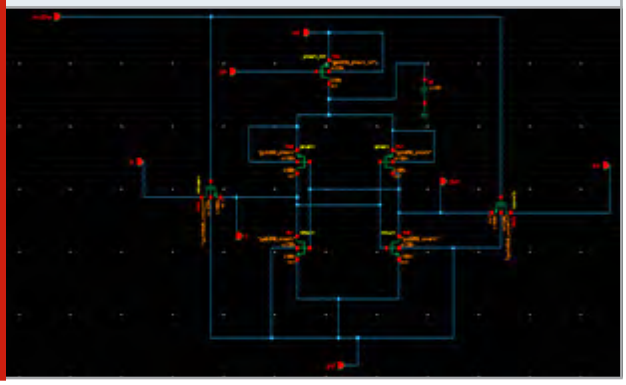


Figure 8: Schematic of proposed 7T SRAM using power gating during Read mode

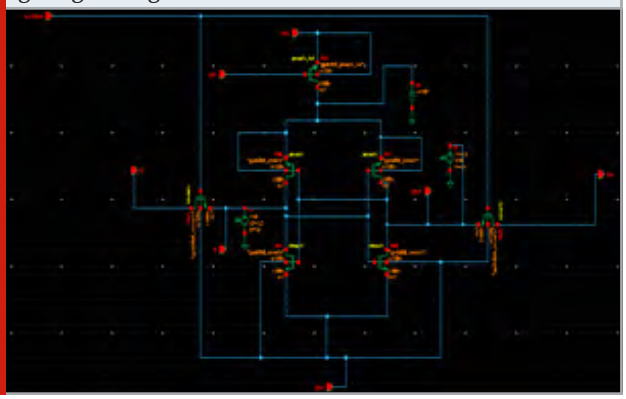


Figure 9: Waveform of 7T SRAM using power gating during write mode

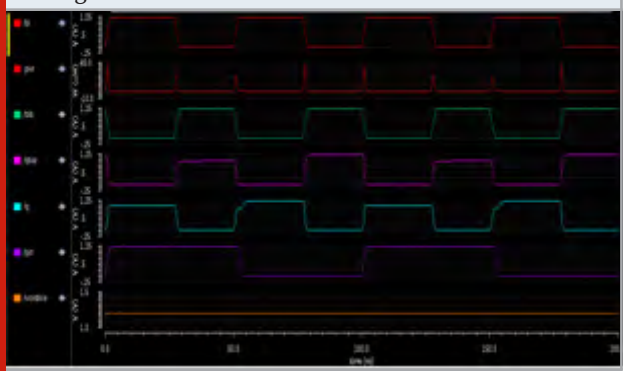


Figure 10: Waveform of 7T SRAM using power gating during Read mode.

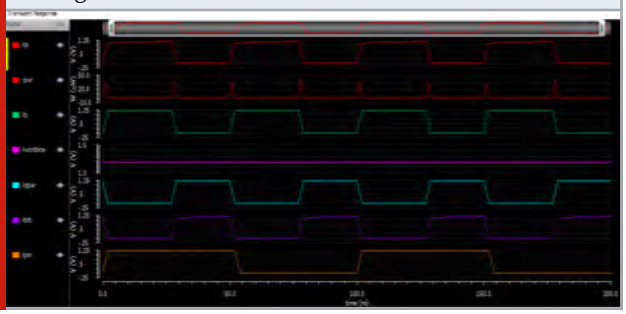


Figure 11: Read static noise margin(RSNM) for 7T SRAM using power gating

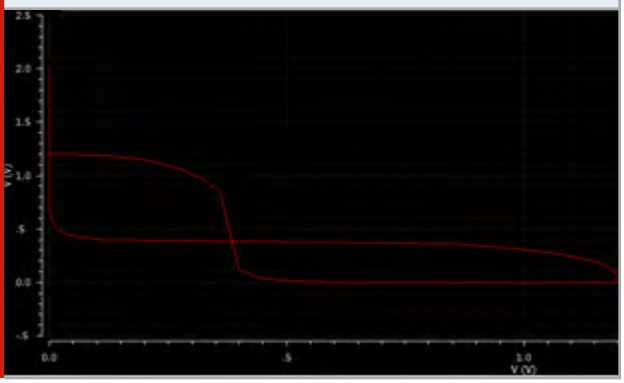


Table 1. Power consumption for 6T,7T,8T,proposed 7T SRAM's.

S. no	Powers	6Tw	7Tμw	8T	Proposed7T (μw) μw)
1.	Write power	1.33	0.9	1.43	0.9
2.	Read power	2.01	1.29	0.37	1.01
3.	Consolidated power	1.7	1.09	0.93	0.95

Table 2: Variation of power,delay,power-delay product with respect to supply voltages.

Supply voltage	Power (μW)	Delay (ps)	Power delay product (v) (fWs)
1	0.8	79.56	0.063
1.2	0.95	73.47	0.118
1.4	1.52	69.85	0.106
1.6	1.98	65.72	0.130
1.8	2.57	63.96	0.164

Figure 12: graphical representation of power dissipation(6T,7T,8T,prop7T)

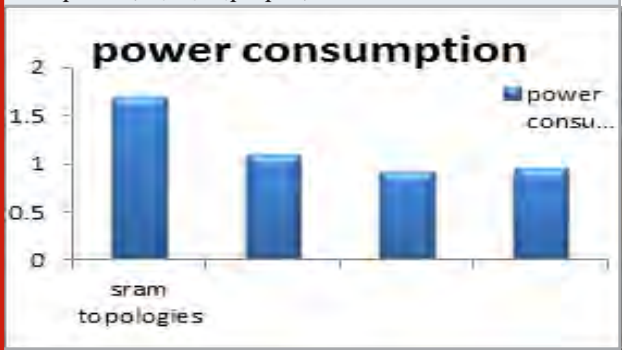


Figure 13: power Vs supply voltage

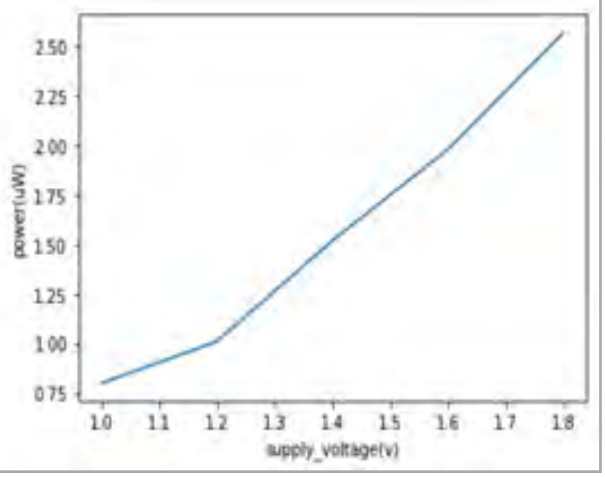


Figure 14: Delay Vs supply voltages.

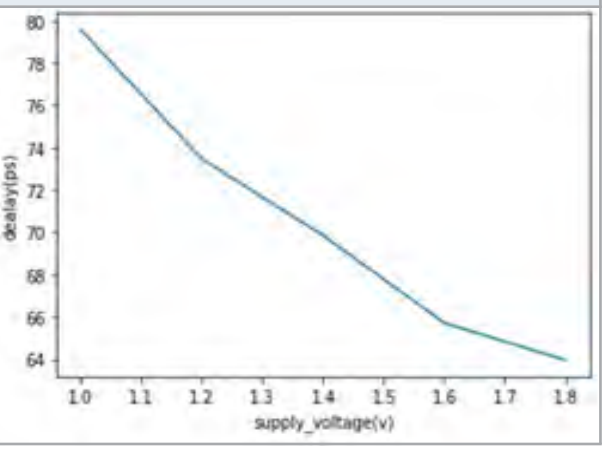
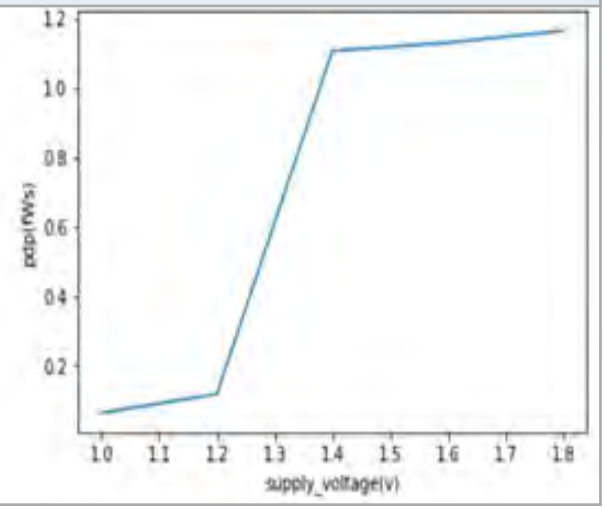


Figure15: Power-delay Vs supply voltages.



CONCLUSION

Simulation of 6T, 7T, 8T SRAM's and proposed7T SRAM using power gating technique can be performed in cadence virtuoso tool, output waveforms and Read Static Noise Margin (RSNM) areverified. Results show that proposed 7TSRAM reduces 10% less power dissipation and less power-delay product in 90nm technology than conventional 7T SRAM topology. In addition to this, power dissipation is proportional to supply voltage and also delay of overall cell is inversely proportional to supply voltage holds good in our proposed 7T SRAM.

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A Design of Coplanar Strip-Fed Monopole Antenna For Multiband Applications

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ABSTRACT

Right now smaller coplanar strip-took care of monopole radio wire for multiband application is proposed. The proposed radio wire comprises of decreased formed transmitting component and meta molecule stacked in the ground plane which yield the various attributes. The model radio wire is structured, estimated and calculated. In this strategy, used to figuring the VSWR, Return loss, S-parameter and bandwidth. simulated and estimated after effect of the receiving wire are in acceptable concur with one another and all are examined. It is see that the proposed radio wire delivers the preferred presentation over the past existing plan.

KEY WORDS: MULTIBAND ANTENNA; ACS-FED ANTENNA; COMPLEMENTARY SPLIT RING RESONATOR (CSRR); WLAN; WIMAX.

INTRODUCTION

Starting at now, reception apparatus has been assuming essential job in the multiband applications. Many plans are here for getting the ideal output however multiband receiving wire is the principal method for coming to the ideal and approximated yield. Multiband radio wire has the benefit of reduced, simple to coordinate with others and minimal effort. Right now the different relevant shapes like F, L, U and T. CSRR (compact split ring resonator) is utilized right now. CSRR stacked in monopole antenna. The radio wire configuration utilizes an alternate taking care of systems those procedures are micro strip, coplanar waveguide(CPW) and ACS (Asymmetric coplanar strip).

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Meta materials has the individual properties of negative permittivity and penetrability.

Emanating component understanding a Wifi and Wimax applications. The printed receiving wire configuration utilize an alternate taking care of systems. ACS (Asymmetric Coplanar Strip) achieve a reduced structure which is yield the few points of interest. Right now, to ascertain the vswr, return loss, s-parameter, band width and efficiency. VSWR is extended as the Voltage Standing Wave Ratio, is an element of reflection coefficient which depicts the force reflected force radio wire. VSWR range ought to be 1 to unbounded.

VSWR go is underneath 2, which demonstrates the correct impedance coordinated. VSWR go is exceeds the above worth which demonstrates the inadequately coordinated. Bring loss back return misfortune utilized in an advanced practice is tendency to SNR (Signal to Noise Ratio) since it has better goals for little estimations of reflected wave. S-parameter is other astute called as dissipating parameter. It describes the info yield connection between the ports. It has two kinds of parameter is utilized one is reflection coefficient and

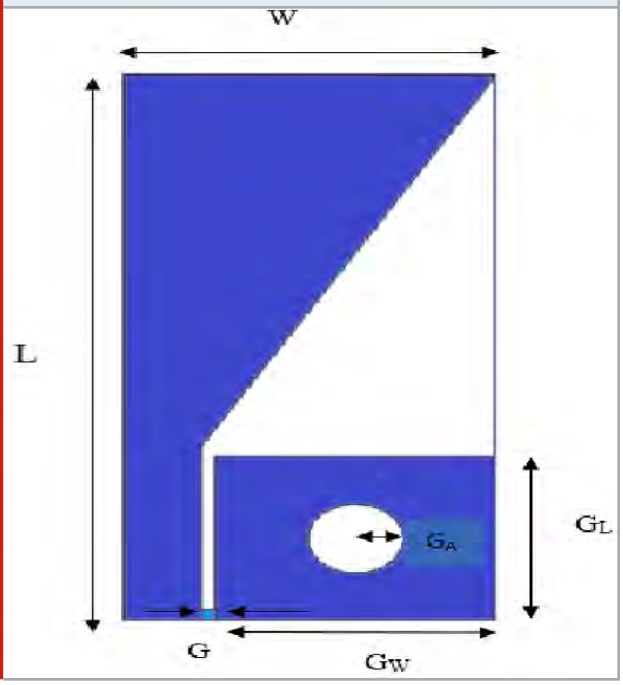
another is transmission coefficient. S11-Reflection coefficient of information, S22-Reflection coefficient of yield, S21-Forward transmission coefficient, S12-Reverse transmission coefficient. The upsides of the Microstrip gathering devices are minor size, little profile, and low weight, like all surfaces. It stacks a beside no volume of the structure when mounting. They are clear and disgraceful to manufacture using current printed circuit advancement and Stepped Impedance Microstrip Low Pass Filter used for Wireless Applications(Rajasekaran.K et.al 2013). In (Mehdipour A et al., 2012; Teng XY et al 2012) RT Duroid 5880 was utilized as a substrate. Here force divider and wideband stage shifter was utilized on the fix to resound at 1.7 to 3.3GHz. The procedure of coaxial taking care of lessens the impedance data transmission of a reception apparatus.

In (Deepu V et al., 2007) Teflon was utilized as a substrate. This procedure likewise restrains the productivity and impedance transmission capacity of radio wire. In (Song Y et al., 2008) expenses of substrate was additionally high, dielectric steady of the substrate is additionally high. This system delivers the impedance transfer speed of about 68%. In (A.K.Thasleem Sulthana et al., 2018) attractive substrates were utilized for diminishing the general element of the reception apparatus. A polluting influence right now diminishes the data transmission of a receiving wire. In (Liu Y et al., 2014) altered F radio wire gives a lot of size decrease yet exceptionally little addition and additionally impedance transfer speed was likewise extremely low. In (Naidu PV et al., 2017) double recurrence fix receiving wire structured by cutting U opening on the fix. This is additionally lessening the size of Micro strip fix reception apparatus. Anyway the addition and impedance transfer speed, radiation proficiency of a reception apparatus diminished by fractal states of the patches. In (Naidu PV et al., 2017).

stacked Microstrip fix reception apparatus gave a confused structure and furthermore manufacture was extremely troublesome. In (A.K.Thasleem Sulthana et al., 2018) opened correlative split ring resonators gives just modest quantity of size decrease. Impedance transfer speed was likewise extremely thin. In (Sujith R et al., 2009; Maheswaravenkatesh P et al., 2017) fractal shapes gave a troublesome structure. In (Deepu V et al., 2009) epoxy pitch substrate was utilized. It gave the impedance crisscross misfortunes. Likewise, this substrate was not open in unadulterated structure. In our work scaling down of fix reception apparatus introduced for Remote application. This reception apparatus comprises of square shape formed fix and reflector. And afterward radio wire geometry has been streamlined to cover the transfer speed for WLAN. The planned reception apparatus was 90% lesser than the ordinary fix receiving wire. Impedance transfer speed is likewise exceptionally high and basic plan, there is no convoluted taking care of system utilized. Creation is moreover extremely basic. This is single layer single fix receiving wire. FR4 substrate is utilized as a substrate. When contrasting and other substrate, FR4 is extremely minimal effort.

Reception Apparatus Structure: The reception apparatus has the elements of the (x, y,z) is12.2*25*1.6mm3. It has the states of F, L, U and T. The front side perspective on the reception apparatus appeared in figure.FR4 substrate is utilized which is accessible and modest also. The fix of the radio wire made up of the copper material. The estimations of the improved measurements are recorded in table.

Figure1: A Circle With Metamaterial Antenna Design



Vswr And Reflection Cofficient: VSWR is extended as the Voltage Standing Wave Ratio, is an element of reflection coefficient which depicts the force reflected force receiving wire. VSWR range ought to be 1to limitless.

Reflection Coefficient: With respect to radio wires and feeders, the reflection coefficient is described as the figure that assesses the measure of an electromagnetic wave is reflected by an impedance anomaly in the transmission medium.

Radiation Pattern: A radiation pattern defines the variation of the power radiated by an antenna as a function of the direction away from the antenna. This power variation as a function of the arrival angle is observed in the antenna's far field. Radiation design is the geometrical portrayal of the radiation properties as a function of room coordinates. Radiation design comprise the parameters of the directivity, beam effectiveness and reception apparatus efficiency. we have the three radiation design right now 3 give the proficient outcome contrasted with Radiation design 1 and Radiation pattern. These figures are given beneath.

In picture depicts Radiation pattern 1, Radiation pattern 2and Radiation pattern3.Radiation pattern 3 compared to Radiation pattern 1 and 2 its give the better result. The E-plane is 90 degrees and the frequency is 5.075GHz

and the H-plane is 0 degree and the frequency is 5.075 GHz.

Picture depicts Radiation pattern 1

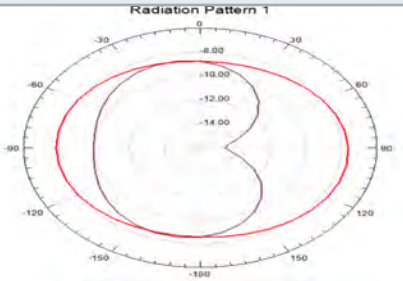


Figure 2: Vswr Curve

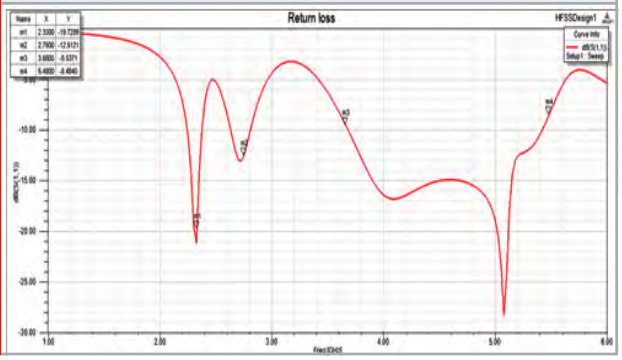


Table 1: Analysis Table

PARAMETER	L	W	G_L	G_W	G_A	L_1	W_1	G	L_2	L_3
VALUE	25	12.2	7.5	9.2	1.6	8	2.5	0.5	-	-
PARAMETER	GL2	GL3	RT	RT1	RW	RW1	RL1	RL2	RL3	RW2
VALUE	15	1.5	0.5	0.5	8	2	5	3	5.5	-

Picture depicts Radiation pattern 2

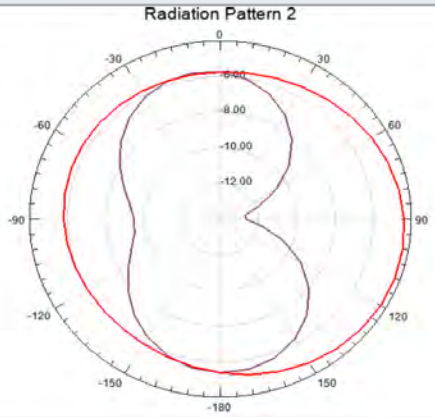
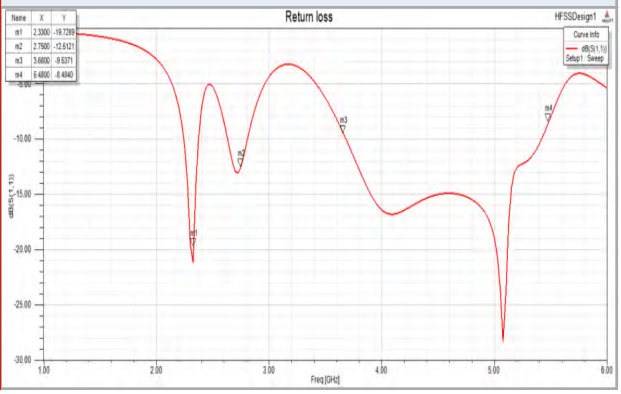
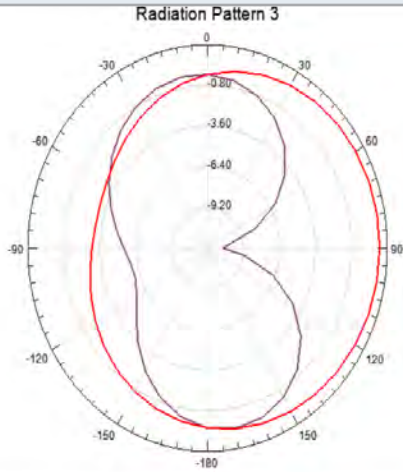


Figure 3



Picture depicts Radiation pattern 3

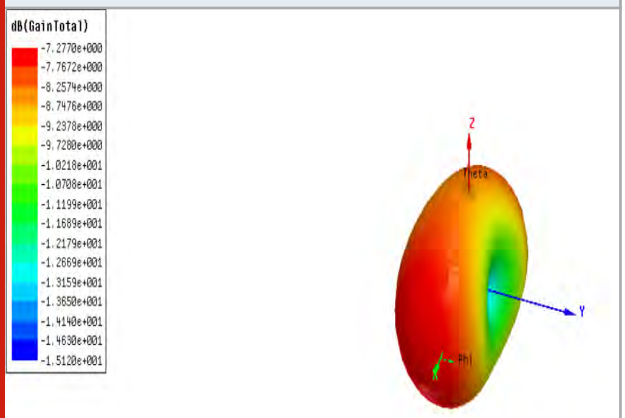


RESULTS AND DISCUSSION

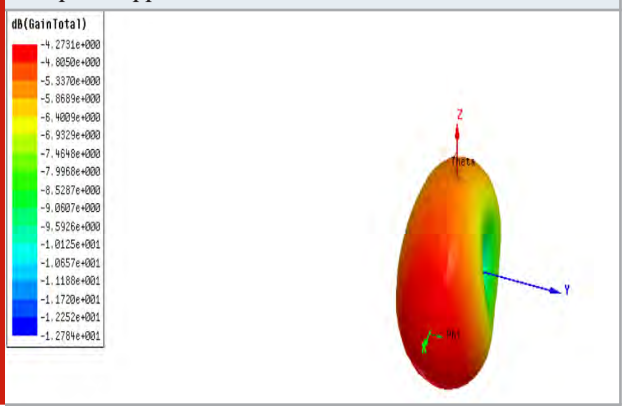
In simulation and its result, we using the tool of HFSS (HIGH FREQUENCY SIMULATED SOFTWARE) and the respective return loss responses with respect to the frequency. The proposed antenna operated at the different frequencies. The antenna offers very good impedance matching at 5.3 with the return loss of db. It is observed that the introduction of SRR slots on the patch and defected ground structure results in multiband operation with improved bandwidth.

Simulated Result of 3d Gain of the Proposed Antenna at Different Operating Frequencies: The beneath picture portrays the 3D increase of the reproduced outcome at various frequencies.

The below GAIN 1 speaks to the 3D impact of the proposed reception apparatus



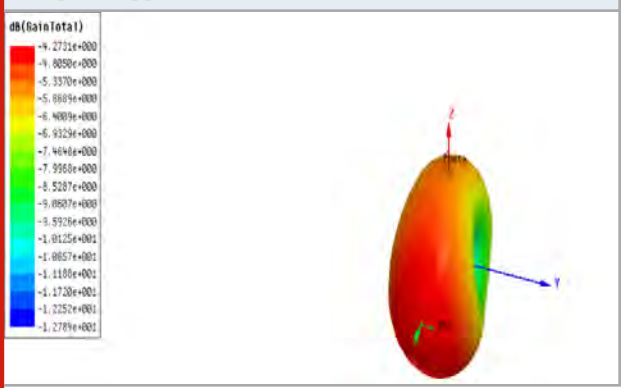
The below GAIN 2 speaks to the 3D impact of the proposed reception apparatus.



CONCLUSION

A minimized meta material stacked monopole radio wire for WLAN/WiMAX/LTE applications has been proposed. Data transfer capacity improvement and impedance coordinating were accomplished with stacking meta material structure. The receiving wire has a little size with great radiation qualities at the working recurrence groups. The attributes referenced above signify that the proposed antenna is appropriate for future smaller remote specialized gadgets.

The below GAIN 3 speaks to the 3D impact of the proposed reception apparatus.



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Microcantilever Sensor Design – Explosive Detection Through Volatile Organic Compounds in Humidity Conditions

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ABSTRACT

Selective explosive detection of terrorist attacks and trace explosives is now very difficult and costly. This is due to various effects, such as the wide range of materials used as explosive devices, the absence of simply measurable signatures and a wide range of avenues by which these weapons can be used, thereby ensuring a lack of low-sensors with high sensitivity. High sensitivity and property combined with power, to reduce the sensor organizing price. Production of victimization is important in winning the war a terrorist act based on explosives. Nanosensors have the potential to satisfy all the trace detection explosives requirements of an efficient platform. Moto of this paper omni directional rectangular form NEMS Cantilever cheap sensor increases sensitivity by 52%.

KEY WORDS: EXPLOSIVE DETECTION, VOLATILE ORGANIC COMPOUNDS, NEMS CANTILEVER SENSOR.

INTRODUCTION

With development in technologies, well-developed explosives are being used in terrorist attacks. Identification of such kind of explosives to diffuse them before the damage occurs has a lot of prominence.

Also, the developed sensing system should be portable, compact and easy to handle in any circumstances. The sensors used are primarily affected by the environmental parameters like temperature, humidity, and pressure. Earlier scientists have developed good number of techniques {Mohammad Hossein Zarifi et.al,2015 & Ifat Jahangir , Goutam Koley,2016} for identification of these explosives, but detecting the Volatile Organic Compounds (VOC) makes it more comfortable to identify these explosives from a distance with less human intervention. The developed sensors were primarily working with sensing characteristics at the laboratory level or on-site without considering the environmental effects. Explosive detection can be achieved using multiple modern X-ray, gamma ray, infrared, terahertz, and millimetre waves techniques. These methods need huge experimental setup and a larger time for result generation {Zbigniew Bielecki et.al ,2012}. Vapor detection methods help in early detection as well as building compact sensing systems. Vapours and traces can be detected by means of electronic/chemical sensors, optical sensors, and biosensors.

Microcantilevers are finding good number of applications in modern compact electronic sensing systems. Piezoresistive microcantilevers can be used as sensors to make compact sensing systems. In this work, the design and development activity of a piezoresistive microcantilever is presented. The research focuses on both

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aspects, i.e. the application of piezoresistive cantilevers in static and dynamic sensing. Primarily it is designed to improve the sensitivity performance of piezoresistive cantilevers. An advantage of using the piezoresistive transducer is it can transfer the data from mechanical domain to the electrical domain. The present research focuses on the static mode of piezoresistive cantilevers. Due to its versatility, nanomechanical sensors can be used for receptor-based and receptor-free sensing and integrated into a multimodal sensing system.

The integration of performance of electrical and mechanical devices into the Nanoscale. They mainly integrate transistors with mechanical actuators such as Nano-electronics. Emblematic devices that have low mass, high mechanical frequencies, use full for sensing mechanisms based on surface. At the molecular level, NEMS offers assurance that measurements of extremely small displacements, weak forces, are revolutionised. Nano materials started with carbon and have a morphology hinge on their performance. Low power consumption, greater efficiency, less cost of manufacture, reduced size in electromechanical systems are the benefits of NEMS [Rinaldi M ,2016]. Nano small size and mass machines have several unique qualities which offer enormous potential for basic measurements and new inventions. It has high fundamental power scores.

Explosive trace detectors: Explosive terrorism has increased enormously in today's world, since explosive arms can be easily and easily deployed and can cause massive explosive detection. The main problems in the identification of the explosives are the low explosive pressure and the introduction of novel explosive compositions. The detection and testing of explosive substances usually includes vapor or particulate sample collection. Several techniques are already available for the detection of trace explosion, including ion mobility spectrometry (IMS), mass spectrometry (MS). Most of these devices, however, need time-consuming, sensing and detection procedures, and the near unchecked access points to large, expensive public places. For the explosive trace detection sensitivity in the air to be improved,

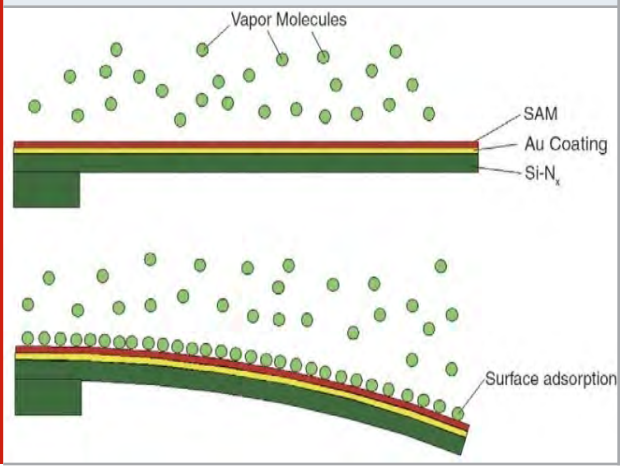
some of the well- techniques are used to optimize explosive trace detection in the air. the proven strategy is:

- collect the air sample from the explosive location
- attract the explosive molecules onto a absorbent material using a preconcentrate
- molecules released from the preconcentrator are adsorbed for detection On element of a signal transduction sensor
- analyse, characterize and report the data signal transduction system

Sensor characteristics such as sensitivity and selectivity determine the level of detection.

Design of Piezoresistive Cantilever: NEMS cantilever sensor in static mode relies on deflection of the cantilever beam {Ibrahim Ethem SACU, Mustafa ALCI,2016 & I Clausen, S T Moe and A Vogl ,2012}. When load is applied on the cantilever, the stressed elements are deformed. Deformation of shape and structure occurs in the cantilever due to loading effect. The deformation occurs at the free end or on the lifting surface of the NEMS when filled, as shown in figure 1. The loading is usually a force or mass attached to the NEMS cantilever that bends the NEMS in a cantilever way. The resulting deformation is known as a bending when the NEMS cantilever deflects. An external load that causes bending can lead to free-ended reactions consisting of displacement or When a point force is applied to the beam-free end at a point along the cantilever length, the cantilever deflection on the cantilever tip can be measured.{ Ribu Mathew ,A Ravi Sankar,2015} .

Figure 1: Diagram showing the bending of a cantilever beam, induced by molecular adsorption, resulting from different adsorption.



$$\delta = \frac{3L^2(1-v)}{Et^2}(\sigma_1 - \sigma_2)$$

The strain gauge factor(γ) is due to the change in resistance with strain created i.e., due to geometrical Changes in structure and material characteristics {Joseph C. Doll, Sung-Jin Park ,2008}.

$$\gamma = \frac{\Delta R}{\frac{R_i}{\Delta_\varepsilon}} = (1+2V) + \frac{\Delta_\rho}{\frac{\rho_0}{\Delta_\varepsilon}}$$

Where
Ri is the initial resistance,
ΔR=R-R is the resistance change resulting from the strain change,
γis the Poisson's ratio, and ρo and Δρ are the electrical resistivity and the change of resistivity resulting from Δρ, respectively.

In certain volumes the mass of water vapor is defined as Absolute Humidity. The absolute humidity is calculated by{ Hidetoshi Takahashi, Tetsuo Kan, Kiyoshi Matsumoto ,2013} when considering ideal gas

$$A = C.\frac{P_v}{T}\ (g/m^3)$$

Where
C= 2.16679 Kg/J
Pv = vapor pressure in pa
T= heat (Temperature) at 0K
Stress can be determined at this point{ J. A. Harley and T. W. Kenny et.al,2018}:

$$\sigma_{max} = \left(\frac{6L}{Wt^2}\right)F = \left(\frac{3Et}{2L^2}\right)\delta$$

Where,
F is the force used and
W is the width of the beam.

The resulting increase in fractional resistance is {Yu-Hsiang Wang , Chia-Yen Lee , and Che-Ming Chiang et.al ,2007}: The sensitivity is calculated with respect to the change in resistance due to the strain created.

$$\frac{\Delta R}{R} = \pi_L \sigma_{max}$$

Where,πLis the longitudinal piezoresistive coefficient of the material.

Fem Simulation: Many modes of operation, such as cantilever beam, are possible for nanomechanical sensors. For instance, the mass adsorption of a lifting beam depends on the resonance frequency { BoisenA., et al ,2007}. Mass adsorption nanocantilevers are very sensitive. Photo-masking and etching techniques{ Johnny H. HE and Yong Feng LI ,2006} are widely used to render panels with very low spring constants (low resonance frequency). Depending on how the lift is handled, the measurements will typically vary from 150 to a few nm in duration. The COMSOL simulation of a double layer nanocantilever is as shown in fig 2. The comparative study of single layer and double layer nanocantilevers are shown in table 1.

Table 1. Deflection of double layer gold

	Single layer	Double layer
Material	Silicon (Si)	Gold (Au)
Length (L)	150nm	150nm
Thickness (h)	10nm	10nm
Poisson Ratio	0.28	0.42
Young's module	170e9	76e9
Deflection	3.278× 10-12	0.1487×10-12

Experimental Studies: The developed cantilever is tested using Omnicant setup shown in fig 3. The cantilevers are coated with 4-MBA and the resistance changes are studied. The stretching differential of a 4-MBA-coated piezo-resistive beam against a non-coated cantilever in TNT vapor exposure. The double layer nanocantilever studies with coated 4-MBA are as shown in table 2. It can be seen from the table that the response with the coating is producing more sensitivity than without coating. The six response pattern cantilevers can be coated with a different SAM when exposed to TNT vapors, ethanol, 30ppm acetone, and 20ppm acetone, as shown in Fig 4. Each column shows one cantilever / coating's bending response (If with gold poly-Si with gold) Each of the four analytes should be exposed. The figure's rows are created by placing all six reactions side by side with one analyte to produce a pattern of reactions that is unique to the analyte and unique to the analysis. These reaction patterns are then analysed with an algorithm for recognition of speciationpattern.

Figure 2: Double layer Nano-cantilever FEM Response

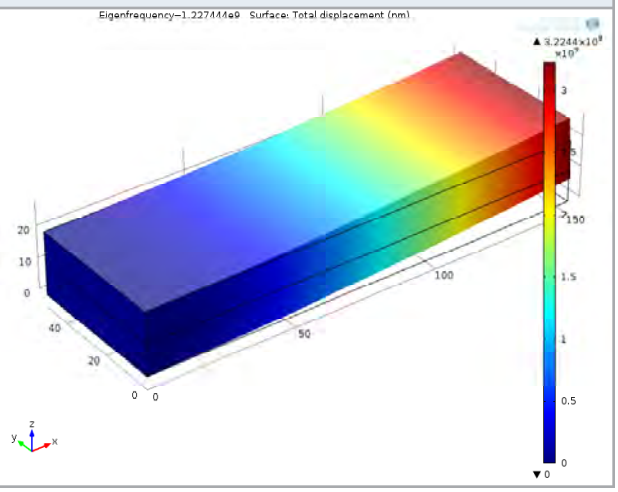


Table 2: Double layer silicon with gold respons deflection and sensitivity

Silicon with 4-MBA (gold) material	Double layer coated material	Double layer uncoated material
Deflection (nm)	3.278 X 10-12	1.287 X 10-11
Humidity	0.148 X 10-12	1.881 X 10-6
Sensitivity	6.827 X 10^-12	5.712 X 10^-6

The TNT vapor is exposed to Differential response of bending in piezoresistive, 4-MBA gold-coated material. The instrument is exposed to TNT for a brief period followed by dry nitrogen, which generates a reaction peak Show in Figure 3 and then a period of desorption during which nitrogen is removed from the adsorbed material, which means that the device remains ready to detect new analytes. As the cantilever coatings are picky

only partially. The array is displayed to every analyte in the same way as TNT described above. Table 3 shows the nanocantilever deflection response in different humidity conditions.

Figure 3: Omnicant setup used in experimentation

Figure 4: A piezoresistive, functionally layered cantilever of 4-MBA has a differential bending response

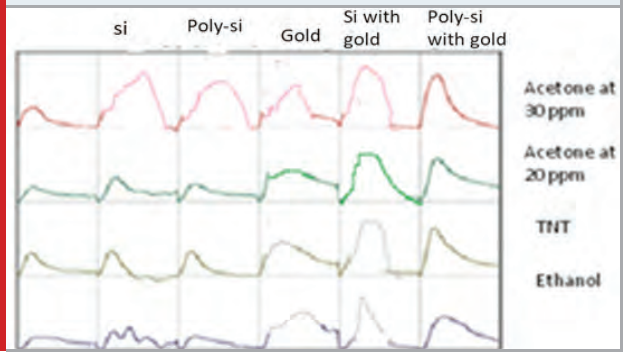


Table 3. Humidity based deflection in different material cantilever beam response.

Material	Deflection at 70% humidity (nm)	Deflection at 80% humidity
Si	1.429×10-8	1.546×10-8
Poly silicon	1.645×10-8	1.824×10-8
Ge	2.424×10-8	2.917×10-8
GaAs	2.711×10-8	3.521×10-8
Al	3.133×10-8	4.214×10-8

Deflection and humidity require many challenges to Be defeated. Extremely low vapor pressures limit the number of explosive molecules that can be collected within a reasonable time of detection. The expected response of the nanocantilever with coated 4-MBA functional layer is as shown in fig 5

Acetone concentration sensitivity reactions are shown in Figure 6. The instrument is uncovered in the form of a glide of dry nitrogen for a brief period. This results in the reaction level observed through desorption, during which nitrogen eliminates the adsorbed tubing, and the tool allows you to find a new TNT, RDX, example of the analysis. Therefore, the most effective cantilever coating is a selective array in which each cantilever is coated with a single selective coating. The reaction from a range of silicon and 4-MBA selective coating cantilevers. The advertising of the array for all analytes is conducted in the same way as that described above for acetone PVP with acetone, based on the variation in physical and/or chemical cloth residences below the fuel exposure. The figures 7(a) and 7(b) the omnicant response of PVP and 4-MBA with acetone coating on the nanocantilever.

Figure 5: Differential bending reaction of a cantilever piezo resistive coated with a 4-MBA functional mask.

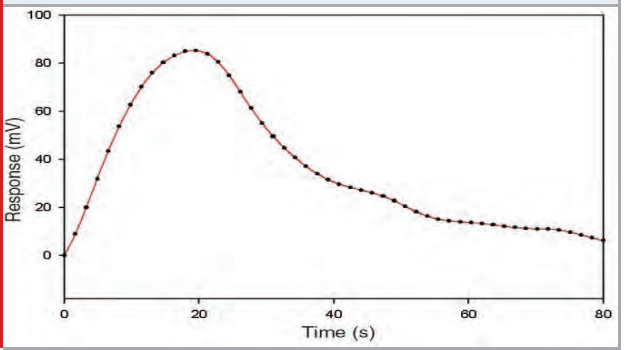


Figure 6: Acetone Sensitivity and Temperature: 50 PPM from 4-MBA (Benzone Meta) and TNT, Ethanol and RDX.

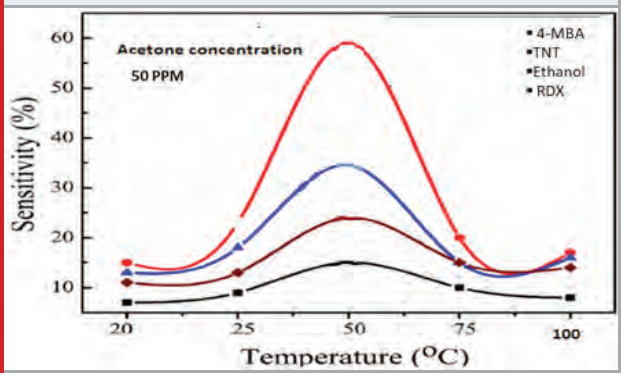


Figure 7(a): Omnicant result for PVP with acetone.

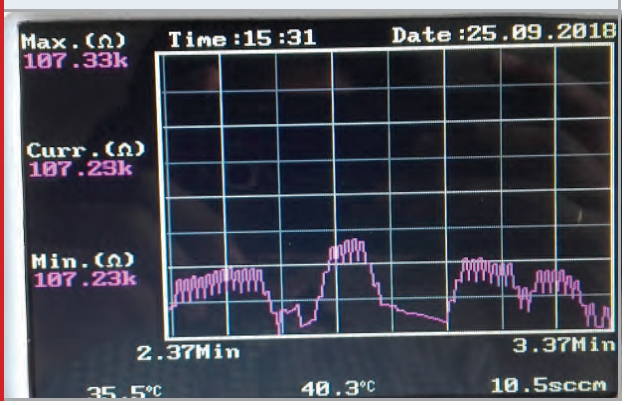
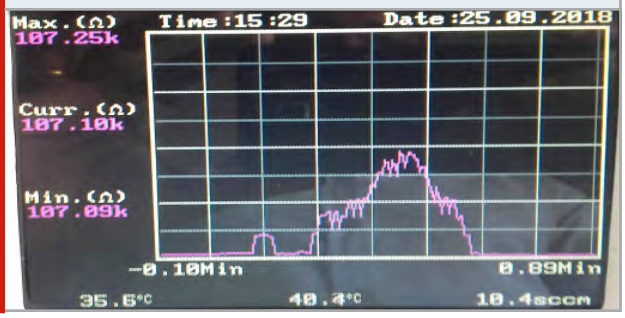


Figure 7(b): Omnicant result for 4-MBA with acetone



Sensitivity is usually described as the ratio of the sensing element resistance within the target gas to that of the air. The sensitivity depends clearly on cantilever metrics 200C Vapor strain the explosive undergoes thermally brought on decomposition. Tracing high sensitivity and selectivity explosive detection is an incredible challenge. because of several operational factors, such as the acute dearth of explosive molecules that can be collected in reasonable time lack of selectivity because of interference from other molecules is paving a clear path to the development of nanosensors.

CONCLUSIONS

Nanoscale effects can be exploited to give sensor possibilities that meet all criteria of trace explosive detection. A potential paradigm for nanosensors with increased sensitivity and selectivity and the ability to operate on a multimodal platform the deployment of many sensors. That nano sensor possesses potential As highly sensitive and very selective signal transduction platform for an integrated explosive sensor device. Relative humidity as a significant impact on time-changes in differential total deflections increases as humidity decreases, cantilever deflection as a function of humidity.

ACKNOWLEDGMENT

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Power Quality Impacts and its mitigation in Grid-Tied Photo Voltaic Power Generation

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ABSTRACT
The rising demand for clean energy and dramatic continuous decrease in fossil energy resources has created it obligatory to use renewable energy sources. Now a day Photovoltaic power generation plays a vital role because of the development of power electronic converters that are most generally used for converting DC power to AC power in electric power grid. But the introduction of these power electronic converters in the power grid creates lot of power quality problems at the connecting point. This work investigates the power quality impacts created by the power electronic converters of the photovoltaic micro power generation with the assistance of Power Quality Analyzer. A Static Synchronous Compensator (STATCOM) based reactive power compensator is also proposed to mitigate these impacts. The real time test results validate the present work.

KEY WORDS: PHOTO VOLTAIC POWER GENERATION, POWER QUALITY, POWER ELECTRONICS BASED CONVERTERS, REACTIVE POWER CONTROL, STATIC SYNCHRONOUS COMPENSATOR.

INTRODUCTION

As of late, with consistently expanding electrical vitality request and ecological contamination brought about by petroleum derivatives, forces the energy producers to give special attention on alternate Renewable Energy Sources (RES) and micro power generation.

Usually, power electronics based converters plays a vital role to move the power created from these vitality sources to the power grid. The Voltage Source Inverter (VSI) and Current Source Inverters (CSI) are most generally used to interface a low power renewable energy sources to the high power grid (Monfared, et al., 2012). Among the sustainable power sources, Photo Voltaic (PV) power generation systems have been spread because of cutting edge advancements in solar cells producing (Koutroulis, et al., 2012; Sayed, et al., 2015).

The introduction of grid tied inverters of the photo voltaic distributed micro power generation opens up new challenges in common connecting point of the electrical distribution network as they induces problems related to safety, protections and power quality (Srisaen, et al., 2006; Eltawil, et al.,(2010). The system power quality mainly depends on reactive power compensation since the total power in Alternating Current (AC) grid is the logarithmic entirety of real power and reactive power. In photo voltaic connected electric power grid systems the reactive power

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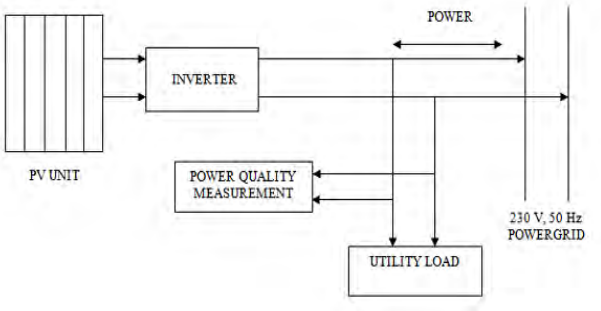
infused in the electric power grid is proportional to the radiation level. It is also noted that at high levels of radiation the injection of PV generated

power improves the grid quality. However, for low levels radiation, the injected power quality is degraded (Patsalides, et al., 2007). The impact of these issues on the conventional grid may be neglected with small size photo voltaic plant. But many number of photo voltaic plants with larger size may affect adversely that must be considered (Aiello,et.,al.,2006). Some power quality issues identified with incorporation of photo voltaic systems with power grid have been introduced (Canova, et al., 2009; Omran, et al., 2011; Awadallah, et al.,2015). All the researchers have done their work using simulation software, the present work investigates the impact of photo voltaic converters using real time manner. Some attempts have been already made (Manivasagam, et al., 2014; Silvin Daniel,et al., 2015) regarding the mitigation of power quality issues in power distribution lines using custom power devices, but not in PV connected Grid. This paper investigates the power quality issues at the common connecting point created by a photovoltaic grid connected system using Electrical Power Quality Analyzer. A single phase voltage source based Static Synchronous Compensator (STATCOM) is also developed and analyzed to mitigate the reactive power impacts produced by the power converters of the photo voltaic power generation.

MATERIAL AND METHODS

Description of the Test System: The test photo voltaic system considered for this analysis is having the capacity of 100 kW located on the roof of our college building situated in Tiruchirappalli District, Tamil Nadu India. The electricity generated by photovoltaic solar panels is connected directly into Tamil Nadu Generation and Distribution Corporation Limited grid, without storage battery through a bidirectional energy meter that measures the energy imported and exported to the grid.

Figure 1: Outline diagram of the grid-tied PV-system



The electrical power quality problems like voltage sag, voltage swell, current harmonics, active power, reactive power, and THD(current and voltage) at connecting junction are measured and recorded using a Fluke make (Fluke-435-II) Power Quality Analyzer. The outline diagram of the grid-tied photo voltaic system including the PV sub-array, the inverter, the power analyzer and load is depicted in Figure 1.

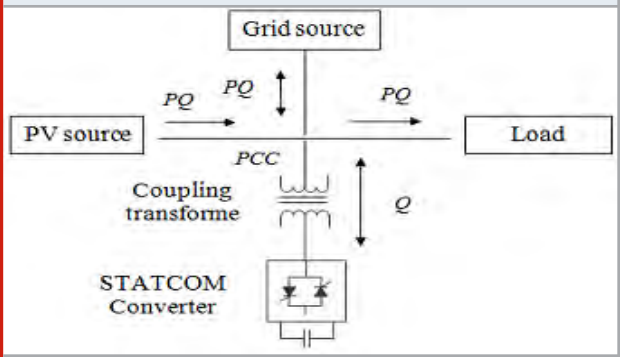
Conventional Compensation: The electric power produced at the huge power generating stations is conveyed to buyers through a tremendous system of transmission and circulation frameworks. The voltage of the distribution grids is controlled at the substations. The utilization of reactive power by end users and the power line impedance cause a voltage drop. Employing Synchronous generators and shunt capacitor banks in power system distribution grids are some classical compensation techniques for reactive power improvement.

Synchronous generators method, the reactive power control is acknowledged with an excitation framework, controller and voltage measuring equipment (Turitsyn, et al., 2011). This system plays a vital role in power grids to balance out the high voltage by giving reactive power support, but restricted impact on voltage and reactive power regulation in distribution lines. In distribution networks a lesser number of huge capacitor banks are switched in or switched out as needed.

This allow the amount of reactive power provided by the capacitors to be increased or decreased so as to keep the power factor as close to unity. Then again, the reactive power requirement in some feeder which has large industrial loads varies highly and frequently. In such cases the capacitor banks cannot be connected rapidly and effectively. This, in turn, brings down the power factor also increases the losses. Another important issue is that the switching of capacitor banks produces voltage transients and high frequency harmonics, which may affect the sensitive equipment connected in the network.

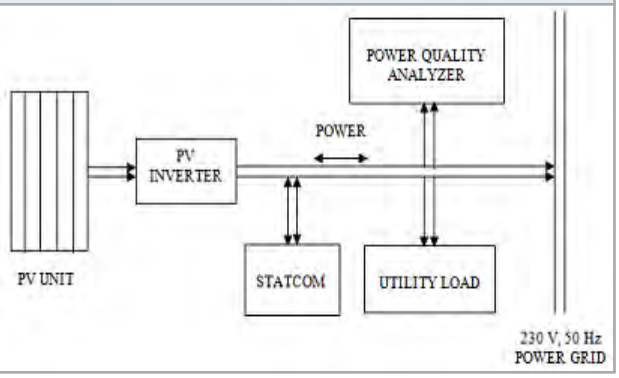
Statcom Based Compensation: A Static Synchronous Compensator (STATCOM) is an emerging class of technology device, consists of power electronic based voltage or current source based converter linked with an energy storage device (DC capacitor) that provides continuous reactive power support, to the power grid with less switching losses (Ilango, et al., 2014). The block diagram of reactive power control using STATCOM is shown in Figure 2.

Figure 2: STATCOM based reactive power control



STATCOM in principle is a shunt connected device, which injects current into the connecting point of the system. The STATCOM injects or receive reactive power as long as the injected current is in phase quadrature with the line voltage. When the output voltage of the STATCOM is higher than the grid source voltage, then it works like a capacitor and produces the reactive power. Otherwise, it works like an inductor and receives reactive power from the power grid (Pranesh Rao, et al., 2000). The control of capacitive or inductive output current is independent of system voltage. It consists of a voltage source inverter, linked to a DC capacitor or a battery (Pradeep Kumar, 2011; Silvin Daniel, et al., 2015). The block diagram of a STATCOM based topology for power quality enhancement is shown in Figure 3.

Figure 3: . STATCOM based topology



The proposed system is connected at the common connecting point of the grid system to enhance the power quality. When costumers utilize high inductive load, the reactive power demand in the source side also increases more which indirectly affect the power quality. During such situations the STATCOM supplies the needed reactive power to the load to increase the power factor, voltage stability by controlling the switching pulses with the help of PI controller. Hence source provider need not bother about the demand of reactive power created by the costumer's load.

Table 2: Results of pot experiments and extract

Power Quality Analyzer: The Power Quality Analyzer is a multi function power analyzer gadget that measure precisely Direct Current (DC), Alternating Current (AC), AC voltage, DC voltage, harmonics, phase sequence, apparent power and effective power. The Figure 4 depicts the image of a Power Quality Analyzer. The Analyzer provides an extensive and powerful set of measurements to check the quality of power available in power system network. Some types of power quality analyzers are designed to give general impression of power system performance; others are used to investigate the power system parameters specifically. It has additional measurement features like flicker, transients, power wave, power signaling, wave event, RMS event, with high % of accuracy (Fluke Users Manual).

RESULTS AND DISCUSSION

The various Power Quality issues such as voltage, current, frequency, active power, reactive power, apparent power, voltage harmonics and current harmonics are analyzed at the common connecting point for various loads conditions. A 60W fan is considered as an inductive load and the 40W fluorescent lamp is used as a non - linear load. The power quality measurements are taken using power quality analyzer for one hour duration.

Table 1 shows the test data obtained during the test with and without considering STATCOM. From this table it is evident that when the STATCOM is not added to the system the voltage sag is 218.6 V, but when the STATCOM is added at the common connecting point the voltage is 228 V. Hence it is evident that the STATCOM improves the voltage sag. The main reason for this voltage sag is due to the variation of radiation levels which is falling on the PV panel. Reactive power at the connecting point during both loads switched on condition, without STATCOM is 20W; it is increased to 40 W when STATCOM is in operation. This is due to the injection of reactive power by the STSTCOM. Similarly, when the STATCOM is connected at the connecting point the Total Harmonics Distortion (THD) of the current is only 15.2; but it is high 24.89 when STATCOM not connected. Form the test results; it is clearly shows that, the STATCOM when it is connected in the common connecting point mitigates the power quality issues produced by the PV converter.

The voltage and current waveforms of 'R' phase during the test duration of one hour for various load condition are depicted in Figure 5 and in Figure 6 respectively. The THD of the current harmonics of 'R' phase for one hour duration with various load conditions is dipicted in Figure 7. When the STATCOM is not connected in the circuit, the average value of current harmonics is 24.89. This value is during the fan and fluorescent lamp loads are 'switched off' condition. But when the STATCOM is connected in the circuit it is only 15.2. From this it is clear that during 'off load' condition also the THD is high. This is mainly due to the converters that present in the Photo voltaic power generation. But when the STATCOM is connected this value is reduced to 15.2; this proves that the STSTCOM plays a vital role in reducing

the harmonics. The frequency waveform of 'R' phase for various load condition is shown in Figure 8. When the STATCOM is not connected the value of frequency is 50.5 Hz, but during the STATCOM is in operation it is only 50 Hz.

Table 1. Data of the electrical parameters with and without STATCOM

SL. No	Parameters	Load duration with STATCOM			Load duration without STATCOM				Both load ON at 3.28
		Both loadON at 2.32 pm.	Fan OFF fluorescent lamp ON at 2.45 pm	Fan ON fluorescent lamp OFF at 2.55 pm	Both load OFF at 3.05 pm.	Both load ON at 3.15 pm.	Fan OFF fluorescent lamp ON at 3.20 pm.	Fan ON fluorescent lamp OFF at 3.25	
1	Voltage (V)	228	231	223	221	218.6	216.3	216.7	227
2	Current (I)	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3
3	Frequency (Hz)	50	50	49	50.36	50.5	50.5	50	49.9
4	Active power(W)	40	20	20	20	20	40	40	40
5	Apparent power(VA)	60	40	40	40	40	60	60	60
6	Reactive power (VAR)	40	20	20	20	20	20	40	40
7.	THD Voltage (V)in Avg%	2.6	1.8	1.7	1.94	5.6	5.0	4.29	5.4
8.	THD Current(I) in Avg%	15.2	13.7	12.8	10.42	24.89	20.5	17.3	24.7

Figure 5: Voltage waveforms of 'R' phase

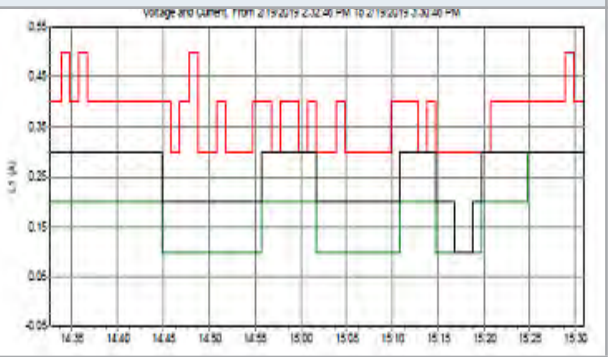


Figure 6: Current waveforms of 'R' phase

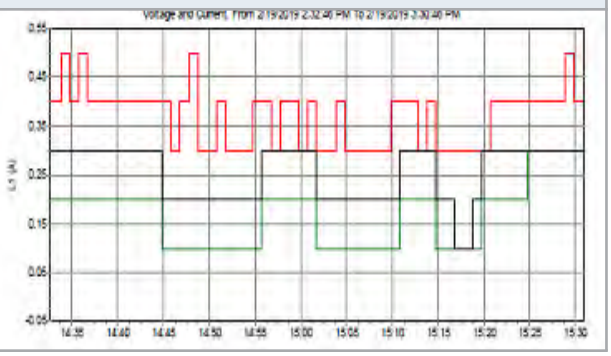


Figure 7: THD of Current Harmonics

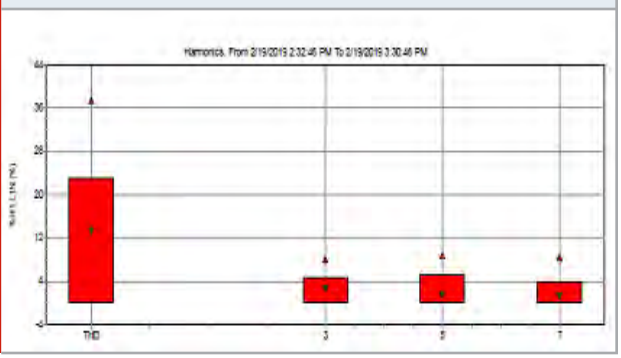
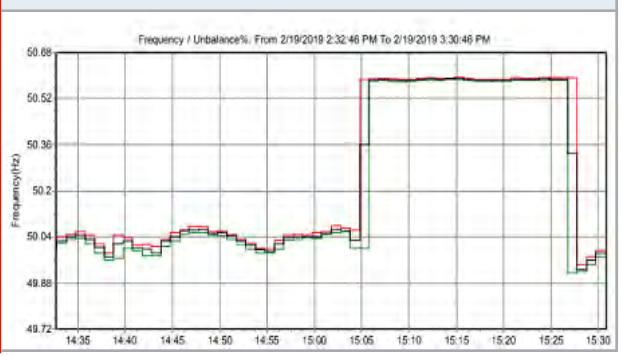


Figure 8: Frequency Waveform of 'R' phase



CONCLUSION

Different power quality issues that occurred in the photo voltaic grid -tied micro power generating system have been addressed. Various measurements have been analyzed and evaluated with the help of Power Quality Analyzer to understand the overall impact of PV power generating system. The data analysis shows that the grid

connected PV inverter injects high harmonic content to the load. Further, it has been found that the irradiation level of the Photo voltaic also has significant impact on the grid system power quality. A single phase reactive power compensator based on the concept of STATCOM has been developed and analyzed to mitigate the impacts created by the PV inverters. The test results validate the significant of the present study.

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Estimation of Fruit Ripeness Using IoT

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ABSTRACT

Fruit ripeness detection the use of deep convolution neural networks gives novel approach. Recent paintings in deep neural networks has delivered approximately the development of a present day item detector termed Faster Region-based CNN (Faster R-CNN). We adapt this version, thru transfer gaining knowledge of, for the challenge of fruit detection the usage of imagery. This outcome in a novel CNN version, which achieves contemporary day outcomes as distinguished to earlier artwork with the F1 rating, which specific one consideration each precision and take into account performances enhancing from 0.807 to 0.838 for the detection of candy pepper. In addition to improved accuracy, this approach is likewise a good deal quicker to put in for emblem spanking new fruits, because it requires bounding subject notation in preference to pixel-level notation (notating bounding packing containers is ready an order of importance brief to carry out). The version is retrained to carry out the detection of 9 end result, with the whole technique taking 4 hours to notate and educate the modern-day version in keeping with fruit

KEY WORDS: CNN, RGB IMAGE, GIS.

INTRODUCTION

Ripening is a manner in end result that causes them to end up extra palatable. In standard, fruit turns into sweeter, less inexperienced (usually "redder"), and softer as it ripens. Even though the acidity of fruit will increase because it ripens, the better acidity stage does now not make the fruit appear tarter.

Post-harvest process of culmination and veggies is finished in numerous steps: washing, sorting, grading, packing, transporting and garage. A cost powerful, constant, superior velocity and correct sorting can be finished with computerized sorting. Most raw substances incorporate some additives which can be inedible or have variable bodily traits. Processing strategies inclusive of sorting, grading, screening and trimming are essential to obtained Climatic end result go through a number of modifications for the duration of fruit ripening. The important changes encompass fruit softening, sweetening, decreased bitterness, and coloration exchange. Color change is the result of pigments, which had been usually gift in the fruit, turning into visible when chlorophyll is degraded. However, extra pigments also are produced by means of the fruit because it ripens (Christopheret al.,2017).

In this paper we present a new robot harvester (Harvey) that may autonomously harvest candy pepper in protected cropping environments. Our technique combines powerful vision algorithms with a unique cease-effector layout to enable a hit harvesting of candy peppers. (S.Nuskeet al., 2011).Initial area trials in blanketed cropping environments, with cultivars, display the efficacy of this approach achieving a 46% fulfilment price for unmodified

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crop, and 48% for modified crop (P.Vanmathi et al., 2019; Mrs.S.Sathiya et al., 2018).HetalNikunj Patel, M.V. Joshi in 2012, Efficient locating the fruit on the tree is one of the most important necessities for the fruit harvesting machine (Q. Wang et al., 2012; T.Ojala et al., 2002). In this paper, automated segmentation and yield calculation of fruit based on shape evaluation is presented. Color and shape evaluation turned into utilized to segment the pics of various culmination like apple, pomegranate, oranges, peach,

Figure 1: Ripening dates

litchi and plum obtained underneath exclusive lights situations. The Edge detection and combination of a circular becoming algorithm became used for the automated segmentation of fruit within the photo. The resultant facet factors were then used for fitting the approximate circular shape. The resultant equipped circles were used as a matter of general wide variety of culmination in a photo. Hundred sectional tree photos of various fruits have been used for the segmentation and yield dimension. The results suggest that the proposed technique can appropriately phase the occluded fruits with the performance of 98% and the average yield size blunders became 31.4.

MATERIALS AND METHODS

The key objective of our work is to detect the ripeness of a fruit into three categories such as ripen,non-ripen,rotten. Firstly,the input is given to the pre-processing system as a 3D digital image captured by digital camera.The image which is in RGB format is converted into gray image in this block and the later is subdivide into parts by segmentation process.After this process the image is classified by using different features such as size,shape,colour,rms value,homogeneity,skewness. The proposed technique for estimating the maturation country of apples follows the standard scheme of computer imaginative and prescient algorithms, First, the segmentation step separates the gadgets of interest (the apples) from the historical past. Second, a combination of color characteristics is removed from each segmented item, primarily based on a prior observe of the maximum discriminant features.

Third, a classifier is educated and proven the use of those features; the classifier follows a hybrid method of CNN The dataset used for the experiments emulates the aerial images that would be acquired by using a drone flying at a medium-low altitude. This is a critical requirement because end result might now not be seen on a high-altitude flight, as a result hindering ripeness estimation. A brand new algorithm to stumble on apples and estimate their ripeness stages in apple cultivars of the Red Delicious variety, using pix captured beneath natural light and heritage, like those acquired from drones flying at a medium-low altitude. The proposed technique is based on an aggregate of hybrid artificial neural networks, genetic algorithms, and extraction of the best coloration features. To emulate the conditions of drone acquisition systems, video analysis is used instead of nonetheless photo processing. All these classified are stored in database for testing process.In testing process the input image values are being compared with the values stored in database ant then final results are obtained.

Figure 2: Blockdiagram

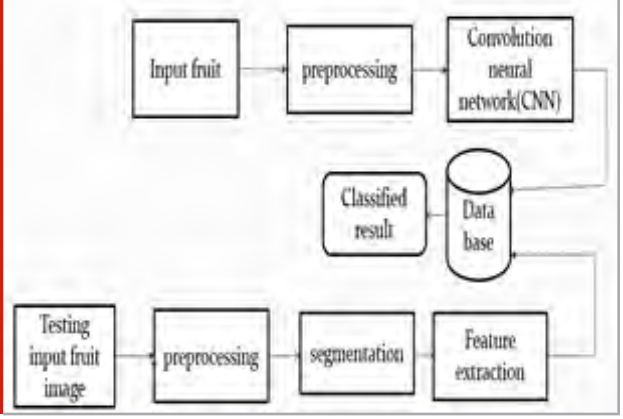
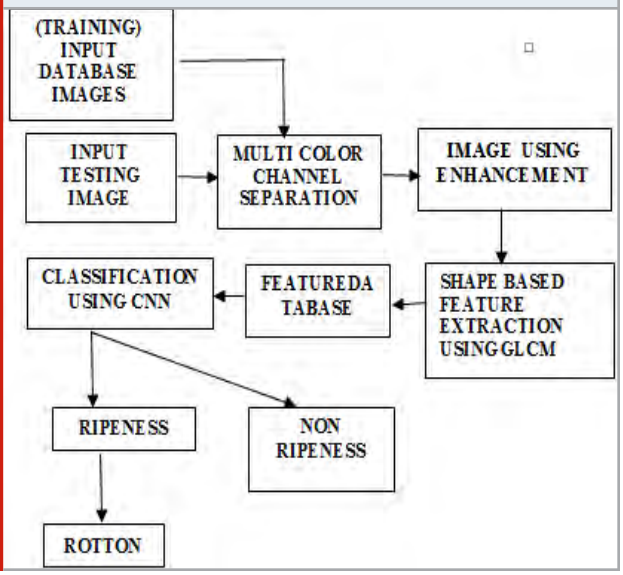


Figure 3: Block Diagram for Ripeness Detection



Convolution neural community(CNN) is a gracious of synthetic neural network, which has emerged as a warm analysissubject matter inside the issue of speech recognition and image reputation at an existent and

applicable deep complication neural community in Image Net database in 2012 and done well effects. As the picture can be immediately input to the community, it stays away from characteristic eradication and facts regeneration system in conventional popularity set of guidelines. The shape of CNN coatings usually includes complication coating, bringing together coating and entire-related coatings.

Figure 4: Histogram Output

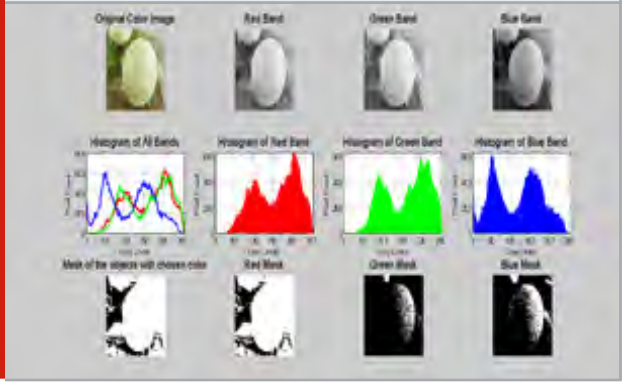


Figure 5: Class Result

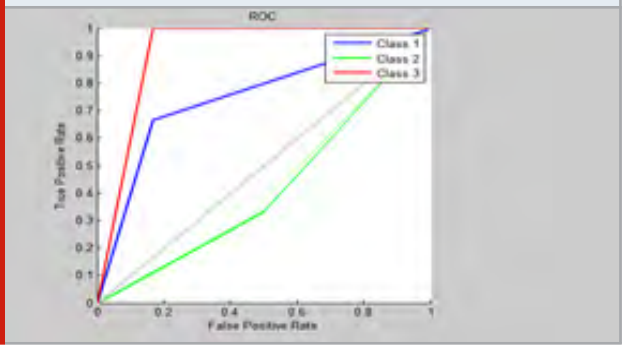
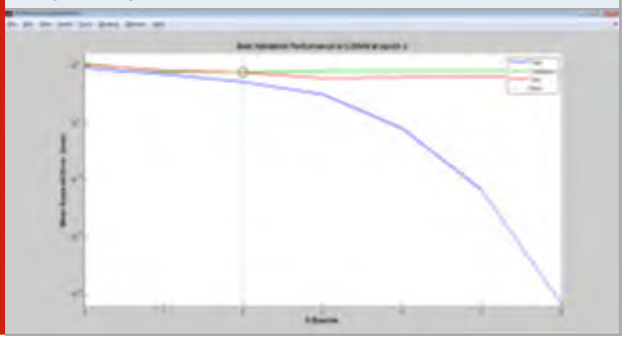


Figure 6: Performance Curve for Best Validation Performance at 2 Epoch is 0.25949 VsMean Squared Error in ms



By complication scheme, the specific notable capabilities may remain extra in addition to facts. As suggests in Figure 1, the arrangement incorporates 3 complication coatings, every of them is observed by way of manner of bringing together coatings, and genuinely connected coatings. The non-linearity is achieved to the yield of each complication and complete- related coating. That first complication coating filters the 32*32*3 enter image with 32 kernels of length 5*5*3. A 2D complicationcoating has 32 kernels of length 3*5*32. That 0.33 complicationcoating has 64 kernels of size 5*5*32. All bringing together coating pool over 3*3 areas with stride of two. One whole- linked coatinghave 64 neurons each. Conclusively, softmax classifier is applicable on the final coating.

RESULTS AND DISCUSSION

In this work,Experimental results are done in MATLAB r2017a 64bit software.

Table 1. Comparison Result

S.NO	TECHNIQUES	ALGORITHM	ACCURACY
1.	KNN	Classification Fruit Ripeness	78%
2.	Random Forest	LKKJJ	60%
3.	SVM	Classification	85%

CONCLUSION

We have presented a system that can accurately estimate the ripeness of culmination. Empirically we have established that a tracking through detection device is then hired to appropriately count the end result present in the field. This tracking method is an imaginative and prescient-simplest answer and as such is cheap to enforce as it best calls for a digital camera. But our proposed device can correctly estimate the state of end result whether or not it's far ripned non-ripned or rotten via using a Parallel-RFCNN structure which appropriately detects.

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Programmed Food Deliverance Scheme for Eatery

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ABSTRACT

More individuals want to eat out these days and the nourishment business needs to reform its method for serving clients so as to stay economical to the developing populace. The proposed framework structure comprises of hued lines that are drawn on the café ground and they connect all tables to the kitchen filling in as a managing track; a robot that is in a state of harmony with the requesting framework will serve. At the point when clients put in their request through the requesting framework, the framework will send the request to the kitchen. When the dish is ready, the robot will at that point convey it to the particular table and come back to the kitchen. This framework is yet to be main stream in the nourishment and refreshment industry and there are a few specialized troubles to be survived. In any case, when the specialized troubles are survived and upgrades are made, the computerized nourishment conveyance framework utilizing a automaton is a potential answer for the issues looked by the eatery proprietors.

KEY WORDS: ZIGBEE, PIC CONTROLLER, NOURISHMENT, ROBOT, IR SENSOR, LCD.

INTRODUCTIO

Manual Food Ordering System utilizes server to take request from clients. During top hour, clients might be such a large number of to be served by servers. The nature of the administration may drop in this way causing dissatisfactory of clients. Nonetheless, if there are such a large number of servers are enlisted, it might be a misuse of assets during non-top hour. Computerization includes the utilization of innovation where a human isn't vital. The least demanding path is to robotize the basic assignments of sending certain data. This is the means by which a robotized café requesting framework works. The nourishment conveyance advertise is experiencing dynamic change. 60% of US shoppers proclaim that they request nourishment online at any rate once every week and 30% state at any rate twice. This pattern will increment – the innovation cognizant age will frame an expanding extent of society. Clients request nourishment things on contact screens in the table, and hang tight for their nourishment. The Chef getting the requests remotely (Using ZIGBEE handsets), puts the nourishment things on the upper plate of administration portable robot.

The robot tracks the area of the client and conveys nourishment to them. Subsequent to conveying the nourishment things, the machine comes back to its unique spot in a similar track. The machine is implanted with the hindrance maintaining a strategic distance from sensors to keep the clients from coincidental hitting with the robot. In the event that the robot detects any clients on the directing track, it makes them aware of move with the assistance of connected amplifiers. The design can also be made with the help of (Nagarajan et. al., 2019) VLSI standard technology.

ARTICLE INFORMATION

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The System Architecture: The clients put in their requests at the client's table. The putting in of request should be possible with the assistance of the requesting framework which comprises of a LCD show appended with a resistive touch screen and a ZigBee handset as shown in figure 1. The client's Table has LCD in which Touch Screen is set to interface the requesting. For, remote correspondence, ZigBee handset is interfaced with the MAX232 IC. PIC16F877A is utilized to control the whole framework. ZigBee transceivers of TARANG XBEE modules are used for the system.

Figure 1: Customer Module

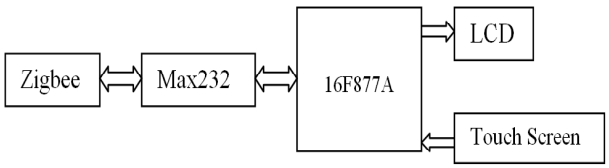
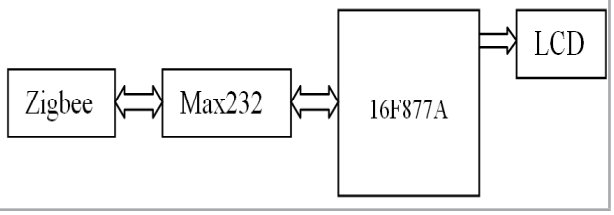


Figure 2: Chef's Module



Since the framework is especially client well disposed the requests can be effectively set. This procedure begins by choosing the dishes needed and their amount by contacting the resistive touch screen. After the request is put, It would be ideal if you sit tight for 10 min' will show up on the LCD show. The request set is transmitted to kitchen through the ZigBee handset which is available at both the client's table and kitchen. The beneficiary (Chef's End) has the ZigBee handset to get the requests. Max232 is utilized to interface with the PIC16F877A. The LCD is appended to show the requests put by the client. In the cook's end, the framework comprises of same parts expect the resistive touch screen as shown in figure 2.

The requesting procedure is carried on so that, when the client chooses the dishes it is transmitted all the while individually to the gourmet specialist's end. By along these lines the gourmet expert can make the dishes and puts them on a plate and keeps it on the highest point of rule following robot. The robot as shown in figure 3 will be furnished with a push-on switch on the top and when the plate of dishes is kept on it the switch will be pushed and the robot begins. Since each table will be relegated with a different managing track, the robot will follow the track and arrives at the table from which the request is set. The robot has a PIC16F877A microcontroller. It utilizes IR sensors for following the dark lines on the eatery floor. Engines are associated for pulling forces purposes. High Intensity IR hindrance sensors are utilized for human snag recognition. The APR9600 module alarms the human block.

Figure 3: The Robot

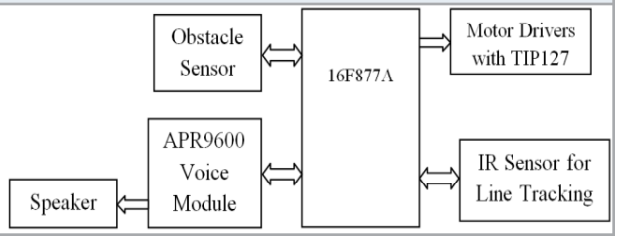


Figure 4: Customer Module Circuitry

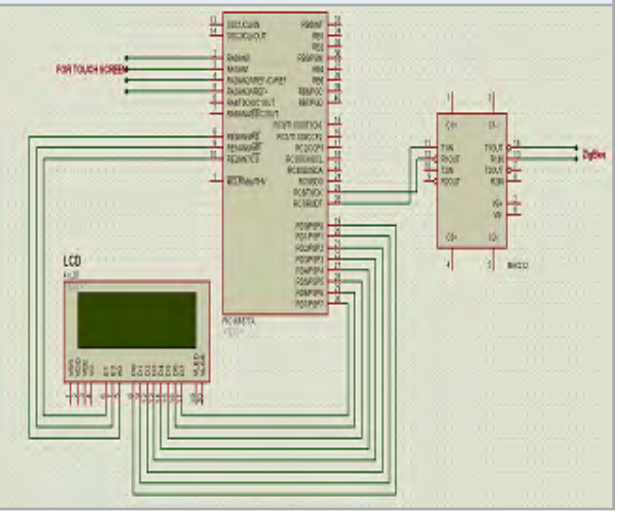
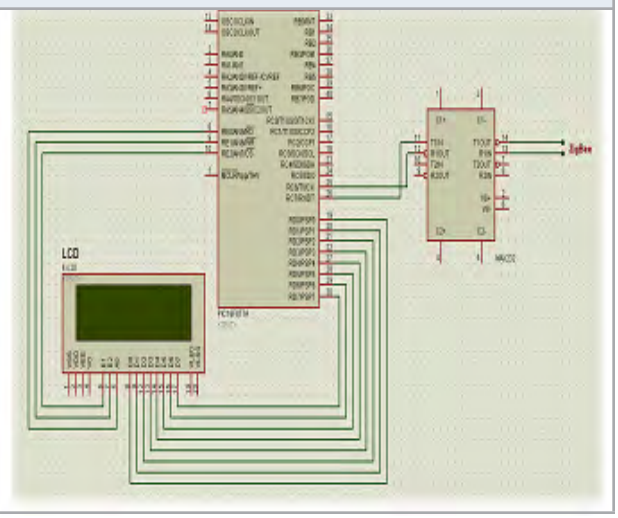


Figure 5: Chef's Module circuitry



Essentially the robot will follow the dark hued way and arrives at the table, so there will be nearness of white shading at the track close to the table which will assist with halting the robot effectively close to the table. After the plate is taken the push-on switch will come to old position, and after that the robot will move marginally advance till it detects the dark shaded track. At that

point the robot will come back to its old situation by following the dark track.

Figure 6: The Robot Circuitry

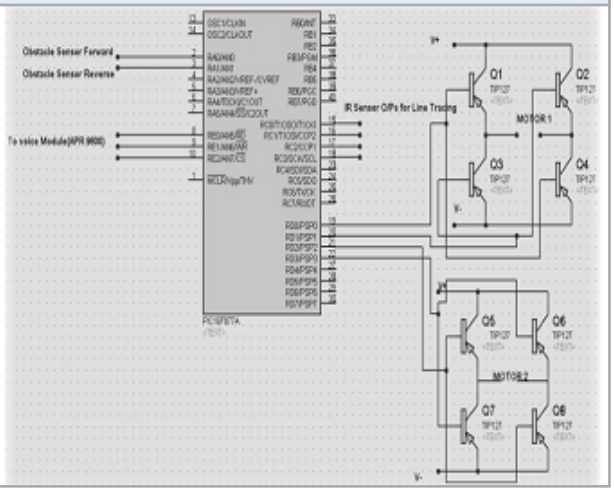
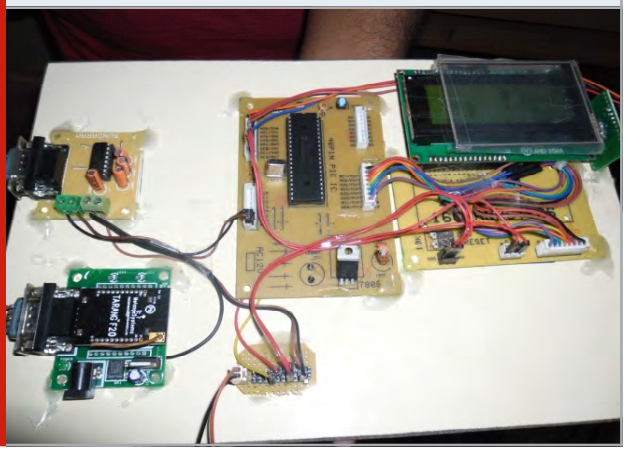


Figure 7: Real Time Snap of the Customer Module



The robot circuit comprises of voice module, obstruction sensor, PIC microcontroller board, engine driver board. The hindrance sensor is additionally an IR sensor which is utilized to detect the deterrents like clients strolling or remaining on the track when the robot is moving to dispatch the requests. At the point when snag sensor detects the clients on the track implies, the robot will stop and alarms the individuals with the assistance of the voice module. The voice module comprises of a speaker and APR 9600 board. The robot's tires are associated with the poles of the high torque dc engines. These engines are driven with the assistance of the double engine driver circuit board (Balamurugan et al., 2019). The force supply is given to the robot with the assistance of a 12V/7.2A dc fixed upkeep battery which is battery-powered. In this way with the assistance of both the requesting framework and track guided robot, the programmed nourishment conveyance framework is executed.

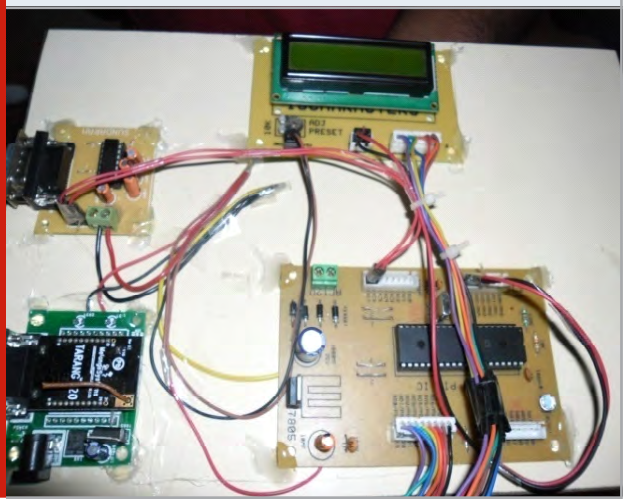
RESULTS AND DISCUSSION

The circuit for the module has been designed in proteus design suite and successfully verified for the ordering of the menu by a customer. The proteus design is shown in the figure 4. And in the figure 5 which depicts the circuit layout of the Chef's module. The robot circuitry framed using the Proteus design suite is depicted in the figure 6 where the programmed Pic controller is connected with the motors for the movement of the robot. Battery-powered batteries were utilized as the force supply for the robot. Joined with essential line guideline battery-powered batteries give spotless, solid force, and permitted reuse of the batteries when drained. The choice between various sorts of batteries was made dependent on size and force necessities. In this way, a 12V/7.2A dc SMF (Sealed Maintenance Free) battery is utilized as force supply. The designed customer module is furnished in the figure 7. The design functioned well for the menu chosen by the customer. Based on the specification made in the customer module the robot shown in figure 9 which responded through the guiding track shown in the figure 8. The figure 10 shows the designed chef's module with the LCD display.

Figure 8: The guiding Track for the Robot

Figure 9: The Robot

Figure 10: Real Time Snap of the Chef's Module



CONCLUSION

Delivering nourishment utilizing a robot is certainly not another yet there are a few specialized troubles to survive. First it would be the cost in question. To persuade this mechanized nourishment conveyance framework is functional, it goes to a point that individuals will sensibly look at the expense of employing a laborer and purchasing a robot. In this way it is fundamental to hold the expense down. Speed versus dependability is another perspective to be explicitly focused on. As the speed expands, the dependability of the robot can't be undermined. This prompts the assurance of the ideal working pace. The same design can also be implemented (Maheswari et. Al., 2020) with the help of advancement in IoT by UFMC development standards for 5G Communication.

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On the Robust Solution to Multi-Fuel Environmental Economic Power Dispatch Problem with Fuzzy Instituted EMF Optimization

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ABSTRACT

Attributed to the ever-increasing deterioration of environment, one of the most dynamic research zones as of late is the combined economic emission dispatch (CEED) problem. However, owing to the intermittent power supplies' sustained growth, connected to power system, their randomness and volatility will pose new challenges to power system optimization dispatch. In this study, a new heuristic algorithm called fuzzy instituted electromagnetic field optimization (FI-EMFO) is proposed to solve CEED by addressing the multi fuel alternatives (MFA), valve point loading (VPL) and various practical constraints. The EMFO mimics Coulomb's and Franklin's doctrines of electromagnetism. The fuzzy instituted decision-making strategy is acquainted with recognize the best trade off solution for the obtained Pareto frontiers. The comprehensive spectacles of the proposed FI-EMFO have been extensively researched on the 10-unit framework with MFA and VPL impacts. The simulation results showed that the proposed FI-EMFO approach successfully lessens the fuel costs just as perilous emissions and displays more serious execution than the other best in class heuristic methodologies, for example, krill herd algorithm (KHA) and exchange market algorithm (EMA). Consequently, the suggested FI-EMFO can give a superior trade-off among fuel and emission objectives considered right now.

KEY WORDS: EMF OPTIMIZATION, ECONOMIC AND EMISSION DISPATCH, GAS EMISSIONS, MULTI FUEL ALTERNATIVES, VALVE POINT IMPACTS.

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INTRODUCTION

In modern power system analysis, Economic load dispatch (ELD) has obtained an incredible significance in maneuver and control. The economic ecological load dispatch issue (EELD) is a mix of ELD and emanation dispatch (ED) issues. As of late, with the expansion of natural contamination, EED has caused quite a bit of researchers to notice diminish discharge for ecological assurance. EED's aim is to schedule optimum generation from all the accessible units to limit the fuel cost just as the ecological poison, for example, NOx and SO2 that discharge into environment through combustion of fossil fuel.

The mathematical models representing emissions are non-linear and hence, the ecological perspective adds multifaceted nature to the arrangement of the ELD issue. The CEED issue is additionally confounded if non-smooth and non-curved fuel cost capacities are utilized to show generators, similar to VPL impacts. Every one of these contemplations makes the CEED issue an exceptionally nonlinear and a multimodal optimization issue (Bensala et al., 2014).

For the most part, three methodologies have been accounted for to deal with the CEED issue in the literature (Abido., 2009). In the principal approach, the emanation is treated as a constraint with an admissible limit. Be that as it may, this plan sees outrageous difficulty in getting

Table 1. Summary of the alluded approaches with its application for 10-unit system of various dispatch issues

References	Approaches	Multi fuel alternatives		
		ELD	ED	CEED
Chiang (2005)	Improved Genetic algorithm (IGA)	Yes	No	No
Selvakumar and Thanushkodi (2007)	New particle swarm optimization (NPSO)	Yes	No	No
Hemamalini and Simon (2010)	Artificial bee colony algorithm	Yes	No	No
Vo et al. (2012)	Cuckoo search algorithm (CSA)	Yes	No	No
Moradi-Dalvand et al. (2012)	Continuous quick) group search optimizer (CQGSO	Yes	No	No
Thang (2013)	Hopfield Lagrange network (HLN)	Yes	No	Yes
	lamda-iteration method (LIM)	Yes	No	Yes
Modiri-Delshad et al. (2016)	Backtracking search algorithm (BSA)	Yes	No	No

the trade off relations between costs likewise, emanation. The subsequent methodology regards the emanation as another goal notwithstanding the costs. Right now, CEED issue is changed over into a solitary objective issue either by direct mix of the two objectives or by thinking about each objective in turn for optimization. In the third methodology, at the same time clashing targets are assessed together in the arrangement of the CEED issue. Both the fuel cost and the emanation are limited together.

By and by, the CEED issue has been comprehended by utilizing deterministic (traditional) and heuristic techniques. In the previous hardly any decades, numerous traditional strategies, for example, lambda iteration (Zhan et al., 2014), Newton-Raphson (Chen et al., 2003), interior point method (Bishe et al., 2011) and quadratic programming (Yuan and Lan, 1998) have been applied to different ED issues. In any case, the vast majority of them experience issues in taking care of ED issues because of non-linearity and non-convexity fuel cost and emission attributes. The traditional strategies are profoundly touchy to the beginning stage and every now and again combine to neighbourhood ideal arrangement. Besides, these strategies are not ready to discover a solution with a noteworthy computational time for CEED issue (Bensala et al., 2014).

As of late, numerous populace based techniques have been utilized to take care of CEED issues. For the most part, accomplishing an ideal or close to ideal solution for a particular issue will entail various preliminaries just as fitting tuning of related parameters. A wide assortment of populace based systems has been employed for CEED problems and few approaches are summarized in Table 1.

This investigation proposes a physics inspired meta-heuristic approach named as FI-EMFO (Ghasemi et al., 2017) to tackle the CEED issue with MFA and VPL impacts. The demonstration of the alluded approach is tried on 10-unit standard test framework. Numerical outcomes acquired by the alluded approach were contrasted with KHA and EMA approaches.

The rest of the article is sorted out as follows. In Section 2, the mathematical model of CEED issue addressing multi fuel alternatives is introduced. Sections 3 and 4 expound the proposed FI-EMFO strategy and Successive progression of FI-EMFO for CEED issue respectively. Thusly, the plausibility and adequacy of the suggested technique are assessed in Section 4 by contrasting and the ongoing heuristic approaches in existing literature. At long last, the conclusions are outlined in Section 5.

MATERIAL AND METHODS

Mathematical Model Of Multi-Fuel Ceed

Fuel cost objective function with MFA: The goal of the economic load dispatch (ELD) issue is to limit the all out expense of thermal units as follows:

$$Minimize\ F = \sum_{i=1}^{ng} F_i(P_i) \tag{1}$$

In the ELD issue, the fuel cost of each generating unit is communicated as a quadratic function of its capacity yield. As the generating units utilize different fuel choices to create power and the valve point impacts considered, the fuel cost function is expressed in Eq. (3)

Emission objective function with MFA: The objective of the emission dispatch (ED) problem is to lessen the hazardous emissions as follows:

$$Minimize\ E = \sum_{i=1}^{ng} E_i(P_i) \tag{2}$$

The outflow target function is truly like the fuel cost function while it deals with all discharge types discharged by generation units. The scientific model for emanation

$$F_i(P_i) = \begin{cases} Fuel\ type\ 1;\ a_{i1} + b_{i1}P_i + c_{i1}P_i^2 + \left|e_{i1} \times \sin(f_{i1} \times (P_{i,min} - P_i))\right|;\ P_{i,min} \le P_i \le P_{i1} \\ Fuel\ type\ 2;\ a_{i2} + b_{i2}P_i + c_{i2}P_i^2 + \left|e_{i2} \times \sin(f_{i2} \times (P_{i,min} - P_i))\right|;\ P_{i1} < P_i \le P_{i2} \\ \ldots \\ Fuel\ type\ k;\ a_{ik} + b_{ik}P_i + c_{ik}P_i^2 + \left|e_{ik} \times \sin(f_{ik} \times (P_{i,min} - P_i))\right|;\ P_{ik-1} < P_i \le P_{i,max} \end{cases} \tag{3}$$

$$E_i(P_i) = \begin{cases} Fuel\ type\ 1;\ \alpha_{i1} + \beta_{i1}P_i + \gamma_{i1}P_i^2\ ;\ P_{i,min} \le P_i \le P_{i1} \\ Fuel\ type\ 2;\ \alpha_{i2} + \beta_{i2}P_i + \gamma_{i2}P_i^2\ ;\ P_{i1} < P_i \le P_{i2} \\ \ldots \\ Fuel\ type\ k;\ \alpha_{ik} + \beta_{ik}P_i + \gamma_{ik}P_i^2\ ;\ P_{ik-1} < P_i \le P_{i,max} \end{cases} \tag{4}$$

CEED function with MFA: The CEED issue can be figured as bi-target work in which fuel cost and discharge as equaling destinations. This bi-target function can be moved to a solitary target function as follows:

$$Minimize\ F_{CEED} = w \times F + h \times (1 - w) \times E \tag{5}$$

The above condition becomes ELD target function when w = 1 and becomes EED target work when w = 0. w is a primary function of rand [0,1] which bargains the fuel cost and emanation objectives.

Power balance constraint: The all out power generated from a set of accessible units must fulfil the all out load demand

$$\sum_{i=1}^{ng} P_i = P_D \tag{6}$$

Generator capacity limits: The real output power of thermal units ought to be in their range between minimum and maximum limits:

$$P_{i,min} \le P_i \le P_{i,max} \tag{7}$$

Fuzzy Instituted Electromagnetic Field Optimization (Fi-Emfo):

EMFO: EMFO is a metaheuristic approach which is presented by Ghasomi et al. (2018). This approach mimics the Coulomb's and Franklin's hypotheses. The accompanying ideas of laws are used in the EMFO approach.

Coulomb's Law: The connection between two distinctive point charges is controlled by the greatness of electrostatic power of fascination (or) repugnance.

Franklin's Law: Each object comprises of equivalent positive and negative charges.

EMFO approach utilizes various objects (populaces) of points charges (X) which moves around various territories in an investigating space to perceive the global ideal solution. The initial objects are formed by different gatherings of point charges which are arbitrarily generated in the search space. Each point charge involved D quantized charges x and each point charge compares to a candidate solution of the problem. The model of EMFO is a monotonous procedure, which contains four stages, in particular

Initialization stage

Fascination/shock stage

Probabilistic ionization stage

Probabilistic contact stage

Initialization stage: Consider on object formed by a populace of m charges with dimension D. The objects, populaces and each individual are represented by

$$O = [O_1, O_2, \ldots O_n]$$
$$X = [X_1, X_2, \ldots X_m]$$
$$X_{ij} = [x_{i1}, x_{i2}, \ldots x_{iD}]$$

The initial populations of point charges are generated as follows:

$$x_{ij} = U\left(x_j^{min}, x_j^{max}\right) \quad for\ i = 1, 2, \ldots m \text{ and } j = 1, 2, \ldots D \tag{8}$$

Where U is a vector of consistently disseminated arbitrary numbers between x_j^{min} and x_j^{max}.

Then, the initial population is arranged and disseminated into a few objects (O1.....On).

Fascination/repugnance stage: The relocation of point charge is impacted by fascination and aversion forces following up on them. The net power following up on a point charge (Xi) is equivalent to its value (Fi). The EMFO approach is utilized to limit the net force (cost) following up on them. For each object, the area of point charges is refreshed by

$$x_j^{new} = x_{ij}^{old} + \left|\cos\theta_j^{new}\right|^2 \times \left(x_j^{best} - x_j^{Worst}\right) + \left|\sin\theta_j^{new}\right|^2 \times \left(mean\left(\sum_{n=1}^{a_{max}} x_{jn}\right) - mean\left(\sum_{n=1}^{r_{max}} x_{jn}\right)\right) \tag{9}$$

$$\text{Where, } \theta_j^{initial} = U(0, 2\pi)$$
$$\theta_j^{new} = \theta_j^{old} + U\left(0, \frac{3}{2}\pi\right)$$

The a_{max} and r_{max} are determined by the following equations

$$a_{max} = a_0 \times (1 + \cos\theta) \tag{10}$$
$$r_{max} = r_0 \times (1 - \cos\theta) \tag{11}$$

Probabilistic ionization stage: Due to the influence of probabilistic ionization energy, there is a possibility in the displacement of location of elementary charge xj and can be mathematically modelled by the following equation.

$$x_j^{new} = x_j^{Best} + x_j^{Worst} - x_j^{old} \text{ if } rand(i) \le p_i \tag{12}$$

The control variable 'j' is chosen as

$$j = round(unifrnd\ (1,\ D)) \tag{13}$$

Where, rand (i) is the i^{th} point charge of a uniform random number generation within [0, 1].

Probabilistic contact stage: If the objects are in contact with each other, then each object passes its best and worst point charges to its neighbour. The probabilistic contact phase is displayed as follows:
If rand $_c \le P_c$, then.

$$x_j^{Best_{Obj1}} = x_j^{Best_{Obj2}}, \ldots x_j^{Best_{Obj_n}} = x_j^{Best_{Obj_{n-1}}}$$
$$x_j^{Worst_{Obj1}} = x_j^{Worst_{Obj2}}, \ldots x_j^{Worst_{Obj_n}} = x_j^{Worst_{Obj_{n-1}}} \tag{14}$$

where, $rand_c$ is uniform number generation inside [0, 1].

Fuzzy instituted best concessive solution: Fuzzy set hypothesis is more than once utilized by analysts to get the best concessive solution from numerous uncontrolled solutions. As both the targets of fuel costs and emissions are opposite characteristically, it is not plausible to get the least fuel cost and to achieve minimal emanation simultaneously. Yet, it is achievable and practicable to get a dispatch alternative that can decrease both fuel cost and discharge quite far. Level of understanding (LU) to every objective is appointed by fuzzy membership functions, where LU mirrors the value of their target in a direct size of 0 – 1(worst to best). If Fj is a solution in the Pareto-optimal set in the jth objective function and is represented by a membership function as,

$$\mu(F_j) = \begin{cases} 1 & if\ F_j \le F_j^{min} \\ \dfrac{F_j^{max} - F_j}{F_j^{max} - F_j^{min}} & if\ F_j^{min} \le F_j \le F_j^{max} \\ 0 & if\ F_j \ge F_j^{max} \end{cases} \tag{15}$$

For each non-dominated solution, the standardized membership function μ_D^k can be determined as,

$$\mu_D^k = \frac{\sum_{i=1}^{2} \mu\left(F_i^k\right)}{\sum_{k=1}^{M} \sum_{i=1}^{2} \mu\left(F_i^k\right)} \tag{16}$$

The solution that contains the maximum μ_D^k of dependent on cardinal need positioning is the best compromised solution.

$$Max\left\{\mu_D^k : k = 1, 2, \ldots, M\right\} \tag{17}$$

Successive Progression of Fi-Emfo For Ceed Issue: Right now, strategy to actualize the FI-EMFO approach for taking care of the CEED issues has been depicted as flow diagram in Figure 1.

RESULTS AND DISCUSSION

To test the viability of the suggested approach, it is applied to 10-unit framework with MFA and VPL impacts. The coefficients of multi-fuel cost and discharge capacity, and generation limits of generating unit taken from Thang (2013). The alluded FI-EMFO approach is actualized in Matlab 7.1 and executed on an Intel core i3 processor with 4GB RAM PC. The proposed approach is executed for 50 autonomous trials to assess the solution quality and convergence behavior. The number of objects, populace size and maximum iteration number of FI-EMFO approach are picked as 5, 20 and 100 respectively. The accompanying three scenarios are researched and the results of the alluded FI-EMFO approach are contrasted with KHA, EMA and other state-of-art approaches accessible in the literature.

Figure 1: Flow chart of FI-EMFO applied in CEED issues

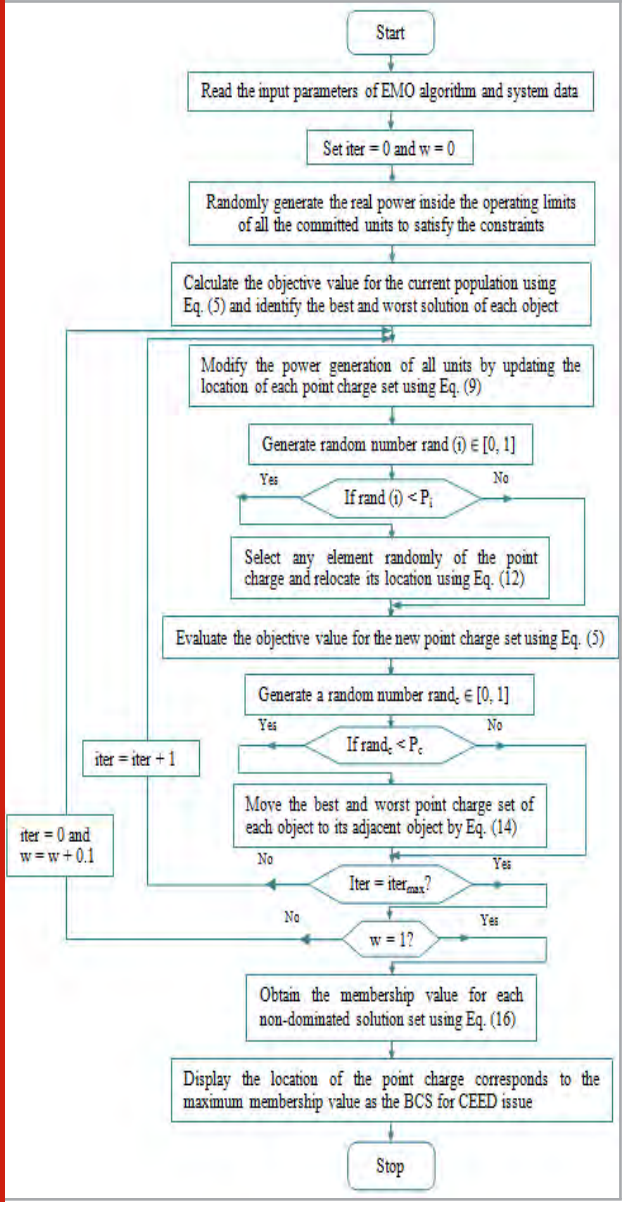
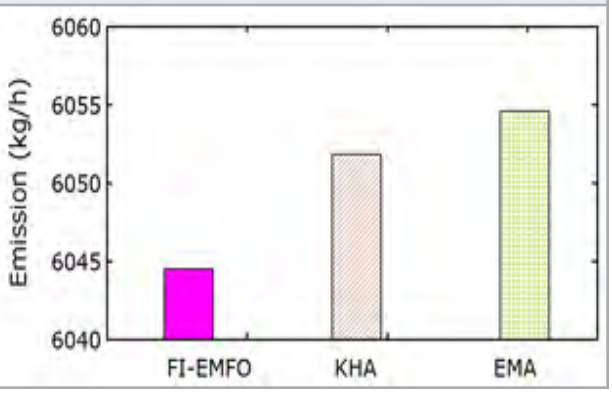


Figure 2: Performance comparison of FI-EMFO with other techniques for emission objective



Scenerio 1. Reduction of the total fuel cost alone, Scenerio 2. Reduction of the total emission level solely, and Scenerio 3. Reduction of both the total fuel cost and the total emission level.

Scenario 1: The optimal generation schedule acquired by illuminating the generation cost minimization of the alluded approach is introduced in Table 1. In this scenario, the alluded approach is compared with the known approaches such as EMA, KHA, CSA and BSA in Figure 2. As can be seen from the outcomes introduced in Figure 2, the FI-EMFO approach outflanks the aforementioned approaches as far as the total production cost.

Scenario 2: Table 2 presents the ideal values of generating units of the FI-EMFO for emanation minimization. The minimum emanation amount accomplished from FI-EMFO is 6044.4789 kg/h. The results accomplished from the alluded FI-EMFO approach have been compared with other heuristic methodologies, for example,

Table 2: Optimal solution acquired by the alluded approach for fuel cost objective

Unit	Fuel Types	FI-EMFO
1	2	218.2496
2	1	211.6654
3	1	280.9792
4	3	239.8704
5	1	278.7599
6	3	239.3943
7	1	288.5493
8	3	239.3835
9	3	428.2963
10	1	274.4732
Minimum cost ($/h)		623.8613
Emission (kg/h)		6460.9222

KHA and EMA in Figure 3. The consequences of this correlation, which are given in Figure 3, demonstrate that the insinuated approach is better than those of the KHA and EMA approaches. FI-EMFO approach has accomplished 7.34 kg/h and 10.1 kg/h less emanation level decrease than those acquired utilizing of KHA and EMA respectively.

Table 3. Optimal solution acquired by the alluded approach for emission objective

Unit	Fuel Types	FI-EMFO
1	2	199.7561
2	1	212.9532
3	1	298.5494
4	3	255.6735
5	1	287.3095
6	1	169.7462
7	2	366.8659
8	3	256.3758
9	3	440
10	1	212.7704
Fuel cost ($/h)		668.6195
Minimum Emission (kg/h)		6044.4789

Figure 3: Performance comparison of FI-EMFO with other techniques for CEED

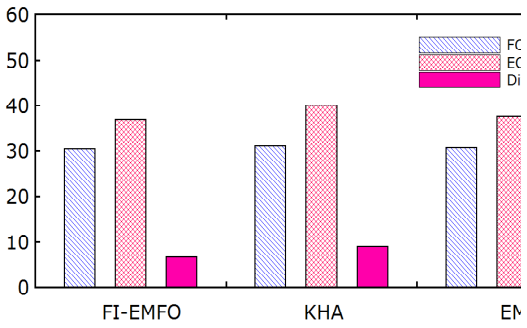
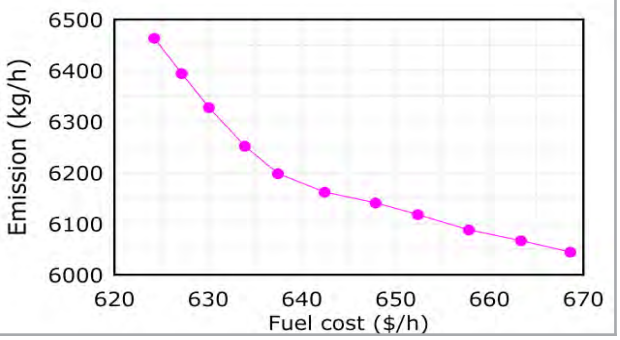


Figure 4: POF curve of the proposed FI-EMFO algorithm



Multi-objective Performance measures: The multi-objective performance indicators such as, generational distance (GD), spacing metric (SM) and ratio of non-dominated individuals (RNI) are utilized to get to the

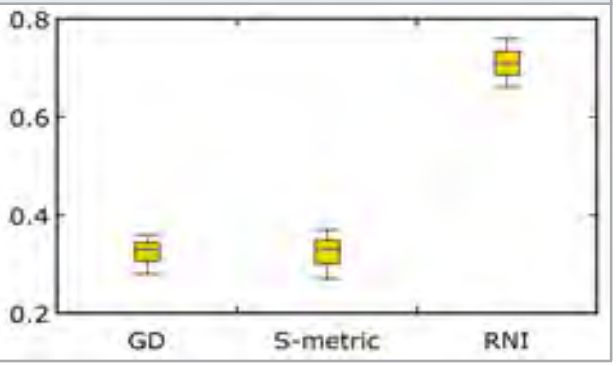
Table 4. Non-dominated solutions for various weighting values acquired by the alluded approach

W1	W2	Fuel cost ($/h)	Emission (kg/h)	Membership value (μ_D)
1	0	624.2642	6463.2841	0.077760
0.9	0.1	627.1618	6394.3657	0.085477
0.8	0.2	630.0796	6327.4648	0.092783
0.7	0.3	633.9257	6251.7609	0.100097
0.6	0.4	637.4385	6198.1572	0.103891
0.5	0.5	642.4138	6161.9721	0.101887
0.4	0.6	647.8515	6140.8452	0.096277
0.3	0.7	652.3607	6117.9579	0.092621
0.2	0.8	657.7984	6088.0282	0.088645
0.1	0.9	663.3687	6066.9014	0.082802
0	1	668.6193	6044.4789	0.077760

Table 5. BCS acquired by the alluded approach

UUnit	Fuel Types	FI-EMFO
1	2	209.3864
2	1	212.9548
3	1	294.2932
4	3	252.7033
5	1	285.8751
6	1	195.8957
7	2	300.7344
8	3	245.6157
9	3	425.6682
10	1	276.8732
Fuel cost ($/h)		637.4385
Emission (kg/h)		6198.1572

Figure 5. Boxplots of MO performance measures



exhibition of the suggested approach. The smaller estimations of GD and SM demonstrate that better union to the POF curve, and better conveyance and assorted variety of the non-dominated solutions respectively. A closer estimation of one for RNI index demonstrates that the greatest number arrangements in a populace are non-

dominated. The aforementioned performance indicators got by the proposed approach in 50 autonomous trials are shown as box and whisker plots in Figure 6. It tends to be seen from them that FI-EMFO has discovered the littler values regarding GD and SM indices, and more like one as for RNI indicator.

CONCLUSION

In this article, FI-EMFO strategy has been effectively actualized for taking care of CEED issues with various fuel alternatives and VPL impacts. The viability and vigour of the proposed FI-EMFO technique have been checked on 10-unit framework. The outcome correlation between the proposed strategy and different strategies has shown that the proposed technique can get the best concessive solution (BCS). In this way, the alluded FI-EMFO technique can be a productive and strong strategy for taking care of complex CEED issues. In this manner, it might at last be reasoned that the recommended approach can reach POF solution regardless of the idea of the objective function.

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Effective Load Balancing and Dynamic Channel Allocation in Mobile Ad Hoc Networks

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ABSTRACT

Mobile ad hoc networks are becoming increasingly common, and typical network loads considered for MANETs are increasing as applications evolve. This, in turn, increases the importance of bandwidth efficiency while maintaining tight requirements on energy consumption delay and jitter. Coordinated channel access protocols have been shown to be well suited for highly loaded MANETs under uniform load distributions. However, these protocols are in general not as well suited for non-uniform load distributions as uncoordinated channel access protocols due to the lack of on-demand dynamic channel allocation mechanisms that exist in infrastructure based coordinated protocols. This paper presents a lightweight dynamic channel allocation mechanism and a cooperative load balancing strategy that are applicable to cluster based MANETs to address this problem. We present protocols that utilize these mechanisms to improve performance in terms of throughput, energy consumption and inter-packet delay variation (IPDV).

KEY WORDS: MOBILE, CONSUMPTION, on-DEMAND DYNAMIC.

INTRODUCTION

MOBILE ad hoc networks (MANETs) have been an important class of networks, providing communication support in mission critical scenarios including battlefield and tactical missions, search and rescue operations, and disaster relief operations. Group communications has been essential for many applications in MANETs. The typical number of users of MANETs has continuously increased, and the applications supported by these networks have become increasingly resource intensive. This, in turn, has increased the importance of bandwidth efficiency in MANETs (B. Karaoglu, et al 2011). It is crucial for the medium access control (MAC) protocol of a MANET not only to adapt to the dynamic environment utilization. In general, MAC protocols for wireless networks can be classified as coordinated and uncoordinated MAC protocols based on the collaboration level. Low network loads, these protocols are bandwidth efficient due to the lack of overhead (L. Kleinrock et al 2008).

However, as the network load efficient. On the other hand, in coordinated MAC protocols the channel access is regulated. Fixed or dynamically chosen channel controllers determine how the channel is shared and accessed. Coordinated channel access schemes provide support

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for quality of service (QoS), reduce energy dissipation, and increase throughput for dense networks (Gopinath et al 2019). Extensively deployed cellular networks also use a coordinated MAC protocol in which the channel access is regulated through fixed base stations. Some of the key challenges in effective MAC protocol design are the maximization of spatial reuse and providing support for non-uniform load distributions as well as supporting multicasting at the link layer. Multicasting allows sending a single packet to multiple recipients. In many cases, supporting multicasting services at the link layer is essential for the efficient use of the network resources, since this approach eliminates the need for multiple transmissions.Integrating spatial reuse into a MAC protocol drastically increases bandwidth efficiency (K.Vinoth et al 2015).

On the other hand, due to the dynamic behavior in MANETs, the traffic load may be highly non-uniform over the network area (S.Pramela et al 2020). Thus, it is crucial that the MAC protocol be able to efficiently handle spatially non-uniform traffic loads. Uncoordinated protocols intrinsically incorporate spatial reuse and adapt to the changes in load distribution through the carrier sensing mechanism.MAC layer, allowing the channel controllers to utilize spatial reuse and adopt to any changes in the traffic distribution. Similar to cellular systems, coordinated MANET MAC protocols need specialized spatial reuse and channel borrowing mechanisms that address the unique characteristics of MANETs in order to provide as high bandwidth efficiency as their uncoordinated counterparts(K.Vinoth et al 2019). Due to node mobility and the dynamic nature of the sources in a MANET, the network load oftentimes is not uniformly distributed.

In this paper we propose two algorithms to cope with the non-uniform load distributions in MANETs: a light weight distributed dynamic channel allocation (DCA) algorithm based on spectrum sensing, and a cooperative load balancing algorithm in which nodes select their channel access providers based on the availability of the resources (Vinoth et al 2015).

We apply these two algorithms for managing non-uniform load distribution in MANETs into an energy efficient real-time coordinated MAC protocol, named MH-TRACE. In MH-TRACE, the channel access is regulated by dynamically selected cluster heads (CHs). MH-TRACE has been shown to have higher throughput and to be more energy efficient compared to CSMA type protocols (K.Vinoth et al 2019). Although MH-TRACE incorporates spatial reuse, it does not provide any channel borrowing or load balancing mechanisms and thus does not provide optimal support to non-uniform loads.

Hence, we apply the dynamic channel allocation and cooperative load balancing algorithms to MH-TRACE, creating the new protocols of DCA-TRACE,CMH-TRACE and the combined CDCA-TRACE (M.Premkumar et al 2019). The responsibility of the MAC layer is to coordinate the nodes'' access conflicts. In a multi-hop network, obtaining high bandwidth efficiency is only possible through exploiting channel reuse opportunities. In multi-hop wireless networks, CSMA techniques enable the same radio resources to be used high bandwidth efficiency as their uncoordinated counterparts (K.Vinoth et al 2017). Due to node mobility and the dynamic nature of the sources in a MANET, the network load oftentimes is not uniformly distributed.

Proposed System: We proposed two algorithms to cope with the non-uniform load distributions in MANETs: a light weight distributed dynamic channel allocation (DCA) algorithm based on spectrum sensing, and a cooperative load balancing algorithm in which nodes select their channel access providers based on the availability of the resources. We apply these two algorithms for managing non-uniform load distribution in MANETs into an energy efficient real-time coordinated MAC protocol, named MH-TRACE. In MH-TRACE, the channel access is regulated by dynamically selected cluster heads (CHs). MH-TRACE has been shown to have higher throughput and to be more energy efficient compared to CSMA type protocols. Although MH-TRACE incorporates spatial reuse, it does not provide any channel borrowing or load balancing mechanisms and thus does not provide optimal support to non-uniform loads. Hence, we apply the dynamic channel allocation and cooperative load balancing algorithms to MH-TRACE, creating the new protocols of DCA-TRACE, CMH-TRACE and the combined CDCA-TRACE.

System Analysis: System analysis will be performed to determine if it is flexible to design information based on policies and plans of organization and on user requirements and to eliminate the weakness of present system. This chapter discusses the existing system, proposed system and highlights of the system requirements.

A distributed dynamic channel allocation algorithm with no optimality guarantees for a network with a fixed a-priori control channel assignment. Alternatively, there are various game-theoretic approaches to the channel allocation problem in ad hoc wireless networks. Multichannel model the channel allocation problem in multi-hop ad hoc wireless networks as a static cooperative game, in which some players collaborate to achieve a high data rate. In multi-hop wireless networks, CSMA techniques enable the same radio resources to be used in distinct locations, leading to increased bandwidth efficiencies at the cost of possible collisions due to the hidden terminal problem. Different channel reservation techniques are used to tackle the hidden terminal problem. Karn use an RTS/ CTS packet exchange mechanism before the transmission of the data packet. 802.11 distributed coordination function (DCF) uses a similar mechanism. The main disadvantages of this design are not scalable and not cover group communication.

This paper proposes two algorithms to cope with the non-uniform load distributions in MANETs: a light weight distributed dynamic channel allocation (DCA)

algorithm based on spectrum sensing, and a cooperative load balancing algorithm in which nodes select their channel access providers based on the availability of the resources. We apply these two algorithms for managing non-uniform load distribution in MANETs into an energy efficient real-time coordinated MAC protocol, named MH-TRACE. In MH-TRACE, the channel access is regulated by dynamically selected cluster heads (CHs). MH-TRACE has been shown to have higher throughput and to be more energy efficient compared to CSMA type protocols. Although MH-TRACE incorporates spatial reuse, it does not provide any channel borrowing or load balancing mechanisms and thus does not provide optimal support to non-uniform loads. The responsibility of the MAC layer is to coordinate the nodes' access to the shared radio channel, minimizing conflicts. In a multi-hop network, obtaining high bandwidth efficiency is only possible through exploiting channel reuse opportunities.

Indeed, efficient utilization of the common radio channel has been the centres of attention since the early development stages of wireless communication. Cidon and Sidi present a distributed dynamic channel allocation algorithm with no optimality guarantees for a network with a fixed a-priori control channel assignment. Alternatively, there are various game-theoretic approaches to the channel allocation problem in ad hoc wireless net-works. Gao and Wang model the channel allocation problem in multi-hop ad hoc wireless networks as a static cooperative game, in which some players collaborate to achieve a high data rate. However, these approaches are not scalable, as the complexity of the optimal dynamic channel allocation problem has been shown to be NP-hard.

In multi-hop wireless networks, CSMA techniques enable the same radio resources to be used in distinct locations, leading to increased bandwidth efficiencies at the cost of possible collisions due to the hidden terminal problem. Different channel reservation techniques are used to tackle the hidden terminal problem. Karn use an RTS/CTS packet exchange mechanism before the transmission of the data packet. 802.11 distributed coordination function (DCF) uses a similar mechanism. Although this handshake reduces the hidden node problem, it is inefficient under heavy network loads due to the exposed terminal problem. Several modifications to the RTS/CTS mechanisms have been proposed to increase the bandwidth efficiency including use of multiple channels. In coordinated MAC protocols, channel assignment is performed by channel coordinators. Spatially separated coordinators can simultaneously use the same channels with the channel reuse concept. The cellular concept that regulates channel access through fixed infrastructure called base stations also forms the basis of the widely deployed GSM systems.

The types of strategies for on-demand dynamic channel allocation used in cellular systems can be divided into two categories: centralized and distributed schemes. In centralized dynamic channel allocation schemes, the available channels are kept in a pool and distributed to various cells by a central coordinator. Although quite effective in maximizing channel usage, these systems have a high overhead and cannot be applied to MANETs due to the lack of high bandwidth and low latency links between the cluster heads for coordination. Distributed dynamic channel allocation for cellular net-works has also been studied extensively. In distributed dynamic channel allocation, each cell is assigned a number of channels. These channels can be exchanged among adjacent cells through message exchange mechanisms between the channel regulators (cell towers) in an on demand basis. This approach, too, is not directly applicable to MANETs. Unlike in the cellular case, in MANETs, the message exchanges between the channel regulators also consume network resources.

Due to node mobility and the dynamic behavior of the network, the large overhead associated with the frequent message exchanges may overwhelm the network and decrease the bandwidth efficiency. we first introduced the preliminary concept of dynamic channel allocation for TRACE systems in. In this paper, we extend the concept and analyze the non-uniform load distribution problem from both the perspective of member nodes and the cluster heads. We also introduce a collaborative load balancing algorithm for TRACE. By combining the dynamic channel allocation and collaborative load balancing algorithms, we propose the CDCA-TRACE protocol that has the highest bandwidth efficiency among the TRACE family of protocols.

Bandwidth Efficiency Techniques for Coordinated MAC Protocols: This section describes the lightweight dynamic channel allocation mechanisms based on channel sensing and the cooperative load balancing algorithms. We begin with a discussion of our assumptions. The nodes in the network are equipped with a transceiver that can operate in one of two modes: transmission or reception. Nodes can-not simultaneously transmit and receive. Channel sensing. The receiver node is able to detect the presence of a carrier signal and measure its power even for messages that cannot be decoded into a valid packet. In the case of simultaneous transmissions in the system, neither of the packets can be received unless one of the transmissions captures the receiver. The receiver can be captured if the power level of one of the transmissions is significantly larger than the power level of all other simultaneous transmissions. Such a capturing mechanism is the driving factor of the advantages gained through channel reuse. Channel coordinators. The channel resources are managed and distributed by channel coordinators. These coordinators can be ordinary nodes that are selected to perform the duty, or they can be specialized nodes. The channel is provided to the nodes in the network for their transmission needs by these channel coordinators. The system is also assumed to be a closed system where all the nodes comply with the channel access rules.

Dynamic Channel Allocation Algorithm: The first mechanism that we propose is a dynamic channel allocation algorithm similar to the ones that exist in cellular systems. Under non-uniform loads, it is crucial for

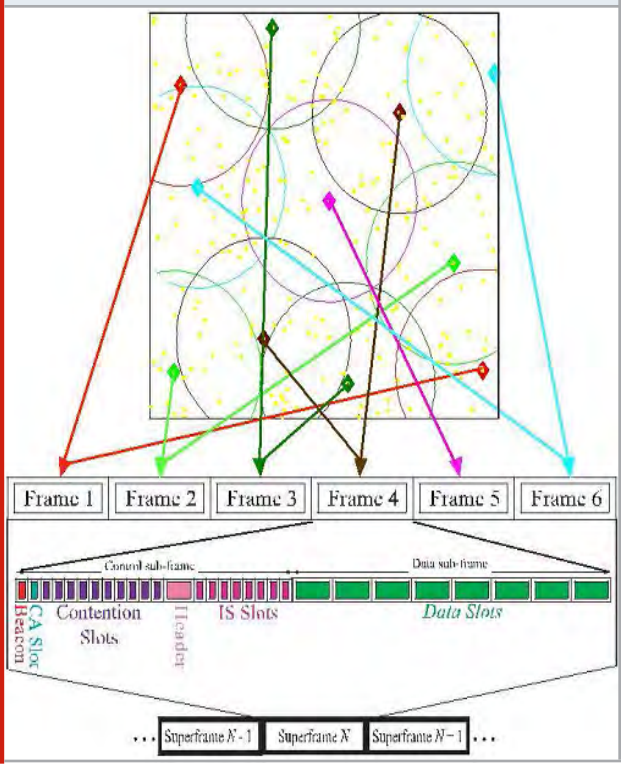
the MAC protocol to be flexible enough to let additional bandwidth be allocated to the controllers in the heavily loaded region(s). Dynamic channel allocation systems in cellular systems depend on higher bandwidth back-link connections available to cell towers. The cell towers are coordinated using these back-link connections in order to provide dynamic channel allocation and spatial reuse simultaneously. On the other hand, in MANETs, the channel coordinators can only communicate by sharing common channel resources, reducing the resources available for data transmission. In addition to this, the interference relation-ships between channel coordinators are highly dynamic. Hence, implementing a tight coordination would be too costly for a MANET system. Instead, we adopt a dynamic channel borrowing scheme that utilizes spectrum sensing.

CHs are represented by diamonds. CH-frame matching, together with the contents of each frame, is depicted. In this algorithm, the channel controllers continuously monitor the power level in all the available channels in the network and assess the availability of the channels by com-paring the measured power levels with a threshold. If the load on the channel controller increases beyond capacity, provided that the measured power level is low enough, the channel coordinator starts using an additional channel with the lowest power level measurement. Once the channel coordinator starts using the channel, its transmission increases the power level measurement of that channel for nearby controllers, which in turn prevents them from accessing the same channel. Similarly, as the local network load decreases, controllers that do not need some channels stop the transmissions in that channel, making it available for other controllers.

Cooperative Load Balancing: The DCA algorithm approaches the problem of non-uniform load distribution from the perspective of the channel coordinators. The same problem can also be approached from the perspective of the other nodes in the network. Using cooperative nodes smooth out mild non-uniformities in the load distribution without the need for the adjust-mentis at the channel coordinator side. The load on the channel coordinators originate from the demands of the ordinary nodes. Many nodes in a network have access to more than one channel coordinator. The underlying idea of the cooperative load balancing algorithm is that the active nodes can continuously monitor the load of the channel coordinators and switch from heavily loaded coordinators to the ones with available resources. These nodes can detect the depletion of the channels at the coordinator and shift their load to the other coordinators with more available resources. The resources vacated by the nodes that switch can be used for other nodes that do not have access to any other channel coordinators. This increases the total number of nodes that access the channel and hence increases the service rate and the throughput.

Mh-Trace: In MH-TRACE, certain nodes assume the roles of channel coordinators, here called cluster-heads. All CHs send out periodic Beacon packets to announce their presence to the nodes in their neighborhood. When a node does not receive a Beacon packet from any CH for a predefined amount of time, it assumes the role of a CH. This scheme ensures the existence of at least one CH around every node in the network. In MH-TRACE, time is divided into super frames of equal length, as shown in Fig. 1, where the super frame is repeated in time and further divided into frames. Each cluster head operates using one of the frames in the super frame structure and provides channel access for the nodes in its communication range. There are an equal number of IS slots and data slots in the remainder of the frame. During the IS slots, nodes send short packets summarizing the information that they are going to be sending in the corresponding data slot. By listening to the relatively shorter IS packets, receiver nodes become aware of the data that are going to be sent and may choose to sleep during the corresponding data slots. These slots contribute to the energy savings mechanism by letting nodes sleep during the relatively longer data slots whose corresponding IS packets cannot be decoded. IS packets can also carry routing information.

Figure 1: A snapshot of MH-TRACE clustering and medium access



Dynamic Channel Allocation for TRACE: In MH-TRACE, each CH operates in one of the frames in the super frame. Since the number of data slots is fixed, the CH can only provide channel access to a limited number of nodes. Due to the dynamic structure of MANETs, one CH may be overloaded while others may not be using their data slots. In that case, although there are unused data slots in the super frame, the overloaded CH would provide channel

access only to a limited number of nodes, which is equal to the number of data slots per frame, and the CH would deny the channel access requests of the others. Thus, the system needs a dynamic channel allocation scheme to provide access to a larger number of nodes.

DCA-TRACE includes two additional mechanisms on top of MH-TRACE:

i) Mechanism to keep track of the interference level from the other CHs in each frame; and
ii) Mechanism to sense the interference level from the transmitting nodes in each data slot in each frame.

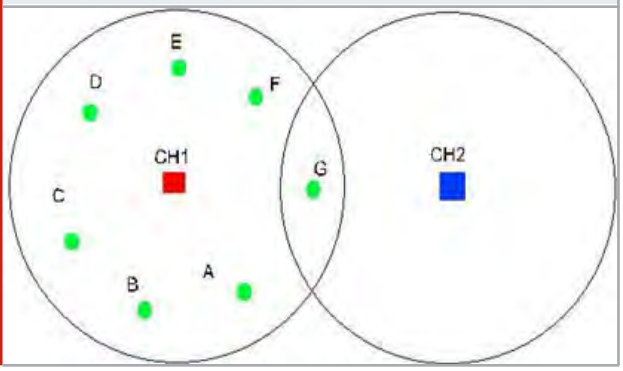
These mechanisms make use of existing messages and do not add complexity other than slightly increasing memory requirements to store the interference levels. The MH-TRACE structure provides CHs the ability to measure the interference from other CHs in their own frame and in other frames through listening to the medium in the CA slot of their own frame and the Beacon slots of other frames. In MH-TRACE, CHs use this mechanism to choose the minimum interference frame for themselves. DCATRACE makes use of the same structure. However, in order to accommodate temporary changes in the interference levels that may occur due to CH resignation or unexpected packet drops, an exponential moving average update mechanism is used to determine the current interference levels in each frame. At the end of each frame, the interference level of the Beacon and CA slots are updated with the measured values in that frame using In DCA-TRACE, CHs mark a frame as unavailable if there is another cluster that uses the frame and resides closer than a certain threshold, measured through the high interference value of that frame. Even under high local demand, CHs refrain from accessing these frames that have high interference measurements, in order to protect the stability of the clustering structure and the existing data transmissions. At the end of each super frame, CHs determine the number of frames that they need to access, m, based on the reservations in the previous frame. Depending on the interference level of each frame, they choose the least noisy m frames that have an interference value also below a common threshold, if the number of available frames is less than, the CHs operate only in the available frames. Prevents excessive interference in between co-frame clusters that can potentially destabilize the clustering structure.

Another mechanism that DCA-TRACE adds on top of MH-TRACE is the dynamic assignment of data slots. In MHTRACE, data slots are assigned in a sequential order. On the other hand, since DCA-TRACE introduces channel borrowing, the CH has to refrain from reallocating a data slot that has been borrowed by another CH and instead must allocate another data slot that has a lower interference value. In order to do this, CHs keep track of the interference levels of each IS slot of each frame in the super frame. In order to accommodate temporary changes, the exponential moving average smoothing mechanism of (1) is also used for IS frames. Knowing the interference values of all IS slots; the CH opportunistically assigns the available data slots to the nodes that request channel access beginning with the slot that has the lowest interference value. This mechanism helps to reduce any possible collisions between the transmissions sharing the same data slot. Channel sensing and assignment in DCA-TRACE is similar to cognitive radio systems. However, since we do not distinguish between the primary CH of the frame and the CH that borrows a channel, we treat them equally in having access to the available data slots in any frame.

Collaborative Load Balancing for TRACE: In the previous section, we described DCA-TRACE, which tackles non-uniform load distribution by allowing the CHs to access more than one frame in the super frame. The same problem can also be tackled from the member nodes' perspective. In our previous work, we determined that the majority of the nodes in a TRACE network are in the vicinity of more than one CH (they are in the vicinity of two, three or four CHs with probabilities of 52, 19 and 1 percent). The nodes that are in the vicinity of more than one CH can ask for channel access from any of these CHs. Using a cooperative approach and a clever CH selection algorithm on the nodes, the load can be migrated from heavily loaded CHs to the CHs with more available resources. In the TRACE protocols, nodes contend for channel access from one of the CHs that have available data slots around themselves. After successful contention, they do not monitor the available data slots of the CHs around them. Due to the dynamic nature of the network load, a cluster with lots of available data slots may become heavily loaded during a data stream. In order to tackle this issue, nodes should consider the load of the CH not only when they are first contending for channel access but also after securing a reserved data slot during the entire duration of their data stream. In order to further elaborate this, consider Fig. 2. Nodes A-G are source nodes and need to contend for data slots from one of the CHs. Each CH has six available data slots. In MH-TRACE, if their contentions go through in alphabetical order, node G would mark CH1 as full and would ask for channel access from CH2. However, if node G secures a data slot from CH1 before any of the nodes A-F, one of the source nodes would not be able to access to the channel.

In DCA-TRACE, once CH1 allocates all of its available slots, it triggers the algorithm to select an additional frame. However, accessing one additional frame might not always be possible, if the interference levels on all the other frames are too high. Moreover, accessing additional frames increases the interference in the Beacon and Header slots of these frames and may trigger CH resignations and reselections in the rest of the network that temporarily disturbs ongoing data streams on the resigned CHs. Finally, accessing additional frames increases interference on the IS and data slots of the new frame and decreases the potential extent these packets can reach.

Figure 2: Demonstration of a scenario for the collaborative load balancing algorithm



CONCLUSION

This paper we have not investigated the effects of upper layers such as the routing layer, and instead focused on the MAC layer capability and local broadcasting service. Packet routing has a significant impact on the load distribution. Local link layer broadcasting service is directly used by some routing algorithms such as network flooding. Moreover, it can be used alongside with network coding and simultaneous transmission techniques for cooperative diversity. In general, joint optimization of the MAC and routing layers may enable even more efficient solutions. Investigation of the effects of routing is left as future work.

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Implementation of Chatbot in Trading Application Using SQL and Python

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ABSTRACT

At this computerized period, the ongoing phase of business framework makes such huge numbers of chance and development, for example, internet shopping. The framework gives simpler communication among vender and client. Be that as it may, the issue is, the merchant can't reaction promptly while the client inquires. Consequently, a chatbot can be an answer so the merchants can reaction an inquiry rapidly. This exploration proposes a chatbot framework with an oftentimes posed inquiry information base. An extra question extension system dependent on thesaurus lexicon is actualized. Cosine comparability metric at that point being utilized to gauge also among inquiry and in every now posed to address. This exploration uncovers the exploratory aftereffects of this methodology not on a par with of comparability rationale framework.

KEY WORDS: CHATBOT, NATIVE LANGUAGE PROCESSING, QUERY ANALYSIS.

INTRODUCTION

As of now, the improvement of business can make such a large number of chances and advancements, for example, internet shopping. The framework can make the cooperation among dealer and client simpler. In any case, the issue still continues. The merchant cannot convey their react quickly while the client sending a few inquiries (C. F. Pratama Putra et al 2017). Consequently, a chatbot framework can be an answer for the merchant, where they ready to convey a reaction to an inquiry rapidly.

Various frameworks and approaches have been created for Chatbot application (D. Aditya et al 2017). Nevertheless, evaluation papers of basic language application are up 'til now compelled. Consequently, here we intend to investigate on various chatbot assessments to enhance the talk of this subject. Beforehand, we already built up a programmed remark replying with characteristic language preparing in Facebook. They use closeness estimation between client remark and remark information base with cosine similitude technique. Here, exactness is 46% (F. A. Ramadhani et al). The framework has a low precision since it just can answer a remark with an equivalent question from the information base. Thusly, we add question

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advancement to the exchanging chatbot application with typical language taking care of. This procedure can grow terms looking with practically identical word looking, so it could improve the framework answer execution even the solicitation isn't same conclusively with the information base (S. A. Abdul-Kader and J. Woods 2015).

Literature Review:

Native Language Processing: This is a framework that can distinguish a human- regular language with utilizing of a man-made brainpower. It can change over human language to be reasonable by a PC (Hidayatin et al 2018).

Query Analysis: Inquiry development is a strategy in data recovery framework to recover importance input. The System includes the extra term question into the first inquiry. Inquiry extension adjusts a question to meet the data required (H. K. Azad and A. Deepak 2017).

Question development system can be isolated into:

Static Query Analyzing:

A strategy to change the inquiry by the client physically.

Dynamic Query Analyzing: A strategy to change the inquiry naturally. For instance, a framework that consistently includes new equivalent word from the principal question can be named a programmed inquiry extension.

Bilateral Query Analyzing: A procedure that client has an association with the framework in question extension process. C. Text Frequency (TF) – Inverse Document Frequency
(IDF)

$$W_{dt} = TF_{dt} * IDF_t \quad (1)$$

d : sentence_id
t : term_id
W : weight over t term in d sentence
TF : searched number of terms in a sentence
IDF : Inversed Document Frequency

IDF value is

$$IDF = log\frac{D}{df} \quad (2)$$

D: Total number of document in a corpus
df: document total number that contains searched term

TF-IDF metric is utilized in the wake of stemming procedure to figure the terms weight. This measurement figures TF and IDF for each term in a lot of sentences. This measurement figures the t term weight in a d sentence with this recipe (M. Ulum et al 2017):

Inquiry extension is a broadly utilized strategy in data recovery framework (Promila Ghosh et al 2019). In any case, the methodology isn't utilized at this point for chatbot application in India.

(I) Similarity Estimation: Cosine Similarity is an estimation to calculate the equivalence among A and B vector. The estimation makes a cosine edge x between the two vectors (Tussanai Parthornratt et al 2019). Cosine point a motivation between two vectors is settled as resemblance estimation of two things took a gander at.

Figure 1: System overview

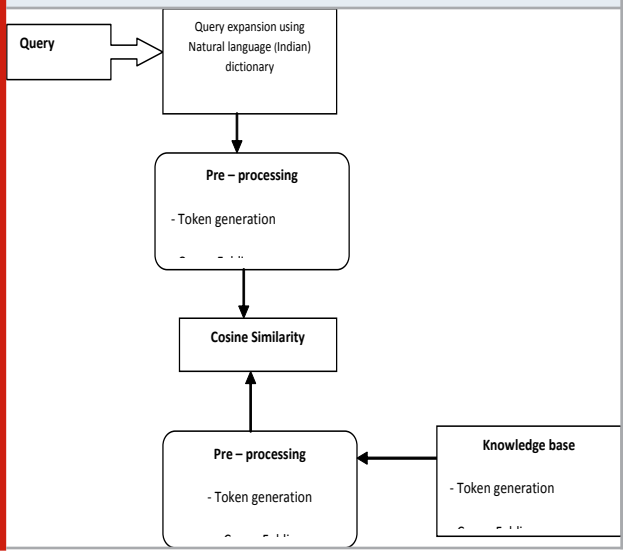
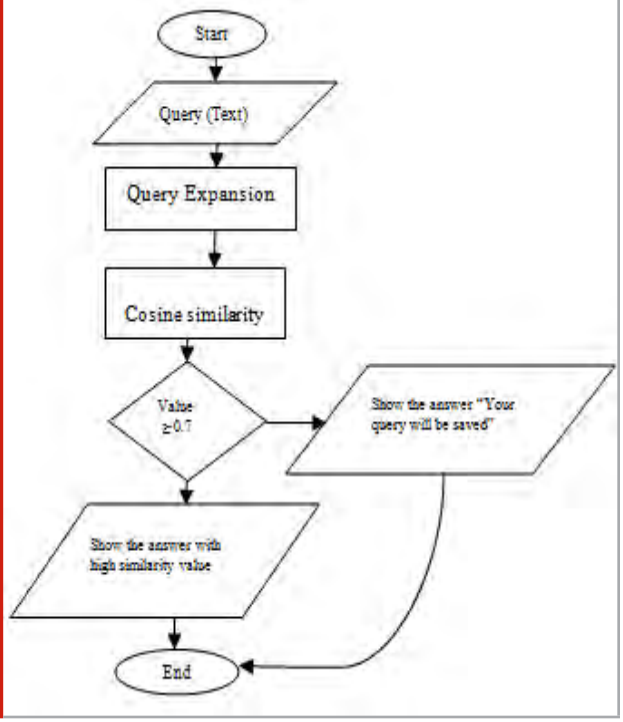


Figure 2: System flow design



$$cos(\theta) = \frac{A \cdot B}{||A||||B||} = \frac{\sum_{i=1}^{n} A_i B_i}{\sqrt{\sum_{i=1}^{n} A_i^2}\sqrt{\sum_{i=1}^{n} B_i^2}}$$

With A · B as a spot item that speaks to the edge between of two vectors. The spot item is a scalar incentive because of figuring from two vectors that have a similar segment. In the event that vector An and B has n-segment, along these lines spot item can be determined with the recipe underneath.

Proposed System

Information Gathering Method:

Information gathering technique is utilized to get the necessary information as a supporting segment in the advancement of online store chatbot application. Some technique that can be utilized to accumulate the information, for example:

- Literature concentrates to assemble and gather references from numerous sources that have the necessary information.
- In this exploration, online store perception to accumulate information from client's inquiry from different online helpline, for example, Swiggy and Zomato nourishment administrations.

Architecture: The system will execute a request improvement with NLP that appeared in Fig 1. The customer establishes a connection on application Amy chat_bot. The message contains sentences in English and a while later the request stretched out with Thesaurus Dictionary (English) depends upon the proportionate words to develop the inquiry.

Following stage is pre-handling. To begin with, we will do token age which separate the substance reliant on the terms that makes it. By then summary of terms recuperated, and each letter on each term will be changed over to lowercase, it called case-impacting. It changes over letter into lowercase for the letter a-z specifically, if not it will be eradicated and taken as a delimiter. A short time later, the key word is disconnected from the delimiter term. This method called stemming. By then the consequent stage is to process the largeness of term and its association with question. It is done by finding out the estimation of TF and IDF (Vaios Koumaras et al 2018). Besides, the result is A vector. An information base is a rundown of inquiry and answer. Pre-preparing and term connection weight count with computes TF and IDF will be done in this space. In this way, that estimation will deliver vector term B. The last advance is computing the separation between vector A and B.

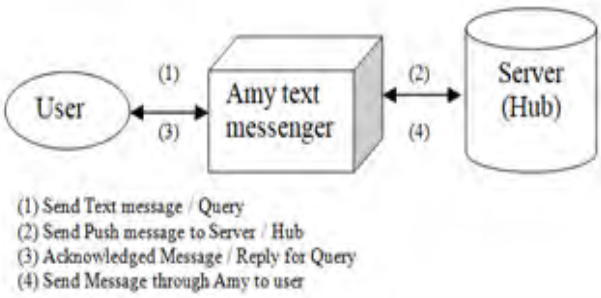
From the Fig 2, the work structure that customer can use Amy chatbot application to check for trading by easy texting. The system will respond to the query with query expansion in Thesaurus Dictionary (English). At that point, the framework will analyze the similitude among inquiry and archives question with cosine closeness figuring. If cosine closeness regard is greater than or comparable to 0.7, the structure will respond back with an answer that matches with the customer's request. Nevertheless, if the cosine similarity regard is more diminutive than 0.7, the system will respond back that the customer's request will be saved.

Implementation: This area clarifies the usage of database, Telegram API stage, design framework and Amy chatbot. This chatbot application uses SQL as database system and is coded in python programming language. Database is created with frequently asked questions from various resources on trading section. We process the text query and see for match in the database and then proceed with overall procedure as discussed in previous sections. In Fig 3, we discussed the representation of a system when the user sends a message via text message and then transmitted through web to the hub to get a reply with the maximum similarity value. Now, the hub will give acknowledgement and reply as text message.

RESULTS AND DISCUSSION

In this result, we use three kinds of calculation, which is *Precision*, *Recall* and F – Score [7]. *Precision* is a level of performance between requested information and the answer. The *Recall* is a level of system performance in retrieving information. F – Score is a combined value between *Precision* and *Recall*. The equations are described in equation (6), (7) and (8) respectively. Chatbot application tested is with the comparison between implementation NLP with query expansion and without query expansion.

Figure 3: Architecture



$$Precision = \frac{number\ of\ relevant\ document}{number\ of\ document} \quad (6)$$

$$Recall = \frac{number\ of\ relevant\ document}{number\ of\ document\ in\ collection} \quad (7)$$

$$F - Score = \frac{2(precision \times recall)}{(precision + recall)} \quad (8)$$

From the implementation of chatbot in Messenger, the user can ask query Fig 4. The system will answer based on the customer's question if the cosine similarity value is larger or equal to 0.7. The system will answer with "This chat will be stored for future reference". The answer showed like that because of cosine similarity is smaller than 0.7. The edge worth and F – Score esteems are taken from the exploration reference diaries. Dependent upon the result, all things considered the precision of chatbot application with NLP and question improvement is lessened. Typical *Precision* regard is lesser than without request in advance. In range > 0.7 decreased to 10%, edge > 0.8 reduced to 14.52%, and edge > 0.9 reduced to 44.17%.

Figure 4: Amy answering the query

Normal *Recall* is also lesser than required development. In range > 0.7 lowered to 6.11%, edge > 0.8 reduced to 8.34%, and edge > 0.9 reduced to 24.84% Average F –Score is lesser than query amplification. In range > 0.7 reduced to 7.22%, edge > 0.8 reduced about 11.46%, and edge > 0.9 lessened about 29.47%. The derived conclusions are not practically identical to our throbbing because of a few conditions. Honestly off the bat, the development of a requesting term is an inordinate measure of wide. Since, this structure makes to the total of the proportionate word set where the set wires the term. The structure including such an enormous number of terms that less connected with the sales term meaning. It will when all is said in done be compelled by releasing up the sales more fixations to the customer meaning. Furthermore, the structure relaxes up to the total of the term types.

The introduction can be meaning. It will when in doubt be constrained by slackening up the solicitation more fixations to the customer meaning. Correspondingly, the structure makes to the whole of the term types. The feature can be extended further by limit the improvement to a few sorts of the term, for example thing, action word, or descriptor.

FUTURE WORK AND CONCLUSION

Usage of characteristic language handling with inquiry extension for online trading chatbot application indicated that question development with equivalent word looking in Thesaurus gives us the outcome that the exhibition is diminished contrasted with the application without question development.Where estimates with range ≥ 0.9 limited to 44.17%, range with edge ≥0.9 reduced to 24.84%, and esteem with edge ≥0.9 limited to 29.47%. This assessment can deduce that execution of request advancement with cosine resemblance has a low accuracy. We propose for the accompanying assessment is the improvement of Thesaurus word reference database model. The cutoff is also can be cut down and request expansion can be used to the specific class.

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Laundry Management System

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ABSTRACT

Laundry firms are usually faced with difficulties in keeping detailed records of customers clothing, this little problem as seen to most laundry firms is highly discouraging as customers are filled with disappointments, arising from issues such as customer clothes mix-ups and untimely retrieval of clothes. The aim of this application is to determine the number quickly. Also customer's information is secured, as a specific id is allocated per registration to avoid contrasting information. This project was centred on the design and implementation of a laundry management system (LMS) used in a laundry establishment. The current process of operation is being operated manually and due to this procedure, numerous problems are been encountered. A design was taken too computerized the manual process in order to check these problems. The new system was designed using PHP and MySQL. This language was chosen because of its easy syntax and features for developing web-based applications. The laundry cleaning on an industrial scale has become a highly automated process, carried out by machines generating very detailed data. The combination of new machines with information technology has created a more efficient and cost effective process, enabled by software based on extensible architecture. The operations of a laundry exhibit all the properties of a context-aware system. This paper extends the authors' earlier work on context-aware laundry management architecture emphasizing business processes. In this study, we present architectural details that will aid implementers of the system in their choice of tools, techniques and technologies. In particular, a detailed account of laundry context information is presented. The proposed architectural framework used in the solution is able to monitor and autonomously manage laundry operations.

KEY WORDS: LAUNDRY FIRMS, DIFFICULTIES DISCOURAGING.

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INTRODUCTION

Laundry firms currently use a manual system for the management and maintenance of critical information. The current system requires numerous paper forms, with data stores spread throughout the laundry management infrastructure. Often information (on forms) is incomplete or does not follow management standards. Records are often lost in transit during computation requiring a comprehensive auditing process to ensure that no vital information is lost. Multiple copies of the same information exist in the laundry firm data and may lead to inconsistencies in data in various data stores (Dey, A. K.and Abowd, G., D 2000).

A significant part of the operation of any laundry firm involves the acquisition, management and timely retrieval of great volumes of information. This information typically involves; customer personal information and clothing records history, user information, price of delivery and retrieval period, users scheduling as regards customers details and dealings in service rendered, also our products package waiting list. All of this information must be managed in an efficient and date wise fashion so that the organization resources may be effectively utilized. The goal of laundry management system is to automate the management of the laundry firm making it more efficient and error free. It aims at standardizing data, consolidating data ensuring data integrity and reducing inconsistencies, through the use of highly computerized process that is stress free, reliable and quick through the use of PHP computer programming language and MySQL database application to both the users and the staff in charge of the registration and laundry management processes (Noor, M. Z. H 2012). PHP would be at the front-end and provide the graphical user interface that relates with the user, while the MySQL database will be at the back-end to handle the data storage process.

Related Works: Location-aware applications motivated them to create a UI for contextaware applications (Papazoglou M. P 2008). In his lab, location-aware applications support researchers in their daily interaction with computing, communication, and I/O facilities by adapting to changes in user and object locations. However, the user experience has remained suboptimal because of the three usability problems they noted earlier.Their approach introduces visual interaction using augmented reality (AR). With them, they can show users—who wear headmounted displays—visualizations anywhere in space.5 Visualization of context-aware applications is a challenge the research community is only beginning to explore. His prototype uses an AR interface (based on a bulky headset that introduces its own usability problems), but their architecture is independent of the visualization technology. As a result, it would work equally well with projector-based visualization, PDAs, or displays embedded in the environment. If a piece of information can be used to characterize the situation of a participant in an interaction, then that information is context. Take the task of using a spreadsheet to add a list of weights as an example.

The entities in this example are the user and the application. They will look at two pieces of information – presence of other people and location – and use the definition to determine whether either one is context. The presence of other people in the room does not affect the user or the application for the purpose of this task (Truong H-L. &tDustdar, S. 2009).. Therefore, it is not context. The user's location, however, can be used to characterize the user's situation. If the user is located in the United States, the sum of the weights will be presented in terms of pounds and ounces. If the user is located in Canada, the sum of the weights will be presented in terms of kilograms. Therefore, the user's location is context because it can be used to characterize the user's situation. A general assumption is that context consists only of implicit information, but this is a troublesome distinction. His definition allows context to be either explicitly or implicitly indicated by the user (Perttunen, et al 2009).

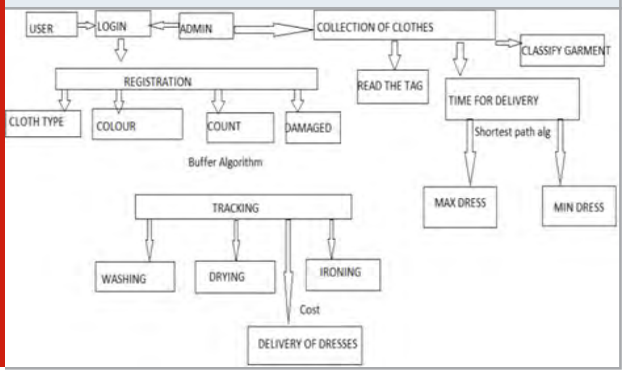
For example, whether a user's identity is detected implicitly using vision or explicitly via a login dialogue, the user's identity is still context. Researchers have focused on implicit information because there is much unexplored promise in leveraging off implicit information pertaining to the human– computer interaction. Services Research Roadmap introduces a stratified logical service-based architecture (known as extended Service-Oriented Architecture2,6) to create a reactive and adaptive IT environment. This environment has the ability to represent detailed business policies and rules abstracted from fixed functional and operational capabilities and delivering these abstracted capabilities in the form of customizable service-oriented solutions. Its objective is to provide facilities for ensuring consistency across the organization, high availability of services, security of non-public services and information, orchestration of multiple services as part of mission critical composite applications — all essential requirements for business-quality services (Rehman, K et al 2007).

Thus, it strives to improve systems and business visibility and provide greater control and flexibility in defining and adjusting business rules and parameters. The architectural layers in the Services Research Roadmap, which are depicted in Fig. 1, describe a logical separation of functionality in such a way that each layer defines a set of constructs, roles and responsibilities and leans on constructs of its preceding layer to accomplish its mission. The logical separation of functionality is based on the need to separate basic service capabilities provided by a services middleware infrastructure and conventional SOA from more advanced service functionality needed for dynamically composing (integrating) services and the need to distinguish between the functionality for composing services from that of the management of services and their underlying infrastructure (Tajima, N et al 2011).

Hostel Laundry, in the current system requires numerous paper forms, with data stores spread throughout the Hostel Laundry firm management infrastructure. Often information (on forms) is incomplete, or does not follow management standards. Forms are often lost in transit between departments requiring a comprehensive auditing process to ensure that no vital information is lost. This has led to inconsistencies in various data due to large volume of contrasting customer details leading to mix-up of clothes in the hostel laundry .Forms are often lost in transit between departments requiring a comprehensive auditing process to ensure that no vital information is lost (Strang, T. &Linnhoff-Popien, C. 2004). This has led to inconsistencies in various data due to large volume of contrasting customer details leading to mix-up of clothes in the laundry firm which challenges faced, technologies used and unresolved problems. This forms the basis for implementing later versions.

Proposed System: The Hostel Laundry Management System is designed for any Laundry firm to replace theirexisting manual, paper based system. The new system is in form of an e-registration system to control the following; customer information, products, services, users, carts and receipt. These services are to be provided in an efficient, cost effective manner, with the goal of reducing the delay and resources currently required for such tasks as clothes details are bounded to a particular customer with a given id. Since the existing system makes use of tedious administrative tasks, lots paper work and time, in which full information cannot be gotten from busy customers.The goal of the laundry management system is to provide a computerized process that is stress free, reliable and quick through the use of PHP would be at the front-end and provide the graphical user interface that relates with the user, while the MYSQL database will be at the back-end to handle the data storage process. And the order can be delivered quickly as per the option given as QUICK DELIVERY with the double charges. The sorting of dress is done by the date and time and delivered soon as per the number of clothes given.The objective of this work is to implement a management system that will streamline registration process, reduce administrative tasks and paper work so as to improve the registration cycle process flow.

Figure 1: System Architecture



System Design and Working
System Architecture

Laundry Cycle: Laundry refers to the washing of clothing and other textiles. Laundry processes are often done in a room reserved for that purpose; in an individual home this is referred to as a laundry room or utility room. An apartment building or student hall of residence may have a shared laundry facility. A stand-alone business is referred to as a self-service laundry (launderette in British English or Laundromat in American English). The material that is being washed, or has been laundered, is also generally referred to as laundry.Laundry has been part of history since humans began to wear clothes, so the methods by which different cultures have dealt with this universal human need are of interest to several branches of scholarship. Laundry work has traditionally been highly gendered, with the responsibility in most cultures falling to women (known as laundresses or washerwomen). The Industrial Revolution gradually led to mechanized solutions to laundry work, notably the washing machine and later the tumble dryer. Laundry, like cooking and child care, is done both at home and by commercial establishments outside the home. In India, laundry was traditionally done by men. A Washer man was called a dhobi wallah, and dhobi became the name of their caste group. The most crucial stage is achieving a successful new system and giving a user confidence in that the new system will work efficiently and effectively in the implementation stage as per shown in the Fig.2.The stage consist of

- Testing a developed program with sample data
- Detection and correction of error
- Creating whether the system meets a user requirement.
- Making necessary changes as desired by users.
- Training user personal

Implementation Procedures: The implementation phase is less creative than system design. A system design may be dropped at any time prior to implementation, although it becomes more difficult when it goes to the design phase. The final report of the implementation phase includes procedural flowcharts, record layouts, and a workable plan for implementing the candidate system design into a operational design.

User Training: It is designed to prepare the users for testing & converting the system. There is several ways to trail the users they are:

1) User manual
2) Help screens
3) Training demonstrations.

1) User manual: The summary of important functions about the system & software can be provided as a document to the user. User training is designed to prepare the user for testing and convening a system. The summary of important functions about the system

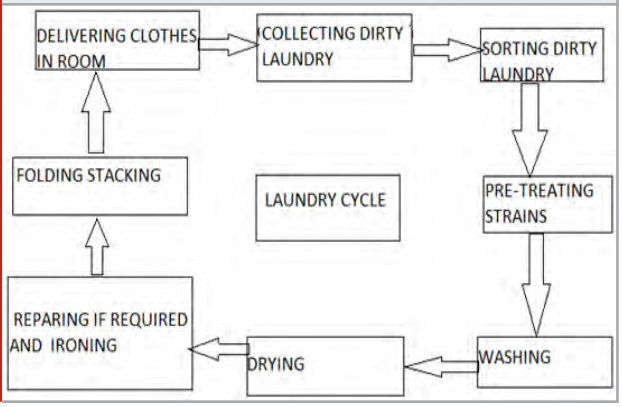
and the software can be provided as a document to the user

1. Open http page
2. Type the file name with URL index .php in the address bar
3. Index. php is opened existing user the type the username and password
4. Click the submit button

2) Help screens: This features now available in every software package, especially when it is used with a menu. The user selects the "Help" option from the menu.

3) Training demonstration: Another user training element is a training demonstration. Live demonstration with personal contact is extremely effective for training users.

Figure 2: System Work



RESULT AND DISCUSSION

The implementation installing different web servers is not a big problem because their root directories are different, as are their logical names. The main issue is their configuration – each should have its own set of ports to listen to. The "reference" system – that is, the system that has been delivered – gets a port on each server. Since each programmer will use each of the three web servers, each programmer was assigned a port on each server, to be used in the URL to access the specific environment. Added to these was the need for a port to access the web interface in the DVLP environment, and one for a test environment (the version to be delivered) to allow regression and acceptance testing on each server. Actually, this is what "multiple webs" is all about: one web server serving a number of different, unrelated webs. All three servers support multiple webs, even though their naming differs. It was decided that one machine – separate from DVLP and, therefore, from the programmers – would be set up for testing and research. On the DVLP system, configuration for each web server was as follows:

- A virtual web for the reference system
- A virtual web for the DVLP system
- A virtual web for each of the developers

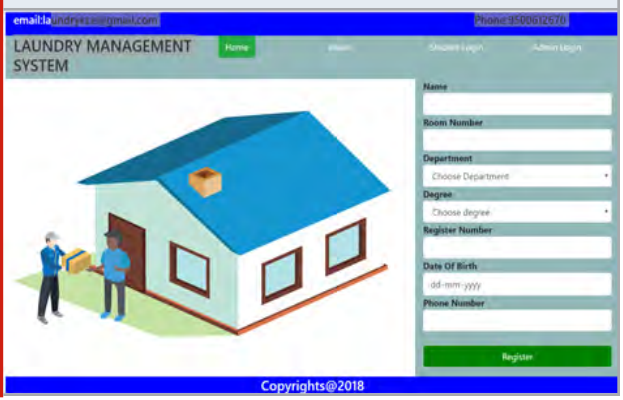
On the test system, the configuration contained:

- A virtual web for testing HTML interface
- A virtual web for testing application access
- At least one virtual web for research Because of development of a common CGI procedure, and the requirement to start with renewal of the reports, we started with the development machine. Here, only SWS 1.3 was installed, and testing on the OSU web server could be done on another machine.

The next point was to map the structures for the web server in such a way that it would be identical for each of them: Each web server needed to see the identical structure. That meant only a single CGI procedure could handle all requests. Another requirement was that the URL used could not contain any data that was specific for one server, implying that any differences would need to be handled by the CGI procedure. Furthermore, changing the URL was out of the question. The mapping of the structure meant correct definition of logical names.

This was already present in both the OSU and SWS web server environments in the production environment, and so needed to be set up in the DVLP and the programmers' environments. Because a single command procedure was to handle all three servers, this issue was moved to the development of that procedure. Like the development system, the CGI directory tree is located outside the web server structure, but a link is made in each of them, so here as well, the CGI directory seems to reside directly below the web server. That allows the internal structure of the web interface to be exactly the same as on the development system – no matter from what environment it is copied.

Figure 3: System Initial Process



The CGI procedure that was created on the development machine was copied to this machine and tested with all three servers. Changes were applied on the development system and were copied back afterward. Once the procedure was finalized, both the application and the web interface were copied to this machine.Graphical User Interface, Hyper-Text Markup Language, Cascading Style Sheets, Client-side Script, MySQL.

Figure 4: System Input Process

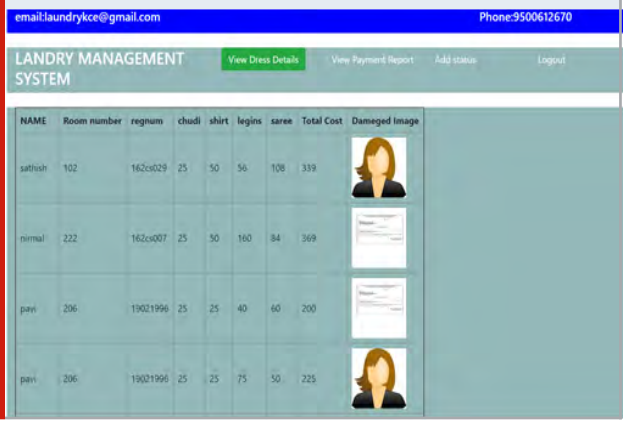


Figure 5: System Analysis Process

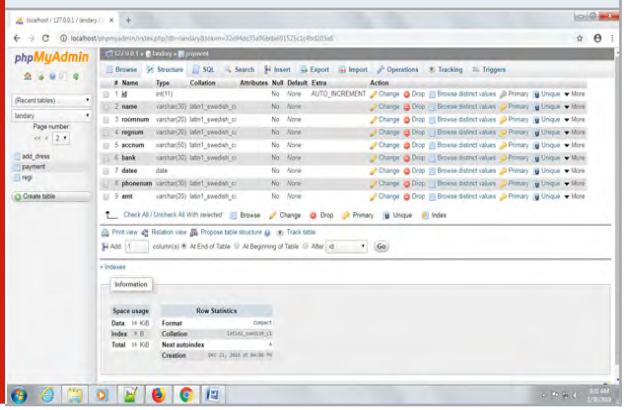
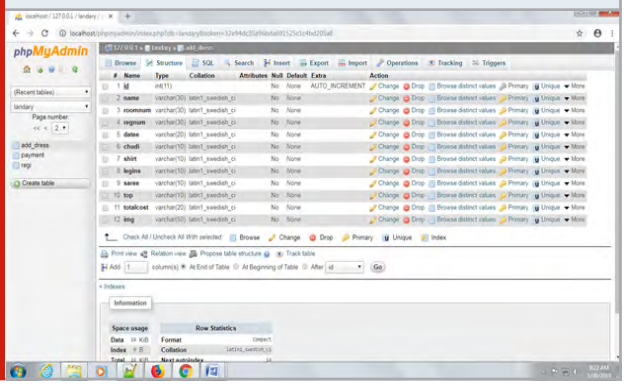


Figure 6: Final Result Analysis



CONCLUSION AND FUTURE ENHANCEMENT

The package was designed in such a way that future modifications can be done easily. The following conclusion can be deduced from the development of the project. Automation of the entire system improves the efficiency. It provides a friendly graphical user interface which proves to be better when compared to the existing system. It provides a friendly graphical user interface which proves to be better when compared to the existing system. In future it can be developed as an android application.The package was designed in such a way that future modifications can be done easily. The following conclusion can be deduced from the development of the project. Automation of the entire system improves the efficiency. It provides a friendly graphical user interface which proves to be better when compared to the existing system. It gives appropriate access to the authorized users depending on their permissions. It effectively overcomes the delay in communications. Updating of information becomes so easier. System security, data security and reliability are the striking features.The System has adequate scope for modification in future if it is necessary. Its solution is based on the principles of context-aware and service oriented architectures is proposed in study. Two major processes define LMS: business and information, each of which can be decomposed into sub processes. Business processes are driven by business rules and workflows, whereas information processes are driven by information technology. We proposed a layered architecture that is modular,

extensible, and cohesive. It also uses web services to provide the highest degree of decoupling of system components and the agility needed in the current IT environment. Web services allow business processes to be decoupled from business rules, and context data providers to be decoupled from the rules engine enabling remote and local context acquisition. Ontology based context modelling is used, as this is the most expressive model. The proposed system facilitates the convenient integration of information technology infrastructure with an industrial cleaning system for hotels, hospitals or other businesses using cleaning services. The service-oriented context-aware architecture presented here offers seamless integration of the laundry management system with the partners. This architecture makes the integration and unification of various departments within a laundry business very straightforward.The System has adequate scope for modification in future if it is necessary. We have done the project with algorithms use all these algorithms to find the maximum clothes –Buffer algorithm and tracking clothes uses the shortest path algorithm .We have planned to store those data in the local host and it can also be stored in cloud in which the maintenance become easy.

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Exit Chart Analysis for Channel Encoder with Security

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ABSTRACT

Error control and security are functions in communication systems. Reliability, safety and efficiency in electronic data transmission systems with more require in high-speed communication systems. To keep into the varying channel conditions against the error-free data transmission station encoding schemes are employed. In trellis pruning and this paper puncturing as coding theories that are new, we afford safety to the station encoders supported turbo codes and also to achieve too. Puncturing is used to diminish the code's operation and so boost the BER probability. The cryptanalytic attacks will become attributable to puncturing due to whose complexity depends on the error probability. The trellis pruning empowers the legitimate consumers to speak reliably during a manner. The legitimate users have performance that is superior, in terms of BER compared to eavesdropper, which is determined by pruning and puncturing prices. In this paper, to propose an algorithm is to compute the puncturing and charts were supported by pruning rates. We are going to show their charts as a function of the EXIT graphs related to the turbo code for transmission.

KEY WORDS: ERROR CONTROL, BER, PUNCTURING, TRELLIS PRUNING, CRYPTANALYTIC ATTACKS , EXIT CHARTS.

INTRODUCTION

In 1948 Shannon established that errors introduced by a noisy channel can be abridged to a desired point by appropriate encoding of information (S. Lin and D. Costello 2004). The utilize of coding for EC is an important part in modern communication systems design and digital computers. The main problems in satellite communication systems are lower security, error analysis, energy efficiency and implementation costs. A result to these problems for some extent is using of secure channel coding schemes. For providing security to the channel encoder that may lead to low complexity (D. Klinc 2009] and get better processing latency. A Channel provides .secure encoder schemes in the past few years have been presented in (Katsiotis et.al 2013; Esmaeil et.al 2014). secure encoder schemes have an acceptable level of security accordance with smaller key size and provide an proficient error system and benefit for superior code rate which can move toward to the channel capacity for big polar code were proposed (Mafakher et.al 2011; Payandeh et.al 2006) secure encoder design by proposing.(Nerri et.al 2008, Abbasi et.al 2012).

In (Payandeh et.al 2006) protected that was adaptive channel coding strategy based on parallel or sequential turbo codes is manufactured. By adapting the a method into the states of the channel, safety and 2 reliability can be accomplished. An algorithm is suggested for channel coding and safety is done by way of a Shannon's limitations plot along with also a pseudo-random punctured Turbo Code, whose parameters are pick based on some personal .(Nerri et.al 2008) . A safe channel programming technique is suggested based on arbitrary puncturing of quasi-cyclic non invasive parity-check (QC-

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LDPC) codes go(t from prolonged different households (Esmaeiliet.al 2014). Puncturing a few of the outputs of the encoder obtains convolution codes. The outputs which are removed are not selected by the rule and not sent to the station. (Cain, J. B 1979) is a design tool that is practical to attain the codes with levels that are substantial also raises the speed of a code. The punctured generate high rate and reduced functionality (for some station conditions).

Encoder by trellis pruning was suggested in modern communication system due to trellis structure convolution codes have software that allows capable decoding (S. Lin et.al 2004). Trellis pruning is introduced in (O. Collins and M. Hizlan 1993) and is the technique of removing state transitions from is used enhancement co-operating (S. Maiya and T. Fuja 2011; T. Breddermann et.al 2014). (Katsiotis et.al 2013) encode data by which is also it's decoded by employing full mommy trellis diagram. and not sequence. Analysis of (N. Kolokotroniset.al 2014), high BER needs when is decoding secret pruning introduced the variety of which is legitimate Even though with which isn't eaves dropper sufficient (full different trellises that are after partitioning), while the valid consumer using dependable communication, no matter view an extension of station design in (A. Katsiotis et.al 2013) and also combines the puncturing and pruning techniques based on turbo codes.

The key trellis pruning (performance raises) provides a reduced bit error rate for valid users. The coding technique that was revolutionary called turbo coding having (C. Berrou et.al 1993) communication. This coding technique a concatenation (O. Collins and M. Hizlan 1993) of two binary Interleaved in the encoder and decoded by decoding of two MAP The Safety is provided to the channel Exit graph. Exit graphs illustrates the flow of extrinsic information throughout the constituent SISO decoders. EXIT chart(Ten Brink, S 2001) is a really helpful instrument for the evaluation of iterative decoders. The iteration procedure is analyzed by this tool in decoders that use quotes which can be passed to another from 1 decoder. Convolution (unpunctured) acquired by proposing a method in (R. Thobaben 2007 ; T. Breddermann 2013). Randomly pruned codes for turbo codes utilized is introduced in (T. Breddermann and P. Vary 2011). eaves dropper 2 . In section, 3 have some back ground information about EXIT charts. In section 4 the proposed method is presented. Section 5 provides the results

System model

memory is multiplexing the n sequences $w_1, w_2 \ldots\ldots\ldots\ldots w_n$.

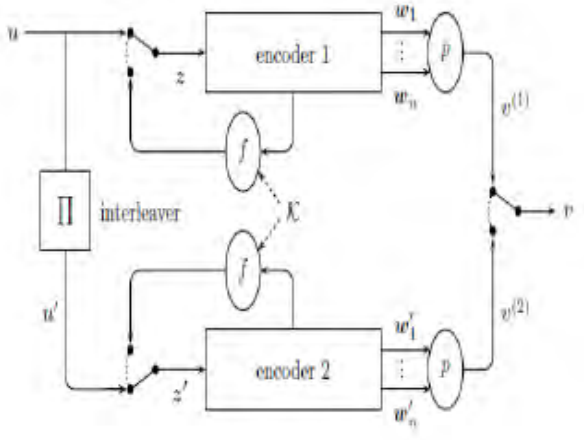
$$R = \frac{h}{(h+m)n} \quad (1)$$

$$r_{pr} = \frac{l}{h} \quad (2)$$

non linear. $w_1, \ldots\ldots, w_n$ and $w_1, \ldots\ldots, w_n$

$$r_{pu} = \frac{l}{(h+m)\,n} \quad (3)$$

Figure 1: Secure Turbo Encoder



BACK GROUND WORK: The MAP decoders constitute the turbo decoder exchange extrinsic log likelihood ratios. Each decoder employs the extrinsic LLRs produced for the information bits by the other decoder as a priori LLRs. The caliber of the extrinsic LLRs is quantified by the mutual information IE between them and the data bits. Let IA function as mutual information between the priori LLRs as well as the information bits. For a SNR, Es/No=γ the transfer characteristic IE=τ(IA,γ) of the convolution decoder could be derived via Monte Carlo simulations. A input A to the part decoder can be modeled by using a different Gaussian random variable nA with variance and mean zero with all the bits x. that was transmitted We convolution (S.ten Brink 2011; R. Thobaben 2011)

$$A = \mu_A + \eta_A \quad (4)$$

since A is supposed to be n L-value based on Gaussian distributions, the mean expressed μA as

$$\mu_A = \frac{\sigma_A^2}{2} \quad (5)$$

The

$$P_A(\ ) = \frac{e^{\frac{-2}{2\sigma_A^2}}}{\sqrt{2\pi\sigma_A}} \quad (6)$$

To compute the information contents of the a priori knowledge, mutual information $I_A = I(x;A)$ between transmitted systematic bits x and L-values A is used

$$I_A = \frac{1}{2}\sum_{x=-1,1}\int_{-\infty}^{\infty} p_A\left(\xi/_{X=x}\right) * ld\frac{2p_A\left(\xi/_{X=x}\right)}{p_A\left(\xi/_{X=-1}\right)+p_A\left(\xi/_{X=1}\right)}d\xi \quad (7)$$

$$0 \le IA \le 1 \quad (8)$$

with (6) and (7) becomes

$$I_A(\sigma_A)=1-\int_{-\infty}^{\infty}\frac{e^{-\left(\frac{\left(\xi-\sigma_A^2/2\right)^2}{2\sigma_A^2}\right)}}{\sqrt{2\pi\sigma_A}}ld\left[1+e^{-\xi}\right]d\xi \qquad (9)$$

For abbreviation we define

$$J(\sigma):=I_A(\sigma_A=\sigma) \qquad (10)$$

$$\text{withlim}_{\sigma\to 0}J(\sigma)=0 \quad ,\lim_{\sigma\to\infty}J(\sigma)=1,\ \sigma>0\ .$$

In (J. Ha ett.al 2004) the capacity CG (the function of J(σ) respectively and its monotonically increasing function in $\sigma = 2/\sigma_n$ and thus reversible

In the case of prior variable with variance σ_A^2 and mean $\mu_A = I * \frac{\sigma_A^2}{2}$

with (9) and (10) becomes

$$I_A(\sigma_A=\sigma)=J(\sigma)=1-\int_{-\infty}^{\infty}\frac{e^{-\left(\frac{\left(x-\sigma^2/2\right)^2}{2\sigma^2}\right)}}{\sqrt{2\pi\sigma}}\log_2\left[1+e^{-x}\right]dx$$

Different values of I_A , if I_E as a function of I_A and the E_b/No value expressed as

$$I_E=\tau(I_A,\frac{Eb}{No}) \qquad (12)$$

Where I_E extrinsic information transfer characteristics (J. Ha ett.al 2004)

or for fixed $\frac{Eb}{No}$ just $I_E=\tau(I_A)$ (13)

The $I_E=(I_A)$ $I_E=I_A$ (the constituent decoders are identical which is assumed). $I_E=I_A$ =if $I_E\neq$ use

EXIT chart can be used to acquire an estimation on the BER after an arbitrary no of iterations its represent in equ 14

$$D = Z+A+E \qquad (14)$$

The bit error probability written as

$$P_b\approx\frac{1}{2}erfc(\frac{1}{\sqrt{2}}\frac{\mu_D}{\sigma_D})=\frac{1}{2}erfc(\frac{\sigma_D}{2\sqrt{2}}) \qquad (15)$$

Assume independence it is

$$\sigma_D^2=\sigma_z^2+\sigma_A^2+\sigma_E^2 \qquad (16)$$

we know that

$$\frac{Eb}{No}=\frac{1}{2R\sigma_n^2}$$

By using the EXIT chart, the estimation of bit error rate after no of iterations for a particular point (I_A,I_E) may lead the decoding procedure to that point be

$$P_b\approx\frac{1}{2}erfc\left[\frac{\sqrt{8\gamma+J^{-1}(I_A)^2}+J^{-1}(I_E)^2}{2\sqrt{2}}\right] \qquad (17)$$

The approximations (17) is accurate only for high BERs. The (unpunctured) is determine in (F. Babichet.al 2005). we assume

$$(I_A,\gamma)=(I_{A\,\varphi}\,\gamma) \qquad (18)$$

Equation (18) shows the without vγ, (F. Br¨annstr¨om and L. K. Rasmussen 2005)

$$J(2\sqrt{2\gamma})=(-r_{pu})J(\sqrt{2\gamma}) \qquad (19)$$

The [from [10]]

$$\tau^{(pr)}(I_A,\gamma)=\tau(I_A^*,\gamma) \qquad (20)$$

$$I_A^*=I_A+r_{pr\,(1-I_A)}\geq I_A \qquad (21)$$

That is some of (unpunctured) we consider in that (18) (20) relations of the mother code has been produced by the assumption of the . coming to puncturing and pruning case puncturing approximations if $r_{pu}r_{pr}$.

MATERIALS AND METHODS

In this paper we using the BCJR MAP decoding gives high eaves dropper (by) and the pruning rate gives low BER at the legitimate user. The proposed gives theHere, the transfer characteristic each Peveeaves dropper which is δ be required Let γ_i be the first SNR value of the mother turbo code .eq (17) because δ has to be high . The eq(17) is derived the apriori, For apriori From eq(17) becomes

$$P_b\cong\frac{1}{2}erfc\left(\frac{\sqrt{J^{-1}(I_A)^2+J^{-1}(I_E)^2}}{2\sqrt{2}}\right) \qquad (22)$$

From eq(22) (I_A,I_A) such that

$$\delta\leq\frac{1}{2}erfc\left(\frac{\sqrt{2J^{-1}(I_A)^2}}{2\sqrt{2}}\right) \qquad (23)$$

$$I_A\leq J\left(2erfc^{-1}(2\delta)\right)=I_{A0} \qquad (24)$$

If the SNR γ_o is moderate and $I_{A0}<I_{E0}=\tau(I_{A0},\gamma_0)$ of γ and $I_{E0}=\tau(I_{A0},\gamma)$ using Monte Carlo simulations. The first SNR valueγ_i set by $I_{A0}\geq I_{E0}$, the SNR transfer functions intersect at (I_{Ao},I_{Ao}) and this gives the δ. The as

ALGORITHM : computation of γ_i

Input :$I_{A0},\gamma_0,\in$

$\gamma=\gamma_0$

while($I_{A0} < I_{E0}$) do

$\gamma=\gamma- \in$

$I_{E0} = \tau(I_{A0}, \gamma)$

end

$\gamma_i = \gamma$

Output: γ_i

The two is present below.

$\gamma_e > \gamma_i$be the SNR at the eavesdropper. P_{eve} be the δ . (19)

$$r_{pu} = -\frac{J(2\sqrt{2\gamma_i})}{J(2\sqrt{2\gamma_e})} \quad (25)$$

for which it holds that

$$\tau^{pu}(I_A, \gamma_e) = \tau(I_A, \gamma_i) \quad (26)$$

for $0 \le I_A \le 1$.

The value of r_{pu} that gives the randonlyγ_i (unpunctured) mother code at SNR γ_i. eq(22) gives that Peve ≥δ.

puncturing,it was employed it eavesdropper. Assume the puncturing (I_A,I_E),withI_A=I_E<γ_d[from (18)]

$$\tau^{pu}(I_A, \gamma_d) = \tau(I_A, \gamma_d') \quad (27)$$

where from(19)

$$J\left(2\sqrt{2\gamma_d'}\right) = (1 - r_{pu})J(2\sqrt{2\gamma_d})$$

$$\gamma_d' = \frac{1}{8}\left[J^{-1}((1 - r_{pu})J(2\sqrt{2\gamma_d}))\right]^2 \quad (28)$$

ofr_{pr}^{min} of r_{pr} gives the

$$\tau^{pr}(I_A, \gamma_d') - I_A > 0 \quad 0 \le I_A \le 1 \quad (29)$$

improve

$$\tau^{pr}(I_A, \gamma_d') - I_A > \Omega \quad 0 \le I_A \le 1 \quad (30)$$

where $\Omega = \begin{Bmatrix} \emptyset & 0 \le I_A \le 1 - \emptyset \\ 0 & 1 - \emptyset \le I_A \le 1 \end{Bmatrix} 0 < \emptyset < 1$

of∅ gives no If for I_A ≥eq(30)

$$\tau^{pr}(I_A, \gamma_d') \ge 1$$

In ref [10] we have two possible approaches to determine the value of r_{pr}^{min} .calculate the minimum value of puncturing is one method and the other is algorithm by the steps of it.r_{pr} characteristics (20) and (21) (30) (20) and (30). r_{pr}^{min}

$$\tau(I_A^*, \gamma_d') - I_A \ge \Omega, \quad 0 \le I_A \le 1 \quad (32)$$

or equivalently

$$I_A^* \ge \tau^{-1}(\Omega + I_A, \gamma_d'), 0 \le I_A \le 1 \quad (33)$$

Let $r_{pr}^*(I_A)$ be the of r_{pr} (33) I_A. which means $r_{pr}^*(I_A) = r_{pr}$ .From (21) and(33) straight forward computations yield

$$r_{pr} = \frac{I_A^* - I_A}{1 - I_A}$$

$$= \frac{\tau^{-1}(\Omega + I_A, \gamma_d') - I_A}{1 - I_A} \; 0 \le I_A \le 1 \quad (34)$$

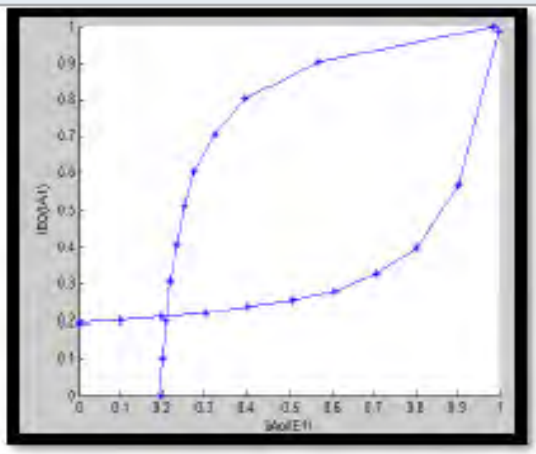
$$= \frac{\tau^{-1}(I_E, \gamma_d') + \Omega - I_E}{1 + \Omega - I_E} \; 0 \le I_E \le 1 \quad (35)$$

by setting $I_E = \Omega + I_A$ in (34) guaranteeing $\tau^{pr}(I_A, \gamma_d')$ satisfies (30) is equal to

$$r_{pr}^{min} = \max_{I_E}\{r_{pr}^* I_E\} \quad (36)$$

The exact form of the functions $\tau^{-1}(I_E, \gamma_d')$ and $\tau(I_A, \gamma_d')$ are not known. The (I_{Ai}, I_{Ei}) which have resulted from Monte carlosimulations.r_{pr}^{min} will be the (35)

Figure 2: Exit chart of the mother turbocode



$$r_{pr}^{*}(\mathrm{i}) = \frac{I_{Ai}+\Omega-I_{Ei}}{1+\Omega-I_{Ei}} \quad 1\leq i\leq N-1 \qquad (37)$$

And $r_{pr}^{*}(i) = \max_i\{r_{pr}^{*}(i)\}$ (38)

In thisbut (37). 1A but it is r_{pr} which total code rate equals

$$R=\frac{h}{2n(h+m)}\frac{1-r_{pr}^{min}}{1-r_{pu}} \qquad (39)$$If h>>m then

$$R=\frac{1}{2n}\frac{1-r_{pr}^{min}}{1-r_{pu}} \qquad (40)$$

ALGORITHM 2: To compute r_{pr}^{min} and r_{pu}

Input: $\gamma_e, \gamma_d, \gamma_i, \tau, \emptyset$

Initialization :$r_{pr}^{min} = 0$

$$r_{pu} = 1 - \frac{J(2\sqrt{2\gamma_i})}{J(2\sqrt{2\gamma_e})}$$

$$\gamma_d' = \frac{1}{8}\left[J^{-1}\left((1-r_{pu})\,J(2\sqrt{2\gamma_d})\right)\right]^2$$

$$r_{pr}^{*}) = \frac{I_{Ai}+\Omega-I_{Ei}}{1+\Omega-I_{Ei}}$$

if$r_{pr}^{min} < r_{pr}^{*}$ then

$$r_{pr}^{min} = r_{pr}^{*}$$

end if

end for

Output :r_{pr}^{min}, r_{pu}

Figure 3: exit chart of the mother turbo code and

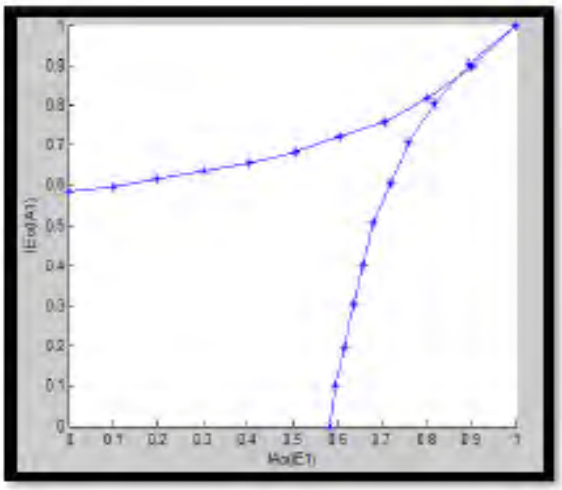


Figure 4: Exit function at the input of the decoder which is in 3d axis

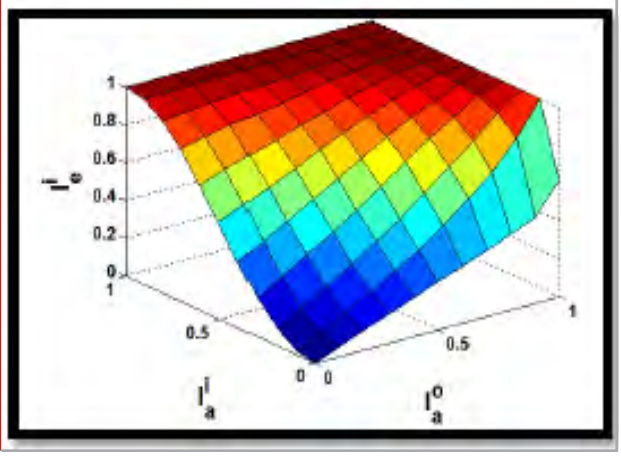
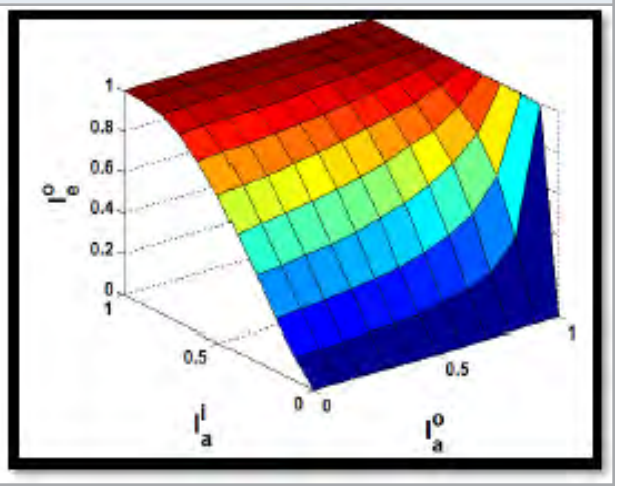


Figure 5: Exit function at the output of the decoder which is in 3d axis



CONCLUSION

The channel encoder was created by employing turbo code implementation. The safety in station encoder can be made better by puncturing and trellis pruning. The constituent encoders are punctured to produce with. In that the secret defines pruning is applied on the trellis of a mother convolution code, this leads to a pruned trellis that legitimate users are utilizing to perform decoding, compared to the dropper that used the mommy trellis diagram. The EXIT chart has been offered as an engineering tool for the propose of iterative decoding methods. We have presented the information transfer characteristics based on MI to express the flow of information that was extrinsic out section decoders. The, complexity of attack rely on, bit error rate verses SNR shows turbo code's performance. The transport characteristics of decoders performance is assessed when code is encoded through constituent encoders by using exit graphs.

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Automated Textile Defect Identification

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ABSTRACT

This paper contributes to identify the defects in textile industry. In weaving industry, accurate, dependable, quality control and inspection becomes an important criteria. In present this technique is still accomplished by humans using visual inspection. It leads to error and consumes more time. In olden days, textile industries used some methodologies such as histogram, correlation function method, smart visual sensors and Gabor Filter Methodology which is not efficient. In our proposed method, the reference image and faulty image are captured through web cameras and it is considered as a particle analyzer. This method is performing with more precision than leading method. This process provides high accuracy, speed and using limited time. In textile manufacturing industries, the defects in the materials are identified by using LABVIEW software with digital image processing techniques

KEY WORDS: SMART VISUAL SENSORS AND GABOR FILTER METHODOLOGY LABVIEW.

INTRODUCTION

In textile industry, fabric defect identification plays a major role in the quality control. Image processing plays a vital role in defect detection. The goal of any production and manufacturing task is to have a high quality assurance and control. Quality evaluation is an important aspect in manufacturing of materials. The quality of the material can be increased by decreasing the defects in the fabric. In fabric material some keen defects are not verified by human inspection such defects are pin marks, stain, float, slub, ladder, hole and design mismatch, fibril missing. Simultaneously the fingerprint, finger venous and finger knuckle patterns can be taken and used for the reliable identification of biometrics. Speech is a biometric method that has been used over several days (Revathi et al., 2018)

In a fabric defect occurs due to scratch, poor finishing, crack point, excessive stretching, dirt spot, color bleeding, machine faults and hole. Textile materials are used in the fabric industry for the preparation of different categories and types of material products. Materials such as natural tissue and synthetic fabric have two different classifications.

Fourier Analysis for Fabric Fault Identification: The fourier transforms describe the defect in a structural manner. The simulated representations are used to understand the characteristics of frequency spectrum. Since the three dimensional frequency spectrum is very difficult to examine the defects which occurs along the horizontal and vertical axis. (Chi-ho Chan et al.,2017)

This paper includes online fabric inspection using image processing techniques. This thesis tells about optimizing fast fourier transform (FFT) and the principle of cross correlation. Development of a fabric fault is to determine

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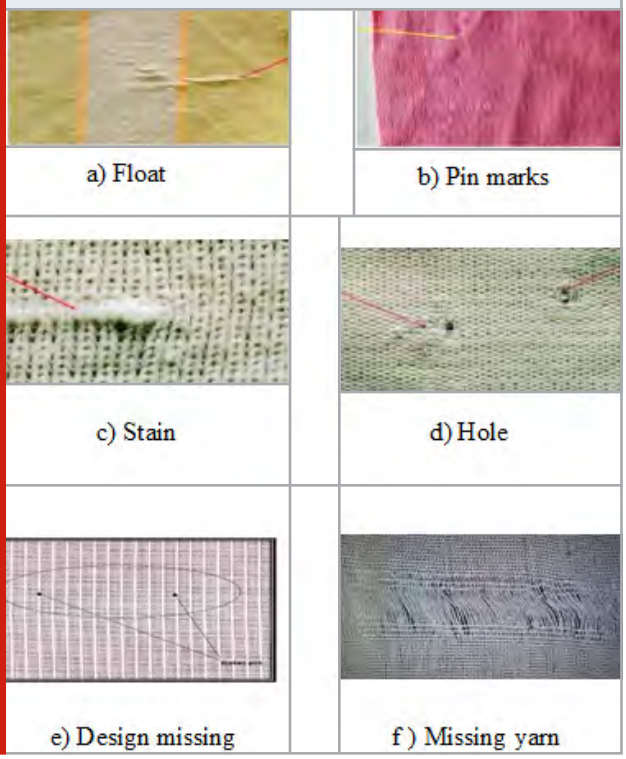
the major defects which is not efficient. Texture analysis problem is divided into several categories and it is very difficult to analyze. (R.Kurkutel et al., 2017)

Figure 1: Major defects in fabric material



In this paper, a direction aware descriptor denoted as Greater Hartford Orthopedic Group (GHOG) is designed with a combination of Gabo and HOG. In order to divide the matrix from image blocks into a low rank matrix and sparse matrix, an efficient low range decomposition model is built. (Di huang et al., 2017)

This paper approaches to detect a class of fabric defects that has been demonstrated. The experimental results were investigated on various defective images showing that the image of the fabric can be located using Gabor filter parameters. In order to determine a region with uniform texture, adequate textural measures are needed. (Utkarsha Singh et al., 2015)

This paper aims to a new fabric defect detection based on Binary Pseudo Noise (BPN) identifier. The recognizer acquires digital fabric images by preprocessing methods. The features are extracted and it is given as an input to the BPN classifier for further matching process. It has more noise. (Dr. G. M. Nasira et al., 2015)

In this paper the developed efficient method for the identification of textile defects based on the Gray Level Competition Matrix (GLCM). The textile image descriptor based on GLCM features which is used as an input to recognize and classify raw textile defects. This study mainly contributed to the development of a computer-aided decision(CAD) system for automatic tissue inspection online. (Gamil Abdel Azim et al., 2015)

This paper describes a new algorithm known as fuzzy C-mean algorithm for factor detection based on a computer. For analysis and comparison the present algorithm is developed. The fluid logic is a way to process the data by giving every pixel in the image its partial membership value. It takes more time to calculate. (Yang, M.S et al., 2017)

Figure 2: Design Flowchart

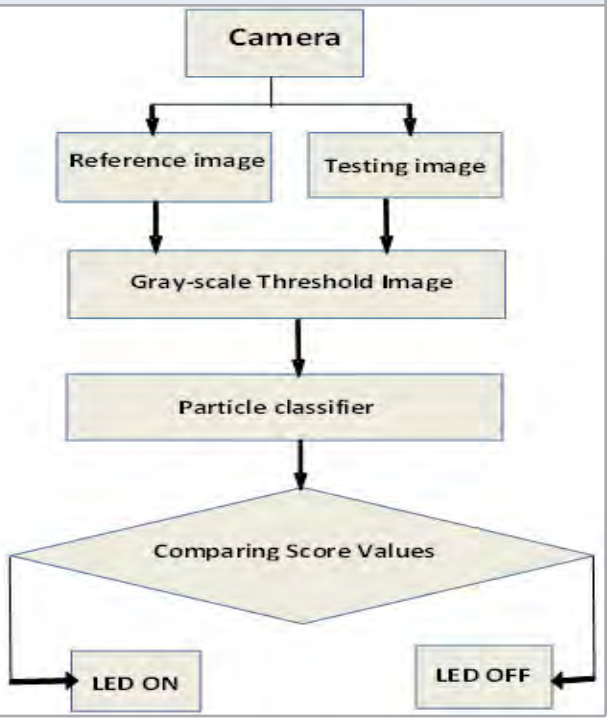
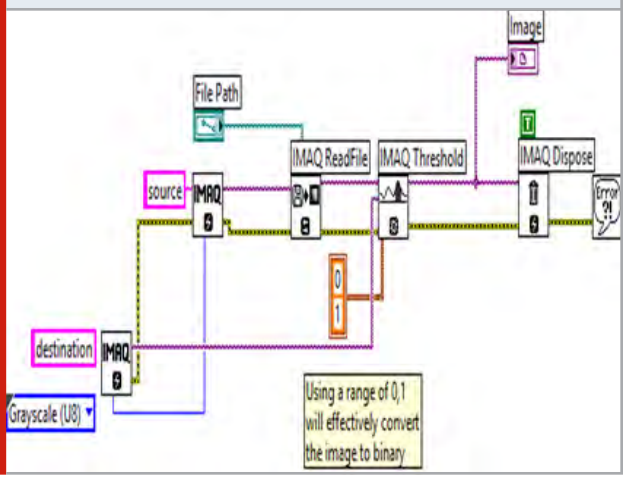


Figure 3: Conversion of RGB Image to Threshold Image



The drawbacks of the above existing methodologies are:

i. Computation time is high.
ii. It leads to less accuracy.
iii. Implementation process is tedious.
iv. Usage of old algorithms are not efficient.
v. Noise level is high

METHODOLOGY

Ni Vision Acquisition: In this proposed method, the reference image is captured through camera and then it is analyzed. The reference image is stored in the database for further process. The next step is the faulty image is captured from the web camera are processed and analyzer for fault detection. During preprocessing the fabric images are converted into gray scale images are subjected to the thresholding. The threshold images are the binary images which are characterized by the particle analyzer. Then the number of particles are calculated and compared with the reference image. Finally the faulty fabric is detected. It is more accurate than the human inspection.

a) Image Acquisition: The image acquisition is basic and first stage in every computer vision system. First, fabric images are captured using digital camera and then different pre-processing methods are applied.

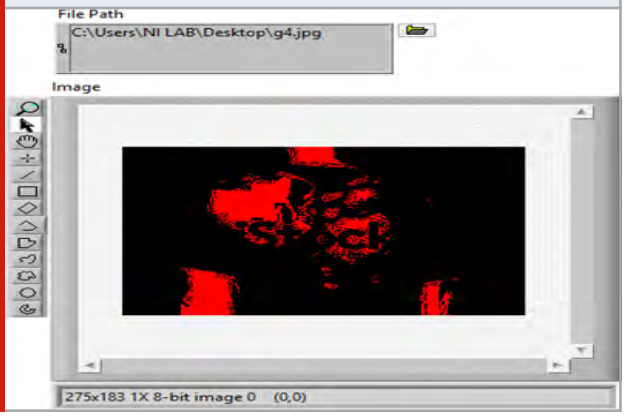
b) Preprocessing: Preprocessing images simply means that the image is resized, the histogram equalized and noise removed, etc. In the pictures the noise changes the energy of an image, by using different filtering methods, simply by removing them.

c) Thresholding and Segementation: Segmentation is simply to divide the image into several segments. The characteristics of every image pixel are the same. Due to image segmentation, faulty pixels can be easily found. Pixels in the foreground and background of the image are ported in thresholds which make it easy to identify faults.

d) Feature Extraction: The feature Entry of image extraction is called the data input in the feature group. The Image feature gives the helpful image information and rejects the remaining information.

d) Classification: The most important part of image analysis is image classification. Classification is nothing more than grouping similar object types and different object type into a different partition, in order to provide an easy way to analyze the image.

Figure 4: Output of Fig 3



e) Recognition: The image processing means that an object or feature is identified and found in an image. Recognition is simply a method in which patterns and objects can be found based on previous knowledge or information extracted from the image in the fabric.

RESULTS AND DISCUSSION

The image to be checked is provided by the NI Vision Assistant and is called an inspected image. The button stops the image testing process. For the present state of the checked picture the boolean button and state information are used. The image tested, without defects, is checked using a reference picture from fig 5. The production is presented with the glowing led in green color following the results of the pattern matching and the comparison of images. The tested picture with a defect (hole) is compared with a reference image, shown in Fig 6. The performance is shown with failure of the status by brightness led in red color, when the pattern is matched and images are compared. We checked a collection of 40 images having both faulty and inappropriate images. Through the review of data we found that 95% of the precision was achieved.

Figure 5: Comparing defect free material

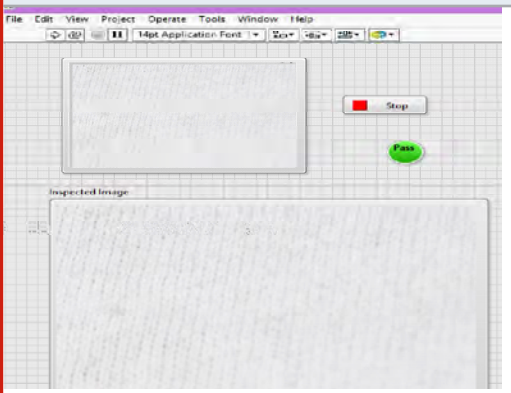
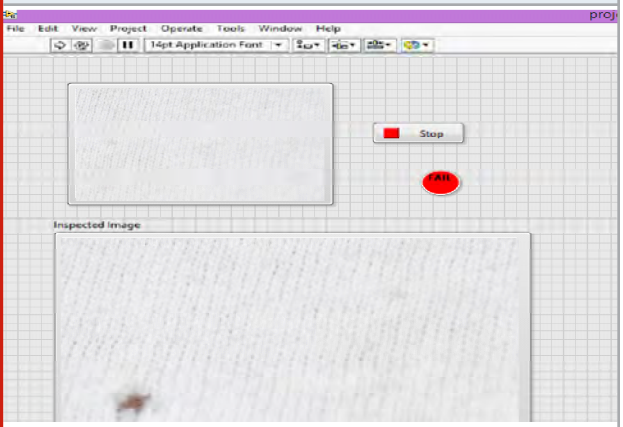


Figure 6: Comparing defected material



CONCLUSION

The textile image descriptor is based on lab-view statistics to identify deficiencies in raw textiles. Automated inspection of fabric defects is necessary to reduce defect costs and time wastes. The picture in the fabric is pre-processed and the features for defect-free and damaged images are extracted. The extracted characteristics are given as feedback and defects are marked. This allows a better inspection of fabric defects with laboratory viewing software to recognize the types of defects that exist in cloth. Quite specific results have been obtained for defect detection, effectively removing the defect area from good textiles. Experimental tests demonstrated the efficiency and precision than of human inspection.

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A Multicast Effective Intrusion Detection System for MANET

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ABSTRACT

Mobile ad hoc network is the emerging network and works in the absence of ad hoc network. Due to the absence of access point, network is easily impersonated by the attackers. Attackers present in the network which reduces the network performance gradually. The packets are dropped by the attackers. Black hole attack is the major attack which does more packet losses in the network. In this research work, A Multicast Effective Intrusion Detection System (EIDS) is proposed to detect the attackers in the network. The proposed system consists of two phases. In first phase, multicast route discovery and maintenance is introduced to provide the network connectivity and seamless support to the network. In second phase, trust based intrusion detection is proposed to identify the attackers in the network. The simulation results are performed using network simulator tool in terms of queuing delay, overhead, black hole attack detection ratio, route lifetime and node stability rate.

KEY WORDS: MANET, MULTICAST ROUTE DISCOVERY AND MAINTENANCE, BLACK HOLE ATTACK, QUEUING DELAY, INTRUSION DETECTION, NODE STABILITY RATE AND ROUTE LIFETIME

INTRODUCTION

Ad hoc network is a kind of wireless network where the nodes are connected in the absence of access point. There are major two categories of ad hoc network. Mobile ad hoc network and Vehicular Ad hoc Network are the major two types. Mobile ad hoc network is required for the emergency purposes i.e. military applications, disaster applications and earth quake scenarios.

Due to dynamic environment, black hole attack is one of the major attacks where the packet are dropped at another end and grasped at one end without the knowledge of members of the network. In this case, packet reachability is a major concern. It will be reduced due to attacks. Packets are dropped unlimitedly if more nodes are compromised by the attackers. In this research work, en effective intrusion based detection scheme is introduced to reduce the attackers in order to improve the netwrk performance.

Literature Review: (Vinothkumar et.al 2017) proposed a secure trust based routing protocol using fuzzy decision mechanism. In the presence of high mobility scenarios, shortest paths may not provide a secure route. It leads to

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instability of routes in the dynamic network. Based on trust vector and link lifetime, the security level of path is identified and integrated with fuzzy mechanism. From the trust vector, the misbehaving nodes were found and isolated from the network easily. The data encryption of packets was done with the mechanism of crypto-mechanism.

(Yaseena and Aldwairia 2018) introduced the on demand vector routing with enhanced approach to identify the black hole attacks in the network. The concept of updating reputation table was introduced to prevent black hole attackers inside the network. It was maintained in every route discovery process. The reasonable traffic overhead was reduced using reputation followers to provide authentication of nodes in the network.

(Sridhar et.al 2017) explored the trust and energy supported on demand vector routing to ensure integrity in the ad hoc networks. The introduced on demand vector routing contains energy value, trust value of all 2 nodes and authentication management inside the network. In each route maintenance process, threshold vector value is maintained based on trust and energy levels. The reliability of routing was increased using message digest algorithm MD5 to secure data transmission between two nodes. The number of nodes and pause time varied for the simulation analysis using network simulator tool.

(Shuiyuan Hua and Jianjun Wen 2018) introduced the secure routing based on the strategy of trust model and reference node in ad hoc network. The security challenges and goals of ad hoc networks were discussed to defense against attackers to provide reliable transmission and also to mitigate black hole attackers. From the If the strategy of trust model and reference node is increased, it may lead to more energy consumption and also will affect the delay.(Farruh Ishmanov and Yousaf Bin Zikria 2017) surveyed the trust mechanisms in sensor networks in the ad hoc environment. The open research findings were analyzed to solve the issues of attackers in the network to provide secure routing.

(Devakumari and Shanthini 2018) introduced the concept of modified trust algorithm based on energy efficiency of nodes in ad hoc network. The protocol used here was on demand vector routing protocol which supports routing for overhead reduction and minimization of delay. The best and trustable routes were found to improve energy efficiency of nodes during sleep mode period. The network performance was dramatically improved using the algorithm and compared with previous techniques effectively.

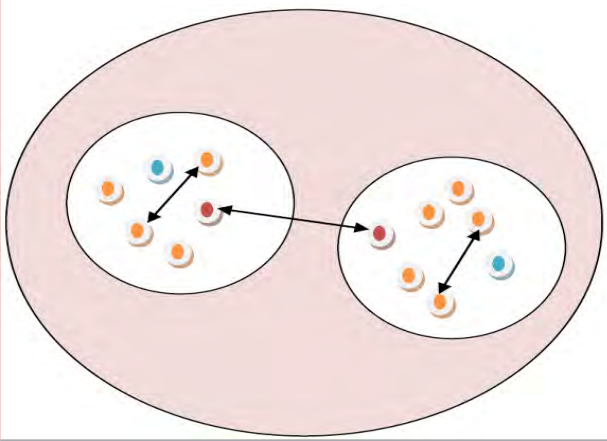
(Kalaiselvi and Palaniammal 2019)] developed the algorithm called clustered routing algorithm with the calculation of fitness prediction. During dynamic environment, the fitness of node was estimated based on mobility, link lifetime and trust. Based on features and characteristics of intermediate node, the fitness value can be estimated to meet QoS standards. The stable cluster head was identified based on the computation of fitness value. The network tability and lifetime of the clusters were improved using the simulation results and analysis. (Sripriya and Santha 2017; Kirubaburi et.al 2019) enhanced the quality of service of ad hoc networks by developing trust based secure routing protocol. The trust threshold vector based key management scheme and ad hoc on demand vector routing protocol were combined together to provide authentication and improve network performance. Three factors were effectively calculated based on node competency, node integrity and relationship with the neighbour nodes. The weight value based trust vector was chosen to ensure reliability of the path to balance network performance and security.

MATERIAL AND METHODS

Performance of Meids: In this phase, a Multicast Effective Intrusion Detection System (MEIDS) is implemented based on reliable routes and intrusion detection rate. This scheme aims to prevent the black hole attack and to improve the packet delivery ratio. In first phase, routes are identified by exchanging the route request packets and reply packets. The multicast routes are discovered after formation of mobile node topology setup. Source node sends multicast route_request to join the group. The concept of mesh based multicast routing is derived in the proposed. Mesh based routes are identified for providing global connectivity. Once the request packets are received by the intermediate nodes, it will send the multicast_route reply packets to join the group. The route discovery process is installed for creating cluster multicast group. Once the routes are formed, data packets will be forwarded from source to sink node. Once the round trip time of first route is completed, The packet forwarding ratio is estimated as,

$$PFA_{ab}(t) = \frac{AR_{ab}(t)}{TP_{ab}(t) + PL_{ab}(t)} \times 100 \quad (1)$$

Figure 1: Multicast Group Establishment



AR indicates the number of packets arrived at the sink node. TP indicates the total number of packets in the route. PL means the packet loss rate from source to destination. The packet forwarding and arrival rate is the number of packets arrived and forwarding from source to sink node. Figure 1. shows the multicast group establishment.

Sequence number based Intrusion Detection System: Once the multicast group is attained, source node sends route_request packets to join the group. The genuine nodes send reply packets to source node. Each node maintains the packet ID and the sequence number of packets is maintained. Black hole attack present in the route, tries to send the fake ID to source node. The trust score table is maintained by the source node. In this table, route history, packet sequence number and node Id are stored. The packet forwarding arrival ratio is determined based on the route reliability rate and stable nodes. The trust score is stored in all nodes. The neighbor node recommendation, node forwarding capability and stability rate of link. During route discovery process, the reliable path is discovered based packet loss ratio. It is determined as follows,

$$RP_{ab}(t) = NR_{ab}(t) + NFC_{ab}(t) + LSR_{ab}(t)$$

Black hole attack detection algorithm
The algorithm contains the following steps.

Step 1: Source node sends request packet to join the group.

Step 2: Neighbor node replies via reply packet to source node.

Step 3: Packet ID and sequence number of packets are stored in trust score table of the source node.

Step 4: The threshold of packet forwarding arrival rate is maintained by source node.

Step 5: Genuine node replies the forwarding arrival rate which is above the threshold value.

Step 6: If any node goes below the threshold value, node is considered is black hole attacker.

Step 7: Source node observes the packet dropping of attack and record it in trust score table. It will block the packets to black hole attacker and advertise to all intermediate nodes about the attacker.

RESULTS AND DISCUSSION

A Multicast Effective Intrusion Detection System (EIDS) is simulated using network simulator tool (NS 2.35). The basic routing protocol used here is on demand routing. Random way point mobility model is used for varying the node movement in the network environment. Table 1 illustrates the metrics of EIDS.

Figure 2: Identification of black hole attack

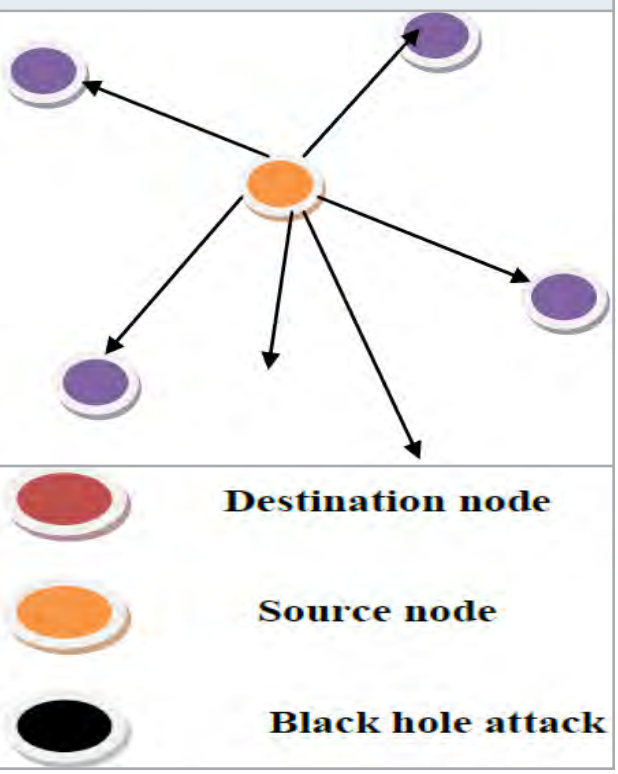


Table1. Simulation and Setting Parameters of EIDS

No. of Nodes	200
Area Size	1000 X 1000 sq.m
Mac	802.11
Radio Range	300 meter
Simulation Time	100 sec
Traffic Source	CBR
Packet Size	128 bytes
Mobility Model	Random Way point
Protocol	AOMDV

The performance metrics of EIDS is as follows.

Black hole detection ratio: It is the ratio of packet dropping attack to the total number of nodes.

Queuing delay: It is the propagation of packet delay originated from source to sink node.

Packet forwarding ratio: It is the ratio of packets forwarded to the sink node to the total number of packets

Node Authentication rate: It is the number of authenticated packets based on trust score.

Figure 2 illustrates the performance of EIDS while varying the number of mobile nodes in x axis. Based on

the results, it seems that the proposed system achieves high packet forwarding ratio than existing schemes.

Figure 2: Packet forwarding ratio Vs No. of links

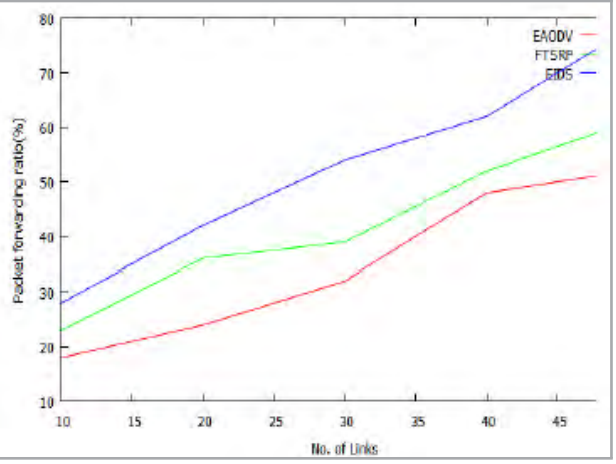


Figure 3 shows the illustration of queuing delay. In this analysis, the proposed system achieves less queuing delay than existing schemes due to the identification of reliable routes. If reliability persists, the delay of packet can be reduced effectively compared to existing schemes.

Figure 3: Queuing delay Vs Number of packets

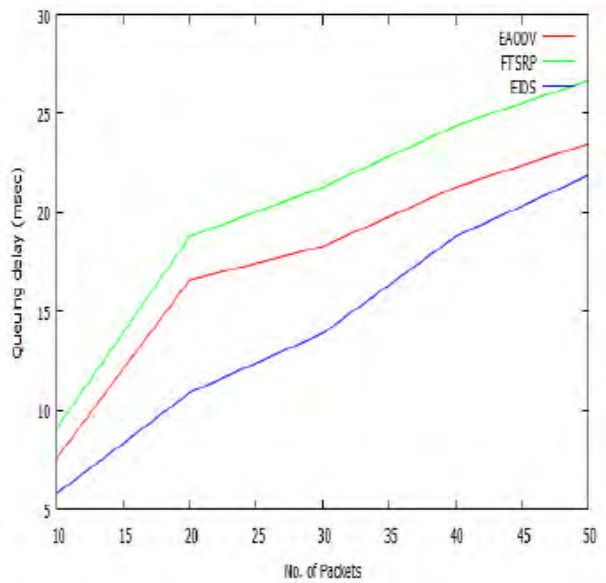


Figure 4 provides the analysis of data authentication ratio. The proposed scheme provides high authentication ratio than existing schemes due to packet ID verification.

Figure 5 shows the simulation results of black hole attacker detection ratio. From the analysis, it is seen that detection ratio of proposed system is comparatively high as compared to existing schemes.

CONCLUSION

Black hole attack in MANET produces more packet

Figure 4: Data authentication ratio Vs No. of data packets

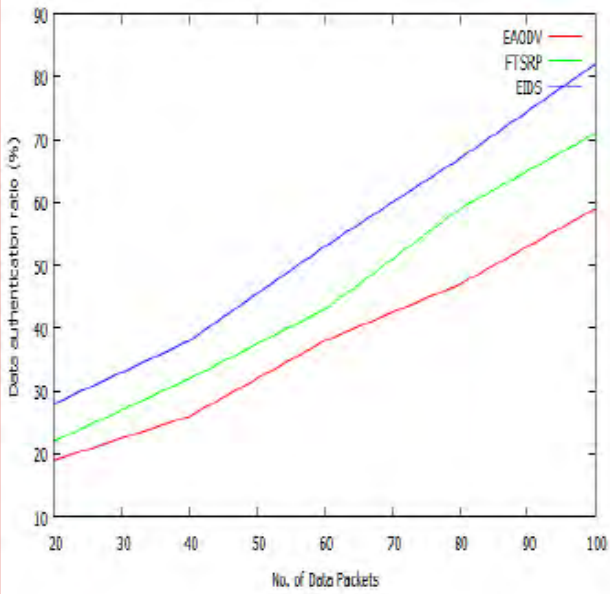
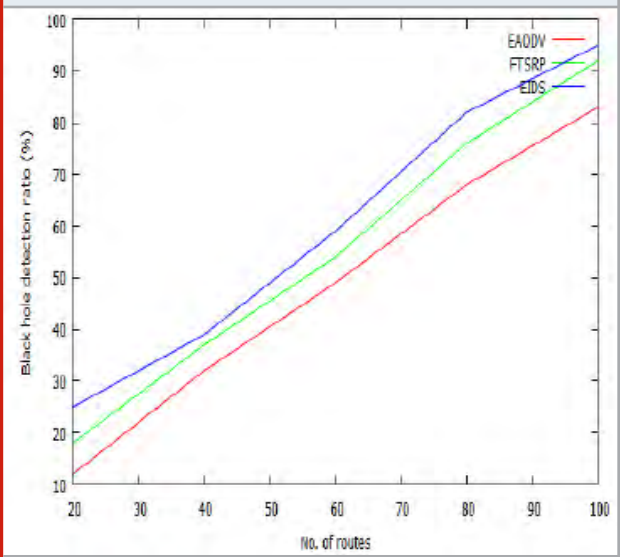


Figure 5: Black hole detection ratio Vs No. of routes



dropping during data transmission. Due to that, links transmit the fake packets or misrouting the packets will be induced. It leads to lagging in network performance. In this research, multicast route based effective 5 intrusion detection system is introduced to detect the black hole attackers effectively in the network. Trust score table is maintained to identify fake node and unreliable packets travelling in the route. Based on the extensive simulation results, EIDS achieves more authentication ratio, high packet delivery ratio, less delay and more packet forwarding ratio compared to existing schemes.

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Wireless Monitoring and Controlling of Irrigation Using IoT

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ABSTRACT

Agriculture is the main source and backbone of food production of a nation. Irrigation is an important role in agriculture .But irrigation is a time and energy consuming process. IoT is the result of advancement in science and technology. This converges the internet and communication that paves the way for a fast and automated system. In agriculture, the irrigation system is automated via wireless monitoring and controlling of the agriculture land using sensor, through which the user can see accurate changes in the moisture level of the land. Whenever there is a change in the moisture content of the soil the sensor senses the change and gives an input signal to the micro-controller and automatically switch on and off the motor if required.

KEY WORDS: AGRICULTURE,IRRIGATION,TECHNOLOGY,SOILMOISTURE,IOT,AUTOMATION,SENSOR,MOTOR

INTRODUCTION

Agriculture is highly important for its raw material productivity and it becomes a manhood need.An important role in agriculture is irrigation.Irrigation is the method in which water is supplied to the plants in a controlled and systematic way.It has been taken into consideration to maintain crop yield and productivity. This paper designs an automatic irrigation system based on IOT using a Wi-Fi module esp8266. This project is mainly designed to ease the watering effort and save watering time to the plants by the human using the advancement in technology (Karankansara et al 2015).

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Agriculture becomes difficult due to some issues like midnight irrigation because of improper power supply,Irrigation is also a time and energy consuming process.Development in science and technology is playing a big role in agriculture to ease the human effort in irrigation. So, automation in agriculture is encouraged replacing the effortful manual irrigation (Yiming Zhou et al 2009).

Existing System: Existing system of automatic irrigation system are developed with WSN,PIC microcontroller or Raspberry pi or Arduino along with zigbee module. One such system uses the PIC microcontroller to gather the sensor information in real time. The data can be acquired and processed by sending and receiving the information from cultivation field. The measured data is allowed for data inspection with cellular internet interface to be graphically visualized through GPRS module. The whole irrigation system is powered by solar photovoltaic panel with battery power management system (Kirandeep Kaur, Rita Mahajan 2016).

Another system uses algorithm which was developed with threshold values of temperature and soil moisture that was programmed into a microcontroller-based gateway to control water quantity. The system was powered by photovoltaic panels and had a duplex communication link based on a cellular-Internet interface that allowed for data inspection and irrigation scheduling to be programmed through a web page. Another system, controls all these operations through any remote smart device or computer connected to Internet and the operations will be performed by interfacing sensors, Wi-Fi or ZigBee modules, camera and actuators with micro-controller and raspberry pi (Joaquin Gutierrez et al 2016).

The main vision of advanced development in science and technologies is to reduce human effort and to save energy resources. Before the development in science and technologies, all machines and equipments are manually controlled. and energy consuming. Irrigation is also a time consuming process.Atpresent,There is an urgent need to save water and other energy resources. Hence, using newer technologies in agriculture makes the work easy and beneficial activity with an automated system along with saving the resources with limited and effective usuage.Using technology is now become economical and eco-friendly (NikeshGondchawar,R.S.Kawitkar 2016).

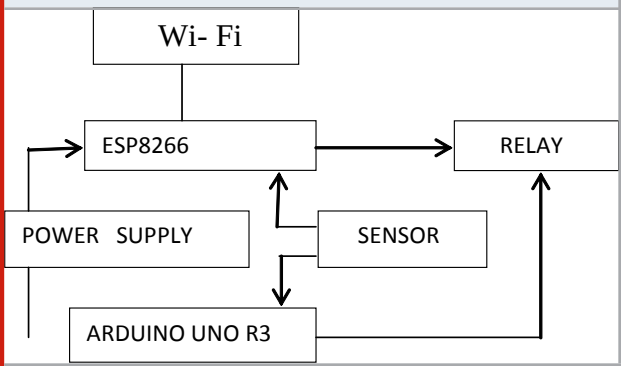
Proposed System: In this proposed system,soil moisture sensor is placed the field.It is used to monitor and provide the accurate information about the changes in the moisture level of the soil to the farmer.This sensor is made to communicate with thearduino microcontroller and ESP8266 Wi-Fi module of the system.Information about the soil moisture level is updated and displayed in the mobile app designed.The system consists of two modes,one is manual and other is automatic.When the moisture level,reaches the limited threshold value the sound buzzer and LED connected to the system turns on and also intimation about the need of water to the plant is given to the user via a notification message through the mobile app used for the system (Prathyusha, M. ChaitanyaSuman 2012).

The development of the automated irrigation system based on microcontrollers and wireless communication at experimental scale within smaller areas is presented. The aim of this project was to demonstrate that the automatic irrigation can be used to reduce water use.This gateway permits the automated activation of irrigation when the threshold values of soil moisture is reached. Communication between the sensor nodes and the data receiver is via the esp8266 (Revathi,C.Rajasekaran, 2015).

The proposed system comprises of power supply, esp8266 Wi-Fi shield and arduino microcontroller and mobile app.Mobile app is used to control the system.This system is designed to offer two modes of operation; auto and manual mode.If manual mode is on,the user needs to switch on and off the button on the mobile or if the automatic mode is on switching on and off the motor is not needed.

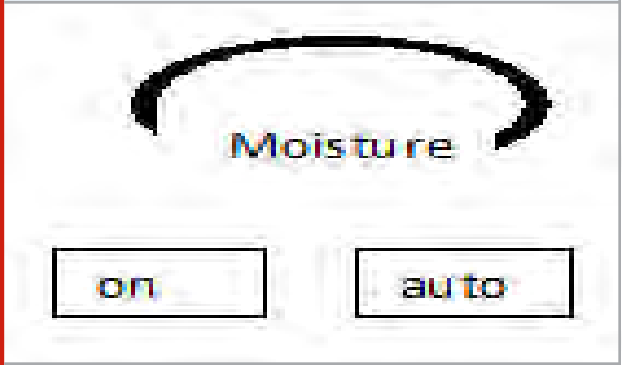
Server End

Figure 1: System Design



User End

Figure 2: User End design



Arduino UNO R3

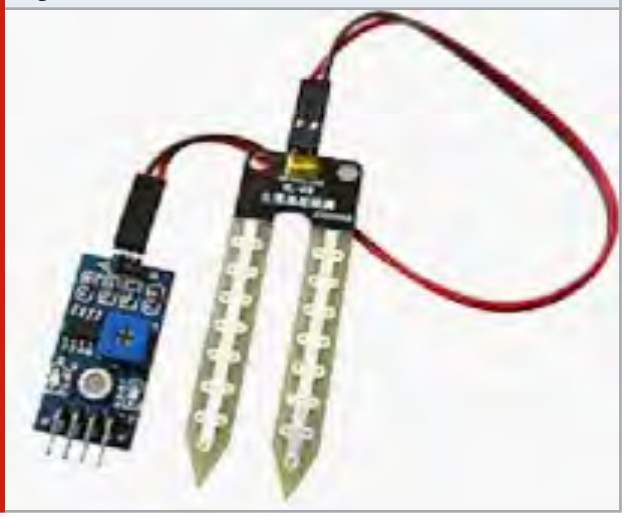
The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins,6analog inputs, a USB connection, a power jack and a reset button. Use USB cable or power it with a AC-to-DC adapter or battery to get it on.

ESP8266 Wi-Fi Module: The ESP8266 WiFi Module developed by espressif TCP/IP protocol stack that can give any microcontroller access to specified Wi-Fi network

Moisture sensor: Soil moisture sensor measures the moisture content in the soil.(refer fig 6.3)It uses capacitance tomeasure the moisture content of the soil. Digital output is simple, analog output more accurate, serial output with exact readings.

ArduinoIDE: The Arduino Integrated Development Environment or Arduino Software (IDE) contains a text editor,a message area,a text console,a toolbar with buttons and a series of menus.

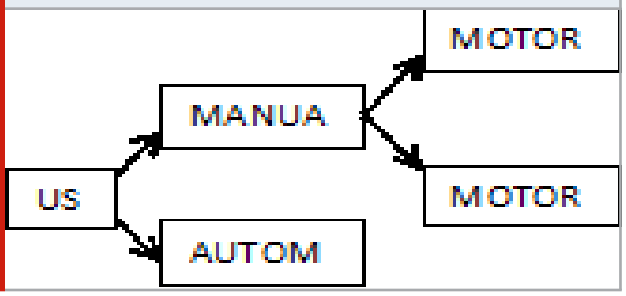
Figure 3: Soil moisture sensor module



Relay: Relays are switches.It can be operated by both electrical and mechanical.It has an inductance coil. Whenever the Vin connects with ground, the coil inside the circuit produces flux, that helps the normally open and normally closed switches to switch with respect the common terminal.Such that relay acts as a switch. Here,relay is used to drive the motor with respect to the on or off cases.

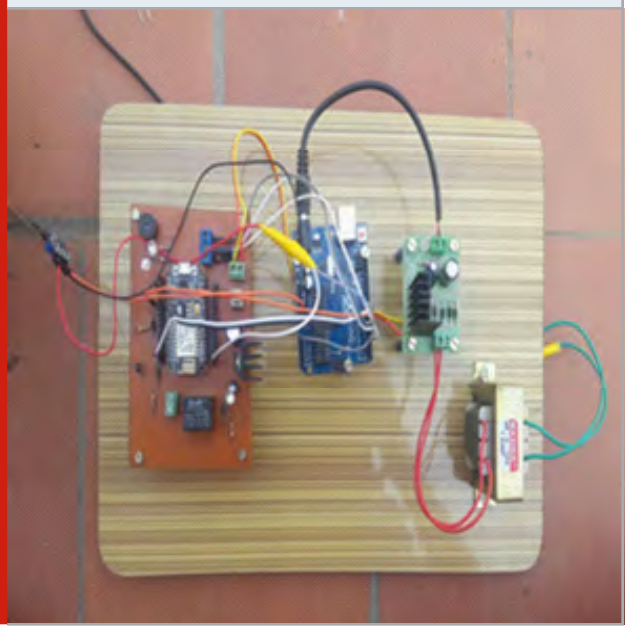
DC motor: Direct current is used to power the motor and hence called dc motor.Motor converts electrical energy into mechanical energy.In this systemrelay is used to switch on and off the motor.When the relay is switched on the motor pumps the water and flush it out.When the relay switches off the motor is off

Figure 4: User task design



System Design: Soil moisture sensor is used to measure the amount of moisture content present in soil. Moisture sensor data are fed to the Arduino microcontroller and ESP8266 Wi-Fi Module. Microcontroller acts according to the control algorithm. The same moisture content and flow level will be displayed in mobile app designed for the system The same moisture content and flow level will be displayed in mobile app designed for the system. When the moisture content present in the soil is dry, then water flow in the tank starts to flow in a pipe by turn ON the motor. When the moisture content in the soil is high, then the water flow in a tank stops to flow in a pipe by turn OFF the motor.The user only wants to set auto mode to water the plant automatically with respect to the change in the moisture level of the field.The information about the moisture is fed to both arduino and esp8266.So,the microcontroller gives an input signal to the relay and drives the motor on and off as required.

Figure 5: Experimental Setup



Working Procedure

Step 1: Connect the system with mobile app through Internet.

Step 2: At once, the system configures with mobile,the mobile app shows online for the system.

Step 3: Moisture sensor is placed in the land soil and the accurate changes in the moisture level of the soil is displayed in the mobile instantly.

Step 4: D0,D1 are the pin in esp8266 used to fix auto and manual modes in the system.

Step 5: If D0 is high,Automatic mode will be set.If D1 is high,manual mode will be set,user wants to switch on and off the system through mobile.

RESULTS & DISCUSSION

So, whenever the moisture level of the soil goes above the threshold value ,in automatic mode the motor gets turn on automatically and whenever the moisture level goes dry, the LED, buzzer interfaced with the Arduino goes high and a notification message is sent to the user via the mobile app. So, the user can be get notified with the accurate changes about the moisture level of the soil and can water the plants only when it is required. This would be an efficient way of watering the plants.Sinceit would save water from excess supply and saves the plant from water Logging . Using high efficient sensors and motor will help in maintaining a large land area.

Figure 6: IoT based irrigation system user end

CONCLUSION & FUTURE WORK

Using technology is now become economical and eco-friendly. So,the management of the agriculture field with moisture sensor will help in notifying the immediate and accurate changes in the moisture level of the soil and helps to automatic switch on and off the system which will stop excessive usuage of water and power in irrigation if water is not needed to the field. Large area of land field can be covered into maintenance by this system using highly efficient dc motor and efficient soil moisture sensor. And temperature, humidity, pH, weather condition monitoring and other features can also included in addition to moisture monitoring for extendability features. Using automatic irrigation makes irrigation easy and simplifies the work of gardener and farmer in maintaining the fields

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An Efficient Implementation of Data Masking Through Image Steganography

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ABSTRACT
Everyday enormous amount of information transferred from one user to another on internet with very high speed and so the risk for data crime also increases tremendously. Steganography provides a solution for the secure data transmission. Steganography is the process of enclosing information inside a data source without modifying its originality.Hiding information in an image file is called ImageSteganography. This paper deals with encoding the secret image file into the Cover Image. To enhance the security the image at the transmitter side resembles the cover image, but actually which has secret image in it. At the receiver section the secret image can be retrieved back by decoding the cover image.The Proposed method is implemented in LabVIEW which buildsan confident on the sensitivity of human visual system.

INTRODUCTION

In the emerging world, internet for communication is getting more attraction among people, which promises that people all over the world connected irrespective of certain physical barriers. Hence, the need for security in data transmission has been increased. In this sense different methods of secure transmission of information were introduced and in practice. In recent years, Image Steganography is an attractive research area in disparate data hiding technologies, which has become a hopeful tool for data hiding technologies. Since now a day's not only the secret message transmission is needed but also image is mostly preferred. There are many techniques to hide secret data in an image such as Least significant bit, Pixel value differencing Edges based data embedding, Random pixel embedding, Mapping pixel to hidden data, Labeling or connectivity method, Pixel intensity or gray level value based method ,Texture based method, Histogram based methods,Spread Spectrum based methods and Color Palette based methods (Saket Kumar, Ajay Kumar Yadavet al 2015). TheImage Steganography overcomes the problem of cryptography in which the existence of secret image is not visible whereas in some communications it is not enough to encrypt the data (RigDas, ThemrichonTuithung 2012).

In (Souvik Bhattacharyya 2011 &B. KiranBala 2017) the author explains a typical overview of steganography, and also detailed explanation about different types of cover media such as image, text, audio and video. In (BaluramNagaria 2012) A DCT based steganography provides high protection against the attacks like JPEG compression, noise, rotation, translation etc. In (Poonam V Bodhak2012) have given an idea which is based on Least data transmission with high flexibility and high

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consistency. In this approach, the data or information which is to be hidden in the cover frames or images have been read at first. After that the data have been converted into binary form. The pixels of the frame have been calculated for the video in which the data going to be hidden. Each bit of the text message is to be replaced with the frames of LSB (Least significant bit (LSB) insertion). Now the frame has been read and the pixel of that particular frame is calculated. Now the Retrieved bits are converted each 8 bit into a character. This method is convenient and in practice. One of its drawback is that it is easy to implement and does not stand up for compression. It is mostly preferred for lossy compression.

In (KousikDasgupta 2012), the authorproposed an algorithm Hash-Based Least Significant Bit (HLSB). Here the data which is to be hidden can be hidden in a video file in various ways. In (S.Anitha2017) They used LSB video frames for hiding private message. At first the eight bit data to be hidden is breaked three parts three, three, two. And then those various parts of input data will be entrenched in the video frames. But this technique will be applicable only for compression.In (Shruti C. Dande 2016) the author focuses on applying the LSB insertion method for edge pixel of image and achieved high PSNR.

Figure 1: Block diagram of Image Steganography – Encoding

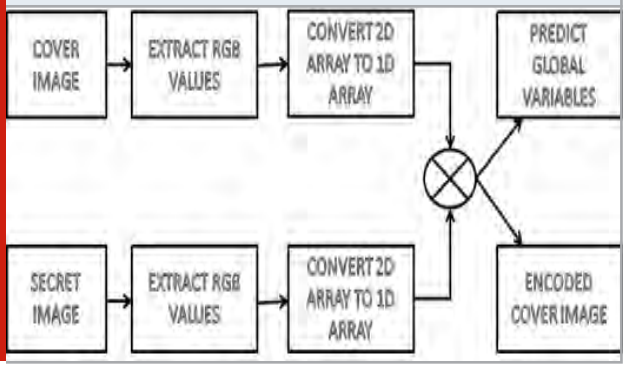
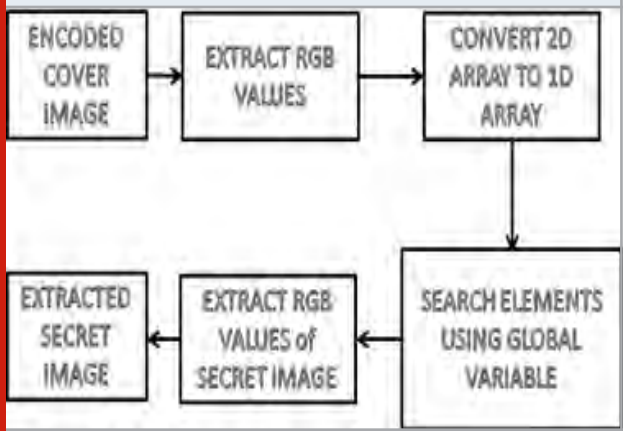


Figure 2: Block diagram of Image Steganography – Decoding



METHODOLOGY

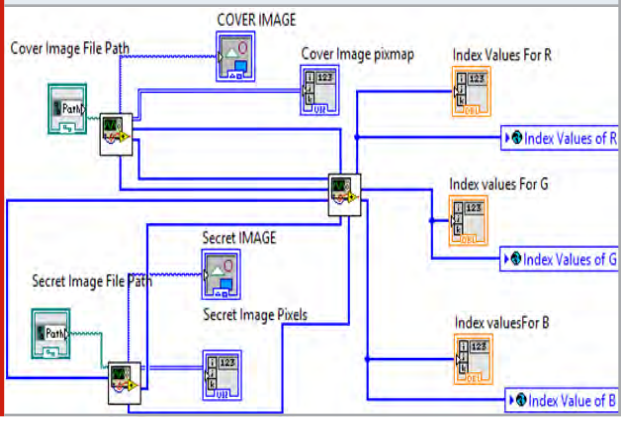
In this paper the secret image is encoded on to the cover image, also without any visible changes in the cover image the secret image can be hidden in to the cover image by calculating the RGB values of cover image as well as for secret image and it assigns global variable. With the global variable, as a key for decoding the secret image can be easily retrieved back from the cover image.

At first the RGB values of the Cover image and the RGB values of the Secret image has been calculated parallel in three different matrices. Then the 2D array was reshaped into 1D array and stored as an global variable individually for corresponding RGB. After that by using the same cover image the secret image has been decoded by calculating the RGB value of the encoded cover image and then again converting the 2D array into 1D array and with the help of global variable the secret image can be retrieved back from the encoded cover image. The proposed work has been implemented by using LabVIEW which is a Visual programming language introduced by National Instruments. The programming was made easy for those who feel difficult to learn text based programming.

RESULTS AND DISCUSSIONS

The Figure 1 and 2 shows the block diagram of Image Steganography Encoding & Decoding Technique. Figure 3 shows the block diagram of Image Steganography Encoding in which three subVIs has been used , one for calculating RGB from cover image , another for calculating RGB from secret image and the third one for encoding the secret image on to the cover image & to assign index variables as global variable which act as the secret code for further use in decoding process. Figure 4 shows the Front Panel of Encoding which represents the cover image, secret image & the RGB values of both cover image & secret image along with index variables.

Figure 3: Block Diagram of Image Steganography – Encoding



The Figure 5 represents the Block diagram window of the Image Steganography – Decoding in which a subVI created to decode the encoded cover image with reference

to the index variables and extract the secret image & gives the RGB values of secret image. Figure 6 shows the front panel of decoding process in which the extracted secret image can be viewed.

Figure 4: Front Panel of Image Steganography – Encoding

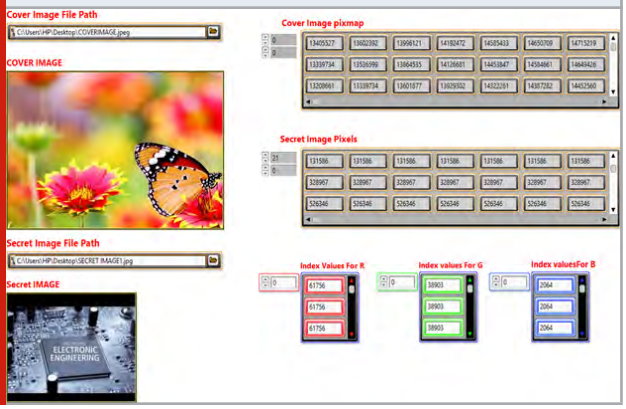


Figure 5: Block Diagram of Image Steganography – Decoding

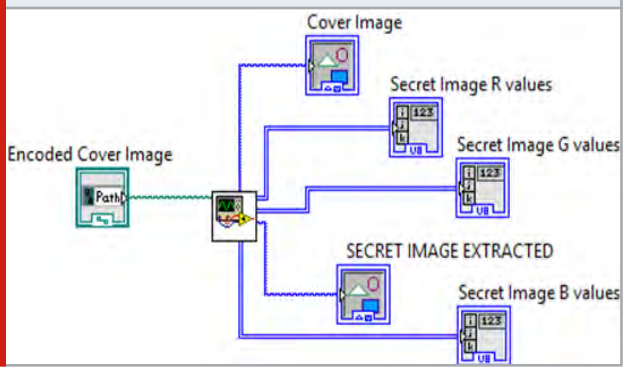
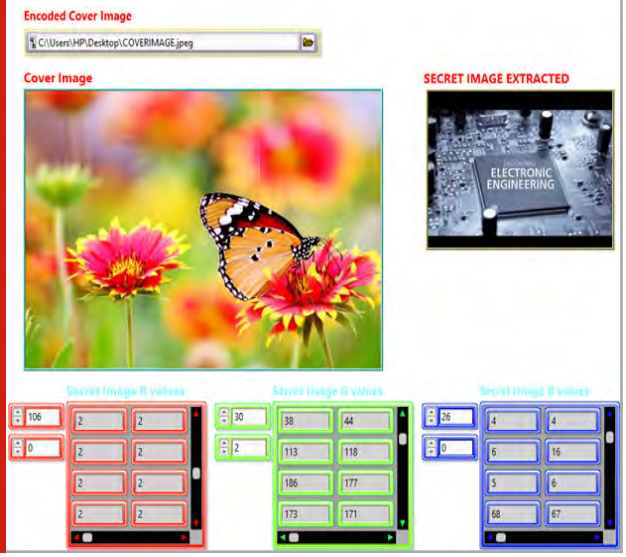


Figure 6: Front Panel of Image Steganography – Decoding



CONCLUSION

In this paper an efficient implementation of image steganography method has been done with LabVIEW, in which data hiding is made simple and with promising security. There will be no changes in the cover image which ensures the security of the hidden secret image. The implementation is made simple with the advancement in the LabVIEW software. In future it can be extended with sending any kind of secret information via real time video.

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Velocity Estimation of Moving Targets Using Discrete Wavelet Decomposition in SAR Imaging

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ABSTRACT

Estimation of motion parameters for moving targets in SAR imaging is a research challenge.Focusing of final processed image is degraded due to the presence of phase errors in return signals from the moving targets. The phase errors are proportional to velocity of moving targets. A modified range Doppler algorithm has been proposed to estimate the velocity of moving targets by reducing the phase errors present in the received signal in this research. In this algorithm, range migration correction, focus filtering, and wavelet decomposition is performed automatically. The phase gradient method is used to estimate the phase errors present in the wavelet decomposed signal. The cross-track velocity and the along-track velocity of moving targets are estimated from the coefficients, which are extracted from the range migration correction, and focus filtering. Haar, Db4, and Sym8 discrete wavelets are used in wavelet decomposition for phase errors elimination. Out performs from the results, at is found that the proposed method is out performs with the existing methods.

KEY WORDS: RANGE-DOPPLER ALGORITHM, RANGE MIGRATION CORRECTION, FOCUSES FILTERING, AND WAVELET DECOMPOSITION.

INTRODUCTION

Estimation of motion parameters is very difficult in the presence of phase errors in the received echo signals from the moving targets in SAR imaging. In conventional range Doppler algorithm (curlander J.C, MCDonough,1991 and R.K.Raney et.al,1994 and R.Bamler 1992), automatic range migration correction (wang.J, Liu.X, 2006), and autofocus (wang.J, Liu.X, 2006 and X.Li, G.Liu, J.Ni, 1999 and D.Kasilingam,2000) is performed after range compression. The coefficients extracted from RCMC and autofocus are used to estimate the motion parameters of moving targets. To reduce complexity and execution time while selecting proper parameters (Wang.J, Liu.x,2014 and Caner ozdemir,2011), we proposed a modified RDA. In this modified algorithm, the phase gradient method (Y.G.Niho,1991 and D.Kasilingam,2000) is used to calculate the phase errors present in the wavelet decomposition signal, according to these phase errors, the coefficient of focus filter is adjusted. From this updated focus filter coefficient the RCMC coefficient is adjusted automatically. This process is repeated to get well focused image. The parameter entropy is used to measure the focus quality of image. Minimum entropy of the image implies better focus quality.

The velocity of moving target is composed of cross-track velocity and along track velocity (Wang.J, Liu.x,2014). The

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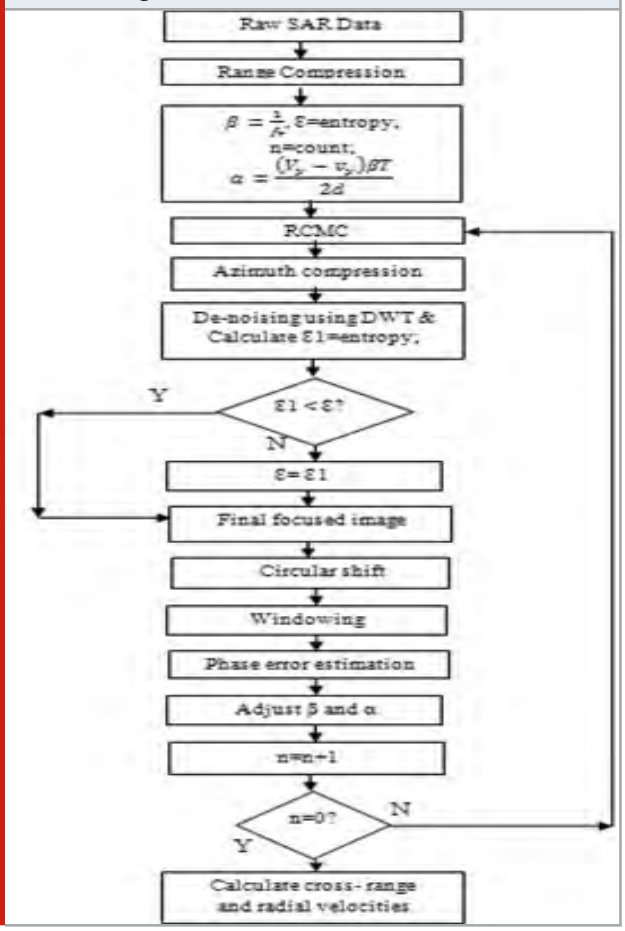
radial velocity is approximated from the range migration correction coefficient and the along-track velocity is approximated from the azimuth filter coefficient. The reflections from the same object are failed to place in the same range gate because of the target moving through the azimuth antenna beam, which results variation in the range between the target and the radar degrades the focus quality of the image. The automatic range migration correction is required to remove the range migration (J.Wang et.al, 2004 and J.Wang,X.Liu, 2004).

Figure 1: Flowchart of modified Range-Doppler algorithm with Phase gradient metho



Improper design of the phase response of the focus filter degrades the focus quality of the image. The focus quality of image is optimized through reducing the phase errors present in the received echo signals from the moving target by adjusting the focus filter coefficient. After azimuth compression, the signal is applied to the wavelet decomposition for further focus quality and accurate estimation of motion improvement of focus quality and accurate estimation of velocity of moving target. The proposed method gives better results compared to the conventional RDA. The organization of this paper is as follows. Section-II presents flowchart of proposed method for automatic imaging and velocity estimation process. Section-III contains necessary mathematical expressions for velocity estimation of moving targets, the minimum entropy and phase gradient method. Section-IV contains results and section-V concludes the paper.

MATERIALS AND METHODS

Automatic imaging: Motion parameters of moving target are extracted from its automatic imaging. The flowchart of proposed modified Range Doppler Algorithm for SAR imaging is as shown in Fig.1. First, the received echo signals from the scatters are resolved in fast time using their different time delays and the range resolution is improved using matched filtering the received signals with range reference signal. Similarly, the signals from scaterrers are resolved in slow time based on their different azimuths and the azimuth resolution is improved using focus filter. To acquire well focused and a correct positioned image, range migration correction before azimuth filtering, and wavelet decomposition after azimuth filtering is required. The range migration correction, azimuth filtering and wavelet decomposition are performed automatically during imaging of the moving target.

Range cell migration correction: The range between the target and the radar is varied because the target is moving through the azimuth antenna beam; the echoes from the same target are not placed in the same range bin. It exhibit very poor focus quality of the image. The range migration correction is carried out in the range-Doppler domain, so that signals from the same target are placed at same range bin. The range migration correction is accomplished by shifting the samples at a Doppler frequency in the range Doppler domain up to the amplitudes are equal. This is referred to as automatic range migration correction.

Focus filtering: The focus filter minimizes the phase errors present in received signal and improves the focus quality of image by matched filtering the columns of Fourier transformed RCMC signal with the azimuth reference signal in azimuth direction. The design of the azimuth filter is based on the received echo signal from the moving target. This is known as autofocus. The phase gradient method (Y.G.Niho,1991) is used to estimate the phase errors present in the received signal. The focus filter coefficient is adjusted to design the phase response to optimize the focus quality of the image.

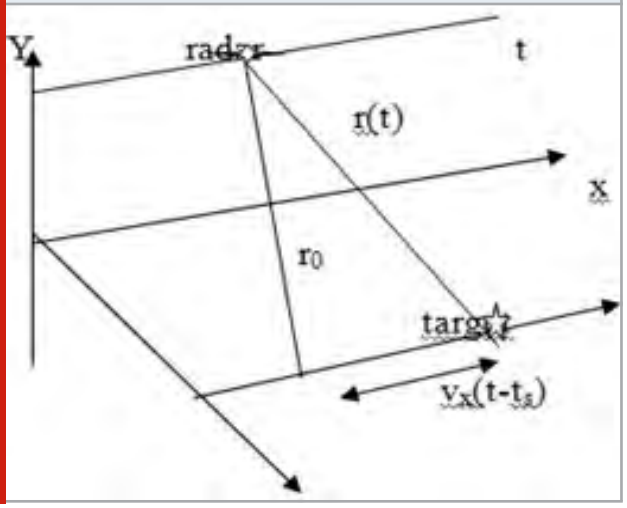
Wavelet decomposition: After azimuth compression, a de-noised azimuth compression signal is obtained by using wavelet coefficients thresholding using global positive threshold THR (Michel misiti,1997 and H.Demirel, G.Anbarjafari,2011 and H.Demirel,2010). Haar, Db4, and Sym8 wavelets with 2, 4, & 6 decomposition levels are used to reduce the noise. Noise due to the phase errors are further reduced by this process.

Velocity estimation: The received echo signal from target is represented as

$$x(t) = w\exp(-j\frac{4\pi r(t)}{\lambda}) \quad (1)$$

Where t is slow time, w is the coefficient of scattering, λ is the carrier wavelength and r(t) is the range of the target to the radar. Here r(t)is written as

Figure 2: Graphical representation of SAR imaging plane



$$r(t) = \sqrt{(y_o + v_y t - V_y t)^2 + (x_o + v_x t - V_x t)^2} \quad (2)$$

and it is derived from the SAR imaging plane shown in above Fig.2. Let us consider the y-axis is the radar bore sight directed towards target. The radar moves with radial velocity Vy in y-axis and cross range velocity Vx in x-axis. Let the target also moves with radial velocity vy and with cross range velocity vx. At t=0, the target is located at point (x0,y0) and the radar at point (0,0).

After some timet=t_s the radar bore sight is directed to the target, therefore

$$t_s = \frac{x_0}{V_x - v_x} \quad (3)$$

and r0 be the range of the scatter to the radar at t_s is given by

$$r_0 = y_0 + v_y t_s - V_y t_s \quad (4)$$

Then, approximating the r(t) by its second order Taylor series at t_s, we obtain

$$r(t) = r_0 - (V_y - v_y)(t - t_s) + \frac{(V_x - v_x)^2}{2r_0}(t - t_s)^2 \quad (5)$$

substituting above equation (5) into equation (1) yields

$$x(t) = w\exp\left\{-j\frac{4\pi}{\lambda}\left[r_o - (V_y - v_y)(t - t_s) + \frac{(v_y - v_y)}{2r_o}(t - t_s)^2\right]\right\} (6)$$

Differentiate the phase angle of x(t) will results the instantaneous Doppler frequency of that received signal i.e.

$$\Omega_i = \frac{4\pi}{\lambda}\left[\left(V_y - v_y\right) - \frac{(V_x - v_x)^2}{r_o}(t - t_s)\right] \quad (7)$$

Doppler centriod is obtained by substituting t=t_s in above eq...(7),

$$\Omega_o = \frac{4\pi}{\lambda}(V_y - v_y) \quad (8)$$

$$t - t_s = -\frac{\lambda r_o}{4\pi(V_x - v_x)^2}(\Omega_i - \Omega_o) \quad (9)$$

substituting equation (9) into (5) yields

$$r(t) = r_o + \frac{\lambda r_o(V_y - v_y)}{4\pi(V_x - v_x)^2}(\Omega_i - \Omega_o) + \frac{\lambda^2 r_o}{32\pi^2(V_x - v_x)^2}(\Omega_i - \Omega_o) \quad (10)$$

Equation (10) exhibits the relationship between the distance and the instantaneous Doppler frequency. This gives the approximate relationship between spectral Doppler frequency and range. Therefore the shifting of the Doppler slice in the range is given as

$$r_o - r(t) = -\frac{\lambda r_o(V_y - v_y)}{4\pi(V_x - v_x)^2}(\Omega_i - \Omega_o) - \frac{\lambda^2 r_o}{32\pi^2(V_x - v_x)^2}(\Omega_i - \Omega_o) \quad (11)$$

Extending the equation (11) to the original interval and discretizing $r_\Omega = r_o - r(t)\text{and}\,\Omega_i$, we get.

$$r(k) = \begin{cases} -\sum_{i=1}^{2}\alpha_i\left[\frac{2}{M}(k - k_o)\right]^i, 0 \le k < k_o + \frac{M}{2} \\ -\sum_{i=1}^{2}\alpha_i\left[\frac{2}{M}(k - k_o - M)\right]^i, k_o + \frac{M}{2} \le k < M \end{cases} \quad (12)$$

$$\alpha_1 = \frac{\lambda r_o(V_y - v_y)}{4dT(V_x - v_x)^2} \quad (13)$$

$$\alpha_2 = \frac{\lambda^2 r_o}{32dT^2(V_x - v_x)^2} \quad (14)$$

where index of instantaneous Doppler frequency Ωi is k, fast time sampling periodis d, the shifting of thesamples at a Doppler frequency k is r(k)and normalized by d. the coefficients of range cell migration are α_1 and α_2. The azimuth filter phase response is properly designed to improve the focus quality of image. For azimuth compression, the design of the azimuth filter phase response with the parameters, that depends upon the radar velocity, the pulse repetition frequency (PRF), and the absolute range. The azimuth filter phase response is derived as follows, The Fourier transform of the received echo signal x(t) is approximately equal to

$$x(\Omega_i) = w\sqrt{\frac{\lambda r_o}{2(V_x - v_x)^2}}\exp\left[-j\frac{\pi}{4} - j\frac{4\pi}{\lambda}r_o - j\Omega_i t_s + j\frac{\lambda r_o}{8\pi(V_x - v_x)^2}(\Omega_i - \Omega_o)^2\right] (16)$$

Therefore the phase response of the azimuth filter should be

$$\phi(\Omega_i) = -\frac{\lambda r_o}{8\pi (v_x - v_x)^2}(\Omega_i - \Omega_o)^2 (17)$$

Extending the equation (16) to the fundamental interval and discretizing $\phi(\Omega_i)$,Ωi and model as polynomial i.e.

$$\phi(k) = \begin{cases} -\sum_{i=2}^{I} \pi\beta \left(\frac{k-k_o}{M}\right)^i, 0 \le k < k_o + \frac{M}{2} \\ -\sum_{i=2}^{I} \pi\beta \left(\frac{k-k_o-M}{M}\right)^i, k_o + \frac{M}{2} \le k < M \end{cases} (18)$$

$$\beta = \frac{\lambda r_o}{2T^2 (v_x - v_x)^2} (19)$$

Where φ(k) is the phase response of azimuth filter with k as independent parameter and β, is called the coefficient of focus filter. Focus filter coefficient β can be adjusted to minimize the phase errors present in azimuth compression signal to improve the focus quality of the focused image and it is referred to as the autofocus. Minimum entropy autofocus using phase gradient method carried out in the following way. Focus filtering is achieved by

$$P(m,n) = \frac{1}{M}\sum_{k=0}^{M-1} x_r(k,n)\, exp\left(j\phi(k)\right) (20)$$

Doppler rate, azimuth, and fast time are indexed by k, m and n, respectively. The range cell migration corrected signal isx_r (k,n) , and the phase response of azimuth filter is Φ(k). P(m,n) is the complex image. The focus quality of complex image P(m,n) is improved by reducing phase errors of focus filter. The phase response Φ(k) of azimuth filter is optimized until the entropy of | P(m,n)|^2is minimized.

The entropy of $|P(m,n)|^2$ is defined as

$$\mathcal{E}[|P(m,n)|^2] = \sum_{m=0}^{M-1}\sum_{n=0}^{N-1} \frac{|P(m,n)|^2}{S} ln \frac{S}{|P(m,n)|^2} (21)$$

Where $S = \sum_{m=0}^{M-1}\sum_{n=0}^{N-1}|P(m,n)|^2$

In SAR imaging, the entropy can be used to measure the smoothness of a distribution function, using this characteristic of entropy, sharpness of an image to be calculated (Bhuvan,ISRO and Michel misiti,1997 and D.E.wahl,1994 and Y.G.Niho,1991 and X.Li, et.al, 1999 and D.kasilingam,2000).The entropy of | P(m,n)|^2is minimized implies phase errors of focus filter are reduced, and focus quality of complex image is improved. Let the focus filter's amplitude response is assumed to be a unit and S is a constant. Therefore the entropy of image can be determined by

$$\mathcal{E}[|P(m,n)|^2] = -\sum_{m=0}^{M-1}\sum_{n=0}^{N-1}|P(m,n)|^2 ln|P(m,n)|^2 (22)$$

Thus, the entropy of image has to be minimized by estimating the phase response of the azimuth filer Estimation of Φ(k) using phase gradient method Estimation of Φ(k) is depending upon the parameter βi. To improve the computational efficiency, the signal is focused using conventional focus filter and de-noised using wavelet decomposition. From the de-noised signal, the parameter β is adjusted as follows.

Phase estimation and correction: Phase Gradient method is used to estimate phase errors present in the azimuth compression signal. The first step in the PGM is to select strongest scatter from each range bin and shift it to the origin, to remove the frequency offset due to the Doppler of the target. Circular shifting is used for this process. The next important step is windowing the circularly shifted image data. The gradient of phase error estimation from circularly shifted and windowed image data is given by

$$g(u) = \frac{\sum_{n=0}^{N} \mathrm{Im}\left\{G^*_n(u) G_n(u)\right\}}{\sum_{n=0}^{N} |G_n(u)|^2} (23)$$

filter coefficient β relation with Doppler rate where g(u) is the gradient of the phase error, Gn(u) is the inverse Fourier transform of the circularly shifted and windowed azimuth compression image data. The slope rate of the gradient of phase errors is estimated and then the variance of Doppler rate dfr is calculated. Therefore the Doppler rate fr is equal to fr + dfr and the azimuthfilter coefficient

$$\beta = \frac{1}{T^2 f_r}$$

to phase errors in azimuth compression signal, β is adjusted to get fine focused SAR target image. The focus quality of image is measured by entropy. Better focus corresponds to smaller entropy. After calculating β, the RCMC coefficient is determined by dividing equations 13 by 19

$$\alpha_1 = \left(V_y - v_y\right)\frac{\beta T}{2d} (24)$$

RCMC, focus filtering and wavelet decomposition is carried out automatically until entropy is minimized. From these coefficients the radial and cross-range velocities (X.wang et.al, 2018) are estimated. The radial velocity is represented by

$$v_y = V_y - \frac{2d\,\alpha_1}{\beta T}$$

and the cross-range is given by

$$v_x = V_x - \frac{1}{T}\sqrt{\frac{\lambda r_o}{2\beta}}$$

The total velocity of moving target is estimated by using the parameters cross-track velocity 'vy' and the along-track velocity 'vx' is written as

$$v = \sqrt{\left[\frac{V_y}{\cos(\theta)}\right]^2 + v_x{}^2} \quad (2$$

RESULTS AND DISCUSSION

Four sets of raw data are used to test the proposed method. The moving targets with different velocities are taken as a raw data and applied. The radar moves at a cross-track velocity of 0.262m/s and along-track velocity of 7125m/s. the pulse repetition period of radar is 5.6ms. The azimuth beam has an angle of 0 rad. The pulses have a wavelength of 5.67 cm and a bandwidth of 15.5MHz. The sampling frequency is 189.6Hz and 1024 echoes with 512 range bins each are recorded. When the slow time is 0, the platform is situated at (0, 0) and the center of the target situated at (0, 1547300km). The scene is a road, as shown in Fig.3(a), (b), (c) and (d) where a bike moves at velocity of 13.88m/s, 16.67m/s, 25m/s and the car (URL,ubisafe.org) moves at velocity of 29m/s respectively. The target is blurred because of its motion. Using MATLAB function "roipoly", the moving target is isolated and its complex image converted into the signal. The signal is processed with our scheme for automatic imaging and velocity estimation and compared with other existing methods. Table-1 and Fig.4 and Fig.5 show the estimated velocities and velocity errors compare with the true velocities of moving target using conventional RDA using PGA method. The average velocity error in the conventional RDA with PGA is 1.17m/s.

The velocity errors in the conventional RDA are not constant, fluctuating from minimum error value to maximum error value. Table-2 and Fig.6 and Fig.7 show the estimated velocities and velocity errors compared with the true velocities of moving targets using modified RDA with Haar-2, Haar-4 and Haar-6 decomposition levels using PGA method. The average velocity error in the modified RDA with Haar-2, Haar-4, and Haar-6 decomposition levels is 1.1m/s, 0.84m/s and 1.24m/s respectively.

Figure 3:(a) Raw data with 13.88m/s velocity (b) Raw data with 16.67m/s velocity (c) Raw data with 25m/s velocity (d) Raw data with 29m/s velocity

Figure 4: Estimated and error velocities compared with true velocities using conventional RDA.

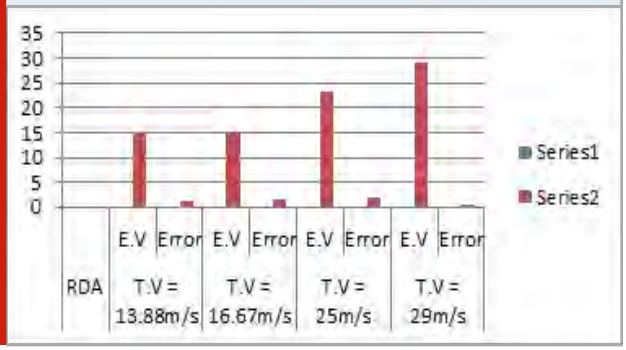


Figure 5: True velocities Vs. velocity errors using conventional RDA.

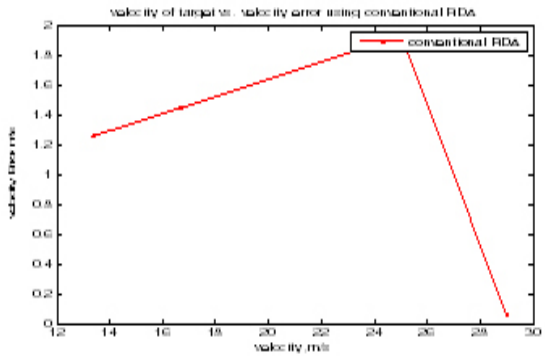


Table 1. The estimatedvelocities and the velocity errors compared with true velocitiesof moving target using conventional RDA with PGA method.

S.No	Model	True velocity = 13.88m/s Estimated velocity(m/s)	True velocity = 16.67m/s Error	True velocity =25m/s Estimated velocity	True velocity = 29m/s Error	Estimated velocity	Error	Estimated velocity (m/s)	Error
1	Conventional RDA	14.64	1.26	15.21	1.45	23.07	1.93	28.92	0.07

Figure 6: Estimated and error velocities compared with true velocities using modified RDA with Haar using PGA.

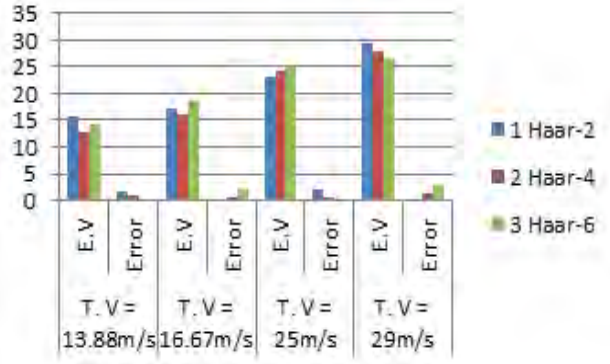


Figure 7: True velocities vs. velocity errors using modified RDA with Haar decomposition levels using PGA.

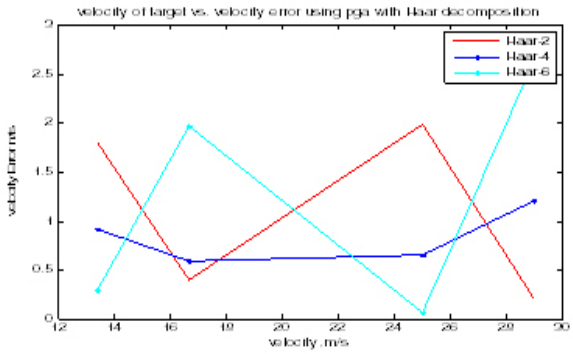


Table 2. The estimated velocities and the velocity errors compared with true velocities of moving target using modified RDA with Haar-2, Haar-4 and Haar-6 decomposition levels with PGA method.

S.No	Model	True velocity = 13.88m/s		True velocity =16.67m/s		True velocity =25m/s		True velocity = 29m/s	
		Estimated velocity	Error	Estimated velocity	Error	Estimated velocity	Error	Estimated velocity	Error
1	Modified RDA with Haar-2	15.68	1.8	17.07	0.40	23.01	1.99	29.21	0.21
2	Modified RDA with Haar-4	0.92	12.92	16.07	0.59	24.35	0.65	27.78	1.21
3	Modified RDA with Haar-6	14.17	0.29	18.64	1.97	25.07	0.07	26.35	2.64

Therefore Haar-4 decomposition level performance is better compared to Haar-2 and Haar-6 decomposition levels, because the velocity of moving targets are varied the velocity error is approximately constant. Table-3 and Fig.8 and Fig.9 show the estimated velocities and velocity errors compared with the true velocities of moving targets using modified RDA with Db4-2, Db4-4 and Db4-6 decomposition levels using PGA method. The average velocity error in the modified RDA with Db4-2, Db4-4 and Db4-6 decomposition levels is 1.05m/s, 1.36m/s and 1.08m/s respectively. ThereforeDb4-2 decomposition level performance is better compared to Db4-4 and Db4-6 decomposition levels. But the Db4-6 decomposition level maintains approximately constant velocity error when compared with other two decomposition levels.

Table 3. The estimated velocities and the velocity errors compared with true velocities of moving target using modified RDA with Db4-2, Db4-4 and Db4-6 decomposition levels with PGA method

S.No	Model	True velocity = 13.88m/s		True velocity = 16.67m/s		True velocity =25m/s		True velocity = 29m/s	
		Estimated velocity	Error	Estimated velocity	Error	Estimated velocity	Error	Estimated velocity	Error
1	Modified RDA with Db4-2	13.57	0.31	14.64	2.02	23.89	1.11	29.78	0.78
2	Modified RDA with Db4-4	13.36	0.52	13.92	2.74	23.00	2.00	28.78	0.21
3	Modified RDA with Db4-6	15.64	1.76	15.78	0.8	23.28	1.72	28.92	0.07

Figure 8: Estimated and error velocities compared with true velocities using modified RDA with Db-4using PGA.

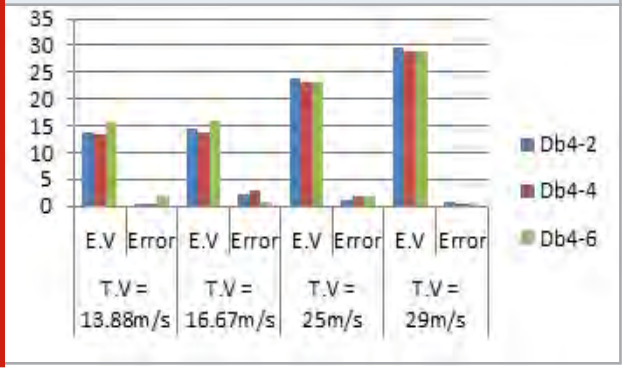


Figure 9: True velocities vs. velocity errors using modified RDA with Db4 decomposition levels using PGA.

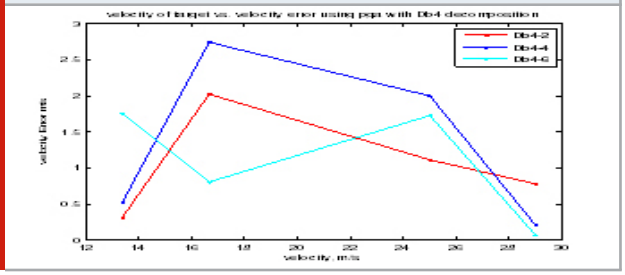


Figure 12: Estimated and error velocities compared with true velocities using modified RDA with different wavelet decomposition levels using PGA.

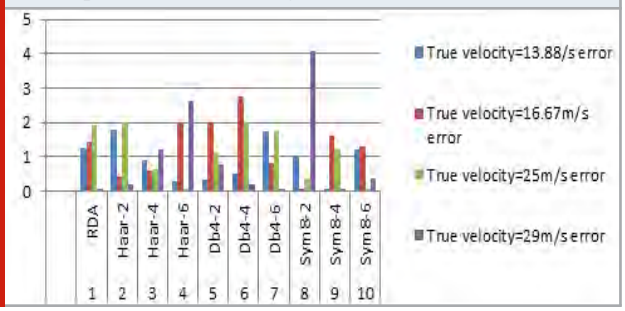


Figure10: Estimated and error velocities compared with true velocities using modified RDA with Sym-8 using PGA.

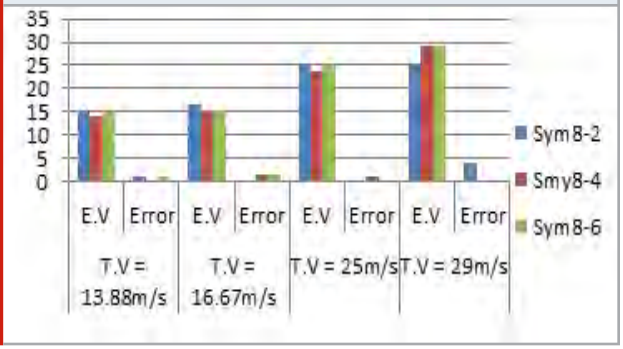


Figure 11: True velocities Vs. velocity errors using modified RDA with Sym8 decomposition levels using PGA.

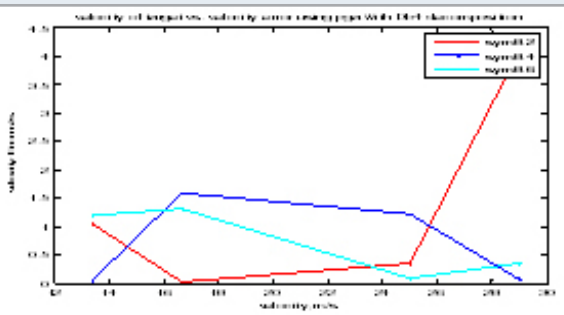


Fig.13 (a) Raw data (b) Isolation of moving target (c) Final processed data using modified RDA using PGA method.

Table 4. The estimated velocities and the velocity errors compared with true velocities of moving target using modified RDA with Sym8-2, Sym8-4 and Sym8-6 decomposition levels with PGA method

S.No	Model	True velocity = 13.88m/s		True velocity = 16.67m/s		True velocity =25m/s		True velocity = 29m/s	
		Estimated velocity	Error	Estimated velocity	Error	Estimated velocity	Error	Estimated velocity	Error
1	Modified RDA with Sym8-2	14.92	1.04	16.64	0.02	25.35	0.35	24.92	4.07
2	Modified RDA with Sym8-4	13.92	0.04	15.07	1.59	23.78	1.22	29.07	0.07
3	Modified RDA with Sym8-6	15.07	1.19	15.35	1.31	24.92	0.08	29.35	0.35

Table 5. The estimated velocities and the velocity errors compared with true velocities of moving target using modified RDA with different wavelet decomposition levels using PGA method and conventional RDA.

S.No	Model	True velocity =13.88m/s		True velocity =16.67m/s		True velocity =25m/s		True velocity =29m/s		Average Velocity Error(m/s)
		Estimated Velocity (m/s)	Error	Estimated Velocity (m/s)	Error	Estimated Velocity (m/s)	Error	Estimated Velocity (m/s)	Error	
1	Conventional RDA	14.64	1.26	15.21	1.45	23.07	1.93	28.92	0.07	1.17
2	Modified RDA with Haar-2	15.68	1.8	17.07	0.40	23.01	1.99	29.21	0.21	1.10
3	Modified RDA with Haar-4	12.92	0.92	16.07	0.59	24.35	0.65	27.78	1.21	0.84
4	Modified RDA with Haar-6	14.17	0.29	18.64	1.97	25.07	0.07	26.35	2.64	1.24
5	Modified RDA with Db4-2	13.57	0.31	14.64	2.02	23.89	1.11	29.78	0.78	1.05
6	Modified RDA with Db4-4	13.36	0.52	13.92	2.74	23.00	2.00	28.78	0.21	1.36
7	Modified RDA with Db4-6	15.64	1.76	15.78	0.8	23.28	1.72	28.92	0.07	1.08
8	Modified RDA with Sym8-2	14.92	1.04	16.64	0.02	25.35	0.35	24.92	4.07	1.37
9	Modified RDA with Sym8-4	13.92	0.04	15.07	1.59	23.78	1.22	29.07	0.07	0.73
10	Modified RDA with Sym8-6	15.07	1.19	15.35	1.31	24.92	0.08	29.35	0.35	0.732

Table-5 and Fig.12 show the estimated and error velocities compared with true velocities of moving targets using conventional RDA and modified RDA with different wavelet decomposition levels using PGA method. According to above observations, we conclude that the sym8-4 and sym8-6 decomposition levels give estimated values with minimum velocity errors,and the velocity errors are approximately constant when compared with other decomposition levels using Sym8, Haar and Db4.

Table 6. The estimated moving target unknown velocity at different cross-track and along-track velocities using conventional RDA with PGA method.

S.No	Radial velocity (m/s)	Cross-range velocity (m/s)	Estimated Velocity (m/s)	Minimum entropy
1	0.30	18.3554	18.3	3322.6
2	0.32	13.9289	13.9	3328.4
3	0.34	14.0711	14.0	3321.6
4	0.36	13.7867	13.7	3329.1
5	0.38	12.3557	12.3	3322.4
6	0.40	20.6448	20.6	3329.0
7	0.42	5.6441	5.6	3324.6
8	0.44	9.9289	9.9	3329.5
9	0.46	23.2131	23.2	3325.4
10	0.48	25.0710	25.0	3327.3

Table 7. The estimatedmoving target unknown velocity at different cross-track and along-track velocities using RDA with Haar-2 using PGA method.

S.No	Radial velocity (m/s)	Cross-range velocity (m/s)	Estimated Velocity (m/s)	Minimum entropy
1	0.30	7.9288	7.92	3307.1
2	0.32	15.3555	15.35	3313.7
3	0.34	21.6449	21.64	3303.6
4	0.36	21.9290	21.92	3316.5
5	0.38	8.7865	8.78	3308.0
6	0.40	18.2132	18.21	3315.6
7	0.42	16.2133	16.21	3311.0
8	0.44	15.2133	15.21	3315.2
9	0.46	14.7867	14.78	3312.5
10	0.48	12.2134	12.21	3313.9

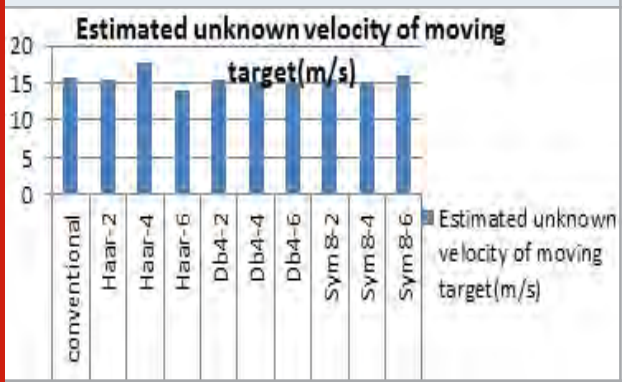
Fig.13shows the scene of moving vehicles with unknown velocities on the road (URL,sputniknews.org). Usingroipoly MATLAB function, we selected the moving object with the unknown velocity from the scene as shown in Fig.13 (b). Then the signal is processed by using conventional RDA with PGA method. Table-6 shows at different radial velocities, the cross-range velocity with minimum entropy are calculated. The average estimated unknown velocity is calculated from the radial and the cross-range velocities. The average estimated unknown velocity of target from ten observations is equal to 15.69m/s. Table-7 shows the selected signal processed by using modified RDA with Haar-2 using PGA methodat different radial velocities, the cross-range velocity. with minimum entropy is calculated.

Therefore we estimate the unknown velocity of moving target from Table-8 and Fig.14 show the estimated unknown velocity of moving target using conventional RDA and modified RDA with different wavelet decomposition levels using PGA method. The average estimated unknown velocity of moving target from the conventional and modified RDA is 15.47m/s. According to Fig. 3 and Table-5, the average velocity error of moving targets with known velocities using the conventional RDA and the modified RDA are not exceed 1.5m/s. therefore the estimated unknown velocity of moving target as shown in Fig. 13are approximately equal to 15.47±1.5m/s. The performance of Sym8 wavelet is better when compared with conventional RDA and modified RDA. The unknown velocity of moving target is estimated by using modified RDA and compared with conventional RDA method. The unknown velocity of moving target present in the scene is calculated using this proposed method with ±1.5 velocity error.

Table 8. The estimated moving target unknown velocity using RDA with various wavelets with different decomposition levels using PGA method.

S.No	Model	Estimated unknown velocity of moving target(m/s)
1	Conventional RDA	15.69
2	Modified RDA with Haar-2	15.48
3	Modified RDA with Haar-4	17.60
4	Modified RDA with Haar-6	14.12
5	Modified RDA with Db4-2	15.29
6	Modified RDA with Db4-4	15.10
7	Modified RDA with Db4-6	14.95
8	Modified RDA with Sym8-2	15.40
9	Modified RDA with Sym8-4	15.20
10	Modified RDA with Sym8-6	15.95

Figure 14: Estimated unknown velocity of moving target using conventional RDA and modified RDA.



CONCLUSIONS

The performance of the modified Range–Doppler algorithm using different wavelet decomposition levels with Phase gradient method is appropriate for estimating the velocities of moving targets in the presence of phase errors. In this proposed method, the RCMC, focus filtering and wavelet decomposition are performed automatically to reduce the phase errors. The coefficients extracted from this process are used to estimate the velocity of moving target. The average velocity errors using modified RDA with different decomposition levels using Sym8 wavelet is 0.944m/s, with Haar wavelet is 1.06m/s, with Db4 is 1.16m/s and conventional RDA is 1.17m/s respectively.

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Security Based Adversary Prevention Scheme for MANET

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ABSTRACT

Due to the dynamic nature of ad hoc network, the nodes can be easily compromised by means of attackers. Due to attackers, the network will be vulnerable and it will not be useful for the transmission of data. Security is a major concern and it plays an important role to protect the data packets from the network. In this research work, Security based Adversary Prevention Scheme (SAPS) is proposed to isolate attack and provide security among the mobile nodes. It consists of two phases. In first phase, round trip time based worm hole detection scheme is introduced to isolate the attackers based on probability of packet loss and probability of clock delay. In second phase, secret sharing based encryption and decryption scheme is deployed to reduce the impact of attacks and also to provide authentication and integrity of data. The simulation results are performed using network simulation tool.

KEY WORDS: MANET, WORMHOLE ATTACK, DETECTION AND PREVENTION, SECRET SHARING, ENCRYPTION AND DECRYPTIONC.

INTRODUCTION

Mobile ad hoc network is a group of nodes which are distributed to ensure efficient packet delivery without relying any base station. Based on the requirement of data, routes are created automatically on their own. In the presence of dynamic topology, nodes may attempt to perform packet transmission and take part in the route.

Packet transmission in ad hoc network may get affected due to resource constraints and security attacks. The major attack concentrated in this work is worm hole attack. The regular activity of route and data is affected by the wormhole attack by dropping packets in unauthorized places. It will interrupt the data transmission in future. Due to the collection of attacks, the security level may be violated which will disturb the normal operations.

ARTICLE INFORMATION

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Previous Work: (Selladevi et.al 2019; E.Vishnupriya 2015) proposed artificial immune system to detect wormhole attack based on the consideration of delay and route length form source to sink node, The detection accuracy was improved using enhanced secure aware wormhole attack detection scheme. A scalable and distributed scheme was adopted to neglect single node failures and high speed using the probability value of sequential set. An effective and scalable approach were determined to reduce the problem of attackers i.e. wormhole attacks in the network. (Vandana et.al 2013) introduced the concept of worm hole detection approach using hop latency and neighbor node analysis method. In this scheme, only on demand vector routing model was adopted which can support up to certain level. Meanwhile the per hop determination model produced lagging in the performance. The adjoining node detection schemes reduced the overhead dramatically but not upto the QoS meets.

(Swapnil S. Bhalsagar et.al 2019) proposed the security enhancement schemes to provide authentication in ad hoc networks. The working of trust mechanism and its behavior is compared with various attackers. The 5c[;p'm reliability based models and approaches were introduced in order to avoid misbehaving nodes in the routes based on the assignment of trust value. Based on the comparative analysis, the trust based security schemes provides better security and less delay compared to existing schemes. The source routing protocol was analyzed with respect to delivery rate, and delay. (Julián Ramírez Gómez et.al 2019; R.ArunPrakash et.al 2018) proposed a wormhole attack detection with Xbee 2 devices. The packets were manipulated with Scapy coding techniques and killer bee framework model. Meanwhile the risk of misbehaving nodes and flexibility of network was analyzed and summarized in the network. The new type of worm hole attack was identified and reduced the impact of attackers. The vulnerability of zigbee device for wrong packet injection was identified. The gap was identified with the new variant of worm hole attack to find the gap of IoT with the recent technology. The end mobile users were enabled to provide security for real devices. (Mohammad Riyaz Belgaum et.al 2019) proposed the triple factor approach based on reactive routing to improve the delivery ratio with low overhead in the presence of misbehaving nodes.

Due to dynamic nature, there is a chance of becoming misbehaving node from normal node. The reason for finding misbehaving nodes with triple factor mechanism using cryptographic mechanism was also obtained in this phase to provide secure transmission path. The network throughput was improved based on network routes and elimination of false nodes. (Muthukumar and Ruba Soundar 2019) developed the five stage security analysis model to identify the worm hole attacks in ad hoc networks. The information about the nodes, route and communicated history was collected and analyzed. The indirect communication between the nodes was monitored in hop manner between the intermediate nodes. It is easy to determine the nearby disjoint neighbors in the route.

(Vikram Neerugatti and Rama Mohan Reddy 2019) proposed acknowledgement based technique for detecting wormhole attacks in the internet of things networks. The tunneling procedure in wormhole attack observes the packets in one location and drops it in another location. It leads to the collision of packets during route reply phase from the intermediate nodes or sink node. Acknowledgement based approach was used for the detection of worm hole attack in the internet of things network. The analysis of proposed scheme was done with Contiki Cooja simulator in terms of Quality of service metrics. (Sharada Kori et.al 2019; R. Kiruba Buri and T. Jayasankar 2019) proposed the two tier wormhole detection mechanism based on mamdani fuzzy model. In the fuzzy decision routing, output is varied as low, medium, high and very high. The fuzzy inference technique was used to differentiate the crisp values based on the input given. Here the inputs were assigned to fuzzy set values. During the evaluation phase, fuzzy input values are received to minimize the stage of min method to attain high output.

(Ambili and Jimmy Jose) proposed trust based intrusion detection system for detecting insider attacks in internet of things systems. The trust results of the nodes based on response to request packets to provide trustworthiness of the node. The block-chain was maintained to store the trust result. In this case, each node may act as monitoring node to evaluate the performance of the network. All the scores were loaded into the machine based on trust results. Based on the results, node will be decided to join or leave the network. (Sharada Kori et.al 2019) proposed the wormhole attack mitigation scheme using two tier authentication system. It was used to separate misbehaving node from the normal node. If the round trip time of misbehaving node is expired, it will be immediately isolated from the network. Next hop intermediate node was utilized for fast transmission to reduce overhead. A worm hole node was tried to attract the intermediate nodes within the network transmission radius.

MATERIAL AND METHODS

Performance of Saps: In this section, the concept of round trip time based technique is adopted. It is based on packet dropping and routing trip time of request packets with hop count metric. In the presence of traffic congestion, the network may be collapsed that leads to more overhead. Due to the presence of observer and dropping attack in the attack, the length of route may be extended which leads to reduce the round trip time value of data packets. Small processing delay may occur between the nodes which causes congestion.

The proposed technique is aware of the entire route information about packet dropping and end to end delay per hop path for the entire route in an ad hoc network.

The every sector of wormholes is derived without consuming major cost. Proposed technique permits the source or cluster head in the network environment to estimate the probability of wormhole detection for a particular route with the inclusion of hop count of the path. The clock per delay probability value is estimated to identify the presence of wormhole attack in the network. It can also be deployed to determine the clock delay probability of entire route and probability of packet loss in a route during transmission. Both calculation of probability is used to discover the secure route for future transmission.

The following steps are used to identify the wormhole attack in a network.

Step 1: Source node initiates a broadcasting process by sending route request packets and receives replies via intermediate nodes.

Step 2: Calculate the round trip time based on received and sent packets

$$RTT = \tau_k - \tau_m$$

Step 3: Probability of clock per delay is the probability of clock delay produced at each hop in the discovered route from source to sink node.

Step 4: Estimate the probability of total clock delay during the broadcast of request and reply packets. The mathematical model is given as,

$$PCD_{TOT} = PCD_{REQ} + PCD_{REP}$$

Step 6: The probability of clock delay of entire route is estimated based on the product of clock delay probability of individual mobile nodes in a route. The mathematical representation is given as,

$$(PCD_R) = 1 - \left(\prod_{l=1}^{m} (1 - PCD_l) \right)$$

Step 7: The source node forwards the fake packets to the intermediate nodes towards destination node to check the presence of wormhole attackers in a particular route. The packet loss rate probability of particular route is also determined by the sender node. It is estimated as,

$$(PLR_R) = 1 - \left(\prod_{l=1}^{m} (1 - PLR_l) \right)$$

Step 8: Discover the new route if the packet loss probability of individual exceeds the threshold value. It seems the presence of attackers.

Step 9: The presence of wormhole attacker probability is based on the relationship between packet loss rate probability and probability of clock delay in the particular route. It is represented as,

$$PWD_R = \{PCD_R + PLR_R - (PCD_R . PLR)\}$$

Step 10: Source node finds the detection of worm hole attack and isolate them by avoiding the path. The alternative path selection mechanism is adopted to reroute the packets towards sink node.

Secure encryption and decryption procedure: In this phase, secret key based encryption and decryption is adopted to produce authentication. Secret keys are shared between the multiple nodes to encrypt or decrypt the message. The generation of secret keys is of great importance. The sequence number is altered and added in each packet to find the presence of attackers. The encryption is performed at each interval to protect the data from the intruders. At destination or sink node, the message will be decrypted and the same will be forwarded to nearby node. The process will be continued until the assurance of secure transmission begins.

Encryption model: The encryption is performed using the public key K. The plain text N is converted into cipher text C by encrypted with public key. The process is given as below.

$$C = N^K \pmod m$$

Decryption model: The decryption is performed using the private key G and it is derived as,

$$C^G = (N^K)^G = N \pmod m$$

Based on decryption scheme, original message can be retrieved at the sink node.

RESULTS AND DISCUSSION

Security based Adversary Prevention Scheme is simulated using network simulation tool. Table 1 shows the performance settings of propose scheme.

Table 1. Simulation and Setting Parameters of SAPS

No. of Nodes	100
Area Size	1200 X 1200 sq.m
Mac	802.11
Radio Range	100 meter
Simulation Time	100 sec
Traffic Source	Poisson
Packet Size	80 bytes
Mobility Model	Random Way point
Protocol	DSR
The following performance parameters are used to evaluate the system results.	

Packet loss rate: It is the ratio of number of packet loss to the total number of packets travelling in the route.

Network reliability rate: It is the ratio of number of reliable nodes to the total available links.

Control overhead: It is defined as the number of excessive route control packets to the total number of packets obtained.

4 Packet delivery ratio: It is the ratio of packet delivered to the packet sent during route maintenance phase.

Network lifetime: It is the no. of epochs in the route during entire route maintenance phase.

Figure 1: Packet delivery ratio Vs No. of Nodes

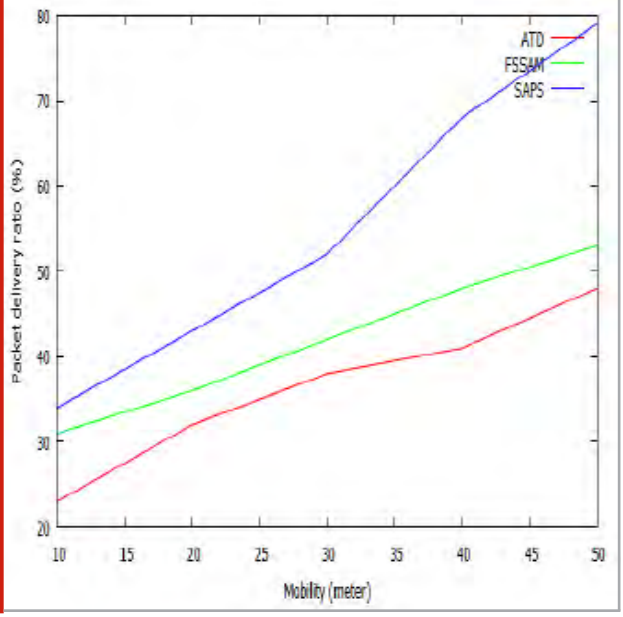


Figure 1 shows the performance of SAPS in terms of packet delivery ratio. Compared to existing schemes, the proposed scheme achieves high packet delivery ratio while varying mobility in x axis.

Figure 2 illustrates the result of network reliability rate of proposed system while varying the number of links in x axis. From the results, it is seen that proposed scheme achieves high network reliability rate than existing schemes.

Figure 3 illustrates the performance of packet loss rate while varying number of nodes in x axis. The packet loss rate of proposed scheme is low compared to existing schemes.

Figure 4 illustrates the performance of control overhead while varying the number of packets. The SAPS consumes less overhead than existing schemes.

Figure 2: End to end delay Vs No. of Nodes

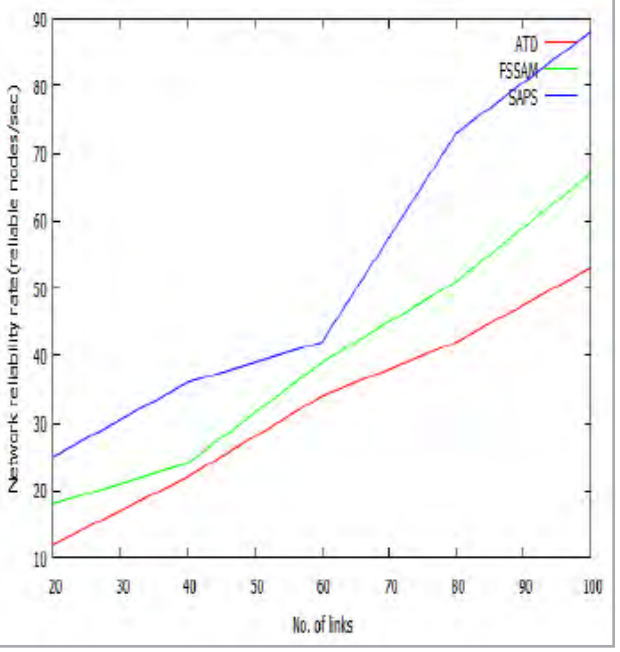


Figure 3: Packet reliability rate Vs No. of packets

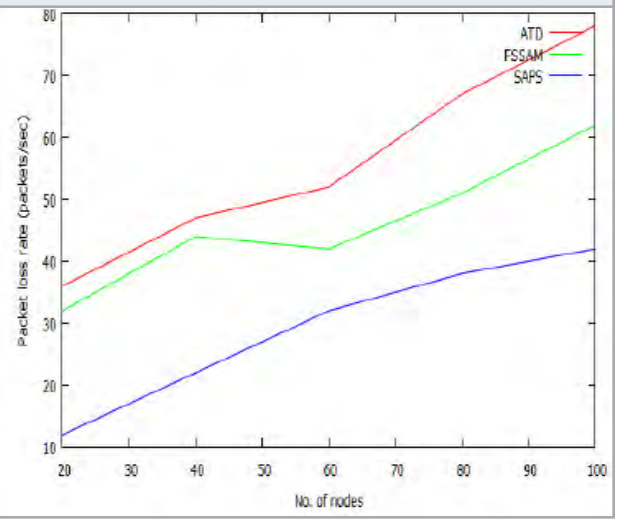


Figure 4: Control Overhead Vs No. of Packets

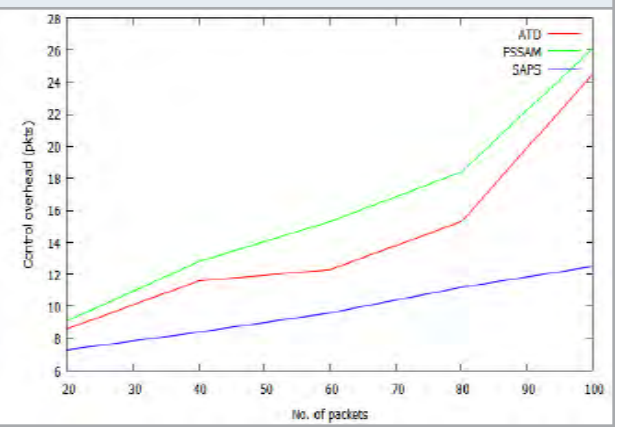
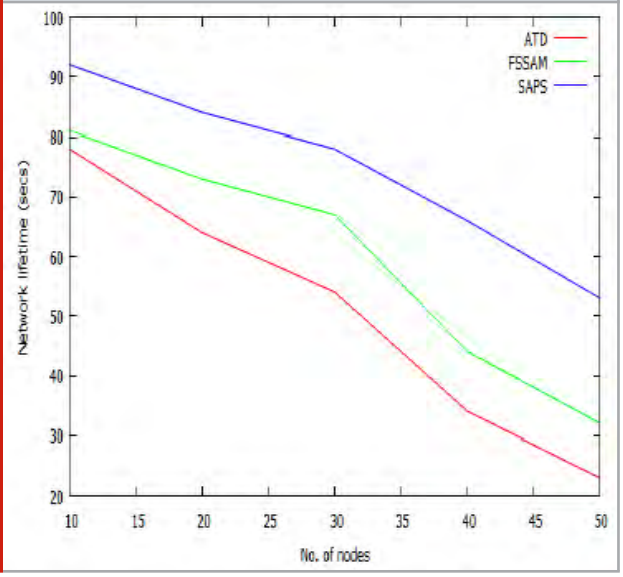


Figure 5 shows the results of network lifetime while varying number of nodes in x axis. It is seen that SAPS achieves high network lifetime than existing schemes.

Figure 5: Network Lifetime Vs No. of Nodes



CONCLUSION

Security is a major concern in ad hoc networks. Due to open nature, the attackers can easily enter into the network environment and inject the false information. Due to that, the security plays a vital role in the network. Meanwhile the presence of wormhole attack makes network more difficult. To avoid such issues, the Security based Adversary Prevention Scheme (SAPS) is introduced to withstand attacks and provide authentication among mobile nodes. Secret sharing procedure with encryption and decryption scheme was adopted. From the results, SAPS outperforms than exiting schemes. In future, it is planned to add cross layer based secret sharing to withstand both energy and authentication.

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The Impact of Voluntary Disclosure on Financial Reporting Quality – An Applied Study on the Listed Banks' Sector in the Saudi Stock Exchange

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ABSTRACT

The goal of research to clarify the importance of voluntary disclosure and test the impact of voluntary disclosure on financial reporting quality in the Saudi stock exchange. To achieve this objective, reference was made to previous studies and related research, with an applied study of a sample of (12) bank from commercial banks listed in the Saudi Stock Exchange during the time series (2015-2019), The data were analyzed through (SPSS 17.0) using multiple regression analysis. The study concluded that there is a statistically significant impact of voluntary disclosure on earnings quality measures and hence financial reporting quality, represented in the ratio of net operating cash flows/net operating profit, the ratio of the difference between net accounting profit and net operating cash flows/ net operating cash flows, the ratio of the difference between net accounting profit and net operating cash flows/ the average of total assets, and the ratio of the standard deviation of net operating profit/the standard deviation of net operating cash flows. This emphasizes the importance of voluntary disclosure in corporate financial reporting. The study8 recommends conducting seminars for boards of directors of listed companies in the stock market in order to spread the culture of voluntary disclosure and know its importance and positive impact on promoting the quality of financial reporting, developing accounting standards for disclosure, and the conversion of voluntary disclosure information to mandatory information according to the needs of investment decision-makers, and carrying out further scientific research in this area.

KEY WORDS: VOLUNTARY DISCLOSURE, EARNINGS QUALITY, FINANCIAL REPORTING QUALITY, FINANCIAL AND NON-FINANCIAL INFORMATION, THE BANKING SECTOR, THE SAUDI STOCK EXCHANGE, AN APPLIED STUDY.

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INTRODUCTION

In light of the globalization of financial markets and technical and information developments taking place in the world, mandatory disclosure has not yet met the multiple needs of users of accounting reports and information. Therefore, the need for voluntary disclosure was an urgent necessity to reduce the variance of information between managers and investors and to improve the quality of the disclosed information (Helmi, 2020). The study of (Salehi et al. 2018) has indicated that the objective of voluntary disclosure of financial reports and lists is to provide current and prospective investors and creditors with information that enables them to estimate the amount, time and benefits of their investments, to reduce the cost of the capital that the company wants to obtain by providing sufficient and accurate information to make investment decisions, and to reduce information asymmetry among dealers in the stock market, leading to the activation of the market and the performance of its role effectively and achieving balanced prices for various aspects of investment (Chin et al. 2019).

Consequently, the voluntary disclosure is a practical and logical solution to the problem of the inability to determine the needs of users for financial reports (Consoni et al. 2017). The financial reports quality relates to the extent of the ability of disclosed information to make a difference in the decisions of financial reports' users. Thus, the identification of the effect of voluntary disclosure on the quality of financial reports is one of the most significant topics that require more attention and research (Mankin et al. 2017), financial reports aim to provide its users with the necessary information, but traditional financial statements are no longer sufficient to meet its users' needs due to the fact that these traditional statements neglect the disclosure of many of items, especially non-financial ones. In fact, non-financial statements become very important when estimating the value of a company and evaluating its performance. Then, the development and amendment of the traditional report model become an urgent necessity in order to provide its users with the necessary information. Interest in expansion has increased in the voluntary disclosure of financial reports has considered due to the lack of transparency and the manipulation and the exploitation of internal information by the management or some investors (Carvalho et al. 2017).

Moreover, the issue of the quality of financial reports and the extent of its expression of the company's financial position and business results has recently received a great deal of attention owing to the fact that financial crises overthrew the business establishments and negatively affected the confidence of the users of financial reports. Accordingly, the study problem is to test the impact of voluntary disclosure on financial reporting quality with applying to banks sector listed in the Saudi stock exchange, and then the research problem revolves around the following question: What is the impact of voluntary disclosure on the financial reporting quality in banks listed in the Saudi stock exchange?

The Role of Voluntary Disclosure in Improving the Financial Reporting Quality

The Concept of Voluntary Disclosure and Its Components: The voluntary disclosure is:" disclosing any information that exceeds mandatory disclosure with the aim of providing the users of financial reporting with additional information that meets their needs" (Hassan, 2010). The study of (Antonelli et al. 2017) has stated that "voluntary disclosure represents free options of the company's management to provide accounting information and other information in annual financial reporting of the company that seems appropriate to the users of information when making decisions". The components of voluntary disclosure include (Scaltrito , 2016) information about: the company's strategy and its business model, general information about the company, the classification of investors and the performance of stocks, future perspectives, the board of directors, the costs of research and development, financial, environmental and social sustainability, governance (Chobpichien, 2020), the company's staff, risks and the continuity of business, the most prominent decisions and achievements during the year, and the financial performance and financial and non-financial analyses (Rezaee and LingTuo 2017).

The Importance of Voluntary Disclosure: The voluntary disclosure contributes to achieving the objectives of the financial reporting, as the disclosure of financial and non-financial information leads to providing the users of reports with useful information that enables them to make rational investment decisions, and it contributes also to improving the understanding of the information contained in financial reports (Enache and Hussainey 2020; Grewalet al. 2017; Diez et al. 2018; Weiss and Shon 2017; SudiptaBose and Habib 2017). In reality, providing further financial and non-financial information leads to improving the quality of accounting information, which increases the quality of information content of financial reports, contributes to raising the efficiency of companies' performance, provides information to assist the users of financial reports in estimating risks, and provides information about future cash flows. This reflects on the company's reputation and market value in the stock market (Oyerogba, 2014). In addition, the voluntary disclosure contributes to improving the quality of financial reporting. The more the level of the disclosure, the more the quality of financial reporting, leading to reducing the asymmetry of information, decreasing the costs of capital, increasing the value of the company, increasing the degree of liquidity in the market, in addition to promoting the confidence of the market's dealers, and then improving the efficiency of investment and reducing the degree of risks surrounding investments (Dencicihajlov and Spasic, 2016).

Factors Affecting the Level of Voluntary Disclosure: There are many factors that affect the level of voluntary disclosure, where the study of (Jaggi et al. 2017) showed

that environmental committees, ownership structure and the independence of the board of directors are more important factors affecting the voluntary disclosure than environmental information. The study of (Call et al. 2017) found that there is a relationship between the quality of staff's education involved in preparing reports and the quality of these reports. The study also demonstrated that the level of education affects the level and quality of mandatory and voluntary disclosure.

The study of (Rene, 2017) illustrated that the types of compensations affect the voluntary disclosure, as incentives based on the prices of stocks have a positive relationship with the voluntary disclosure. The study of (Chen et al. 2015) concluded that there is a positive relationship between auditing fees and the possibility of issuing the report of corporate social responsibility as a type of voluntary disclosure. The study of (Adelopo, 2011) demonstrated that there is a positive relationship between the size of the company and the voluntary disclosure, According to (Mohammad, 2013), the size of the company and profitability have a positive relationship with the voluntary disclosure, and the size of the auditing office and financial leverage is one of the most important factors that affects the voluntary disclosure. The study of (Broberg and Collin 2010) concluded that the size of the company and its debt have a positive relationship with the voluntary disclosure.

The Concept of Financial Reporting Quality and Factors Affecting It: The study of (Herath and Albarqi 2017) defined the financial reporting quality as: "the quality means a set of characteristics that the accounting information must have to be useful to meet the necessary needs of its users. These characteristics are understandability, reliability, relevance, comparability, and appropriate timing. The financial reporting quality mainly related to the extent of the difference in the decisions of these reports' users". AICPA defined it as: "the extent of the ability to use information in forecasting, and the extent of the suitability of the information for the purpose of obtaining it, as well as the degree of honest representation of financial reports that reflects the basic accounting concepts. There are many factors that affect the financial reporting quality (Al-Shaer et al. 2017; Xu-dong et al. 2017). These factors are the size of the company and its future development, the company's performance, debt ratio, ownership structure, the governance of companies, internal control system, the quality of accounting standards, internal and external auditing, and the committee of auditing.

Measuring the Financial Reporting Quality: Previous studies were different in the methods of measuring the financial reporting quality, where there were two trends for measurement (Maria and Emma 2017; Tan et al. 2016; Shroff, 2015; Gajevszky, 2015). The two trends are the following:

The First Trend: It is the measurement of the financial reporting quality through the characteristics of the quality of accounting information: relevance, credibility, comparability, understandability, appropriate timing, honest expression, etc. However, these characteristics are difficult to measure in a quantitative manner to validate the quality of financial reporting.

The Second Trend: It is the measurement of the financial reporting quality through earnings quality by the accruals value or a set of financial indicators. The current study focuses on the second trend of measurement through financial indicators. Studies agreed that the measurement of earnings quality is to be done through a set of financial ratios that link cash flows of operating activities and net profit and standard deviations. The study explores these financial ratios in the following section: (Pietro, 2014; Leuz et al. 2003)

1 The Ratio of Net Operating Cash Flows/ Net Operating Profit
This measurement has been used in many studies as an indicator of earnings quality, and hence the quality of financial reporting. The higher the value of this ratio, the higher the earnings quality, and then the higher the quality of financial reporting, and vice versa.
2 The Ratio of the Difference Between the Net Accounting Profit and Net Operating Cash Flows/ Net Operating Cash Flows
This ratio depends on the fact that the lower the difference between the net accounting profit and the net operating cash flows to net operating cash flows, this is an indication that the profits are of high quality, and therefore and then the higher financial reporting quality, and vice versa.
3 The ratio of the Difference Between the Net Accounting Profit and the Net Operating Cash Flows/ the Average of Total Assets
This ratio depends on the fact that the lower the difference between the net accounting profit and the net operating cash flows to the average of total assets, the higher the quality of the profit. The opposite is right where the higher this ratio, the lower profits quality, and thence the lower financial reporting quality.
4 The Ratio of Standard Deviation of Net Operating Profit/ the Standard Deviation of Net Operating Cash Flows

This ratio depends on the fact that earnings quality can be measured through constancy and stability in profits. So, the lower this ratio, this indicates the stability of accounting profit, and hence the possibility of using it to forecast and increase the quality of profits, and then increasing the quality of financial reporting.

The Relationship Between the Voluntary Disclosure and the Quality of Financial Reporting: The voluntary disclosure affects the quality of financial reporting, as companies that expand the disclosure of financial and non-financial information enjoy the quality of their reports. The study of (Francis and Dhananjay

2008) stated that companies have objectives to expand information disclosure. These objectives are: (1) assisting financial reports' users in making rational economic decisions, which lead to improving the quality of financial reporting, increasing the value of the company, and the stability of the financial market. (2) The voluntary disclosure contributes effectively to enhancing confidence in companies' financial reports. The study of (Scaltrito, 2016) revealed that the voluntary disclosure of ratios, financial analyses and of information about the company's activity and future play a significant role in the quality of financial reporting. The study of (Xi Li, 2015) confirmed that the higher the level of disclosure of financial reports, the higher the improvement in the quality of them, as companies' commitment to expand disclosure contributes to make the users of financial reports aware of everything related to these reports. This leads to protecting financial reports' users from illegal practices, improving the understanding and credibility of information contained in these reports, reducing the state of information asymmetry, and decreasing the cost of capital. This reflects on improving the quality of financial reporting.

There is a positive relationship between voluntary disclosure and the quality of accounting profits. In fact, companies that enjoy a high quality of profits have a higher voluntary disclosure than companies that enjoy a low quality of profits. Therefore, the high quality encourages the company to disclose information. Also, companies with low accounting profits quality, which results from profit management practices, intentionally disclose more information to avoid the negative effects of low-profit quality. Recently, the topic of the relationship between the voluntary disclosure, information quality, and information asymmetry has received more attention. The study of (Olsson, 2013). Discussed that low quality of information results in higher information asymmetry, which leads to increased demand for disclosure of information, and study referred (Lemma et al. 2020) to firms with higher carbon risk exposure tend to provide financial statements of poorer quality and this association is partially mediated through voluntary carbon disclosure. The negative association between corporate carbon risk exposure and the firm's financial reporting quality is partly explained by the quality of voluntary carbon disclosure. Hence, it can be considered that the quality of information and the voluntary disclosure are alternatives to each other. However, the quality of information, on the other hand, also affects the quality of voluntary disclosure.

Accordingly, the researcher concludes that there is a positive relationship between the voluntary disclosure and the quality of financial reporting, as the more the level of voluntary disclosure, the more the quality of financial reports. The researcher also sees that there is an integrated relationship between the voluntary disclosure and the financial reporting quality because companies' commitment to voluntary disclosure improves earnings quality, which reflects on the quality of financial reporting.

The Research Methodology: The applied study aims to test the effect of voluntary disclosure on the quality of financial reports. Earnings quality has been used as a measure of the quality of financial reports in banks listed in the Saudi stock exchange. To achieve this goal, the researcher has relied on the content analysis method, where financial reports have been analyzed for all commercial banks registered in the Saudi stock market. The main hypothesis can be formulated as follows: "There is no statistically significant effect of the voluntary disclosure on earnings quality".

The Study's Population and Sample: The study's population is represented in a "Saudi commercial banks, the number of which is (23) banks during the period from (2015-2019). The study's sample consists of (12) banks with a rate of 52.2 % because these banks are registered in the Saudi capital market and the availability of annual financial reports for these banks during the study period. Data has been obtained from the financial lists found in the banks' websites on the internet, or available at www.tdawul.com, or www.mubasher.info.

The Study's Variables and their Measurement

The Independent Variable: It is the voluntary disclosure. It is symbolized by (X). This variable is measured by giving weights to each of the elements of the voluntary disclosure list. It takes the value (1) in case of the voluntary disclosure by the bank and takes the value (0) if the bank will not make the voluntary disclosure.

S	Element
1	Information about the company's strategy and its business model.
2	General information about the company.
3	Information about the classification of investors and stock performance.
4	Information about future perspectives.
5	Information about the board of directors.
6	Information about the costs of research and development
7	Information about financial, environmental and social sustainability.
8	Information about governance.
9	Information about the company's staff.
10	Information about risks and business continuity.
11	Information about the most prominent decisions and achievements during the year.
12	Information about the financial performance, and financial and non-financial analyses.

The Dependent Variable: It is earnings quality and It is symbolized by (Y). Since there are many measurements that are used to measure earnings quality (mentioned above), the study has used more than one measurement as follows:

1 The ratio of net operating cash flows/ net operating profit.
2 The ratio of the difference between net accounting profit and net operating cash flows / net operating cash flows.
3 The ratio of the difference between net accounting profit and net operating cash flows / the average of total assets.
4 The ratio of the standard deviation of net operating profit / the standard deviation of net operating cash flows.

Results of Statistical Analysis:

The Results of the First Sub-Hypothesis Test: it states: "There is no statistically significant effect of voluntary disclosure on the ratio of net operating cash flows / net operating profit". The following table No. (1) shows the most important results that were obtained from the simple linear regression analysis of data during the period (2015 – 2019).

Table (1). Results of regression analysis for the data during the period (2015 - 2019)

Model	Unstandardized Coefficients			Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
	(Constant)	.028	.090	.	309	.758
	X	0.898	.033	970	30.630	.000

Dependent Variable: Y

Thus, the formula for the simple regression equation for the data takes the following form:

Y = 0.028 + 0.898 X
R2 = 0.970 R = 0.942
Adjusted R2 = 0.941 F Calculated = 938.222
Sig. F =.000

Through statistical analyses, the following results can be summarized: The coefficient of determination R2 is (0.970) and the adjusted R2 is (0.941), which is a high ratio. There is a positive relationship between the independent variable X and the dependent variable Y at the significance level 1%. This means that the voluntary disclosure leads to an increase in this ratio, and then an increase in earnings quality, as the correlation coefficient (R) reached (0.942), which is a high coefficient. Likewise, the model significance where the significance F is less than 1% and the calculated value of F reached 938.222, which is greater than tabulation. The significance of the independent variable X is high, where the significance of T is less than (α=5%), meaning that there is a significant effect of this variable on the dependent variable. Accordingly, the previous results show the invalidation of the first sub-hypothesis, and show also the validation of the alternative hypothesis, which states that: "There is a statistically significant effect of voluntary disclosure on the ratio of net operating cash flows / net operating profit".

The Results of Second Sub-Hypothesis Test

It states: "There is no statistically significant effect of voluntary disclosure on the ratio of the difference between net accounting profit and net operating cash flows / net operating cash flows".

Table 2. Results of regression analysis for the data during the period (2015 - 2019)

Mode	Unstandardized Coefficients			Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
(Constant)		390	.263		1.483	.144
X		-.785-	.198	-.462	-3.969	.000

a. Dependent Variable: Y

Thus, the formula for the simple regression equation for the data takes the following form:

Y = 0.390 - 0.785 X

R2 = 0.214 R = 0.462
Adjusted R2 = 0.200 F Calculated = 15.573
Sig. F =.000

Through statistical analyses, the following results can be summarized: The coefficient of determination R2 is (0.214) and the adjusted R2 is (0.200), which is a low ratio. There is an inverse relationship between the independent variable X and the dependent variable Y at the significance level 1%. This indicates that the voluntary disclosure leads to a decrease in this ratio, and then an increase in earnings quality, where the correlation coefficient (R) amounted to (0.462-). Likewise, the model significance where the significance F is less than 1% and the calculated value of F reached (15.573), which is greater than tabulation. The significance of independent variable X was high, where the significance of T is less than (α=5%), meaning that there is a significance effect of this variable on the dependent variable. Accordingly, the mentioned above results demonstrate the invalidation of the second sub-hypothesis and the validation of the alternative hypothesis, which states: "There is the statistically significant effect of voluntary disclosure on the ratio of the difference between net accounting profit and net operating cash flows/ net operating cash flows".

The Results of Third Sub-Hypothesis Test

It states: "There is no statistically significant effect of voluntary disclosure on the ratio of the difference between net accounting profit and net operating cash flows / the average of total assets". The following table No. (3) shows the most important results that were obtained from the simple linear regression analysis of data during the period (2015 – 2019).

Table 3. Results of regression analysis for the data during the period (2015 - 2019)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
(Constant).		020	.079		.255	.800
X		-.505	.106	-.531	-4.768	.000
a. Dependent Variable: Y						

Thus, the formula for the simple regression equation for the data takes the following form:
Y = 0.020 - 0.505 X
R2 = 0.282 R = 0.531
Adjusted R2 = 0.269 F Calculated = 22.734
Sig. F =.000

Through statistical analyses, the following results can be summarized: The coefficient of determination R2 is (0.282) and the adjusted R2 is (0.269), which is a low ratio. There is an inverse relationship between the independent variable X and the dependent variable Y at the significance level 1%. This indicates that the voluntary disclosure leads to a decrease in this ratio, and then an increase in earnings quality, where the correlation coefficient (R) amounted to (0.531-). Likewise, the model significance where the significance F is less than 1% and the calculated value of F reached (22.734), which is greater than tabulation. The significance of independent variable X was high, where the significance of T is less than (α=5%), meaning that there is a significance effect of this variable on the dependent variable. Accordingly, the mentioned above results demonstrate the invalidation of the third sub-hypothesis and the validation of the alternative hypothesis, which states: "There is the statistically significant effect of voluntary disclosure on the ratio of the difference between net accounting profit and net operating cash flows / the average of total assets".

The Results of Fourth Sub-Hypothesis Test

It states: "There is no statistically significant effect of voluntary disclosure on the ratio of the standard deviation of net operating profit / the standard deviation of net operating cash flows". The following table No. (4) shows the most important results that were obtained from the simple linear regression analysis of data during the period (2015 – 2019).

Table 4. Results of regression analysis for the data during the period (2015 - 2019)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
(Constant)		.052	.052		1.010	.387
X		-.945	.109	-.981	-8.683	.003
a. Dependent Variable: Y						

Thus, the formula for the simple regression equation for the data takes the following form:

Y = 0.052 - 0.945 X
R2 = 0.962 R = 0. 981-

Adjusted R2 = 0.949 F Calculated = 75.398
Sig. F =.003

Through statistical analyses, the following results can be summarized: The coefficient of determination R2 is (0.962) and the adjusted R2 is (0.949), which is a high ratio. There is an inverse relationship between the independent variable X and the dependent variable Y at the significance level 1%. This indicates that the voluntary disclosure leads to a decrease in this ratio, and then an increase in earnings quality, where the correlation coefficient (R) amounted to (0.981-). Likewise, the model significance where the significance F is less than 1% and the calculated value of F reached (75.398), which is greater than tabulation. The significance of independent variable X was high, where the significance of T is less than (α=5%), meaning that there is a significance effect of this variable on the dependent variable. Accordingly, the mentioned above results demonstrate the invalidation of the fourth sub-hypothesis and the validation of the alternative hypothesis, which states: "There is the statistically significant effect of voluntary disclosure on the ratio of the standard deviation of net operating profit / the standard deviation of net operating cash flows".

CONCLUSION AND RECOMMENDATIONS

The findings of the analysis indicate that there is a statistically significant impact of voluntary disclosure on earnings quality measures and hence financial reporting quality, represented in the ratio of net operating cash flows / net operating profit, the ratio of the difference between net accounting profit and net operating cash flow / net operating cash flows, the ratio of the difference between net accounting profit and net operating cash flows / the average of the total assets, and the ratio of the standard deviation of net operating profit, the standard deviation of net operating cash flows. This confirms the importance of the voluntary disclosure of companies' financial reporting, which means rejecting the study's main hypothesis: "There is no a statistically significant effect of the voluntary disclosure on earnings quality ", and means also accepting the alternative hypothesis: "There is a statistically significant effect of the voluntary disclosure on earnings quality".

By mentioned above findings of the impact of voluntary disclosure on financial reporting quality, the researcher recommends the following: Firstly, the necessity of holding symposia for the members of the board of directors of companies listed in the stock exchange with the aim of spreading the culture of voluntary disclosure and inform them of its importance and positive impact on promoting the financial reporting quality. Secondly, the accounting standard for voluntary disclosure should be developed. Thirdly, the conversion of voluntary disclosure information to mandatory information according to the needs of investment decision-makers. Fourthly, keeping pace with economic developments. Fifthly, conducting more future research on the relationship between the voluntary disclosure and the value of the company, as well as on the impact of voluntary disclosure on the cost of capital.

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