

# EVOLVER

2024-25

Enriching Minds...



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ACADEMY OF  
TECHNOLOGY**



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## **An Invocation to EVOLUER**

Evolver has a French origin meaning “to evolve”. Evolver is here for you to change your thinking, wisdom and implement the truth of technical knowledge in you. As you scroll through the pages you would find a new insight to the advancements in science and technology. This magazine will bring in you the inquisitiveness for technology, and thereby keep you updated of the technical world. Thus we hope that our sincere effort in bringing out the 2024-2025 edition of EVOLUER will add a spark to your knowledge in this techno-world

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## **Foreword from Chairperson, Trident Academy of Technology**

I am extremely happy that the Electronics Society of our students is bearing out the next issue of their in house magazine "Evoluer". I am sure that this literary creation will bring to increase the potentiality among the young players and will prove to be a proper platform to present their talents and ideas. I wish all the best to "Evoluer".

**Mrs. Smitarani Panigrahi**

Chairperson,  
Trident group of Institution,  
Bhubaneswar.

## **Foreword from Principal, Trident Academy of Technology**

I am glad that the electronics society which is under the department of Electronics & Telecommunication engineering Trident Academy of Technology is publishing a magazine, "EVOLUER". Manufacturing of electronics system have taken rapid strides in improvement with respect to speed, size and cost. The very purpose of the magazine is to inspire creativity among students and provide a platform to showcase their potential. I am confident that the deliberation in magazine would render valuable service to the students in providing an insight to the technological updates. I wish all the success to "E-Society".

**Prof. (Dr.) Debanarayan Pattanayak**

Principal  
Trident Academy of Technology,  
Bhubaneswar

## EDITORIAL

Every issue of “EVOLUER” honour an individual who has made significant contributions of Electronics and Telecommunication Engineering and whose achievements are inspirational. After the release of the last issue, which I'm sure that all of you must have enjoyed reading, we have arrived at the happy situation of bringing the next issue. I take this opportunity to once again thank all the editorial board members. From the inception of the development of thought , the process is responsible for expanding the boundaries of our knowledge to understand the field behind the application to our syllabus. Exploration and development increase the human knowledge and experience. The pupils in this issue have struggled for more productive creativities in pursuit of excellence. The technologies that aid in integration of various sources of information and knowledge will find critical need in future for facing the challenges of understanding the field of telecommunication.

Articles exposing new frontiers of knowledge in the arenas of current advancements are published in this “EVOLUER”, will contribute to future progress in the evolution of new methodologies for different valuable applications. The diversity of topics is nicely blended into this issue and I'm sure that the readers will enjoy and get sufficiently educated to appreciate the facets of this new technological prospects. I look forward to these contributions with great anticipation.

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# EEG In The Diagnosis, Classification and Management of Patients with Epilepsy

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**Abstract**—In The human electroencephalogram (EEG) was discovered by the German psychiatrist, Hans Berger, in 1929. Its potential applications in epilepsy rapidly became clear, when Gibbs and colleagues in Boston demonstrated 3 per second spike wave discharge in what was then termed petit mal epilepsy. EEG continues to play a central role in diagnosis and management of patients with seizure disorders—in conjunction with the now remarkable variety of other diagnostic techniques developed over the last 30 or so years—because it is a convenient and relatively inexpensive way to demonstrate the physiological manifestations of abnormal cortical excitability that underlie epilepsy.

However, the EEG has a number of limitations. Electrical activity recorded by electrodes placed on the scalp or surface of the brain mostly reflects summation of excitatory and inhibitory postsynaptic potentials in apical dendrites of pyramidal neurons in the more superficial layers of the cortex. Quite large areas of cortex—in the order of a few square centimetres—have to be activated synchronously to generate enough potential for changes to be registered at electrodes placed on the scalp. Propagation of electrical activity along physiological pathways or through volume conduction in extracellular spaces may give a misleading impression as to location of the source of the electrical activity. Cortical generators of the many normal and abnormal cortical activities recorded in the EEG are still largely unknown. Spatial sampling in routine scalp EEG is incomplete, as significant amounts of cortex, particularly in basal and mesial areas of the hemispheres, are not covered by standard electrode placement. Temporal sampling is also limited, and the

relatively short duration of routine interictal EEG recording is one reason why patients with epilepsy may not show interictal epileptiform discharge (IED) in the first EEG study.

If inappropriate questions are asked of the EEG, diagnostic errors will occur, and there will be poor yield of information that could be useful in the management of patients with seizure disorders. It is crucial to recognise that a normal EEG does not exclude epilepsy, as around 10% of patients with epilepsy never show epileptiform discharges. Secondly, an abnormal EEG demonstrating IED does not in itself indicate that an individual has a seizure disorder, as IED are seen in a small percentage of normal subjects who never develop epilepsy, and IED may also be found in patients with neurological disorders which are not complicated by epilepsy. Table 1 lists the areas in epilepsy diagnosis and management for which interictal and ictal EEG are useful, strongly so in some, but in a more limited way in others.

## INTRODUCTION

Epileptiform activity is specific, but not sensitive, for diagnosis of epilepsy as the cause of a transient loss of consciousness or other paroxysmal event that is clinically likely to be epilepsy. EEG has relatively low sensitivity in epilepsy, ranging between 25–56%. Specificity is better, but again variable at 78–98%. These wide ranges can be explained partly by diverse case selection and differences in clinical requirements for diagnosis of epilepsy in population studies of EEG specificity and sensitivity. Secondly, correlation between different EEG patterns and epilepsy varies, and only IED are associated with seizure disorders at a sufficiently high rate to be of clinical use. Abnormalities of background cerebral rhythms, focal slow activity or regional attenuation are much less specific than epileptiform activity, although they can indicate localised structural pathology underlying the seizure disorder, or diffuse cortical dysfunction as in symptomatic generalised epilepsies. Some types of epileptiform phenomena—3 per second spike wave discharge, hypsarrhythmia, and

generalised photoparoxysmal response—are strongly correlated with clinical epilepsy, whereas focal sharp waves in centro-temporal or occipital regions have moderate association with clinically active epilepsy. Of children with centro-temporal or rolandic EEG discharges, only about 40% have clinically expressed seizures. Spikey or rhythmic phenomena such as 14 and 6 Hz spikes, phantom spike and wave, rhythmic mid temporal theta ( $\theta$ ), psychomotor variant and subclinical rhythmic epileptiform discharge in adults (SREDA), have low or zero predictive value for epilepsy. Misinterpretation of such non-epileptogenic phenomena, or overinterpretation of non-specific EEG abnormalities and spiky/paroxysmal variants of normal cerebral rhythms, are a common reason for over-diagnosis of epilepsy.

## **CONCLUSION**

Reversible gate are used to implement arithmetic circuit using full adder. The main focus of this paper is the proposal of new reversible 4\*4 PERES gate. The purposed PERES gate is used to design full adder. It is proved that the purposed PERES full adder is better than the existing counterparts in literature in terms of garbage outputs. By using purposed PERES full adder we can design large reversible systems. Here we can calculate the power consumption and compare it with the irreversible full adder.

# An enhanced Design Technology For Position And Force Control

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**ABSTRACT** - Generally the robotic controllers are developed for position control, without accomplishing integrally the requirements of tasks in which interactions with the environment occur. However, this is currently one of the main research areas in robotics. To consider this interaction the robot controller has to give priority to the force control time response, because in the instant of end-effectors contact with the surface, several forces act on them which lead to damages. To avoid this proposed work design embedded system for position as well as force control to improve efficiency. Embedded implies integration of various functional blocks on one System-On-Chip board, for data acquisition, computation and control tasks, of relatively small size and low power consumption, compared to regular PC-based industrial controllers. It is industrial robot type independent, as long as the motors are equipped with incremental position encoders and driven by PWM signals. This is done with at Mega128 microcontroller which is communicated through Pcs.

## INTRODUCTION

The objective of the proposed work will be to control the position and force of robotic arm in working environment to reduce the possible damages or errors to the environment in contact and diminishes the necessity of compliance in system. Current robotic applications are limited by the industry state of art of the manipulators control algorithms. The inclusion of force and vision feedbacks, the possibility of cooperation between two or more manipulators, the control of robots with irregular topology will certainly enlarge the industrial robotics applications. The development of control algorithms to this end brings the necessity of the use of controllers with open architecture. As a matter of fact, rapid prototyping, i.e., the capability of designing and testing new control algorithms in short time and with limited costs, is becoming a fundamental

issue in industrial robotic applications. Notice that the degree of openness. In a robot controller may vary from one system to the other. Usually the control of some components of the system (e.g., the power system, the low level control) are proprietary and cannot be modified by the user, others may be considered open (e.g., the communication interface, the higher level control), i.e., are based on standard hardware and software with open interface specifications.

## LITERATURE SURVEY

Generally the robotic controllers are developed for position control, without accomplishing integrally the requirements of tasks in which interactions with the environment occur. However, this is currently one of the main research areas in robotics. To consider this interaction the robot controller has to give priority to the force control time response, because in the instant of end-effectors contact with the surface, several forces act on the system To achieve force control firstly concept of fuzzy-logy was developed. The control objective is to track the desired force and position trajectories simultaneously regardless of the unknown parameters of the task environment and the existence of the manipulator dynamics, represented as a fuzzy rule-base. The algorithm embedded in the proposed architecture can automatically update the fuzzy rules and, consequently, guarantee the global stability and drive the tracking errors to a neighborhood of zero [1]. After that concept of open embedded architecture was discovered in 1992 at Ford that addresses issue of what is an open architecture robot controller. Three different classifications are defined along with the various advantages and shortcomings of each approach. Knowledge from past research and new technology development has been included in this analysis Limited survey of the diverse issues related to robot control design architectures is presented. Based on this review, an initiatory taxonomy of robot control tasks, motions, architecture and controllers is proposed [2]. With help of this review framework of parallel force/position control for a robot manipulator in contact

with a compliant environment, a new scheme is proposed which is aimed at controlling the endeffectors force in the face of uncertainty on the surface stiffness. The controller is of inverse dynamics type with force feed forward action. Adaptation to unknown stiffness is achieved by resorting to a suitable estimate update law driven by the force error. Tracking of both position along the unconstrained directions and force along the constrained direction is ensured. Experimental results on an industrial robot with open control architecture are present in 2007 at Lippielo [3]. But some problem had arisen related with both controlling and programming of position control. For this purpose, Element Contact Formation (ECF) is proposed to describe contact state. For different ECF has different force clustering, the modified FCM clustering is used for automatic classification of ECF in demonstration based forces information. Then from demonstration data the sequence of contact states and desired distances and velocities for transitions are obtained. The ECF identifier can be built with the similar degree between the force information and clustering. The skill acquisition module is implemented in robot controller with open architecture [4]. In the next step an intelligent prediction algorithm for robot force control is reviewed. The algorithm is not only applied to with open architecture controller is developed to test the force tracking effect when the environmental change in curvature and stiffness is taken into account[5]After removing all drawback open architecture for industrial or non-industrial robot controllers was design allowing system designers and robot manufacturers to develop rapid deployment automation solutions for particular mechanics of robot manipulators. The navigation and locating of the mobile robot platform, the motion control of the robotic arm, as well as monitoring, learning, program editing, debugging and execution are embedded in a multiprocessor system developed around a Motion[6].Recent development in robotic arm controller is that low cost open architecture PC-based controller for a planar is described. The system is based on

an available low price commercial PC interface board and all of the control software runs on a Pentium 100 MHz computer to control the arm. The driving kernel of software for supervisory, management and control was developed in a high level language and enables the analysis of several position and force/position strategies for research and practical applications [7].In last few years back Field Programmable Gate Array (FPGA) design methodologies with a focus on Industrial Control System applications. The paper starts with an overview of FPGA technology development, followed by a presentation of design methodologies, development tools and relevant CAD environments, including the use of portable Hardware Description Languages and System Level Programming Design tools. They enable a holistic functional approach with the major advantage of setting up a unique modeling and evaluation environment for complete industrial electronics systems [8].In 2012 open embedded hardware and software architecture for industrial robot control was proposed. Here motion is controlled with help of PWM signal, width of signal is varied in accordance with lifting force. Then PWM signal is given to motor so that motor can run up to that extent.[9]

## **CONCLUSION**

As we have gone through the literature and reviewed most of the recent developments it has been seen that robotic controller are developed for position control, without knowing the task in which interactions with the environment occurs .This leads to damages of object, however how to reduce errors is an main research in robotic areas. The proposed work mainly emphasis on force control to avoid damages by designing embedded system which control robotic arm through PC.

# A Technological solution for Near-Field Sensing Transceiver For Intrabody Communication

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**ABSTRACT**— Human society is entering an era of ubiquitous computing or pervasive computing, when networks are seamlessly interconnected and information is always accessible at our fingertips. When very weak radio signals are used for the communication, data speeds are reduced by packet collision and other such problems in crowded places such as exhibition sites and security risk from unwanted signal interception is another problem. Technology for solving such problems includes the use of the person body as a signal path for communication. A transmission path is formed automatically when a person comes into contact with a device and communication between mobile terminals begins. This paper describes a near-field-sensing transceiver for intrabody communication, in which the human body is the transmission medium. The key component of the transceiver is an electric-field sensor implemented with an electrooptic crystal and laser light. This sensor is suitable for detection of the small and unstable electric fields produced by the human body because it has extremely high input impedance. This transceiver enables IEEE 802.3 half-duplex communication of 10 Mb/s through a person's body in an operating range of about 150 cm between the hands.

## INTRODUCTION

AS CELLULAR phones, personal digital assistants (PDAs), digital video cameras, and other information and communication devices become smaller and more widespread, there are increasing opportunities for people to come in contact with small computers in their everyday lives. There is no question that the process of miniaturization will continue, and we will soon see the emergence of the so-called ubiquitous computing environment (Fig. 1), where, ideally, many computers serve each person everywhere in the world.

For ubiquitous computing to be implemented in a comfortable and useful way, it is essential that we are able to share data not only among our own personal computers but also among peripheral computers. Wire connections are clearly impractical because they so easily become tangled, so some sort of short-range wireless communications technology is required. A number of short-range wireless schemes have been considered, including the Bluetooth and IEEE 802.11 standards. However, these radio wave-based methods are susceptible to interference and cannot connect between many computers without decreasing speed. One solution is intrabody communication, which uses the human body as the transmission medium and is an entirely new concept for communications systems. The unique feature of intrabody communication are that data can be exchanged by unconscious actions, such as touching or stepping, and the person is clearly aware of connection. In addition, data transmitted through the human body eventually escapes through the feet into the ground, thus minimizing the chance of intercept and, thereby, providing secure transmissions. Some intrabody communications systems using very small voltages and currents applied and detected on the human body have been reported. Drawbacks in all recent systems are a short operating range and low speed because the systems employ electrical sensors. The input impedance of the sensors is not very high, making it difficult to accurately detect signals through the human body. As a consequence, the typical operating range is only about 30 cm, and speed is limited to about 40 kb/s. We have been researching electric-field sensors using electrooptic (EO) crystals and laser light, which we have applied in the development of various probing systems for measurement of ultrafast electronics. Because our EO sensor has extremely high input impedance and ultrawide detection bandwidth, it is especially useful for accurate detection of small and high-speed electric fields. Recently, we have developed a near-field-sensing transceiver for intrabody communication using an EO sensor.

We have achieved the first successful 10-Mb/s halfduplex communications in accordance with IEEE 802.3 through the human body at an operating range of about 150 cm between the hands. Moreover, this transceiver enables intrabody communication through clothes and interbody communication between two persons by a handshake. In this paper, we describe the configuration of the transceiver and the electric-field sensor unit in detail and present results of a communication test.

### **PROPOSED WORK**

Though pervasive computing components are already deployed in many environments, integrating them into a single platform is still a research problem. The problem is similar to what researchers in distributed computing face, but the scale is bigger. Integrating pervasive computing components has severe reliability, quality of service, invisibility, and security implications for pervasive networking. The need for useful coordination between confederation components is obvious. So the proposed idea behind that to use RFID technology with the REDTACTON device so that the users can communicate with their sophistication. The uncomfortable users restricts access to the services by touching. As the area of redtacton device is limited that might be increased by using high electro optic sensors and laser diodes. so the user can either use REDTACTON or RFID for the communication.

### **CONCLUSION**

We have developed a transceiver that uses a human body as a data transmission medium based on electric field sensor that uses an electro-optic crystal and laser light. Using this transceiver, we succeeded in achieving 10BASE communication in accordance with IEEE 802.3 through a human body from one hand to other hand. Our longer term plans include developing a mass market transceiver interface supporting PDA's. Using this transceiver, we succeeded, for the first time, in 10BASE communication in accordance with IEEE 802.3 through the human body at an operating range of about 150 cm between the hands. This transceiver will open the way to intrabody communication in a comfortable and useful ubiquitous computing environment.

# Computational Estimations of MIMO-MC-CDMA

Name: **Udit Routray**  
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**ABSTRACT** - In this paper we estimate the performance of 2\*1 MIMO-MC-CDMA system using convolution code in MATLAB which highly optimizes 3G and 4G wireless communication system by reducing BER. MC-CDMA (Multi Carrier Code Division for Multiple Access) is a multi-user and multiple access system which is formed by the combination of OFDM and CDMA and convolution encoding scheme is used in encoder of CDMA as FEC (Forward Error Correction) code to reduce BER (Bit Error Rate). MC-CDMA system is a multi-carrier system in which single broadband frequency selective carrier is converted into parallel narrowband flat fading multiple sub-carriers to optimize the performance of system. Now this system further improved by combination of 2\*1 MISO (Multiple Input Single Output) system which utilizes ZF (Zero Forcing) decoder at the receiver to reduce BER and also 1/2 rate convolutionally encoded Alamouti STBC (Space Time Block Code) block code as transmit diversity of MISO for multiple transmission of data through multiple transmit antenna. Main advantage of using MIMO-MC-CDMA using convolution code is to reduce the complexity of system and to reduce BER with increasing gain. In this we analyze system performance in different modulation schemes like, QPSK, 8-PSK, 8-QAM, 16-QAM, 32-QAM and 64-QAM in Rayleigh fading channel using MATLAB.

## INTRODUCTION

Due to increased demand of high data rate and low probability of error in this paper we utilizes the technique of MIMO, CDMA and OFDM results enhanced technique for minimizing error rate. MC-CDMA is multicarrier and multiple access system which is a combination of OFDM and CDMA. CDMA is multiple access system and OFDM is multiple carrier system in frequency selective channel that is in OFDM, the frequency selective channel is converted into a group of N narrowband

flat-fading channel or sub-carriers. The combination of both the technique results improved efficiency of the wireless communication system which results high data rate and low probability of error. After that in this paper MIMO is combined with MC-CDMA to increase throughput. MIMO is multiple antenna system in which multiple receive diversity and multiple transmit diversity i.e half-rate convolutionally encoded Alamouti STBC code is used for synchronization of system to reduce ISI. To detect signal orthogonality ZF detection scheme is used. And finally combined MIMO-MC-CDMA [5] is formed by all above operations using MATLAB is then encoded using convolution code as FEC encoder. This MIMO-MC-CDMA using convolution code then analyzed in QPSK, 8-PSK, 8-QAM, 16-QAM, 32-QAM and 64-QAM modulation techniques in Rayleigh fading channels. 2. MULTI CARRIER CODE DIVISION MULTIPLE ACCESS (MC-CDMA) MC-CDMA [2,6,4] is a combination of system of OFDM and CDMA system. This system allows the multiple users to access the wireless channel simultaneously by modulating and spreading their input data signals in frequency domain using PN spreading sequences. MC-CDMA combines the multipath fading of OFDM system with the multi-user access of CDMA system.

## CONCLUSION

The comparative estimation of MIMO-MCCDMA using convolution code in QPSK, 8-PSK, 8-QAM, 16-QAM, 32-QAM and 64 QAM modulation schemes. Table 2 shows the comparative estimation of different modulation schemes which shows that as modulation scheme order is lower results increase in BER. This paper aims to reduce bit error rate which is found in QPSK modulation scheme with gain of 17.86 dB with respect to 64-QAM which represents that the gain of QPSK is higher as compared to other modulation technique with very low probability of error because errors were removed at 2dB in QPSK.

# A Hybrid Intrusion Detection Systems For MANETS

Name: **Durga Prasad Patra**  
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**ABSTRACT**— The MANET in wireless sensor networks is preferred because of its mobility and scalability. This makes the use of MANETs in wide range of applications. The important criteria of the MANETs are its decentralized architecture. It does not require fixed infrastructure such as a base station for its operation. Instead it requires mobile nodes for transmitting the messages among the network. MANET is a collection of nodes connected with a wireless links either directly or indirectly. These nodes have ability to communicate among themselves by maintaining their mobility. Another important criteria of MANETs is its ability of self configuring. The major drawback of the MANETs is its open medium and remote distribution which allows intruder to easily insert the malicious nodes on to the network. Because of the decentralized architecture of MANETs it is difficult to develop IDS.

## INTRODUCTION

The wireless networks are preferred because of their improved technology and reduced cost. The Mobile Adhoc Network is a collection of nodes connected with wireless links either directly or indirectly. Each node in this network acts as a transmitter and receiver. These nodes communicate with each other through the wireless links. In wireless networks the nodes can communicate with each other only when the mobility is maintained, Which means that two nodes cannot transfer the data with each other when they are beyond the communication range. MANET overcomes this problem by providing the intermediate nodes that relays the data transmission. This is possible by dividing the MANETs into two network categories namely; single hop and multi hop. In single hop network all the nodes within the same range can communicate with each other. In the multi hop network the nodes depend on the other intermediate nodes to transfer while the destination node is out of their

range. MANETs does not require fixed infrastructure[9] but it requires cooperative nodes, for forming the environment of cooperative nodes every nodes is supposed to be a friendly node and should willingly transfer the messages to their destination. Each node works in peer to peer mode and acts as an independent router that produces the independent data. The management of this transmission is distributed across the network. The open environment and remote distribution of MANET[4] makes it vulnerable to various types of attacks. Due to the lack of physical protection attackers can easily compromise the nodes and attack them[5]. Because of decentralized architecture of MANETs it is difficult to develop an Intrusion Detection System (IDS).[6]

## CONCLUSION

It does not require fixed infrastructure such as a base station for its operation. Instead it requires mobile nodes for transmitting the messages among the network. MANET is a collection of nodes connected with a wireless links either directly or indirectly. These nodes have ability to communicate among themselves by maintaining their mobility. Another important criteria of MANETs is its ability of self configuring. The major drawback of the MANETs is its open medium and remote distribution which allows intruder to easily insert the malicious nodes on to the network. Because of the decentralized architecture of MANETs it is difficult to develop IDS.

# Five Disruptive Technology Directions for 5G

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## INTRODUCTION

The fifth generation (5G) cellular network is coming. What technologies will define it? Will 5G be just an evolution of 4G, or will emerging technologies cause a disruption requiring a wholesale rethinking of entrenched cellular principles? This article focuses on potential disruptive technologies and their implications for 5G.

## DEVICE-CENTRIC ARCHITECTURES

Cellular designs have historically relied on the axiomatic role of “cells” as fundamental units

within the radio access network. Under such design postulate, a device obtains service by establishing a downlink and an uplink connection, carrying both control and data traffic, with the base station commanding the cell where the device is located. Over the last few years, different trends have been pointing to a disruption of this cell-centric structure:

The base station density is increasing rapidly, driven by the rise of heterogeneous networks. While heterogeneous networks were already standardized in 4G, the architecture was not natively designed to support them. Network densification could require some major changes in 5G. The deployment of base stations with vastly different transmit powers and coverage areas, for instance, calls for a decoupling of downlink and uplink in a way that allows the corresponding

## MILLIMETER WAVE COMMUNICATION

Microwave cellular systems have precious little spectrum: around 600 MHz are currently in use, divided among operators [10]. There are two ways to gain access to more microwave spectrum: To repurpose or reform spectrum. This has occurred worldwide with the repurposing of terrestrial TV spectrum for applications such as rural broadband access. Unfortunately, repurposing has not freed up that much

spectrum, only about 80 MHz, and at a high cost associated with moving the incumbents.

To share spectrum utilizing, for instance, cognitive radio techniques. The high hopes initially placed on cognitive radio have been dampened by the fact that an incumbent not fully willing to cooperate is a major obstacle to spectrum efficiency for secondary users. Altogether, it appears that doubling the current cellular bandwidth is the best case scenario at microwave frequencies. Alternatively, there is an enormous amount of spectrum at mmWave frequencies ranging from 3 to 300 GHz. Many bands therein seem promising, including most immediately the local multipoint distribution service at 28–30 GHz, the license-free band at 60 GHz, and the E-band at 71–76 GHz, 81–86 GHz, and 92–95 GHz. Foreseeable, several tens of gigahertz could become available for 5G, offering well over an order of magnitude increase over what is available at present. Needless to say, work needs to be done on spectrum policy to render these bands available for mobile cellular information to flow through different sets of nodes [5].

## MASSIVE MIMO

Massive MIMO (also referred to as “Large-Scale MIMO” or “Large-Scale Antenna Systems”) is a form of multiuser MIMO in which the number of antennas at the base station is much larger than the number of devices per signaling resource [14]. Having many more base station antennas than devices renders the channels to the different devices quasi-orthogonal and very simple spatial multiplexing / de-multiplexing procedures quasi-optimal. The favorable action of the law of large numbers smooths out frequency dependencies in the channel and, altogether, huge gains in spectral efficiency can be attained.

## SMARTER DEVICES

Earlier generations of cellular systems were built on the design premise of having complete control at the infrastructure side. In this section, we discuss some of the possibilities that can be direct link ones, the corresponding spectral efficiencies

are also lower. While it is clear that D2D has the potential to handle local communication more efficiently, local high-data-rate exchanges could also be handled by other radio access technologies such as Bluetooth or Wi-Fi direct. Use cases requiring a mixture of local and nonlocal content or a mixture of low-latency and high-data-rate constraints (e.g., interaction between users via augmented reality) could represent more compelling reasons for the use of D2D. In particular, we envision D2D as an important enabler for applications requiring low latency, especially in future network deployment utilizing based and centralization and radio virtualization.

### **NATIVE SUPPORT FOR M2M COMMUNICATION**

Wireless communication is becoming a commodity, just like electricity or water [13]. This commoditization, in turn, is giving rise to a large class of emerging services with new types of requirements. We point to a few representative such requirements, each exemplified by a typical service.

### **CONCLUSION**

This article has discussed five disruptive research directions that could lead to fundamental changes in the design of cellular networks. We have focused on technologies that could lead to both architectural and component design changes: device-centric architectures, mmWave, massive MIMO, smarter devices, and native support of M2M. It is likely that a suite of these solutions will form the basis of 5G.

# Fundamentals aspects on Digital Image Processing

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The various Medical images acquired directly from various instruments are in the AVI format, which reduces the easy control of image display without conversion to medical image standard, that is the DICOM format. The purpose of this project is to develop software to handle online data acquisition from medical equipments like Ultra Sound machine, control the display rate, convert the AVI image acquired from the Medical equipment directly to DICOM image with patient's detail's got from the user, freeze the AVI image frame of interest, convert the freezed AVI frame to Bitmap image, convert this Bitmap image to DICOM image with patient's details. This software is highly reliable, efficiently handles memory and very user friendly.

Medical equipments like Ultra Sound, CT etc... have images at their output in the AVI file format, which are acquired with the respective probes. These AVI images acquired are stored. The software captures this AVI image, displays them frame-by-frame in succession and converts them to DICOM image with required patient's details obtained from the Specialist during conversion. The frame of interest can be freezed and converted to Bitmap image, which can also be viewed on a separate window with options to brighten, darken, change the color combination, invert the image and restore the image. The converted DICOM image can be viewed on any Standard DICOM viewer. Mostly all the DICOM viewer will have provision to view the patient's details entered during conversion.

## OBJECTIVE

To help the doctor view a particular frame of interest captured from a medical equipment which is usually an AVI image and to enable the doctor to manipulate the frame for correct diagnosis and provide efficient treatment.

## MEDICALIMAGING

From Ophthalmology and radiology to orthodontics, image processing touches the medical field in many ways. The ability to visualize and interactively manipulate three-dimensional objects derived from sets of two-dimensional MRI and CAT scan (now shortened to CT scan) slices has changed the way we deal with medicine. MRI stands for nuclear magnetic resonance imaging.

## DISADVANTAGE OF EXISTING SYSTEM

There is no AVI viewer that facilitates the doctors to manipulate the medical image captured from the equipment. All AVI viewers available just displays the frames in predetermined time intervals and time of display of each frame cannot be controls as per the physicians requirement. Frame at a particular given time can be displayed but, it wont help the doctor capture the exact frame that is required to find out the exact defect.

## PROPOSED SYSTEM

This system will prove to be user friendly as this captures the medical AVI image, grabs the required header information, converts them to DICOM file format and stores it along with the patient's details, physicians details, etc... so that any physician can diagnose the patient without any other further details. Moreover there are many DICOM viewer available with many image processing provision.

### Steps to Control Image

- Capture the image from an medical equipment which will normally be in AVI (Audio/Video Interleaved) format.
- Analyze the header details of the AVI image.
- Copy the required header details into the DICOM header format.
- If the length of the header is greater than zero it is considered to be valid.
- Find the start of frame in the AVI file, check for its length, if data is valid copy the frame into DICOM file else skip the frame.
- View the DICOM file in appropriate DICOM viewer.

# Power Management For Wireless Data Transmission Using Complex Event Processing

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## DEFINITION

presentation on Power Management for Wireless Data Transmission Using Complex Event Processing discuss about Power Management of WNI, System Architecture, Architecture of EDF, Complex Event Processing, Event Generator, Event Processing Agent, Scheduler, Implementation, Event Specification and ECA Rules, XML Elements in Event Processing and ECA Rules, Event Processing Agent, Conflict Detection and Resolution.

A significant component of overall energy consumption on mobile devices caused by wireless data transmission, Energy consumed dependent on the situation in which the transmission happens. Propose an event driven framework, used for implementing power management. Framework can use ECA rules to describe the power management mechanism. Framework supports complex event processing. Energy consumption of wireless data transmission is caused by the operation of WNI. Implemented as a part of hardware resource management. Try to keep the hardware components in lower power states. The PSM for Wi-Fi forces the WNI to go sleep. Event driven framework that supports complex event processing for PM.

## SYSTEM ARCHITECTURE

Propose an event driven framework for power management. Event driven adaptations are described with ECA rules. Three components of the framework are event generator, event processing agent and scheduler. The ECA rules and event processing specification-rule base. Contents of context storage get updated when relevant contexts change.

## COMPLEX EVENT PROCESSING

Event-driven framework support complex event processing in the event processing agent. Difference between simple and

complex event processing is in functionality. It also support event derivation and pattern matching, Take into account the history of event occurrences. Generate events of higher abstraction levels based on changes in the patterns of event occurrences.

## EVENT GENERATOR

Software component that generates events based on the changes in contexts. Definition 1 - An atomic state is a tuple:  $S = (c, op, val)$ , where  $c$  is the capability value,  $op$  is one of the binary operators defined in a set:  $\{<; >; ;\};$  and  $val$  is the reference value of the capability. Definition2 - An atomic event  $e$  indicates the change in a state from  $S_0$  to  $S_1$ . It can be represented as  $e: S_0 \rightarrow S_1$ .

## EVENT PROCESSING AGENT

Event processing specification written in structural XML is loaded into the event processing agent. Event processing agent provides four logical functions of complex event processing are event filtering, Instance partitioning, Event derivation, Pattern matching

## SCHEDULER

When loading a new rule, the scheduler checks if the newly loaded rule has any potential conflicts with the previously loaded rules. If the installation of the new rule is successful, the scheduler will subscribe to the events that may trigger the new rule from the event processing agent.

## EVENT GENERATORS

Implemented the framework and the two applications in C++. Two event generators are

**Traffic monitor** - Provides the atomic events. Implemented packet sniffing in a kernel module using Netfilter.

**Network monitor** - Generates events for the changes in the network environment. It does not passively listen for messages. It pulls information directly through OS APIs. Generates events that indicate changes in the predicted SNR

## EVENT SPECIFICATION AND ECA RULES

Define rules for event processing in the event

generators. Get events out of the queue and also push back events that are generated during event processing. Instance partitioning divided into two types, segmentation-oriented partitioning temporal-oriented partitioning. Segmentation-oriented partitioning-classifies event instances based on event attribute. Temporal-oriented partitioning divides the input into groups based on the timestamps of the event occurrence. Events accepted by the input filter. Partitioned based on the connection identifier. difference-event attributes used for differing event instances in segmentation-oriented partitioning are defined in the attributes of the <on> element. Temporal-oriented partitioning-implement with a time window

### **CONFLICT DETECTION AND RESOLUTION**

The scheduler checks for potential conflicts whenever loading a new rule. Parses the actions defined in the new rule into operations to be applied to certain hardware/software components. Rule that tries to set different values to the same parameter of the same component is found conflict.

### **CONCLUSION**

We proposed an event-driven framework for rule-based power management for wireless data transmission. The framework supports complex event processing, Provides potential for reducing the event processing overhead. Event driven framework can be extended to support the collection and sharing of context data between mobile devices and to utilize the context data that other users produce for saving energy.

# Next Generation DPNE

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## DEFINITION

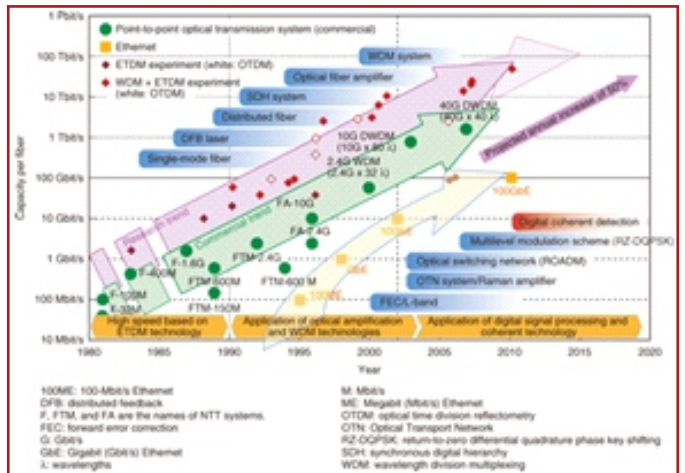
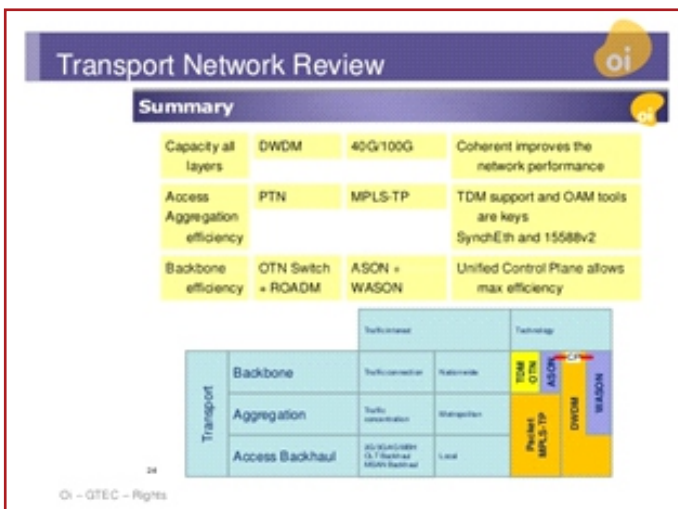
Over the years, advancement in technologies has improved transmission limitations, the number of wavelengths we can send down a piece of fiber, performance, amplification techniques, and protection and redundancy of the network. When people have described and spoken at length about optical networks, they have typically limited the discussion of optical network technology to providing physical-layer connectivity.

When actual network services are discussed, optical transport is augmented through the addition of several protocol layers, each with its own sets of unique requirements, to make up a service-enabling network. Until recently, transport was provided through specific companies that concentrated on the core of the network and provided only point-to-point transport services.

A strong shift in revenue opportunities from a service provider and vendor perspective, changing traffic patterns from the enterprise customer, and capabilities to drive optical

opportunity available through the introduction of new technology advancements and the economic implications these technologies will have.

Specifically, the new technologies in the metro space provide better and more profitable economics, scale, and new services and business models. The current metro infrastructure comprises this equipment, which emphasizes voice traffic; is limited in scalability; and was not designed to take advantage of new technologies, topologies, and changing traffic conditions. Next-generation equipment such as next-generation Synchronous Optical Network (SONET), metro core dense wavelength division multiplexing (DWDM), metro-edge DWDM, and advancements in the optical core have taken advantage of these limitations, and they are scalable and data optimized; they include integrated DWDM functionality and new amplification techniques; and they have made improvements in the operational and provisioning cycles.



This tutorial provides technical information that can help engineers address numerous Cisco innovations and technologies for Cisco Complete Optical Multiservice Edge and Transport (Cisco COMET). They can be broken down into five key areas: photonics, protection, protocols, packets, and provisioning.

fiber into metropolitan (metro) areas has opened up the next emerging frontier of networking. Providers are now considering emerging lucrative opportunities in the metro space. Whereas traditional or incumbent vendors have been installing optical equipment in the space for some time, little attention has been paid to the

# DIVE : An Experimental Platform For Virtual Environments

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## INTRODUCTION

The Distributed Interactive Virtual Environment (DIVE) is an experimental platform for the development of virtual environments, user interfaces and applications based on shared 3D synthetic environments. DIVE is especially tuned to multi-user applications, where several networked participants interact over a network. DIVE is based on a peer-to-peer approach with no centralized server, where peers communicate by reliable and non-reliable multicast, based on IP multicast. Conceptually, the shared state can be seen as a memory shared over a network where a set of processes interacts by making concurrent accesses to the memory.

Consistency and concurrency control of common data (objects) is achieved by active replication and reliable multicast protocols. That is, objects are replicated at several nodes where the replica is kept consistent by being continuously updated. Update messages are sent using multicast so that all nodes perform the same sequence of updates.

The peer-to-peer approach without a centralized server means that as long as any peer is active within a world, the world along with its objects remains "alive". Since objects are fully replicated (not approximated) at other nodes, they are independent of any one process and can exist independently of the creator.

Users navigate in 3D space and see, meet and collaborate with other users and applications in the environment. A participant in a DIVE world is called an actor, and is either a human user or an automated application process. An actor is represented by a "body-icon" (or avatar), to facilitate the recognition are graphically modeled in 3D space.

A user 'sees' a world through a rendering application called a visualizer (the default is currently called Vishnu). The visualizer renders a scene from the viewpoint of the

actor's eye. Changing the position of the eye, or changing the "eye" to another object, will change the viewpoint. A visualizer can be set up to accommodate a wide range of I/O devices such as an HMD, wands, data gloves, etc. Further, it reads the user's input devices and maps the physical actions taken by the user to logical actions in the Dive system. This includes navigation in 3D space, clicking on objects and grabbing objects etc.

In a typical DIVE world, a number of actors leave and enter worlds dynamically. Such applications typically build their user interfaces by creating and introducing necessary graphical objects. Thereafter, they "listen" to events in the world, so that when an event occurs, the application reacts according to some control logic

## DIVE CHARACTERISTICS

The characteristics of Distributed Interactive Virtual Environments (DIVE) are those applicable for Distributed Interactive Simulation applications. The DIS standards provide application protocol and communication service standards to support DIS inter-operability. The DIS characteristics that apply to DIVE are:

" Large number of participants: the DIVE application can be played by several users connected via a network such as the Internet. The number of participants should be unlimited to allow everybody to enter the virtual world.

"Interactive data are short (few tens of bytes) and frequent. This characteristic differs from other multimedia application data like audio and video. Each simulation object can transmit its local state that, in the worst case, represents a small amount of information (less than hundred bytes).

"High level of dynamicity in group structure and topology. Participants join and leave the session dynamically. In this context, the IP multicast model is particularly convenient.

"Information is continuous. In most of the cases, the behavior of an Avatar at a given time T+1 is an evolution of its behavior at time T (for example the displacement of an avatar).

## Transition For Core Processor

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### DEFINITION

Seeing the technical difficulties in cranking higher clock speed out of the present single core processors, dual core architecture has started to establish itself as the answer to the development of future processors. With the release of AMD dual core opteron and Intel Pentium Extreme edition 840, the month of April 2005 officially marks the beginning of dual core endeavors for both companies.

The transition from a single core to dual core architecture was triggered by a couple of factors. According to Moore's Law, the number of transistors (complexity) on a microprocessor doubles approximately every 18 months. The latest 2 MB Prescott core possesses more than 160 million transistors; breaking the 200 million mark is just a matter of time. Transistor count is one of the reasons that drive the industry toward the dual core architecture. Instead of using the available astronomically high transistor counts to design a new, more complex single core processor that would offer higher performance than the present offerings, chip makers have decided to put these transistors to use in producing two identical yet independent cores and combining them in to a single package.

To them, this is actually a far better use of the available transistors, and in return should give the consumers more value for their money. Besides, with the single core's thermal envelope being pushed to its limit and severe current leakage issues that have hit the silicon manufacturing industry ever since the transition to 90 nm chip fabrication, it's extremely difficult for chip makers (particularily Intel) to squeeze more clock speed out of the present single core design. Pushing for higher clock speeds is not a feasible option at present because of transistor current leakage. And adding more features into the core will increase the complexity of the design and make it harder to manage. These are the factors that have made the dual core option the more viable alternative in making full use of the amount

of transistors available.

### WHAT IS A DUAL CORE PROCESSOR?

A dual core processor is a CPU with two separate cores on the same die, each with its own cache. It's the equivalent of getting two microprocessors in one. In a single-core or traditional processor the CPU is fed strings of instructions it must order, execute, then selectively store in its cache for quick retrieval. When data outside the cache is required, it is retrieved through the system bus from random access memory (RAM) or from storage devices. Accessing these slows down performance to the maximum speed the bus, RAM or storage device will allow, which is far slower than the speed of the CPU. The situation is compounded when multi-tasking. In this case the processor must switch back and forth between two or more sets of data streams and programs. CPU resources are depleted and performance suffers.

In a dual core processor each core handles incoming data strings simultaneously to improve efficiency. Just as two heads are better than one, so are two hands. Now when one is executing the other can be accessing the system bus or executing its own code. Adding to this favorable scenario, both AMD and Intel's dual-core flagships are 64-bit.

To utilize a dual core processor, the operating system must be able to recognize multi-threading and the software must have simultaneous multi-threading technology (SMT) written into its code. SMT enables parallel multi-threading wherein the cores are served multi-threaded instructions in parallel. Without SMT the software will only recognize one core. Adobe Photoshop is an example of SMT-aware software. SMT is also used with multi-processor systems common to servers.

An attractive value of dual core processors is that they do not require a new motherboard, but can be used in existing boards that feature the correct socket. For the average user the difference in performance will be most noticeable in multi-tasking until more software is SMT aware. Servers running multiple dual core processors will see an appreciable increase in performance.

## IPSC : An advancement of Nanotechnology

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### INTRODUCTION:

Nanotechnology is the nexus of sciences. Nanotechnology is the engineering of tiny machines - the projected ability to build things from the bottom up using techniques and tools being developed today to make complete, highly advanced products. It includes anything smaller than 100 nanometers with novel properties. As the pool of available resources is being exhausted, the demand for resources that are everlasting and eco-friendly is increasing day by day. One such form is the solar energy. The advent of solar energy just about solved all the problems. As such solar energy is very useful. But the conventional solar cells that are used to harness solar energy are less efficient and cannot function properly on a cloudy day. The use of nanotechnology in the solar cells created an opportunity to overcome this problem, thereby increasing the efficiency. This paper deals with an offshoot in the advancement of nanotechnology, its implementation in solar cells and its advantage over the conventional commercial solar cell.

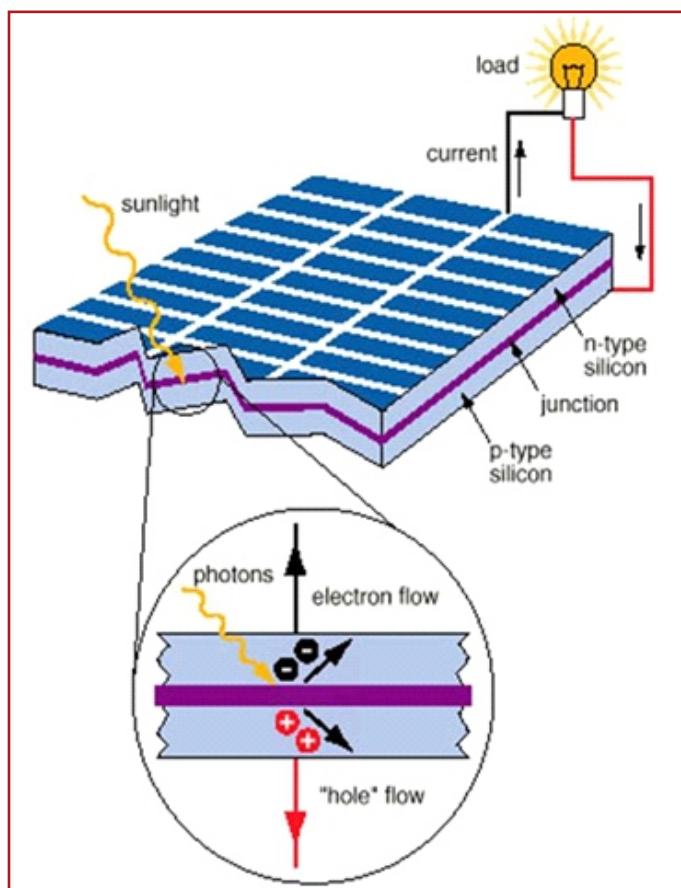
In order to the miniaturization of integrated circuits well into the present century, it is likely that present day, nano-scale or nano electronic device designs will be replaced with new designs for devices that take advantage of the quantum mechanical effects that dominate on the much smaller ,nanometer scale . Nanotechnology is often referred to as general purpose technology. That is because in its mature form it will have significant impact on almost all industries and all areas of society. It offers better built, longer lasting, cleaner, safer and smarter products for the home, for ammunition, for medicine and for industries for ages. These properties of nanotechnology have been made use of in solar cells. Solar energy is really an abundant source that is renewable and pollution free. This form of energy has very wide applications ranging from small household items, calculators to larger things

like two wheelers, cars etc. they make use of solar cell that converts the energy from the sun into required form.

### WORKING OF CONVENTIONAL SOLAR CELL

Basically conventional type solar cells Photovoltaic (PV) cells are made of special materials called semiconductors such as silicon, which is currently the most commonly used. Basically, when light strikes the cell, a certain portion of it is absorbed within the semiconductor material. This means that the energy of the absorbed light is transferred to the semiconductor. The energy knocks electrons loose, allowing them to flow freely. PV cells also all have one or more electric fields that act to force electrons freed by light absorption to flow in a certain direction. This flow of electrons is a current, and by placing metal contacts on the top and bottom of the PV cell, we can draw that current off to use externally.

For example, the current can power a calculator. This current, together with the cell's voltage (which is a result of its built-in electric field or fields), defines the power (or wattage) that the solar cell can produce. Conventional semiconductor solar cells are made by polycrystalline silicon or in the case of highest efficiency ones crystalline gallium



arsenide. But by this type of solar cell, it is observed that, only 35% of the sun's total energy falling on it could be judiciously used. Also, this is not so favorable on cloudy days, thus creating a problem. This major drawback led to the thought of development of a new type of solar cell embedded with nanotechnology. The process involved in this is almost the same as explained earlier. But the basic difference lies in the absorption of the wavelength of light from the sun.

#### *Infrared Plastic Solar Cell*

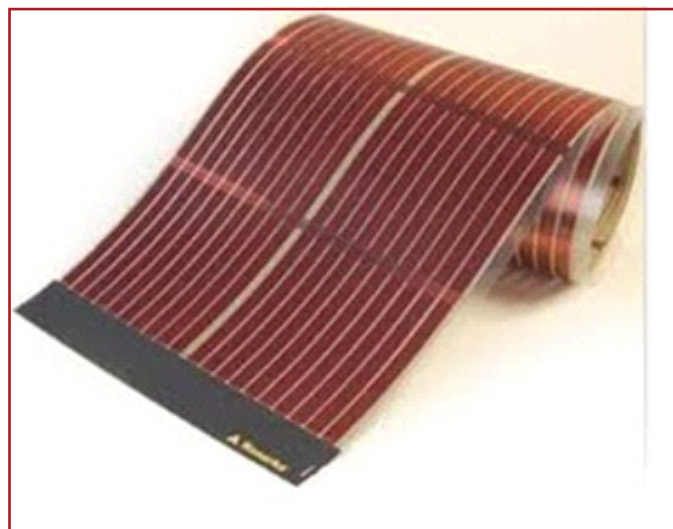
Scientists have invented a plastic solar cell that can turn the sun's power into electric energy even on a cloudy day. Plastic solar cells are not new. But existing materials are only able to harness the sun's visible light. While half of the sun's power lies in the visible spectrum, the other half lies in the infrared spectrum. The new material is first plastic compound that is able to harness infrared portion. Every warm body emits heat. This heat is emitted even by man and by animals, even when it is dark outside. The plastic material uses nanotechnology and contains the 1st generation solar cells that can harness the sun's invisible infrared rays. This breakthrough made us to believe that plastic solar cells could one day become more efficient than the current solar cell.

#### **INFRARED PLASTIC SOLAR CELL**

The researchers combined specially designed nano particles called quantum dots with a polymer to make the plastic that can detect energy in the infrared. With further advances the new PLASTIC SOLAR CELL could allow up to 30% of sun's radiant energy to be harnessed completely when compared to only 6% in today's plastic best plastic solar cells. A large amount of sun's energy could be harnessed through solar farms and used to power all our energy needs. This could potentially displace other source of electrical production that produce greenhouse gases like coal. Solar energy reaching the earth is 10000 times than what we consume.

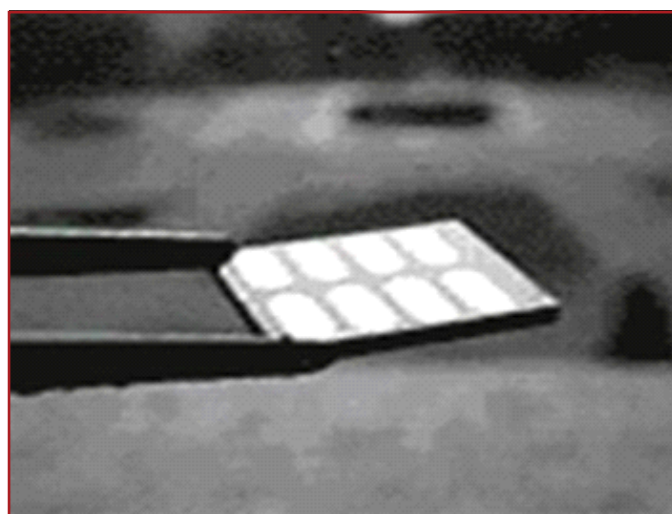
If we could cover 0.1% of the earth's surface with the solar farms we could replace all our energy habits with a source of power which is clear and renewable. The first crude solar cells have achieved efficiencies of today's

standard commercial photovoltaic's the best solar cell, which are very expensive semiconductor laminates convert at most, 35% of the sun's energy into electricity.



#### **WORKING OF PLASTIC SOLAR CELL**

The solar cell created is actually a hybrid, comprised of tiny nanorods dispersed in an organic polymer or plastic. A layer only 200 nanometers thick is sandwiched between electrodes and can produce at present about .7 volts. The electrode layers and nanorods /polymer layers could be applied in separate coats, making production fairly easy. And unlike today's semiconductor-based photovoltaic devices, plastic solar cells can be manufactured in solution in a beaker without the need for clean rooms or vacuum chambers.



Working of Plastic Solar Cell

The technology takes advantage of recent advances in nanotechnology specifically the production of nanocrystals and nanorods. These are chemically pure

clusters of 100 to 100000 atoms with dimensions of the order of a nanometer, or a billionth of a meter. Because of their small size, they exhibit unusual and interesting properties governed by quantum mechanics, such as the absorption of different colors of light depending upon their size. Nanorods were made of a reliable size out of cadmium selenide, a semi conducting material.

Nanorods are manufactured in a beaker containing cadmium selenide, aiming for rods of diameter-7 nanometers to absorb as much sunlight as possible. The length of the nanorods may be approximately 60nanometers. Then the nanorods are mixed with a plastic semiconductor called p3ht-poly-(3-hexylthiophene) a transparent electrode is coated with the mixture. The thickness, 200 nanometers-a thousandth the thickness of a human hair-is a factor of 10 less than the micron-thickness of semiconductor solar cells. An aluminium coating acting as the back electrode completed the device. The nanorods act like wires. When they absorb light of a specific wavelength, they generate an electron plus an electron hole-a vacancy in the crystal that moves around just like an electron. The electron travels the length of the rod until it is collected by aluminium electrode. The hole is transferred to the plastic, which is known as a hole-carrier, and conveyed to the electrode, creating a current.

## **IMPROVEMENTS**

Some of the obvious improvements include better light collection and concentration, which already are employed in commercial solar cells. Significant improvements can be made in the plastic, nanorods mix, too, ideally packing the nanorods closer together, perpendicular to the electrodes, using minimal polymer, or even none-the nanorods would transfer their electrons more directly to the electrode. In their first-generation solar cells, the nanorods are jumbled up in the polymer, leading to losses of current via electron-hole recombination and thus lower efficiency.

They also hope to tune the nanorods to absorb different colors to span the spectrum of sunlight. An eventual solar cell has three

layers each made of nanorods that absorb at different wavelength

## **CONCLUSION AND FUTURE SCOPE**

Plastic solar cells help in exploiting the infrared radiation from the sun's rays. They are more effective when compared to the conventional solar cell. The major advantage they enjoy is that they can even work on cloudy days, which is not possible in the former. They are more compact and less bulky.

Though at present, cost is a major drawback, it is bound be solved in the near future as scientists are working in that direction.

As explained earlier, if the solar farms can become a reality, it could possibly solve the planets problem of depending too much on the fossil fuels, without a chance of even polluting the environment.

# Adhoc Network Based ANT Colony Optimization

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## INTRODUCTION:

Over the last two decades there has been such tremendous growth in the field of networks that it has paved a way for a wireless era from a wired one. Wireless networks find their applications in many fields such as in military, radio satellites, emergency operations, wireless mesh networks, wireless sensor network among a few. Ad-hoc networks keep changing dynamically, which results in disturbance of the network. Hence a need arises to have seamless communication. Mobile Ad-hoc Network (MANET) is a type of Ad-hoc network with a self-organizing capability. They basically consist of mobile nodes which are connected to each other by wireless links. They do not have any fixed infrastructure or a centralized administration. During communication, nodes within the transmission range can have direct communication, but if that isn't the case they have to communicate through intermediate nodes.

The term routing refers to the process of selecting paths in a computer network along which data is sent. This process is carried out by a routing protocol, used to exchange information about topology and link weights, and a routing algorithm, that computes paths between nodes. The routing protocols are divided into three categories. Firstly the proactive protocols like DSDV, OLSR, reactive protocols like AODV and hybrid protocols like TORA, ZRP, and MPOLSR. Another most important type of protocols in recent times is the Bio-inspired protocols. Bio-inspired protocols are found to be capable of demonstrating self organizing behavior due to their robustness and efficiency; examples of such protocols are AntHocNet, BeeAdHoc, and ANSI.

This paper discusses the results of the experiments conducted on AntHocNet algorithm, whose design is based on a self-organizing behavior of ants, shortest path discovery and on Ant Colony Optimization.

AntHocNet follows hybrid approach unlike other bio-inspired algorithms. While most of the previous bio-inspired algorithms were adopting a proactive scheme by periodically generating ant-like agents for all possible destinations, AntHocNet generates ants according to both proactive and reactive schemes. The paper is organized as follows: In Chapter 2, we discuss the related works carried out in the area. Chapter 3 briefly describes the literature survey relevant to our work. Chapter 4 gives a brief discussion on system design and Implementation followed by Simulation results in Section V. Section VI gives the conclusion and future enhancements possible.

## BIO-INSPIRED PROTOCOL

It is based on the application of social behavior of insects and other animals to solve the problems of routing. Some of the Bio-inspired routing protocols are: AntHocNet, ARA (Ant-colony based Routing Algorithm), BeeAdHoc, ANSI (Ad hoc Networking with Swarm Intelligence), etc. Swarm Intelligence (SI) is an artificial bio-inspired intelligence technique based on the study of collective behavior in decentralized, self-organized systems. Since 1999, there is a great interest in applying swarm intelligence to solve hard static and dynamic optimization problems. These problems are solved using cooperative agents that communicate with each other modifying their environment, like ant colonies or others insects do. This is the reason why these agents are commonly called ants.

Key characteristics of these models are:

- Large numbers of simple agents.
- Agents may communicate with each other directly.
- Agents may communicate indirectly by affecting their environment, a process known as stigmergy.
- Intelligence contained in the networks and communications between agents.
- Local behavior of agents causes some emergent global behavior.

Ant routing is the result of using swarm-intelligence in systems for routing within communications networks. Ant Colony Optimization (ACO) is popular among other

## **ACO**

The main idea behind ACO routing algorithms is that they gather routing information through repeated sampling of full paths using small control packets, which are called ants. This is in line with the behavior of ants in nature, where a large number of ants continuously move between their nest and the food source, and with the working of ACO algorithms for combinatorial optimization, where multiple artificial ants repeatedly and in parallel construct sample solutions for the problem at hand.

The ants are generated concurrently and independently by the nodes, with the task to test a path to an assigned destination. An ant going from source node 's' to destination node 'd' collects information about the quality of the path and uses this on its way back from 'd' to 's' to update the routing information at the intermediate nodes. Ants always sample complete paths, so that routing information can be updated.

The routing tables contain for each destination a vector of real-valued entries, one for each known neighbor node. These entries are a measure of the goodness of going over that neighbor on the way to the destination. They are termed pheromone variables, and are constantly updated according to path quality values calculated by the ants. The repeated and concurrent generation of path-sampling ants results in the availability at each node, a bundle of paths, each with an estimated measure of quality. In turn, the ants use the routing tables to define which path to their destination they sample: at each node they stochastically choose a next hop, giving higher probability to those links which are associated with higher pheromone values. This pheromone information is used for routing data packets, more or less in the same way as for the routing of ants: all packets are routed stochastically, choosing with a higher probability those links associated with higher pheromone values. There are also some initiatives for ant-routing algorithms in ad hoc networks other than AntHocNet, ARA, and PERA among a few. In case of wireless networks, AntHocNet is

more efficient among all the considered ant based algorithms. This is because it has greater chance of exploring new paths based on probability. But it is costlier as more resources are required for implementing it. This is due to the fact that there is lot of ant traffic generated during the routing process.

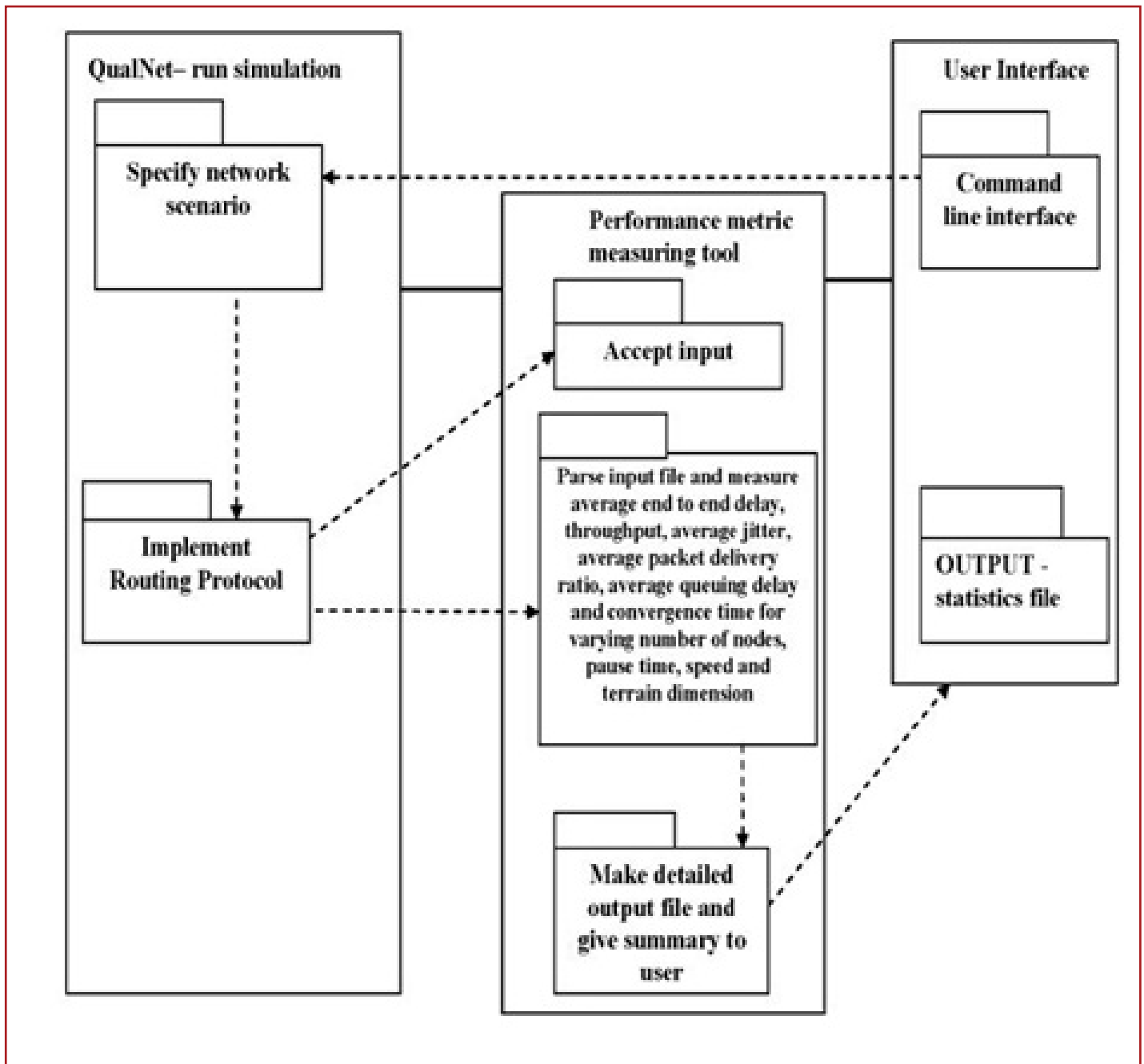
## **AGENTS FOR HYBRID MULTIPATH ROUTING (ANTHOCNET)**

AntHocNet is a multipath routing algorithm for mobile ad-hoc networks that combines both proactive and reactive components. It is based on AntNet, designed for wired networks, with some modifications to be used on ad-hoc networks. AntHocNet emerges as a reactive, adaptive, multipath and proactive algorithm (hybrid).

It is reactive because it has agents operating on-demand to set up routes to destinations. It does not maintain paths to all destinations at all times, but sets up paths when they are needed at the start of a session. This is done in a reactive path setup phase, where ant agents called reactive forward ants are launched by the source in order to find multiple paths to the destination, and backward ants return to set up the paths. The paths are represented in pheromone tables indicating their respective quality. After path setup, data packets are routed stochastically as datagrams over the different paths using these pheromone tables. While the data session is open, paths are monitored, maintained and improved proactively using different agents, called proactive forward ants. The algorithm reacts to link failures with either a local route repair or by warning preceding nodes on the paths.

## **MAIN DESIGN CRITERIA**

Simulator chosen: The simulator chosen to evaluate the two protocols is QualNet 5.0 as it offers a number of important advantages when compared to other simulators. Some of the features of QualNet are: it includes an extensive documentation and technical support, user-friendly tools, tools for building scenarios and analyzing simulation output. It offers large set of modules and protocols for both wired and wireless networks (local, Ad hoc, satellite and cellular).



**ANTHOCNET SUBSYSTEM DESIGN- MODULES AND THEIR INTERACTION.**

The key to successful deployment of wireless networks in QualNet is its speed, scalability, accuracy and portability. QualNet offers highly detailed models of all aspects of networking. This ensures accurate modeling results. Scalability in QualNet is necessary for prediction of large network behavior of thousands of nodes. QualNet runs on all

common platforms (Linux, Windows, and Solaris).

A feature-rich visual development environment offered by QualNet allows users to set up models quickly, efficiently code protocols and then run models that present real-time statistics. It also provides packet-level debugging insight.

## HawkEye: A Sport Based Sophisticated Tool

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### INTRODUCTION:

In the 1970s, the world hockey champions had a coach who inspired them by insisting that they start every match, by imagining they were 0-3 down. "A goal for your weaknesses, another for your opponent's strengths and a third for umpiring errors." In the past few decades, skepticism about umpiring follies hasn't abated. In the world of sports, where stakes are increasing by every passing minute and an erroneous line-call can mean change of fortunes, there is an increasing reliance on technology to ensure that all arbitrations are unbiased. The component of human error in making judgments of crucial decisions often turns out to be decisive. It is not uncommon to see matches turning from being interesting to being one sided due to a couple of bad umpiring decisions. There is thus a need to bring in technology to try and minimize the chances of human error in such decision making.

Teams across the world are becoming more and more professional with the way they play the game. Teams now have official strategists and technical support staff which help players to study their past games and improve. Devising strategies against opponent teams or specific players is also very common in modern day sports. All this has become possible due to the advent of technology. Technological developments have been harnessed to collect various data very precisely and use it for various purposes.

The HawkEye is one such technology which is considered to be really top notch in sports. The basic idea is to monitor the trajectory of the ball during the entire duration of play. This data is then processed to produce life like visualizations showing the paths which the ball took. Such data has been used for various purposes, popular uses including the LBW decision making software and colorful wagon wheels showing various statistics. The HAWKEYE is one of the most commonly used

technologies in the game of cricket today. It has been put to a variety of uses, such as providing a way to collect interesting statistics, generate very suggestive visual representations of the game play and even helping viewers to better understand the umpiring decisions, especially in the case of LBWs.

### WHY HAWK-EYE?

Hawk-Eye is the most sophisticated officiating tool used in any sport. It is accurate, reliable and practical: fans now expect and demand it to be a part of every event. Hawk-Eye first made its name in Cricket broadcasting, yet the brand has diversified into Tennis, Snooker and Coaching. Hawk-Eye is currently developing a system for Football. In Tennis the technology is an integral part of the ATP, WTA and ITF tennis tours, featuring at the Masters Cup in Shanghai, the US Open, and the Australian Open etc. Hawk-Eye is the only ball-tracking device to have passed stringent ITF testing measures. Hawk-Eye offers a unique blend of innovation, experience and accuracy that has revolutionized the sporting world. The system is the most technologically advanced cricket coaching system in the world. It will provide valuable information to players, coaches and umpires to enable them to identify faults, measure performance and improvement, focus on specific areas, improve tactical awareness and provide a level of realism never before achieved in a net environment.

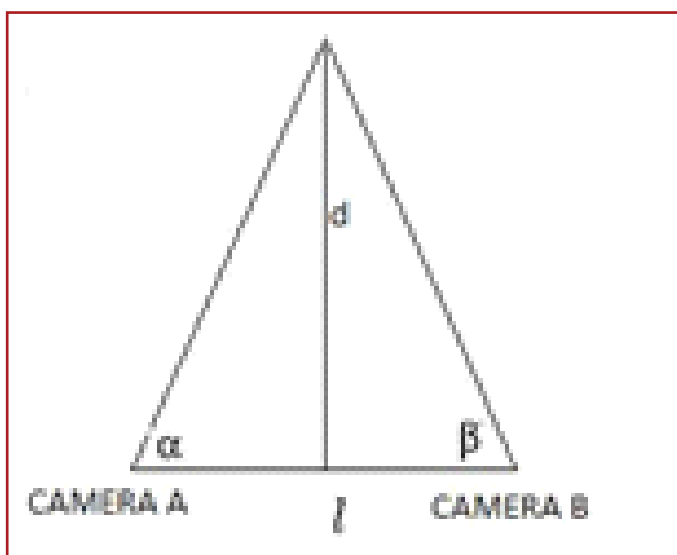
Hawk eye technology since from its beginning has gained huge popularity due to its highly innovative and state of the art features. Though initially it was made for the benefit of umpires regarding decisions in cricket but now it is being used in tennis, snooker, video games and also for enhancing military strength. While the system provides for things which we see every day on television, there is very impressive technology going into it, which many of us are oblivious to.

All Hawk-Eye systems are based on the principles of triangulation using the visual images and timing data provided by at least four high-speed video cameras located at different locations and angles around the

area of play. The system rapidly processes the video feeds by a high-speed video processor and ball tracker. A data store contains a predefined model of the playing area and includes data on the rules of the game. In each frame sent from each camera, the system identifies the group of pixels which corresponds to the image of the ball. It then calculates for each frame the 3D position of the ball by comparing its position on at least two of the physically separate cameras at the same instant in time. A succession of frames builds up a record of the path along which the ball has travelled. It also "predicts" the future flight path of the ball and where it will interact with any of the playing area features already programmed into the database. The system can also interpret these interactions to decide infringements of the rules of the game. The system generates a graphic image of the ball path and playing area, which means that information can be provided to judges, television viewers or coaching staff in near real time

### PRINCIPLE OF HAWK EYE

A hawk Eye system is based on the principle of 'triangulation' in geometry. Triangulation is the process of determining the location of a point by measuring angles to it from known points at either end of a fixed base line. Triangulation is the process of finding coordinates and distance to a point by calculating the length of one side of a triangle, given measurements of angles and sides of the triangle formed by that point and two other known reference points, using the law of sin.



$$l = \frac{d}{\tan \alpha} + \frac{d}{\tan \beta}$$

Therefore

$$d = l / \left( \frac{1}{\tan \alpha} + \frac{1}{\tan \beta} \right)$$

Therefore,

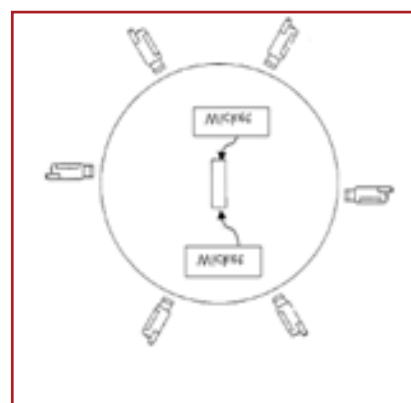
The

coordinates and distance to a point can be found by calculating the length of one side of a triangle,

given measurements of angles and sides of the triangle formed by that point and two other known reference points. In this section, we go into the technical details of the steps involved in the HAWKEYE system. The process, as done before, can be broken down into the following steps (we will mainly concentrate on working of Hack-Eye in a cricket field);

#### 1. The cameras:

Typically, for a cricket field, 6 cameras are used. These cameras are placed around the field at roughly the places as indicated in the diagram below:



each other. They are placed high in the stands, so that there is lesser chance of their view being blocked by the fielders. There are two cameras, one

each looking at the wickets directly in sideways fashion. These 6 cameras are calibrated according to the distance they are at from the pitch. In order to get good accuracy, one needs to restrict the view of each camera to a smaller region. This means each camera image would show a more prominent picture of the ball and hence the ball will be located more accurately. However, we also need to keep in mind that the whole field of play has to be covered by just the 6 cameras which are available. This puts some limitation on how restricted the view of a camera can be. Nevertheless, the accuracy obtained by using 6 cameras is acceptable to the standards prevalent today.

# Fundamental Concepts On High-Altitude Long Operation Aircraft

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## INTRODUCTION:

High-Altitude Long Operation (HALO) aircraft present a new layer in the hierarchy of wireless communication – a 10-mile tall tower in the stratosphere above rain showers and below meteor showers (i.e., high above terrestrial towers and well below satellite constellations).

HALO airplane will be the central node of a wireless broadband communications network. The HALO Network, whose initial capacity will be on the scale of 10 Gbps, with a growth potential beyond 100 Gbps. The packet-switched network will be designed to offer bit rates to each subscriber in the multimegabit-per-second range.

The airplane's fuselage can house switching circuitry and fast digital network functions. A MMW antenna array and its related components will be located in a pod suspended below the aircraft fuselage. The antenna array will produce many beams – typically, more than 100. Broadband channels to subscribers in adjacent beams will be separated in frequency. For the case of aircraft-fixed beams, the beams will traverse over a user location, while the airplane maintains stationary overhead, and the virtual path will be changed to accomplish the beam-to-beam handoff. The aircraft will fly above commercial airline traffic, at altitudes higher than 51,000 feet. For each city to be served, a fleet of three aircraft will be operated in shifts to achieve around-the-clock service. Flight operational tactics will be steadily evolved to achieve high availability of the node in the stratosphere.

The High Altitude Long Operation (HALO) Network is a broadband wireless metropolitan area network (MAN) consisting of HALO aircraft operating at high altitude and carrying an airborne communications network hub and network elements on the ground.

The HALO Network combines the

advantages of two well-established wireless communication services: satellite networks and terrestrial wireless networks like cellular and personal communication systems. Satellite networks was deployed at low earth orbit (LEO), medium earth orbit (MEO), high elliptic orbit (HEO), and geosynchronous earth orbit (GEO). Their disadvantages include expensive high-power user terminals, long propagation delays. Also, system capacity will be practically fixed and can be increased incrementally only by adding satellites. In contrast, terrestrial wireless networks have advantages such as low-cost, low-power user terminals, short propagation delays, and good scalability of system capacity. However, their disadvantages include low look angles and complex infrastructures. They require many base stations that must be interlinked over cables or microwave links. They often require significant re-engineering to increase capacity when using cell-splitting techniques.

The HALO network will be located in the atmosphere, at an altitude of 15 miles above terrestrial wireless, but hundreds to thousands of miles below satellite networks. It will provide broadband services to businesses and small offices/home offices in an area containing a typical large city and its neighbouring towns. To each end user it will offer an unobstructed line of sight and a free-space-like channel with short propagation delay, and it will allow the use of low-power low-cost user terminals.

The HALO network infrastructure is simple, with a single central hub. Consequently, the deployment of service to the entire metropolitan area can occur on the first day the network is deployed; and the subsequent maintenance cost is expected to be low. The system capacity can be increased by decreasing the size of beam spots on the ground while increasing the number of beams within the signal footprint, or by increasing the signal bandwidth per beam. The HALO network can interface to existing networks. It can operate as a backbone to connect physically separated LANs through frame relay adaptation or directly through LAN bridges and routers.

The HALO Network will be able to offer

wireless broadband communications services to a "super metropolitan area," an area encompassing a typical large city and its surrounding communities. The aircraft will carry the "hub" of the network from which we will serve tens to hundreds of thousands of subscribers on the ground. Each subscriber will be able to communicate at multi-megabit per second bit rates through a simple-to-install user terminal. The HALO Network will be evolved at a pace with the emergence globally of key technologies from the data communications, millimeter wave RF, and network equipment fields. The HALO aircraft will be operated in shifts from regional airports. While on the ground, the network equipment aboard the aircraft will be assessed, maintained and upgraded on a routine basis to ensure optimal performance. The HALO/Proteus airplane has been specially designed to carry the hub of the HALO Network. In the stratosphere, the airplane can carry a weight of approximately one ton. The airplane is essentially an equipment bus from which commercial wireless services will

be offered. A fleet of three aircraft will be cycled in shifts to achieve continuous service. Each shift on station will have an average duration of approximately eight hours. The HALO/Proteus airplane will maintain station at an altitude above 51 Kft in a volume of airspace. Under these assumptions, the Many types of organizations schools, hospitals, doctors' offices, and small to medium-size businesses around the world will benefit from the low pricing of broadband services provided by the HALO Network. Standard broadband protocols such as ATM and SONET will be adopted to interface the HALO Network as seamlessly as possible. The gateway to the HALO Network will provide access to the Public Switched Telephone Network (PSTN) and to the Internet backbone for such services as the World Wide Web and electronic commerce. The gateway will provide to information content providers a network-wide access to a large population of subscribers.

# Thunderbolt-An Incredibly Fast Input/Output Technology

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## INTRODUCTION

Thunderbolt began at Intel Labs with a simple concept, create an incredibly fast input/output technology that just about anything can plug into. After close technical collaboration between Intel and Apple, Thunderbolt emerged from the lab to make its appearance in Mac computers. Intel co-invented USB and PCI Express, which have become widely adopted technologies for data transfer. Apple invented FireWire and was instrumental in popularizing USB. Their collective experience has made Thunderbolt the most powerful, most flexible I/O technology ever in a personal computer.

Thunderbolt (originally codenamed Light Peak) is an interface for connecting peripheral devices to a computer via an expansion bus. Thunderbolt was developed by Intel and brought to market with technical collaboration from Apple Inc. It was introduced commercially on Apple's updated Mac Book Pro line up on February 24, 2011, using the same port and connector as Mini display Port. Though initially registered with Apple Inc., full rights of the Thunderbolt technology trademark belong to Intel Corp., and subsequently led to the transfer of the registration.

Thunderbolt essentially combines PCI Express and Display Port into a new serial data interface that can be carried over longer and less costly cables. Because PCI Express is widely supported by device vendors and built into most of Intel's modern chipsets, Thunderbolt can be added to existing products with relative ease. Thunderbolt driver chips fold the data from these two sources together, and split them back apart again for consumption within the devices. This makes the system backward compatible with existing Display Port hardware upstream of the driver.

The interface was originally intended to run on an optical physical layer using components and flexible optical fiber

cabling developed by Intel partners and at Intel's Silicon Photonics lab. The Intel technology at the time was marketed under the name Light Peak, today (2011) referred to as Silicon Photonics Link. However, conventional copper wiring turned out to be able to furnish the desired 10 Gbit/s Thunderbolt bandwidth per channel at lower cost. Later versions of Thunderbolt are still planned to introduce an optical physical layer based on Intel silicon photonics technology.

Data transfers for backup, sharing, and editing are faster with Thunderbolt technology, significantly reducing times to complete these tasks. For time-sensitive data, such as video and audio during creation and playback, data transfers can be critical to the success of the work. Thunderbolt technology was specifically designed with video and audio applications in mind with inherently low latency and highly accurate time synchronization capabilities.

For some power users, optimal workflows can be had with workstation performance and expandability while using a thin and light laptop. Thunderbolt technology enables using the thinnest and lightest laptops, connected, with "in the box" performance over a single external cable, to high-performance external media drives, HD displays, HD media capture and editing systems, as well as legacy I/O hubs and devices, for the utmost in performance, simplicity and flexibility.

## KEY FEATURES

- Dual-channel 10Gbps per port
- Bi-directional
- Dual-protocol (PCI Express and Display Port)
- Compatible with existing Display Port devices
- Daisy-chained devices
- Electrical or optical cables
- Low latency with highly accurate time synchronization
- Uses native protocol software drivers
- Power over cable for bus-powered devices

As every generation of information technology progresses, I/O technologies evolve to provide higher bandwidth for

getting data into and out of computers. At its simplest, two discrete types of I/O have resulted – display (with formatted video and audio components), and data. Traditional approaches to this evolution have been to make an Existing technology faster.

Thunderbolt technology combines the next step in higher performance with the innovation of mapping two of the most fundamental I/O protocols at the heart of computing (PCI Express and Display Port), onto a single highly efficient meta protocol, transmitting them over a single cable, and managing the traffic routing (supporting daisy chaining and hot-plugging devices) with intelligent hardware controllers. The choice of PCI Express was clear, providing for off-the-shelf controller use to attach to nearly any technology imaginable, and the choice of Display Port was equally clear for meeting the needs of the PC industry with capabilities like support for greater-than-high definition display resolutions, and support for up to 8 channels of high-definition audio.

## PROTOCOL ARCHITECTURE

Thunderbolt technology is based on switched fabric architecture with full-duplex links. Unlike bus-based I/O architectures, each Thunderbolt port on a computer is capable of providing the full bandwidth of the link in both directions with no sharing of bandwidth between ports or between upstream and downstream directions. The Thunderbolt protocol architecture can be abstracted into four layers as shown in Figure. A Thunderbolt connector is capable of providing two full-duplex channels. Each channel provides bi-directional 10 Gbps of bandwidth. A Thunderbolt connector on a computer is capable of connecting with a cable to Thunderbolt products or to Display Port devices.

The Thunderbolt connector is extremely small, making it ideal for thin systems and compact cables. Compatibility with Display Port devices is provided by an interoperability mode between host devices and Display Port products; if a Display Port device is detected, a Thunderbolt controller will drive compatibility mode Display Port signals to that device. Thunderbolt cables may be

electrical or optical; both use the same Thunderbolt connector. An active electrical-only cable provides for connections of up to 3 meters in length, and provides for up to 10W of power deliverable to a bus-powered device. And an active optical cable provides for much greater lengths; tens of meters. The Thunderbolt protocol physical layer is responsible for link maintenance including hot-plug detection, and data encoding to provide highly efficient data transfer. The physical layer has been designed to introduce very minimal overhead and provides full 10Gbps of usable bandwidth to the upper layers. In Thunderbolt, both PCIe and Display port are transferred through same cable based on the switched fabric architecture with full-duplex links. The heart of the Thunderbolt protocol architecture is the transport layer. Some of the key innovations introduced by the transport layer include:

- A high-performance, low-power, switching architecture.
- A highly efficient, low-overhead packet format with flexible QoS support that allows multiplexing of busy PCI Express transactions with isochronous Display Port communication on the same link.
- A symmetric architecture that supports flexible topologies (star, tree, daisy chaining, etc.) and enables peer-to-peer communication (via software) between devices.
- A novel time synchronization protocol that allows all the Thunderbolt products connected in a domain to synchronize their time within 8ns of each other. Display Port and PCI Express protocols are mapped onto the transport layer. The mapping function is provided by a protocol adapter which is responsible for efficient encapsulation of the mapped protocol information into transport layer packets. Mapped protocol packets between a source device and a destination device may be routed over a path that may cross multiple Thunderbolt controllers. At the destination device, a protocol adapter recreates the mapped protocol in a way that is indistinguishable from what was received by the source device.

**CONCLUSION:**

Thunderbolt technology is based on switched fabric architecture with full-duplex links. Unlike bus-based I/O architectures, each Thunderbolt port on a computer is capable of providing the full bandwidth of the link in both directions with no sharing of bandwidth between ports or between upstream and downstream directions.

## Application of AI in Power Station

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Recently, due to concerns about the liberalization of electricity supply, deregulation, and global impact on the environment, securing a reliable power supply has become an important social need worldwide. To ensure this need is fulfilled, detailed investigations and developments are in progress on power distribution systems and the monitoring of apparatus. These are on (1) “digital technology” based on the application of semiconductor high-speed elements, (2) intelligent substations applying IT (information technology), and (3) system configurations aimed at high-speed communication. Incorporated in these are demands for the future intelligent control of substations, protection, monitoring, and communication systems that have advantages in terms of high performance, functional distribution, information-sharing and integrated power distribution management. Today's conventional apparatus also requires streamlining of functions, improvements in sensor technology, and standardized interfaces. By promoting these developments, the following savings for the whole system can be expected: (1) reduced costs in remote surveillance in the field of apparatus monitoring, operation, and maintenance, (2) reduced maintenance costs based on the integrated management of equipment, and (3) reduced costs due to space saving as a result of miniaturizing equipment

### CONCEPT OF INTELLIGENT SUBSTATIONS

In conventional substations, substation apparatus, such as switchgear and transformer, control, protection and monitoring equipment is independent of every other device, and connection is based on the signals coming through the cable. On the other hand, an intelligent substation shares all information on apparatus, control, protection, measurement and apparatus monitoring equipment through one bus by applying

both “digital technology” and “IT-related technology.”

Moreover, high efficiency and miniaturization can be achieved because the local cubicle contains unified control/protection and measurement equipment that is one integrated system (see Fig. 1). Since an optical bus shares the information between the apparatus and equipment, the amount of cable is sharply reduced. Moreover, as international standards (IEC 61850 and 61375 etc.) are adopted and the system conforms to the telecommunications standard, equipment specifications can be standardized for different vendors.

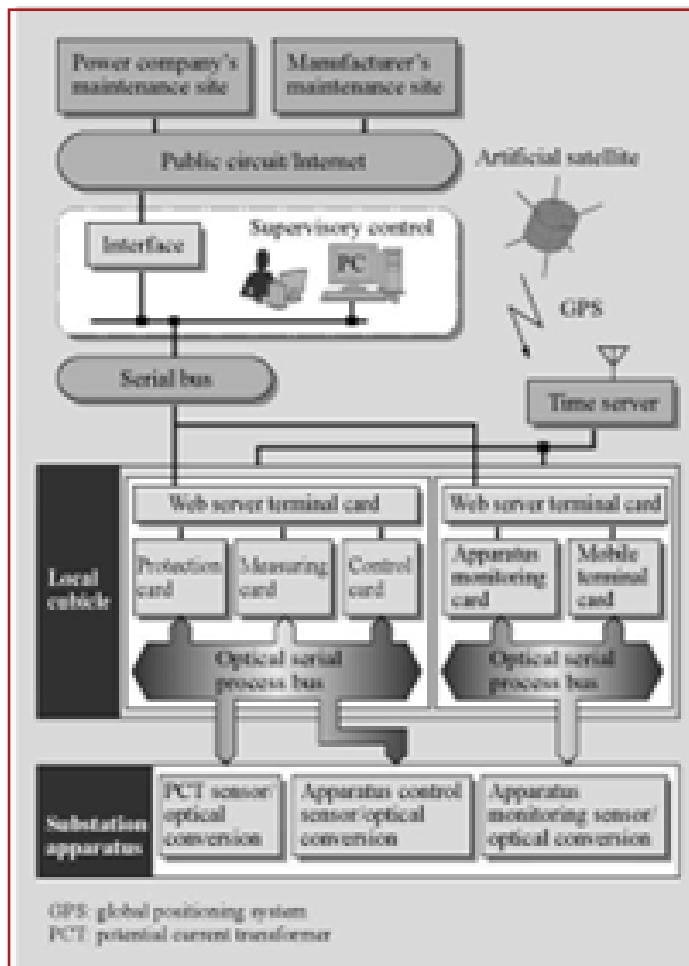
All the data from each monitoring and measuring device is transmitted and used for a higher-level monitoring system via an optical bus. The required data is accessed through the Intranet or the Internet at the maintenance site of an electricity supply company or a manufacturer and the apparatus can be monitored from a remote location. The construction, analysis and diagnosis of the database including trend management and history management also become possible. As a result, signs of abnormalities can be checked out well in advance, and prompt action can be taken in times of emergency.

Maintenance plans can also be drafted to ensure reliability, by inspecting revision description and parts management, efficient maintenance planning and reliability maintenance are also realized simultaneously.

### POWER SYSTEM CONTROLS

Power system controls can be broadly classified into two categories: local and area (regional/system-wide). The boundary between these two categories is not precise as area controls are often implemented by optimally adjusting local control parameters and set points. Area controls main characteristic is the need to process information gathered at various points of the network and to model the behavior of large parts of the power system. This type of control is usually not limited to the automatic feedback type but often includes strategies based on empirical knowledge and human intervention. Local control, on the other

hand, is typically implemented using conventional automatic control rules, such as, PID control, which are believed to offer adequate performance in most applications. Still, this is not to discount the usefulness of new intelligent methodologies, such as, fuzzy logic controllers, for local controls.



the grand challenges in this area are on-line Dynamic and Voltage Security Assessment (DSA and VSA);

- Emergency control: manages the problem of controlling the system after a large disturbance; it is an event driven type of control and includes special protection schemes
- Restorative control: its main function is to re-energize the system after a major disturbance followed by a partial or total blackout.

Intelligent system techniques may be of great help in the implementation of area power system controls. Most of these applications require large quantities of system information, which can be provided by modern telecommunications and computing technology, but require new processing techniques able to extract salient information from these large sets of raw data. Importantly, such large data sets are never error free and often contain various types of uncertainty. Finally, control actions may be based on operating strategies specified in qualitative form, which need to be translated into quantitative decisions

For convenience, power system higher level controls are classified here as:

- Generation scheduling and automatic control: includes unit commitment, economic dispatch, and automatic generation control; in the past, well established control methods were used but this situation has been changing to deal with the new scenario created by the power industry restructuring;
- Voltage control: is mostly of the local type but some systems have already gone to a higher coordinated secondary control to allow a more effective use of reactive power sources and increase stability margins;
- Preventive security control: has the objective to detect insecure operating points and to suggest corrective actions;

# Software Methods in Embedded Systems

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An embedded system is a special-purpose computer system, which is completely encapsulated in the device it controls. It has specific requirements and performs pre-defined tasks, unlike a general-purpose personal computer. PDAs, mobile phones, household appliances, monitoring and control systems for industrial automation etc are examples embedded systems.

Even though the technology of embedded systems is fast improving and devices are becoming more and more advanced very less attention is being given to its security. The reason mainly being the high sensitivity of costs, even a small rise in cost of production will make a big difference when building millions of units.

Embedded systems often have significant energy constraints, and many are battery powered. Some embedded systems can get a fresh battery charge daily, but others must last months or years on a single battery. Protection of an embedded system is very intricate from that of a typical computer because of the working environments of the particular system. Building a secure embedded system also involves designing a robust application that can deal with internal failures; no level of security is useful if the system crashes and is rendered unusable. It is obvious that the higher the level of security the bigger the cost of the product. For this reason the manufacturer should carry out a risk analysis to determine what the cost of a successful attack against his product will be and what class of attacker he must protect the product from. Once he knows the possible loss he must identify the candidate security measures for completion and their cost.

## COUNTER MEASURES TO AVOID ATTACKS

### SOFTWARE METHODS

Whenever a system has to communicate with another device the data passes through a number of untrusted intermediate points. Therefore the secure data must be

scrambled in such a way that the data will be useless or unintelligible for anyone who is having unauthorized access to the secure data. This can be achieved with the help of cryptographic methods, Digital Signatures and Digital Certificates.

### DATA ENCRYPTION

Encryption is the process of scrambling/encrypting any amount of data using a (secret) key so that only the recipient, who is having access to the key, will be able to decrypt the data. The algorithm used for the encryption can be any publicly available algorithm like DES, 3DES or AES or any algorithm proprietary to the device manufacturer.

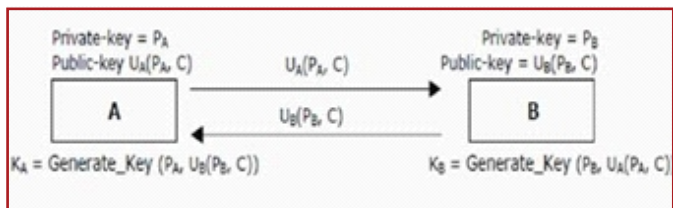
The Data Encryption Standard (DES) is a block cipher (a method for encrypting information) .It is based on a Symmetric-key algorithm that uses a 56-bit key. An algorithm that takes a fixed-length string of plain text bits and transforms it through a series of complicated operations into another cipher text bit string of the same length. In the case of DES, the block size is 64 bits. DES uses a key to customize the transformation, so that decryption can supposedly only be performed by those who know the particular key used to encrypt. The key ostensibly consists of 64 bits; however, only 56 of these are actually used by the algorithm. Eight bits are used solely for checking parity, and are thereafter discarded. Hence the effective key length is 56 bits.

If publicly available algorithms are used, the security of the transferred data totally depends on the secrecy of the keys used for the encryption.

### PUBLIC-KEY KEY AGREEMENT ALGORITHM

Key agreement algorithms exchange some public information between two parties so they each can calculate a shared secret key. However, they do not exchange enough information that eavesdroppers on the conversation can calculate the same shared key. Key agreement algorithm will have a private-key and an associated public-key. The private-key is generally a random number of hundreds or few thousands of bits and the public-keys are derived from the private-key using the one-

way function specified by the key agreement algorithm.



The key generation algorithm 'Generate Key' will be such that the generated keys at the device A and B will be the same, that is shared secret  $K_A = K_B = K(P_A, P_B, C)$ .

This protocol faces a deficiency. Nothing in this key agreement protocol prevents someone from impersonating.. So even though the transmissions of the public keys do not need to be encrypted, they should be signed for maximum safety.

### DIGITAL SIGNATURE

As mentioned before, public-key cryptography is inefficient. In order to make public-key authentication practical, the digital signature was invented. A digital signature is simply a hash of the data to be sent encrypted using the public-key authentication method. Some digital signature algorithms DSA, Full Domain Hash, RSA-PSS, etc.

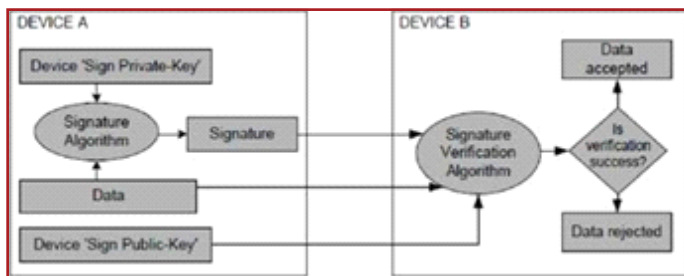


Fig 2 Digital signature algorithm

For establishing shared secret using the key agreement algorithm, it is important for device to receive an authenticated public-key from the peer. For authenticated exchange of public-key, Digital Signature is used. By encrypting only the fixed-size message hash, we remove the inefficiency of the public-key algorithm and we can efficiently authenticate any arbitrary amount of data.

In digital signature, like the key agreement algorithm, a device uses a pair of keys, 'sign private-key' and 'sign public-key'. Only the device knows its sign private-key whereas the sign public-key is distributed to all the communicating devices.

A device signs the message using a signatures algorithm with its sign private-key to generate a signature and any device that has got the access to the sign public-key of the signed device can verify the data with the signature using the signature verification algorithm. If any third party modifies the data or signature, the verification fails.

### DIGITAL CERTIFICATE

Even while using the digital signature algorithm, the 'sign public-key' from a peer device has to be obtained by an authenticated way to ensure the authenticity of a received message. For key agreement or digital signature the authenticated transfer of public-key in a large network is difficult or even not possible without a centralized trusted authority. This centralized authority is trusted by all the devices in the network. This authority is generally known as trusted Certificate Authority or CA. The Certificate Authority (CA) signs the public-keys of devices along with the device ID using the CA's private-key to generate the signature.

#### Security Needs Within The Device

Security is not all about encryption. It's also about policy, procedure, and implementation. Case in point, encryption based on a secret key is only as good as the policy that controls access to the key. Secure code alone does not make a secure system. Security must be considered at each phase of the process, from requirements to design to testing, and even support.

Whether it is the private-key of any public-key algorithm or it is any previously negotiated shared secret between the devices, the security of data transferred depends in the secrecy of these keys. These secret keys and secret values stored in the device (some even for the lifetime of the device.) that requires protection from unauthorized exposure. Hardware and software security measures implemented in the device must defeat any attempts of unauthorized access to retrieve these secret keys.

# Resonant Frequency Of Microstrip Antenna using Artificial Neural Network

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**Abstract** :- There are some key parameters in RFID reader antenna which are related closely with the antenna structure, such as resonant frequency, return loss and bandwidth in the antenna design process. Structure and properties of the antenna is a complex nonlinear system with complex state which is difficult to make mode by the mathematic method. In this case, neural network is used to express the nonlinear system in this article. Giving a large number of simulation data for the samples, adaptive artificial neural network is used to train network by simulation experiment which is used to verify the fitting degree of neural networks and simulation results. The experiment result shows that artificial neural network can improve the level of computer-aided design of micro strip antenna and achieve the antenna design quickly.

## INTRODUCTION

In 1990, Hansen and Salamon creatively put forward the NNE method. They proved that generalization ability of the neural computing system can be improved obviously by the way of training several NNs and then ensembling the results according to the rule of relative plurality voting or absolute plurality voting. Presently, the NNE studies mainly focus on two aspects: one is how to build/select every individual network, and the other is how to ensemble the outputs of every individual network. Taking the regression problem as an example, matrix inversion has to be carried out for getting combination weights of some conventional methods, and it is affected easily by multi-dimensional co linearity and noise in the data, which may decrease the generalization ability of the NNE. To solve the problem of multidimensional co linearity, we can adopt some methods, such as avoiding matrix inversion and restricting combination weights, selective ensemble method, extracting principal components, etc. To

decrease the influence of noise, we can also adopt some methods, such as restricting combination weights, adjusting objective function, etc.

## METHODOLOGY

The resonance frequency of microstrip antennas is a phenomenon driven by laws whose behavior can be determined from previously known input/output samples. Empirical models like ANN permit to estimate the resonance frequency for similar cases by interpolation, within the range where the samples were obtained. Feed forward Perceptions Multilayer (PML) and Radial Base Functions (RBF) models were developed, using experimental data presented in references, and compared with the deterministic results presented in through and the empirical results presented in (1) and (2). In general, PML networks are valid alternatives, but their training is done using the backpropagation algorithm, which can present typical difficulties of the optimization algorithms based on gradient descendent methods. The major difficulties are velocity of convergence and susceptibility to local minima, increasing the computational effort and decreasing the interpretability/ transparency of the results. Good alternatives to the PML networks are the RBF ones. Many different algorithms can be used with the feed forward architecture. A classical algorithm used for the training of PML neural networks is the gradient conjugate, a heuristic method. The Newton analytical method is an alternative to the gradient conjugate method, for a rapid convergence. The basic equation for the Newton method is:

$$x_{k+1} = x_k - H_k^{-1} g_k$$

Where H is a Hessian matrix (second partial derivatives) of the performance index at the current values of the weights and biases. Newton's method often converges faster than conjugate gradient methods. Unfortunately, it is complicated and expensive to compute the Hessian matrix for feed forward neural networks. There is a class of algorithms that is based on Newton's method, but it doesn't require calculation of second derivatives. These are called quasiNewton (or secant) methods. They update an approximate Hessian matrix at

each iteration of the algorithm. The update is computed as a function of the gradient. The quasi-Newton method that has been most successful in published studies is the Broyden, Fletcher, Goldfarb, and Shanno (BFGS) update, whose basic equation is:

$$\Delta x = -J^{-1} \nabla J(x)$$

$$\nabla J(x) = J^T(x) \cdot e(x)$$

Where  $J(x)$  is Jacobean matrix and  $e(x)$  represents the errors. BFGS algorithm was used for rectangular antennas. For triangular antennas, the algorithm that presented best results was the Rprop - Resilient Propagation, described in reference. In the Rprop algorithm the weights and learning rates are modified only once in each training epoch. Each weight  $w_{ji}$  has its own variation rate ( $\eta_{ji}$ ), which depends of the time  $t$ .

## CONCLUSION

From the above experimental results, artificial neural network has the faster convergence rate and the smallest error. This proves the effectiveness of neural network to solve the problem of the design and calculation of micro strip antenna's different parameters. The neural network method can significantly improve the level of computeraided design of micro strip antenna to achieve the calculation of antenna's parameters quickly. In future we can use PSO to solve the problem of the design and to calculation the different parameters of micro strip antenna. Because the optimization of the Microstrip Patch is partially realized this concludes that the PSO code is functioning correctly.

## A GPS Guided Missile

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In the modern day theatre of combat, the need to be able to strike at targets that are on the opposite side of the globe has strongly presented itself. This had led to the development of various types of guided missiles. These guided missiles are self-guiding weapons intended to maximize damage to the target while minimizing collateral damage. The buzzword in modern day combat is fire and forgets. GPS guided missiles, using the exceptional navigational and surveying abilities of GPS, after being launched, could deliver a warhead to any part of the globe via the interface of the onboard computer in the missile with the GPS satellite system. Under this principle many modern day laser weapons were designed.

Laser guided missiles use a laser of a certain frequency bandwidth to acquire their target. GPS/inertial weapons are oblivious to the effects of weather, allowing a target to be engaged at the time of the attacker's choosing. GPS allows accurate targeting of various military weapons including ICBMs, cruise missiles and precision-guided munitions. Artillery projectiles with embedded GPS receivers able to withstand accelerations of 12,000 G have been developed for use in 155 mm. GPS signals can also be affected by multipath issues, where the radio signals reflect off surrounding terrain; buildings, canyon walls, hard ground, etc. These delayed signals can cause inaccuracy.

A variety of techniques, most notably narrow correlator spacing, have been developed to mitigate multipath errors. Multipath effects are much less severe in moving vehicles. When the GPS antenna is moving, the false solutions using reflected signals quickly fail to converge and only the direct signals result in stable solutions. The multiple independently targeted re-entry vehicles (MIRVs) – ICBMs with many sub-missiles – were developed in the late 1960s. The cruise missile has wings like an airplane, making it capable of flying at low altitudes.

In summary, GPS-INS guided weapons are not affected by harsh weather conditions or restricted by a wire, nor do they leave the gunner vulnerable for attack. GPS guided weapons, with their technological advances over previous, are the superior weapon of choice in modern day warfare.

### INTRODUCTION OF ADAPTIVE MISSILE GUIDANCE USING GPS

Guided missile systems have evolved at a tremendous rate over the past four decades, and recent breakthroughs in technology ensure that smart warheads will have an increasing role in maintaining our military superiority. On ethical grounds, one prays that each warhead deployed during a sortie will strike only its intended target, and those innocent civilians will not be harmed by a misfire. From a tactical standpoint, our military desires weaponry that is reliable and effective, inflicting maximal damage on valid military targets and ensuring our capacity for light ingfast strikes with pinpoint accuracy. Guided missiles systems help fulfill all of these demands.

Many of the early guidance systems used in missiles were based on gyroscope models. Many of these models used magnets in their gyroscope to increase the sensitivity of the navigational array. In modern day warfare, the inertial measurements of the missile are still controlled by a gyroscope in one form or another, but the method by which the missile approaches the target bears a technological edge. On the battlefield of today, guided missiles are guided to or acquire their targets by using:

- Radar Signals
- Wires
- Lasers
- Most recently GPS

The central idea behind the design of DGPS/GPS/inertial guided weapons is that of using a 3-axis gyro/accelerometer package as an inertial reference for the weapon's autopilot, and correcting the accumulated drift error in the inertial package by using GPS PPS/P-code. Such weapons are designated as "accurate" munitions as they will offer CEPs (Circular Error Probable) of the order of the accuracy of GPS P-code signals, typically about 40ft.

## GLOBAL POSITIONING SYSTEM USED IN RANGING NAVIGATION GUIDANCE:

The next incremental step is then to update the weapon before launch with a DGPS derived position estimate, which will allow it to correct its GPS error as it flies to the target, such weapons are designated "precise" and will offer accuracies greater than laser or TV guided weapons, potentially CEPs of several feet. For an aircraft to support such munitions, it will require a DGPS receiver, a GPS receiver and interfaces on its multiple ejector racks or pylons to download target and launch point coordinates to the weapons. The development of purely GPS/inertial guided munitions will produce substantial changes in how air warfare is conducted.



Unlike a laser-guided weapon, a GPS/inertial weapon does not require that the launch aircraft remain in the vicinity of the target to illuminate it for guidance - GPS/inertial weapons are true fire-and-forget weapons, which once released, are wholly autonomous, and all weather capable with no degradation in accuracy. Existing precision weapons require an unobscured line of sight between the weapon and the target for the optical guidance to work

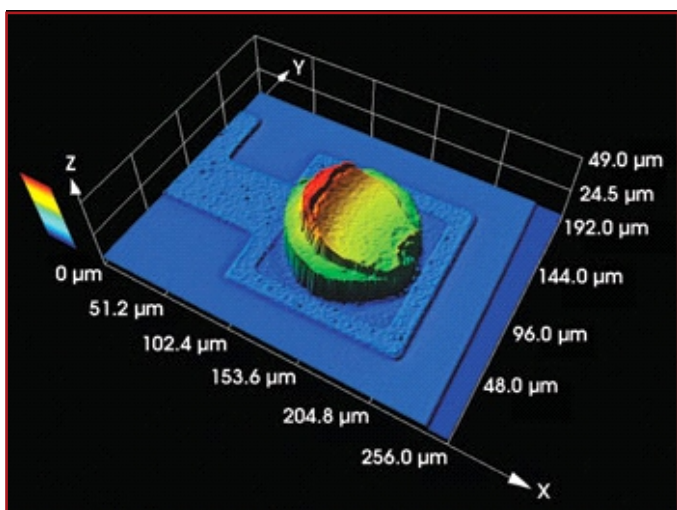
The proliferation of GPS and INS guidance is a double-edged sword. On the one hand, this technology promise a revolution in air warfare not seen since the laser guided bomb, with single bombers being capable of doing the task of multiple aircraft packages. In summary, GPS-INS guided weapons are not affected by harsh weather conditions or restricted by a wire, nor do they leave the gunner vulnerable for attack. GPS guided weapons, with their technological advances over previous, are the superior weapon of choice in modern day warfare.

## An improved Non-Visible Imaging Technology

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Near infrared light consists of light just beyond visible red light (wavelengths greater than 780nm). Contrary to popular thought, near infrared photography does not allow the recording of thermal radiation (heat). Far-infrared thermal imaging requires more specialized equipment. Infrared images exhibit a few distinct effects that give them an exotic, antique look. Plant life looks completely white because it reflects almost all infrared light (because of this effect, infrared photography is commonly used in aerial photography to analyze crop yields, pest control, etc.) The sky is a stark black because no infrared light is scattered. Human skin looks pale and ghostly. Dark sunglasses all but disappear in infrared because they don't block any infrared light, and it's said that you can capture the near infrared emissions of a common iron.

Infrared photography has been around for at least 70 years, but until recently has not been easily accessible to those not versed in traditional photographic processes. Since



the charge-coupled devices (CCDs) used in digital cameras and camcorders are sensitive to near-infrared light, they can be used to capture infrared photos. With a filter that blocks out all visible light (also frequently called a "cold mirror" filter), most modern digital cameras and camcorders can capture photographs in infrared. In

addition, they have LCD screens, which can be used to preview the resulting image in real-time, a tool unavailable in traditional photography without using filters that allow some visible (red) light through.

### INTRODUCTION

Near infrared light consists of light just beyond visible red light (wavelengths greater than 780nm). Contrary to popular thought, near infrared photography does not allow the recording of thermal radiation (heat). Far-infrared thermal imaging requires more specialized equipment. Infrared images exhibit a few distinct effects that give them an exotic, antique look. Plant life looks completely white because it reflects almost all infrared light (because of this effect, infrared photography is commonly used in aerial photography to analyze crop yields, pest control, etc.) The sky is a stark black because no infrared light is scattered. Human skin looks pale and ghostly. Dark sunglasses all but disappear in infrared because they don't block any infrared light, and it's said that you can capture the near infrared emissions of a common iron

Near-infrared (1000 - 3000 nm) spectrometry, which employs an external light source for determination of chemical composition, has been previously utilized for industrial determination of the fat content of commercial meat products, for in vivo determination of body fat, and in our laboratories for determination of lipoprotein composition in carotid artery atherosclerotic plaques. Near-infrared (IR) spectrometry has been used industrially for several years to determine saturation of unsaturated fatty acid esters (1). Near-IR spectrometry uses antunable light source external to the experimental subject to determine its chemical composition.

Industrial utilization of near-IR will allow for the in vivo measurement of the tissue-specific rate of oxygen utilization as an indirect estimate of energy expenditure. However, assessment of regional oxygen consumption by these methods is complex, requiring a high level of surgical skill for implantation of indwelling catheters to isolate the organ under study.

## Methods for removal of artifacts from EEG signal:A review

**Abstract.** Electroencephalogram (EEG) is the record of cerebral activity, the electric potential of cerebral activity is of low amplitude, and less frequency ranges between 4 to 60 Hz, which can easily mix up different non-cerebral signals and other environmental noise signals. The extraction of actual cerebral signals from the contaminated EEG signal is the major challenge in medical analysis. Somehow, during the recording of the EEG signal, contamination of other signals takes place, which increases complexity in analyzing the accurate EEG signal. This leads to inaccurate information signals in the analysis. Accordingly, the process to eliminate the unwanted signals in the pre-processing level is mandatory in brain signal analysis. The unwanted signals from various sources are together termed as artifacts; the researchers have implemented various techniques to reduce the undesired signals. However, still, there is no standard technique in detecting and eliminating the artifacts, and hence, the research became most challenging.

### INTRODUCTION

The Electroencephalogram (EEG) represents states of the brain of the human being's mental condition. EEG signals are the electrical potentials of the cerebral, which is contaminated with other bio-potentials like Electroculogram (EOG), Electrocardiogram (ECG), and Electromyogram (EMG). Hence the segregation of EEG signals from different bio-potentials is a challenging task for analyzing EEG signals. Source separation methods focused much attention on EEG signal analysis; primarily, the source separation techniques are designed based on two types of artifacts; they are extrinsic and intrinsic artifacts [1-3]. Extrinsic artifacts have occurred electric and electronic components, namely high electrode impedance and meddling, line noise, earthing problems, electrode failure, ventilation, and power supply. Intrinsic means various artifacts that occurred in EEG signals like movements of the eye, eye blinks, bioelectric potentials from muscle,

heart etc. Artifacts are unwanted components that arise from other sources; they mislead the actual cerebral activity of present recorded EEG data, and hence this leads to more complex in analyzing the EEG data. Due to artifacts, the accurate EEG signal is misguided. Hence the extraction of original EEG signals from contaminated EEG signals occupied the highest priority in the field of EEG signal processing.

### Figure 1. Elements of Human Brain.

The EEG recording process is non-invasive, trouble-free, and does not create pain for the patient. EEG recordings resemble the global behavior of the brain. These waveforms display the rhythmic pattern at characteristic frequencies. EEG signals associated with the behavior of human activities such as excited, relaxed, drowsy, asleep, deep sleep, coma etc. These activities fall into distinct rhythms of frequency ranges, as shown in Table 1.

### Traditional Methods in Artifacts Removal

#### *Regression Method.*

The fundamental process for eliminating unwanted signals in EEG is the regression method [7]. This method described the amplitude relation of reference and estimated artifacts from EEG; thereby, this algorithm requires external reference signals such as ECG, EOG, and EMG to segregate the various undesired signals. From figure 3, the first stage output consists of EEG, ECG, EOG signals, where line frequency is omitted with reference channel as a linear filter; finally, the corrected EEG data can be obtained.

Hillyard and Gallambos, [8] done their research in removing EOG based on the time-domain regression approach. Whitton et al. [9] approached based on frequency domain regression, and in conjunction with the software tool, the EEG signal had been analyzed. Where ocular potentials can contaminate the EEG potentials and similarly. The simplified model and reduced computational method are the pros, and it needs the reference channels for eliminating the EOG, and ECG remained as cons of the regression methods [1]. The researchers found the counterclaim to a

regression algorithm named Blind source separation techniques, but still, the regression methods remained as a golden foundation to appraise the novel approaches.

### EMPIRICAL MODE DECOMPOSITION

EMD method is a practical and data-driven technique, whereas other methods depend on the selection of essential functions, such as wavelet analysis [18]. Let the signal  $x(n)$  it can be decomposed as a linear combination of finite number  $(N)$   $b_k(n)$  and residual  $r(n)$ . A shifting process is done to calculate the IMF of the given signals, at the end the original signal is constructed as,

$$x(n) = \sum_{k=1}^m b_k(n) + r(n)$$

EMD algorithm has one negative aspect of that the sensitivity of noise, which incurring mode mixing complications, that the sensitivity of noise [22]. Another tailored EMD, to decompose multivariate signals into multivariate IMFs. Therefore, the simultaneous analysis of intrinsic modes across multiple channels, i.e., Multiple Empirical Mode decompositions, can more efficiently and accurately remove artifacts related to broadband muscle artifacts.

### HYBRID METHODS

To avail the benefit from established approaches, novel research approaches came into the scenario, the conjunction of various methods known as hybrid methods, which means a combination of two or more methods [25-27]. The fundamental hybrid strategies are discussed below.

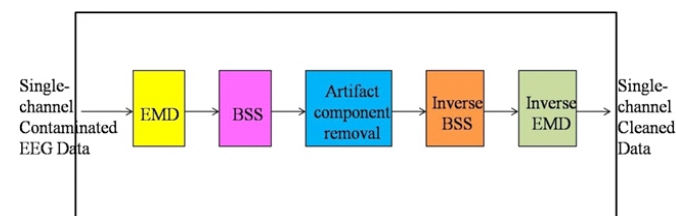


Figure 7. Process flow of the EMD-BSS method. Figure 7 represents the process flow of the EMD-BSS method, in which the raw contaminated EEG data is decomposed by the EMD algorithm, combined with BSS to remove artifacts and to reconstruct the clean EEG by applying the reverse algorithms. This hybrid method is the most

powerful tool in the removal of EMG artifacts from EEG signals; other side complexity is more in computing and identifying the artifactual components.

Whilst WT failed, in the case, if the artifacts overlap with the spectral properties in the spectral domain, this remained as the limitation of ICA, the conjunction of ICA with wavelet method has been proposed to avoid the short comes of both and to pick the positive [28-31].

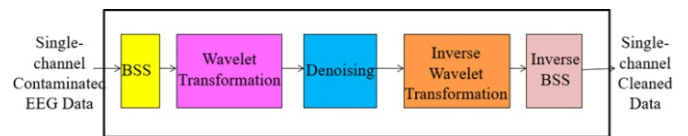


Figure 8. Block diagram of Wavelet-BSS Method.

Figure 8 shows the block diagram of the Wavelet-BSS method. Initially, the EEG signal data is decomposed with WT, and EEG data is decomposed by WT, and then contaminated data components are fed into the selected ICA algorithm. However, at the endpoint, artifacts are removed and reconstructed using preserved wavelet components and disposed components.

### BSS and Support Vector Machine

A further extended method of BSS in the hybrid model is BSS-SVM. Using BSS, the recorded raw EEG data were decomposed into multiple components. In the subsequent level, extraction of numerous features takes place such as temporal, spatial etc. Then the extracted features are given as input to SVM classifier to examine the artifacts and to reconstruct the signal with the remaining

components as artifact-free signals. Figure 9 shows a schematic of the BSS-SVM method. Shocker et al. [32] first applied BSS with SVM to eliminate artifacts related to eye blinking.

### COMPARATIVE ANALYSIS

The different methodologies summarized in this paper are most widely used, removing the artifacts of the EEG signal. Few techniques implemented to remove eye blinking and eye movement's artifacts. The majority of EEG related applications are real-time applications like biomedical-signal processing can be booming with the help of

the reference signal. Regression and filtering algorithms can be efficiently executed to eliminate the various artifacts. Filter methods have more practically opted methods for specific reference artifacts. The requirement of the reference channel that detains the adaptive and regression algorithms in removal of the unsurpassed artifacts. WT transforms not make the grade to identify artifacts that overlap with spectral properties. BSS techniques ensure flexibility because it does not require any preceding data and extra reference channels.

Along with these BSS methods, ICA these separation is done, where the signal is converted into independent components as ICCs with the decomposing process, and by discarding the artifacts, the new signal is reconstructed. In CCA algorithm was implemented to separate the EMG potential from EEG potential, and the computational time is less. Due to this CCA algorithm is applicable in real-time application. In such circumstances, the BSS is not suitable due to which it works on a more significant number of channels, and the accuracy in obtaining the truth is high. Zou et al. [33] following the ICA algorithm was extended by a grouping of ICCs components; therefore, physiological and non-physiological artifacts are identified from the EEG signal data. BSS method is incorporated with advantages of both ICA and CCA into one single carcass vector analysis, which is used to reject the muscle artifact by extracting the sources with maximal independence and maximal autocorrelation [34,35]. Contrasting the conventional algorithms, machine learning-based approaches became new research projections to identify artifacts using massive datasets.

### Conclusion

EEG potentials are originated from the cerebral cortex, which is picked up with scalp electrodes. EEG signals, however, continuously merge with unwanted surrounding signals. In fact, a wide variety of techniques have been implemented to remove the undesired signal components known as artifacts, and these artifact removal methods still require high accuracy

and efficiency. This review paper recaps the basic approaches and conclusions set by the researcher's literature. The pros and cons are emphasized for each method. Consequently, there is no most excellent preference method for removing of all categories artifacts. As a result, the main focused future objective is to implement a specific algorithm for sufficient attenuation of artifacts with better accuracy and efficiency.

In conclusion, there is a future scope where machine learning and traditional methods may combine to develop new distinguished algorithms to achieve an effective removal of artifacts in EEG signal analysis.

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## WEKA Approach for Comparative Study of Classification Algorithm

**Abstract** - This paper discusses data mining techniques to process a dataset and identify the relevance of classification test data. Mining tools to solve large amounts of problems such as classification, clustering, association rule, neural networks, it is an open access tool that directly communicates with each tool or called from Java code to implement using this. In this paper we present machine learning data mining tool used for different analysis, Waikato Environment for Knowledge Analysis is introduced by University of New Zealand it has capacity to convert CSV file to Flat file. Our work shows the process of WEKA analysis of file conversion and selection of attributes to be mined and comparison with Knowledge Extraction of Evolutionary Learning not only analysis the data mining classifications but also the genetic, evolutionary algorithms is the best efficient tool in learning. We have provided an evaluation based on applying these classification methods to our dataset and measuring the accuracy of test results.

### INTRODUCTION

The Waikato Environment for Knowledge Analysis (Weka) is a machine learning toolkit introduced by Waikato University, New Zealand. It is open source software written in Java (GNU Public License) and used for research, education and Projects. It can be run on Windows, Linux and Mac. It consists of collection of machine learning algorithms for implementing data mining tasks. GUI (data visualization) based tool mainly used for preprocessing tools, evaluation methods and has an environment for comparing learning techniques. There are several versions of Weka like Weka 3.0 "book version" compatible with description in data mining book. WEKA 3.2: "GUI version" adds graphical user interfaces (book version is command-line only). WEKA 3.3: "development version" with lots of improvements. This talk is based on the latest snapshot of WEKA 3.5. This article gives a comparative study of open source tools of data mining available in the market and focuses on the vital role of Weka

in comparison with other tools and its implementation in the real world scenario. Many classification methods have been developed with the aid of learning algorithms such as Bayesian, Decision Tree, K-nn (K-nearest neighbour), Support Vector Machine (SVM) and boosting. All these classifiers are basically learning methods and adopt sets of rules. Bayesian classifiers are derived from Bayesian Decision Theory.

This is the simplest and most widely used classification method due to its manipulating capabilities of tokens and associated probabilities according to the user's classification decisions and empirical performance. Support vector machine (SVM) is a powerful, state-of-the-art algorithm that can guarantee the lowest true error due to increasing the generalization capabilities. Random Forest (RF) is a classifier that is based on a combination of many decision tree predictors such that each tree depends on the values of a random vector sampled independently and with the same distribution for all trees in the forest. RF has excellent accuracy among current classifier algorithms. It also has an effective method for estimating missing data and it maintains accuracy when a large proportion of the data are missing.

### CLASSIFICATION

In Classification, training examples are used to learn a model that can classify the data samples into known classes. The Classification process involves following steps:

- Create training dataset.
- Identify class attribute and classes.
- Identify useful attributes for classification (Relevance analysis).
- Learn a model using training examples in Training set.
- Use the model to classify the unknown data samples.

### IMPLEMENTATION

WEKA has the capacity to read in ".csv" format files is fortunate since many databases or spreadsheet applications can save or export data into flat files in this format can be

seen in the sample data file, the first row contains the attribute names (separated by commas) followed by each data row with attribute values listed in the same order (also separated by commas). In fact, once loaded into WEKA, the data set can be saved into ARFF format. Interested in converting a ".csv" file into WEKA's native ARFF, then the recommended approach is to use the following from the command line: `java weka.core.converters.CSVLoader filename.csv > filename.arff` Load the data set into WEKA, perform a series of operations using WEKA's attribute and discretization filters, and then perform association rule mining on the resulting data set. While all of these operations can be performed from the command line, we use the GUI interface for WEKA Knowledge Explorer. Initially (in the Preprocess tab) click "open" and navigate to the directory containing the data file (.csv or .arff). In this case we will open the above data file. This is shown in Figure IV.

## CONCLUSION

In this paper Decision Tree classification algorithms are analysed and an explanation mechanism to explain the results. The specific approaches for classification are characterized, we developed the WEKA method is based on choosing the file and selecting attributes to convert.csv file to flat file and discussed features of WEKA performance. Our work extends to utilize the implementation of different datasets. Each decision tree presented and achieves a high rate of accuracy. It classifies the data into the correct and incorrect instances. We can use these decision tree algorithms in medical, banking, stock market and various areas.

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# SHADOW DETECTION USING TRICOLOR ATTENUATION MODEL ENHANCED WITH ADAPTIVE HISTOGRAM EQUALIZATION

## ABSTRACT

Shadows create significant problems in many computer vision and image analysis tasks such as object recognition, object tracking, and image segmentation. For a machine, it is very difficult to distinguish between a shadow and a real object. As a result, an object recognition system may incorrectly recognize a shadow region as an object. So the detection of shadows in images will enhance the performance of many machine vision tasks. This paper implements a shadow detection method, which is based on Tricolor Attenuation Model (TAM) enhanced with adaptive histogram equalization (AHE). TAM uses the concept of intensity attenuation of pixels in the shadow region which is different for the three color channels. It originates from the idea that if the minimum attenuated color channel is subtracted from the maximum attenuated one, the shadow areas become darker in the resulting TAM image. But this resulting image will be of low contrast due to the high correlation among R, G and B color channels. In order to enhance the contrast, adaptive histogram equalization is used. The incorporation of AHE significantly improved the quality of the detected shadow region.

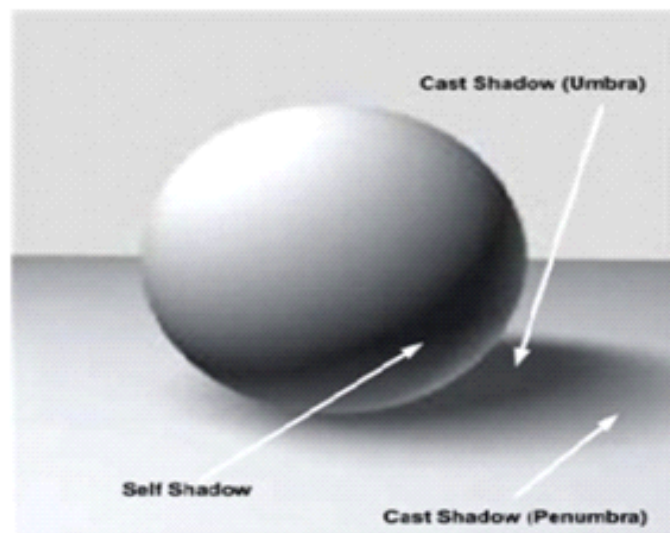
## KEYWORDS

ShadowDetection, TricolorAttenuationModel, AdaptiveHistogramEqualization, IntensityImage

## INTRODUCTION

Shadows in images have long been disruptive to certain computer vision applications such as edge detection, image segmentation, object recognition, video surveillance, and stereo registration. Shadows occur when direct light from a light source is partially or totally occluded by an object. In outdoor scenes, there are mainly two light sources: direct sunlight (regarded

as a point light source) and diffuse skylight (regarded as an area light source).



Shadows can be divided into two types: self shadow and cast shadow (shown in fig. 1). The self shadow (also called attached shadow) is the part of an object that is not illuminated by direct light. Cast shadow of an object can be defined as the dark area projected by the object on a surface. Cast shadow can be further divided into umbra and penumbra region. Umbra region is the part of cast shadow where direct light is completely blocked; the penumbra region is the part of a cast shadow where direct light is partially blocked.

Shadows can either aid or challenge the scene interpretation tasks. They are useful in certain kinds of applications such as making flat objects to appear three dimensional, making judgments about local shape and global scene properties, generating constraints on the orientations of surfaces in line-drawings of scenes etc. On the other hand, shadows cause problems in applications where automatic object identification is used such as machine vision. Shadows modify the perceived shape and color of objects or maybe mistakenly recognized as separate objects, because of their well-defined shape and depth. So the removal of shadows from images can significantly improve and facilitate the performance of such applications. In either case, efficient shadow detection is necessary. In this paper we propose a method for detecting cast shadows in outdoor still images.

## RELATEDWORK

The area of shadow detection has made great progress in recent years. Shadow detection methods can be generally classified into property based and physics based techniques. For physics-based techniques, some prior knowledge is needed like geometry and light [1], calibration of the camera [2], or indoor scenes [3]. So the physics-based techniques are usually designed for specific applications, such as moving cast shadow detection [4] and shadow detection in aerial images [5]. Property-based techniques identify shadows through shadow features. Sometimes, only one feature is not enough. For example, shadows usually have lower pixel values, but pixels that have lower values may not be shadows. The useful features for shadow detection are intensity, chromaticity [6, 7], geometry and texture. One of the simple assumptions that can be used for detecting cast shadows is that pixel intensity is very less in the shadow regions since they are blocked directly from the illumination source. But using only this feature is not a reliable method for shadow detection. However it can be used as a first stage to reject non-shadow regions.

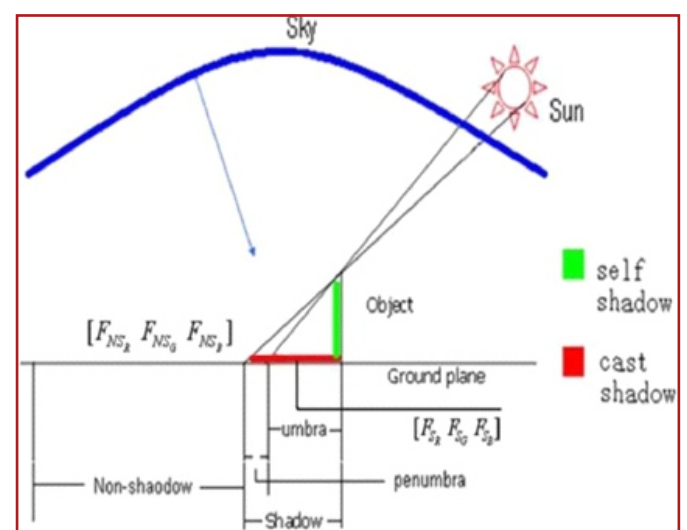
According to the input data, shadow detection methods can be classified into moving shadow detection and static image shadow detection. In video sequences, moving shadow detection methods can employ the frame difference technique to locate moving objects and their moving shadows. Prati et al. [8] provided a comparative evaluation of shadow detection methods in video streams. Hsieh et al. [9] provided anovel method to eliminate unwanted pedestrian-like shadows from a static background through Gaussian shadow modeling.

Multiple images can provide more information than single image for shadow detection. So the detection in still images remains a difficult problem. Wu and Tang [10] used the Bayesian approach to extract shadows from a single image, but it needs user intervention. For modeling shadows, Panagopoulos et al. [11] used the Fisher

distribution, But it needs 3D geometry information. For detecting ground shadows, Lalonde et al. [12] proposed a learning approach for training decision tree classifier on a set of shadow sensitive features. Another learning-based approach was proposed by Guo et al. [13] for the detection of shadows using paired regions, for a single image. If the parameters are trained well, these learning methods can achieve good performance. However, they will fail when the test image is significantly different from the images in the training set. Another approach based on Tricolor Attenuation model for detecting shadows in single images was proposed in [14]. The algorithm is automatic and simple but it depends upon prior segmentation and the four thresholds which are simply chosen. An improved algorithm which addresses these two problems is proposed in [15].

## TRICOLOR ATTENUATION MODEL

Fig. 2 shows the formation of a shadow in outdoor scenes [14]. The illumination on non-shadow region is daylight which is a combination of direct sunlight and diffused skylight; that on penumbra is skylight and part of sunlight; and that on umbra is only skylight. Since skylight is a component of daylight, pixel intensity in shadow is lower than that in non-shadow background. i.e., there exists intensity attenuation



Let  $[F_{SR} F_{SG} F_{SB}]$  denotes the pixel value vector of shadow region and  $[F_{NSR} F_{NSG} F_{NSB}]$  as the pixel value vector of the corresponding non-shadow background, the relationship between  $[F_{SR} F_{SG} F_{SB}]$  and  $[F_{NSR} F_{NSG} F_{NSB}]$  is  $[F_{SR} F_{SG} F_{SB}] = [F_{NSR} F_{NSG} F_{NSB}] - [\Delta R \Delta G \Delta B]$

$$[F_{SR} F_{SG} F_{SB}] = [F_{NSR} F_{NSG} F_{NSB}] - [\Delta R \Delta G \Delta B]$$

Where  $[\Delta R \Delta G \Delta B]$  is the tricolor attenuation vector. The relationship among  $\Delta R$ ,  $\Delta G$  and  $\Delta B$  is called Tricolor Attenuation Model (TAM) [14] which can be used for shadow detection. If  $\Delta R, \Delta G, \Delta B$  are different, the disparities of R, G, B channels of shadow region are different from those of non-shadow region. Let  $\Delta R > \Delta G > \Delta B$ , if we subtract B channel from R channel:

$$\begin{aligned} F_{SR} - F_{SB} &= F_{NSR} - \Delta R - (F_{NSB} - \Delta B) \\ &= F_{NSR} - F_{NSB} + (\Delta B - \Delta R) \\ &< F_{NSR} - F_{NSB} \end{aligned}$$

Here the disparity between R and B channels of shadow is lower than that of the corresponding nonshadow background. This model originates from the key idea that if we subtract the minimum attenuated channel from the maximum attenuated channel, the results in shadow regions will be lower than the results in nonshadow regions. TAM-based subtraction image (TAM image) is the

result of this subtraction. So the shadows will become darker in the resulting TAM image. This is very useful for shadow identification. The relationship among  $\Delta R, \Delta G, \Delta B$  can be represented by:

$$\begin{bmatrix} \Delta R \\ \Delta G \\ \Delta B \end{bmatrix} = \begin{bmatrix} \frac{\Delta R}{\Delta B} \cdot \Delta B \\ \frac{\Delta G}{\Delta B} \cdot \Delta B \\ 1 \cdot \Delta B \end{bmatrix} = \begin{bmatrix} m \cdot \frac{F_{NSR}}{F_{NSB}} \\ n \cdot \frac{F_{NSG}}{F_{NSB}} \\ 1 \end{bmatrix} \cdot \Delta B$$

The multistep shadow detection algorithm based on the Tricolor Attenuation Model [14] consists of the following steps:

1. Segment the input image and calculate TAM in each segmented sub-region.
2. Binarize the TAM images using a threshold, which is the mean value over each subregion. Thus obtain the initial shadows.
3. Verify these shadow regions using the mean values in R, G and B color channels, in each sub-region, as the thresholds.

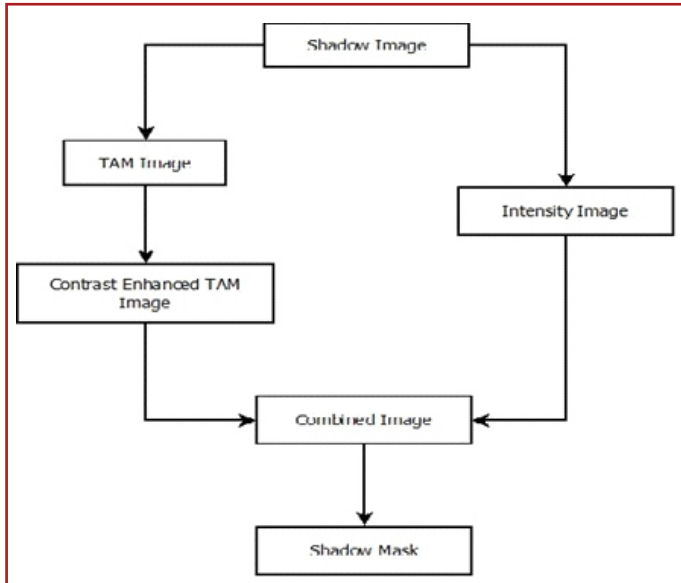
This shadow detection method works on single still images, even with complex scenes. But still there exists some problems by using this method.

1. It needs segmentation as the pre-processing step.
2. It uses four simply calculated mean values as thresholds.

To overcome these shortcomings another method is proposed [15], in which TAM image and intensity image are combined. This avoids the segmentation step and it is needed to derive only one threshold instead of four simple ones. In this paper we use adaptive histogram equalization to enhance the TAM image and thereby improving the detection results.

## PROPOSED METHOD

The design of the proposed method is showing fig.3.



## RESULTS AND DISCUSSION

In this paper a shadow detection method is proposed by combining intensity image and the contrast enhanced TAM image. This method was implemented in Matlab

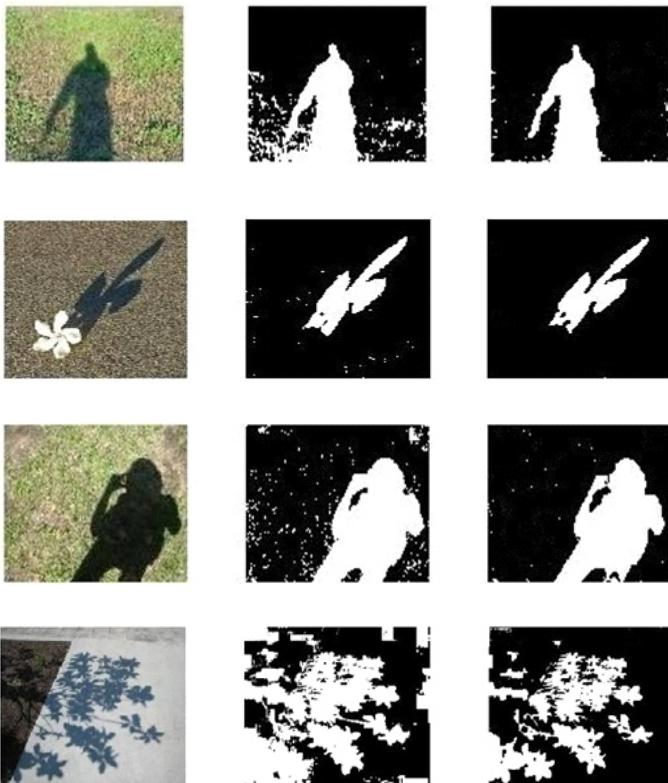


Fig.7.(a) Input image (b) Result without contrast enhancement (c) Result using contrast enhancement (AHE)

Enhancing the contrast of the TAM image has made a significant improvement in the shadow detection results. Fig. 7 (a) shows

the original input image, of which the shadow has to be detected. Fig.7(b) shows the resulting shadow mask without using any contrast enhancement on TAM image. Fig. 7 (c) shows the shadow mask after enhancing the contrast of the TAM image.

Histogram equalization is the widely used technique for contrast enhancement in digital images. But the ordinary histogram equalization is suitable only when the pixel intensities are evenly distributed throughout the image. But the images given as the input to our shadow detection system usually contain regions of the accumulated dark pixels due to the presence of shadows. Hence we used AHE instead of ordinary histogram equalization. In AHE each pixel is transformed based on the histogram derived from its neighbourhood region. Therefore it is suitable for enhancing the local contrast of an image.

## CONCLUSIONS

Detection and removal of shadows in still images enhances many computer vision applications. The effectiveness of a shadow removal algorithm relies on the accuracy of the shadow detection result. In this paper a methodology for shadow detection is proposed by enhancing the TAM image using adaptive histogram equalization. This improves the contrast of the TAM image and thereby improving the quality of detection results. Combining TAM and intensity image avoids the need for segmentation. Furthermore, it requires only one threshold for detecting shadows. These advantages make this method easier to use and more robust in applications. Different still images with shadows were tested and verified.

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