



COLLEGE OF ENGINEERING
FOR WOMEN

TECHNIYATI

QUARTERLY TECHNICAL MAGAZINE

Issue No. 1
January 2017



Integrating Learning Classroom Theory
Curriculum Special Design Teaching
World Schools Advanced Online Assistive Digital Ethical Computer Production Issues Applications Web Instructional Leadership School
Educational Education Using Instructional Development
Strategies Delivery Systems Video Evaluation Multimedia Fundamentals Tools Media Instruction
Social Research Authoring Effective Client
Environments Experience

Technology

Placements

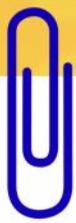
The college has a dedicated training and placement cell. The placement activities are coordinated by the placement team that comprises of staff from each department. The placement record shows the confidence of the industry in the academic standard of our college. The students are being recruited by reputed organizations wiz. TCS, Wipro, HCL, IBM, Intergraph, Syntel, Sonata, Mphasis, RapidBizApps, Sasken to name a few.





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About the College

Gayatri Vidya Parishad society has been founded in the year 1988 with an objective for inculcating scientific temper among the new generation of youth with a blend of human values by providing quality education with a holistic approach and facilitate value based career in the fields of Science , Engineering and Technology . The society was founded by eminent Academicians, Educationists Industrialists and Philanthropists . The founder president of the society was a renowned economist from Andhra University, later served as Vice-Chancellor Acharya Nagarjuna University and the subsequent presidents were too renowned elites of city of Visakhapatnam . Dr. B. Swamy , the succeeding president was also ex. Vice -Chancellor of Acharya Nagarjuna University and a member of Medical Council of India . The succeeding president Sri. D.V. Subba Rao garu ia legal luminary and had the merit of being the first Mayor of Visakhapatnam . He has been the member of Bar Council of India , a loving sports person and served as President of Vizag District Cricket Association . The present president is Sri. A.S.N. Prasad garu, a Mechanical Engineer by his vocation, an Industrialist and Philanthropist who has been serving the parishad with commitment since its inception . The parishad is ably steered by a Mathematician, an eminent teacher himself, Prof. P. Somaraju the secretary , a well prized administrator.

Gayatri Vidya Parishad is also well equipped with stalwarts in other fields as its Vice-President and members on the governancy body Sri. V. Seetaramiah, a chartered accountant of the prestigious Brahmaya & co. is the Vice-President. The super structure of the parishad is aptly supported and organized by the committed group of academicians drawn from various higher learning institutions in and around Visakhapatnam. To highlight Sri. D. Dakshina Murty garu, Dr. P. Raja Ganapathi garu, Prof. Dr. P.V. Sarma, Sri. D.V. Kameswara rao are some among them.

The engineering education has its debut in the year 1996 when the society initiated its first Engineering College in Madhurawada with Dr. Ing Prof. P.S. Rao as the principal . He with all his wisdom , integrity fostered the college into an institution of good quality sought after by the students and parents even from the other states .

In time with the Governments idea of empowering women in the technological and Engineering fields , the society contemplated an Engineering College exclusively for women and this has materialized into the college Gayatri Vidya Parishad College of Engineering for Women in the year 2008. Approved by AICTE, New Delhi and affiliated to Jawaharlal Nehru Technological University Kakinada (JNTUK), the college has started its academic innings with an initial intake of 300 with four branches of Engineering . By now it has grown into a full-fledged college with four undergraduate branches and Post Graduate branch of Engineering with a total intake of 378. The college has spacious class rooms , will equipped departmental laboratories with the latest and sophisticated equipment and excellent Library . The college has a team of more than 100 faculty members who are specialists in different areas of Science and Engineering. The in-campus hostel with a capacity of 350 provide the right academic ambience for students to pursue their ambitions and goals . The digital Library , e-class room, Seminar Halls and AC auditorium provide a good learning environment. The campus is Wi-Fi enabled and the internet facility of more than 40 Mbps provided by three service providers BSNL, V online & Reliance JIO meets the requirements of faculty and students.

A dedicated HT line and a 125 KVA Generator, 6 buses, 64 line capacity EPABX, ATM, Stationary & Xerox, Cafeteria, Health care centre and good sports facilities supplement the infrastructure to provide hassle free learning environment.





Message from the President

It is a matter of great pride that Gayatri College of Engineering for Women has made consistent progress, year on year, in academic and co-curricular activities. The primary goal of the institution is women empowerment through comprehensive learning.

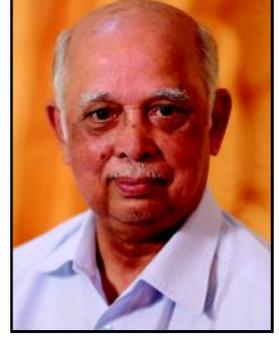
Dear students, "You are the nation-builders. You are the movers of technology. You are the agents of change." It is our fervent hope that the years that you spend in this college would enable you to equip with holistic skills for your bright future. The knowledge that you will gain, the fine qualities that you will imbibe and the technical skills that you will learn to apply will be your major contribution to your parents, to society, and to the nation.

Holistic education should include all round development of a student hence a magazine of this kind is like a mirror which reflects the writing skills of the students in particular and teaching faculty in general.

A students' development significantly lies at the time spent in the college to learn and discover his/her true interests. College is about the generation of new knowledge and the interpretation and conveyance of existing knowledge. Faculty at Gayatri Vidya Parishad College of Engineering for Women do these things very well— all the more so because, outside the classroom, they continue to learn themselves, through their research and creative work.

A Commendable job has been done by the Editorial Board in planning for and producing the magazine. I am confident that this technical Magazine will send a positive signal to the staff and students who are interested in knowledge sharing and gaining.

You don't have to be great to start but you have to start to be great'



Message from the Secretary

I am pleased to know that Gayatri College of Engineering for Women is bringing out a technical magazine for the first time since its inception in the year 2008. So much goes into the making of a College where academic ambition lies at the heart of things. I can boldly say that we have excelled in every initiative that we undertook and we have stood together in facing the challenges in realizing quality education.

When looking at science in society, there is a vast interface to explore. As rightly quoted by Sir Isaac Asimov, 'Science can amuse and fascinate us all, but it is engineering that changes the world'. The budding Engineers of today should have a perspective to realize that Education is not just an act of acquiring knowledge but learning a skill to lead life and forming one's personality. I've been an academician most of my life, why college? I was often asked. My response would be, 'We go to college to know, assured that knowledge is sweet and powerful, that a good education emancipates the mind and makes us citizens of the world'.

This magazine should be a good source of guidance for faculty and students for building their careers. At the outset I send my greetings to the Editorial Board of TECH NIYATI, for working on a Magazine best in all aspects. I applaud the authors for their stimulated thoughts and varied hues in articles contributed by them.

I am hopeful that this small piece of literary work shall not only develop the taste for reading and writing among students but also develop a sense of belonging to the institution as well. After all a college Pride lies in its Alumni.

नरत्नमन्विष्यतिमृग्यतेहितत्

A valuable diamond does not seek, it is sought after. Be a diamond my friend!



Director's Message



I am very much delighted and pleased to know that the College is bringing out a Magazine with good and useful information on Engineering and Technology and also the available infrastructure and facilities provided for the benefit of students and Faculty. The efforts by the faculty and students to bring out this magazine with a beautiful getup needs a good word of appreciation and accolades. I wish this would continue in future too which certainly upholds the academic environment and decorum of this campus.

Let me thank all the senior teachers and the other faculty who had shared their experiences by their rich and highly informative contributions to the Magazine.

My hearty congratulations to all those concerned in planning, organizing and bringing out this colorful product which I believe, keeps this College in the limelight amongst all the Institutions in and around Visakhapatnam

Wishing you all the best

Principal's Message

Dear Readers,

It is with great joy that Gayatri Vidya Parishad College of Engineering Women presents the inaugural issue of our magazine, TECH NIYATI. In addition to the numerous achievements of the institute this is yet another mile stone in their curricular and co-curricular activities.

The development of our students and faculty members is the focus of the magazine and GVPW is committed to enhancing their knowledge of various topics in diversified areas. TECH NIYATI was conceived as a platform through which our students and professors may communicate with us.

In this pursuit of excellence, I appreciate our editorial board especially for initiating and supporting this technical magazine in every aspect. I also laud the relentless efforts of our professors for giving their best in bringing out the best in each student.

I welcome all readers and writers, young and old, to the current issue of TECH NIYATI for a wonderful journey of reading ahead.





Editorial

Welcome to the first of many editions of TECH NIYATI. Any educative society is incomplete without adequate time investment in informative articles. This is the key motivation behind the launch of this magazine. Gayatri Vidya Parishad College of Engineering for Women was established in 2008 with the primary objective of enhancing quality education and vocational skills amongst women.

For unleashing a person's creativity a proper platform is a prerequisite. This magazine is intended to bring out the hidden literary talents among students and teachers of the college.

In this current issue we feature diversified articles by the authors of various departments. We would like to express our thanks and appreciation to all the authors of the articles in this issue for coming out with good articles in a short time.

Dear students', learning is a continuous activity throughout our lives. We observe, dream, imitate, replicate and try to rediscover the things present around us through our learning. College is a place which transforms our dreams and aspirations into reality.

We sincerely hope that the student fraternity receives the first issue enthusiastically and motivate us with their articles for the forthcoming issues.

We sincerely thank Prof. P. Somaraju garu for inspiring and motivating us to bring out this magazine.

We wish you a pleasant reading

Thin Films

Prof. D N Madhusudhana Rao,
Head of the Dept. of ECE, GVPCEW

Many of the older generation people (may be some of the younger too) may remember making smoked or lamp black glass plates to look at the Sun when they were children. They, however, were not aware of the dangers (to the eye) in using such contraptions to see the Sun. They also did not know then that they were using a kind of thin film technology, which involves coating a surface (or a substrate) with a thin layer of another material. Here, in the above example of lamp black a thin film of carbon/soot is deposited on a glass plate. Thus, a thin film is understood as a layer of material (liquid or solid) one of whose linear dimensions is very small compared to the other two. Usually thin films have thicknesses ranging from a few nanometres to few micrometers.

Thin film coated materials have been in use for a variety of applications including art for many centuries. By far the most familiar example of application of thin films is the looking glass or mirror which has a thin coating of metal or silvering on one side of the glass. One example of use of thin films in art is perhaps the most celebrated painting, the 16th century Mona Lisa by Leonardo da Vinci. The Mona Lisa, in the words of art connoisseurs has a mysterious heavenly beauty. It is reported that for painting this Leonardo developed a new technique called 'sfumato', meaning 'to tone down' or to 'evaporate like smoke'. He applied over many years' translucent glazes in delicate films no more than the thickness of a red blood cell to the painting with the sensitive tip of his finger. He gradually stacked as many as 30 of these films and colour gradations until it appeared as if the entire figure lay behind a veil of smoke. Though da Vinci used his hands for thin film coating and produced a master piece, it is not the best way of deposition especially for scientific and industrial purposes. Had Leonardo been living in the present generation he would have used modern thin film technologies to create much greater wonders of art. Now we have several methods of depositing films ranging from physical and chemical vapour deposition to thermal

spraying and electro-surfacing. The areas where thin films find their application are well known. Some of them are for protection of materials from corrosion, oxidation, and wear. Thin films are also used to increase transmission or reflection in certain wavelength regions, in filters for colour separation, and in high temperature superconductors. Thin film technology is used extensively in making microelectronic devices, integrated circuits in microprocessors and memory devices.

With ever growing demand for increasing the number of active as well as passive components in the integrated circuits the need for newer methods for efficient signal or data transmission within the circuit has increased. One such new method developed is the use of photonics to overcome the limitations set by electronic interconnects within the integrated circuits. At one time it was thought that with the use of photonic devices the problems concerning the signal transmission within the circuit and to other circuits in the system have been solved and these will replace electronic circuits in microprocessors and other computer chips. But this is not to be; because there are certain limitations on the size and performance of the photonic devices. The width of the optical fibre used to carry the waves must be at least half the wavelength of the light used inside to avoid interference between closely spaced signals. In micro-chips the light used is usually around 1500 nm. Then, the minimum width of the 'interconnect' between the components becomes much larger than the size of the components themselves in the integrated circuit. Therefore, finding alternative methods of transmission between various internal stages of the IC has become imperative.

One such new technique developed in recent years which has many exciting applications is Plasmonics. Light waves impinge at the interface between a conductor such as metal and a dielectric such as air, the free electrons in the metal conductor undergo a

resonant interaction with the electromagnetic field of the incident wave. When the oscillation frequency of the electrons at the surface matches the frequency of the electromagnetic wave a 'density wave' of electrons, called Surface Plasmon will be produced and travels along the interface. The waves are like ripples that spread on the surface of water in a pond when disturbed. By properly designing the conductor-dielectric interface, plasmons with the same frequency of the incident wave can be produced. Such metal-dielectric interconnects can be used in microelectronic circuits to carry information between segments in computer chips. This newly emerging field is named Plasmonics by the group of scientists at the California Institute of Technology in the year 2000.

The potential of surface plasmons and plasmonic thin film devices go far beyond their use in computing instruments. Rice University scientists Naomi Halas and Peter Nordlander have developed structures called Nanoshells. Nanoshells consist of about 10 nm thick layer of gold deposited around the whole surface of a silica particle, which is 100 nm in size. When this is exposed to electromagnetic waves it is found that electron oscillations are generated in gold shell. They observed that by varying the size of the silica substrate and the thickness of the gold layer it is possible to design nanoshells which can selectively absorb radiations. They believe that nanoshell devices can be effectively used in cancer treatment. Plasmonic materials may also be used to enhance the brightness of LEDs. LEDs are known for their low light emission efficiency. Plasmonics can be successfully employed to increase the emission. The enhancement of the electric field at the boundary between metal and dielectric could increase the rate of emission of luminescent dyes placed near the metal's surface and greatly raise the emission of quantum dots. Quantum dots are tiny semiconductor structures that absorb and emit light. LEDs can thus be made to emit bright light with more efficiency.

Perhaps one of the most fascinating future applications of plasmonics might be the development of invisibility cloak. In 1897, one of the great science fiction writers, H G Wells published 'The Invisible Man'.

In this novel he describes how a young scientist discovers a method to make his own body's refractive index equal to that of air and thus making him invisible. If a plasmonic structure is excited by a radiation close to its resonant frequency it is possible to make its refractive index equal to the refractive index of air. The structure then would be invisible at least to certain light frequencies since it can neither refract nor reflect light. However, a true invisibility cloak must be able to hide anything inside for the entire visible spectrum. John Pendry and his colleagues at the Imperial College, London, found that this could be achieved by using negative refractive index meta-materials. The distinguishing property of metamaterials is negative index of refraction. Metal micro-strips with a large number of free electrons in them can have a negative permittivity at certain frequencies. Together with Split Ring Resonators with negative permeability they will form negative index materials called metamaterials. These metamaterials have wide ranging and potential applications in thin films ranging from making integrated circuits to invisibility cloaks. Metamaterial based thin films called 'Sculptured Thin Films' which are under development have wide ranging applications such as polarization filters in optics and low permittivity barrier layer in ICs.

Thus, thin films, particularly the surface plasmons and plasmonic thin film devices, and metamaterial based thin films of different materials are areas seeing rapid developments and in which exciting research is being carried out worldwide. Readers will be glad to know that Gayatri Vidya Parishad, whose motto is 'Towards Academic Excellence' with its farsightedness, established a Thin Film Research Centre at its Autonomous Engineering College in 2013 and is carrying out interesting research in this field since then.

(This article is based on the inaugural address given by the author at the Workshop on Thin Films at GVPCE (A) on March 22, 2013, and the author dedicates this to the memory of Prof. T S N Somayaji, founder of the Thin Films Research Centre at GVPCE (A).)

Wireless Communication Standards

WLANs - WPANs - WI FI - BT - Z-WAVE

Prof. B. S. Murthy

Department of ECE, GVPCEW

“The Wireless communication Industry requires engineers who can design and develop new wireless systems, make meaningful comparisons of competing systems and understand the Engineering trade-offs that must be made in any system”.

At the beginning of the 21st century Wireless communications, already a couple of decades of its development, envisaged, in the coming decade, multimedia communication through hand-held palm-top and lap-top devices, networks connecting these devices anywhere, anytime in the buildings, open spaces – fixed and mobile environments-remote classrooms-Video conferencing, connected to Internet always- and several civilian and Military applications. The above vision can now be seen as an ‘Obsolete’ reality!

How all this has happened? Evolution is the key to success. There has been a lot of competition between the different technologies associated with communication and every year a new standard has been getting introduced and implemented. From the Consumer’s (User) point of view the best evolving technology is the one that provides a high rate of data exchange on a more secure network, at a lesser cost, obviously. A brief narration of these technology standards and their developments is presented in the following.

WIRELESS LOCAL AREA NETWORKS (WLANs) - WI FI - IEEE 802.11 suite of Standards

Wireless Local Area Network (WLAN) provides wireless connectivity within a small area such as a building, an Office, a college campus, shopping complexes, etc. In the year 1999, leading manufacturers of the WLAN products all over the world formed into an alliance, called the Wireless Ethernet Compatibility Alliance (WECA) to provide a compatibility among the WLAN products and to achieve high data speeds. This alliance later in the year 2002 named as WI FI (Wireless Fidelity) alliance and the Industry standards IEEE 802.11 b and an year after, 802.11 g tries are producing WI FI products all

over the world were launched achieving data rates of about 11 Mbps. By the year 2012 more than 550 Industries are producing WI FI products all over the world.

WLANs became very popular because of the ease of their installation, flexibility, operating range and almost no or minimum maintenance requirement. As such, most of the electronic consumer devices for e.g., Mobile phones, Lap-tops, palm-tops, iPads, PDAs, Note books, etc., are WI FI compatible these days. WLANs offer many unique features. They operate on 2.4 GHz Industry Scientific Medicine (ISM) unlicensed band, providing omni-directional transmission with low radiation and with

In-built encryption mechanism. WLAN devices are generally battery operated low power devices and are easy to operate and maintain user privacy.

WLAN System Architecture

WLAN operates in two modes. The infrastructure mode and the infrastructure less ad-hoc mode. In the Infra-structure Mode of operation, a number of wireless terminals are either configured as Client-Server model via a LAN Access Point (AP) or as a distributed wireless network connected to a wired LAN via a number of Access Points that act as a Gateway between the wireless terminals and the wired network. The other mode of operation is the infrastructure less ad-hoc mode, where- in the wireless terminals do not require the presence of an access point but form a network by directly communicating and co-ordinating with each other to exchange the information through the system. The wireless terminals in this mode, communicate with each other on a Peer to Peer basis. Wireless Network Interface Cards (NIC) are the key components that provide the interface between the wireless terminals and the Access Points in both modes of operation.

IEEE 802.11 LAN (Wireless LAN) defines three different Physical layer (ISO-OSI model) specifications that include two types of radio transmissions – Direct Sequence Spread Spectrum (DSSS) and Frequency Hopping Spread Spectrum (FHSS) – and one type of Infrared transmission.

In one type of Radio transmission, operating in the 2.4 GHz ISM (Industry Scientific Medical) band using DSSS baseband modulation scheme and with Differential Binary Phase Shift Keying (DBPSK) as carrier modulation WLAN obtains 1 Mbps data rate and with Differential Quadrature Phase Shift Keying (DQPSK) obtains 2 Mbps data rate. The maximum power is limited to 100 mW in Europe and 1 W in U.S.A. DSSS provides more stable signal and better radio coverage.

The other type of WLAN radio transmission operating on 2.4 GHz ISM band uses FHSS baseband modulation technique. This scheme defines 79 pseudo random frequency hopping channels, with about 2.5 hops per second, each with a bandwidth of 1 MHz. The carrier modulation is either a two level Gaussian Frequency Shift Keying (GFSK) giving a 1 Mbps data rate or a Four level GFSK for optional 2 Mbps data rate. The data packet duration is variable up to 20 msec. The FHSS based WLAN provides a low power simple implementation compared to DSSS.

The Infrared WLAN operates at 850-900 nm wavelength and uses Intensity Modulation scheme with omni-directional coverage of up to 20 m radius. The carrier modulation scheme is 4-level PPM (Pulse Position Modulation) for 1 Mbps transmission data rate. The peak transmission power is specified at 2 W with an average power of 125 – 250 mW.

Wi-Fi family of standards (IEEE 802.11b to 802.11n) have come out a long way, specifying new Physical and MAC (Medium Access Control) layer extensions and providing higher data rates of about 600 Mbps, using OFDM (Orthogonal Frequency Division Multiplexing) and MIMO (Multi Input Multi Output) techniques. The latest Wi-Fi standard IEEE 802.11ac, introduced in 2014, is an upgrade of 802.11n. Operating on 5 GHz frequency with wide bandwidths (BW of 80 MHz, with 160 MHz optional) Multiple antennae and

beam forming techniques delivers a data rate of 1.3 Gbps. This standard supports better penetration through walls and longer ranges. Generally security is the major concern in Wireless networks. 802.11ac standard solves this issue by enabling high density per packet. Works on Multiuser MIMO system, decreasing interference with efficient spectrum usage and provides large AP/Client capacity. However, unlike other technologies, 802.11ac standard is not omni-directional and throws a single beam of signal from the AP to the device and vice versa, range being 12 – 35 m.

IEEE 802.15 STANDARDS - WPANs - BLUETOOTH - ZIGBEE (802.15.4)

The IEEE 802.15 standard is a family of protocols to address the needs of Wireless Personal Area Networks (WPANs) at different data rates in 2.4 GHz ISM band, same as WLAN. A WPAN is a communications network among a number of portable and mobile devices, such as, pagers, smart phones, PCs, Laptops, PDAs peripherals and consumer electronic devices within a small service area of about 10 m; enables the use of low power low cost and very small sized devices. The IEEE project 802.15 covers all the different working groups for WPANs. For eg., 802.15.1 standard identifies Bluetooth working group and 802.15.4 the Zigbee.

BLUETOOTH (BT)

The word Bluetooth is an anglicized version of the Scandinavian “Blatandi Blatann” – the 10th century king, Harold Bluetooth, who united dissonant Danish tribes into a single kingdom. The name Bluetooth was proposed by Jim Kardach (1997) for WPANs, who developed a system that would allow mobile phones to communicate with computers. A Special Interest Group for Bluetooth was formed- BT SIG- which oversees the development of the specification and manages the qualification programme. According to this group Bluetooth is a standard wire replacement communication protocol designed for low power consumption with a short range based on low cost transceiver microchips in each device.

BT operates in the ISM band frequency range 2.40 – 2.4835 GHz. BT uses FHSS technology, by dividing the transmission data into packets and each packet is

transmitted on one of the 79 designated BT channels of each having 1Mhz band width. The hopping frequency is usually 1600 hops per second , with adaptive frequency hopping enabled. The first BT standard called BT classic used GFSK modulation but the later versions like BT 2.0 ,BT E.D.R (BT Enhanced data rate) used DQPSK modulation acheieving 1,2,and 3 Mbps rates respectively. The combination of BT and BT EDR is called BT Radio Technology and is classified as BR/EDR radio hanced data rate) used DQPSK modulation acheieving 1,2,and 3 Mbps rates respectively. The combination of BT and BT EDR is called BT Radio Technology and is classified as BR/EDR radio.

Architecture: BT is a packet based protocol with a Master - Slave structure, one master communicating with 7 slaves in a 'Piconet'. A piconet is an ad-hoc computer network wherein a Master BT device can communicate with a maximum of 7 slave devices, not necessarily all the devices reaching this maximum. By agreement a Master device can switch to a slave and the slave can become a master. All the devices share the master's clock. Packet exchange is based on this basic clock defined by the master, which ticks at 312.5 micro sec. intervals. Two clock ticks make up a slot of 625 microsec. and two slots make up a slot pair of 1250 micro sec. In the case of a single slot packet transmissions, the Master transmits in even slots and receives in odd slots. Or conversely, the slave receives in even slots and transmits in odd slots.

BT specification provides two or more piconets to form into a 'Scatter Net' in which a 'certain' device can play both as master in one piconet and as a slave in another piconet.

Based on operating range and power BT devices are classified into three classes. Class 1 BT devices are of 100 mw of power with atypical range of = 100m. Class 2 and 3 BT devices are of lesser powers about 2.5 and 1 mw with typical ranges of 2m and 1m respectively. Many USB BT adapters are readily available. They are called 'Dongles'.

Now-a-days BT exists in many products such as Telephones, Tablets, Media-players, hand held Lap-tops, console gaming equipment and some HD

headsets, modems and even watches. With Telephones BT transfers sound data using BT Head-set or transfers files using hand held computers. BT protocols mainly deal with the discovery of BT enabled devices and set up of services between them.

Applications: BT applications are called profiles. A few profiles are given below as examples.

1. A typical BT mobile phone Head-set (one of the first applications of BT- Hands-free head-set)
2. Wireless control of and communication between a mobile phone and a BT compatible car stereo system.
3. Wireless bridge between Industrial Ethernet networks (Eg. Profinet)
4. Sony's play station 3 uses BT controllers.
5. Roads and Traffic Division of Canada uses data collected from Travellers' BT devices to predict travel times and road congestion for Motorists.

BLUETOOTH LOW ENERGY (BLE)

BT low energy standard is marketed as BT smart. This standard is introduced by Nokia as WIBREE in 2006 and merged with the main BT standard in 2010 , with the adoption of BT core specification version 4.0. (BT v 4.0). BT smart intended to provide considerable reduced power consumption and cost while maintaining the same communication range aimed at many novel applications – for eg., in Health care, fitness, beacons, security and home entertainment industries. Mobile operating systems including ios, Android, Blackberry, Windows phone, OSX, Linux and Windows 8 natively support BT smart. The BT SIG expects by 2018 , 90% of BT enabled smart phones will support BT smart. The latter version of BT smart released in 2011 is not backward compatible with BT classic.

BT v 4.0 specification permits devices to implement either or both BLE or BT classic systems. The operating frequency of BT v 4.0 is the same 2.4 GHz but uses a simpler modulation scheme. The first smart phone to implement BT v 4.0 specification is the iphone 4S released in OCT.2011.

The Special Interest Group introduced the BT v 4.1 specification on 4th Dec.2013. This specification provides incremental software updates to BT v 4.0 specification. It also added new features that could

improve consumer usability –for eg.,- increased co-existence support for LTE (Long term evolution-3GPP), bulk data exchange rates and developer innovation by allowing devices to support multiple roles simultaneously. (Limited discovery time, Mobile wireless coexistence signaling).

The latest standard introduced in Dec.2014 is the BT v 4.2 specification. This is intended to provide hardware update for BT v 4.0. This has introduced some key features for IOT (Internet of Things) in the protocols. This standard enables the IOT with support for flexible internet connectivity options (IPv6 / LOWPAN or BT smart Gateway. BT v 4.2 makes BT smart even smarter with Industry leading privacy, power efficiency, faster throughput speed and packet capacity increases.

BT v4.0 profiles include Health care, Blood Pressure profile, sport and fitness profiles, location and navigation profiles, Internet connect protocol support, user data services alerts and time profiles.

One of the important advantages of all BT devices, is the maximum power output, which is about 100 mw (Class I BT devices) that is much less than lowest powered Mobile phones –UMTS and WCDMA (250 mw), GSM 1800/900 Mhz phones (1000 mw), GSM 850/900 phones (2000 mw). As such BT devices do not seem to cause Health hazards.

BT vs Wi Fi: Wi Fi is the brand name for products using IEEE 802.11 series of standards, whereas WPANs are defined by IEEE 802.15 Standards, with BT devices being specified by IEEE 802.15.1 standards. BT and Wi Fi have some similar applications, like setting up of networks, and printing or transferring of files. Wi Fi is intended to use as a replacement for high speed cabling for general local area network access called WLANs. BT is intended for portable equipment and applications, widely known as personal area networks, WPANs. BT is also a replacement for cabling in a variety of personally carried applications in any setting and works for fixed location applications, for eg., smart energy functionality in homes. Both are complimentary to some extent in application and usage. Wi Fi is usually access point centered with an asymmetrical client sever connection, with all the traffic

routed through the access point. BT usually is symmetrical between the two communicating BT devices. BT serves well in simple application where two devices need to get connected with minimal configuration. Wi Fi suits better in applications where some degree of client configuration is possible and high speeds are required, especially for network access through an access node.

However BT access points do exist and ad-hoc connections are possible with Wi Fi, for eg., the Wi Fi -Direct, developed recently. It adds more BT like ad-hoc functionality to Wi Fi.

ZIGBEE: (ZB) : Zigbee is based on the IEEE 802.15.4 standard used to create Personal Area Network built from small low power radio frequency signals (radios). These standards define low rate low power WPANs with low bandwidth requirements. The transmission range is limited to < 100 m depending on power output and environmental conditions.

ZB operating in 2.4 Ghz ISM band, supports 16 channels between 2.4 to 2.4835 Ghz, with 5 Mhz channel spacing and provides 250 Kbps transmission data rates. The system employs a 16-ary quasi orthogonal modulation technique based on DSSS binary data. The applications require either a few or no QOS (quality of service) requirement, but provision is available for retransmission of data in case errors are detected.

ZB can transmit data over long distances by passing data through a 'Mesh' network of intermediate devices. ZB specifications are intended to be simpler and less expensive than other WPANs such as BT or Wi Fi. For low latency applications ZB chips are integrated with Microcontrollers that have 60 – 250 KB of flash memory.

ZB applications include – wireless light switches, Electrical Meters in Home displays, Traffic management systems and other consumer and Industrial equipments.

ZB device types and operating modes:

ZB devices are categorized into three types.

1. Zigbee coordinator (ZC) : This is the most capable device and forms the root of the network tree. It

stores the information about the network and acts as a repository for security keys.

2. Zigbee router (ZR) : The second type of zigbee device is the Zigbee router which acts as an intermediate router and pass data from other devices.
3. Zigbee End Device (ZED) : Most of the time this device will be in the power saving mode (sleeping mode). This device become active only when data need to be passed from other devices.

Z - Wave protocol: Z-wave is a communication protocol designed for home automation , specifically for 'remote control' applications in residential and small commercial establishments. The technology uses a low power RF radio embedded into electronic devices and systems such as Lighting, Access controls, entertainment systems and house hold appliances.

Z-Wave technology is first developed by Danish Start-up called ZEN-SYS but later acquired by Sigma Systems in 2008. The Z-Wave protocol is optimized for reliable low latency communication of small packets with data rates limited to 100 kbps. Z-Wave operates in 900 Mhz band , which generally competes with card-less phones and other consumer electronic devices , but avoids interference with WI FI ,BT and other devices operating in the 2.4 Ghz band.

Z- Wave products : A Z-Wave project called 'Open Z-Wave ' initiated in the year 2010 started to offer development support for electronic products without expensive software development kits. One of the products created is the Z-Wave 'daughter' board for Raspaberi Pi, a credit card sized single board computer. Z- wave is presently supported by over 250 manufacturers worldwide and appears in broad range of products in U.S.A. , Europe and Asia.

Z- Wave Architecture: A Z-Wave network may include up to 232 nodes , grouped into two sets of nodes called Controllers and Slave devices. Nodes may be configured to transmit the message in order to guarantee connectivity in the multipath environment of a home. Average communication range between nodes is about 100' (30 m) with message ability to hop up to 4 times between nodes.

Radio Specification : Z- Wave works in the ISM band on a single frequency using FSK radio. The rates of transmission are 9.6 kbps, 40 kbps and 160 kbps – with speeds fully inter-operable. The operating frequencies are : USA - 908.42 Mhz, Europe - 868.42 Mhz, India – 865.2 Mhz, Australia and New zealand -921.42.

Network set up: Generally the Z-Wave architecture is the MESH type of network architecture. The set – up can begin with a single controllable device and a Controller. Additional devices may be added as multiple controllers that can include either hand-held or wall-switch controllers.

A device must be ' Included ' into the Z-Wave network before it can be controlled via Z-Wave. This process is called " Pairing " and " Adding ". Each network is identified by a network ID (4 bytes length) and each device is identified by a node ID (1 byte length). identified by a node ID (1 byte length).

6 LO-WPAN : This is an acronym of IP V6 low power Wireless Personal Area Network. The basic concept is originated from the idea that all low power devices , like BT, ZB etc., with limited processing capabilities should be able to participate in the Internet Of Things (IOT).

CONCLUSION:

Bluetooth Smart (BT v 4.2) is going to be the most popular technology in the coming years because of the wide acceptability among the mobile users and the industry. The main reason for its acceptability is perhaps, of its less interference . Among the various technologies BT Smart has evolved from a high energy simple BT network for a limited application to a low energy BT smart for large number of applications.

A word of caution need to be taken seriously. Although the amount of Microwave radiation emitted by the various mobile nodes (smart phones and other gadgets in WLANs and WPANs) is of low energy , the sheer volume of radiation should be a reason for concern for Human health and Eco system.

An Introduction to Programming Enhancement Techniques in JAVA

Ms. K. Rohini

Asst. Professor, Department of CSE

INTRODUCTION

This inaugural article introduces my experience during teacher Training Program (TTP), which involves training students at engineering colleges through Certificate in Information Technology (CIT) course for JAVA that is conducted at IIIT Hyderabad. This article focuses on Object Oriented Programming, explains the difference between its three editions: Java SE, Java EE, and Java ME. You'll also learn about the role of programming methodology in deploying Java applications. I'll help you to develop java programs on your system and the way to solve a typical Java application so that you'll follow step-by-step instructions to compile and run a simple Java program.

Nowadays, one of the biggest challenges in the Computer Education area is how to teach programming. In this context, this article aims to help beginners to develop their programming skills by teaching them how to program in a meaningful, incremental and systematic manner.

EnhanceEdu & STEP, IIIT-HYDERABAD

EnhanceEdu, an initiative of IIIT Hyderabad and Ministry of Communications and Information Technology (MCIT), works towards empowering individuals and communities by enhancing the quality of education. Thanks to EnhanceEdu for offering such a course and bridging the employability gap between engineering students and industry. Basically, it will help to improve and tune the skills that you already have, and will make you a good logical thinker. CIT follows a great approach i.e., "learning by doing" based on the fact that programming languages can be best understood by not only listening to the lectures, but also by working on them. CIT provided me a great opportunity to assess my programming skills and also to develop them. The modules in the course are well organized and thus help to learn right from the basics.

Overall, it is a great experience for me in taking part in the course and being certified by IIT-Hyderabad. Learning

to code is easier once you know the basics. Technical skills play a major role in professional industry, wherein many people lack the same. These kind of training programs helps to develop technical skills and innovative thoughts for a given specific problem.

Advantages:

1. Thinking over a specific problem.(Group discussions produce different solutions)
2. Sharing of knowledge within groups.
3. Effective learning by practice.

In my view the Student Enhancement Program (STEP) is helpful for all students pursuing professional courses. Especially the students who are theoretically sound but logically not well find this program instrumental in improving their skills. More over it improves the thinking ability of every student and also in solving the problems in a more effective manner. Students are encouraged to follow all coding standards. For ex: proper comments and proper alignment of the code.

STEP is an innovative program through which the student can enhance their learning and thinking capabilities. The resources and tools provide better understanding of the fundamental concepts. The inspiring procedure of STEP is LBD i.e. Learning By Doing which will help the students to improve in both theoretical and practical concepts." STEP is the excellent choice for route of perfect learning that enhances our logical thinking step by step and builds our confidence over programming languages. By participating in IIIT Hyd – CIT, I experienced different working environment, through submitting assignments, analysis etc.

A. What is Java?

Java is a programming language and a platform. Platform is nothing but any hardware or software environment in which a program runs. Since Java has its own Runtime Environment (JRE) and API, it is called platform.

It is a simple programming language. Writing, compiling and debugging a program is easy in java. It helps to create modular programs and reusable code.

B. Where it is used?

According to Sun, 3 billion devices run java. There are many devices where java is currently used. Some of them are as follows:

- Desktop Applications such as acrobat reader, media player, antivirus etc.

- Web Applications such as irctc.co.in, ttdsevaonline.com etc.

- Enterprise Applications such as banking applications.

- Mobile, Embedded System, Smart Card, Robotics, Games etc.

BRIEF HISTORY OF JAVA

It is interesting to know about the history of Java. Java team members (also known as Green Team), initiated a revolutionary task to develop a language for digital devices such as set-top boxes, televisions etc. For the green team members, it was an advance concept at that time. But, it was suited for internet programming. Later, Java technology was incorporated by Netscape.

Currently, Java is used in internet programming, mobile devices, games, e-business solutions etc.

James Gosling, Mike Sheridan, and Patrick Naughton initiated the Java language project in June 1991. The small team of sun engineers called Green Team. Originally designed for small, embedded systems in electronic appliances like set-top boxes. Firstly, it was called "Greentalk" by James Gosling and file extension was .gt. After that, it was called Oak and was developed as a part of the Green project.

C. Why Oak name for java language?

Why Oak? Oak is a symbol of strength and chosen as a national tree of many countries like U.S.A., France, Germany, Romania etc. In 1995, Oak was renamed as "Java" because it was already registered as trademark by Oak Technologies.

D. Why Java name for java language?

Why they choose the name "Java" for java language? The team gathered to choose a new name. The suggested words were "dynamic", "revolutionary", "Silk", "jolt", "DNA" etc. They wanted something that reflected the essence of the technology: revolutionary, dynamic, lively, cool, unique, and easy to spell and fun to say. According to James Gosling "Java was one of the top choices along with Silk". Since java was so unique, most of the team members preferred java.

Java is an island of Indonesia where first coffee was produced (called java coffee). Notice that Java is just a name not an acronym. Originally developed by James Gosling at Sun Microsystems (which is now a subsidiary of Oracle Corporation) and released in 1995. In 1995, Time magazine called Java one of the Ten Best Products of 1995. JDK 1.0 released in January 23, 1996

E. Java Version History

There are many java versions that have been released.

- JDK Alpha and Beta (1995)

- JDK 1.0 (23rd Jan, 1996)

- JDK 1.1 (19th Feb, 1997)

- J2SE 1.2 (8th Dec, 1998)

- J2SE 1.3 (8th May, 2000)

- J2SE 1.4 (6th Feb, 2002)

- J2SE 5.0 (30th Sep, 2004)

- Java SE 6 (11th Dec, 2006)

- Java SE 7 (28th July, 2011)

- Java SE 8 (18th March, 2014)

OBJECT ORIENTED PROGRAMMING

Object Oriented Programming is a programming style in which the program is made with components which match to real world objects.

Object Oriented Programming is a programming method that combines Data and Instructions for processing that data into a self-sufficient object' that can be used within a program or in other programs.

Advantage of Object Oriented Programming

a) Objects are modelled on real world entities. b) This enables modelling complex systems of real world into manageable software solutions. Object is a bundle of related variables (also known as properties) and functions (also known as methods).

Objects share two characteristics: State and Behavior.

State: State is a well defined condition of an item. A state captures the relevant aspects of an object.

Behavior: Behavior is the observable effects of an operation or event.

Any real world object has some properties (which may or may not change over time) and some behavior (which may or may not vary depending upon other conditions).

E.g. A pencil is a real world object; which has the following properties:

- It is red in colour (will not change with time)
- It is 9 cm in length as of now (may change when sharpened)

Behaviors:

- It leaves mark when used properly.
- The mark may vary depending upon the pressure applied. (Depends upon external factor)
- Its length gets reduced when sharpened (constant behavior)

Just like this example, the real world objects have many more features, but in programming we cater only the required features.

Some other examples are:

E.g. 1:

Object : House

State : Current Location, Colour, Area of House etc

Behavior: Close/Open main door.

E.g. 2:

Object : Car

State : Colour, Make

Behavior: Climb Uphill, Accelerate, Slowdown etc

Note: Everything a software object knows (State) and can do (Behavior) is represented by variables and methods (functions) in the object respectively.

Programming in OOPs, has its own advantages. E.g. it is easier for the programmers to relate an Object to the real world and program what is expected. It is really helpful as and when the application grows bigger and there are multiple objects interacting with each other. It helps in distributing responsibilities within the objective world enabling focused thinking.

Another important feature associated with OOP (Object Oriented Programming) is classification of objects. Since world (real/virtual) is full of objects, it is difficult to manage them as individual objects. We need a way to classify these objects helping us relate different objects and their features. E.g. a black coloured pencil. It is all the same as the one used in previous example, but it is a different object. But since they both are pencils, they belong to same class "Pencil". Whereas a pen, which is very similar to a pencil, belongs to a different Class. Although, both Pen and Pencil are "Writing Instruments".

THREE EDITIONS OF JAVA & TYPES OF JAVA APPLICATIONS

Sun Microsystems released the Java 1.0 software development kit (JDK) in 1995. The first JDK was used to develop desktop applications and applets, and Java subsequently evolved to encompass enterprise-server and mobile-device programming. Storing all of the necessary libraries in a single JDK would have made the JDK too large to distribute, especially because distribution in the 1990s was limited by small-size CDs and slow network speeds. Since most developers didn't need every last API (a desktop application developer would hardly need to access enterprise Java APIs), Sun solved the distribution issue by factoring Java into three main editions. These eventually became known as Java SE, Java EE, and Java ME:

Java Platform, Standard Edition (Java SE) for Desktop Applications:

Java SE is the Java platform for developing client-side applications, which run on desktops, and applets, which run in web browsers.

Standalone Application is also known as desktop application or window-based application. An application that we need to install on every machine such as media player, acrobat reader and antivirus etc. AWT and Swing are used in java for creating standalone applications.

Java Platform, Enterprise Edition (Java EE) for Web Applications and Enterprise Applications:

Java EE is the Java platform built on top of Java SE, which is used exclusively to develop enterprise-oriented server applications. Server-side applications include servlets, which are Java programs that are similar to applets but run on a server rather than a client. Servlets conform to the Java EE Servlet API.

A web application that runs on the server side and creates dynamic page, is called web application. Currently, servlet, jsp, struts, jsf etc. technologies are used for creating web applications in java. Web Applications such as irctc.co.in, gvpcew.ac.in etc.

An enterprise application that is distributed in nature, such as banking applications etc. has the advantage of high level security, load balancing and clustering. In java, EJB is used for creating enterprise applications.

Java Platform, Micro Edition (Java ME) for mobile application:

Java ME is also built on top of Java SE. It is the Java platform for developing MIDlets, which are Java programs that run on mobile information devices, and Xlets, which are Java programs that run on embedded devices.

A mobile application is created for mobile devices. Currently Android and Java ME are used for creating mobile applications. A mobile application, most commonly referred to as an app, is a type of application software designed to run on a mobile device, such as a Smartphone or a tablet computer. Mobile applications frequently serve to provide users

with similar services to those accessed on PCs. Apps are generally small, individual software units with limited function. This use of software has been popularized by Apple Inc. and its App Store, which sells thousands of applications for the iPhone, iPad and iPod Touch. A mobile app may be a mobileWeb site bookmarking utility, a mobile-based instant messaging client, Gmail for mobile, and many other applications.

A mobile application may also be known as an app, Web app, online app, iPhone app or Smartphone app. JAVA SE is the foundation platform for

Java and it is the main focus for this series.

PROGRAMMING METHODOLOGY

Programming Methodology teaches the widely-used Java programming language along with good software engineering principles. Emphasis is on good programming style and the built-in facilities of the Java language.

Problem solving methodology

Programs are created faster and quickly. To create efficient and effective program, the following procedure has to be followed. They are

Understand the problem: Collect the problem to generate a program.

Analyze the problem: Analyze the various steps of solving a problem.

Design the problem: Design the problem by creating flow chart and writing algorithm.

Code the program: Create coding by using proper programming language.

Test and Debug the program: Use proper testing methods and check the program and debug the errors.

Complete the documentation: Create documentation for all the details about the program. For instance, the analysis data, design data, source code, testing details etc., has to be maintained.

Maintain the program: Create the steps for modifying program to remove previously detected errors etc.

I have gone through many Assessment Tests conducted at IIT- Hyderabad. I would like to share those questions to improve your logical thinking abilities.

While answering the questions we are strictly instructed to follow coding standards, like

- Class name should be a noun and start with a capital letter
- Appropriate comments has to be used
- All java programs should have proper indentation
- File name should be equal to main class name

The questions given in my first Assessment Test were

NUMBER TO WORD

Given a number say "101" convert this to word form i.e. One hundred and one.

Note: Your input should be less than 1000 and greater than 0.

UGLY NUMBERS

Write a program that prints the first 50 UGLY numbers. Ugly numbers are numbers whose only prime factors are 2, 3 or 5.

For example 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15 ... are ugly numbers. By convention, 1 is considered as an ugly number.

Hint: You can use any one of the iterative statements to implement this program.

In the next article, we will discuss the characteristics of OOPs.

If you have any queries with regards to this article you can contact me at: krohini@gvpcew.ac.in

Integration and Monitoring of Smart Grid

Mr. M. Krishna,

Assistant professor, Dept of EEE

Abstract:

In the present scenario the information technology plays a very important role in all engineering applications. In electrical engineering, information technology support secure operation, customer participation, market advantages and growth for the power industry. Smart grid refers to electric power system that enhances grid reliability and efficiency by automatically responding to system disturbances. This paper discusses the new communication infrastructure and scheme designed to integrate data, protection control and metering etc.

1. Introduction

Power system consists of generation, transmission, distribution and utilization of electrical power. The distribution and utilization need to embrace active network management technologies with an interface to the transmission system. A smart grid embrace new technologies i.e. telecommunication, control, self-healing, efficiency, reliability and security of power systems [6].

The need to meet increasing electricity demand, integrate more distributed sustainable resources including renewable energy sources and advanced storage devices (batteries, compressed air system, fuel cell etc.). The role of the electric grids is becoming very important to balance the energy demand variations with the fluctuating power generation from the irregular sun and wind [10]. Smart grids must provide the electric energy to all consumers with a highly reliable, cost effective power supply, fully utilizing the large centralized generators and smaller distributed power sources. To switch from modern grid to smart grid all the relevant must be involved: government, regulators, consumers, generators, traders, power exchangers, transmission companies, distribution companies, power equipment manufacturers, etc.[3]

2. Smart Grid

About hundred years ago, the power engineers crafted a excellent reliable power delivery system from generation to the consumer end through transmission and distribution. At that time power system supported a regulated monopolistic business model, large remote generation sites, less restrictive environmental constraints and system overbuild to account for load growth. In the present scenario, higher reliability is expected, with dramatically different and challenging design criteria consumers are more sensitive to outages, low voltage and harmonic issues.

Environmental constraints are more restrictive. Efforts to control CO₂ emissions is leading to expanded adoption of central station and distributed renewable power and electric energy storage, as well as expanded electric transportation and demand response technologies. The power delivery infrastructure in its current state will not be able to effectively accommodate the extent and types of these carbon reduction technologies [1]. There is need for upgrading and evolving the networks design to accommodate all low carbon generation technologies as well as to encourage the demand side to play an active part in supply, efficiently and economically.[1][4]

The smart grid is a network of computers and power infrastructures that observe power system parameters and control energy usage. The intelligent electronic devices communicate energy usage to then utility using a modern communication technology. The intelligent electronic device at each consumer premises is called a smart meter.

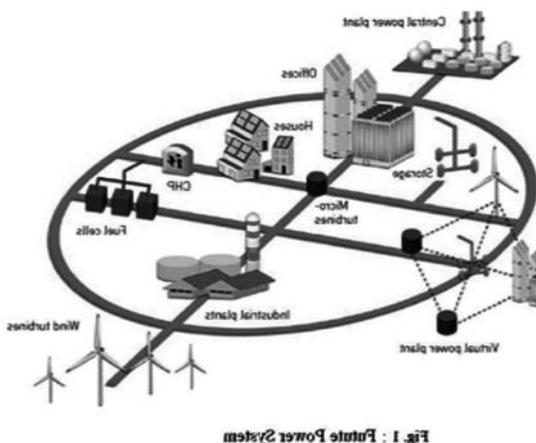
It's a computerized replacement of the electrical meter attached to the outer walls of many of our homes today. Each smart meter contains a processor, nonvolatile storage, and communication facilities. Smart meters can track usage as a function of time of day, disconnect a customer via software, or send out alarms in case of

problems [2]. The smart meter can also interface directly with consumers, in following way:

- Consumers receive a “high cost period” pricing signal.
- Plug-in hybrid electric vehicles stop charging and pump power onto the grid.
- The set points on air conditioning thermostats are raised by two degrees or turn down the air conditioner during peak periods.
- The heating coils in cloth dryers turn off.
- One of two heating coils in each storage electric water heater turns off.
- The lights at large retail stores are gradually reduced by 20%.
- Refrigerator and freezer compressors are cycled off.
- Back-up generation at commercial and industrial facilities comes on-line.

Smart Grid necessitates two-way flow of electricity and information for monitoring the operation of power system including consumer appliances [5][11]. Consumer may play active role to minimize the demand and supply gap by generating power by installing the solar panels on their roof. Consumers can sell excess energy generated back to the utility, thereby reducing or eliminating energy costs. Smart grid provides attractive incentives for customers to install green power generation technology.[15]

The fig.1 shows the various element of utility.[13]



Real-time information and power exchange between elements of the Smart Grid requires high-speed, fully integrated, two-way communication down to the every customer level. The smart grid will improve

environmental quality by allowing customers to purchase cleaner, lower-carbon-emitting generation, promote a more even deployment of renewable energy sources, and allow access to more environmentally-friendly distributed generation. The smart grid will allow for more efficient consumer response to prices,

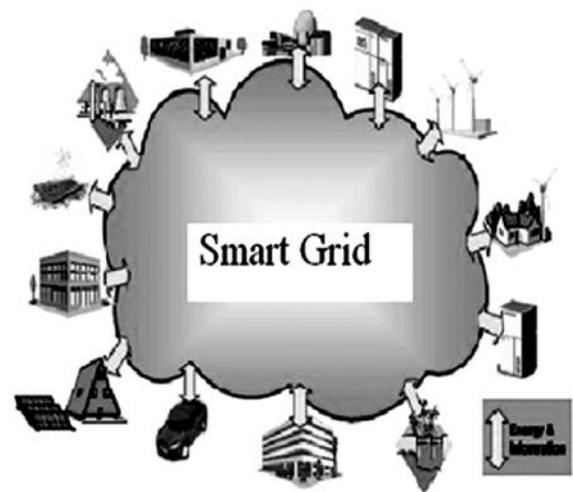


Fig. 2: Smart Grid

which will reduce the need for additional fossil fuel-fired generation capacity [14]. The “smart grid” is based on the usage of smart energy technologies the application of power control by means of digital information systems (smart meters and smart appliances) that communicate through the advanced communication technology (i.e. internet) with the electricity utility—to optimize electrical power system generation, delivery, and end-use energy demands. Smart Grid implies the use of two independent and separate infrastructures: “Smart Grid” and Internet. [13] [14]

Smart grid is a vision for electricity networks to the rising challenges and opportunities, which bring benefits to all consumers

3. Smart Grid Objectives:

The objectives are to provide grid observability, controllability of assets, enhance power system performance and security, reduction in operating cost, maintenance and system planning. [15] Objectives of smart grid are as follows:

- To accommodate a wide variety of generation—centralized and distributed, intermittent and

dispatchable.

- To communicate with energy management system in smart buildings to enable customers to manage their energy use and reduce their energy cost.
- To provide improved power quality to the users.
- To provide real time information, lower operation cost and electricity available to everyone.
- To use information technology for monitoring and control to optimize its capital and operational cost.
- To predict and instantly respond to system problems in order to avoid power outages and power quality problems.
- To make the nation energy independent.
- To provide employment.

Smart Grids is not felt to be a necessity only for the integration of distributed generation, renewable energy sources and plug-in (hybrid) cars into the electricity grid but also for active participation of consumers for improvements in overall system efficiency, meet the peak demand without investment in generation and variable pricing system. [4]

4. Communication

Smart Grid will integrate all the components of power system to enhance the performance of the grid. Much of the integration of components relates to communication systems, IT systems, and business processes. Efficient communication is needed for proper co-ordination of protective devices to adopt the new operating conditions. Distribution networks are designed to deliver power to customers within certain voltage tolerances without overloading equipment.[7] For Smart grid, real time data and active grid management, requires fast and two-way digital communication with third party entities.

Electric utilities use a wide variety of telecommunications including:

- Wired and wireless telephone
- Voice and data dispatch radio
- Fiber optics
- Power line carrier
- Satellite
- The internet
 - Fiber
 - Hybrid fiber cable (HFC)

Digital subscriber line (DSL)
Broad band over power lines (BPL)
Wireless (wi-fi and wi-max), and
Satellite

Smart grid requires fast communication with utility. Delay in communication may be higher through WAN. The current transmission media cannot meet all the high capacity and quality of service requirement. Electronic delivery is far more efficient than physically moving people to a site and improves the power system delivery and demand response. The fiber-optic system of the Smart Grid will provide speeds in the range of Gbps at the interface. This is an interactive technology to connect power system component dynamically and interactively at multiple locations, an effective alternative way to facilitate remote consumers. [7][13].

5. Conclusion

In near future, electricity demand is expected to continue to grow further, to provide the power quality and to meet the ever rising demand economically, more power generation is needed at centralized level or at distribution level. Due to environmental constraints, more stress has to be given to generate the power from green and clean energy sources. The power through green energy sources varies with time, to integrate with these sources, network configuration has to be changed. The plug in hybrid electric vehicles may also play a important role to meet the energy demand during peak demand period and during off peak hours they may be connected for charging.

With the help of advanced communication technologies the utility will be able for effective decisions to be made and timely actions propagated to the points at which intelligent electronic devices installed, resulting in the smart grid benefits that the utility and its consumers expects. Modern communication technology has ability to introduce a new era in electricity generation, distribution, and consumption.

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Java Virtual MACHINE

Mr. B.L.V. Vinay Kumar
Assistant Professor, CSE

The Java virtual machine is called "virtual" because it is an abstract computer defined by a specification. To run a Java program, you need a concrete implementation of the abstract specification.

To understand the Java virtual machine you must first be aware that you may be talking about any of three different things when you say "Java virtual machine."

You may be speaking of:

- the abstract specification,
- a concrete implementation,
- a runtime instance.

The abstract specification is a concept, Concrete implementations, which exist on many platforms and come from many vendors, are either all software or a combination of hardware and software. A runtime instance hosts a single running Java application. Each Java application runs inside a runtime instance of some concrete implementation of the abstract specification of the Java virtual machine.

Where the intended sense is not clear from the context, one of the terms "specification," "implementation," or "instance" is added to the term "Java virtual machine".

I.Lifetime of Java Virtual Machine

A runtime instance of the Java virtual machine has a clear mission in life: to run one Java application. When a Java application starts, a runtime instance is born. When the application completes, the instance dies. If you start three Java applications at the same time, on the same computer, using the same concrete implementation, you'll get three Java virtual machine instances. Each Java application runs inside its own Java virtual machine.

A Java virtual machine instance starts running its solitary application by invoking the main() method of some initial class. The main() method must be public, static, return void, and accept one parameter: a String array. Any class with such a main() method can be

used as the starting point for a Java application.

For example, consider an application that prints out its command line arguments:

```
class Echo {  
    public static void main(String[] args) {  
        int len = args.length;  
        for (int i = 0; i < len; ++i) {  
            System.out.print(args[i] + " ");  
        }  
        System.out.println();  
    }  
}
```

You must in some implementation-dependent way give a Java virtual machine the name of the initial class that has the main() method that will start the entire application. One real world example of a Java virtual machine implementation is the java program from Sun's Java 2 SDK. If you wanted to run the Echo application using Sun's java on Window98, for example, you would type in a command such as: java Echo Greetings, Planet.

The first word in the command, "java," indicates that the Java virtual machine from Sun's Java 2 SDK should be run by the operating system. The second word, "Echo," is the name of the initial class. Echo must have a public static method named main() that

returns void and takes a String array as its only parameter. The subsequent words, "Greetings, Planet.," are the command line arguments for the application. These are passed to the main() method in the String array in the order in which they appear on the command line. So, for the previous example, the contents of the String array passed to main in Echo are: arg[0] is "Greetings," arg[1] is "Planet."

Inside the Java virtual machine, threads come in two flavors: daemon and non- daemon. A daemon thread is ordinarily a thread used by the virtual machine itself, such as a thread that performs garbage collection.

The application, however, can mark any threads it creates as daemon threads. The initial thread of an application--the one that begins at `main()`--is a non-daemon thread.

A Java application continues to execute (the virtual machine instance continues to live) as long as any non-daemon threads are still running. When all non-daemon threads of a Java application terminate, the virtual machine instance will exit. If permitted by the security manager, the application can also cause its own demise by invoking the `exit()` method of class `Runtime` or `System`.

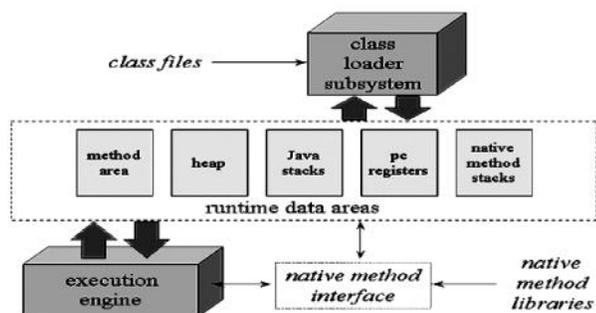
In the Echo application previous, the `main()` method doesn't invoke any other threads. After it prints out the command line arguments, `main()` returns. This terminates the application's only non-daemon thread, which causes the virtual machine instance to exit.

II. Architecture of JAVA Virtual Machine

In the Java virtual machine specification, the behavior of a virtual machine instance is described in terms of subsystems, memory areas, data types, and instructions. These components describe an abstract inner architecture for the abstract Java virtual machine. The purpose of these components is not so much to dictate an inner architecture for implementations. It is more to provide a way to strictly define the external behavior of implementations. The specification defines the required behavior of any Java virtual machine implementation in terms of these abstract components and their interactions.

Figure shows a block diagram of the Java virtual machine that includes the major subsystems and memory areas described in the specification.

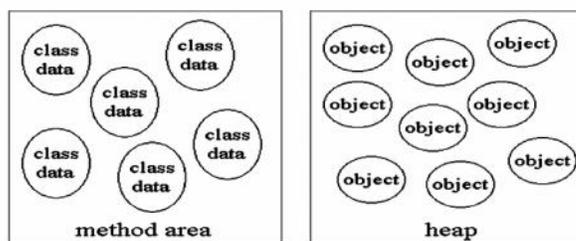
each Java virtual machine has a class loader subsystem: a mechanism for loading types (classes and interfaces)

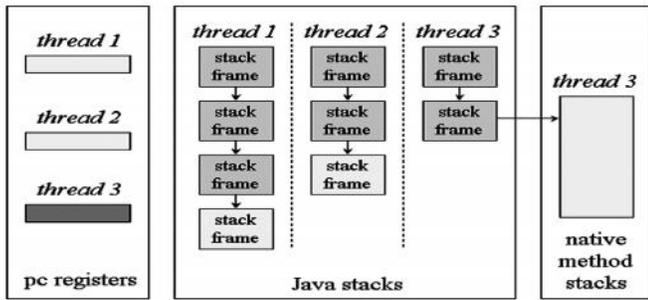


given fully qualified names. Each Java virtual machine also has an execution engine: a mechanism responsible for executing the instructions contained in the methods of loaded classes.

When a Java virtual machine runs a program, it needs memory to store many things, including bytecodes and other information it extracts from loaded class files, objects the program instantiates, parameters to methods, return values, local variables, and intermediate results of computations. The Java virtual machine organizes the memory it needs to execute a program into several runtime data areas. Although the same runtime data areas exist in some form in every Java virtual machine implementation, their specification is quite abstract. Many decisions about the structural details of the runtime data areas are left to the designers of individual implementations. Different implementations of the virtual machine can have very different memory constraints. Some implementations may have a lot of memory in which to work, others may have very little. Some implementations may be able to take advantage of virtual memory, others may not. The abstract nature of the specification of the runtime data areas helps make it easier to implement the Java virtual machine on a wide variety of computers and devices.

Some runtime data areas are shared among all of an application's threads and others are unique to individual threads. Each instance of the Java virtual machine has one method area and one heap. These areas are shared by all threads running inside the virtual machine. When the virtual machine loads a class file, it parses information about a type from the binary data contained in the class file. It places this type information into the method area. As the program runs, the virtual machine places all objects the program instantiates onto the heap. See Figure for a graphical depiction of these memory areas.





As each new thread comes into existence, it gets its own pc register (program counter) and Java stack. If the thread is executing a Java method (not a native method), the value of the pc register indicates the next instruction to execute. A thread's Java stack stores the state of Java (not native) method invocations for the thread. The state of a Java method invocation includes its local variables, the parameters with which it was invoked, its return value (if any), and intermediate calculations. The state of native method invocations is stored in an implementation-dependent way in native method stacks, as well as possibly in registers or other implementation-dependent memory areas.

The Java stack is composed of stack frames (or frames). A stack frame contains the state of one Java method invocation. When a thread invokes a method, the Java virtual machine pushes a new frame onto that thread's Java stack. When the method completes, the virtual machine pops and discards the frame for that method.

The Java virtual machine has no registers to hold intermediate data values. The instruction set uses the Java stack for storage of intermediate data values. This approach was taken by Java's designers to keep the Java virtual machine's instruction set compact and to facilitate implementation on architectures with few or irregular general purpose registers. In addition, the stack-based architecture of the Java virtual machine's instruction set facilitates the code optimization work done by just-in-time and dynamic compilers that operate at run-time in some virtual machine implementations.

Pic Based Hand Gesture Control Led Rover

Mr. V.V.V. Satyanarayana

Assistant Professor, Department of Physics

Abstract

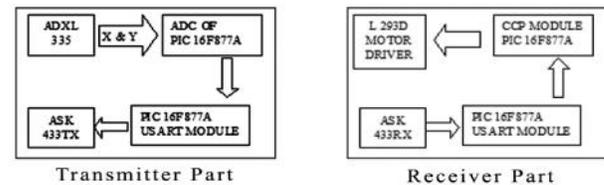
This mini project is about the design and construction of a microcontroller based gesture controlled rover. It is based on the hand gestures which are sensed through an accelerometer and are transmitted and received through RF modules between a pair of microcontrollers. Based on the gesture one may control the rover in both forward and backward directions along with steering as well as speed control.

Design

To sense a gesture or tilt one may use accelerometers like ADXL 335/ 345. The 335 will sense all the x, y and z directions and produce a linear output for a given axis (analog) which lies approximately between 1 volt to 1.5 volt (when powered by 3V DC) for a tilt from one extreme to the other. It will produce an output of about 1.25Volt when the accelerometer is horizontal in a given axial direction. The ADXL 345 gives an output that can be interfaced with a controller either by I2C or SPI.

To produce a wire-less link between the rover and the gesture sensing mechanism one may use ASK RF modules, Xbee modules etc. This project employs the low price 433.8MHz RF modules. The controller chosen in the project must be capable of sensing analog signals with at least a three channel ADC as the output of accelerometer ADXL335 is analog. The ASK RF modules (Amplitude shift keying) support the baud rate up to 1200 bps (without much noise). The controller must be capable of sending receiving data through serial communication with above said baud rate. The speed of rover is to be controlled by the technique of PWM (pulse width modulation). Hence the controller must have a built-in PWM module.

The suitable PIC (Microchip) that meets all the above requirements is the popular 16F877A.



Construction

Transmitter part is constructed with 16f877A sensing the x, y channels of ADXL335 through the An0 and An1 channels of PortA. PIC has 10 bit resolution ADC whose 10Bits are stored as two parts in the ADRESH and ADRESL bytes in the special function register memory. As the 16f877A is 8 bit, the math will be complicated if we consider all the 10 bits. This PIC has a provision of analog input voltage reference at An3 of PortA. It is given with a voltage reference of 2.5V through a standard potential divider. The Eight bits of ADC o/p are stored in the ADRESH register if the Left Justified option in the ADCON1 (ADFM) register is set. As the ADRESH contains only the 8 bits of ADC result, the value will be one fourth of the actual measurement i.e. 10 bit means a maximum value of 1024 and for eight bit it will be 256. The reference voltage given is 2.5V, to an approximation; one may consider 0 to 255 values in ADRESH as 0 V to 2.5 V with a resolution of 10mV. This design will sense voltages up to 2.5V only and is sufficient for the current project.

The x and y values of ADXL 335 are sampled every time by the PIC and are converted into their digital equivalent values. If the ADXL is flat without any tilt along a given axis, it will show approximately 125 as digital value. If it shows 100, it means that the ADXL is tilted to one extreme along that axis and if it shows 150, a tilt to the other extreme along the same. An error of about 5 is permissible due to shivering of hands in the reading of the flat position. Hence, from 120 to 130 of ADC, the gesture has no specific



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One Who Loves to Involve
One Who Loves to Upgrade
One Who Loves Time
One Who Loves Place
One Who Loves to Deal
One Who Loves to Accept
One Who Loves to Take-up
One Who Loves to Give-up
One Who Loves to Watch
One Who Loves to Enquire
One Who Loves to Waite
One Who Loves to Observe
One Who Loves to Patience
One Who Loves to Direct

Social Self

One Who Loves to be Generous
One Who Loves to be Kind
One Who Loves to be Patriotic
One Who Loves the Poor
One Who Loves Unity
One Who Loves to Appreciate
One Who Loves Principles
One Who Loves to Cheer
One Who Loves Joyfulness
One Who Loves Ambience
One Who Loves Companionship
One Who Loves Fun
One Who Loves to accept his Mistakes
One Who Loves to rectify his mistakes
One Who Loves Sincerity
One Who Loves Simplicity

Honesty

One Who Loves Confidence in him
One Who Loves to be Confident of other
One Who Loves to Check
One Who Loves to be Secure
One Who Loves to be Gentle
One Who Loves to be Dignified
One Who Loves Hospitality
One Who Loves to Remember
One Who Loves Instant Problem Solving
One Who Loves Rules
One Who Loves Regulations
One Who Loves to Help
One Who Loves Peace
One Who Loves Offer
One Who Loves Ability



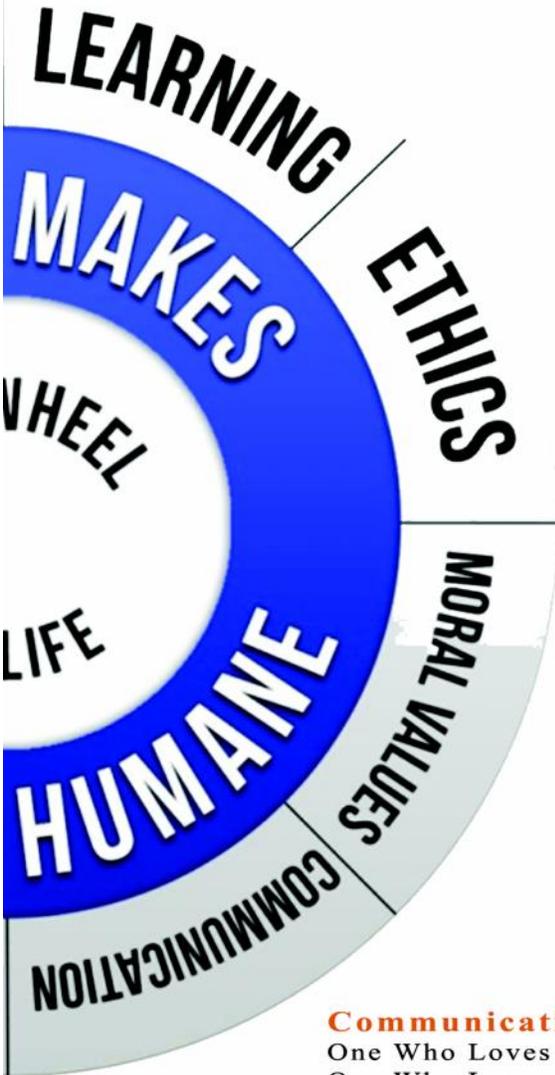
Professionalism

One Who Loves to Oblige
One Who Loves to Inspire
One Who Loves to Cultivate Knowledge
One Who Loves System
One Who Loves to Streamline
One Who Loves Responsibility
One Who Loves Duty
One Who Loves Attention
One Who Loves Calmness
One Who Loves to be Clean and Clear
One Who Loves Accuracy
One Who Loves to Create
One Who Loves Other Mindset
One Who Loves Stability
One Who Loves to do Good

Learning

One Who Loves to Speak
One Who Loves to See
One Who Loves to read
One Who Loves to write
One Who Loves to learn
One Who Loves to listen
One Who Loves to say briefly and communicate
One Who Loves to demonstrate
One Who Loves to clarity

Dr. K. Visweswara Rao
Associate Professor,
Department of Management Studies



Ethics

One Who Loves the Student Absolutely
One Who Loves the Other Teacher
One Who Loves the Student Unconditionally
One Who Loves to Respect
One Who Loves Honesty
One Who Loves Cordial Relationship
One Who Loves Understanding
One Who Loves to Forgive
One Who Loves Custom
One Who Loves Wisdom
One Who Loves Truth
One Who Loves Non-violence
One Who Loves to be Ready

Moral Values

One who Loves Culture
One who Loves Ethics
One who Loves Tradition
One who Loves Humbleness
One who Loves Values
One who Loves Performance
One who Loves Attitude
One who Loves Ideas
One who Loves Thoughts

Communication

One Who Loves to Communicate
One Who Loves to Motivate
One Who Loves to Co-ordinate
One Who Loves to Guide
One Who Loves to Protect
One Who Loves to Plan to do
One Who Loves to Decide
One Who Loves to Organize
One Who Loves to Lead
One Who Loves to Analyze
One Who Loves to know the subject
One Who Loves Promptness
One Who Loves to refer to the past
One Who Loves to Perfect the behavior
One Who Loves to Control himself

Achievement in Internet of Things

In tune with the Gayatri Vidya Parishad's policy of embracing latest and emergent technologies, GVP College of Engineering for Women has set up a lab for IoT in its campus. The basic purpose was to train the students in IoT. Sri P.V.K Chaitanya, Assistant Professor, Dept of ECE and Sri V.V.V Satyanarayana, Assistant Professor, Dept of Physics trained around five teams.

The students of III B.Tech (ECE) Ms. B. Sravya , Ms. Y. Meiheru and Ms. V Sri Vidya participated in the Students Fest at **I I T Bombay** and won **Second Prize** in “Infinity of Things” and a cash prize of Rs 12,000/-

Four teams participated in the **Vizag Science Fest** conducted by Jana Vignana Vedika at Andhra University and obtained **Platinum Certificate**.



1. M. Sindhuja
2. S. Sirisha
3. T. Vaishnavi
4. V.V Kalyani
5. N. Soujanya
6. S. Soumya
7. S. Jahnavi
8. M. Priyanka



meaning other than being at rest. If the sensed value is, say, 105 it means the tilt is $120 - 105 = 15$ (Actually proportional to the difference). Similarly if the reading is 142 it means a tilt of $142 - 130 = 12$ in the other direction. Like this the controller makes a decision according to the ADC values obtained from both X and Y directions.

As the PIC is 8 bit, the USART module enables transmission of 8 bits at a time only. Out of eight bits, two bits are assigned to describe the state (ON/OFF) of two motors of the rover. One bit is assigned to say whether to move forward or backward. The remaining five bits are reserved for the difference value as said Based on the data obtained from ADXL, PIC makes a decision whether to run or stop a specific motor and if it runs, in which direction it has to run is decided and stored in a RAM location of the TX PIC (Transmitter side). This data is connected to USART module of TX PIC and the TXREG will hold this data every time and transmit at a baud rate of about 300BPS.

On the receiver side, the RX ASK RF module will receive the data and sends it to the RX PIC (PIC on Receiver Side). The received byte is unpacked and different bits representing the states of motors are obtained by the PIC. The 5 Bit number will act like the Duty cycle for the motors of rover. It is multiplied by 5 to get the exact duty cycle. The RX PIC drives the motor control bits to its PORTD compatible with L293D. The PWM module of RX PIC is initialized with 8 bit timer2 with a prescaler of 8. The PWM output of the PIC is obtained at the RC2 pin of PORTC.

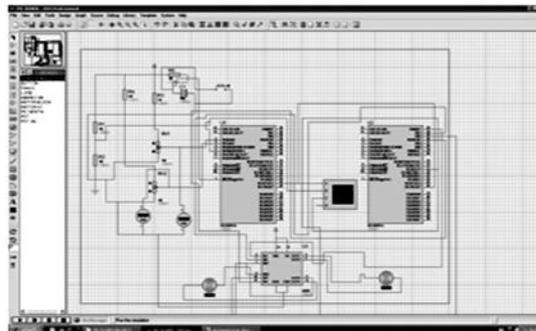
The PWM output is given to the enable pins of both the channels of the motor driver L293D.

Programing

MPLAB IDE of Microchip® is used in assembling the code for both transmitter and receiver parts using Assembly language. The developed code may be dumped into the chips using ISCP (In circuit serial programming) pins on the boards with PICKIT-3 programmer/debugger.

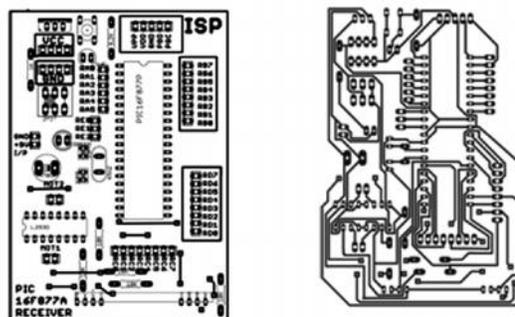
Simulation

The design is made first with a Proteus 8.3 simulator and is found to be working properly. The simulation design files are available with Research Laboratory, GVPCEW. A screen shot of the simulation is shown below.

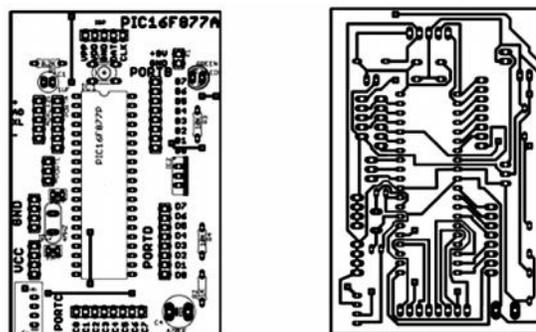


Hardware construction

The PCB version of the above said simulation is designed and constructed in the Research Laboratory, GVPCEW using CADSOFT EAGLE®. The boards are developed using Toner transfer method and etching is done with Ferric Chloride in an agitating tank. The boards are then treated with acetone/petrol and bare copper traces are obtained. Holes for pads are drilled and soldering of components is done.



Top and bottom layers of PCB for Receiver part



Top and bottom layers of PCB for Receiver part

The MPLAB Tool based Assembly Programming codes for the project is available with the Research Laboratory, GVPCEW. The prototype of this project is also available with the same.

(The author's prototype is a two wheeled rover with castor wheel, but can be extended even to four wheel drive with stepper motor controlled steering).

Conclusion

The PIC based gesture controlled rover is designed, simulated and constructed. The working of the rover is found to be satisfactory. As the prototype is only a two wheeled rover, proportionate steering control is not achieved and only speed control (like a feel of pressing the accelerator) is achieved. This limitation can be overcome with the employment of a stepper motor in place of the castor wheel for steering control.

References

1. Datasheet of PIC16f877A
2. Datasheet of ADXL335
3. PIC midrange reference manual by Microchip®.
4. Datasheet of L293D

Software/ Programms used

1. MPLAB IDE
2. Microchip PICKIT 3 programmer
3. CADSOFT EAGLE Light 7.2 for PCB
4. PROTEUS 8.3 for simulation

555 TIMER HOW IT WORKS?

This is a popular, widely used timer chip designed by Hans R. Camenzind in 1970 and brought to market in 1971 by Signetics (later acquired by Philips).

The name is probably because of the three 5K it comes in the 8 pin DIP. The NE/LM 555 (operating range is 4.5-15V) is the TTL version and its CMOS version comes out as 7555 (runs even with 1.5V) with limited current driving ability and very low power consumption. (7555 takes few μA in idle state in contrast to 3 – 15 mA consumption of LM555). For battery operated devices it is not advisable to use LM555 for long time as they will flat the 9V battery very quick. Though CMOS 7555 is suitable for battery based designs it costs high. Reliability of device

is doubtful when we cross the 300kHz frequency in the case of LM555 where as the CMOS version can be operated up to several Mega Hertz. Let us try to understand what are the pins and their functions.

Gnd: Ground pin for 0V reference.

Vcc: supply voltage 4.5 - 15V

Output: It either sources a current up to 50mA to load or sinks up to a current of 200mA from the load connected to it.

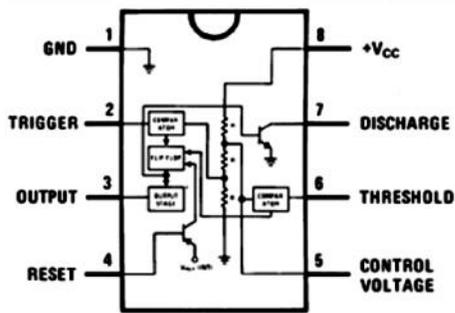
Reset: An active low INPUT pin which resets (forces its output to go zero) the chip on observing a less than 0.7v on it. Usually it is tied to the power rail without any series resistor as the reset pin has several Mega Ohm input impedance. It is the superior control pin among all the pins of 555.

Trigger: Next comes in hierarchy is the Trigger pin. As the name itself suggests that it can trigger the output pin to a "high" state if it was earlier in a "low" state. This is an INPUT pin with several Mega Ohm input impedance which sees for a voltage of less than $1/3V_{cc}$. It will force the output pin to go high when the voltage on trigger is less than $1/3V_{cc}$. It will not affect the output pin when the voltage is greater than $1/3V_{cc}$.

Threshold: Next pin in the hierarchy is the Threshold which also is an INPUT pin with several mega ohm input impedance. It forces the output pin to a low state when it sees a voltage greater than $2/3V_{cc}$ provided neither Reset is active nor the Trigger is less than $1/3V_{cc}$. If trigger is made less than $1/3V_{cc}$ and simultaneously Threshold is made higher than $2/3V_{cc}$, the Trigger will win the race and output will be in high state only. Threshold does not care for voltages less than $2/3V_{cc}$.

Discharge: This is another input pin which is the open collector pin of a transistor built-in. This pin has relatively low impedance and can sink hardly a current of less than 100mA. This pin can sink this current only when the output is in LOW state. Discharge pin remains inactive as long as the output pin is in the HIGH state and does not source/ sink any current.

Control: This pin is at $2/3V_{CC}$ reference level formed by three 5K resistors inside the 555. It can set the threshold voltage at a desired level other than being at default $2/3V_{CC}$. If this pin is connected to a different reference voltage, the Threshold pin will sense and deactivate the output to zero at the voltage that is given as reference voltage rather than doing it at $2/3V_{CC}$. In Astable mode this pin can be grounded through a 100nF capacitor to suppress the noise.

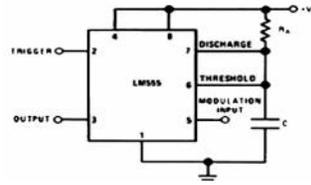


Top View

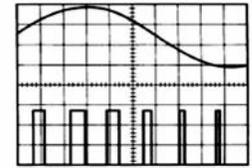
00785100

Pulse Width Modulator

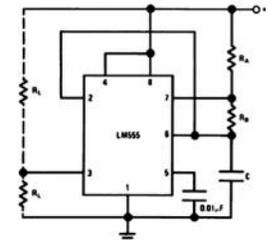
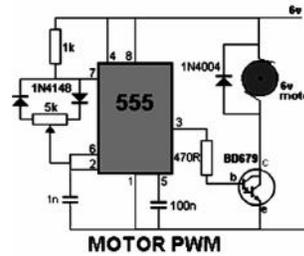
Motor Speed Control



Astable multivibrator

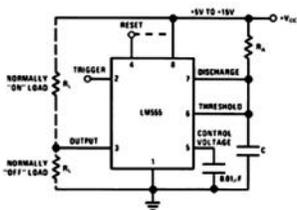


Images are taken from website of talking electronics

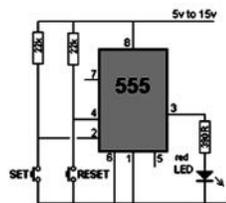


and datasheet of Lm555 of National Semiconductors

Possible Configurations



Monostable Multivibrator



Bistable Multivibrator

An Introduction to Kalman Filter

Mr. D.V.A.N.Ravi Kumar
Assistant Professor, Department of ECE

Abstract—The primary intention of this paper is to introduce the most powerful stochastic tool of the present century called kalman filter, to those who are new to the area of the optimal state estimation. An effort was made to show, how to fit a real time estimation problem to a kalman filter. The mechanism of operation of this popular algorithm is explained by deriving the a posteriori estimate and its covariance in the simplest possible form. Finally, the variety of areas in which the kalman filter is used in the present day life is listed out to show the importance of this estimator.

Index Terms— Stochastic tool, Kalman filter, Optimal State estimation, A posteriori estimate, Covariance.

I. INTRODUCTION

ESTIMATION is the process of anticipating the elements of the state vector as close to the true state as possible with the help of the available noise corrupted sensor data. The estimation task is performed by the algorithms like Least square estimator(LSE), Weighted least squares estimator(WLSE), Pseudo linear estimator(PLE) and Maximum likelihood estimator(MLE) in the earlier days. The stochastic tools discussed above belong to the category of the batch processing algorithms which uses all the previous data to estimate the future state. The disadvantage associated with these algorithms is, as time progress the processing or the computational time required to process the measurements becomes much higher than the time required to receive the new sensor measurements which in turn leads to the loss of data. This limits their usage for the real time applications. The present generation stochastic algorithm called the kalman filter[1,2], developed by R.E.Kalman, which belongs to the category of the sequential processing algorithms, solves this problem by estimating the state with the help of present measurement and the statistics

of the previous data (instead of using the entire past data). In simple words the kalman filter works by the propagation of the means and covariances of the elements of the state vector. This propagation of the first two orders of statistical parameters is done in three steps namely initialization, prediction and correction. Where the initialization is done only once at the beginning while the prediction is done before the measurements are collected and the updation is done after the sensor data is collected in a recursive fashion. The detailed explanations of how these steps are performed is given in the following sections. The feature of this algorithm is, it is an adaptive algorithm whose impulse response or the filter coefficients vary adaptively with time (time variant).

Section II shows how to fit a real time estimation problem to a kalman filter. **Section III** explains the mechanism of operation of the kalman filter. **Section IV** talks about the wide variety of applications where, the KF is used in the present day life and finally the paper is concluded in **section V**.

II. FITTING AN ESTIMATION PROBLEM TO A KALMAN FILTER

In order to estimate the desired parameters using kalman filter with the available noisy measurements, it is essential for us to represent the given situation in the form of the state and the measurement equations. A state equation is the equation which gives the relationship between the present state and the next state. The general form of the state equation is given in (1)

$$x(n) = A(n-1)x(n-1) + B(n-1)u(n-1) + w(n) \quad (1)$$

$x(n-1)$ in the eqn.(1) is the state vector at the present instant, it is normally comprised of the elements which are to be estimated. for example if we are tracking a target, in that case the state vector is normally comprised of the position and the velocity components. $x(n)$ is the next state and $A(n-1)$ is the state transition matrix which relates the present state and the next state.

The next state not only depends on the present state but it will also depend on the control input which is denoted by $u(n-1)$. The control input is comprised of the variables which are in our control and by varying them, the next state can be altered. In case of target tracking, we normally speak about the relative position of the target with respect to the observer. So the state influencing data which can be altered, is the observer position and the velocity data. Hence this data constitute the elements of the control input and the $B(n-1)$ in eqn.(1) represents the control matrix which relates the control inputs with the next state. Apart from the present state and the control input the next state also depends on the uncertainties which are represented by $w(n)$. $w(n)$ is called the state noise or process noise. For example if we are talking about tracking a target on the road then the uncertainties can be resulted due to the roughness of the road. Similarly if we are talking about tracking a target in air then, the uncertainties can be resulted due to the wind velocity and in the same way the tidal motion is the culprit for the uncertainties while tracking targets in the underwater scenarios. In order to apply the kalman filter, it is essential to know the statistical parameters namely the mean and the variance of the process noise. The mean is normally considered to be zero because at some instants if the noise is positive then at the other instants it will be negative, making the average value tend to approach zero. This also justifies the statement that the noise in the nature is unbiased. On the other hand, variance or the second statistical parameter can be obtained with the help of the data base of the state dynamics.

The second and the important mathematical modeling required to be done, to apply a kalman filter, is possible with the help of the sensor measurements that we receive. This equation is called the measurement equation in the literature of the control systems. The general form of the measurement equation is given in eqn.(2)

$$Y(n) = C(n)X(n) + v(n) \quad (2)$$

$X(n)$ in eqn.(2) should be the same state vector that was defined in the state equation. $Y(n)$ in the above equation is called the measurement vector. It is normally comprised of the measurements that we receive from the sensors. In case of the target tracking problem using a

Radar, the measurements that we get are, the Range and the Azimuth(also called as Bearing in the naval literature) of the target. These elements normally make the measurement vector. $C(n)$ in eqn.(2), called the measurement matrix relates the measurements and the parameters to be estimated. The sensor measurements what we receive are corrupted by some bugs. These are denoted by $v(n)$ in the above equation and termed as the measurement noise. As in the case of the state noise, it is essential to know the statistical parameters(mean and variance) of the measurement noise before the kalman filter can be applied.

Once the estimation Problem is mathematically modeled as explained above, the kalman filter can be applied directly to estimate the desired parameters from the noise corrupted sensor measurements. In the process of doing this the following assumptions are to be considered.

- $V(n)$ and $w(n)$ are Gaussian random variables.
- $E[v(n)] = 0$; i.e mean of the state noise is zero.
- $E[v(n)v(n)^T] = Q$; i.e. variance of the state noise is a known value Q .
- $E[w(n)] = 0$; i.e mean of the measurement noise is zero.
- $E[w(n)w(n)^T] = R$; i.e. variance of the measurement noise is a known value R .
- $E[v(n)w(n)] = 0$; i.e the state and the measurement noise are uncorrelated to each other.
- State and the measurement equations are Linear.

If all the above conditions are met, then the kalman filter, which is normally comprised of the following three steps and seven equations can be applied directly to the estimation problem.

Step 1: Initialization:

$$\begin{aligned} \hat{X}(0/0) &= E[X(0)] \\ P(0/0) &= E[X(0)X(0)^T] \end{aligned} \quad (3)$$

Step 2: Prediction:

$$\begin{aligned} \hat{X}(n/n-1) &= A(n-1)\hat{X}(n-1/n-1) \\ P(n/n-1) &= A(n-1)P(n-1/n-1)A^T(n-1) + Q(n) \end{aligned} \quad (4)$$

Step 3: Correction:

$$\begin{aligned} \hat{X}(n/n) &= \hat{X}(n/n-1) + K(n)[Y(n) - C(n)\hat{X}(n/n-1)] \\ P(n/n) &= [I - K(n)C(n)]P(n/n-1) \end{aligned}$$

Where

$$K(n) = P(n/n)C(n)^T [C(n)P(n/n-1)C(n)^T + R(n)]^{-1} \quad (5)$$

III. MECHANISM OF OPERATION OF KALMAN FILTER

Kalman filter primarily operate in three steps as mentioned earlier in the paper. The first step is the Initialization and it has to be implemented only once, at the start of the algorithm while the other two steps called prediction and the correction has to be implemented in an iterative manner. The detailed explanation of each step is given below.

A. Initialization

This step involves feeding the kalman filter with 1) the rough values of the parameters which are to be estimated (denoted by $\hat{X}(0/0)$ also called as initial estimate) and 2) confidence level of our initial estimate(denoted by $P(0/0)$ also called as initial covariance).

$$\begin{aligned}\hat{X}(0/0) &= E[X(0)] \\ P(0/0) &= E[X(0)X(0)^T]\end{aligned}\quad (6)$$

B. Prediction

This is the second of the three steps involved in the execution of kalman filter. This step is primarily concerned with the forecasting of the parameters which are to be estimated. This estimation step is implemented before the next measurement is received from the sensors and hence the estimate at this stage is called the priori estimate (denoted by $\hat{X}(n/n-1)$). The priori estimation is possible by knowing the rough dynamics of the state which can be obtained from the state equation given in eqn.(1).

$$\hat{X}(n/n-1) = A(n-1)\hat{X}(n-1/n-1) \quad (7)$$

It is also essential to compute the level of confidence in the priori estimate (denoted by $P(n/n-1)$ called as priori covariance).The level of confidence is nothing but the variance of the error in the priori estimation.

$$\begin{aligned}P(n/n-1) &= E[|e(n/n-1)|^2] \\ &= E[e(n/n-1)e(n/n-1)^T]\end{aligned}\quad (8)$$

where $e(n/n-1)$ is the error in the priori estimate.

$$\begin{aligned}e(n/n-1) &= X(n) - \hat{X}(n/n-1) \\ &= A(n-1)X(n-1) + w(n) - A(n-1)\hat{X}(n-1/n-1) \\ &= A(n-1)[X(n-1) - \hat{X}(n-1/n-1)] + w(n) \\ &= A(n-1)e(n-1/n-1) + w(n)\end{aligned}\quad (9)$$

Where $e(n-1/n-1)$ is the error in the estimation of the state at the time instant $n-1$, by taking into account the measurement at $n-1^{\text{th}}$ instant. Using eqn.(8) and eqn.(9)

$$\begin{aligned}P(n/n-1) &= \\ &E\{[A(n-1)e(n-1/n-1)+w(n)]\end{aligned}$$

$$\{A(n-1)e(n-1/n-1)+w(n)\}^T]$$

By assuming that 1)The estimation error and the process noise are uncorrelated i.e $E[e(n-1/n-1)w(n)]=0$, 2)The variance of the process noise is a known value $Q(n)$ i.e $E[e(n-1/n-1).e(n-1/n-1)^T]=Q(n)$. The priori covariance is computed as follows

$$P\left(\frac{n}{n}-1\right) = A(n-1)P\left(n-\frac{1}{n}-1\right)A(n-1)^T + Q(n) \quad (10)$$

C. Updation or correction

This is the third and the last step involved in the execution of kalman filter. This step is performed as soon as a new measurement is received and hence the estimate at this stage is called the posteriori estimate(denoted by $\hat{X}(n/n)$).The implementation of this step definitely makes sense because, additional information can certainly refine the estimate. The posteriori estimate is a linear combination of both priori estimate and the measurement received at the current instant. It can be mathematically expressed as below.

$$\hat{X}(n/n) = K'(n)\hat{X}(n/n-1) + K(n)Y(n) \quad (11)$$

Computation of $K'(n)$:

$$\begin{aligned}e(n/n) &= X(n) - \hat{X}(n/n) \\ &= X(n) - K'(n)\hat{X}(n/n-1) - K(n)Y(n)\end{aligned}$$

$e(n/n)$ in the above equation is the error in the posteriori estimate which is the difference between the true and the estimated values.

$$\begin{aligned}e(n/n) &= \\ &X(n) - K'(n)[X(n) - e(n/n-1)] - K(n)[C(n)X(n) + \\ &\quad v(n)] \\ &= X(n)[I - K'(n) - K(n)C(n)] + K'(n)e(n/n-1) - \\ &\quad K(n)V(n)\end{aligned}\quad (12)$$

For the error to be unbiased for any $X(n)$

$$E[e(n/n)] = 0$$

This in turn implies, the coefficient of $X(n)$ in the above equation should be zero because it is already assumed that the mean of the measurement noise and the estimation errors are zero i.e $E[v(n)]=0, E[e(n/n-1)]=0$

$$I - K'(n) - K(n)C(n) = 0$$

$$\text{This makes } K'(n) = I - K(n)C(n) \quad (13)$$

Substituting the value of $K'(n)$ as given in the above eqn.(13) into the posteriori estimate(11)results in the following equation.

$$\hat{X}(n/n) = [I - K(n)C(n)]\hat{X}(n/n-1) + K(n)Y(n)$$

$$\hat{X}(n/n) = \hat{X}(n/n-1) + K(n)[Y(n) - C(n)\hat{X}(n/n-1)] \quad (14)$$

Computation of K(n):

$K(n)$ called the kalman gain is chosen such that the mean square error in the estimation yields to a minimum possible value. In order to do this the covariance in the posteriori estimation i.e $P(n/n)$ should be computed first.

$$\begin{aligned} e(n/n) &= K'(n)e(n/n-1) - K(n)V(n) \\ &= [I - K(n)C(n)]e(n/n-1) - K(n)V(n) \end{aligned}$$

By using the equations $E[v(n)v^T(n)] = Q(n)$ and $E[e(n/n-1)e(n/n-1)^T] = P(n/n-1)$

$$\begin{aligned} P(n/n) &= E[e(n/n)e(n/n)^T] \\ &= [I - K(n)C(n)]P(n/n-1)[I - K(n)C(n)]^T + K(n)Q(n)K(n)^T \end{aligned} \quad (15)$$

The minimum possible value of the mean square error can be obtained for the value of $K(n)$ at which the first derivative of the covariance is zero.

$$\text{i.e } \frac{d P(n/n)}{d K(n)} = 0$$

This is achieved at $K(n)$

$$= P(n/n-1)C(n)^T [C(n)P(n/n-1)C(n)^T + Q(n)]^{-1} \quad (16)$$

The posteriori covariance can now be written as

$$\begin{aligned} P(n/n) &= [I - K(n)C(n)]P(n/n-1)[I - K(n)C(n)]^T \\ &\quad + K(n)Q(n)K(n)^T \\ P(n/n) &= [I - K(n)C(n)]P(n/n-1)[I - C(n)^T K(n)^T] \\ &\quad - K(n)Q(n)K(n)^T \end{aligned}$$

The above equation on solving yields to the following

$$\begin{aligned} P(n/n) &= [I - K(n)C(n)]P(n/n-1) \\ &\quad - [I - K(n)C(n)]P(n/n-1)C(n)^T - K(n)Q(n)K(n)^T \end{aligned}$$

The second term in the equation becomes zero to yield

$$P(n/n) = [I - K(n)C(n)]P(n/n-1) \quad (17)$$

IV. RECENT ADVANCES AND APPLICATIONS OF KALMAN FILTER

Kalman filter is used in almost all the primary fields of science and engineering these days. Some of the examples are given below

1) *KF for Electrical and Electronics Engineering people:*

- KF can be used to estimate the current in the windings of a motor which in turn enable us to control the speed and position of the motor.
- Important electrical power quantities like the voltages, currents and powers can be estimated by KF[3].

- KF shows its importance in the Self Commissioning High Performance Drive System with an Elastic Joint[4].
- KF can be used for the Grid Synchronization and Voltage Analysis[5].

2) *KF for Electronics and Communications Engineering people:*

- KF can be used to estimate the altitude of the satellite by which the velocity of it can be controlled.
- Position and Velocity Tracking in Cellular Networks can be done with the help of KF[6].
- Dead-Reckoning Method for Personal Navigation Systems to Augment Inertial/Magnetic Sensing[7] is performed by different KF Techniques.
- Localization with very high accuracy in Wireless Sensor Networks(WSN) is achieved by Using Extended Kalman Filters [8].
- Global positioning System(GPS) Navigation is highly supported by the time variant and the nonlinear version of KF[9].
- Innovation Approach Based Sensor FDI in LEO Satellite Altitude Computation and Control System[10] .
- Joint Multi-Input Multi-Output(MIMO) Channel Tracking and Symbol Decoding can be performed by using KF[11].
- KF can be used for the motion estimation in the area of video processing[12].
- Target Tracking in underwater scenarios as well as in air in greatly supported by kalman filter[18].

3) *KF for Economists:*

- Here the KF can be used to estimate the economic growth by which the unemployment can be controlled.

4) *KF for Doctors and Biomedical People:*

- KF can be used to estimate the blood sugar levels and temperature of the human body by which we can control the heart beat count and the rate of respiration.

- Detection of the Pathological Constriction in the Cerebral Arterial Blood Vessels can be done by using Constrained Nonlinear KF[13].
- Extended Kalman Filter(EKF) can be used for the Modelling and Estimation of ICG Pharmacokinetics in malignant Tumors using NIR Measurements[14].
- Respiratory System Modeling can be done with the help of a Dual Unscented KF [15].

5) KF for Business people:

- A highly sophisticated KF can even estimate the stock market.

6) KF for Industrial Applications:

- Fault Detection Diagnosis and Isolation(FDDI) in Attitude Control(AC) and Heating Ventilation Air Conditioning(HVAC) Systems can be done with the help of Unscented Kalman Filter(UKF) [16].
- Robust Descriptor KF is commonly used in Robotics for solving the problem of localization[17].

V. CONCLUSION

From the long list of applications seen in the paper it can be concluded that, the kalman filter and its derivatives like extended kalman filter, unscented kalman filter and others KF based filters entered into almost all the major areas of Engineering and science, where the problem of estimation has to be solved in the optimal sense. In future KF can be used to solve many more real time estimation problems like the estimation of the stock market with a high degree of accuracy. The other major area in which the KF can be used widely is the Artificial intelligence, where the decision making is the utmost important aspect.

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Introduction to Android App Development

Mr. K. Purushotham Naidu
Assistant Professor, CSE



Introduction

Android is the first step in the vision of creating a smarter mobile phone. It is a complete open mobile platform software stack which has been recently released by Google. Android can be run on mobile devices from companies that have come together to form the Open Handset Alliance.

The Alliance currently consists of 34 companies including Motorola, T-Mobile and Sprint-Nextel. These companies have agreed to open access devices. This basically means that I, as a customer, can purchase a Motorola phone with service from one cellular network then later switch carriers by keeping the same phone!

Android would run on Open Handset Alliance devices. It includes an operating system, middleware and key applications such as email client, calendar, maps, browser, and contacts. It also takes the basics one step further by merging contacts with maps.

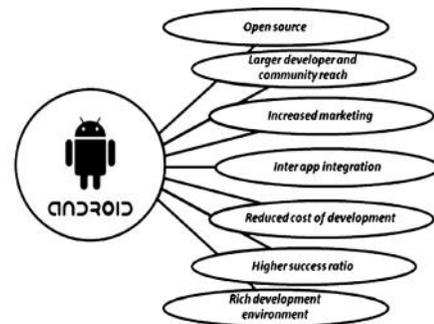
For example, if you have contacts' address stored on you mobile device you can bring up that location on a map with one click of a button. No need to open a browser, navigates to Google maps or MapQuest, type the address and wait for it to load. What's even more exciting about Android is that it is an open platform. What's great about this is that it's customizable and modifiable. You are not running a platform that prefers to keep you hands tied. You can also be assured that there will be a lot of cool and innovative tools to download for free.

2. What is Android?

Android is an open source and Linux-based operating system for mobile devices such as smart phones and tablet computers.

As the number of users is increasing day by day, facilities are also increasing. Starting with simple phones which were made just to make and receive calls. Now we have phones which can even access GPS , GPRS, Wifi, NFC and other advanced features. So in this Mobile world complication, android is one of those operating system platforms which made it easy for manufacturers to design top class phones.

3. Why Android?



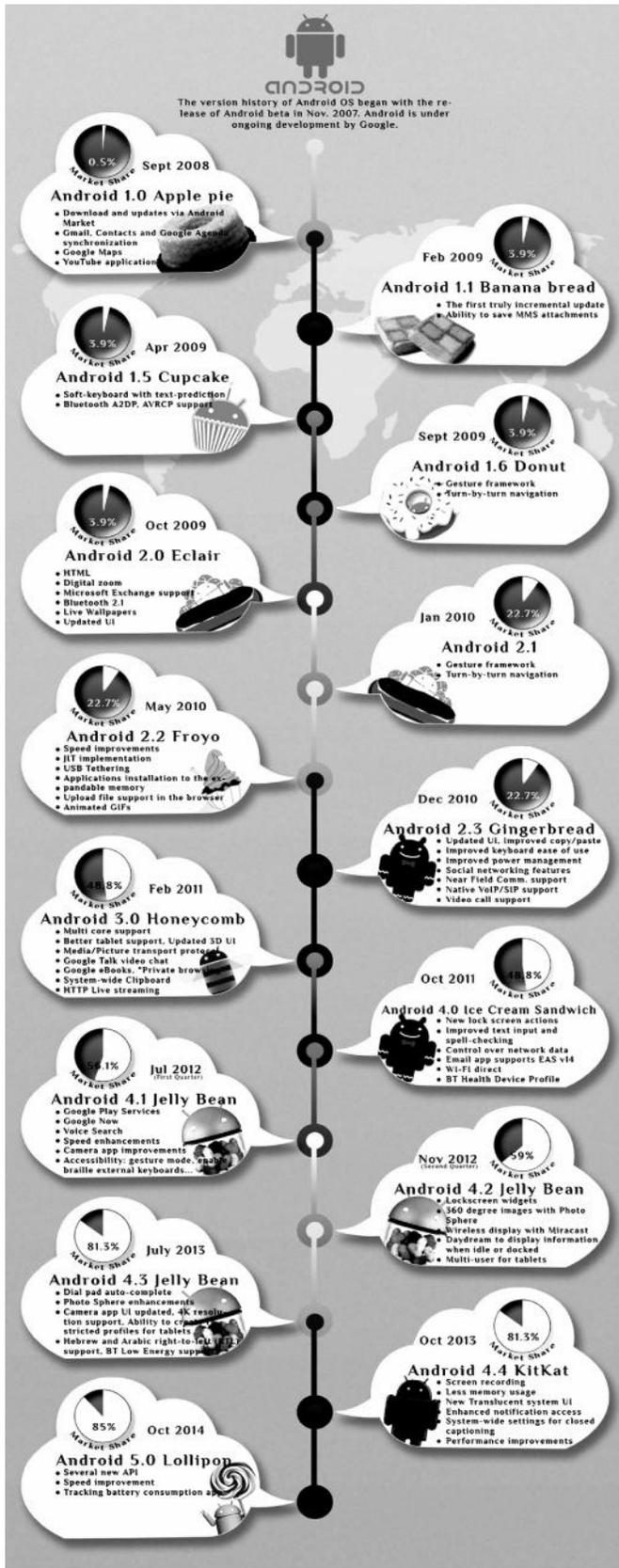
4. History of Android

Android was found way back in 2003. It was developed in Palo Alto, California by Andy Rubin, Rich Miner, Nick Sears and Chris White. Later it was purchased by the GOOGLE in AUGUST, 2005 for 50 million\$. The code names of android ranges from A to L currently, such as Aestro, Blender, Cupcake, Donut, Eclair, Froyo, Gingerbread, Honeycomb, Ice Cream Sandwich, Jelly Bean, KitKat and Lollipop. Let's understand the android history in a sequence.

5. Android Features

i) Handset layouts :

The platform is adaptable to larger, VGA, 2D graphics library, 3D graphics library based on OpenGL ES 2.0 specifications, and traditional smart phone layouts



ii) Storage:

SQLite, a lightweight relational database, is used for data storage purposes.

iii) Connectivity:

Android supports connectivity technologies including

GSM/EDGE, IDEN, CDMA, EV-DO, UMTS, Bluetooth, Wi-Fi, LTE, NFC and WiMAX.

iv) Messaging :

SMS and MMS are available forms of messaging, including threaded text messaging and now Android Cloud To Device Messaging (C2DM) is also a part of Android Push Messaging service.

v) Multiple language support

vi) Web browser

The web browser available in Android is based on the open-source WebKit layout engine, coupled with Chrome's V8 JavaScript engine. The browser scores 100/100 on the Acid3 test on Android 4.0.

vii) Java support

While most Android applications are written in Java, there is no Java Virtual Machine in the platform and Java byte code is not executed. Java classes are compiled into Dalvik executables and run on Dalvik, a specialized virtual machine designed specifically for Android and optimized for battery-powered mobile devices with limited memory and CPU. J2ME support can be provided via third-party applications.

viii) Media support

Android supports the following audio/video/still media formats: WebM, H.263, H.264 (in 3GP or MP4 container), MPEG-4 SP, AMR, AMR-WB (in 3GP container), AAC, HE-AAC (in MP4 or 3GP container), MP3, MIDI, Ogg Vorbis, FLAC, WAV, JPEG, PNG, GIF, BMP.

ix) Streaming media support

x) Additional hardware support

Android can use video/still cameras, touch screens, GPS, accelerometers, gyroscopes, barometers, magnetometers, dedicated gaming controls, proximity and pressure sensors, thermometers, accelerated 2D bit blits (with hardware orientation, scaling, pixel format conversion) and accelerated 3D graphics.

xi) Multi-touch

xii) Bluetooth

xiii) Video calling

xiv) Multitasking

xv) Tethering

Android supports tethering, which allows a phone to be used as a wireless/wired Wi-Fi

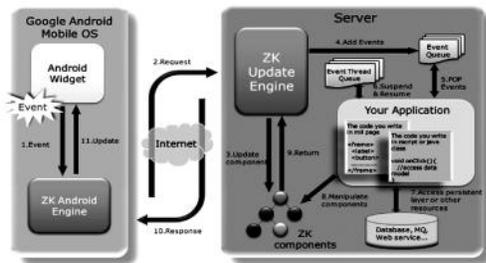
hotspot. Before Android 2.2 this was supported by third-party applications or manufacturer customizations.

xvi) Screen capture xvii) External storage

Android architecture



7. Android Applications



Android applications are usually developed in the Java language using the Android Software Development Kit.

Once developed, Android applications can be packaged easily and sold either through a store such as Google Play, SlideME ,Opera Mobile Store, Morang, F-droid and the Amazon Appstore.

Android powers hundreds of millions of mobile devices in more than 190 countries around the world. It's the largest installed base of any mobile platform and growing fast. Every day more than 1 million new Android devices are activated worldwide.

7.1 Categories of Android applications

There are many android applications in the market. The top categories are:

Music, Travel, Sports, Business, Social Media, News, Lifestyle, Weather, Reference, Utility, Multimedia, Food & Drink, Books, Navigation, Finance.

8. Advantages

1. Android can Run Multiple Apps at the Same Time.
2. Android keeps information visible on your home screen. Android is a customizable home screen which keeps active widgets right at your fingertips, always accessible and always visible – without having to launch an application.
3. Android has a better application market compare to Apple's App because Apple's App store has over 180,000 applications, while the Android Marketplace has only just broken the 50,000 mark
4. Android gives you better notifications compared to iPhone because iPhone has some trouble with notifications. Because it is restricted to pop-up notifications, it can only handle one at a time.
5. Innovative products like the location-aware services, location of a nearby convenience store etc., are some of the additive facilities in Android.
6. Android is Hardware independent.
7. Android lets you install custom ROMs.
8. We can change your settings faster in Android. iPhone users are stuck digging around in the system settings every time they want to use the internet or a Bluetooth device. Android lets you use widgets to manage your settings directly from your home screen.
9. Android does Google and Social Integration but The iPhone can do this only through use of third party apps, and is nowhere near as seamless to use as the Android alternative.
10. Android gives you more options to fit your budget. Of course these are lower end Android devices, but they are still comparable in performance to the iPhone 3GS.

9. Disadvantages

1. Connected to the Internet: Android can be said is in need of an active internet connection. At least there should be a GPRS internet connection in your area, so that the device is ready to go online to suit our needs.

2. Sometimes slow device company issued an official version of Android your own.
3. Android Market is less control of the manager, sometimes there are malware.
4. As direct service providers, users sometimes very difficult to connect with the Google.
5. Sometimes there are ads: because it is easy and free, sometimes often a lot of advertising. In appearance it does not interfere with the performance of the application itself, as it sometimes is in the top or bottom of the application.
6. Wasteful Batteries, This is because the OS is in "process" in the background causing the battery to drain quickly.

10. Development Tools:

The Android SDK includes a variety of custom tools that help you develop mobile applications on the Android platform. Three of the most significant tools are:

1. Android Emulator -A virtual mobile device that runs on our computer -use to design, debug, and test our applications in an actual Android runtime environment
2. Android Development Tools Plug-in -for the Eclipse IDE - adds powerful extensions to the Eclipse integrated environment
3. Dalvik Debug Monitor Service (DDMS) -Integrated with Dalvik -this tool let us manage processes on an emulator and assists in debugging

Evolution of Mobile Wireless Technologies 1G, 2G, 3G, 4G LTE, and 5G

Dr. K. Srinivasa Rao

Associate Professor, Department of ECE

Introduction

Cellular Communication Technology has evolved over the past 3 decades with each phase bringing new and exciting capabilities and services to the end user. The ability to communicate with people on move has evolved remarkably, since Marconi, first demonstrated radio to provide continuous contact with ships. The mobile wireless evolved in a very short span of time. In this article, evolution of mobile Wireless Communication technologies along with their significance and advantage of one over the other is discussed. In few past decades, the mobile wireless evolution progressed from Zero Generation (0G) to Fifth generation (5G) systems with the aim Quality of Service (QoS), efficiency and performance.

Evolution of Mobile cellular Networks

Cellular Mobile communication has various generations as shown in Fig 1.



The brief description of each generation:

Wireless telephone started with 0G, which became available after World War-II. In those pre-cell days, telephone operator sets up the calls and there were only a handful of channels available. 0G refers to pre cellular mobile telephony technology in 1970's., such as Radio telephones that some had in cars before the advent of cell phones. 0.5 G is a group of technologies with improved feature than the basic 0G technologies. This early mobile telephone system can be distinguished from earlier closed radio telephone systems in that they were available as a commercial

service that was part of the public switched telephone network, with their own telephone numbers, rather than part of a closed network such as a police radio or taxi dispatch system. These mobile telephones were usually mounted in cars or trucks, though briefcase models were also made. Typically, the transceiver (transmitter receiver) was mounted in the vehicle trunk and attached to the "head" (dial, display, and handset) mounted near the driver seat.

1G First-generation technology of the early 1980s was based on analog transmissions. 1G technology only provided voice and subscribers were super excited with the new mobile technology now that they didn't have to rely on stationary telephones or landlines at home or in the office. For the first time, cellular technology had cut the cord from the telephone, giving users the flexibility of being mobile while still staying connected! Then industry switched to digital spread spectrum about 10 years later, ushering in the age of 2G cellular networks based on Global System for Mobile Communication (GSM) standard. 2G came along with improved transmission quality, system capacity, and coverage for the telecoms and for the subscribers, encryption, voice, voicemail, SMS, and basic data called General Packet Radio Service (GPRS). 2G cellular systems include GSM, digital AMPS (D-AMPS), code-division multiple access (CDMA), and personal digital communication (PDC). Even though it got a lot better with the release of 2.5G network that brought along with it EDGE(Enhanced Data rates for GSM Evolution), still at only about 256Kbps, using phones having more or less same capabilities as their predecessors wasn't much of an improvement.

Fast forward to 3G: 3G is a term used to represent the 3rd generation of mobile telecommunications technology. The 3G technology adds multimedia facilities to 2G phones by allowing video, audio, and graphics applications to be transmitted over the

network. 3G is like the puberty of mobile network standards. On 3G phones, you can stream video or have video telephony. The idea behind 3G is to have a single network standard instead of the different types adopted in the US, Europe, and Asia. A 3G cell-phone system depends on code division multiple access (CDMA) and spread spectrum radio technology, which allows many users to share both time and frequencies. If eight units of bandwidth are available, for instance, each user can transmit all of the time over all of the frequencies, but will be limited to using only one of the eight available orthogonal codes (non-overlapping communication channels for each active link) to avoid interference with anyone using the other seven units of bandwidth.

- 0G : Private telephone network, Landline
- 1G : Only voice, Cordless phones,
- 2G : Voice + SMS + basic data (GPRS)
- 2.5G : Voice + SMS + a little faster data (EDGE)
- 3G : Voice + SMS + fast data (3G)
- 3.5G : All the above with faster data speeds at 7.5Mbps
- 3.75G : All the above with even faster data speeds at 21Mbps.

3.5G, 3.75, 4G LTE and beyond: Today several operators in the country claim to support 3.75G which offers up to 21Mbps downstream speed. But other than these networks powering 3G capable phones, what's more interesting is that 3G is being used as the internet access means on laptops and stand-alone desktops through 3G modems. This is so because of low cost of installation (only a modem with a SIM card is required) and eases of reloading data, plus of course wide coverage of 3G networks across the country.

4G LTE (Long Term Evolution) is set to be the next big thing after 3G. Next year, local networks here are rumored to launch their 4G networks. Now if you think 21Mbps on 3G+ is faster, then you won't grasp how fast 4G's 100Mbps.

In the 5G (5th generation mobile networks or 5th generation wireless systems) system, each cell phone will have permanent "Home" IP address and "care of address" which represents its actual location. When a computer on the Internet wants to communicate with cell phone after that first, it sends a packet to the home address and subsequently server onhome

address send a packet to the actual location through the tunnel. Server also sends a packet to the computer to inform the correct address so that future packets will send on that address. Cloud computing is a technology that uses the internet and central remote server to maintain data and applications. In 5G network this central remote server will be our content provider. Cloud computing allows consumers and business to use applications without installation and access their personal files at any computer with internet access. In 5G researches are being made on development of WWW (World Wide Wireless Web).

The applications of Next Generation Cellular Systems are set to evolve in a multiplatform environment Viz.

Virtual Presence: This means that 4G and 5G provide user services at all times, even if the user is off-site. Virtual navigation: 4G provides users with virtual navigation through which a user can access a database of the streets, buildings etc. of large cities. This requires high speed data transmission.

Tele-Medicine: 4G and 5G will support remote health monitoring of patients. A user need not go to the hospital instead a user can get videoconference assistance for a doctor at anytime and anywhere.

Tele-geoprocessing applications: This is a combination of GIS (Geographical Information System) and GPS (Global Positioning System) in which a user can get the location by querying.

Crisis management: Natural disasters can cause breakdown in communication systems. In today's world it might take days or weeks to restore the system. But in 4G it is expected to restore such crisis issues in a few hours.

Education: For people who are interested in lifelong education, 4G provides a good opportunity. People anywhere in the world can continue their education through online in a cost effective manner.

Security: This layer also branches across all the layers of the 4G and 5G network architecture which perform the function of authentication, authorization, encryption, establishment, and implementation of service policy agreement between the various vendors.

Economic growth: Economic growth is supported because these technology changes allow consumers

and businesses to benefit from high-value wireless data and content services.

Artificial Intelligence: More applications combined with artificial intelligent (AI) as human life will be surrounded by artificial sensors which could be communicating with mobile phones.

Travelling: Introducing the launch of new mobile phone apps; the use of Bluetooth & NFC technology integrated smart phones in the passenger travel process. Technology is likely to play a role in re-ordering these phases over the next decade, allowing, for example, people to experience a destination

virtually before transit, or to seek inspiration and share information live, while they are travelling and experiencing a place.

Economic growth: Economic growth is supported because these technology changes allow consumers and businesses to benefit from high-value wireless data and content services. This relationship had not yet been explicitly quantified yet.

These articles concludes by looking back at existing wireless technologies and summarize the next generation wireless communication technologies in Table 1.

Generation	Speed	Technology	Time period	Features
1G	14.4 Kbps	AMPS,NMT, TACS	1970 – 1980	During 1G Wireless phones are used for voice only.
2G	9.6/ 14.4 Kbps	TDMA,CDMA	1990 to 2000	2G capabilities are achieved by allowing multiple users on a single channel via multiplexing. During 2G Cellular phones are used for data also along with voice.
2.5G	171.2 Kbps 20-40 Kbps	GPRS	2001-2004	2.5G the internet becomes popular and data becomes more relevant.2.5G Multimedia services and streaming starts to show growth. Phones start supporting web browsing though limited and very few phones have that.
3G	3.1 Mbps 500-700 Kbps	CDMA 200 (1xRTT, EVDO) UMTS, EDGE	2004-2005	3G has Multimedia services support along with streaming are more popular. In 3G, Universal access and portability across different device types are made possible. (Telephones, PDA's, etc.)
3.5G	14.4 Mbps 1-3 Mbps	HSPA	2006 – 2010	3.5G supports higher throughput and speeds to support higher data needs of the consumers
4G	100-300 Mbps. 3-5 Mbps 100 Mbps (Wi-Fi)	WiMax LTE Wi-Fi	Now (Read more on Transitioning to 4G)	Speeds for 4G are further increased to keep up with data access demand used by various services. High definition streaming is now supported in 4G. New phones with HD capabilities surface. It gets pretty cool. In 4G, Portability is increased further. World-wide roaming is not a distant dream.
5G	Probably gigabits	Not Yet	Soon (probably 2020)	Currently there is no 5G technology deployed. When this becomes available it will provide very high speeds to the consumers. It would also provide efficient use of available bandwidth

III. CONCLUSION

In this article the evolution of mobile communications through all its generations has been presented. From the initial speech vocation 0th generation to 5th generation of cellular technologies, the goal was to enhance the voice experience of a user, by improving the quality of the communication. At the same time, the enhanced mobility provided by seamless handover and the additional data communications capacity. However, the global mobility, while an important objective, was never really reached. The newcomer generation tries to address this problem by integrating all different wireless technologies.

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Cyber Security of Electric Utility Services

Excerpt from IEEE Power and Electrical Magazine, Sept-Oct 2016, pp 48 - 51 by Ellen Smith et al

CYBER ATTACKS HAVE CHALLENGED the existing electric utility cybersecurity standards to protect critical assets, their integrated dependents, and public safety from cyberthreats.

Introduction

The electric grid is monitored and controlled by Industrial Control Systems(ICS), including supervisory control and data acquisition(SCADA) systems and field devices that are cyber vulnerable. Although very few electric utility cyberincidents have been reported and successful reports are underreported, there have been many cyberattack attempts, challenging organizations to think and prepare for future attacks based on their own perceived cyber vulnerabilities.

Background

To date, most utilities and policy makers have understandably focussed on traditional cyber vulnerabilities, attacks on systems connected to the internal utility company information technology(IT) networks. For a period of time, this approach was sufficient since attacks on these systems could effect customer data and normal back office operations such as billing, which could impact a customer's service connection, credit rating, or exposure to identity theft. Meanwhile, the implications of cyberattacks on the utility operational control systems that monitor and manage power flow represent an even greater risk of damage and increasingly gaining the attention of experts in the ICS and cybersecurity space. To understand cyberincidents of a potentially catastrophic nature, it is necessary to expand the perception of cybersecurity beyond Internet-connected devices and

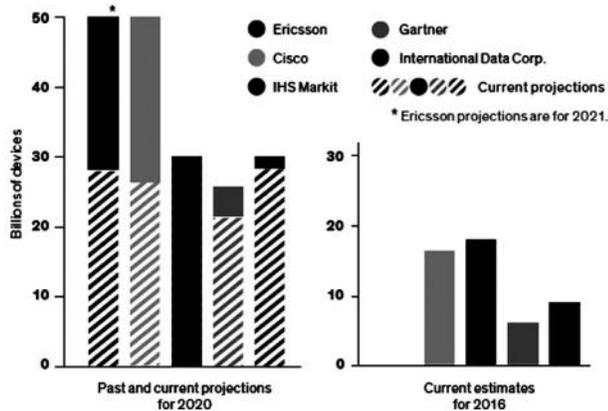
servers. The electric utility industry has become more automated and connected to the internet through smart grid and other industrial internet initiatives, making power production, transmission, and distribution significantly more operationally dynamic than ever before and hence more vulnerable to cyber security threats and breaches. The so called industrial Internet of Things is a rapidly expanding reality already ushering in unintended elements of weakness with the consequence of increased operational points of failure.

A Comparison of traditional IT and ICS cybersecurity priorities		
Attribute	Traditional IT Focus	ICS Focus
Maintain confidentiality (privacy)	High	Low
Message integrity	Low-medium	Very high
System availability	Low-medium	Very high
Authentication	Medium-high	High
Nonrepudiation	High	Low-medium
Safety	Low	Very high
Time criticality	Delays tolerated	Critical
System downtime	Tolerated	Not acceptable
Security skills/ awareness	Usually good	Usually poor
System life cycle	3-5 years	15-25 years
Interoperability	Not critical	Critical
Computing resources	"Unlimited"	Very limited
Standards	ISO27000	ISA/IEC 62443

The Internet Of Fewer Things

Excerpts from Spectrum Magazine, IEEE, Oct 2016, pp 12 - 13

The world will have 50 billion Internet-connected devices by 2020. Ericsson's former CEO, Hans Vestburg, was among the first to toss out that number, when he gave a 2010 presentation to shareholders. A 2012 IBM forecast predicted 1 trillion connected devices by 2015.

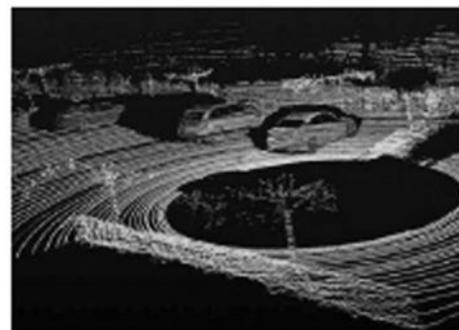


At this point, even the strictest definitions of IoT remain fuzzy because of breathless hype, including attempts to anticipate demand for devices that have yet to be invented or commercialized. IoT in 2020 Analysts' original projections for the number of connected devices by 2020 [solid bars] varied by many billions. Some have ratcheted down expectations in newer forecasts [striped bars]. Conflicting definitions make it difficult to compare expectations. Some firms count smartphones, tablets, and laptops, while others (Gartner, International Data Corp.) do not.

Light Radar

Excerpt from IEEE Spectrum oct 2016
Lidar (light radar) is complex and expensive right now, but within the next few years, it'll be cheaper and more reliable-and everywhere. Lidar is a sensing technology

similar to radar that detects objects with pulses of laser light. Though lidar has a shorter range than radar (tens to hundreds of meters), the much shorter wavelengths used by lidar result in a massive increase in resolution. The uniquely reliable and high-quality data that lidar provides has made it the sensor of choice for the majority of vehicle autonomy applications. In fact, many experts feel that lidar is a necessity for driverless cars.



PIXELS AND POINTS:

A Velodyne lidar produces a set of data points that show nearby cars. Makers of self-driving cars consider it essential tech.

High Performance Transistor

*Excerpt from IEEE Power and Energy Magazine,
Sept - Oct 2016, pp 48 - 51*

Five years ago, Intel introduced today's high performance transistor to the world. Dubbed there FinFET, the device takes its name from its appearance: The transistor's current carrying-channel sticks up vertically in the shape of a fin, and the gate that controls it drapes over the sides. The result is a much tighter control over the flow of current, which in modern microprocessors can fairly easily sneak across the transistor when it's supposed to be shutoff.

But well before the FinFET exploded into the scene in 2011, engineers and device physicists had already been looking at the possibility of taking that transistor geometry to its local conclusion, with a gate that completely surrounds the current-carrying channel. Shifting to such a "gate-all-around" geometry would in theory, allow chip companies to produce shorter transistors that do not leak copious amounts of current, improving speed or power consumption in the process.

Now, Hans Mertens and colleagues from the nano electronics research firm Imec, based in Leuven, Belgium, have constructed gate-all-around transistors from dense stacks of 8-nanometer wide nanowires of a conventional silicon surface.

Although engineering hurdles remain, the coming years could see further improvements to this basic approach- and perhaps its introduction into mass engineering.

Gate-all-around devices can be made by orienting a nanowire made of semi conducting material in one of two ways: laterally, as today's transistor channels are arranged, or vertically, so that the nano wire stands on end, perpendicular to the plane of the chip more vulnerable to cyber security threats and breaches. The so called industrial Internet of Things is a rapidly expanding reality already ushering in unintended elements of weakness with the consequence of increased operational points of failure.

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Experiences of our internship @ IIT Kharagpur

One fine day, during our mid exams in the month of December, we were called by our Vice Principal sir. We were asked if we have interest in pursuing internship at IITs. Though we were IIT aspirants from our intermediate, we never got a chance to step into IIT. As soon as we heard those words from sir, our immediate reply was YES!!! Then we were advised to interact with one of our Professors from IIT Kharagpur. The following week we got a chance to interact with the Professor and explained our interest in taking up projects involving new technologies. After going through our credentials and our earlier projects done, believing us to be capable, we have been recommended.

Finally the day has come, we started our journey on 11th May'16 at 8:00 AM. Though it is our first time travelling alone, we were excited about the thought of stepping into an IIT and working on a project for 2 months. It being a day journey we had a lot of time to discuss about our stay and the work. It was 10:00 PM by the time we reached our destination. We directly went to the hostel where we were given accommodation. In the dark, we couldn't see the campus properly. The next day we woke up early in the morning and went to the G S Sanyal School of Telecommunications hardware lab (Takshashila complex), where we were supposed to report and work for the next two months. The in-charge of the lab introduced all the M. Tech, M.S., Ph.D. students present there and informed us the rules of the lab. The hardware lab is well equipped with various experimental setups. We, intern students, were 5 members from GVPCEW, NIT Rourkela and IIT Bhubaneswar. On that day we were asked to revise the fundamentals of electronics and communication subjects which might help us in the project. The following day we had a meeting with the Professor and we were assigned the task of designing an LED driver.

From then started our work. We tried designing it in many ways and learned a lot of practical concepts in the process. After completion of the design and testing of it, we also designed the OWC Receiver. It took 3 weeks for us to complete the implementation and testing of this Optical Wireless Communication setup. After this, we 5 members were divided into 3 groups and each group was assigned a different task. The tasks were Designing an Instant Messaging Application using Visible Light Communication (VLC) as front end, VLC Front End design. During our stay there, MHRD happened to conduct a GIAN course on 5G Technologies and some foreign professors were invited to deliver lectures. We were very fortunate as we got a chance to attend the lectures and interact with them. In the process of completion of the assigned tasks, we did not notice the day and night difference for a couple of weeks. Finally, the day of submission has come. We felt nervous as we were supposed to present our entire work to all the scholars gathered in the lab. Fortunately, everything went fine and we were applauded for the work we have done. We were awarded the Experience Certificate.

IIT Kharagpur is the largest and oldest IIT in India. The natural beauty and the marvel of the environment of the campus is beyond description. It included the Main building, Green Avenues, the Vikramshila, Takshashila, JCB Lab complexes, Gymkhana and the park behind it, Nehru Museum, Students activity center, Scholar's Avenue, Jnan Ghosh Stadium, Tech Market, Theatre and Halls of Residence. We enjoyed our stay there with many cherishable moments and a great exposure. This is, and will be a lifetime memory for us. We are grateful to all those people who helped us in getting this wonderful opportunity. This is all about our successful journey from GVPCEW to IIT Kharagpur.

Opportunities for students after completing B.Tech in ECE & EEE

Option 1: Take up job

There are many good opportunities for jobs available after completing B.Tech, E.C.E. One can start a career by entering into State Government department jobs. To get a job in the government sector, one has to qualify in the written test conducted by State Public Service Commission.

There are also many opportunities in the Central government departments like Defense as a scientist, Railways, Indian Engineering Services as an engineer, etc. One can get a job in

Maharatna CPSEs

1. Bharat Heavy Electricals Limited
2. Coal India Limited
3. GAIL (India) Limited
4. Indian Oil Corporation Limited
5. NTPC Limited
6. Oil & Natural Gas Corporation Limited
7. Steel Authority of India Limited

Navratna CPSEs

1. Bharat Electronics Limited
2. Engineers India Limited
3. Hindustan Aeronautics Limited
4. Mahanagar Telephone Nigam Limited
5. Oil India Limited
6. Power Finance Corporation Limited

Option 2: Higher education

If you pursue further studies and specialize in a particular subject, it will also give you an advantage during interviews.

23 IITs and 31 NITs offering M.Tech (Electronics and Communication Engineering) which is a two year course. Candidates who have completed B.E/B.Tech in Electronics and Communication Engineering can get admission for M. Tech through GATE (Graduate Aptitude Test in Engineering).

Reputed central, state universities and engineering colleges also offering M.Tech (Electronics and Communication Engineering) and Candidates who have good GATE score can get stipend given by AICTE.

Some of the M. Tech courses:

- . M. Tech. Automotive Electronics (in collaboration with TIFAC-CORE industry partners)
- . M. Tech. Communication Engineering
- . M. Tech. Nanotechnology
- . M. Tech. Sensor System Technology
- . M.Tech VLSI and Embedded systems

If you are willing to go abroad, you can prefer M.S. One has to appear for GRE & TOEFL or IELTS for doing M.S in foreign countries.

Central Government departments by qualifying in the tests conducted by Union of Public Service Commission (UPSC) and Staff Selection Commission (SSC). One can find the notifications for such vacancies in their official websites.

One can also start a career in public sector firms. Some of the public sector firms that recruit candidates who have completed B.Tech with good percentage and good GATE score in Electronics and Communication Engineering.

7. Power Grid Corporation of India Limited
8. Shipping Corporation of India Limited

Miniratna Category - I CPSEs

1. Airports Authority of India
2. Bharat Sanchar Nigam Limited
3. Dredging Corporation of India Limited
4. Garden Reach Shipbuilders & Engineers Limited
5. Goa Shipyard Limited
6. Hindustan Newsprint Limited
7. Hindustan Paper Corporation Limited
8. Indian Railway Catering & Tourism Corporation Ltd
9. Indian Renewable Energy Development Agency Limited
10. India Trade Promotion Organization
11. North Eastern Electric Power Corporation Limited
12. Numaligarh Refinery Limited
13. ONGC Videsh Limited
14. Pawan Hans Helicopters Limited
15. Projects & Development India Limited
16. Railtel Corporation of India Limited
17. Rail Vikas Nigam Limited
18. State Trading Corporation of India Limited
19. Telecommunications Consultants India Limited
20. THDC India Limited

Miniratna Category-II CPSEs

58. Broadcast Engineering Consultants (I) Limited
59. Ed.CIL (India) Limited
60. Engineering Projects (India) Limited
61. National Small Industries Corporation Limited
62. PEC Limited
63. Rajasthan Electronics & Instruments Limited

These companies conduct written tests and interviews. If one can have good GATE score they can directly call for interview. One can find the notifications for these jobs in their official websites and in the leading newspapers. There are many private companies that recruit engineers in B.Tech in Electronics and Communication. Some of them are Reliance, Nokia, Tata, LG, Wipro, Infosys, TCS, etc.

Option 3:

One can start the carrier as an entrepreneur by starting own business or forms or startup companies.

Opportunities for students after completing B.Tech in CSE & IT

1. Data Scientists

Someone expressed that "Data Scientist: The Sexiest Job of the 21st Century". This is very true and jobs are more than job seekers in USA and internationally also. Evidently, suitable candidate has to be good programmer with marvelous recent algorithms skills in addition statistical data analysis abilities so as to increase ROI of the companies for which they will work for.

3. Digital Forensic Experts

Digital savyness among the people is increasing at exponential rate. At the same time, digital crime is also increasing with alarming rates. The digital forensic experts are the one who are supposed to provide sound evidence in the court of law. Main skill set needed for these people is good understanding of operating systems, virtualizations, network protocols.

In addition to the above, the following are also going to be next century jobs.

5. Cognitive Controlled Device Designers

6. E-Learning Professionals

7. Health analytic personal

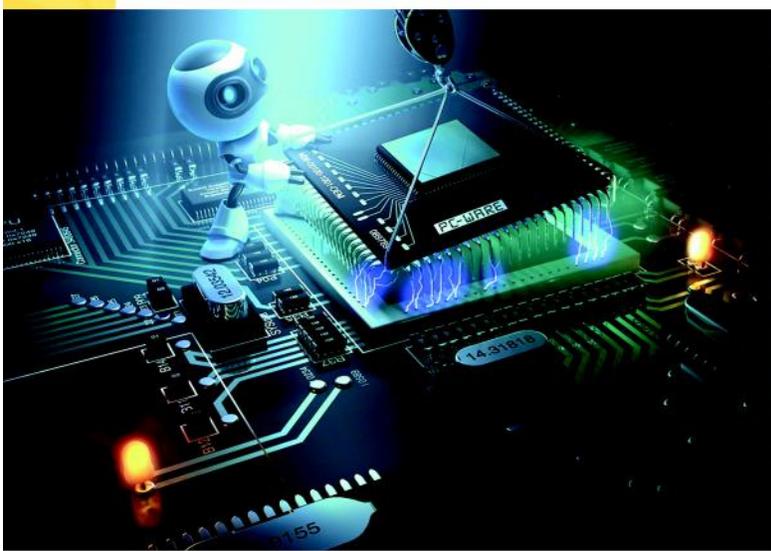
Conventional jobs will be certainly there but with less in number.

2. Security Experts

Not only India, whole world is dirt of Security experts. Recent predictions indicates that in India alone there is a need of 10 lakh security personnel. This number may even increase by many fold in the coming years. What are essential skill set for these people? Good hands on exposure to System Adm, Network Adm of various operating systems along with necessary technical background and mathematic.

4. IOT Interface Designers

Electronics and sensory aspects of Internet connected devices are taken care by ECE and Instrumentation people. Computer Science people are supposed to develop interfaces through these devices so as to collect and communicate for possible analytic processing of data analytistic. Next few years are going to flood IOT enabled devices, I believe interface engineers are also required in big number. These people are supposed have good hardware fundamentals, interfacing, real time operating system design and development in addition to circuit design abilities.



College Activities

Improvement of Qualifications by Faculty and Staff

- ✦ Dr. A Suseelatha, Asst Prof, Mathematics Awarded Ph. D in “Applied Mathematics” by Andhra University on 9/10/2015.
- ✦ Dr. B. Rajesh Babu, Asst Prof, Physics awarded Ph.D by JNTUK on 16/3/2016
- ✦ Dr. K. Srinivasa Rao, Associate Professor awarded Ph.D in “Wireless Communications” by JNTUK on 07/05/2016

Some of the Best practices / Value added Activities

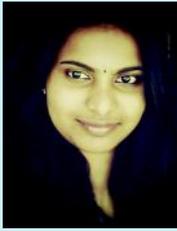
- ✦ An aptitude training was given free of cost to the final year students after conducting a test. Around 167 students were given training by Aptitude Experts from a training academy in Visakhapatnam.
- ✦ In addition, in-house training classes in C Language, reasoning and aptitude were conducted for 10 days (each day 3 hours). The training was given to all the final year students.
- ✦ To improve the communication skills and help students understand, GRE, TOEFL based tests; an English Laboratory with software was set up exclusively for the purpose. In addition starting from II Year, English training classes are being conducted to improve the communication skills.
- ✦ An Internet of Things (IoT) laboratory is established in the campus to give advanced training to students in Advanced Technologies. For this purpose three faculty members (one from ECE and 2 from CSE) were sent to NIT for training in these technologies.
- ✦ Advanced Java Training classes are conducted to final year students by a faculty trained for the purpose by the software giant WIPRO. The classes have been conducted for duration of 45 days.

In house 8051 development boards and IC testers were manufactured and are put to use in the Department of ECE laboratories. The initiative was taken up last year and is being continued by Sri VV Satyanarayana, Asst Prof, Department of Physics.

Workshops/ Seminars/Faculty Development Programmes conducted

- ✦ A Three Day Staff Development Programme on Electromagnetics and RF Fundamentals (EMRF-16) organized by the Department of Electronics & Communications Engineering during 22nd – 24th January, 2016.
 - ✦ Prof.Dr.G.S.N.Raju, Vice-Chancellor, Andhra University invited as Chief Guest for Inaugural Session;
 - ✦ Prof.Dr.K.Balaji, Professor, Department of ECE, JNTUK-UCEV, Vizianagaram invited as Chief Guest for Valedictory session.
 - ✦ Prof Amitabha Bhattacharya, Associate Professor, IIT Kharagpur delivered lectures during the sessions
- ✦ A Three Day Staff Development Programme on BIG DATA AND HADOOP was organized by the Department of Computer Science & Engineering during 26th – 28th February, 2016.
 - ✦ Dr.V Ravi, Professor, Institute of Development and Research in Banking Sector and Sri N Venkatesh, Asst Prof, JNTUK-UCEV graced the occasion
- ✦ A two day workshop on “Cognitive Radio Technologies” conducted by the Department of ECE GVPCEW during 25th-26th Sept.2015. The following dignitaries graced the workshop
 - ✦ Prof.Dr.B Prabhakara Rao, Rector, JNTUK Kakinada and
 - ✦ Prof Zafar Ali Khan, Prof & HOD, Dept of ECE, IIT, Hyderabad

Alumni Speak



Samantha Donga
Sonata Software

"If roots define a tree, fundamentals define engineers". In a competitive world with umpteen engineering colleges like mushrooms, we need to stand out to show what we are capable of. And in order to stand out from the crowd, we need to be outstanding. Everything that is required to remain outstanding is what GVPCEW has given us. Simply the Best of Education with Values.

"Dear girls, I'm sure you'll crib about the discipline in the college. But trust me, it's worth it. If you haven't realized it yet, you'll realize the importance of being disciplined in GVPCEW tomorrow when you are in your flying colours. Do your best girls, the college will do the rest for you. Wish you All the best"

As a child I longed for to become a Doctor. The dream did not come true and for a few choices I had obviously become an engineer. The four years I spent in GVPCEW brought a complete overhaul in my personality and helped me grow personally and professionally. Being a post graduate now whatever I am and will be is because of my Alma Mater. I wish all the success for the institute and successive batches for their future endeavours.



Amulya
TCS

I entered these very gates of GVPCEW as a first batch student with lots of hopes and anticipation. But still deep within I felt there is something missing. My journey here is very eventful and has personally filled in every gap I felt missing. Brick by brick as they say has laid the foundation of my life. Today being a women, I confidently stand up and throw challenges in this corporate world.

I'm always in a learning mode and the credit should go to my Alma mater GVPCEW.



Anjum Shaik
CISCO, US

College has nourished us with experiences and values which help us imbibe knowledge- GVPCEW builds such an environment and has always encouraged and motivated the students to pursue their aspirations. College life has a very important role in my career and life as such; I will always be grateful to my teachers as they taught me a new perspective towards life.



Shobhana Raut
Captain, Indian Army

Institute helped me to develop very positive attitude towards work and also enhanced leadership quality in me. Here, our interests are given both due respect and priority. The point is to do what we like and to be the best at it. I feel proud to be the student of the first batch since I personally visualised the growth and the glory of the GVPCEW in this decade. I would like to take this opportunity to thank one and all who were instrumental in shaping my career.

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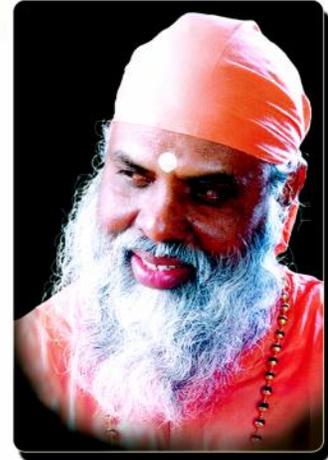
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