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Sept – Oct 2010

# INTELLIGENT LINKS

*Department of Electronics and Telecommunication  
Pillai's Institute of Information & Technology, Engineering  
Media Studies & Research, New Panvel*

# Pillai's Institute of Information Technology, Engineering, Media Studies & Research



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- Pillai's Institute of Information & Technology, Engineering Media Studies & Research, New Panvel
- Pillai's HOC College of Engineering & Technology, Rasayani

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- Pillai's Polytechnic, New Panvel
- Pillai's HOC Polytechnic, Rasayani

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- Pillai's HOC College of Architecture, Rasayani

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- Mahatma Junior College of Education (D.Ed.), Chembur
- Pillai's College of Education & Research, (B.Ed.& M.Ed.) New Panvel
- Vidhyadhiraja College of Physical Education & Research, New Panvel
- Pillai's Comprehensive College of Education & Research (D.Ed.), New Panvel
- Pillai's College of Education & Research (B.Ed.), Chembur
- Dr. Pillai HOC Junior College of Education (D.Ed), Rasayani

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## N.G.O. FOR NON-PROFIT WORK

- Euridite Education Mission

## INTERNATIONAL SCHOOLS

- Mahatma Education Society's HOC International School, Rasayani
- Dr. Pillai Global Academy, Gorai
- Dr. Pillai Global Academy, New Panvel, Sector 7
- Dr. Pillai Global Academy, Rasayani

## SCHOOLS

- Chembur English Pre-Primary & Primary School, Chembur
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- Chembur Marathi Madhyamik Shala, Chembur
- Mahatma School of Academic & Sports, New Panvel

## JUNIOR COLLEGES

- Chembur English Junior College of Commerce, Chembur
- Mahatma Night Junior College of Arts & Commerce, Chembur
- Mahatma School of Academic & Sports, Junior College of Arts, Commerce & Science, New Panvel
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## DEGREE COLLEGES

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- Pillai's HOC College of Arts, Science & Commerce, Rasayani



# Message

Statistics and futuristic projections point to continuance of growth of Indian IT and manufacturing sectors and its contribution to the National economy. We shall witness the transformation of dreams into reality but there is little discussion about whether such growth is sustainable and effective when other areas of the economy continue to lag. For example, 79 per cent of India's population lives in villages with limited basic infrastructure. Over 60 per cent of the population is considered literate, but with literacy being defined as the ability to read and write simple words in any language, acquired with or without formal schooling. This criterion is so basic, that it is almost irrelevant in the context of a knowledge economy. Yet, Central and State governments have projected IT and lately manufacturing as a vehicle for social and economic transformation. Are we putting the cart before the horse here? Even if the focus on IT is justifiable, how must IT policy and labor reforms be designed so that the nation is benefited in a balanced way?

Today, we produce about 7,000 PhD's in Science including Agricultural Sciences and a paltry 700 plus in Engineering per year. It is not going to be easy for Engineering to do what has been done in Science. But, if India has to be technologically strong, it is a MUST. A KNOWLEDGE economy is characterized by a culture of innovation. For such a culture to take root, innovation must be rewarded and intellectual property be protected. A culture that truly enhances innovation, supports the view, to try hard and fail is perfectly fine. Yet, the Indian psyche has historically been averse to blessing the risky venture. In fact, education has been viewed as a way to avoid risky options, rather than as an enabler of intelligent risk-taking and entrepreneurship. Such a cultural mindset hinders innovation, because meaningful innovation is almost never without significant risk. We, at Pillai, dream big and think aloud, you are invited to join us in the collaborative endeavor, for nation building and wealth creation, for the mankind at large.

Dr. K. M. Vasudevan Pillai

(Secretary and CEO, MES)



Dr. K. M. Vasudevan Pillai

We are living in era of globalised economy wherein the limitations of time and place is no longer significant. In such an era, only those who excel in their area of expertise flourish and others perish sooner or later. Further, given the present pace of progress, engineering students are required to keep abreast of the latest state of the art in technology to make themselves competitive in the professional field. I am happy that students have joined hands to bring out this journal. I am also happy to note that the faculty members are chipping in their might to add value to the journal. Contribution to the journal and perusal of the journal articles, along with technical activities organised by professional bodies like IEEE, would surely provide a technical edge to the PIIT students in their professional pursuit. I am extremely pleased with the issue and wish that the journal is published in regular short intervals and cover all areas of interest of the department.

With best wishes,

Dr. R.I.K. Moorthy

(Principal)



Dr. R.I.K. Moorthy





The current trend in world is to absorb “Engineering professionals” which means developing the attitude of an engineer and functional style of professional. This is the transparent indication that an individual is a profit center. Young professionals are expected to acquire skills, knowledge, intelligence and innovative approach to research, the training for which is imparted in this institute.

In the sanctum sanctorum of an educational institute, like PIIT, has major role to be played in creating dynamic performance that are expected to shoulder responsibilities, take up challenges and make a mark in the industrial world.

The curriculum of the programs enable our students develop competitive and leadership skills.

We, at PIIT strongly believe that the budding engineer is adequately trained to make meaningful contribution to the challenging industrial world, and thereby carve a niche for themselves.

Mr. Pragnesh Shah  
(Sr. Executive, MES & Asst. Professor EXTC)



Mr. Pragnesh Shah



Mrs. Priyadarshinee A. Shahapure

“INTELLIGENT LINKS” a phase to be through, an experience shared, skills unleashed, and linked with. I am pleased to take it as an opportunity to share the experience of making of “INTELLIGENT LINKS” as an effort of new talent, which was hidden and waiting to give birth.

Birth of INTELLIGENT LINKS was a cumulative effort, hard work and knowledge shared. The magazine team and participants have tried to make it successful with handling modern technology information, like Blue ray technology, cloud computing, futuristic silicon micro photonics, but with a tinge of poetic ability of a technocrat and skill of brush and paint on the paper.

With the soul of Electronics and telecommunication, INTELLIGENT LINKS has handled subjects, like Memory size paradox, 3G technology which gives an idea to the technology we live with. Future revolution like Clay-tronics also, basics of designing and preparing a printed circuit board. The presence and importance of electronics in railway. The skills to be learned in college, like preparation for interview, do's and don'ts to be successful in life overcoming the fear of failure. The interviews of HOD Mr. Srivastava and Mr. Pragnesh Shah add up the moral support and guides how to be successful in the life.

This is the first step of INTELLIGENT LINKS towards the future; the craze of a new technology, inventions, and discoveries will keep this journey in search for a new talent like voyager through the space of wonders of electronics and telecommunication. “INTELLIGENT LINKS” can be a first rung of a ladder for many of us to reveal the secrets of skills one has.

It has been a remarkable experience working with the talented and creative committee linked with “INTELLIGENT LINKS”.

Mrs. Priyadarshinee (Shravani) A. Shahapure  
(Magazine Co-ordinator, Lecturer -EXTC)



It gives me an immense pleasure to inform that department of Electronics and Telecommunication Engineering is going to publish the first issue of this magazine. Communication Engineering is an emerging field, and it is widely used in day to day life. The best example is mobile phone. Now 4G technology is coming as a new revolution in the mobile phone market. By using this, one shares important information with others, and at the same time, it will also create new job prospects in future. Since technology changes rapidly, it is necessary to keep pace with it. Therefore, by using this platform, one can enhance and improve the knowledge. I hope that the new ideas related to technical and non-technical subjects will come in order to publish the next issue of this magazine in future. I am sure that this magazine will provide a lot of technical and non-technical information to us.

On behalf of my department, I am very much indebted to our beloved and respected Dr. K. M. Vasudevan Pillai, Dr. Daphne Pillai and Dr. R. I. K. Moorthy. Without their support and cooperation, it would not have been possible for us to publish this magazine. Last but not least I am also very thankful to our staff and students, who took a lot of pain and gave there valuable time to publish this issue successfully.

By Sanjeevkumar Srivastava  
(Head of the department-EXTC)



Mr. Sanjeevkumar Srivastava



# INTELLIGENT LINKS

DR. K. M. VASUDEVAN PILLAI'S  
CAMPUS



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Priyadarshinee S

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# Community Talk

## FROM THE EDITORIAL BOARD

It is a pleasure to present this edition of "INTELLIGENT LINKS", the magazine by Electronics and Telecommunication department, PIIT. It had been a long term goal to publicize the knowledge, the skill and creativity of the students. This magazine showcases their talents. The magazine enlightens the recent trends as well as the rich history in Electronics and Telecommunication field. It also emphasizes the need for improvisation of the existing system, through technical papers and articles published by the students and our esteemed faculty. Not only this, for the general knowledge-hungry people, various historical dates about landmark achievements have also been included. The magazine also emphasizes on the literary work, interviews and tips that can be very useful, when applied in real life. The magazine is proposed to be a half-yearly series, with the aim to ignite the minds of young engineering students, and help develop and create young innovators.



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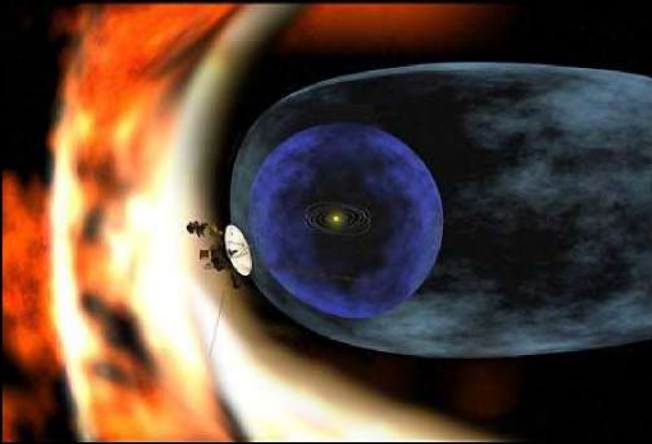
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# EXPLORING SPACE

## THE VOYAGER MISSION



Space is often called the final frontier of humans. Our Planet Earth is just a small planet which is third of the nine planets orbiting a medium sized star which we call Sun which is one of the billions of stars in a galaxy (Milky Way has at least 200 billion stars) which we call Milky Way which is itself one of the several billion galaxies in this observable universe. So, how did the universe begin? How did the galaxies, stars and planets form? What is the size of the universe? Are we alone in this universe? What is the universe made up of? These are some of the questions that astronomers are trying to answer. To help them, they build several instruments like robotic spacecrafts, space telescopes etc to observe the universe. This series will look at some of the famous instruments. In this part, we will learn about the Voyager mission.

Voyager mission is a pair of similar spacecrafts *Voyager 1* and *Voyager 2* that was launched in the year 1977 to explore the Gas Giants (Jupiter, Saturn, Uranus and Neptune). They were the first spacecrafts to provide detailed photographs of these planets. They were built by JPL (Jet Propulsion

Laboratory) and funded by NASA (National Aeronautics and Space Administration). Both the spacecrafts continue to operate to this day, having completed more than 12000 days of operation.

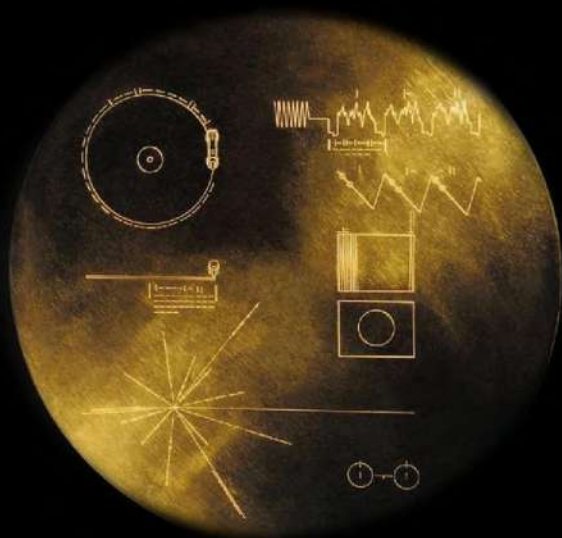
Costing about 865 Million dollars, the Voyager mission returned more information about the Gas Giants than was ever known previously. It generated more than five trillion bits of scientific data (that is about 1000 bits of information for each person on Earth!).

Contradicting logic, *Voyager 2* was launched before *Voyager 1*. *Voyager 1* was launched on September 5, 1977 while *Voyager 2* was launched on August 20, 1977. They were built to take advantage of the alignment of the planets in favourable positions. This allowed any spacecraft launched to visit all the four outer planets easily. *Voyager 1* took a shorter route and reached the planets earlier while *Voyager 2* reached later.

The structure of the two spacecrafts was identical. They were three axis stabilized spacecrafts. Each had 10 instruments to take observations. To communicate with Earth, they used a High Gain Antenna (3.7 meters across) which was always pointed towards Earth. Power for the instruments was provided by three radioisotopes thermoelectric generators which provided a 470 Watts, 30 Volts power supply.

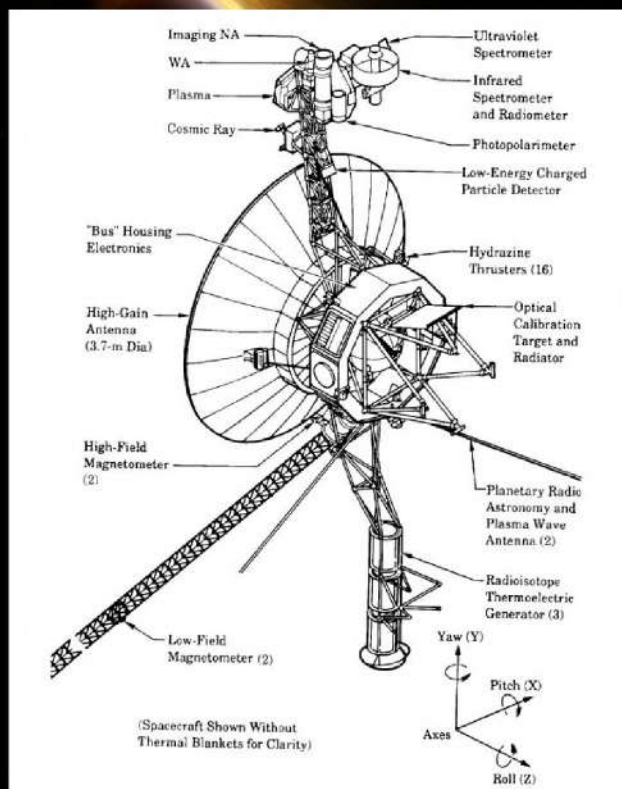
Year	End of specific capabilities as a result of the available electrical power limitations
1998	Terminate scan platform and UV observations
2007	Termination of <i>Digital Tape Recorder</i> operations
2008	Power off <i>Planetary Radio Astronomy Experiment</i>
2015	Termination of gyroscopic operations
2020	Initiate instrument power sharing
2025	Can no longer power any single instrument

Both the spacecrafts also carried a golden record (called *the Voyager Golden Record*) containing images and sounds from Earth which was for any Aliens that the spacecraft intercepted. This disc contains greetings from Earth in 55 languages (Including the Indian languages Hindi, Punjabi, Marathi, Bengali, Gujarati, Kannada, Telugu, Oriya and Rajasthani) and a variety of sounds made by nature and humans. It also has 116 pictures of various things and persons like the solar system and its planets, DNA etc. The disc cover has graphical instructions on how to operate the disc.



Voyager 1 took a shorter route but was able to observe only Jupiter and Saturn. While Voyager 2 took a longer route and was able to visit all the four outer planets. Before Voyager mission, the best photos of the outer planets were taken using telescopes from Earth. They were not very detailed. Voyager provided spectacular photos of these planets and their satellites.

To tour the planets, Voyager 1 used the gravity of Jupiter to give itself a boost i.e. increases its speed for its journey to Saturn. Voyager 2 needed additional boosts from Saturn and Uranus to visit Neptune. This manoeuvre called “gravity assist swing by” reduced the time taken to visit the planets drastically (by as much as 20 years).



Before Voyager, *Pioneer 10* was the farthest manmade object. But Voyager 1 was faster than Pioneer 10 and beat it in 1990's to become the farthest manmade object. It is still in operation and has crossed the Termination Shock, which is a region in outer solar system where the wind from Sun slows down due to Interstellar material. Voyager 2 is travelling in a different direction. Both the spacecrafts are expected to operate until at least 2020.

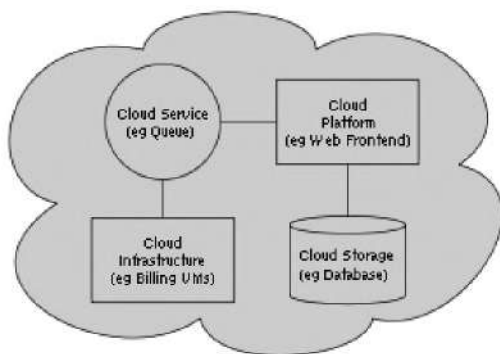
By Balajiganapathi S (TE)



# CLOUD COMPUTING

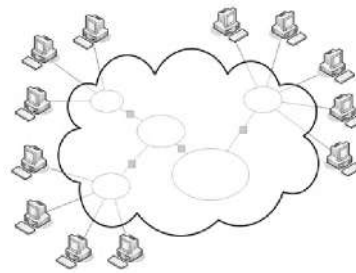
Cloud Computing is the most efficient way of saving money for the big organizations. Generally, the cloud computing customers do not own the physical Infrastructure. Their usage is directly rented from third party providers. They normally consume the resources, as a service, and only pay for the resources that they use. With the help of Cloud Computing, a company can access remote machines, which are owned by another through e-mail. Hence, complex data Analysis software can be used by that company, and they pay for their use.

Cloud Computing users normally or generally avoid capital expenditure on hard or software and only pay for the resources which they use. Their consumption is usually billed on utility or subscription basis. This approach is benefited by low barrier to entries. Some cloud host charge for instances, data transfer, storage etc. In some cases the user can bid on instances, with pricing dependent on demand for available instances. This actual term "Cloud" comes from telephony. Amazon played a key role in the development of "cloud computing" by modernizing the data centers after dotcom bubble.



The feature of cloud computing is, its agility improves with the user ability to rapidly and inexpensively re-provision technological infrastructures resources. Here, a user can access the systems, using web browsers regardless of their locations or what devices they are using (pc, mobile etc.). Multi-tenancy enables sharing of the resources and costs, across a large pool of users, thus allowing for the centralization of peak load, capacity and utilizations, and of course efficiency. Security can be improved by centralization of data.

Cloud computing systems are divided into two parts:



1] Front end

2] Back end

These are connected to each other through a network (internet); the front end section consists of the user or client. And back end is "cloud" section of the system cloud. It consists of numerous computers, servers and data storage systems. The front end also uses the application required to access the cloud computing systems. A central server follows a set of rules called protocols and also uses a special kind of software called "Middleware" that allows network computers to communicate with each other.

In the cloud computing systems there are in all five layers which are as follows:

1. **Client:** It consists of the hardware and software layers that rely on the cloud computing for an application delivery
2. **Application:** This service delivers software as a service over the internet.
3. **Platform:** This serves as a platform and solution stack as a service often consuming cloud application; it also facilitates the deployment of application, without the cost and complexity of buying and managing the hardware and software layers.
4. **Infrastructures:** The service delivers the computer infrastructure, typically a platform virtualization environment.
5. **Servers:** It provides the services that a client requires.

By Sushma Ghadge (BE)

# MEMORY-SIZE PARADOX



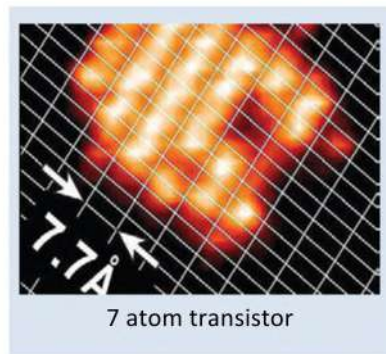
Do you think the pen drive you are carrying with you is very small in size for the size it carries? Think again. The technology is growing at an exponential rate. To be more accurate, according to Moore's law, the number of

transistors we can place on an integrated chip, doubles every two years. For instance, take a look at what seems to be a big container, these people are mounting into the aircraft. It is, actually, a mere 5MB hard disk drive weighing over a ton. This picture was snapped in the year 1956 when IBM manufactured 305 RAMAC. I remember my father purchasing computer back in 1999, when it boasted hard disk drive of 8GB with 56MB RAM, a printer and Pentium 1 processor costing 35,000. And exactly after 10 years, when we sold it and bought a new computer, we got 240GB HDD 3GB ram, Core 2 duo and scanner printer for the same cost. Isn't it surprising so much has changed in matter of just 10 years?

Few months ago, I read in Mumbai mirror that a team of scientists at the University of New South Wales' Centre for Quantum Computer Technology (CQCT) has developed a transistor made up of just 7 atoms of silicon. Its length is roughly  $50 \times 10^{-10}$ . Do you know what it means? The components on future chips could be up to 100 times smaller than those on the current processors. This is one of the first few leaps, taken towards quantum computing. This means that possibly in next few years, you could be carrying hundred of movies in your mobile and, not to mention about the number of songs and pictures stored in your memory stick. The speed at which processing will be carried out will be unimaginable. This technology is a boon for the field of biotechnologies, where they need to crack DNA codes. It takes many days or even months to work on certain type of complex

structures of DNA. This technology will boost the pace at which science is progressing.

On one hand, as the size of transistors is going smaller, innovative ways to increase the size of data in a disc are invented. If I ask you, what is the largest storage device in terms of disc, some of you may say it is DVD, but that is wrong. Some may even say 'Blu-ray', which very few people know that it can contain 25 to 50 GB space, but even that is wrong. A group of Japanese researchers has redefined optical storage device by creating a disc which can hold 1,000 times the memory of a Blu-ray. Its storage capacity is 25,000 GB or simply 25 TB. These discs are made by coating a layer of metallic film. In darkness, the metal remains black and can conduct electricity. When struck by light, the material transforms into a brown semi-conductor. The light itself would act as an on-off switch. Different colors reflect light differently, and each difference can be used to store new sets of information. If proper reading and writing equipments are developed, which might not be that difficult, then it will promise a great leap in optical storage device. The cost of production and availability is, not at all an issue as the metal which will be coated is titanium oxide that is available in plenty, and is even used in many day to day items like face powder and white paint.



Now returning back to our pen drive, now we realize, how large our pen drive is in terms of the single atom storage device, or how very small it is compared to the disk

which promises 25TB on a single disk.

By Karthik Patri (TE)



# Electronics in

## Mumbai Railway System

In Mumbai, the commercial capital and the heart of our country, public transportation forms the lifeline of the city. The reason is, more than 85% of the people in the city commute through it. The trains are the majority in use.

Everyday, more than 200 trains make more than 2000 trips over 300 km of track. They carry more passengers/kilometers than any other railway on earth. The trains are built to carry 1700 passengers but it carries usually 3 times that number. To make it even worse, there are just a few minutes gap between trains. A single delay can delay the entire line.

The reason for mentioning all this is, it is the transportation which 'Millions depend on but only few understand what exactly keeps it so safe and on time'.



To make the motorman move on time, the human eye is always there on every train. A central traffic control room is there, which stays in constant contact with the motorman.

The tracks are dangerous, yet, the trains are safe. Here, the ELECTRONICS come into picture. Mumbai railways have one of the best safety records in India. No

trains have crashed against each other, in a city where during peak hours 409 trains move along the 4 tracks.

Every train is equipped with the electronic safeguards, it's called the auxiliary warning system. It is a mechanical co-pilot which interacts with the signal system to control trains speed and avoid disasters.

Near each signal embedded in the tracks there, is a transmitter. As the signal changes, so is the frequency on the transmitter. As the train passes over the transmitter, it checks the train's speed against the signal, then the transmitter beams its frequency to the train's auxiliary warning system. If the train is too fast for a yellow signal, it will warn the motorman or stop the train.

An even more advanced system used in the train is the ACD or the Anti-Collision Device. A microprocessor is linked to Global Positioning System (GPS), picks up signal from the GPS satellites that are exclusively used for this purpose. The GPS submits the data to command and control unit (CCU) of processor to give information regarding the train's latitude, longitude, speed, angle etc. (CCU is the heart of ACD which process data and generates commands). There is a GPS receiver antenna, which is placed at the roof of the train. The radio trans-receiver which transmits the information and commands generated by the CCU and receives the information being sent by other ACD's, when the two systems are in the range of 5 km radius.



Anti collision device



The final module in the system is the Braking mechanism. To explain this, if a train is in the 5 km radius, the CCU takes the decision of applying either the normal brake or the emergency brake on the train as situation required. The physics involved states that the ‘The electro pneumatics backing is applied for through suitable solenoids interface installed for this purpose’.

I’m glad to state that our microcontroller 8051 is used to avoid railway accidents.

The principle is applied for track switching. Considering a situation wherein an express train and a local train are traveling in opposite directions on the same track; the express train is allowed to travel on the same track and the local train has to switch on to the other track. Two sensors are placed at the either side of the

junction where the track switches. If there’s a train approaching from the other side, then another sensor placed along that direction gets activated, and will send an interrupt to the controller. The interrupt service routine switches the track. Indicator lights have been provided to avoid collisions. Here, the switching operation is performed, using a stepper motor. Assuming that within a certain delay, the train has passed the track is switched back to its original position, allowing the first train to pass without any interruption. This concept of track switching can be applied at 1km distance from the stations.

The reason for writing about the ‘Electronics In Mumbai Railway System’ is that, the next time when you travel in a train you should feel that “WE MAKE IT MOVE SAFE”

By Johnson Joy (T.E)

# http

The **Hypertext Transfer Protocol** also known as **HTTP**, is a networking protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web (WWW).

HTTP functions as a request-response protocol in the client-server architecture. In HTTP, a web browser, for example, acts as a *client*, while an application running on a computer hosting a web site functions as a *server*. The client submits an HTTP *request* message to the server. The server, which stores content, or provides *resources*, such as HTML files and images, or generates such content on the fly, or performs other functions on behalf of the client, returns a response message to the client. A response contains completion status information about the request and may contain any content requested by the client in its message body.

The HTTP protocol is designed to permit intermediate network elements to improve or enable communications between clients and servers.



Mumbai suburban local train



# WONDERS

## of Telecommunication

### WORLD'S BIGGEST SATELLITE DISH

The **Arecibo Observatory** is a radio telescope located Puerto Rico (USA). It is operated by 'Cornell University' and 'National Science Foundation'. The observatory works as the **National Astronomy and Ionosphere Center**. The center was listed on the U.S. National Register of Historic Places in 2008.

The observatory's 305 m radio telescope is the largest telescope ever constructed. It carries out three jobs: radio astronomy, aeronomy and radar astronomy observations of solar system objects. Usage of the telescope was gained by submitting proposals to the observatory.

The Arecibo telescope is distinguished by its enormous size: the main collecting dish is 305 m in diameter. According to the blueprint published in the observatory's guidebook, the dish is actually 848.7 feet across; therefore, the oft-published 1,000-foot dimension is apparently along the spherical curve of the dish. The dish is the largest curved focusing dish on Earth, giving Arecibo the largest electromagnetic-wave-gathering capacity. The Arecibo telescope's dish surface is made of 38,778 perforated aluminum panels, each measuring about 1 m by 2 m, supported by a mesh of steel cables.



The telescope has three radar transmitters, with effective isotropic radiated powers of 20TW at 2380 MHz, 2.5TW at 430 MHz, and 300MW at 47 MHz

The telescope is a spherical reflector. This form is due to the method used to aim the telescope: the telescope's dish is fixed in place, and the receiver is repositioned to intercept signals reflected

from different directions by the spherical dish surface. A parabolic mirror would induce a varying astigmatism when the receiver is in different positions



off the focal point, but the error of a spherical mirror is the same in every direction. The receiver is located on a 900-ton platform which is suspended 150 m in the air above the dish by 18 cables running from three reinforced concrete towers, one of which is 110 m (365 ft) high and the other two of which are 80 m high. The platform has a 93-meter-long rotating bow-shaped track called the azimuth arm on which receiving antennas, secondary and tertiary reflectors are mounted. This allows the telescope to observe any region of the sky within a forty-degree cone of visibility about the local zenith (between -1 and 38 degrees of declination). Puerto Rico's location near the equator allows Arecibo to view all of the planets in the solar system, though the round trip flight time to objects beyond Saturn is longer than the time the telescope can track it, preventing radar observations of more distant objects.

By Jigar S Shah (TE)

#### Research and discoveries

Many significant scientific discoveries have been made using the Arecibo telescope.

- On 7 April 1964, Gordon Pettengill determined that the rotation rate of Mercury was not 88 days, as previously thought, but only 59 days.
- In 1968, the discovery of the periodicity of the Crab Pulsar provided the first solid evidence that neutron stars exist in the Universe.
- In 1974 Hulse and Taylor discovered the first binary pulsar.
- In August 1989, the observatory directly imaged an asteroid for the first time in history: Castalia.
- In 1994, John Harmon used the Arecibo radio telescope to map the distribution of ice in the poles of Mercury.

7 | The first known cell phone virus, Cabir.A, appeared in 2004.





A Subscriber Identity Module, commonly known as SIM card, is a card which securely stores the service-subscriber key (IMSI) used to identify a subscriber on mobile telephony devices (such as mobile phones and computers). The SIM card allows users to change phones by simply removing the SIM card from one mobile phone and inserting it into another mobile phone or broadband telephony device.

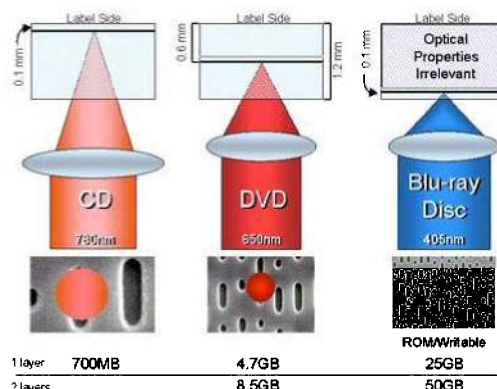
A SIM card contains its unique serial number, internationally unique number of the mobile user (IMSI), security authentication and ciphering information, temporary information related to the local network, a list of the services the user has access to and two passwords.

The first SIM card was made in 1991, with Munich smart card maker Giesecke & Devrient selling the first 300 SIM cards to Finnish wireless network operator Radiolinja.

# BLUE RAY TECHNOLOGY

Blue-ray, also known as Blue-ray Disc (BD), is the name of a next-generation optical disc format jointly developed by the Blue-ray Disc Association (BDA), a group of the world's leading consumer electronics, personal computer and media manufacturers (including Apple, Dell, Hitachi, HP, JVC, LG, Mitsubishi, Panasonic, Pioneer, Philips, Samsung, Sharp, Sony, TDK and Thomson). The format was developed to enable recording, rewriting and playback of high-definition video (HD), as well as storing large amounts of data. The format offers more than five times the storage capacity of traditional DVDs and can hold up to 25GB on a single-layer disc and 50GB on a dual-layer disc. This extra capacity, combined with the use of advanced video and audio codecs, will offer consumers an unprecedented HD experience.

While current optical disc technologies such as DVD, DVD±R, DVD±RW, and DVD-RAM rely on a red laser to read and write data, the new format uses a blue-violet laser instead, hence, the name Blue-ray. Despite the different type of lasers used, the Blue-ray products can easily be made backwards compatible with CDs and DVDs, through the use of a BD/DVD/CD compatible optical pickup unit. The benefit of using a blue-violet laser (405nm) is, that it has a shorter wavelength than a red laser (650nm), which makes it possible to focus the laser spot, with even greater precision. This allows data to be packed more tightly and stored in less space, so it's possible to fit more data on the disc, even though, it's the same size as a CD/DVD. This together with the change of numerical aperture to 0.85 is what enables Blue-ray Discs to hold 25GB/50GB.



Blue-ray is currently supported by more than 180 of the world's leading consumer electronics, personal computer, recording media, video game and music companies. The format also has broad support from the major movie studios as a successor to today's DVD format. In fact, seven of the eight major movie studios (Disney, Fox, Warner, Paramount, Sony, Lions gate and MGM) are supporting the Blue-ray format and five of them (Disney, Fox, Sony, Lions gate and MGM) are releasing their movies exclusively in the Blue-ray format. Many studios have also announced that they will begin releasing new feature films on Blue-ray Disc day-and-date with DVD, as well as, a continuous slate of titles every month. For more information about Blue-ray movies, check out our Blue-ray movies section, which offers information about the new and upcoming Blue-ray releases, as well as, what movies are currently available in the Blue-ray format.

By Tejas Vispute (BE)



# 3G TECHNOLOGIES

Wireless phone standards have a life of their own, because they are spoken in terms of generations. There is great-granddad, a cellular, grandma and grandpa analog cellular, mom and dad digital cellular, 3G wireless is just starting to make a place for itself in the world and a new born baby is on the way, 4G.

Before starting with '3G' let's discuss the aim and the difficulties in fulfilling them. The 3G technology promises that it will keep people connected at all the time in all the places. "Researches, engineers and marketers are faced with the challenge of accurately predicting how much technology consumers will actually be willing to pay for it. As technology becomes more advanced, and as bandwidth increases, system becomes increasingly vulnerable to attack by hackers, unless preventive measures are taken to protect against such activity.

Comparing with the existing technology i.e. GSM (the current most popular cellular phone standards) could deliver not only voice, but also circuit-switched data at download rates up to 14.4kbps. To support mobile multimedia applications, the 3G had to deliver packet-switched data with better spectral efficiency, at far greater bandwidths. Major impetus is to provide greater overall capacity for voice and data users. The 3G wireless technologies represent a shift from voice-centric services to multimedia-oriented services like video, voice data and fax.



The 3G system consists of 2 main standards CDMA2000 and W-CDMA. CDMA2000 and W-CDMA, both use a coding scheme that separates each subscriber from other subscribers. To make it understand better, CDMA2000 is a successor to CDMA, and W-CDMA is successor to GSM. The technical fact that separates both is, W-CDMA relies on mobile station measurements between two base stations, rather than using GPS as CDMA2000 does.

The facilities that 3G provides us is-

## 1. High Speed Downlink Packet Access(HSDPA)

HSDPA is a later addition to the 3G technologies to provide faster data speeds to subscribers. HSDPA provides better latency compared to older technologies. Latency is the time between the request was sent and time for the reply back. There are mobile phones which have the 3G support but not HSDPA.

## 2. Video Calling

With this service two people can transmit audio and video through mobile phone. This is one of the coolest stuff in 3G. The core technology used is video teleconference (VTC) system, which is digital compression of audio and video streams in real time. The hardware and software that performs compression is called codec (coder/decoder). Compression rates up to 1:500 can be achieved.

## 3G Applications

While more speed is always welcome, the truth is, you may or may not need the 3G, speeds for all of your current business applications.

Data usage: If your application is performing simpler functions with smaller amounts of data, 2/2.5G networks will be sufficient. But if you require large data or files transferred or accessed every time, you will definitely benefit from the faster speeds of the 3G networks.

i. Data 'light' applications:-

Applications that fall into this category require the download of data to the mobile device at the start of the day. Examples of applications with lighter data use can include:

- Postal and parcel delivery workers



These workers first download routes and other needed information onto the mobile, before entering the vehicle. Data transfer is limited just for updated navigation information via GPS (for example, traffic and updated maps), the capture of a bar code on a package and the capture of a signature to verify delivery.

- Field service technicians

Field service engineer first downloads daily work orders like, where to install or repair equipment and routes to the mobile device. Data transfer is limited for navigational information via GPS or sending customer records after visit to a customer, or scanning bar codes of any new parts installed, or to verify the customer signature after the job is completed.

ii. Data intensive applications:

For data intensive applications, the 3G networks offer speed, better performance and cost effective unlimited data plans. These applications can include:

- Video and other data intensive images that might be critical to the job, such as high resolution photos, detailed technical diagrams and technical manuals.
- Email that includes routine transfer of sizable attachments.
- The need to regularly send and receive large files, for example, PowerPoint presentations, Word documents and large PDF.

- The need for always-on GPS location-based applications that might be associated with the transmission of graphics intensive files, for example: maps to provide drivers with real time navigation information; real-time vehicle location information for vehicles; and geo stamping of images captured in the field for proof of condition and proof of location (for example, in delivery and field service operations).

- With 3G bandwidth:

Field service technicians can easily access reference materials to assist in equipment repairs, including large manuals as well as product schematics, in addition to capturing and transmitting photos that document condition. First responders in the police and fire department can easily view, capture and transmit photos and video footage.

- Vending machines in shopping mall:



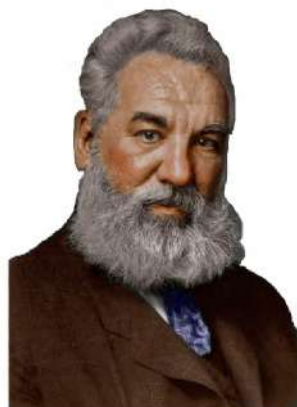
All the automatic vending machines within a confined area can, through a Bluetooth access system, be connected to a central vending machine administration unit, that in turn uses a 3G access system to call for maintenance or supplies.

Minor problems can be relayed to the Mall technician, directly through his Bluetooth communicator. Pricing changes can be sent from central administration and locally "broadcast" to all the Bluetooth vending machines.

By Dattaprasad, Premchand, Sumit, Amit and Johnson (TE)

# INVENTOR'S PROFILE

## ALEXANDER GRAHAM BELL



Alexander Graham Bell was a scientist, inventor, engineer and innovator who invented the first practical telephone. Alexander Bell was born in Edinburgh, Scotland on March 3, 1847. Bell's mother and wife were deaf, profoundly influencing Bell's life's work. His research on hearing and

speech led him to experiment with hearing devices. Bell was awarded the first U.S. patent for the telephone in 1876.

Many other inventions marked Bell's later life, including work in optical telecommunications, hydrofoils and aeronautics. In 1888, Alexander Graham Bell became one of the founding members of the National Geographic Society.

By 1874, Bell's initial work on the harmonic telegraph had entered a formative stage with progress it made both at his new Boston "laboratory".

In 1874, telegraph message traffic was rapidly expanding. Orton had contracted with inventors Thomas Edison and Elisha Gray to find a way to send multiple telegraph messages on each telegraph line to avoid the great cost of constructing new lines. When Bell mentioned to Gardiner Hubbard and Thomas Sanders that he was working on a method of sending multiple tones on a telegraph wire using a multi-reed device, the two wealthy patrons began to financially support Bell's experiments.

In March 1875, Bell and Pollok visited the famous scientist Joseph Henry, and asked Henry's advice on the electrical multi-reed apparatus that Bell hoped would transmit the human

voice by telegraph. Henry replied that Bell had "the germ of a great invention". When Bell said that he did not have the necessary knowledge, Henry replied, "Get it!" That declaration greatly encouraged Bell to keep trying, even though he did not have the equipment needed to continue his experiments, nor the ability to create a working model of his ideas. However, a chance meeting in 1874 between Bell and Thomas A. Watson, an experienced electrical designer and mechanic at the electrical machine shop of Charles Williams, changed all that.

Bell's patent 174,465, was issued to Bell on March 7, 1876, by the U.S. Patent Office.

On March 10, 1876, three days after his patent was issued, Bell succeeded in getting his telephone to work. Vibration of the diaphragm caused a needle to vibrate in the water, varying the electrical resistance in the circuit. When Bell spoke the famous sentence "Mr Watson—Come here—I want to see you" into the liquid transmitter, Watson, listening at the receiving end in an adjoining room, heard the words clearly.



Although Bell is, accused of stealing the telephone from Gray, Bell used Gray's water transmitter design only after Bell's patent was granted and only as a proof of concept scientific experiment to prove to his own satisfaction that intelligible "articulate speech" could be electrically transmitted. After March 1876, Bell focused on improving the electromagnetic telephone and never used Gray's liquid transmitter in public demonstrations or commercial use.

By Jigar shah (TE)

” | Alexander Graham Bell registered his patent for the telephone in 1876



# Timeline of telecommunication

**1793** Claude Chappe invents the first long-distance semaphore (visual or optical) telegraph line.

**1831** Joseph Henry invents the first electric telegraph.

**1835** Samuel Morse invents Morse code.

**1843** Samuel Morse invents the first long distance electric telegraph line. Alexander Bain patents the first fax machine.

**1876** Alexander Graham Bell patents the electric telephone.

**1877** Thomas Edison patents the phonograph - with a wax cylinder as recording medium. Eadweard Muybridge invents high speed photography - creating first moving pictures that captured motion.

**1889** Almon Strowger patents the direct dial telephone or automatic telephone exchange.

**1898** First telephone answering machines.

**1902** Guglielmo Marconi transmits radio signals from Cornwall to Newfoundland - the first radio signal across the Atlantic Ocean.

**1906** Lee DeForest invents the electronic amplifying tube or triode - this allowed all electronic signals to be amplified improving all electronic communications

**1914** First cross continental telephone call made.

**1916** First radios with tuners - different stations.

**1923** The television was invented by Vladimir Kosma Zworykin - first television camera.

**1925** John Logie Baird transmits the first experimental television signal.

**1938** First television broadcasts in the United States.

**1926** Warner Brothers Studios invented a way to record sound separately from the film on large disks and synchronized the sound and motion picture tracks upon playback - an improvement on Thomas Edison's work.

**1934** Joseph Begun invents the first tape recorder for broadcasting - first magnetic recording.

**1938** Television broadcasts able to be taped and edited - rather than only live.

**1939** Scheduled television broadcasts begin.

**1944** Computers like Harvard's Mark I put into public service - government owned - the age of Information Science begins.

**1948** Long playing record invented

**1951** Computers are first sold commercially.

**1958** Integrated Circuit invented - enabling the further miniaturization of electronic devices and computers.

**1969** ARPANET - the first Internet started.

**1976** Apple I home computer invented. First nationwide programming via satellite implemented by Ted Turner.

**1979** First cellular phone communication network started in Japan.

**1981** First laptop computers sold to public. Computer mouse becomes regular part of computer.

**1983** First cellular phone network started in the United States.

**1994** American government releases control of internet and WWW is born - making communication at light speed.

By Jigar Shah (TE)

# CLAY TRONICS

You all might be thinking what is the relation between clay and electronics? When we were small, we played with clay. We can mould clay into any possible shape, morph it; change its colour, etc. Similarly, we can do all these things in electronics too. But how? This is by the help of Claytron, popularly known as Catoms, programmable matter the basic block of Claytronics. It helps create 3-D model of any object and we can morph it easily by means of mere hands. We just have to give particular format or program, necessary for doing the same. It's just so simple!

Everyone, must have seen Star-Trek or Transformers-2. In Star-Trek the Holodeck or in Transformers-2 the Decepticons are all applications of Claytronics. Decepticon had the ability to infiltrate the military facility, as a stream of Catoms, to join together as a robot, once it is inside. The novel Star-Trek: Destiny trilogy featured an alien called Caeliar, whose body was not made up of normal organic matter, but of Catoms. These Catoms can combine together to form any part of machine or a Decepticon or even replica of human beings. We can easily morph Catoms into nearly any possible object, or even human beings to attend boring meetings, video conferencing, presentations, etc.

Claytronics is an emerging field of engineering. It deals with nanoscale robots also known as Claytron or Claytronic atoms or Catoms. This helps us in designing various big machines, which are just impossible to be created in 3-D model presently. But we can manufacture these easily by Claytronics in future. Presently, we are dealing with 2-D models in which any changes we want to make is tough or any slight change in dimension can cause a huge loss in any field. But we can change dimension, do any slightest change necessary by Catoms forming machine or skeletal model of dinosaurs or any extinct animal, etc. change color and they even communicate with each other. This has made the impossible become possible. Catoms can communicate with each other by infra red sensors, that can easily connect just like our remote with T.V. these Catoms move from one place to another with ease by electromagnets provided all over it. There are metal contact

rings that help bind 2 Catoms, or several millions of these, and easily transport and communicate the message from one Catom to another. Slight movement of Catoms can cause macroscopic movement or change.

Claytronics is produced under the mantra of "Scale up in numbers and down in size". But you might be thinking, who has developed this technology and research? They are Prof. Seth Goldstein and Prof. Todd C. Mowry at Carnegie Mellon University, who have sown the seeds of Claytronics, which is sprouting and its roots are getting deeper inside everyone's mind, helping them create something new, innovative and interesting. This seems as a dream world, a world of mere imagination. But yes! The one, who can imagine, creates history.

Nanotechnology- our best known friend till date is helping one and all, to give reality an entirely new dimension of thinking. But, using nanotechnology in various fields will soon fade away, as all its properties will be surpassed by Claytronics. Nanoscale robots can be formed by both nanotechnology and Claytronics. If slight change is required in modifying the current robots formed by nanotechnology, an entirely new robot will have to be manufactured, which is time consuming. At the same time, controlling millions of these nanoscale robots using nanotechnology is tedious. But Claytronics will provide a new wave for robotics. We can do any necessary change easily, and a robot made up of Catoms can be controlled in a much simpler way.



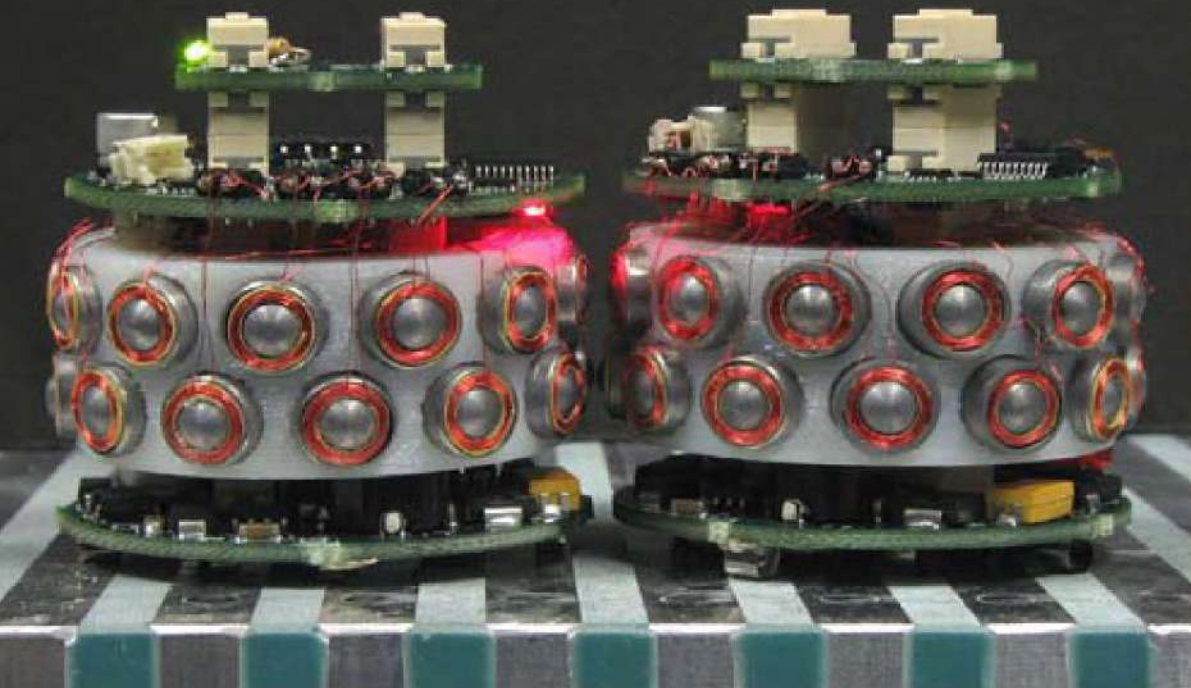


# USB

Universal Serial Bus (USB) is a set of connectivity specifications developed by Intel. USB allows high-speed, easy connection of peripherals to a PC. When plugged in, everything configures automatically. USB is the most successful interconnection standard in the history of personal computing and has migrated into consumer electronics and mobile products.

Providing an industry standard, USB was originally released in 1995 at 12 Mbps. Today, USB operates at 480 Mbps and is found in over six billion PC, consumer electronics (CE), and mobile devices with a run rate of 2 billion USB products being shipped into the growing market every year. In addition to high performance and ubiquity, USB enjoys strong consumer brand recognition and a reputation for ease-of-use.

Today, Hi-Speed USB 2.0, provides greater enhancement in performance-up to 40 times faster than USB 1.0, with a design data rate of up to 480 megabits per second (Mbps). In addition, USB On-The-Go (OTG), a supplement to the USB 2.0 specification, was created in 2002. USB OTG defines a dual-role device, which can act as either a host or peripheral, and can connect to a PC or other portable devices through the same connector.



Catoms will be ready to take challenging tasks like rescuing people from earthquakes or volcano struck place, or flooded areas, and will help the rescuers. Catoms are very small in size, but the power of their working is enormous. Catoms have very complicated IC structure, along with capacitors, resistors, inductors just like our keyboard. Current large proof-of-concept Catoms measure 4.4 centimeters in length as well as in diameters. The Catoms have LCDs and LEDs on their surface, that produce a faintly glowing image, so that a replica of a person made up of millions of tiny microbots would actually look like a real person.

Since, this is a new frontier of engineering, which requires much more changes and improvement in software and hardware to make it work effectively. So, it will be launched by 2017. An effective application of Claytronics is a veteran heart surgeon, whose hands aren't steady at the age of 60 to create a model of heart that would grow into a workable size. The

surgeon would, then, operate on the model created by Catoms and each movement of the scalpel would get transmitted to a robot inside the patient's heart, a robot that will perform life saving procedures with more delicate touch. We can easily turn a laptop into a cell phone, as Catoms can have antennas which will up Wi-Fi ,if it is working as a laptop. These Catoms forming laptop if transformed into a cell phone by our own hands, will start to pick up 3G signals. Development of this powerful form of information display represents partnership between School of Computer Sciences of Carnegie Mellon University and Intel Corporation at its Pittsburgh laboratory.

As a famous visionary Carl Sagan has said, "Imagination will often carry us to the worlds that never were. But, without them, we go nowhere". So let your imagination fly and take new shapes with Claytronics...

By Shweta Shettigar (TE)



# HOW TO MAKE PRINTED CIRCUIT BOARD AT HOME

Printed Circuit Boards form the basis of any electronic gadget or appliance. There are several methods used to make Printed Circuit Boards. However these methods are usually adopted by PCB Manufacturers for mass production. A simple layout given to any PCB Manufacturer will usually take 2-3 days to get the PCB ready and moreover, it is expensive.

This article thus elaborates on another method, which can be easily carried out at home and the quality of PCB thus produced, is similar to the industry-grade PCBs. Using this technique, one can easily make a Homebrewed PCB within 5-6 hrs and at a much lower cost. The method is called as 'Toner Transfer Method'.

## There are certain basic requirements for this process:

**Laser Printer** - (This Process ONLY works with Laser Printer) It is not necessary that you own one Laser Printer. You can easily find it at a Cyber Cafe.

**A4 Photo Paper** - These are easily available at any photo studio at Rs.10 (Max). The cheap ones would cost around Rs.3-5.

**An Ironing Tool (Iron)** - This is the regular iron used for ironing clothes at home.

**Etching Powder (Ferric Chloride Powder)** - Easily available in the market.

And a little extra stuff. The picture will clear everything you need to have.

## Toner Transfer Method

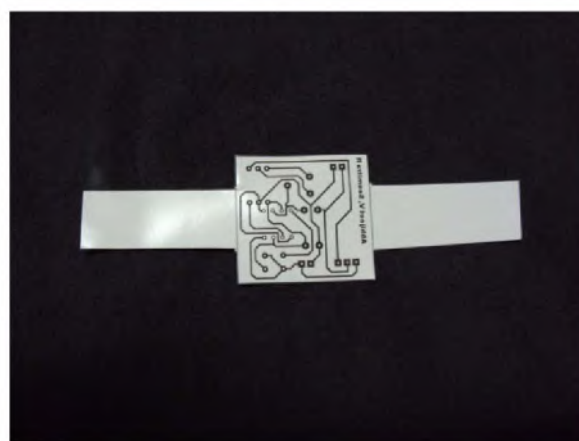
In the beginning, you would basically have a circuit or schematic, for which you want to make the PCB. The very first thing to do is to make the Layout of the given schematic. Layout is basically a graphical representation of the tracks, pads and drill holes etc. There are many programs available in the market for making Layouts. Examples are Target PCB Pool (Free with Autorouting Function), Express PCB etc.

After the Layout has been made, copy and paste it in a Word Document several times. The extra copies would be essential, if you fail in the process the first time.

Make sure that the Layout you have created is of perfect size i.e. the distance between IC pads should be perfect. Also the Layout should be of the component side and not of the Solder Side. There should not be any kind of resizing of the Layout. Otherwise it may happen that the IC's won't fit in their Pads of the PCB.

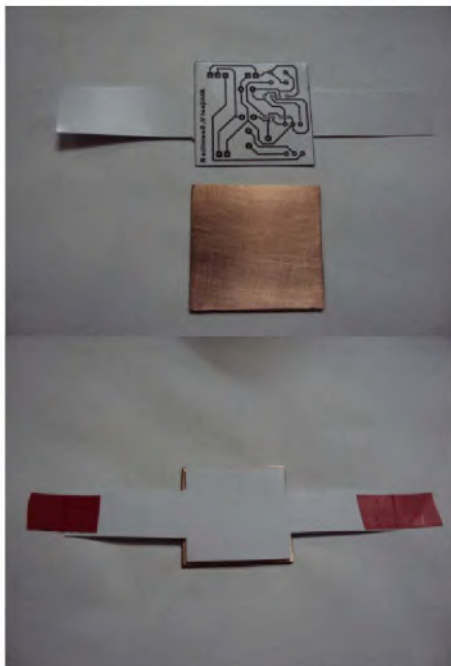
Next get the A4 Photo paper. It will have two sides, one side is shining and the other side is somewhat rough.

Print the Layout saved in the Word Document on the Shinning part of the Photo paper, using Laser Printer.



Cut one piece of the Layout from the Printed Document. As shown above.

The second step is to get the copper board. It is cheap and you can use one for many projects. Cut one Piece of copper board with size approximately equal to that of the Layout using a Hexablade. Clean the Copper Board with steel wool to remove any traces of copper oxide. After that use Thinner (Nail Paint Remover) to remove any traces of oil, grease etc as shown below.



After Cleaning the Copper Board, place it over a plane wooden surface with copper facing up. Put the printed piece of paper over (With the Layout facing copper side) and tape it like the picture. Try to keep the paper with just a little tension over

it.

Now turn the iron on. Set the iron to half of its maximum temperature setting. After the iron is heated up, apply iron over the paper and keep it pressed for at least 30 seconds, without moving it. Heat passes through the paper and the board will absorb good part of it and dissipate it. While this happens, the Printing Toner and a thin photo paper layer is transferred to the



PCB.

Try to use your body weight on the first "press" (that is, lean over the board holding the iron firmly against it and count slowly to 30). After this, "iron" the board by using the iron tip slowly, and carefully go over all the surface. Keep ironing the board for at least 10-15 minutes, just to make sure the borders also got "glued" to the board. Don't keep it pressed for more than 30 seconds, otherwise the copper will get bubbled up and you'll lose the board.

*Note:* be careful to don't let the paper spin or move over the board, if it occurs the Layout will be all messed up and you'll have to start over again. Just clean the board with thinner and get another piece of Layout from the Printed Document. That is WHY you have to tape the paper with a little tension over the board, just a little. On the first ironing the paper should stick to the board.



After ironing, wait until the board is completely cooled. You can remove the masking tape and let the whole thing cool.

After the board is cooled, *carefully* remove the paper off it. In case the paper is too "glued" to the board, you can put on boiling water and let the water help to remove, it is a very good option and the paper comes out easily.







The paper comes off the board without leaving almost NO toner on the sheet! Check Above.

The board is almost ready to be etched. Correct any tracks if needed. You can use a felt tip pen, the kind used to write in CD-Rs or plastic. You can also help to clean the pads holes which sometimes get messed with photo paper stuff.

Now put the board in a plastic container for etching.



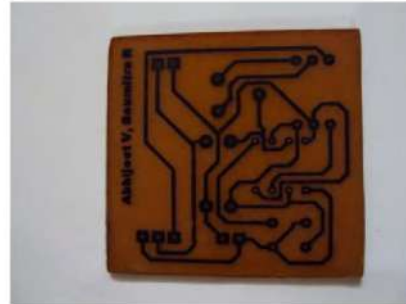
Boil 1 glass of water and pour it in the plastic container just enough to cover the board. Add around 1 to 2 teaspoon of Etching powder ( $\text{FeCl}_3$ ). Use a Plastic spoon for this purpose, because the Etching Powder can corrode the steel spoon.



Etching takes something between 15 to 30 minutes. If the container is gently shaken, it can accelerate the etching a great deal. Temperature also has an influence. If

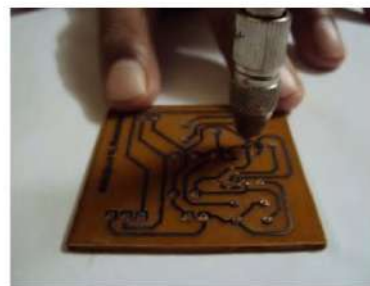
the solution gets cooled, add hot water with some extra etching powder. You can also stir the solution using the plastic spoon, and the board will etch a lot faster. In the Right Assembly, the

Steel mug contains Hot water. The steam of the Hot water keeps the solution inside the plastic container heated.



Your PCB should be completely etched by now. Take it off the solution and flush with water. The remaining solution can be poured into a

NON-METAL sink with tap open. Wash everything that got in contact with the solution. Dry it thoroughly, that includes the board, which should be like as shown above.



It is better do DRILL the board before removing the toner. Toner also helps to center the drilling while doing it. Drilling can be done, using a simple Hand Drill

as shown above.

To be able to use the board, you can remove the toner with Thinner (Nail Paint Remover) or even with the Steel wool.



And finally....***your own high quality homemade PCB.***

By: Abhijeet C. Vishwakarma (TE)

# Securing Wireless Sensor networks using Intrusion Prevention System

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## Abstract

Wireless networks are being rapidly adopted due to convenience and flexibility they provide. However, Wireless signals create a new set of security threats to enterprise networks such as Wireless Sensor Networks, Ad Hoc networks etc. A new and complete security solution in the form of a Wireless Intrusion Prevention System (WIPS) is required to prevent these new security threats. This paper serves as an introduction to various routing attacks in wireless sensor network, network programming and Detection system to prevent unauthorized intrusion, thus enabling secured transfer of data within the network.

**Keywords:** MAC spoofing, WSN, Ad-Hoc Network, Hash function.

## I. Introduction

Wireless networking has revolutionized the way people work and play. By removing physical constraints commonly associated with high-speed networking, individuals are able to use networks in ways never possible in the past. Students can be connected to the Internet from anywhere on campus. Family members can check email from anywhere in a house. Unfortunately, there have been many security issues related to wireless networking. Wireless users have many more opportunities in front of them, but these opportunities open up the user to a greater risk. The risk model of network security has been firmly well-established in the concept that the physical layer is at least somewhat secure. With wireless technology, there is no physical security. The radio waves that make wireless technology possible are also what make wireless technology so dangerous. By properly engineering and using wireless network, attackers can be kept at bay. This paper serves as an introduction to attacks on wireless networking and some of the high level security concerns.

## II. Basic Components and architecture of WIPS

### 2.1. Intrusion detection

A simple intrusion detection system can be a single computer, connected to a wireless signal processing device, and antennas placed throughout the facility. The system monitors the radio spectrum used by wireless LANs, and immediately alerts a systems administrator whenever an unauthorized access point is detected. Conventionally it is achieved by comparing the MAC address of the participating wireless devices.

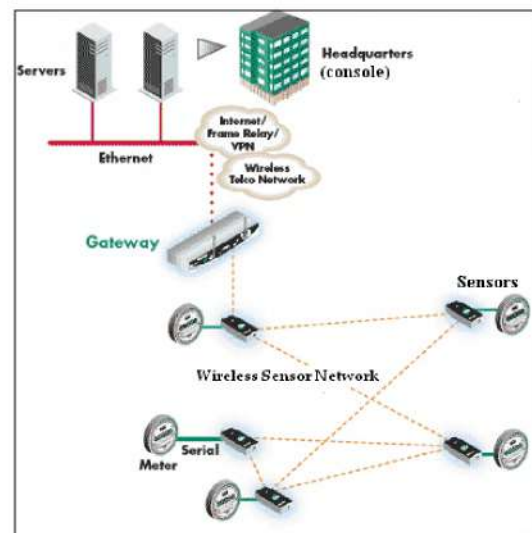


Fig 2.1 Basic architecture of WIPS

Unauthorized devices can spoof MAC address of an authorized network device as their own. The idea to prevent this is to compare the unique signatures exhibited by the signals emitted by each wireless device against the known signatures of pre-authorized, known wireless devices.



## 2.2. Implementation

WIPS configurations consist of three components:

- **Sensors** — These devices contain antennas and radios that scan the wireless spectrum for packets and are installed throughout areas to be protected.
- **Server** — The WIPS server centrally analyzes packets captured by sensors.
- **Console** — The console provides the primary user interface into the system for administration and reporting.

In a WIPS implementation, users first define the operating wireless policies in the WIPS. The WIPS sensors then analyze the traffic in the air and send this information to WIPS server. The WIPS server analyzes the information and validates it against the defined policies and classifies if it is a threat. The administrator of the WIPS is then notified of the threat, or, if a policy has been set accordingly, the WIPS takes automatic protection measures.

### III. Threat Models

There are many ways to attack a particular wireless network. To design a good security system, it is necessary to classify the entire security attacks into the following two basic subparts: Outsider attacks and Insider attacks.

#### 3.1 Outsider Attacks

In an outsider attack, the attacker node is not an authorized participant of the sensor network. Authentication and encryption techniques prevent such an attacker to gain any special access to the sensor network.

The intruder node can only be used to launch passive attacks, like the following:

- Passive eavesdropping: The attacker eavesdrops and records encrypted messages. The messages may then be analyzed in order to discover secret keys.
- Denial of service attacks: The intruder attempts to disrupt the network's operation by broadcasting high-energy signals. This can disrupt the communication between the legitimate nodes and lead to energy depletion in the nodes.
- Replay attacks: The attacker captures messages exchanged between legitimate nodes and replays them in order to change the aggregation results.

#### 3.2 Insider Attacks

The more dangerous attack from a security point of view is an insider attack, where an intruder by physically capturing a node and reading its memory, can obtain its key material and forge node messages. Having access to legitimate keys, the attacker can launch several kinds of attacks without easily being detected:

- False data injection: the intruder injects false aggregation results, which are significantly different from the true results determined by the measured values
- Selective reporting: the intruder halts the reports of events, by dropping legitimate packets that pass through a particular node.

### IV. Routing attacks against wireless networks

Following are the attacks that exploit specific characteristics of the routing protocols. These attacks disrupt the network topology and gain access to the routed information.

#### 4.1 The Sinkhole Attack

The sinkhole attack is a particularly severe attack that prevents the base station from obtaining complete and correct sensing data, thus forming a serious threat to higher-layer applications. As a result, the intruder manages to attract all traffic that is destined to the base station. By taking part in the routing process, more severe attacks can be launched like selective forwarding, modifying or even dropping the packets coming through.

#### 4.2 The Wormhole Attack

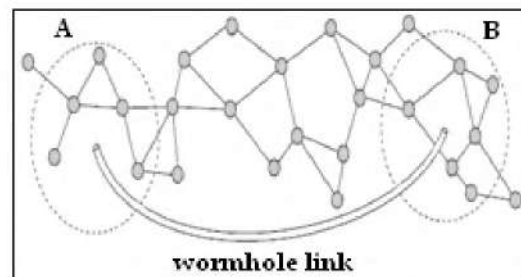


Fig. 4.2. Wormhole attack

The wormhole attack usually needs two malicious nodes. An intruder establishes a low-latency link, referred as a wormhole link, between two points of the network, as shown in the figure. Once the wormhole link is operational, the intruder eavesdrops messages at one end and tunnels them to the other end, where the packets are retransmitted.

The above figure shows an example of a Wormhole attack. Here, the nodes within region *A* think they are neighbours with the nodes within region *B* and vice versa. If the attacker carefully chooses the place of the wormhole's end-points then he can use it to completely disrupt routing and attract a significant amount of traffic. So, if one end of the wormhole is close to the base station then nodes situated multiple hops away could be convinced that they are only one or two hops away. As a result, these nodes will choose to use the high-quality link for their transmission enabling other kind of attacks such as the sinkhole attack.

#### 4.3 The Sybil Attack

A Sybil attack is one in which an attacker uses a malicious device to create a large number of pseudonymous (disguised) entities, using them to influence large amount of traffic. The sensor nodes created by the intruder are called Sybil nodes. Sybil nodes can communicate directly or indirectly with legitimate nodes. In the latter case, legitimate nodes are able to communicate with the Sybil nodes through the malicious device, which claims to be able to reach the Sybil nodes. Moreover, the malicious device can fabricate a new identity for a Sybil node, or it can steal an identity from a legitimate node.

In this way, the intruder can create large number of different identities in the network or create different copies of the original legal nodes.

#### 4.4 The HELLO flood attack

Wireless Sensor Network protocols require nodes to broadcast HELLO packets for neighbour discovery purposes. In a HELLO flood attack, a malicious node can send, record or replay HELLO-messages with high transmission power. It creates illusion of being a neighbour to many nodes in the network and can confuse the network routing badly.

## V. Programming network for intrusion prevention

Network programming process:

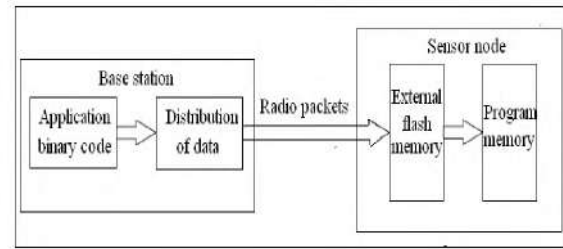


Fig. 5.1. Network programming process

1. The base station reads the new application binary code and breaks it into packets to distribute.
2. The base station sends the packets to the sensor nodes within communication range.
3. The nodes store the packets in the external flash memory after receiving them. They request retransmission of any missing packets.
4. The nodes forward the packets to any of their neighbors that have not received them, until all nodes get the new code.
5. After all packets have been received, the code lies in the external flash memory of the nodes. The nodes verify the program image and call the boot loader to transfer the program code to the program memory. Then the boot loader restarts the system and the new program begins execution.

Block cipher based hash functions are used to provide efficient authentication to allow secured transmission of streams of data over a network and hence ensures security of network nodes.

### 5.1 Hash function

A hash function is a mathematical function that assigns a small integer value/datum to a large block of data. The small integral value/datum is called hash. This hash acts as an index to that particular large block of data.

### 5.2 Hash tree

A hash tree is a tree of hash functions in which the leaves are hashes of data blocks in a file or set of files. Nodes further up in the tree are the hashes of their respective children.



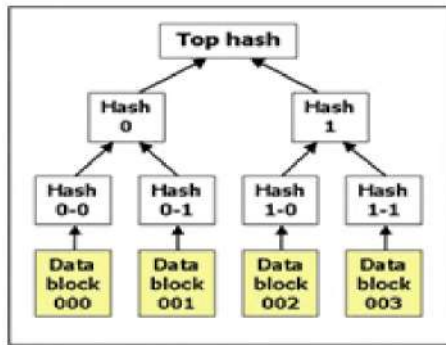


Fig.5.2.1 A binary hash tree.  
Source:www.freebase.com

For example, the above figure shows an example of a simple binary hash tree where, hash 0 is the result of hashing 0-0 and then hash 0-1. That is:

Hash 0 = hash( hash 0-0 + hash 0-1), where '+' denotes concatenation

The top of a hash tree is called top hash which is an authenticated primary hash function. When the top hash is available, the hash tree can be received from any node in the mesh network. Then, the received hash tree is checked against the trusted top hash. A hash function defines an authenticated pathway from the leaves of the tree to the top hash. If a hash tree does not match this architecture, it is a damaged or fake one. If the hash tree is damaged or fake, another hash tree from another source will be tried until the program find one that matches the top hash. A hash tree is generally binary, it can also include more than 2 child nodes under each node

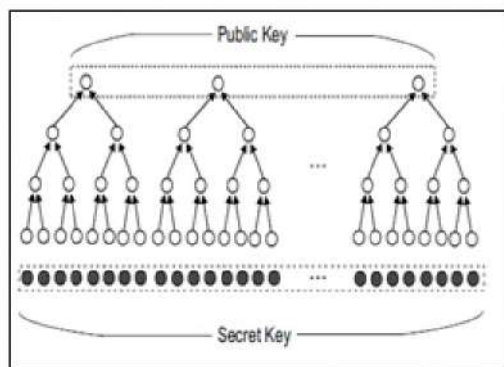


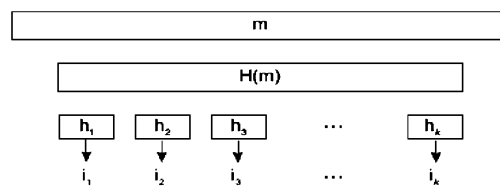
Fig.5.2.2 Public key construction

In order to provide an authentication, a signature scheme is undertaken to produce

secret and public key pair. The following steps are performed:

1. Generate  $t$  random 1 bit quantities for the secret key:  $SK = (s_1, \dots, s_t)$
2. Compute the public key  $PK = (u_1, \dots, u_t)$ , where,  $u_1 = \text{hash}(s_1) \dots u_t = \text{hash}(s_t)$
3. Separate these values into  $d$  groups each with  $t/d$  values.
4. Use these values as leaves to construct  $d$  hash trees.
5. The roots of the tree constitute the Public Key  $PK$  of this scheme.

The following steps are performed to authenticate a message 'm' using secret and public key pair:



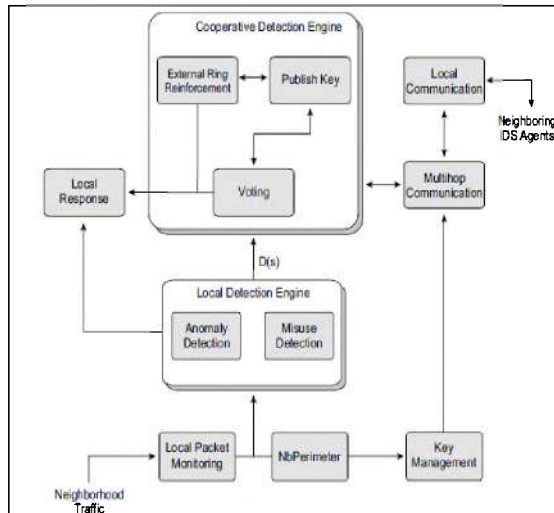
1. Use a cryptographic hash function  $H$  to convert the message to a fixed length output. Split the output into  $k$  substrings of length  $\log_2 t$  each.
2. Interpret each substrings integer in the range  $[1, \dots, t]$ . Use these integers to select a subset of  $k$  values out of the set of Secret Keys  $SK$ .
3. The signature of the message  $m$  is made up by the selected secret values along with their corresponding authentication paths.

In this way the messages/ packets to be transported with a wireless sensor network are secured to prevent intruder attacks. Thus, the data flow is encrypted between sensor and server as well as between server and console.

## VI. Intrusion Detection

After making the data secured, it is necessary to detect the presence of attacker and prevent him from further entering into the network. Following blocks describe the architectural block diagram of Intrusion Detection system:

1. Local Packet monitoring - Gathers communication activities (audit data,  $D(s)$ ) within node's radio range and provides it to the detection module.



6.1 Block diagram of Intrusion detection System

2. NbPerimeter- It Maintains information about the 1-hop and 2-hop neighbours of the nodes. This is used to alert the detection system about attackers who can be 1 or 2 hops away from the node.
3. Key management- It is used to generate and maintain the secret keys. It then links the node to other neighbouring nodes and collects the corresponding information like node IDs and keys from them.
4. Local Detection Engine- It collects the audit data and analyzes it according to some given rules. A set of rules are provided for each attack. When one or more rules are satisfied, a local alert is produced by the module. If the sensor identifies the source of attack, then the output of this block is sent to Local response. If source of attack could not be identified, then the output D(s) is sent to Cooperative Detection Engine.
5. Voting module- This module implements a specific algorithm to generate a suspect list and collects the corresponding list from rest of the alerted nodes.
6. Publish Key module- This module runs an algorithm where the node publishes next key of its hash chain and collects the keys from rest of the alerted nodes. It then authenticates the received votes and extracts the suspect list.
7. External Ring Reinforcement- This block is used to identify the attacker. The attacker node is the node that is neighbor to all the suspected nodes in the list produced by the voting

module. It then sends this information to Local Response.

8. Local Response- This module takes appropriate actions. The first action is to cut off the intruder as much as possible and isolate the suspected nodes. After that, proper operation of the network must be restored. This includes making changes in the routing paths, updating the secret keys or restoring the part of communication link affected.

The best part about this operation is that it is autonomous i.e. it does not include human intervention and is completed within a finite duration of time.

## VII. Conclusion

In this paper, we have given a brief overview of routing attacks in WSN and the architecture and encryption techniques used for Intrusion prevention which serves as an introduction to design algorithms for the same. In a wireless network that uses Intrusion Prevention System the data transfer is made to take place in a secured and authenticated manner and any intrusion in the network is detected easily by algorithms implemented by various functional blocks in the Intrusion Detection System. This secures the network by keeping the intruders out of bay.

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# Silicon Microphotonics : A New Technology for Next Generation

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*Abstract* – Silicon Micro photonics includes photonics and silicon microelectronics components, which is rapidly evolving in various optical systems. It employs at least two different materials with a large differential index of refraction to squeeze the light down to a small size. We have shown that by ultra-dense coupling of Photonic Crystal (PhC) nanocavity lasers, the differential quantum efficiencies can be improved dramatically with large spontaneous emission coupling factor  $\beta$ , without sacrificing the low lasing thresholds of single Ph C nanocavity lasers. This could not have been achieved by coupling lasers with small  $\beta$ . The status of silicon microphotonics and the recent advances that cause people to be optimistic to the realization of an active silicon light source has been also discussed. As soon as this objective gets realized, all the major building blocks for monolithic silicon microphotonics will become available. The final vision is to have Silicon microphotonics participating in every global application of the photonics industry. We indeed propose silicon as the unifying material where the next generation of photonics devices will be realized. In this paper, the behavior of nanocavity array laser and Raman Silicon laser is discussed. Finally, we studied the laser behavior theoretically and shown that the benefits obtained from the coupling of cavities are due to the strong cavity effects such as the enhanced spontaneous emission rate.

## 1. INTRODUCTION

The presence of a single material, silicon, which is widely available, can be purified to an unprecedented level and also easy to handle and to manufacture. It also offers very good Erma land mechanical properties which render the processing of devices based on it easy. The presence of a single dominating processing technology, CMOS, made it possible to integrate more and more devices, yielding a significant reduction in cost per bit. [1][2] Silicon is the electronic material *per excellence*. Integration and economy of scale are the two keys ingredients for the silicon technological success. Silicon has a band-gap of 1.12 eV, which is ideal for room temperature operation, and an oxide (SiO<sub>2</sub>), which allows the processing flexibility to place today more than 10<sup>8</sup> devices on a single chip. The continuous improvements of silicon technology have made possible to grow

routinely 200 mm single silicon crystals at low cost, and even larger crystals are now under development. The high integration levels reached by the silicon microelectronic industry have permitted high-speed device performances and unprecedented interconnection levels [1]. However, today the required interconnections between devices are sufficient to cause critical propagation delays, overheating and information latency. To overcome this *interconnection bottleneck* is together the main motivation and opportunity for silicon Microphotonics, where attempts to combine photonics and electronic components on a single Si chip or wafer are strongly pursued. In addition, photonics aims to combine the power of silicon microelectronics with the advantages of photonics. In this way it is expected that the continuous increase of chip performances predicted by Moore's law can be ultimately faced. An important example is related optical interconnects through optical fibers and a few laser sources are already used to connect different computers. It is predicted that optical interconnects will be used to connect computer boards in coming five years, while the use of optical interconnects within the chip is being investigated and will possibly be realized in next 10–15 years. Optical interconnects are one of the main motivations to look for silicon photonics. [2]

## 2. SILICON NANOCRYSTALS

One of the way to increase the emission efficiency of silicon is to turn it into a low dimensional material and, hence, to exploit quantum confinement effects to increase the radioactive probability of carriers. This approach has been pioneered by the work on porous silicon (PS) which shows that when silicon is partially etched in an HF solution via an electrochemical attack. The surviving structure is formed by small nanocrystals or nanowires which show bright red luminescence at room temperature. Following

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observations have been seen due to high luminescence efficiency in PS.

- Quantum confinement leads to an enlargement of the band gap and to an increased recombination probability,
- The spatial confinement of the free carriers which prevents them reaching non radiative recombination centers and
- The reduction of the refractive index of the material which increases the extraction efficiency via refractive index matching.

This result has motivated many research efforts in order to exploit these properties in LEDs. The PS approach has however a draw-back in the high reactivity of the sponge like texture. No optical gain was reported in bulk PS. From PS, silicon nanocrystals (Si-nc) can be obtained by scrapping or ultrasonically dispersing PS. Then the surface chemistry can be adjusted and, in particular, oxide passivated. Evidence of amplification in these materials has been presented an alternative way is to produce silicon nanocrystals (Si-nc) in a silica matrix to exploit the quality and stability of the SiO<sub>2</sub>/Si interface and the improved emission properties of low dimensional silicon.[4] Many different approaches have been proposed to form the silicon nanocrystals. The most widely used are based on the deposition of sub-stoichiometric silica films, with a large excess of silicon, followed by a high temperature annealing. The annealing causes a phase separation between the two constituent phases,

i.e. silicon and SiO<sub>2</sub> with the formation of small silicon nanocrystals. The size and density of the Si-nc can be controlled by the deposition and the annealing parameters. Recently, the anneal of amorphous SiO/SiO<sub>2</sub> super lattices has been proposed to control the size distribution.

### 3. THEORETICAL ANALYSIS OF A NANOCAVITY ARRAY LASER

The full benefits of the cavity array lasers are achievable only when the cavity effects are strong (i.e. large  $\beta$ ), as possible in Photonic Crystal (PhC) nanocavity arrays. The threshold pump power ( $L_{in,th}$ ) is defined as the input pump power at which the photon number inside the optical mode volume is equal to 1 and the differential quantum efficiency (DQE) is defined as the slope of the laser output-input power curve (LL-curve) above threshold. Starting with the rate equations in the steady-state and assuming that the carrier density and the gain above threshold are clamped to their values at the threshold, and that the non-radiative decay rate is much slower than radiative rate, one can derive an expression for  $L_{in,th}$  and DQE.

$$L_{in,th} = \frac{\hbar\omega_p V_a}{\eta} \left[ \frac{1}{\tau_p V_{mode}} - \beta \frac{N_{th}}{\tau_r} + \frac{N_{th}}{\tau_r} \right] \quad (1)$$

$$DQE = \eta \frac{\omega_l V_{mode}}{\omega_p V_a} \frac{1}{\tau_{mirror}} \frac{1}{\Gamma G(N_{th})}$$

In this expression, in contrary to the usual assumption of neglecting the  $\beta$  term, we have to consider  $\beta$  since it is significant in nano-cavities, studied here. In the expressions above,  $\omega_p$  is the pump laser frequency,  $\omega_l$  the laser emission frequency,  $\eta$  the absorption ratio of the pump in the active region,  $V_a$  is the pumped active volume,  $V_{mode}$  the optical mode volume,  $\tau_p = Q/\omega_l$  is the photon lifetime ( $Q$  is the quality factor of the optical mode),  $\tau_r$  the carrier radiative lifetime,  $N_{th}$  the carrier density at threshold,  $1/\tau_{mirror}$  the photon loss rate towards detection system (ideally  $\tau_{mirror} = \tau_p$ , if all emitted photons are collected),  $\Gamma$  the confinement factor, and  $G(N_{th})$  the gain at the threshold. From the rate equations, the gain at threshold can be given by[5][2]

$$\Gamma G(N_{th}) = \frac{1}{\tau_p} - \beta \frac{N_{th} V_{mode}}{\tau_r} \quad \dots (3)$$

When nano-crystal individual lasers are coupled in an array, both  $V_{mode}$  and  $V_a$  increase by a factor roughly equal to nano-crystal (relative to a single laser). In addition, the photon storage time  $\tau_p$  (and consequently  $\tau_{mirror}$ ) can increase (by nanocrystal times for ideal 3-D coupled nanocavity arrays). Hence, for non-negligible  $\beta$ ,  $\tau_{mirror} \Gamma G(N_{th})$  decreases in a coupled laser array which leads to an increase in DQE. In an ideal case ( $\beta \approx 1$ ), according to the above equation, coupled cavity lasers would have the same threshold as single cavity lasers since the 2<sup>nd</sup> and 3<sup>rd</sup> term in cancel each other and  $L_{in,th}$  becomes independent of nanocrystal, but with a much higher DQE. On the other hand, if  $\beta$  is negligible and  $V_{mode}$  is large (as it is in VCSELs),  $L_{in,th}$  of the laser array increases roughly nano-crystal times relative to an individual laser (as the 3<sup>rd</sup> term inequation (1) dominates), while DQE does not change (as the threshold gain is primarily determined by  $1/\tau_p$  in PhC nano-cavity arrays that are shown here are somewhere in between these two extreme cases: their  $\beta$  is nonnegligible and  $V_{mode}$  is small, implying that different terms in the expression for  $L_{in,th}$  and  $G(N_{th})$  become comparable. Therefore, DQE of the PhC cavity array lasers increases relative to that of a single PhC cavity laser, while the increase in the lasing threshold is slower than the increase in the number of cavities. It should also be pointed out that in PC nanocavity array lasers,  $V_a$  increases slower than  $V_{mode}$  with an increase in the number of cavities. Hence, the ratio  $V_{mode}/V_a$  is larger for nanocavity array laser than for a single PC cavity laser, leading to an additional increase in DQE, which we observe in our experiment below. This effect is a result of a more efficient pumping and the better overlap between the pumped area and the cavity mode. In a single PhC cavity laser, it is extremely difficult to pump only the central cavity region, and the pump also generates carriers inside

the mirrors, which do not couple to the lasing mode. On the other hand, in a coupled array laser one can pack larger number of lasers more efficiently by reducing the space used as mirrors, and the overlap between the pumped region and the cavity mode is better. [3]

#### 4. COUPLED PhC NANOCAVITY ARRAY LASER SPECTRUM

Single mode lasing is observed from coupled nanocavity array lasers (spectrum is shown in Fig. 1). The lasing wavelength matches that of the phase-coupled quadrupole mode at the  $\Gamma$ -point calculated by FDTD. The collection angle of the objective lens is wide enough to collect the emission from any other possible modes. However, we observe only a single mode in the spectrum, even at low powers.

A slight line width narrowing was observed above threshold, while the spectrum below the threshold was hard to measure due to the poor sensitivity of spectrum

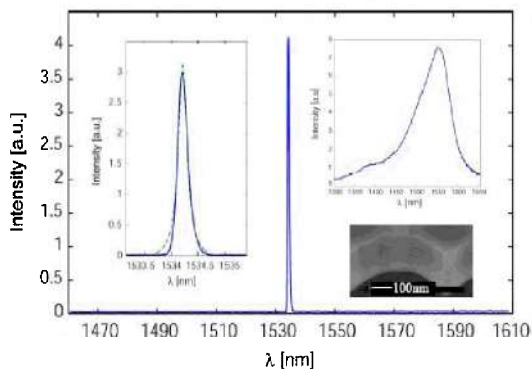


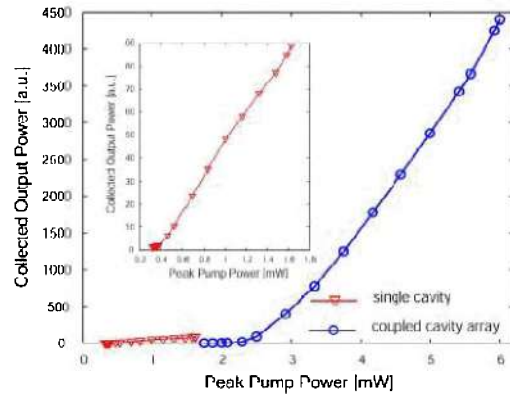
Fig.1 : Single mode lasing spectrum for coupled nanocavity array lasers

The profiles of the lasing modes both from a single cavity and a coupled cavity array laser taken with an infrared-camera. The setup used for probing a single cavity has a higher magnification and shows clearly the four-fold symmetry of the mode, which is expected for the quadrupole. At the center of the square, there is a strong field localization, corresponding to the location of the single defect. A strong radiation leak outside the square is also visible, which is due to the fact that the cavity is surrounded by only four PhC layers. The set-up used for probing coupled cavity array laser has a lower magnification, and therefore individual cavities are hard to resolve, but emission from most of the array is visible. The radiation profiles for the quadrupole mode are simulated by the FDTD method, by calculating the time averaged Poynting vector in the vertical direction. The radiation patterns corresponding to the plane positioned at  $\sim 1\mu\text{m}$  above the structure are very similar to the experimentally measured field patterns, as shown in Fig. 2. The match is especially good for a single cavity, where both localized and leaking field components are nicely reproduced in the simulation.

#### 5. LIGHT-OUT/LIGHT-IN (LL) CURVE

Coupled nanocavity array lasers with different  $r/a$  ratios have been tested and Fig. 3 shows the measured light-out/light-in (LL) curve of one of them (blue curve). We have observed single-mode lasing at 1534nm with a threshold peak pump power of  $\sim 2.4\text{mW}$ . Several single cavity structures with different  $r/a$  have also been tested. The LL-curve of one of them (with  $r/a \approx 0.4$ ) is also shown in Fig. 2 (red curve).

Fig 2:- LL curves of the single PC cavity and the coupled PC



cavity array laser.

The parameters of this cavity and therefore the emission wavelength at 1543nm are quite similar to the coupled cavity array laser, giving an additional indication that the quadruple mode and the phase-coupled quadruple band at the  $\Gamma$  point are the lasing modes for a single cavity laser and a couple nanocavity array lasers, respectively. The threshold peak pump power is around  $\sim 320\mu\text{W}$ , the threshold peak power and DQE of the LL-curve for several different coupled array and single nanocavity lasers. The measured lasing threshold of coupled photonic crystal nanocavity arrays is about 10 times larger than for a single cavity. According to the parameters that we use in the  $\beta$ -fit, the third term dominates the threshold expression, so we expect that the threshold pump power scales with the pumped active volume  $V_a$ . In the experiment, the size of the pump beam size for coupled cavity laser is almost 10 times larger than for a single cavity laser, which explains the observed increase in threshold. [2] On the other hand, the measured 20-fold increase in DQE of the cavity array is larger than the increase in threshold, implying that a higher output power can be extracted per nanocavity in a coupled cavity array laser in comparison to a single nanocavity laser. In fact, the maximum power achieved from the proposed coupled cavity array laser with only  $\sim 10$  nano-cavities ( $>12\mu\text{W}$ ) is about 100 times larger than a single cavity laser. The optical signal is converted into an electrical signal by using silicon based photo detectors. Detectors for silicon photonics are based on three different approaches silicon photo receivers for  $\lambda$



< 1.1  $\mu\text{m}$ , hybrid systems (mostly III–V on Si) and hetero-structure based systems. High speed (up to 8 Gb/s) monolithically integrated silicon photo receivers.

## 5. SILICON BASED WAVEGUIDES

The first essential component in silicon microphotonics is the medium through which light propagates: the waveguide. This has to be silicon compatible and should withstand normal microelectronics processing. Critical parameters are the refractive index of the core material, its electro-optical effects, the optical losses and the transparency region. To realize low loss optical waveguides, various approaches have been followed. low dielectric mismatch structures (e.g. doped silica, silicon nitride or silicon oxynitride on oxide, or differently doped silicon) or high dielectric mismatch structures (e.g. silicon on oxide). Low loss silica waveguides are characterized by large dimensions (Refer Figure 4), typically 50  $\mu\text{m}$  of thickness. Silica waveguides have a large mode spatial extent and, thus, are interesting for coupling with optical fibers but not for integration into/within electronic circuits because of a significant difference in sizes. The large waveguide size also prevents the integration of a large number of optical components in a single chip. Similar problems exist for silicon on silicon waveguides where the index difference is obtained by varying the doping density [19]. Silicon on silicon waveguides are very effective for realizing free-carrier injection active devices (e.g. modulators) as well as fast thermo-optic switches thanks to the high thermal conductivity of silicon. A major problem with these waveguides is the large free-carrier absorption which causes optical losses of some  $\text{dB cm}^{-1}$  for single-mode waveguides at 1.55  $\mu\text{m}$ . Silicon nitride based waveguides and silicon oxynitride waveguides show losses at 633 nm lower than 0.5  $\text{dB/cm}$  and bending radii of less than 200  $\mu\text{m}$ . The nitride based waveguides are extremely flexible with respect to the wavelength of the signal light: both visible and IR. At the other extreme, silicon on insulator (SOI) or polysilicon based waveguides allow for a large refractive index mismatch and, hence, for small size waveguides in the sub-micrometer range.

This allows a large number of optical components to be integrated within a small area. [3] Optical losses as low as 0.1  $\text{dB/cm}$  at 1.55  $\mu\text{m}$  have been reported for channel waveguides in SOI (optical mode cross-section  $0.2 \times 4 \mu\text{m}^2$ ). For on-chip transmission, SOI waveguides have coupling problems with silica optical fiber due to both the large size difference and the different optical impedance of the two systems. Various techniques have been proposed to solve these problems, among which are adiabatic tapers, V-grooves and grating couplers Large single-mode stripe loaded

waveguides on SOI can be achieved provided that the stripe and the slab are both made of silicon. This SOI system provides low loss waveguides ( $<0.2 \text{ dB/cm}$ ) with single-mode operation with large rib structures (optical mode cross-section  $4.5 \times 4 \mu\text{m}^2$ ) and low birefringence ( $<10^{-3}$ ). Appropriate geometry with the use of an asymmetric waveguide allows bend radii as short as 0.1 mm. A number of photonic components in SOI have been demonstrated and commercialized e.g. directional couplers, dense WDM arrayed waveguide grating, Mach–Zehnder filters, and star couplers.

## 6. RAMAN SILICON LASER

To create a laser, optical feedback is needed. Intel researchers coated the ends of the p-i-n diode waveguide with multilayer films to form an optical

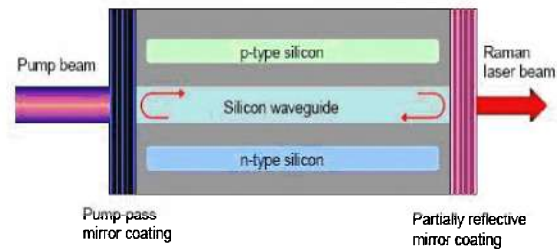


Fig 4 :-Schematic diagram showing a silicon laser using a PIN Diode silicon wave guide

The multilayer coating is designed to have high reflection (low cavity loss) at the Stokes Wavelength but low reflection at the pump wavelength for the input facet. This ensures that pump beam is efficiently coupled into the cavity. After applying a reverse bias voltage to the p-i-n diode waveguide and coupling a CW pump beam into the silicon waveguide cavity, Intel researchers observed a steady beam of light with a different wavelength exiting the cavity. Figure 5 shows the measured laser output power as a function of the input pump power for a 4.8 cm long silicon waveguide cavity with an effective core area of  $\sim 1.7 \mu\text{m}^2$ .

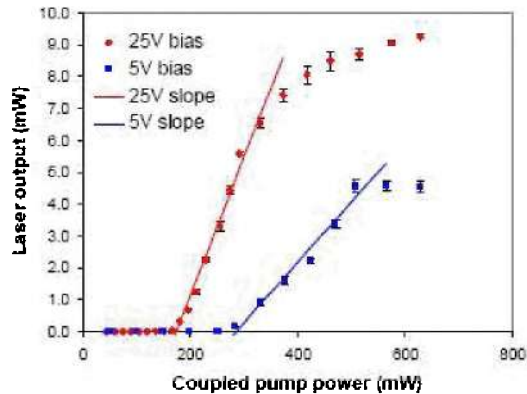


Fig 5:-. Laser output power as a function of input pump power for a Raman Silicon laser at different reverse bias voltages.

The threshold and the laser slope efficiency depend on the bias voltage because the net gain inside the cavity is dependent on the bias voltage. With a reverse bias voltage of 25 V, the threshold power was ~180 mW and the slope efficiency was >4%. The CW Raman silicon laser is single moded and the output spectrum line width is <80 MHz and centered at the Stokes wavelength. From the results, it seems that Intel's first CW Raman silicon laser was not optimized. For better performance, device design optimization is needed. To decrease the lasing threshold, one could use even smaller waveguide dimensions (in turn smaller effective core area) and/or cavity enhancement of the pump power. One could also optimize the p-i-n diode waveguide design to further reduce the effective carrier lifetime and possibly lower the reverse bias voltage. The lasing slope efficiency can be optimized with the optical cavity length and the cavity mirror designs. Waveguide based ring cavity or Bragg grating reflectors could also be used to replace the multilayer coating mirrors for possible monolithic integration. Raman silicon lasers could find potential applications in various areas. For example, the Raman silicon laser can be used as a wavelength converter, which is a critical component needed for optical packet switching. It also performs optical signal regeneration and reshaping (2R) necessary for future high-speed optical networking. Because the Stokes Raman scattering involves the conversion of a pump beam to a longer wavelength radiation, it could also be used to create new laser sources at wavelengths that cannot be attained by compact semiconductor lasers at room temperature. In particular, it would be possible to generate light with wavelengths greater than 2  $\mu\text{m}$  using multiple Stokes scattering scheme. These laser sources could open new applications in the area of sensing and medical spectroscopy.

## 7. CONCLUSION

We have shown that by ultra-dense coupling of photonic crystal nanocavity lasers with large spontaneous emission coupling factor  $\beta$ , the

differential quantum efficiencies can be improved dramatically, without sacrificing the low lasing thresholds of single PhC nanocavity lasers. This could not have been achieved by coupling lasers with small  $\beta$ . Throughout this review, we have tried to describe the status of silicon microphotronics and the recent advances that cause people to be optimistic to the realization of an active silicon light source. If this objective is realized all the major building blocks for monolithic silicon microphotronics will be available. The final vision is to have Si microphotronics participating in every global application of the photonics industry: communications, computing, information displays, optical-and-infrared imaging, medicine, optical printing, optical command-and-control, optical sensing of physical. Chemical and biological inputs, optical signal processing, optical storage and optical control of microwave devices or system. We indeed propose silicon as the unifying material where the next generation of photonics devices will be realized.

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# STUDIES OF ROUTING ALGORITHM IN AD-HOC WIRELESS NETWORKS

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## Abstract

Mobile ad-hoc networks represent complex distributed systems that comprise wireless mobile nodes that can freely and dynamically self organize into arbitrary and temporary "Ad-Hoc" network topologies allowing people and devices to seamlessly inter network in areas with pre-existing communication infrastructure. The new technologies e.g. WLAN (802.11), Blue tooth and Hyperlan are helping ad-hoc networks to be deployed easily. To cope with the self-organizing, dynamic, volatile, peer-to-peer communication environment, most of the main functionalities of networking protocols need to be re-designed. The main aim of ad-hoc networks will be to provide one-hop transmission service for reliable.

To understand the ad-hoc networks, a simulation model for ad-hoc networks is developed. The performance of the DSR (Dynamic Source Routing) protocol is evaluated.

The results reveal that low mobility, high density networks results into excellent performance.

**Key-words:** Ad-hoc wireless networks, Routing Algorithm, Dynamic source Routing (DSR) Protocol etc.

## Introduction:

This chapter deals with the routing algorithm (i.e. Dynamic source routing protocol) used in Ad-hoc wireless networks. DSR (Dynamic Source Routing) protocol gives the concept of route discovery, route cache, route maintenance, route request and route reply.

An ad-hoc network is a collection of wireless mobile host forming a temporary network without the aid of any established infrastructure or centralized administration. In such an environment, it may be necessary for one mobile host to end the aid of other hosts in forwarding a packet to its destination, due to the limited range of each mobile host's wireless transmission. **Dynamic Source Routing (DSR)** is a routing technique in

end-to-end delivery. Once a user is located, routing and forwarding algorithms must be provided to route information through ad-hoc networks. The highly dynamic nature of ad-hoc networks results in frequent and unpredictable changes of network topologies. This results into complex routing procedures. This dissertation work presents the performance evaluation of routing algorithms for ad-hoc networks. There is variety of routing algorithms practiced for wired networks (e.g. Internet). The work studies first the present theories and practices for routing. Secondly the details of ad-hoc networks are studied. During the studies on ad-hoc networks, it was felt that the routing procedures had to be evaluated for such type of the network. A detailed study of various routing algorithms is presented.

which the sender of packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding "hop" by the address of the next node to which to transmit the packet on its way to the destination host. Source routing has been used in a number of contexts for routing in wired networks, using either statically defined or dynamically constructed source routes and has been used with statically configured routes in the Tucson Amateur Packet Radio (TAPR) work for routing in a wireless network. There are no periodic router advertisements in the protocol. When a host needs a route to another host, it dynamically determines one based on cached information and on the results of a **Route Discovery Protocol**.

**1 Dynamic Source Routing Protocol (DSR)**  
Dynamic Source Routing Protocol (DSR) offers a number of potential advantages over conventional routing protocols such as distance vector in ad-hoc network. First, unlike conventional routing protocols, DSR user no periodic advertisement messages, thereby reducing network bandwidth overhead, particularly during periods when little or no significant host movement is taking place.



Battery power is also conserved on the mobile hosts, both by not sending the advertisements and by not needing to receive them. Distance vector link state routing must continue to send advertisements even when nothing changes, so that other mobile hosts will continue to consider those routes or network links as valid. Wired networks are usually explicitly configured to have only one (or a small number) of routers connecting any

## **5. ANALYSIS & DEVELOPMENT OF SIMULATION MODEL**

This chapter gives the parameters, flow chart and algorithm required for simulation in analysis and development of that model.

### **5.1 The Simulation : -**

To evaluate the performance of our dynamic source routing protocol, we constructed a packet level simulator, which allowed us to observe and measure the protocol's performance under a variety of conditions. In addition to a number of parameter choices in the protocol, the simulator allowed us to vary certain environmental factors such as the number of mobile hosts, the pattern and speed of host movement, and the distribution of the hosts in space.

Each host is initially placed at a random position within the simulation area. As the simulation progresses, each hosts pauses at its current location for a period, which is called as Pause time (= 400msec), and then randomly chooses a new location to move to, the velocity between 3 and 10 meters per second at which to move there. Each host continues this behavior, alternately pausing and moving to a new location, for the duration of the simulation. Using this model, hosts appear to wander through the room with their restlessness determined by the pause time constant.

Whenever a host transmits a packet, some method must be used to determine which of the surrounding hosts will receive a copy of the packet. While our simulation's transmission model is admittedly simple, it still allows us to estimate the basic performance of the protocol. In the simulation, each host can be the originator of up to 3 conversations at a time, with the other participant in the conversation chosen randomly from among the other hosts. Actually, we would expect hosts to communicate mostly with a small common subnet of the available hosts (such as servers), which would reduce the number of route discoveries required. Each conversation for a

predetermined number of packets, the number being chosen from a geometric distribution with an average of 1000 packets. Again, in actual use, we would expect same (or all) of the conversations to be of longer durations than this, depending on the mix of network application programs in use. Short conversations, however, give a more conservative measure of the performance of the protocol. Since more route discoveries are required as each host more frequently changes which other hosts it is communicating with.

### **5.2 Simulation Parameters:-**

The basic Simulation Parameters where chosen to model ad-hoc networks are as follows: -

- Buffer Size = 50
- Transmission range of each node = 250 m
- Packet Generation Rate = 500 Packets / Se
- Waiting time calculation using binary exponential back off as in CSMA CD.
- Node processing delay = 2 m Se
- Assuming Propagation delay = 0
- Packet length = 512 bytes
- Channel Bandwidth = 2 M bits / Se
- Node Speed :-
  - i) 3 m/Se, ii) 5 m/Se, iii) 10 m/Se

<b><u>Nodes</u></b>	<b><u>Simulated Area</u></b> (Km <sup>2</sup> )	<b><u>Density</u></b> (No. of nodes/Km <sup>2</sup> )
25	500 × 500	100
50	750 × 750	88.89
75	866 × 866	100
100	1100 × 1100	82.64
125	1270 × 1270	77.50
150	1500 × 1500	66.67

The simulator also does not model possible one-way links between hosts. This choice is necessarily implied by our desire to implement the protocol on top of a data-link layer with link level acknowledgements. However, the protocol will still work in the absence of link layer acknowledgements.

A final minor limitation of our simulation is that our simulated environment is assumed to be devoid of obstacles to transmission or movement. Further, transmission failures are assumed to be uniformly distributed and independent, which does not take into account spatially, localized failures due to sources such as microwave ovens, in the case of radio, or windows and reflections, in the case of infrared.

### 5.3 Algorithm: -

#### Step 1. Start

**Step 2.** Accept parameters for generating simulation.

**Step 3.** For current time should be less than total simulation time.

**Step 4.** Check the current time.

**Step 5.** If current time equals to pause time.

Step 5.1. If current time equals to pause length.

Step 5.2. Update node parameters and update pause length and change corresponding simulation parameters.

**Step 6.** If current time equals to session starting time.

Step 6.1. Check for session starting time.

Step 6.2. For each session repeat Step 6.3

Step 6.3. Check if current time equals to session starting time. If not equals to then go for next step.

Step 6.4. If current time equals to session starting time, then get route from route cache.

Step 6.5. If route exists then generate session starting time else

Step 6.6. Put session in waiting session.

**Step 7.** If current time equals to session waiting time.

Step 7.1. Check if current time equals to session waiting time to update waiting session.

Step 7.2. For all waiting session, go to Step 7.3.

Step 7.3. Check if current time equals to session waiting time. If not, then repeat next time.

Step 7.4. Get route from route cache.

Step 7.5. If route exists, then generate session starting flag,

else go to Step 7.6.

Step 7.6. Generate route discovery flag.

**Step 8.** Check route discovery request.

Step 8.1. Check for route discovery request flag for all session.

Step 8.2. Repeat for all session.

Step 8.3. If route discovery flag is set. If not, then repeat next time.

Step 8.4. Update session waiting time and session end time.

Step 8.5. Generate route discovery packet.

**Step 9.** Check the packet generation.

Step 9.1. Generate packet with predetermined rate for ongoing session.

Step 9.2. For all session do Step 9.3.

Step 9.3. Check if session starting flag is set, then if route error occurs,

else go to next step. If exists, go to Step 9.4. If not, go to Step 9.6.

Step 9.4. Stop session and wait.

Step 9.5. Set route discovery flag.

Step 9.6. Generate packet at certain rate of 40 packets/se.

**Step 10.** Check buffer condition for current time.

Step 10.1. Check buffer content of all nodes.

Step 10.2. For all nodes do Step 10.3.

Step 10.3. If buffer content is greater than zero. If yes,

then follow Step 10.4. otherwise Step 10.5.

Step 10.4. Transmit packet at first buffer position after node processing time.

Step 10.5. Check packet type. If yes, follow Step 10.6.

otherwise Step 10.14.

Step 10.6. Get all nodes in transmission range.

Step 10.7. For each adjacent node.

Step 10.8. If node is scanned earlier for that session,

then follow Step 10.7. otherwise Step 10.9.

Step 10.9. If next node equals to destination node then follow Step 10.10.

otherwise Step 10.11.

Step 10.10. Generate route reply.

Step 10.11. If next node has route to destination node,

then follow Step 10.10. otherwise Step 10.12.

Step 10.12. If next node buffer is full then follow Step 10.7.

otherwise Step 10.13.

Step 10.13. Update next node buffer.

Step 10.14. Get next node from packet route information.

Step 10.15. If next node is in range of zero to one, then follow Step 10.16.

otherwise Step 10.21.

Step 10.16. If next node's buffer is full then follow Step 10.17.

otherwise Step 10.18.  
 Step 10.17. Generate route error.  
 Step 10.18. If next node is destination node then follow Step 10.19.  
 otherwise Step 10.20.  
 Step 10.19. Accept packet.  
 Step 10.20. Update next node buffer.  
 Step 10.21. Generate route error.

## 6. Results and Discussions

### 6.1 Results: -

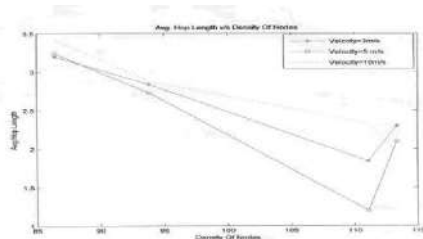
The simulation results are taken for the performance measures like,

- Hop-length
- Throughput
- End-to-End delay
- Route Discovery packets transmitted per session
- Numbers of packets transmitted

To evaluate the performance of ad-hoc networks for DSR (Dynamic Source Routing) Protocol, we have varied the node density for comparison purpose.

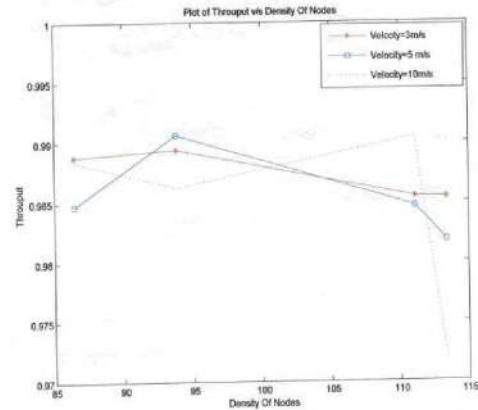
Further we have studied the performance of DSR (Dynamic Source Routing) protocol for ad-hoc networks with three different mobility parameters i.e. node velocities of 3m/se. , 5m/se. and 10m/se.

The assumption for simulation was that the network topology was stationary during the pause time.

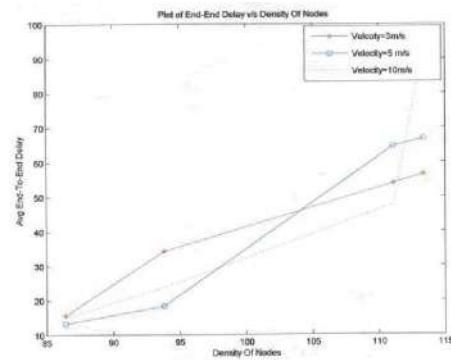


**Fig. (6.1)** shows the graph for average Hop-length required for packet transmission at node speeds of 3m/se, 5m/se and 10m/se. From this graph, we observe that high

mobility, low density topology results into higher average hop-length. The average hop-length decreases with increase in density. The performance of the network for moderate density is better than high mobility and low mobility.

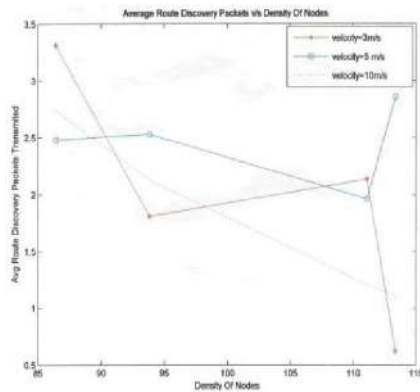


**Fig. (6.2)** shows the plot for Throughput of network for various mobility parameters i.e. for node velocities of 3m/se, 5m/se and 10m/se. The mobility does not have much impact on throughput up to a node density of 100 nodes/km<sup>2</sup>, but as the density rises, the throughput suddenly increases. But if we consider the average hop-length for higher density and higher mobility case, the increase in throughput is justified.



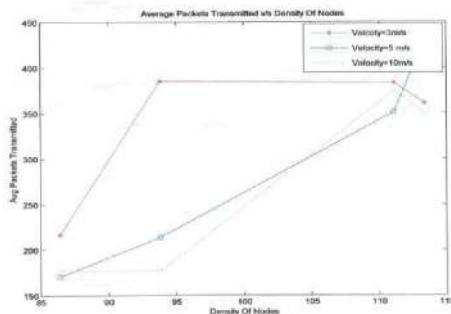
**Fig. (6.3)** shows the plot for the End-to-End delay. In this, we observe that the End-to-End delay for the moderate mobility is low at lower density. When the node density increases above 100 nodes/km<sup>2</sup>, the delay increases. This is justified by the fact that the mean hop-length for higher density reduces as shown in **Fig. (6.1)**.





**Fig. (6.4)** shows the plot for Route Discovery packets transmitted per session for various mobility cases. For low mobility and low density case, the numbers of route discovery attempts are more as compared to high mobility and high density case. This is justified due to the fact that in high mobility and high density case, the average hop-length and average End-to-End delay is less as compared to the low mobility and low density case.

**Fig. (6.5)** shows a plot of Number of packets transmitted for various mobility cases. From the graph, we observe that the low mobility case is far better than the high mobility case.



From this project work, we can conclude that the performance of DSR (Dynamic Source Routing) protocol for Ad-Hoc networks shows the variations for density of nodes and mobility.

Following are the conclusion of the dissertation:

- Hop-length for low mobility case is lowest.
- Throughput for low mobility case is highest.
- End-to-End delay is highest.
- Maximum delivery of packets.
- There is threshold value for the node density.

- Low mobility and high density case gives highest delivery of packets.

Hence we can conclude that DSR (Dynamic Source Routing) protocol in Ad-Hoc networks is best suited under the low mobility and high density scenario.

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# Overview on Impulse Radiating Antennas

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**Abstract-** Data generated at data processor unit needs to be transmitted through a long distance up to 100 mts and carry same information to save it at the other end which is a 2GB Flash memory. The same is recoverable in Reverse direction down to data processor unit.

## I. INTRODUCTION

Whenever any ship undergoes any accident or sinks or is involved in any kind of accident, EPIRB is thrown in water. The two metal contacts, which have a sensitive circuitry inside, get connected via the conducting medium between them which is the Saline Sea Water. On the completion of the circuit EPIRB sends signals while floating on water to the land via the Satellites. After the reception of signal from the EPIRB via Satellite, the rescue work starts at the Marine Stations situated at the coast.

Having EPIRB on the Ship and being used for a long time, the need arose where EPIRB could save all the necessary data on the ship. The necessary data here includes the information related to weather, the location of ship, the information associated with each person on the ship and even the last Conversations held on ship and much more. The idea was to get this entire data from EPIRB on finding it. We thus wanted to have a Flash Memory inside the EPIRB which would have all the necessary data. However the processing of this data was impossible at the EPIRB. So, the processing of the entire data was at the Data Processor Unit of the PC situated at the Control room which is inside the ship. While on the ship voyage EPIRB is kept at a distance of more than 100mts outside on the ship. So, the transfer of Data via a wire needed a Design where data could be captured and transferred to EPIRB Memory (Flash Memory) in an undistorted Format.

The EPIRB earlier was a Saving Device but now it will be a Saving cum Diagnosis Device.

## II. REVIEW AND SCOPE

Knowing that the computers input which digital data is in serial format on RS-232 port; the same cannot be transmitted at or above 20 mts. Hence, Rs-232 to RS-422 conversion (supports length up to 100mts) which will be again converted to Rs 232 at the capsule end carrying end memory. Since, the flash memory to be used in our case was decided to be a standard Flash drive, a serial (RS-232) to USB was essential and the same was accomplished using FT232RL.

The current SVDR for which the memory has failed-JOTRON (SVDR) the modeling can be shown .

The SVDR has a FTP server as interface as shown. Depending on the nature of command, it performs functions. It is important to note that the function is to be performed on the data or on the flash memory. The interface is between the input lines (4in number) –connected at one end to PC and to the other side to flash memory.

The PC is inside the control room of the ship and SVDR is mounted on the top of the ship. The two are connected using the RS232 wires. The distance is more than 100mts.

## JOTRON-ACTUAL FUNCTION

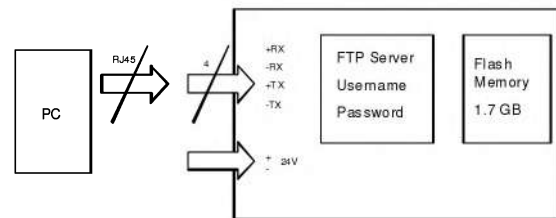


Fig. 1. Memory Interface in Recorder

## III. THEORY

Computers RS 232 (carrying 115.2kbps-serial bits per second, serial output) was device, which was level, converted to RS-422 and then 115.2kbps to RS -232 maintaining same baud rates. The Pen drive (2GBFlashMemory) with the user is attached to this USB port. The USB port is at the SVDR which is on the top of the ship and all the processing is at the PC in control room of the ship .

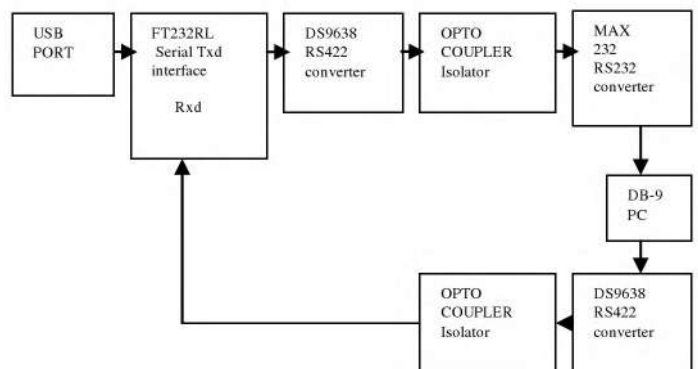


Fig. 2. Block Diagram

The PC inside the control room undergoes too many operations.

While complete information like weather, location and others, which also includes the last conversations on the ship, is stored at the Data Processor unit of computers.

The same information is stored at SVDR memory .SVDR memory that is being used in the system design is a simple 2GB Flash memory in the form of Pen drive. This will be inserted to the USB port at the SVDR.

The biggest challenge was to overcome the long distance of 100mts between USB Port and computer while the data remained unchanged and got carried till the USB Port from where it was sent to the 2GB Flash memory. The first hurdle was the replacement of standard RS232 wires .the need was simple-to get the data at a distance of 100mts in unchanged form.RS422 was the choice. Serial means that the information is sent bit by bit on a single transmission line, just like with RS232. Balanced differential is what makes RS422 different from RS232. On RS232 interfaces, the signals are send on lines which share a common zero. With RS422, each signal line consists of two wires, preferably twisted to reduce noise.

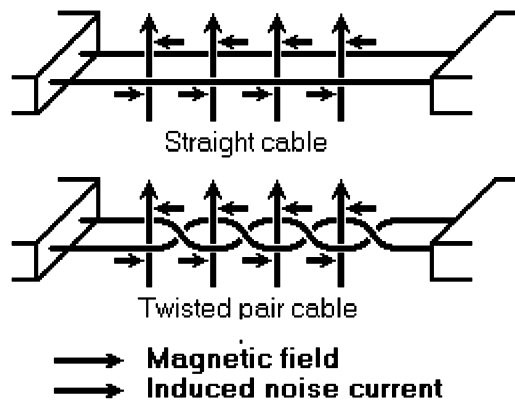


Fig. 3. Noise in straight and twisted pair cable

So to support the long distance with the desired baud rate RS422wire is used. However Data generated at both ends is the RS232 format so a converter IC is used at both ends (PC and USB port).

#### IV.SCOPE OF INVESTIGATION

Knowing the requirements of a recorder device on board marine vessels; the solution of the same has only filtered down to a safety device carrying all

information and the same recoverable on incident of accident; sabotage and private attack and any similar incidences. ince emergency position indicating Radio Beacon already existed on board, implementing Flash memory into the same was the ideal solution due to successful and known procedure of recovery of the EPIRB (Emergency Position Indicating Radio Beacon).

The selling of EPIRB can now be as a Saving cum Diagnosis device. The successful incorporation of memory will lead to favorable aspects for both the manufacturer as the selling cost can increase with the adding of such an important feature and for the buyer as the separate Data Recorders can be omitted now!

#### V.CONCLUSION

Starting as a product to be developed, an add on feature was implemented and it became a Saving cum Diagnosis device. Keeping the design small size, a reliable interface was developed, using minimal number of components. Power supply from USB Port was directly taken eliminating the need of a different power supply. High data rate transmission on USB over a distance of 100mts. This is not possible directly. The desired baud rate of 115200kbps is maintained. USB has 10000 cycles for each read and write instruction and it was done successfully using the Solid State Memory Interface.

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- 6] Datasheet of 6N137 optocoupler from internet.



## Abrupt Scene Change Detection

Priyadarshinee Adhikari, Neeta Gargote , Jyothi Digge, B.G. Hogade

**Abstract**— A number of automated shot-change detection methods for indexing a video sequence to facilitate browsing and retrieval have been proposed in recent years. This paper emphasizes on the simulation of video shot boundary detection using one of the methods of the color histogram wherein scaling of the histogram metrics is an added feature. The difference between the histograms of two consecutive frames is evaluated resulting in the metrics. Further scaling of the metrics is performed to avoid ambiguity and to enable the choice of apt threshold for any type of videos which involves minor error due to flashlight, camera motion, etc. Two sample videos are used here with resolution of 352 X 240 pixels using color histogram approach in the uncompressed media. An attempt is made for the retrieval of color video. The simulation is performed for the abrupt change in video which yields 90% recall and precision value.

**Keywords**—Abrupt change, color histogram, ground-truthing, precision, recall, scaling, threshold,

### I. INTRODUCTION

Video is the most effective media for capturing the world around us. Video has been the primary concern of the movie and television industry. Over the years that industry has developed detailed and complete procedures and techniques to index, store, edit, retrieve, sequence and present video material.

Conceptually the video retrieval system should act like a library system for the users. Video materials should be modeled and stored in a similar way for effective retrieval. Shot change detection is the procedure for identifying changes in the scene content of a video sequence so that alternate representation may be derived for the purposes of browsing and retrieval. e.g. key frames may be extracted from a distinct shot to represent it.[1]

The definition of a shot change is difficult to make. Pronounced object or camera motions may change the content of the view frame drastically.

Shot change may occur in a variety of ways: Cuts, where a frame from one shot is followed by a frame from a different shot, or gradual transitions such as cross dissolves, fade-ins, fade-outs and various graphical effects (wipes, pins) which may also be accorded varying semantic significance (e.g. a fade out to black, followed by a fade-in, is often used by film directors or editors to indicate the passage of time or change of location).

### II. VIDEO SEGMENTATION

The success of the segmentation approach depends largely on how well the video materials are divided into segments or shots.

A shot is defined as a part of the video that results from one continuous recording by a single camera. A scene is composed of a number of shots, while a television broadcast consists of a collection of scenes. The gap between two shots is called a shot boundary.

There are mainly four different types of common shot boundaries within shots:

- *A cut*: It is a hard boundary or clear cut which appears by a complete shot over a span of two serial frames. It is mainly used in live transmissions.
  - *A fade*: Two different kinds of fades are used: The fade-in and the fade-out. The fade-out emerges when the image fades to a black screen or a dot. The fade-in appears when the image is displayed from a black image. Both effects last a few frames.
  - *A dissolve*: It is a synchronous occurrence of a fade-in and a fade-out. The two effects are layered for a fixed period of time e.g. 0.5 seconds (12 frames). It is mainly used in live in-studio transmissions.
  - *A wipe*: This is a virtual line going across the screen clearing the old scene and displaying a new scene. It also occurs over more frames. It is commonly used in films such as *Star Wars* and TV shows.
- As these effects exist, shot boundary detection is a non-trivial task.

There have been a number of various approaches to handle different shot boundaries.[2]

#### A. Shot Boundary Detection Based on Color Diagrams

The first approach tested at Dublin was a shot detection based on color histograms. They computed frame-to-frame similarities based on colors which appeared within them, albeit of the relative positions of those colors in the frame. After computing the inter-frame similarities, a threshold can be used to indicate shot boundaries.

It needs dynamic threshold to work on other effects than simple shot boundaries.[4]

#### B. Edge detection

The next approach is Edge Detection which is based on detecting edges in two neighboring images and comparing these images. It should be possible to detect all kinds of shot boundaries by detecting the appearance of edges in a frame which are far away from the ones in the previous frame. The tested approach in Dublin used over 2 hours and 40 minutes of video files of different TV broadcasts . They spotted various reasons why their program missed a real cut between scenes:

- blurred images where the edges could not be defined clearly
- images with similar backgrounds or intensity edges to the next-following image
- dark or bright images where the edges are not defined in an accurate manner
- straight cuts from a blank screen to a dark screen
- a cut between different camera perspectives showing the same scene.

They also detected reasons for wrong identification of cuts:

- fast action scenes with fast moving and changing edges
- camera flashes
- close-up moving scenes

- objects moving in front of the camera lens without being present on the image before
- a zoom out or in, camera pan or any camera motion
- computer generated scenes
- interferences in the video from broadcasting or recording
- an object cut from an image

Main problems for missing cuts in all kinds of videos are cuts between dark scenes and the detection of so-called pseudo-cuts during the credits at the end of a film or programme. They also found out that the detection of false shots increases with the quality and size of the example videos. Since many false detection had occurred because of camera panning and/or zooming they implemented a technique to compensate these movements. This solution can counter problems caused by dissolves and fades and other changes using soft colour changes. The advantage – compared to colour based shot detection – is that this technique will not be fooled by colour changing effects like a flash. But on the other side, each frame has to be decoded, so it runs very slowly.[7]

### C. SHOT BOUNDARY DETECTION USING MACROBLOCKS

Besides, they investigated the *shot boundary detection using macroblocks*. Depending on the types of the macroblock the MPEG pictures have different attributes corresponding to the macroblock. Macroblock types can be divided into forward prediction, backward prediction or no prediction at all. The classification of different blocks happens while encoding the video file based on the motion estimation and efficiency of the encoding. If a frame contains backward predicted blocks

and suddenly does not have any, it could mean that the following frame has changed drastically which would point to a cut. This approach, however, becomes difficult to implement when there is a shot change, and the frame in the next shot contains similar blocks as the frame before.

Above are different techniques for segmentation and we are focusing on the method where in histogram of the color image we are scaling in order to get good result . [3] [6]

### III. I DETECTION PRINCIPLE

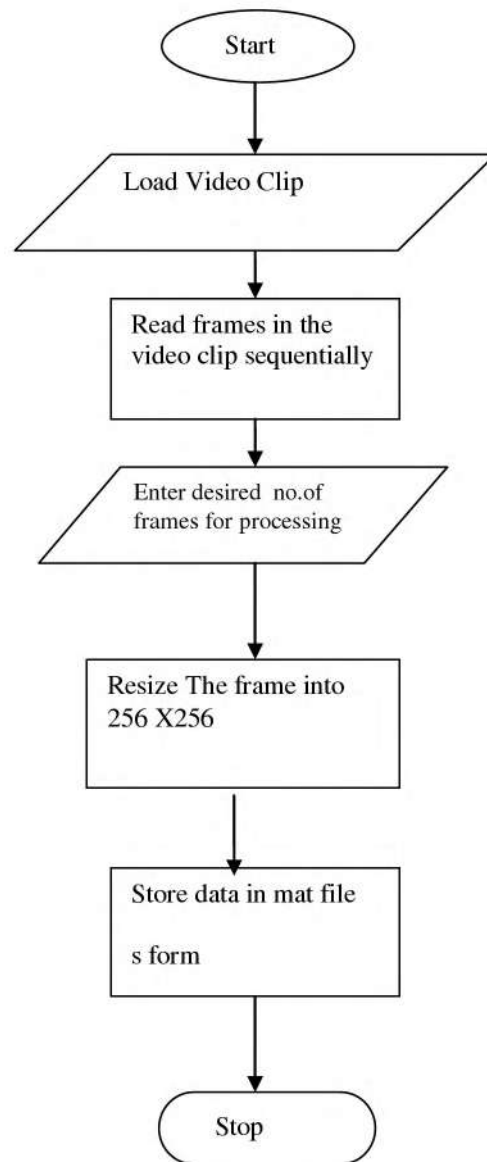


Fig 1 .flow chart for creating data base

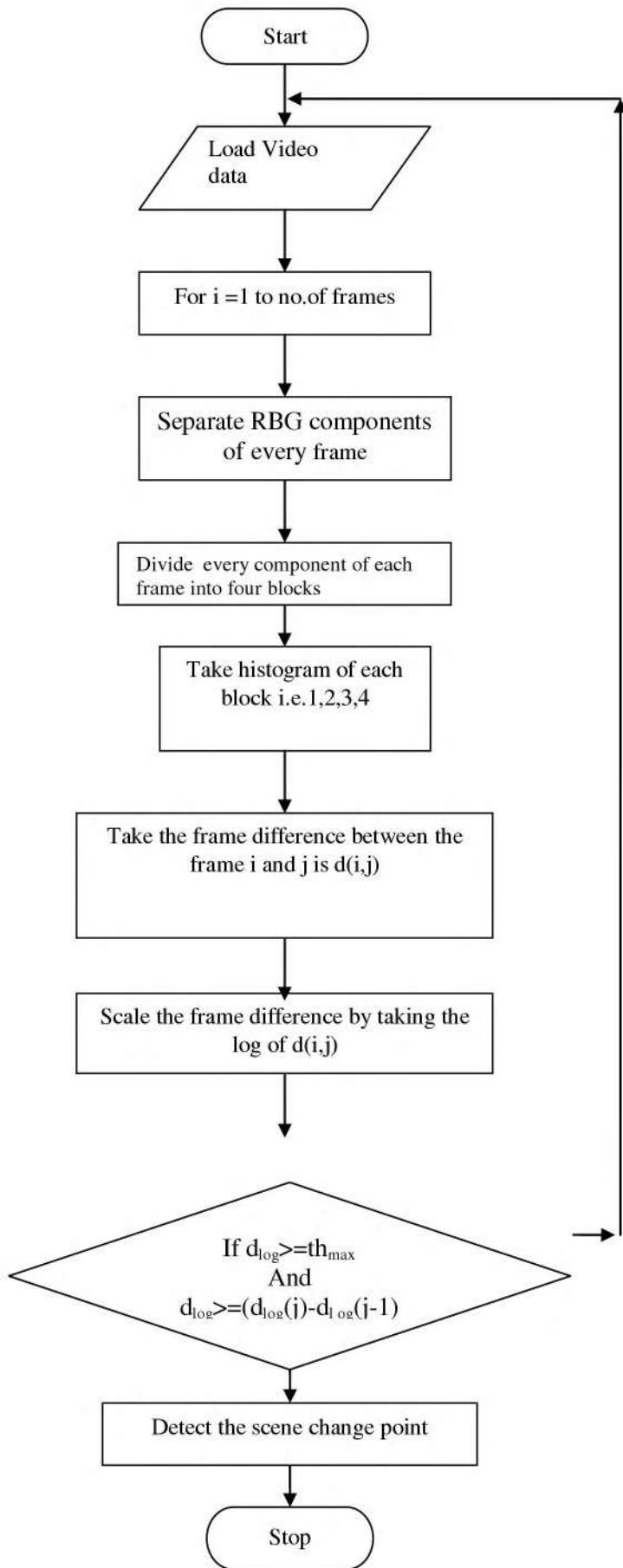


Fig.2 flow chart for abrupt change in video transition

#### IV. ALGORITHM EVALUATION

##### A. Metrics in Scene Change Detection

To extract robust frame difference from consecutive frames. We used verified  $\chi^2$  test which shows good performance comparing existing histogram based algorithm and to increase detection effect of color value subdivision work, color histogram comparison using the weight of brightness grade. Also to reduce the loss of spatial information and to solve the problem for two different frames to have similar histogram, we used local histogram comparison.

Color histogram comparison ( $d_{r,g,b}(f_i, f_j)$ ) is calculated by histogram comparison of each color space of adjacent two frame ( $f_i, f_j$ ) and it is defined as formula (1).

$$d_{r,g,b}(f_i, f_j) = \sum_{k=0}^{N-1} \left( |H_i^r(k) - H_j^r(k)| + |H_i^g(k) - H_j^g(k)| + |H_i^b(k) - H_j^b(k)| \right) \quad \text{--- 1}$$

$H_i^r(k), H_i^g(k), H_i^b(k)$  represent the number (N) of bean (k) of each color space (r,g,b) in i frame  $f_i$ . Using the weight for brightness grade change of each color space from the formula (1), we can redefine it as formula (2).

$$d_{w,r,g,b}(f_i, f_j) = \sum_{k=0}^{N-1} \left( |H_i^r(k) - H_j^r(k)| \times \alpha + |H_i^g(k) - H_j^g(k)| \times \beta + |H_i^b(k) - H_j^b(k)| \times \gamma \right) \quad \text{--- 2}$$

$\alpha, \beta, \gamma$  shows the constants to change the brightness grade according to NTSC standard and it is defined as  $\alpha = 0.299, \beta = 0.587, \gamma = 0.114$ .

Among static analysis method for emphasizing the difference of two frames.  $\chi^2$  test comparison ( $d_{\chi^2}(f_i, f_j)$ ) is efficient method to detect scene change by comparison change of the histogram and it is defined as formula(3).

$$d_{\chi^2}(f_i, f_j) = \begin{cases} \sum_{k=0}^{N-1} \frac{(H_i(k) - H_j(k))^2}{\max(H_i(k), H_j(k))} & \text{if } (H_{i,j} \neq 0) \\ 0 & \text{otherwise} \end{cases} \quad \text{--- 3}$$

The histogram based method may have a problem to detect two different with similar color distribution as same image as it doesn't use the spatial information. This problem can be solved by the method of comparing local histogram distribution as dividing frame area. Formula (4) shows to form the value of frame difference through color histogram



comparison of each area according to the area division and its accumulation.

$$d(f_i, f_j) = \sum_{bl=1}^m DP(f_i, f_j, bl)$$

$$DP(f_i, f_j, bl) = \sum_{k=1}^{N-1} |H_i(k, bl) - H_j(k, bl)| \quad \text{--- 4}$$

$H_i(k, bl)$  is the histogram distribution of  $k$  position of the frame ( $f_i$ ) block ( $bl$ ) and  $m$  is the number of total blocks.

Using the merits of subdivided local histogram comparison applying weight to each color space in above formula (2), value of difference expansion using statistical method of formula (3) and use of spatial information of the frame by local histogram as formula (4), in this paper, following formula (5) which is value of difference extraction formula, combining above formulas, will be used for robustness and reliance of value of difference extraction.

$$d(f_i, f_j) = \sum_{bl=1}^m d_x(f_i, f_j, bl)$$

$$d_x(f_i, f_j, bl) = \sum_{k=1}^{N-1} \left( \frac{(H_i^r(k) - H_j^r(k))^2}{\max(H_i^r(k), H_j^r(k))} \times \alpha \right. \\ \left. + \frac{(H_i^g(k) - H_j^g(k))^2}{\max(H_i^g(k), H_j^g(k))} \times \beta \right. \\ \left. + \frac{(H_i^b(k) - H_j^b(k))^2}{\max(H_i^b(k), H_j^b(k))} \times \gamma \right) \quad \text{--- 5}$$

In above formula,  $H_i^r(k)$ ,  $H_i^g(k)$ , and  $H_i^b(k)$  is histogram distribution of each space  $g r$ , , owned by number  $i$  frame  $i f$ ,  $N$  is total number of bean  $k$  and  $m$  is the total number of the blocks  $bl$

Here, the value of difference was created from formula (5) by histogram comparison of each block after dividing the frame into same block areas. Created value shows the extraction of robust value of difference which can be applied to both abrupt scene change.[4]

### B. Scaled Frame Difference

Extracted frame difference from suggested formula (5) has big variation with characteristic information between frames and it is very hard to get consecutive connected information between frames. Especially, it has a problem that the threshold value decision to extract scene change should meet the change of each value of difference actively.

Therefore the way to reduce the variation of value of difference, to recognize the value of difference connected by time easily and to get the information is required. Existing regulation method using total pixel numbers of the frame is

used as reducing the value of difference size by certain area but it has a demerit that it can't supply the information on time consecutiveness and correlation of the value of difference.

In this paper, we propose the scaled frame difference method to extract more robust scene change from frame difference as recognizing time consecutiveness and correlation by compressing the frame difference dynamically in certain range of the value. Proposed method is applied to frame difference as modifying log function and multiplying constant used to improve brightness of image in image processing .

$$d_{log} = c \times \log(1 + d^2)$$

$$c = \frac{\max(d_{log})}{\max(\log(1 + d^2))} \quad \text{--- 6}$$

Where  $d$  is the frame difference extracted from equation (5) and  $c$  is the constant calculated from  $d$ . Square of frame difference is needed to show the difference value in dynamic range.

Distribution of all frame differences  $d_{log}$  has widely spread difference values in a scaled region than  $d$  and each difference values are enhanced and concatenated each other more closely. So if we apply the simple shot cut rules, we can detect the shot boundaries only using the frame difference.[5]

## V. EXPERIMENTAL RESULTS

A. The formulae mentioned below calculates Recall and Precision where[1]

$$\text{Recall} = \frac{\text{Correct}}{\text{Correct} + \text{False}}$$

$$\text{Precision} = \frac{\text{Correct}}{\text{Correct} + \text{Missed}}$$

B. The description of the sequences in the dataset are given in the table 1 .

TABLE 1  
DESCRIPTION OF THE SEQUENCES IN THE DATASET

Sequence	Length(min)	No.of Frames	No.of Cuts
Sleepy Hollow	105	2202	43
Independence day	144	1231	17

The abrupt change in the scene after applying the algorithm is given in the table 2.

TABLE 2

Sequence	# of scene change cuts	# of detectedscene change cuts	Precision (%)	Recall (%)
Sleepy Hollow	43	38	90.47	88.37
Independence Day	17	14	87.5	82.35

C. Result for Movie sleepy hallow:

For data set 140 to 143

Using Color Histogram difference between the frames :

(For Data set 140 to 143) ie for  $3 \times 24 = 72$  frames

Abrupt transition of shot is at frame 26

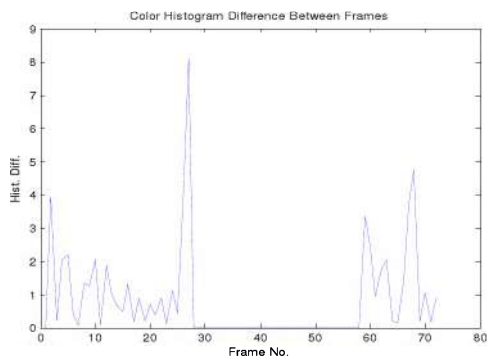


Fig 3 Result for color histogram difference method for data 140 to 143

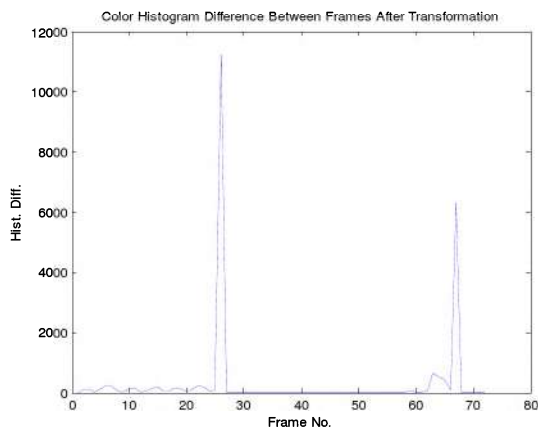


Fig 4 Result for color histogram difference method after transformation for data 140 to 143

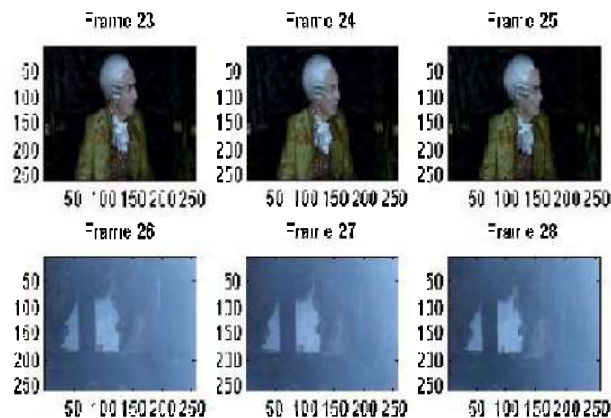


Fig 5 Result for color histogram difference method after transformation

D. For data set (140 to 143) ie  $3 \times 24 = 72$  frames from the movie sleepy hallow

Color histogram difference between the frames.

Abrupt transition of the shot is at frame no 67

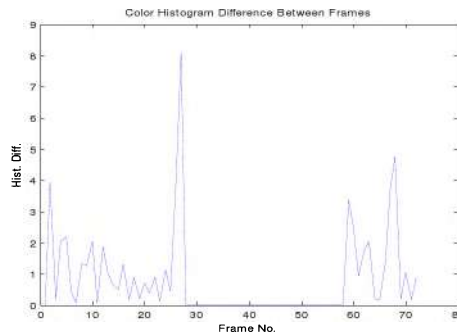


Fig 6 Result for color histogram difference method for dataset 140 to 143

Color histogram difference between the frames after transformation

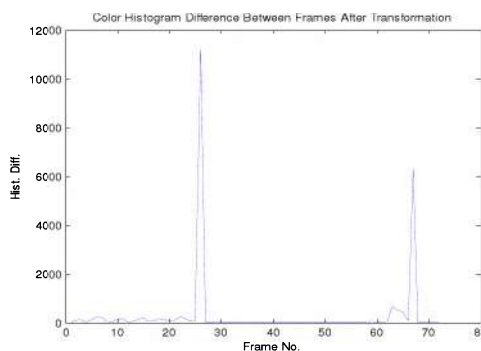


Fig 7 Result for color histogram difference method after transformation for dataset 140 to 143

E. For data set 5399 to 5402 i.e.

number of frames =  $24 \times 3 = 72$  for the movie Independence day

Abrupt Transition of the frame is at 26

Color histogram differences between the frames are

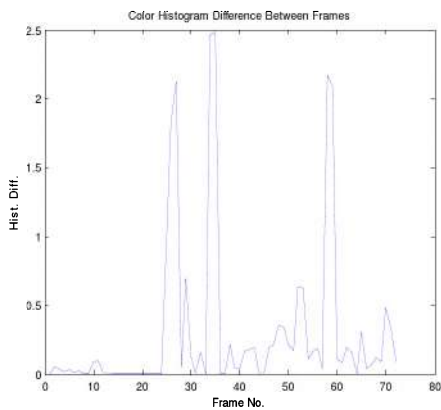


Fig 9 Result for color histogram difference method for data set 5399 to 5402

Color histogram difference between the frames after transformation

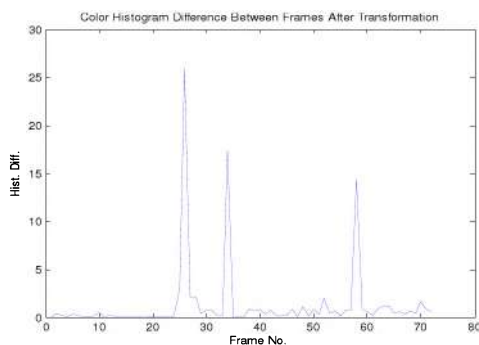


Fig 10 Result for color histogram difference method after transformation for data set 5399 to 5402

## VI. CONCLUSION AND FUTURE WORK

Here in this paper we have proposed new segmentation method based on color difference histogram. We have developed a new scene change detection method by scaling the histogram difference between the two frames.

This paper has presented an effective shot boundary detection algorithm for abrupt transition, which focus on following difficult problems solution: i.e. 1) To provide the scaled frame difference that is dynamically compressed by log formula and it is more convenient to decide the threshold. 2) The shot boundary detection algorithm for abrupt transition gives good result. The simulation result shows that the proposed algorithm is promising.

However the automatic video partition can be implemented where in gradual transition, camera fabrication, special events and so on can be incorporated.

## ACKNOWLEDGEMENT

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# IMPULSE X

ENTERTAINMENT RE-DEFINED



The spirit of innovation rose again. It was the time to experience the battle of the best. People unleashed the competitor, the innovator, the mettle in them. All the heights of creativity were scaled. Boundaries of complexity were leapt. The world of ingenuity was conquered and out emerged the winner at **IMPULSE-X**. It was a plethora of boundless creativity and innovation, where our skills were tested in various exciting challenges. IMPULSE, the annual technical festival of PIITEMSR, held under the banner of IEEE was back with a bang and showed a much bigger and larger show this time.

2002 saw the birth of IMPULSE, and seven years since it is one of the most sought after techfest in Navi Mumbai. A union of brains, skill, technology, talent and creativity. It truly signifies the cultural m lange that PIIT stands for. Enjoying phenomenal success for more than 8 years, IMPULSE has established itself, and more than 6000 students from various educational fields all over Mumbai attend it. This year, it was held on 3rd, 4th and 5th of March. The special thing about IMPULSE this time was that for the first time it went State-wide, students from all over Maharashtra and also from other states participated in it. IMPULSE-X kicked off with a well organized inauguration ceremony. All in the packed hall rose to their feet as Principal Dr.R.I.K. Moorthy inaugurated the event by lighting the lamp.

The various events in IMPULSE-X were divided into separate domains. One of the major successes was the Robotics Domain, which poses a challenge to the participant in manual robotics, and had events like Robotics Level-1, Level-2, Robowars, Robomaze, Bot-Bowling, Robo-Soccer; Robo-Tag. It was a nail-biting experience for the participants as they competed with their robots.

The LAN-GAMING Domain was a major blockbuster. The event had four pc games viz.

1. COUNTER STRIKE 1.6
- 2.NFS MOST WANTED
- 3.FIFA 08
- 4.WARCRAFT 3: DOTA

**Tempers ran high and the language turned colorful as participants tried their best to outwit each other in the competition. The event also saw many teams coming from as far as Pune and Bangalore!**

The Fundaz Domain had events like Imagineering, Technical Quiz, Code Wars, Sudoku, Junkyard wars, which requires a participant to assemble a machine for a specific purpose out of junk was the most talked about. IMPULSE-X also had various fun competitions like Egg-Flu and Fastest Finger First, for the cell-phone enthusiasts saw huge popularity amongst the people.

IMPULSE-X also gave everyone opportunity to unwind and release the stress of the day. PAINT-BALL was organized for the first time in PIIT campus. The event was a huge hit with the students as well as the teachers. Battle-lines were drawn, strategies were planned as both the teams tried to capture the rival team's territory and eliminate rival team's members.

However, it was the RAPPELLING event which stole the show. It had three main attractions-FLYING FOX, LADDER CLIMBING and DESCEND. Professionals were roped in to put up the set up required for the event. Even the height and the thrill involved were not able to dampen the spirits of the participants, who turned in zealously to be part of the event. There were loud screams of excitement, rush of adrenaline as participants flew down from 5th floor with breath taking speed. Originally planned for the first two days, the event had to be extended to the third day due to popular demand from the participants.

The final day was also the day for the mega event TREASURE HUNT! The event saw tremendous response from students all over Mumbai. The participants were divided into team of two and were required to perform various challenging tasks. People were seen hurrying from one corner of the college to another performing various tasks. The tasks tested both the mental as well as physical capabilities of the

participants. Right from eating watermelon with both hands tied to sipping sweet drink from ground floor, the tasks pushed participants to their physical limits. A test which tested the aptitude of the participants was sponsored by IMS, Vashi.

The final day witnessed the prize distribution function in the evening, which was held in the assembly hall and was attended by a large number of students. The chief guest of the function was Mr.Prashant Thakur, MLA of Panvel constituency. A short power-point presentation was given by the IEEE chairman to brief the chief-guest regarding the 3 day technical festival. The sparkle in the eyes, the wide wretched smiles and the palpable enthusiasm amongst the students was the motive behind this presentation. The assembly hall reverberated with the cheers of joy and joys all coming from the audience.

IMPULSE-X in its state-wide debut edition was indeed a success. It was backed by sponsors like Spykar, MoserBaer Photo Voltaic, Federal Bank, IMS Vashi and NIIT. The hard work of the faculty members and the students was well reflected in the triumph of the event. At the conclusion of IMPULSE-X, the crescent smile on the faces of all and sundry said it all!!

By Yusuf Pathan (TE)



# FEAR OF FAILURE

Fear of failure is as common as the desire for success. In fact, if properly utilized, it can turn out to be the energy that drives the wheels of success.

“ALWAYS LEARN TO USE FEAR RATHER THAN LETTING IT USE YOU”

I will like to share a short story – There was an Olympian long jumper who always had a fear that he would lose gold medal. Later, he spoke about this fear to his coach. He told the Olympian “You are the only one who knows how to get your body and mind up to the peak level of achieving success”. The Olympian started realizing and repeatedly recollecting these words told by his coach, before practice, during practice, every time and everywhere and even during the long jump event. This ultimately blocked every fear and made him to concentrate on his goal and the Olympian broke all barriers to achieve gold medal.

## To avoid stage fear:

Fear can be overcome only when you stand up and speak from your heart. Stage fear is due to shyness. People tend to worry about their expression and would fear about how people would react at every moment. This leads to stage fear. The solution to this is to focus on the message you feel strongly about. When you emphasize on the content that you are sharing with people,



you will automatically forget about how others would react and will give your best.

#positive action

Complaining and getting into arguments is a waste of time and energy. Things get better when there are:

1. More doers and few talkers
2. More approvers and few disapprovers
3. More to build up and few to tear down

# See your mistakes and failures as a gateway to learn new things.

Failing at something you undertake doesn't make you a failure as a person. Both mistakes and achievements are a part of human life which enables us to learn new things at every stage of life.

# the best way to learn future is to compare present and past.

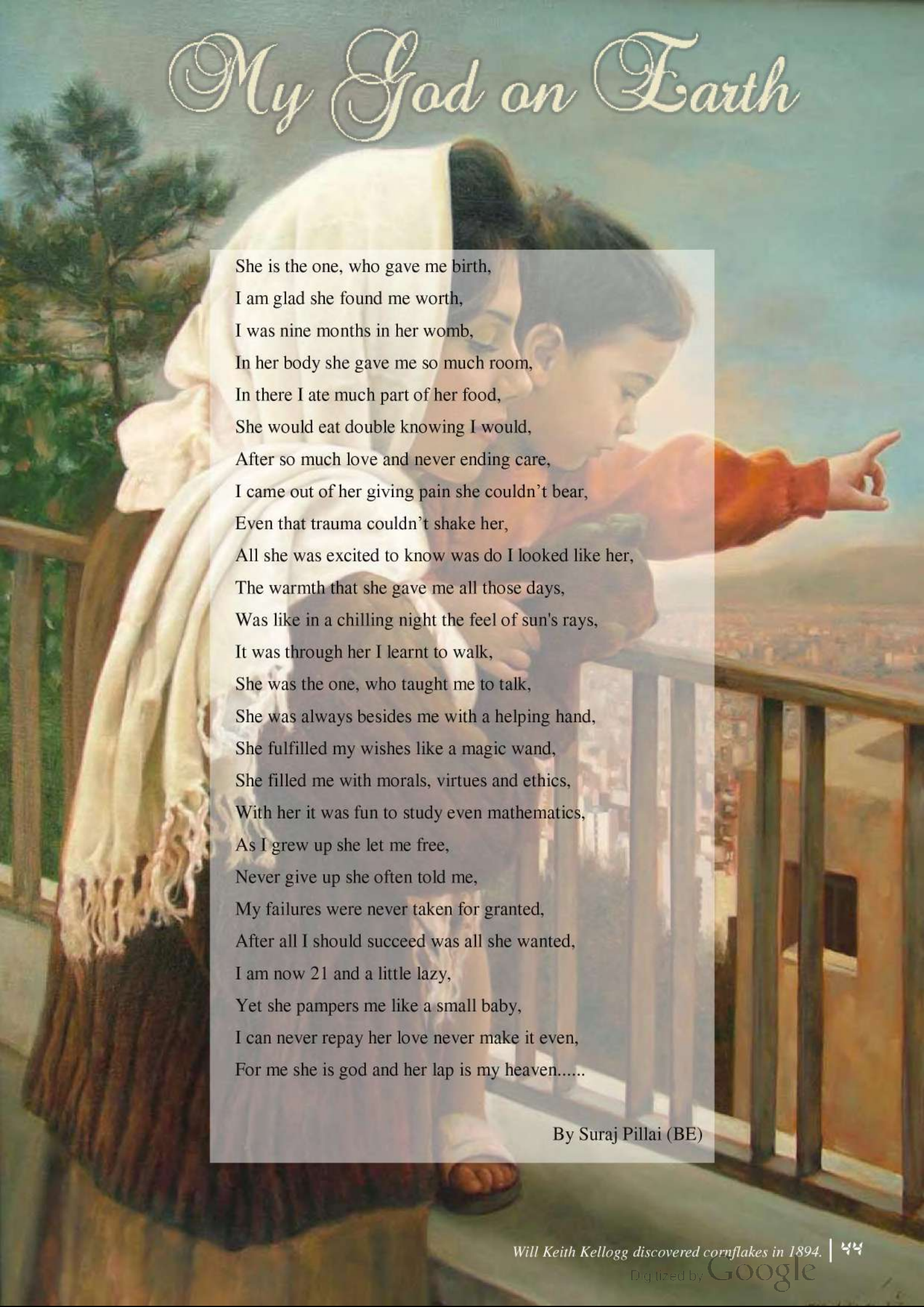
Six things that build up your courage:

1. Choose to be brave
2. Take responsibility (not always)
3. Don't shy away to ask for help (always)
4. Be bold
5. Preserve
6. Pray (always)

By Pandiyan Raja (B.E.)



# My God on Earth



She is the one, who gave me birth,  
I am glad she found me worth,  
I was nine months in her womb,  
In her body she gave me so much room,  
In there I ate much part of her food,  
She would eat double knowing I would,  
After so much love and never ending care,  
I came out of her giving pain she couldn't bear,  
Even that trauma couldn't shake her,  
All she was excited to know was do I looked like her,  
The warmth that she gave me all those days,  
Was like in a chilling night the feel of sun's rays,  
It was through her I learnt to walk,  
She was the one, who taught me to talk,  
She was always besides me with a helping hand,  
She fulfilled my wishes like a magic wand,  
She filled me with morals, virtues and ethics,  
With her it was fun to study even mathematics,  
As I grew up she let me free,  
Never give up she often told me,  
My failures were never taken for granted,  
After all I should succeed was all she wanted,  
I am now 21 and a little lazy,  
Yet she pampers me like a small baby,  
I can never repay her love never make it even,  
For me she is god and her lap is my heaven.....

By Suraj Pillai (BE)

# MY FRIEND

It's the first day of college, as we all know it's the best part of our personality that we all want to show. Some make it, some break it, but everyone does fake it.

I see a guy, who I never passed by, but I don't know why I just say Hi. He looks at me and smiles back. I made my first friend just like that.



With one friend came another and before we knew it we were all together. Lectures and practicals flew away and before we knew it. It was submission day.

Each of our files had the same story to say, they were incomplete and unchecked but we hoped for an "A". We stuck by each other and tried our best, and to lady luck we left the rest.

Mission submission was over and the battle had been won, but we could not rejoice as the war had just begun. Exams were approaching and the days were few, no matter how much we tried to catch it, the time just flew.

We studied at our homes night and day, a good friend's advice was just a call away. Study this way or study that way either way tensions begun to boil, me and my friends got ready to burn the midnight oil.

On the day of the exam everyone arrived early, one question was common "have you studied?" and the answer came "yaar I can't tell you surely". Suddenly the warning bell rang, and together we entered the exam hall like a gang.

We collected our answer sheets and sat on our respective seats. Ahead and behind us known faces were few, but one line was common you show me and I show you.

The wait for the question paper took forever; we all knew that it was now or never. Suddenly the warning bell rocked us and the weird question paper had completely shocked us. That very moment One lesson got

engraved on our mind. No matter how much you plan, life can still take you from behind.

The paper was difficult and lengthy, which almost no one completed in the college. Why 3 hours are given to prove a year's worth of knowledge. Will I pass or Fail the question was worthless, Exam after Exam we bashed on regardless. And like every dark night has to give way to the day, the vacation was well on its way.

During the vacation plans were made and plans were broken, many of our friends had hardly spoken. Was it serious or was it a joke a month long vacation disappeared like smoke. The exam before the vacation we had totally forgot and now it was time for results "OH MY GOD!"

Results were out for all to see, but the next year for some was not meant to be. One after the other the news hit us most of our friends were no longer with us.

They say who is your friend? The one that sticks with you till the end. My friend you will always be stuck in my mind and don't worry You will be a great Engineer but just a year behind...

By Sachin Naik (TE)



# Swiss Bank

In Swiss Bank Money of Indians' account upto 70,00,000 Crore Rupees

1) Yes, 70 lakh crore rupees of India are lying in Switzerland banks. This is the highest amount lying outside any country, from amongst 180 countries of the world.

2) Swiss Government has officially written to Indian Government that they are willing to inform the details of holders of 70 lakh crore rupees in their Banks, if Indian Government officially asks them.

3) On 22-5-08, this news has already been published in The Times of India and other Newspapers based on Swiss Government's official letter to Indian Government.

4) But the Indian Government has not sent any official enquiry to Switzerland for details of money which has been sent outside India between 1947 to 2008 (for the obvious reasons, this way the swindling would be out in open).. The opposition party is also equally not interested in doing so because most of the amount is owned by politicians and it is every Indian's money.

5) This money belongs to our country. From these funds we can repay 13 times of our country's foreign debt. The interest alone can take care of the Center's yearly budget. People need not pay any taxes and we can pay Rs. 1 lakh to each of 45 crore poor families.

6) Let us imagine, if Swiss Bank is holding Rs. 70 lakh Crores, then how much money is lying in other 69 Banks? How much they have deprived the Indian people? Just think, if the Account holder dies, the bank becomes the owner of the funds in his account.

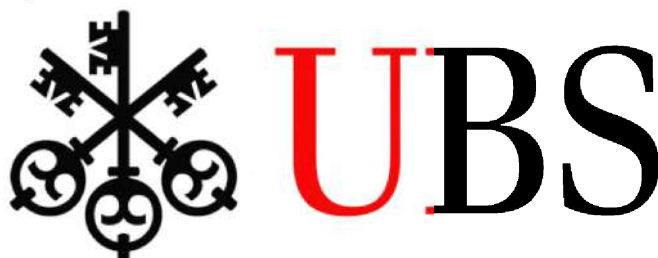
7) Are these people totally ignorant about the philosophy of Karma? What will this ill-gotten wealth do to them and their families when they own/use such money, generated out of corruption and exploitation?

8) Indian people have read and have known about these facts. But the helpless people have neither time nor inclination to do anything in the matter. This is like "a new freedom struggle" and we will have to fight this.

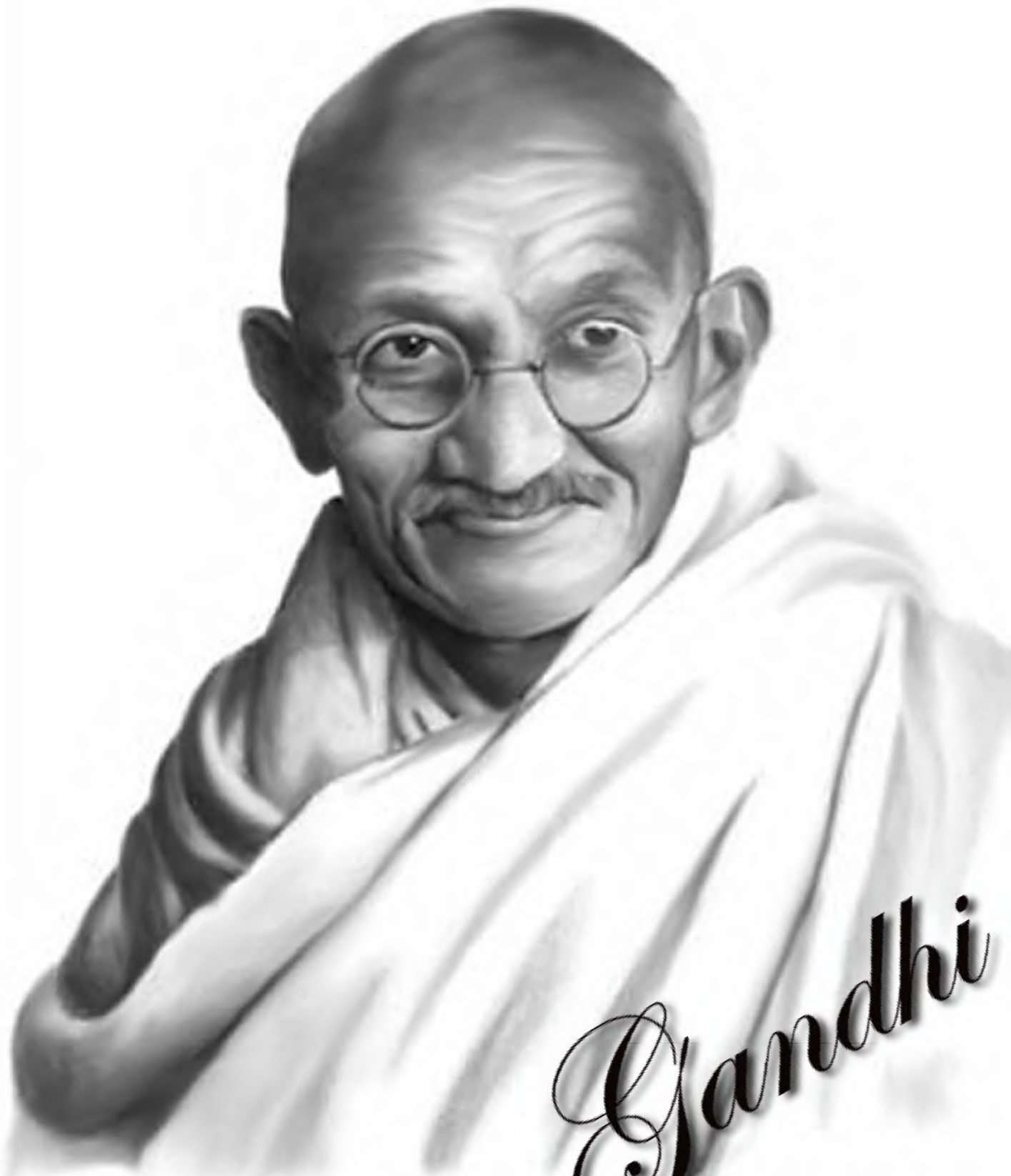
9) This money is the result of our sweat and blood. The wealth generated and earned after putting in lots of mental and physical efforts by the Indian people and it must be brought back to our country. We as responsible citizen must exercise our rights and must take the necessary steps to make sure that the politicians don't get away with all the diddle.

I'd like to end stating the quote—"You may fool all the people some of the time, you can even fool some of the people all of the time, but you cannot fool all of the people all the time.- ABRAHAM LINCOLN"

By Srinivas lakshminarayan (BE)







*Gandhi*

Mahatma Gandhi

As per a geological survey Nagpur lies on Seismic Zone 5 of an earthquake prone area. Though Japan is the top most country in the world suffering from Earthquake, surprisingly Nagpur also needed Earthquake-proof construction.

World's most strong and powerful construction against Earthquake is in Nagpur and was built under the supervision of Mahatma Gandhi, named Sewagram Ashram, Wardha.

It was built on 30th April 1936 when Bapu was 67 and his condition was to complete the ashram within Rs.500. But many architects failed. So, he decided to do the same by his own design. Unbelievably, that ashram was prepared with a budget just within Rs.499 with totally local material collected from a 20 km radius of sight, and a 100 % earthquake proof building was built.

For some people Gandhi is still relevant today whereas some think that India (& the world at large) has changed so drastically that there is no role of Gandhi in it.

The biggest truth of all is that if you go to any corner of earth and ask any stranger to name two Indians he has heard of in his lifetime; the answer in all likelihood will be (1) Mahatma Gandhi and (2) Sachin Tendulkar.

Here are some little known facts about him which most of us don't know.

(1) His income in South Africa touched fifteen thousand dollars a year! Something still a dream for most of the Indians!

(2) On seeing the hopeless condition of one tenth of India which was living in a hungry and half-starved state, Mahatma Gandhi pleaded them to cease bringing children into a world filled with so much misery and want.

(3) Mahatma Gandhi experimented with diets to see how cheaply he could live and remain healthy. He started living principally on fruits, goats' milk and olive oil.

(4) Mahatma Gandhi inspired millions of people world over to take the path of non-violence and civil disobedience. 5 world leaders who got Nobel Peace prize viz. Martin Luther King Jr. (USA), Dalai Lama (Tibet), Aung San Suu Kyi (Myanmar), Nelson Mandela (S. Africa) and Adolfo Perez Esquivel (Argentina) have acknowledged the fact that they were influenced by Gandhi's philosophy. Yet, Mahatma Gandhi, the man who inspired these Nobel Peace Prize winners, never got a Nobel Prize (not that he would have cared)!

(5) The great Scientist Albert Einstein once said about Gandhi: "Generations to come will scarcely believe that such a one as this (Gandhi) walked the earth in flesh and blood."

(6) Bapu passed a total of 2119 days in Prison and Detention.

(7) He fasted on 32 occasions for a total of 159 days. Out of these, he fasted for 56 days to purify him and his Ashram colleagues.

By Rahul Pandya (BE)

**Birth:** October 2, 1869  
**Death:** January 30, 1948  
**Place of Birth:** Porbandar, Gujarat  
**Father:** Karamchand Gandhi  
**Mother:** Putlibai  
**Wife:** Kasturbai

1888-1891: Studied law in London

1893: Sailed for South Africa

1906: Began Satyagraha campaign in South Africa to protest the requirement that Indians be fingerprinted and carry identification cards

1915: Returned to India from South Africa

1917: Initiated Champaran Satyagraha to alleviate the condition of indigo planters

1919: Instituted Satyagraha campaign in India to protest the Rowlatt Acts, which deprived all Indians of important civil liberties.

1922: Ended Non-Cooperation movement against British Raj after his followers were involved in a series of riots and disturbances that violated his policy of nonviolence

1930: Led Dandi March to collect salt in protest of the British salt tax.

1931: Signed a pact with Lord Irwin to suspend the Civil Disobedience Movement and went to London to attend Round Table Conference.

1932: Fasted to protest the treatment of people who belonged to no Hindu caste, the Harijans or Untouchables

1942: Launched Quit India Movement against British Raj.

January 30, 1948: Assassinated by Nathuram Godse, a Hindu extremist.

## A BIRD KNOWN THEN...

Chirp, cheep, chirp.....everyone must be familiar with these sounds of sparrows chirping in the courtyards, balconies and on the roof top. When was the last time u saw a sparrow? Well it's been ages, trust me. We in our engaged life tend not to pay much attention to any such occurrence.

Yes, the reason we don't see them now is because these cute , feeble creatures are on the brink of extinction. Our little familiars for ages are soon going to be a rare sight.

The populations of the sparrows have been declining rapidly and are now listed in the endangered species list. This slump is more salient in urban areas.

Studies sat that the gist of the issue is 'global warming'. Global warming is a broad spectrum word and encompasses various aspects.

One of the many reasons for this is absolute haphazardly of planning and planting of the mobile towers more so in urban areas. Every nook and corner of a building terrace has one of each service provider's antennas. Birds are known to be sensitive to magnetic radiation emanating from the mobile towers. They have fallen prey to the so called telecom revolution .They tend to fly directly into the tower and the frequencies emitted confuse and disorient them. This in turn affects the reproductive, behavior and navigational skills.

And this doesn't end here, it also affects humans just as same in a way one would not imagine. Studies say 60% of the men/women working in the field, i.e. who have a field job have been unable to bear a child,30% of the kids were born with some mental disorder and the lucky 10% probably knew this so didn't show up for the job.

Its indeed ironical that the mobile ringtones play bird music but at the same time are also responsible for their reducing number.

I hope this serves as an eye opener and we do not let us lose sight of these beautiful creatures and find them around for ages to come and not limit them to mere archeological museums and ringtones.

By Srinivas lakshminarayan (BE)





# TIPS FOR AN INTERVIEW

Hello friends, we all are fed with technical knowledge, every semester, so that when we apply for a job we sound like engineers and not any layman. But, the main challenge to get into a company is clearing the interview, which has a science of its own, which is not included in our syllabus and so many fail in it even though having their technicalities right. So, here are some basic, yet foolproof tips that can help you get through even the toughest interviews.

## 1. Chronological Outline of Career and Education

**Divide your life into "segments" defining your university, first job, second job.**

The reason for opting certain course or profession; Your job responsibilities in your previous/current job; Reason of leaving your earlier/current job. You should be clear in your mind, where you want to be in the short and long term, and ask yourself the reason why you would be appropriate for the job you are being interviewed for, and how it will give shape to your future course.

## 2. Strengths and Weaknesses

Write down three technical and three non-technical personal strengths. If you're asked about a general skill, provide a specific example to help you fulfill the interviewer's expectations. It isn't enough to say you've got "excellent leadership skills". Instead, try saying:

"I think I have excellent leadership skills which I have acquired through a combination of effective communication, delegation and personal interaction. This has helped my team achieve its goals."

As compared to strengths, the area of weaknesses is difficult to handle. Put across your weakness in such a way that it seems to be a positive virtue to the interviewer.

## 3. Questions you should be prepared for:

Tell us about yourself?

What do you know about our company?

Why do you want to join our company?

What are your strengths and weaknesses?

Where do you see yourself in the next five years?

Why should we hire you?



Answers to some difficult questions:

### **Tell me about yourself?**

Start from your education and give a brief coverage of previous experiences. Emphasize more on your recent experience explaining your job profile.

### **Why should we hire you? Or why are you interested in this job?**

Sum up your work experiences with your abilities and emphasize your strongest qualities and achievements. Let your interviewer know that you will prove to be an asset to the company.



### **How much salary do you want?**

Emphasize that the opportunity is the most important consideration.

### **Do you prefer to work in a group?**

Be honest and give examples how you've worked by yourself and also with others. Prove your flexibility.

### **5. Do your Homework**

Before going for an interview, find out as much information on the company as possible. The information gives you a one-up

in the interview besides proving your position.

Clearing the interview isn't necessarily a solitary attempt. Seek assistance from individuals who are in the profession and whose guidance you value the most. Be confident in your approach and attitude; let the panel feel it through your demeanor, body language and dressing.

Getting prepared for your interview is the best way to dig deep and know yourself.

All the best and get ready to give a treat.

By Suraj Pillai (BE)

## **JRD-The Silent Conqueror**

Born in Paris on July, 1904, Jehangir Ratanji Dadabhoy Tata was the second child of Ratanji Dadabhoy Tata and his French wife Sooni. His childhood was spent in different countries and he did his schooling in Paris, Mumbai and Yakohama. A Joyride on a plane sparked a passion for soaring in the skies. The first flight of Indian civil aviation took off at Karachi on October 15,1932 with JRD Tata at the control of 'Puss Moth' that he flew solo to Ahmedabad and onwards to Bombay.

In 1938 he was placed at head of India's largest industrial empire. For over half a century, JRD guided the destiny of Tata despite enormous pressure on his time, JRD took the role of a citizen very seriously and never failed to be of service to the nation. He was a patriot of art and supported India's progress to become a scientifically advanced nation.

For these endeavours JRD Tata was awarded the country's highest civilian honour, the Bharat Ratna in 1992 yet he remained at heart a simple and unassuming person. Years after his death he still inspires a little hope and enthusiasm in the youth of the country.





# Career - a fight for Survival

Most people choose a career on the basis of the salary they can expect to make. In the upcoming generation hardly anyone is free to choose a career based on his or her natural talents.

Interests in a particular field of a child are killed before they can explore it themselves. This situation has arisen due to the problematic conditions thriving in our society such as population outburst and the want of a good living.

But the numerous uno problems are that of job satisfaction. When a person works in a field of his interests, aspects like productivity, efficiency and satisfaction get reflected in the work he does. On the other hand, when people opt for a particular tream for mere material gain, it ends in producing stereotyped employees working mechanically.

Such people can be called as 'Educated Morons' with no intention to bring about any development in the institutions they work. This ultimately results in an army of professionally ineligible people.

Our country requires students with potential ability to bring a change in the nation's future. A country of 1billion- INDIA has an enormous force of such high profile people but, in this throat cutting competitive world, our inner talent gets frozen and it results in the deceleration of an entire generation.

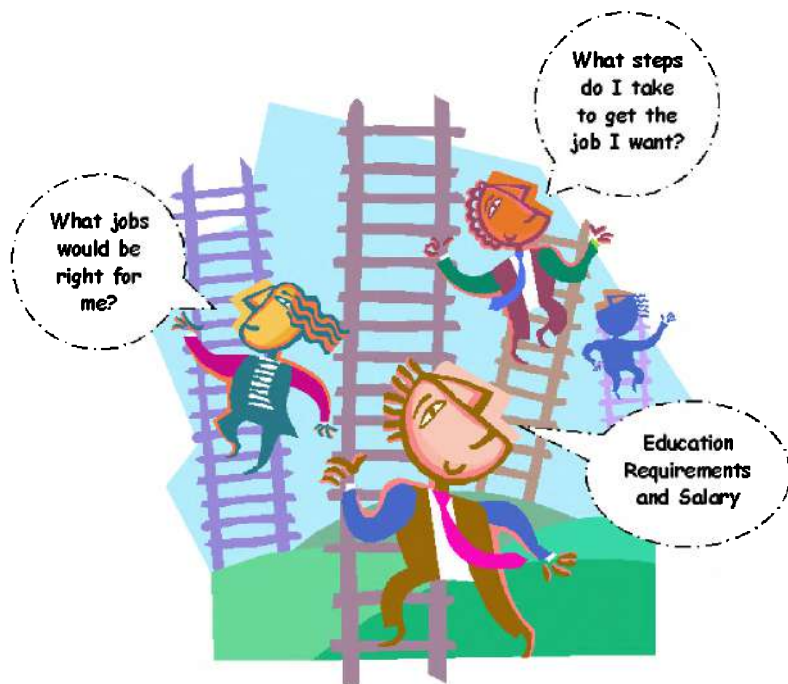
A student of science has avenues galore to venture into courses like Pharmacy, Agriculture and Forensic Sciences. The R&D field has come up with a wide range of streams like Biotechnology, Biomedical, Biostatistics, Food Technology and Micro Biology.

It's high time for every aspiring student to choose the right career and show his/her talents as well as make our country a landmark for other talents.

It is well said by Benjamin Franklin:

"If you would not like to be forgotten as soon as you are dead, either write things worth reading or do things worth writing".

By Aditi Bhosale (TE)



# INTERVIEW

**Mr. Pragnyesh Shah**

**(Managing Secretary Electronics and Telecommunication)**

HELLO my fellow engineers! We have been giving a lot of viva exams, haven't we? So how about a change of positions now, I mean, we get to ask them the questions this time!! Our first professor is Mr. Pragnyesh Shah right from organizing the Technical and cultural festivals of the college, to teaching you'll see him everywhere!!. Currently, working as a managing secretary in the Electronics and Telecommunication Department, he used to teach both Diploma and Degree subjects like BEEE, ECAD-1, ECAD-2, PCom and Software engineering in his early life as a professor. After completing his Graduation in Electronics and Telecommunication from the Government Engineering College, Lonere, he also did his Masters.

**Q] I have never seen you in a ' professor' look ,I mean, coming to the college with a briefcase in the hand and with a serious look in the eye, I always see you with a ' happy go lucky' attitude. Now, was this pre-planned or you had your own 'professor' image that you always wanted to be?**

A] Kapdo se nahi rehta hai, Personality se nahi rehta hai, main rehata hai aapka communication and teaching!! Students should understand what you are teaching them. I don't feel that being serious is the only way of teaching.

**Q] You are quite friendly with your students, how did you manage to keep the students under control when you used to teach?**

A] When inside the campus or in the classroom, I am very strict as a Teacher, outside the campus, I am a friend, I discuss with them over various issues, try to solve even their personal problems, so that I get to know them better.

**Q] What do you think about professionalism?, like being a teacher there's always a pressure from the management to control students and all, how do you manage it?**

A] Firstly, I would say Discipline, it is first defined by the teacher, only then, is it inherited into the students. Secondly, being up-to-date about the on goings of our field around the globe.

**Q] How were you as a student?**

A] I was a very sincere student (with an 'I-know-what-m-saying' smile on the face), I used to attend 100% lectures (the smile goes broader now)

**Q] How do you think is it possible to manage studies and extra-curricular activities ?**

A] If you really want to do other activities along with your studies, you should be able to draw a line between the two. If suppose the college timings are from 10am to 5pm and you have to give some time to your activity work, either you come early or stay late after the college. Bunking lectures and practicals in the name of activity is not the way out.

**Q] What are your views about I.Vs ?**

A] I.Vs are important and must be held regularly, not only as a reason for fun but also to practically learn the subjects, and their application.

**Q] Do you ever want to be Principal of any college?**

A] Me, no! I don't see myself as a principal, I see myself as a CEO or I'll say I'll rather start my own college (Smile, happy face).

By Saurab Joshi (BE) and Akanksha Patil (TE)

# INTERVIEW

**Mr. Sanjeev Kumar Srivastava**  
**(HOD Electronics and Telecommunication)**

*Our next* Interviewee was Mr.Sanjeev Kumar Shrivastav, HOD, Electronics and Telecommunications Dept.As we can make out, he's a man who possesses immense experience as well as teaching skills. After completing his schooling and junior college in his hometown BASTI, Uttar Pradesh, Prof.Shrivastav came to Mumbai in 1989 in order to do his graduation in Electronics and Telecomm Engineering from Mumbai University. After his graduation, he worked in a company for a year, Prof.Shrivastav entered in the profession of teaching for the first time in 1997. He worked as an assistant professor for eight and half years, during this period he also achieved his post graduation ME from Electronics and Telecommunication from Mumbai University.

Finally, on the 1<sup>st</sup> March 2008, Pillai's Institute of Information Technology proudly welcomed Mr.Sanjeev Kumar Shrivastav as HOD of the Electronics and Telecomm Dept. Well, that's not it; Prof.Shrivastav is currently pursuing a PHD course in Wireless Networks.

**Q] If not a professor, what would have been your profession?**

A] If not a professor, I would have been a Singer!! I am very much into singing!!

{ Well, that's something we didn't know }

**Q] Being a professor and that too HOD, how do you manage with a whole lot of responsibilities from the management plus handling the students?**

A] I like to encourage students by understanding them, by communicating with them over various issues but at the same time maintaining a professional attitude. It's more or less like a Filter, whatever input you give, the output will be according to that. If you give correct input, the output is bound to be correct.

**Q] I have never seen you shouting or being aggressive on any student over any issue ever, for eg say if a student comes late for your lecture, you never say anything, what's the secret mantra of your calmness?**

A] (With a healthy smile) I don't totally agree with you on this!! Sometimes it is necessary to tell them when they go

wrong. I have a method in which I handle students from different years in a different manner. Being a Teacher it's very important to understand the mentality of the student, only then can you teach and guide them in a proper way. And being a professional student, it is bound that you'll possess some maturity. Punctuality and Discipline are two very important aspects.

**Q] What according to you are the Qualities that make up an ideal student?**

A] Sincerity, Dedication, Discipline are the factors which are very important being possessed in a person not only as a student, but also it's a long term requirement. Scoring marks does not lead a student to perfection, I have seen so many students who were not able to score very good marks, but knowledge wise they were very strong, and some of them are now currently pursuing MS in the USA. At their college times, I used to tell them that don't just think about marks, aggregate 60% is a must to be maintained. So, students are not to be judged only on the basis if their mark, judging their knowledge is also very important.

**Q] In university examinations, a student's knowledge of the complete semester is judged on what he/she manages to write in those three hours only. Do you think this system is correct?**

A] Yes, I think it's correct. See, proper planning of studies is very important throughout the semester. One who manages to plan properly through this 3-4months span will surely succeed in the examinations.

By Saurab Joshi (BE) and Akanksha Patil (TE)



# माय मराठी

॥ श्री गणेशाय नमः ॥

मी तसा फार मोठा भक्त नाही पण गणपती हे सर्वांचे आराध्य दैवत आणि माझा विश्वास म्हणून मी माझ्या पहिल्या लेखाची सुरुवात माझ्या विश्वासापासूनच करावी असे मला मनोमन वाटले.

मी काही प्रथितयश लेखक नाही पण ह्या आपल्या पहिल्या वहिल्या स्मरणिकेचे औचित्य साधून मी हा लेख आपल्या समोर मांडण्याचा एक प्रांजळ प्रयत्न करित आहे.

तुम्ही आता सध्या ऐकतच असाल की पालक- आपल्या पाल्याला बहूतेक करून ' इंग्रजी माध्यमातून ' शिक्षण घेण्याचा आग्रह करत आहेत का तर सध्याच्या युगात जर यशस्वी व्हायचे असेल तर इंग्रजीची खूप आवश्यकता आहे. मी ह्या सर्व गोष्टींशी सहमत आहे पण आपण आपल्या पाल्याचा विचार करतो का ? की त्यांना ते कसे जमेल ? घरात सर्वमराठी भाषिक आणि मुले कुठे तर इंग्रजी माध्यमामध्ये शिकत आहेत. मी म्हणतो जरी मुले शिकली तर का त्यांना शिकलेल्या गोष्टी आपल्या जीवनात आचरणात आणता येतात का? मला तर असा पूर्ण विश्वास आहे की माणूस आपल्या मातृभाषेतच आपल्या भावना, प्रेम, वात्सल्य, जिव्हाळा इत्यादी गोष्टी योग्यप्रकारे व्यक्त करू शकतो.

समजणे आणि समजलेल्या गोष्टी वर विचार करून त्या आचरणात आणणे ह्यात फरक आहे. हा फरक जर आपण मराठी भाषेतून शिक्षण

घेतल्यास समजतो.मुलांची चौकस वृत्ती जागृत होते आणि पाल्य आपला विकास स्वतः करतो. ह्याची ग्वाही मी देतो.

आता तुम्हाला वाटत असेल की मी कोणत्या तरी राजकीय पक्षासाठी काम करतो तर आपणास एक गोष्ट स्पष्ट सांगतो की मी फक्त आणि फक्त मराठी भाषेच्या पक्षात आहे.मला तर वाटते की राजकीय नेत्यांना ह्या मुद्द्याचे राजकारण करण्याऐवजी ही भावना आपल्या सर्वांच्या मनात रुजू करायला हवी, की आपण मराठी आहोत आणि आपल्या ह्या मातृभाषेला जिवंत ठेवणे हे आपले कर्तव्य आहे.

मला एक गोष्ट प्रकर्षाने सांगावीशी वाटते की मराठीने आपल्याला एक अमूल्य ठेवा दिला आहे ते म्हणजे आपले " संस्कार " .

कधी उत्तरेकडे किंवा दक्षिणेकडे जाऊन बघा ते आपल्या भाषेतच विचारांची देवाण-घेवाण करतात पण दोन मराठी माणसांना एकमेकांशी मराठीत बोलायला लाज वाटते का तर त्यांचा 'स्टेटसचा' प्रश्न असतो.का तुम्हाला हे बरोबर वाटते का ?

मराठी माणसा जागा हो आणि विचार कर आपण कुठे आहोत.अन्यथा " मराठी पाऊल पडते पुढे " बोलण्या ऐवजी मागे जायला सुरुवात होईल.विचार करा .....

By Prasad Patil (BE)

**जय हिंद !! जय महाराष्ट्र !!**

# मैत्री

मैत्री म्हणजे पाण्यात तरंगणारे जहाज  
असतात जश्या जहाजाला किनारे बहु दिशा  
असतात मैत्रीला नाना रूप अन भाषा !

न बोलताच समजून जाते  
एकमेकांच्या खानाखुनातले  
किती हलके वाटते ओकताना  
जड झालेल्या मनातले ..

कधी येतो आसवांचा ओलावा  
कधी वाटतो तो भावनांचा खेळ  
असतात भांडण-तंटांचे वादळ  
जेव्हा बसत नाही विचारांचे मेळ

जरी किनारे असतील वेगळे  
तरी असतो जोपर्यंत प्रवास सोबत  
क्षणाचा विरह सहन होईना तो  
नाही त्यांजपासून करमत !

असतो जोपर्यंत मैत्रीचा ओलावा  
चालते ती दूर दूर  
सुगंध दरवळावा रातराणीचा जसा  
जुळतात जीवनाचे सूर ....

किनार्याला लागले तरी जहाज दिसते  
किती भव्य !

तुटत असेल का हे दिव्य मैत्रीचे नाते ?  
कसे संपवू हे मैत्रीवरचे कधी न संपणारे काव्य !

By Yugali Fulgaonkar (BE)







By Sudarshana Bhagat (TE)

By Ruzuvesh Nair (TE)



By Aditya B (BE)



## Disclaimer

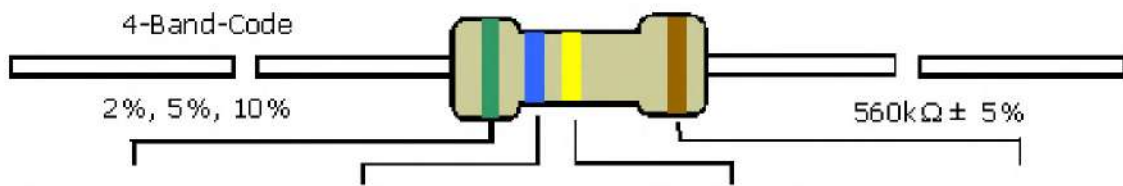
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### Websites for Electronic Component's Datasheet

- [www.alldatasheet.com](http://www.alldatasheet.com)
- [www.datasheetcatalog.com](http://www.datasheetcatalog.com)
- [www.datasheet.in](http://www.datasheet.in)
- [www.datasheet4u.com](http://www.datasheet4u.com)
- [www.datasheetarchive.com](http://www.datasheetarchive.com)

### Websites for Electronic projects guidance

- [www.electronicsforu.com](http://www.electronicsforu.com)
- [www.8051projects.info](http://www.8051projects.info)
- [www.8051projects.net](http://www.8051projects.net)
- [www.projectguidance.com](http://www.projectguidance.com)
- [www.electronics-project-design.com](http://www.electronics-project-design.com)



COLOR	1st BAND	2nd BAND	3rd BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	±0.5% (D)
Blue	6	6	6	1MΩ	±0.25% (C)
Violet	7	7	7	10MΩ	±0.10% (B)
Grey	8	8	8		±0.05%
White	9	9	9		
Gold				0.1	± 5% (J)
Silver				0.01	± 10% (K)





## Our Faculty

“You are the best Teacher in this world. Wherever I may go in my life, I will always remember that I had an excellent guide in the form of a teacher, you.”

---

Mr. Sanjeevkumar Srivastava

Mr. Pragnesh Shah

Mrs. Swati Sinha

Mrs. Jayashree Bhosale

Mrs. Priyadarshinee Shahapure

Mrs. Tusharika Banarjee

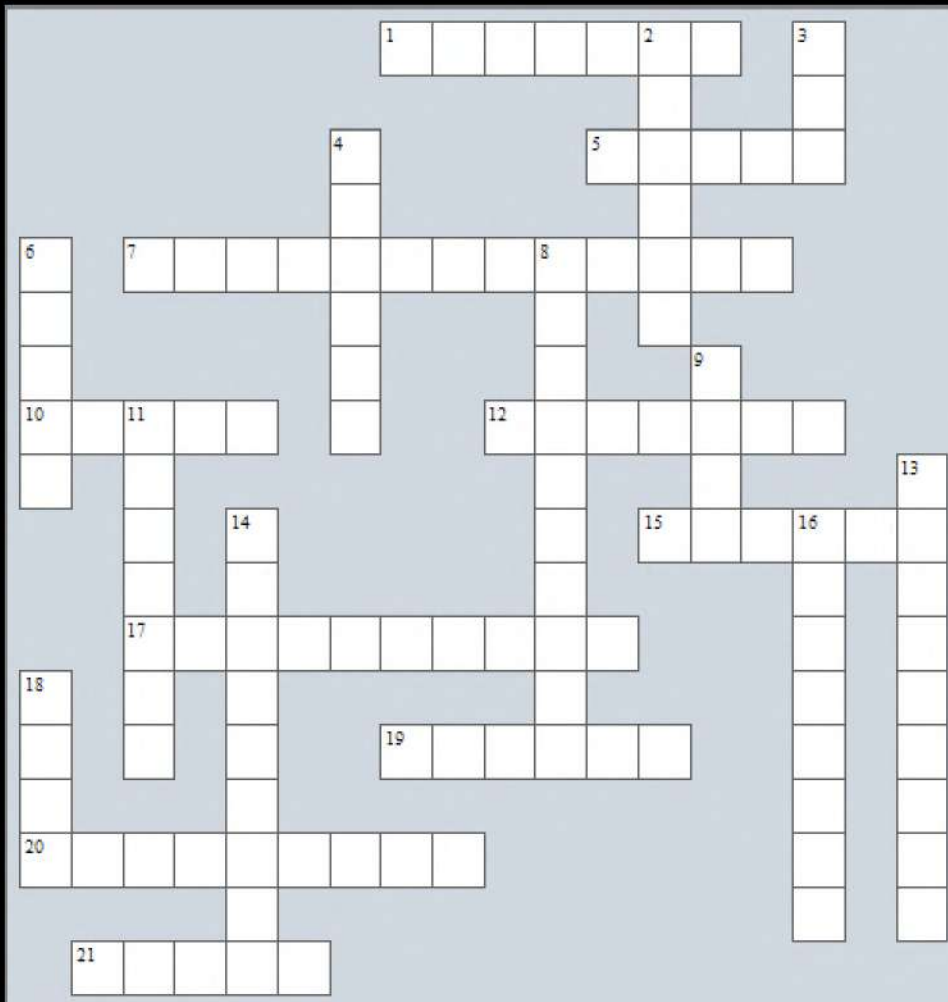
Mrs. Sonali Kathare

Mrs. Sanjivani Nandedkar

Mrs. Shweta Waghmare

Ms. Sheryn Matthew

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Across

1. Standard test signal; seen once a year
5. harmful program; also a famous movie character
7. information transfer
10. integrated electronics acronym
12. event that created the universe
15. father of modern genetics
17. basic electronic instrument
19. instrumentality that combines interrelated interacting artifacts designed to work as a coherent entity
20. name of a galaxy
21. picture elements acronym

*answers will be declared in next edition*

Down

2. NASA's bsot; Also applied before injection
3. group of wires used to transfer data
4. Golden number for aspiring engineers
6. natural processor
8. always completed at eleventh hour
9. an entrance exam; also building blocks of digital electronics
11. unofficial reference book
13. widely used ranged device to device data transfer technology
14. Portable mobile station
16. Not continuous
18. Indonesian Island; also a programming language?

*If you have any suggestion or comment please share with us at [linkedextc@gmail.com](mailto:linkedextc@gmail.com)*



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